THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME XV

NEW YORK
DODD, MEAD AND COMPANY
1926

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Printed in the U. S. A.

The University Press, Cambridge, U.S.A.
Boston Bookbinding Co., Cambridge, U.S.A.

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the KEY TO PRONUNCIATION in Vol. I.

ā as in ale, fate.
a̱ " " senate, chaotic.
â " " glare, care, and as *e* in there.
ă " " am, at.
ä " " arm, father.
ȧ " " ant, and final *a* in America, armada, etc.
a̓ " " final, regal, pleasant.
a̤ " " all, fall.
ē " " eve.
ė̄ " " elate, evade.
ĕ " " end, pet.
ẽ " " fern, her, and as *i* in sir, etc.
e̓ " " agency, judgment.
ī " " ice, quiet.
i̱ " " quiescent.
ĭ " " ill, fit.
ō " " old, sober.
ȱ " " obey, sobriety.
ô " " orb, nor.
ŏ " " odd, forest, not.
o̓ " " atom, carol.
oi " " oil, boil.
o͞o " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
u̇̄ " " unite.
ŭ " " cut, but.
u̱ " " full, put, or as *oo* in foot, book.
û " " urn, burn.
y " " yet, yield.
B " " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.

ch as in chair, cheese.
D " " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g " " go, get.
G " " German Landtag = *ch* in Ger. ach, etc.
H " *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw " *wh* in which.
K " *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̲ " in sinker, longer.
ng " " sing, long.
N " " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh " *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā'b'l (table), kăz''m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on PRONUNCIATION.

A PARTIAL LIST OF THE LEADING ARTICLES IN VOLUME XV

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MANITOBA.
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Mr. John W. Russell.
MANTEGNA.
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MANUAL TRAINING.
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MANUFACTURES.
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MANURES AND MANURING.
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THE NEW INTERNATIONAL ENCYCLOPÆDIA

MAN'ICHÆ'ANS. See MANICHÆISM.

MAN'ICHÆ'ISM. A speculative religious system of western Asia, founded by Mani (q.v.) in the third century of our era. The ideas upon which it was based were mostly Persian (Zoroastrian), but it took some terms from Christianity. The Babylonian elements in it were not so great as was formerly supposed. There may also have been some traces from Buddhism, although this has been questioned by recent critics. The Christianity from which it borrowed was of the Gnostic type (see GNOSTICISM), and Manichæism has been called, not improperly, "the most complete Gnosis." Its western branch came closely in contact with the Church, and appropriated so many Christian ideas and usages that it was sometimes regarded as a heresy, although it was properly a rival system. It differed from Christianity, among other things, in its complete rejection of the Old Testament.

The dualism which Mani taught was radical and materialistic, postulating two opposite original domains, represented respectively by light and darkness, good and evil. They are from eternity contiguous, yet distinct and separate. The kingdom of light included both a heaven and an earth, the latter guarded by good angels (æons). This kingdom has its Good Spirit, or God, whose attributes are set forth in a series of 10 (some say 12) virtues. It is not certain that Mani assumed a second god for his kingdom of darkness, but this kingdom was at least personified, and from it sprang Satan and the evil demons. There is an earth of darkness, analogous to the earth of light, and its five qualities—all obviously evil—are mist, heat, the sirocco, darkness, and vapor. What might be called the equilibrium of the two kingdoms was destroyed by Satan, who overstepped his own boundaries and invaded the light realm. To oppose him God created "primal man," who should be the champion of the invaded kingdom and fight its battles against the evil demons. All this is the prelude to human history.

Mankind came into existence after a long cosmic process, everywhere attended by disturbance and disaster. He is the creation of Satan, who placed in him all the light elements under his control in order to imprison them. Light and dark elements had already become entangled with one another and the conflict had begun before the creation of our present world, but with the advent of humanity it began to wax keener and more tragic. The destiny of the race is to have its light portions finally liberated, which result will accompany the restoration of the lost cosmic order in the universe. Some of the accounts represent the signs of the zodiac as playing an important part in gathering together the scattered particles of light. We also hear of a great final catastrophe, which shall bring the whole process to an abrupt conclusion. The influence of a docetic Christianity appears in Western Manichæism in the notion of the "Jesus patibilis" and "impatibilis." The former term was applied to the light which had become diffused throughout the world. By a peculiar application of the proper name Jesus the sum total of these particles came to be regarded as a being capable of suffering, and actually enduring it, through contact with evil matter. The other term, "Jesus impatibilis," means a sort of phantom, attendant upon the historic Jesus, but not partaker of his human experiences or sufferings. He was rather a messenger descended from the realm of light to aid in the world's redemption. In this work other prophets had taken part, and to crown the series Mani himself appeared, the final prophet of human history. Salvation consists in knowledge of the true nature of the universe and in the final separation of spirit (light) from matter (darkness).

The Manichæans fall into two classes, the *perfecti*, or fully initiated members of the society, and the *auditores*, hearers or novitiates. The hearers constituted by far the larger body, and held the "perfect" in the highest veneration. St. Augustine, before his conversion to Christianity, was for nine years a Manichæan hearer. The elect followed the ascetic rule of life, being distinguished by their threefold "seal" of mouth, hands, and bosom. The *signaculum oris* required abstinence from all defilement through evil speech or animal food; the *signaculum manuum*, abstinence from all avoidable contact with the material world; and the *signaculum sinus*, abstinence from marriage and from all sexual indulgence. The uninitiated were satisfied with a less exacting moral standard, and lived very much as other men and women do.

The Manichæans were organized under a sort of hierarchy, in some respects like that of the Catholic church. Augustine tells us of a graded

system of officers, including 12 teachers, 72 bishops, and a number of elders. Above them all stood one supreme authority, for a long time resident in Babylon, but afterward in Samarkand, who was apparently regarded as the representative of Mani. The worship of the Manichæans was not elaborate. It included, besides the ordinary service of prayer and song, an initiatory rite of baptism, in which oil was used instead of water, and a eucharistic meal. Fasting was emphasized as very important for the elect. An annual festival, called the *Bema*, commemorated the death of the founder, Mani.

From the latter part of the third century Manichæism spread rapidly within the Roman Empire. Among its early adherents were survivors of the Gnostic sects, especially the Marcionites. (See MARCION.) It also won converts from the non-Christian educated classes of Europe, and in Africa even clergy embraced its teachings. By the end of the fourth century it had become one of the three great world systems, competing with Neo-Platonism and Christianity for religious and intellectual leadership. The most notable of its early Christian opponents were Titus of Bostra, Metropolitan Bishop of Arabia, and St. Augustine. The Roman government took measures against the Manichæans almost from the beginning. Diocletian issued an edict against them, commonly dated about 287. Valens (364–378) issued other similar decrees. Manichæans were condemned to exile under Valentinian III (425–455) and to death under Justinian (527–565). But nothing seemed capable of crushing the movement. It survived even the attacks of Islam, and flourished in Asia beyond the tenth century, whence some traces of it came into Europe in the heresies known under the names of the Paulicians, Bogomiles, Cathari, and Albigenses (qq.v.). For references to the literature, see MANI.

MANIÈRE CRIBLÉE, mȧ′nyâr′ krē′blā′ (Fr., sieve fashion). Probably the oldest process of engraving upon metal for the purpose of printing. It derives its name from the white dots with which the dark ground of the print is covered, resembling the holes of a sieve. These dots, which form the outlines of the engraving, were beaten into the plate by means of a punch, the parts hollowed out forming a light image on a dark ground. The plates were made of some soft metal, like brass. The earliest examples of prints, of the Bibliothèque Nationale (Paris), are from Cologne, where the art may have originated, in a manuscript dating at latest from 1406. The manière criblée continued to be practiced as late as the first quarter of the sixteenth century, but was never an important factor in the development of engraving.

MAN′IFEST (Lat. *manifestus*, evident), COMMERCIAL. A document, in commercial navigation, delivered to the officer of customs by the captain of a ship, which gives a list in detail of the cargo in his charge, with the names of the places where the goods were shipped and to which they are addressed.

MANIFES′TO (It., manifest). In international law, a declaration or formal statement of policy or intention which it was formerly customary for a belligerent to publish within its own territory or to communicate to other states through diplomatic agents. With modern conditions of intercommunication, such a formal notification has become less imperative, although commercial interests and international courtesy often render it desirable. See DECLARATION OF WAR.

MAN′IFOLD, IN MOTOR VEHICLE. See MOTOR VEHICLE.

MANIFOLD WRITER. See COPYING MACHINES AND PROCESSES.

MANIHIKI ISLAND. See MANAHIKI ISLAND.

MAN′IHOT. A genus of about 80 species of tall herbs and shrubs of the family Euphorbiaceæ, natives of South America. The best-known species are cultivated in warm climates for their underground parts, which yield a starch known as Brazilian arrowroot, and cassava (q.v.). Other species are rubber-producing plants. See Plate of CARNATIONS, ETC.

MANIL′A, *Sp. pron.* mȧ-nē′lȧ. The capital of the Philippine Islands. It is situated on the west coast of the island of Luzon, at the east end of Manila Bay, at the entrance of the river Pasig, in lat. 14° 35′ N. and long. 120° 58′ E. (Map: Philippine Islands, C 3). The city occupies part of an extensive plain on both banks of the Pasig, and is surrounded on the land side by a semicircle of picturesque mountains. It is divided by the Pasig into two parts, the old walled city and the suburbs. The former lies on the south bank of the river and is surrounded by an old wall with bastions and parapets built about 1590. The wall is 2½ miles long and is pierced by six gateways with drawbridges. The use of the drawbridges was discontinued about 1850 and the moats on the land side of the walls were filled with earth in 1905 for sanitary reasons. The city is surrounded by Manila Bay on the west and the Pasig on the north. The walled city contains the principal public buildings, such as the government offices, colleges, the weather observatory, the archbishop's palace, and the cathedral. The aspect of the old city, essentially mediæval, has materially changed since American occupation. Separated from the old city by the Pasig is Binondo, the centre of the commercial as well as of the industrial activity of the metropolis. Here are situated the principal warehouses, cigar and tobacco factories, the business houses of the European trading companies, and the principal shops. North of Binondo lies the suburb of Tondo, where the working population of the capital lives, chiefly in small houses built of cane and palm leaves. San Miguel, situated on an island formed by an arm of the Pasig, is the fashionable suburb of Manila and contains the fine residences of the wealthy merchants and officials.

Several bridges cross the Pasig from the suburbs, the principal being the Bridge of Spain, a handsome stone structure with a number of arches, leading from Binondo. At the south end of this bridge, and stretching along the Pasig outside the city walls, is the Paseo or Plaza de Magallanes, containing an obelisk erected to the memory of the discoverer of the islands. From this plaza a handsome paseo stretches in a semicircle and terminates on the bay front south of the city, where there is a park and promenade called the Luneta, which is lighted by electricity. Most of the streets of Manila are broad and cross at right angles, and have been greatly improved since American occupation. The street railways are operated by electricity, the streets are well lighted and paved, and by a thorough system of drainage the healthfulness of the city has been greatly improved. Among the buildings of Manila the most prominent is the cathe-

dral, destroyed by the earthquakes of 1863, but rebuilt. The customhouse is a handsome building, also rebuilt since 1863. The best buildings are, as a rule, the convents and some of the churches. Manila is the intellectual centre of the entire archipelago, and has, besides the University of St. Thomas (see MANILA, UNIVERSITY OF), the College of San Juan de Letrán, the medical and pharmaceutical school of San José, a general hospital built and operated by the government, a leper hospital, a hospital for contagious diseases, training schools for nurses, normal schools,. a large military hospital, a home for convalescents, an insane asylum, and the excellent and spacious hospital of San Juan de Dios. The water supply of the city has been greatly improved since American occupation, the water being brought from the Mariquina River 25 miles away to a large storage reservoir about 200 feet above sea level. The drainage system has also been greatly improved, the sewage being discharged into the bay more than a mile from shore by a pumping system.

The chief manufactures are cigars and cigarettes, furniture, boots and shoes, products of the famous Manila hemp or abaca, and some textiles. Iron foundries, machine shops, and various milling establishments are also flourishing. Manila's future, however, will depend chiefly on its commerce. Its harbor has been greatly improved under American rule, by the construction of breakwaters or jetties inclosing about 350 acres of harbor area and dredging this to a depth of 30 feet, and the construction of steel wharves 650 feet long and about 100 feet wide. The Pasig River has also been dredged to a depth of about 20 feet, and the Manila harbor may now be considered the best and most modern in that part of the Orient. The city has steamship communication with many of the great ports on both sides of and in the Pacific Ocean. The larger commercial houses are conducted by Americans and by Spaniards or other Europeans, while the small trade is mostly in the hands of the Chinese, who are very prominent in the commercial activity of the city. Manila exports mainly sugar, hemp, tobacco and cigars, coffee, dyewoods, and precious metals. It is the greatest hemp market of the world. The imports are rice, cotton goods, chemicals, machinery, metal goods, and wine. The trade is chiefly with China, the United States, and Great Britain, the share of the trade with the United States having greatly increased with the removal of all duties on Philippine products entering the United States and the admission duty free into the Philippines of all domestic merchandise from the United States. The population of Manila and suburbs, according to the census of 1903, was 219,941, of whom 189,782 were Filipinos, 21,230 Chinese, 4389 Americans, 2528 Spaniards, and 1117 other Europeans. In 1910 the population was estimated at 234,400. Manila is the centre of a railway system of 475 miles and with its excellent harbor facilities is the chief entrepôt of the Philippine group. A very large share of the $56,000,000 worth of imports and $53,000,000 worth of exports of the islands enters or leaves this harbor. The city received its new charter of incorporation from the Philippine Commission on July 31, 1901, by which the government is vested in a municipal board appointed by the civil Governor of the islands. There is an excellent school system, established by the Americans after assuming control of the islands.

Manila existed as a palisaded native town under the name of Mainila when it was first visited by the Spaniards. In 1569 Juan de Salcedo, a nephew of Legazpi, the conqueror of the Philippines, made an unsuccessful attempt to found a Spanish colony in the town. In 1571 Legazpi himself appeared in the harbor with a Spanish fleet and was admitted into the town by the two native chiefs, who rendered homage to Spain. Legazpi at once strengthened the fortifications and built a church and a number of houses for the Spaniards, and in the same year a municipal government was inaugurated with great solemnity. The city in 1574 was sacked and burned by Chinese pirates; in 1590 the present permanent fortifications were begun. In 1602 an insurrection of the Chinese residents of the city was put down with great severity, several thousands of the insurgents being killed. The same year the city was blockaded by the Dutch. In 1762 it was captured and sacked by the English, who occupied it until 1764.

Towards the end of the nineteenth century Manila became the centre of secret agitation for the overthrow of Spanish sovereignty. Many arrests were made; on Sept. 2, 1896, 13 prominent Filipino citizens were shot at Cavite, and on December 30 Dr. Rizal was executed at Manila. On Aug. 30, 1897, a skirmish with the insurgents took place on the outskirts of the city, which was then declared under martial law. On May 1, 1898, Dewey destroyed the Spanish fleet in Manila Bay—an event which was the signal for a great uprising of the Filipinos against Spanish rule, under the lead of Aguinaldo, and on August 13 the city capitulated to the American forces. It was placed under a military government and policed by a provost guard of American soldiers. During the winter of 1898–99 the city was practically in a state of siege by Aguinaldo's forces until the actual outbreak of hostilities, which began with an unsuccessful attack of the Filipinos upon the Americans at Manila, on Feb. 4–5, 1899. The actual transfer of the military government to the new civil authorities took place on Aug. 7, 1901. In 1914 the constabulary discovered a well-organized native plot to revolt, with headquarters at Manila. About 30,000 Filipinos were involved. It was frustrated by the arrest of several leaders after an abortive attack on the police in the Botanical Gardens.

Manila has a number of times suffered from earthquakes, the most terrible of which occurred on June 3, 1863, when all the prominent buildings were destroyed and several thousand persons killed. Consult the authorities referred to under PHILIPPINE ISLANDS.

MANILA, UNIVERSITY OF (or UNIVERSITY OF ST. THOMAS). A university in Manila which owes its origin to Philip II of Spain, who in 1585 gave permission for its foundation. In 1601 a seminary for nobles was opened here, and in 1611 the Dominicans, supported by the Archbishop of Manila, established the College of St. Thomas for natives and poor Spaniards. In 1619 the college received papal permission to grant degrees and in 1644 was converted into a university. The present institution, however, dates from 1857 and was built up on the basis of the old. In 1871 schools of medicine and pharmacy were added. The university is now organized on the model of similar American institutions and has faculties of theology, canon and civil law, medicine, pharmacy,

philosophy and arts, and engineering. In 1912 the university had an enrollment of 767 students, of whom 655 were in the colleges of law and medicine.

MANILA BAY. A large and beautiful inlet of the China Sea, running into the southwestern coast of Luzon (Map: Philippine Islands, C 3). It has, roughly, the shape of a triangle with its base line, 37 miles long, forming the head of the bay from southeast to northwest, while its apex is at the entrance, which is 11 miles wide. The depth of the bay from the entrance to the base is 25 miles. The land on both sides of the entrance and along the west shore is high and forested; that on the east and north is low, and the north shore especially consists of the marshy delta of the Río Grande de la Pampanga, which enters the bay through numerous mouths, between which tall reeds grow far out into the shallow water. The greater part of the bay, however, has deep water, with good and ample roadsteads at Manila and Cavite, and for harbor purposes it is the finest in the Far East. The entrance is well lighted by a large lighthouse on Corregidor Island and another on the smaller island of Caballo. The bay connects through the Pasig River at Manila with the large Bay Lagoon in the interior of Luzon. Manila Bay was the scene of the victory of Admiral Dewey over the Spanish fleet on May 1, 1898. See SPANISH-AMERICAN WAR.

MANILA FIBRE, or **MANILA HEMP.** See HEMP, MANILA.

MANIL'IAN LAW. A law proposed at Rome in 66 B.C. by the tribune Gaius Manilius, providing for the recall of the commanders then in Asia, where the Romans were fighting Mithridates, and for the extension of Pompey's power over all the East. Pompey was then in the East, clothed with large powers against the Cilician pirates (see CILICIA); Manilius proposed to give him command against Mithridates also. Cicero made his first address to the people in support of the proposition of Manilius. The speech, *Pro Lege Manilia,* or *De Imperio Cn. Pompeii,* is admirable in form, far superior in this respect to the orations against Catiline. It throws much light also on the operations of the publicani (q.v.).

MANIL'IUS, MARCUS. The supposed name of the author of a Latin poem on astrology entitled *Astronomica.* Nothing is known of his personality, but from the poem itself it is inferred that he lived in the reigns of Augustus and Tiberius. Five books of his poem are preserved, treating of the constellations and their influence on human life. The work is of no great poetic value, but exhibits great learning and diligent research in the works of the best authorities. The writer imitates Lucretius and has much of that author's enthusiasm and power to enliven a difficult subject. There are several editions, including those of Scaliger (Leyden, 1579 and 1600), Bentley (London, 1739), Jacob (Berlin, 1846), and Breiter, with Commentary (Leipzig, 1907–09), and an edition of Book ii by Garrod (Oxford, 1911). There is an English translation by Creech (London, 1697). Consult: Lanson, *De Manilio Poeta* (Paris, 1887); R. Ellis, *Noctes Manilianæ* (Oxford, 1891); Martin Schanz, *Geschichte der römischen Litteratur,* vol. ii, part ii (3d ed., Munich, 1913).

MANIN, mä-nēn', DANIELE (1804–57). An Italian patriot. He was born in Venice, May 13, 1804, studied at the University of Padua, and was admitted to the doctorate of laws at the age of nineteen. He was then admitted to the bar, of which his father, Pietro Manin, was an eminent member. After 1831 he became a recognized leader of liberal opinion in Venice. In 1847 his reputation as a political economist was established during the sittings of the scientific congress at Venice. Shortly after he was thrown into prison for a spirited public address against Austrian domination. Previous to the rising against Austria of 1848 Manin was for a second time imprisoned, but when the news came of the revolution in Sicily and of the February revolution in France he was released in triumph by the populace, was placed at the head of the patriotic movement, and was invested with supreme power as President of the restored Republic of St. Mark. The organization of a civic guard and the expulsion of the Austrians from the arsenal were Manin's first public measures. At the same time he prevented the mob from murdering their former oppressors. Manin devoted himself energetically to the organization of the inhabitants for self-defense. For a short time he had to give way to more radical leaders, but was soon recalled. During the invasion of Lombardy by Charles Albert of Sardinia Manin laid down his authority; but on the defeat of the Sardinian army at Novara, March 23, 1849, he resumed power, and was the animating spirit of Venice during the heroic defense of the city for four months against the besieging Austrian army. On August 23 Venice capitulated; but Manin, with 40 of the principal citizens, being excluded from the amnesty, quitted the city. Having lost his fortune in the defense of Venice, he retired to Paris, where he taught his native language, declining innumerable offers of aid. He died there, Sept. 22, 1857. Manin's public career was one of complete unselfishness. Believing as strongly as Mazzini in a republic, he was yet wise enough to see Italy's need, and from his exile in Paris he urged upon his compatriots coöperation with the Sardinian monarchy in effecting the union of Italy.

Bibliography. Rovani, "Di Daniele Manin memoria storica," in *Documenti della guerra santa d'Italia* (Capolago, 1850); Castille, "Manin," in *Portraits politiques au dix-neuvième siècle* (Paris, 1856); Reuchlin, "Daniel Manin," in *Historisches Taschenbuch,* vol. xxxii (Leipzig, 1861); A. Errera, *La vita e i tempi di Daniele Manin* (Venice, 1872); id., *Daniele Manin e Venezia 1804–53* (Florence, 1875); *Daniele Manin e Giorgio Pallavicino: Epistolario politico 1835–57* (Milan, 1877); E. L. H. Martinengo-Cesaresco, *Italian Characters in the Epoch of Unification* (New York, 1901); Ferrari-Bravo and Marloni, *Daniele Manin e i suoi tempi* (Venice, 1904); R. S. Holland, *Builders of United Italy* (New York, 1908). See ITALY; VENICE.

MAN'ING, FREDERICK EDWARD (1812–83). A New Zealand judge, born at Johnville, County Dublin, Ireland. His father emigrated with his family to Tasmania in 1824 and in 1833 young Maning settled among the Maoris of New Zealand. He became a favorite of the natives; was adopted into their tribe; and later he married a Maori wife. He gave good advice to both sides in the wars of 1845 and 1861. From 1865 to 1881 he was judge of the native land courts. A victim of cancer, he returned to England in 1881 and there died. Much credit is due to Maning for the knowledge that has been gained

of the Maoris through his books, *Old New Zealand* (1876; 6th ed., 1906) and *The History of the War in the North with Heke in 1845* (3d ed., 1884).

MAN IN THE IRON MASK, The. See Iron Mask.

MAN'IOC (*Manihot utilissima*). A South American plant, of the family Euphorbiaceæ. Its starchy underground stems are used to make tapioca. See Cassava; Plate of Carnations, etc.

MAN'IPLE (OF. *maniple*, Fr. *manipule*, from Lat. *manipulus*, handful). 1. A narrow strip of silk worn on the left arm by the sacred ministers in a solemn mass. Originally it was a mere linen handkerchief, but since the eleventh century it has been made of the same material and color as the chasuble. When a bishop celebrates mass pontifically he assumes the maniple only at the *Confiteor;* otherwise it is put on in the sacristy with the other vestments. See Costume, Ecclesiastical. 2. In the Roman military organization the legion (q.v.) was divided into 30 maniples, each commanded by a centurion, and consisting of about 100 men in the case of the regular infantry and 40 men among the *velites*, or light-armed skirmishers.

MANIPUR, mä'nê-pōōr'. A native state of northeast India, situated between Assam and Upper Burma, and called by the Burmese Cassay or Kathe (Map: Burma, B 2). Its area is 8456 square miles. It consists chiefly of a deep valley 2500 feet above the sea. The industries are purely agricultural, the chief products being tea, cotton, rice, tobacco, opium, and indigo. The state is administered by a rajah, but has been a political dependency of Assam since 1825. In 1891, during the disputed succession to the throne, the British Commissioner Resident, and several officers were treacherously murdered; a punitive expedition hanged the ringleaders, settled the succession, and resumed the administration under British supervision. Pop., 1901, 283,957; 1911, 346,222, chiefly Hindus. Capital, Manipur.

The natives of Manipur consist of Manipuris proper, Nagas, and Kukis, all of whom are by tradition assigned to a common ancestry. The Manipuris call themselves Meithei, and since their conversion to Hinduism in the beginning of the eighteenth century they claim a Hindu origin. They are of the Mongoloid type of feature and do not resemble the Aryan or Aryanized peoples of Hindustan. Their language is closely allied to the Chin, Lushai, and Kuki tongues. Among the Meithei clan worship of tribal deities and peculiar rain ceremonies prevail, and ancestor worship was probably once in vogue. Each tribe seems to have a rain rite of its own. The Kukis are still migratory, but the Nagas live in permanent villages. Terrace cultivation with irrigation channels occurs in Manipur. The Nagas of Manipur and the mountains to the north are essentially Indonesians, and the Lushai of the south are Nagas mixed with Kyens and Burmese of Arakan. The game of polo was formerly almost peculiar to Manipur and the state was once famous for its breed of ponies. Consult: Grimwood, *Three Years in Manipur* (London, 1891); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Reid, *Chin-Lushai Land* (ib., 1883); Sir James Johnstone, *My Experiences in Manipur and the Naga Hills* (London, 1896).

MANIPUR, or Imphal. The capital of the native State of Manipur (q.v.), on the Namkathay River, 236 miles northwest of Mandalay (Map: Burma, B 2). The town is encircled by a wall and is the centre of a populous district. An export trade is carried on in cattle, tea, and rice. Here in 1891 occurred the massacre of British officials, which led to a change of administration and the establishment of a military cantonment. Pop., 1901, 67,093; 1911, 74,650.

MA'NIS (Neo-Lat., assumed sing. of Lat. *manes*, ghosts; so called from the animal's nocturnal habits). The ordinary and generic name of the scaled anteaters or pangolins of the Old World edentate family Manidæ. Seven species are recognized, all inhabiting the tropical parts of Asia or of Africa. In general structure and habits they resemble the American anteaters (see Anteater), but are singular in having the body covered with horny imbricated scales, between which (except in the adults of the African

Long-tailed Manis or Pangolin.

forms) grow hairs; these scales are sharp-edged and are large upon the trunk and long terete tail, but small on the head, neck, and limbs. A common name is scaly anteater. Their legs are short and strong, and their feet armed with powerful claws, with which they burrow, and in walking those of the forefeet are turned under. They feed, always at night, exclusively on ants and termites, which they procure by means of their long viscid tongue. All are able to roll themselves into a ball, which a man's strength is unable to open, and thus they present to their enemies only an armored surface, after the manner of armadillos. The largest species are those of Africa, and live upon the West Coast, one (*Manis gigantea*) reaching a length of 6 feet, including the tail. The one called phatagen by the ancients was probably the long-tailed manis (*Manis macrura*). A third, the short-tailed (*Manis temminckii*), ranges all across south Central Africa. The three Asiatic species are little different. One, common in India (*Manis pentadactyla*), has a body 2½ feet long and dwells in rocky places. A second species ranges eastward to China, and a third, more slender and long-tailed (*Manis javanicus*), is the one originally called by the Malays pangolin, a term often now applied to the whole genus. They do not live well in captivity and show but little signs of intelligence. Consult writers on the zoölogy of India and Africa; also W. T. Hornaday, *Two Years in the Jungle* (New York, 1885); F. E. Beddard, *Mammalia* (London, 1902); C. W. Beebe, in *New York Zoölogical Society, Bulletin*, vol. xvii (New York, 1914).

MANIS'SA, or Manisa (the ancient Magnesia ad Sipylum: see Magnesia, 1). A town of Asia Minor, in the Vilayet of Aidin, 40 miles northeast of Smyrna, with rail connection (Map: Turkey in Asia, A 2). It has numerous mosques, one Armenian and several Greek churches, four

synagogues, and several notable secular buildings, among them the palace of Kara Osman Oglu. The chief industries are the manufacture of cotton goods and pack saddles. Pop., about 35,000, including 13,000 Greeks, 6000 Armenians, and 3000 Jews. For history and archæology, see MAGNESIA, 1. Consult Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914).

MANISTEE, măn'ĭs-tē'. A city and the county seat of Manistee Co., Mich., 114 miles by rail northwest of Grand Rapids, on the Manistee River, which flows between Manistee Lake and Lake Michigan, a distance of 1 mile, and on the Pere Marquette, the Manistee and Northeastern, and the Michigan East and West railroads (Map: Michigan, C 4). It has a fine harbor and regular steamship communication, during the open season, with Chicago, Milwaukee, and other points on the lake. The city is in a fertile fruit-growing region, and its excellent transportation facilities have developed large commercial interests, particularly in lumber and salt, which are manufactured on an extensive scale. There are manufactures also of furniture, foundry products, vacuum pans, and sole leather. The principal features of interest are a fine courthouse, Carnegie library, Mercy Hospital, Home for Aged Women, Federal building, two bridges across the Manistee River, and Orchard Beach, a popular lake resort. Settled about 1849, Manistee was chartered as a city in 1869 and adopted the commission form of government in 1914. The city owns and operates the water works. Pop., 1900, 14,260; 1910, 12,381.

MANISTIQUE, măn'ĭs-tēk'. A city and the county seat of Schoolcraft Co., Mich., 107 miles by rail west by south of Sault Ste. Marie; on Lake Michigan, at the mouth of the Manistique River, and on the Minneapolis, St. Paul, and Sault Ste. Marie, the Ann Arbor, and the Manistique and Lake Superior railroads (Map: Michigan, C 3). It has some reputation as a summer resort, but is known chiefly as an industrial and commercial centre, its trade being carried on both by rail and lake. There are limekilns, ironworks, and manufactories of lumber, chemicals, alcohol, cedar products, and charcoal. The fishing interests also are important. There are municipally owned water works and a public library. Manistique received a city charter in 1901. Pop., 1900, 4126; 1910, 4722.

MANITO. See MANITOU.

MANITOBA, măn'ĭ-tō'bà. A province of the Dominion of Canada, extending from the international boundary line to Hudson Bay, situated between 49° and 60° N. lat. and between 92° and 101° 20′ W. long. (Map: Canada, L 5, 6). It is bounded on the north by the Northwest Territories, on the east by Ontario, on the south by the States of Minnesota and North Dakota, and on the west by Saskatchewan. Area, 251,832 square miles, including 19,906 square miles of water.

Topography. The province belongs to the great central prairie region in the south and west, and in the east and north it is a part of the Laurentian country, broken and hilly, with a higher altitude than the adjoining region. The southeastern part consists of an almost perfectly level lacustrine bed, the bottom of the Pleistocene Lake Agassiz. (See LAKE AGASSIZ.) It slopes very gently northward, being 800 feet above the sea in the south and 710 feet in the north. Its western boundary is formed by a line of escarpments with a maximum height of 500 feet above the plain and running southeast to northwest. These are the ancient shore lines of Lake Agassiz, and above them stretches a more elevated and undulating plain known as the Riding and Duck Mountains, which cover the western and southwestern parts of the province. Both this plain and the lacustrine plain below are treeless prairies, becoming gradually wooded northward, first along the river courses and in isolated clumps of poplars, and finally thickening into dense pine forests on the Duck Mountain in the northwest. The principal river is the Red River of the North, which enters the province from the south and flows through the prairies into Lake Winnipeg in the southern part of the province. Its chief tributary is the Assiniboine, cutting through the western upland. Nearly all the rivers of the province have cut their beds through the soft drift deposits, so that they flow in narrow valleys from 30 to nearly 100 feet below the surrounding plains. As the waters of Lake Agassiz were drained off the lowest depressions of its bed remained flooded and now form the great lakes of the province. Of these Lake Winnipeg is 270 miles long and from 20 to 60 miles broad, Lake Winnipegosis 150, and Lake Manitoba 135 miles long. The last named is very shallow, and the shores of all are low and marshy.

Climate. The climate is very cold in winter and warm in summer. The mean annual temperature is 33° F., and the extremes 95° F. and 40° or even 50° below zero F. Both extremes, however, are rendered bearable by the dryness of the air; and the winter cold does not interfere with the wheat crops, as the sowing season arrives here even earlier than in the eastern provinces which lie farther south. The mean annual rainfall is only 17.43 inches, but 74 per cent of it falls in growing seasons, the winters being dry and sunny and the snowfall light.

Geology and Minerals. The Laurentian system of ancient crystalline rocks extends into the northern and eastern part of the province, from the east shore of Lake Winnipeg nearly to Hudson Bay. It is bordered by a belt from 60 to 120 miles wide of Silurian and Devonian limestones running from southeast to northwest through the east-central part of the province and forming the western shore of Lake Winnipeg. The remainder of the plains consists of Cretaceous and Laramie formations. Nearly the whole surface, however, is covered with a thick deposit of glacial drift. The principal minerals are lignite and coal, which are mined to some extent along the Souris River, near the southern boundary. By a recent law the settlers are allowed to mine for home use the outcropping coal on public lands by paying a small royalty to the government. Some deposits of iron are also found, but are not worked. Extensive deposits of gypsum have been found in the Dauphin District, north of Lake St. Martin. Gold is found near the east boundary, in the Lake of the Woods area. Brine springs exist on the peninsulas in the southern part of Lake Winnipegosis, but no salt has been manufactured.

Soil and Productions. The poor soils characteristic of the Laurentian region prevail in the eastern part of the province, and in the hills to the west the soils are also of a poor quality. Over the greater portion of the western plains the soil consists of a very deep mold or loam with a tenacious clay subsoil. The best quality

MANITOBA
SCALE OF MILES
0 10 20 30 40 50
Railways thus:
Longitude 99 West from Greenwich
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is found in the Red River valley, which was formerly the bed of Lake Agassiz, and the soil of which is therefore a lake deposit. The Red River valley has become famous for its enormous production of the finest qualities of wheat. The region farther to the west also produces abundantly and contains vast fields of wheat.

Agriculture. The main economic interests of the province centre in agriculture. The hardier grain and root crops are grown with great success, but the season is too short for corn. In extent of area the annual crop of wheat is greatly exceeded by many American States, but the grade of wheat is unexcelled. Oats are also extensively grown, and barley, potatoes, and flax are important crops. The increase and variation of acreage of the leading crops are shown in the following table.

	1913	1911	1901
Wheat	2,804,000	3,094,833	1,965,200
Oats	1,798,000	1,307,434	573,858
Barley	496,000	448,105	139,672
Forage crops	177,000	166,615	43,667
Flax	54,000	79,765	14,404
Potatoes	26,000	26,488	16,042

The decline in wheat acreage in 1913 is due in part to the growth of mixed farming and stock raising. The grasses, both natural and cultivated, grow luxuriantly and afford excellent pasturage. The variation in the number of domestic animals is shown in the following table, taken from official returns.

	1913	1911	1901
Horses	304,088	280,374	163,867
Milch cows	152,792	155,337	141,481
Other cattle	256,926	279,776	208,405
Sheep	42,840	37,322	29,464
Swine	184,745	188,416	126,459

The figures in the above tables for 1901 and 1911 are taken from the census for those years respectively, and those for 1913 are the estimates of the Census and Statistics Office, Ottawa.

The value of the butter and cheese product in 1910 was $593,375. In 1910 there were produced 694,712 pounds of cheese, valued at $81,403. In 1910 the butter production was 2,050,487 pounds, valued at $511,972.

Game and Fisheries. Large numbers of game and fur-bearing animals continue to abound in the north (a region now known as New Manitoba) and are profitably hunted. They include the deer, antelope, elk or wapiti, moose, reindeer or caribou, marten, mink, fisher, and muskrat. Duck, grouse, quail, woodcock, and plover are found in great numbers. Of greater importance are the resources of fish in the large lakes. Large quantities of whitefish, pickerel, sturgeon, and other varieties are caught annually. Assistance from the Dominion government is given for the development of markets for fresh fish in the interior of the provinces by payment of one-third of the ordinary express charges from the Atlantic coast on shipments of fresh fish as far west as the east boundary of Manitoba and from the Pacific coast as far east as that boundary. Manitoba has four of the 51 fish hatcheries supplied by the Dominion government. The value of the Manitoba catch in 1913 was $800,149.

Transportation, Manufactures, Banks. The Dominion, provincial, and municipal governments have aided in the construction of railroads and an admirable system has been developed in the southern portion of the province and is being extended northward. The Canadian Pacific, Grand Trunk Pacific, and Canadian Northern pass through it and establish communication with both the Atlantic and Pacific oceans. Branch lines of the Northern Pacific Railroad pass up the Red River valley and establish connection with the railroad systems of the United States. The National Transcontinental enters Manitoba on the east boundary and runs to Winnipeg. A railway line was under construction by the Dominion government in 1914 from Le Pas in Manitoba to Hudson Bay. There were, in 1913, 3993 miles of steam railway in operation in Manitoba and 872 miles in course of construction. The large lakes to the north, together with the Saskatchewan River system, afford possibilities for an extensive development of water communication with the region to the north and west—possibilities which have only just begun to be realized. The Red River to the south and the Assiniboine to the west are also navigable during the high-water season, but have been little used since the construction of railroads. Enormous quantities of wheat are annually exported to English markets, and exports of hard wheat to the United States for milling purposes and for mixing with the softer varieties of wheat show a substantial increase.

The manufacturing industries, which in 1900 were chiefly represented by flour and lumber mills, had increased in 1905 to 354 establishments, with $27,517,297 invested capital, employing 10,333 hands, with salaries and wages of $5,090,791 and an output valued at $28,155,732; in 1910 there were 439 establishments, an invested capital of $47,941,540, employing 17,325 hands, paying $10,912,866 in wages and salaries, and with an output valued at $53,673,609. Winnipeg in 1910 was the fourth manufacturing city in Canada.

In 1914 the bank branches located in Manitoba numbered 205. In 1913 the clearing-house transactions at Winnipeg amounted to $1,634,977,237, making this place third among Canadian commercial centres in the importance of its clearing-house transactions.

Population. The population of Manitoba has been acquired almost wholly since 1870. In that year there were only 2000 whites in the province and an Indian half-breed population of about 10,000. In 1881 the population had increased to 62,260, in 1891 to 152,506, in 1901 to 255,211, and in 1911 to 455,614. In 1911, of the total population of 455,614 those born in Canada numbered 264,828 and those born in the British Isles and possessions, 91,606; the foreign born numbered 95,688, of whom 78,051 were born in continental Europe and 16,326 in the United States. There were 10,822 Indians in 1913. Winnipeg had in 1911 a population of 136,035; Brandon, 13,839; Portage la Prairie, 5892; and St. Boniface, 7483.

Government. The government of Manitoba consists of a lieutenant governor, appointed by the Governor General in Council of Canada, an executive council of seven members, responsible to the provincial Legislature, and the Legislative Assembly of 41 elective members. The seat of government is Winnipeg. Up to 1890 French

was the official language used by the Legislature. The common law of England is in force in the province. Manitoba sends four Senators and 10 members of the House of Commons to the Dominion Parliament. Practically universal manhood suffrage exists, and the time requirement is one year in the province and three in the electoral division. The judicial system consists of the Court of Appeal, with a chief justice, who ranks as chief justice of Manitoba, and four minor judges; the Court of King's Bench, with a chief justice and five minor judges; and also surrogate courts, county courts, police magistrates, and justices of the peace. The rural regions are organized into townships, and the denser units of population are organized into villages, towns, or cities, according to number of inhabitants. In each of these the governmental affairs are intrusted to a council (called board of aldermen in cities), as is true also of the counties, the members of the county council being elected by the townships and villages.

The receipts and expenditures show a gradual increase from less than $900,000 each in 1880 to $5,788,070 and $5,314,849 respectively for the year ended Nov. 30, 1913. The principal items of revenue were as follows: the Dominion subsidy, $1,349,895; provincial telegraph and telephones, $1,814,407; sales of provincial lands, $323,769; land titles, general fees, $328,137; liquor licenses, $162,466; succession duties, $268,009; railway tax, $205,358; interest on school land funds, $237,488. The principal items of expenditure were: public works, $1,322,963; education, $668,832; Treasury Department, $798,837; Department of Agriculture and Immigration, $411,781; Attorney-General's Department, $563,491. The Dominion subsidy, which forms a large part of the receipts, was increased by reason of the extension of Manitoba's boundaries in 1912. On Nov. 30, 1912, there were 1296 prisoners and insane persons in provincial institutions. Of charitable institutions the province maintains in whole or in part 11 general hospitals, two orphanages, a home for incurables, a deaf and dumb institution, a woman's home, and a Salvation Army rescue home. One of the five Dominion penitentiaries is located in the province.

Public Utilities Commission. An important measure was enacted in 1912 establishing the control of a commission, consisting of a commissioner and his secretary, over all the public utilities subject to the legislative authority of the province (including telegraph and telephone lines, companies furnishing water, gas, heat, light, or power either directly or indirectly to the public), the provincial government telephones and the business carried on under the Manitoba Grain Elevators Act, and also such municipalities as shall properly consent to come within the authority of the commission. The latter has the powers of a court of record, can enforce its judgments, value the property of public-service corporations, regulate rates, control issues of stocks and bonds, and compel a uniform system of accounting. The judgments of the commission are final, except as to questions of jurisdiction, from which an appeal can be taken. Municipal franchises are subject to the commission's approval. The work of the commission was watched with much interest because of its importance as an economic and political experiment. The report for 1913 showed the commission at work shaping the measures resulting in obtaining a Winnipeg water supply and procuring the consent of two cities, four towns, and certain rural municipalities, all of which were to share in the benefits. Other work done included investigations and reports upon publicly owned property and awards and decisions affecting disputes between municipalities and railway companies. Public approval of certain measures was secured by vote in various municipalities and, wherever necessary or expedient, popular opinion is sought in order to strengthen the efforts of the commission. Public confidence therein has thus far resulted from the judicial power and responsibility, subject to provincial legislation, with which the commission is invested, and which enable it to procure adequate evidence and the aid of experts.

Religion. The Roman Catholic church was first in the field, missions having been established among the Indians at a very early day. Among the more recent colonists, however, the Protestants have greatly preponderated, Roman Catholics in 1911 numbering 73,994, less than one-sixth of the total population. A Roman Catholic archbishop resides at St. Boniface, and the see house of the Anglican Bishop of Rupert's Land is at Winnipeg. Of the Protestants in 1911 the Presbyterians (103,621), Anglicans (Episcopalians) (86,578), Methodists (65,897), Baptists (13,992), Lutherans (32,730), and Mennonites (15,600) were the most important. There were 31,042 adherents of the Greek church in 1911.

Education. Originally the school system of Manitoba recognized a complete separation of Roman Catholics and Protestants, but in 1890 the schools were made undenominational; the Act making this provision was unsatisfactory to the Roman Catholics, and was amended in 1897 so as to admit of religious instruction when demanded by the parents of a certain number of pupils, but which would not be obligatory upon the other pupils, nor lead to the establishment of separate schools. According to the report of the Minister of Education for the year ended June 30, 1913, the school population numbered 99,750, of whom 83,679 were enrolled in the public schools and 48,163 were in average attendance. In the same year there were 2964 teachers and 2430 schools. Of the teachers 500 were male and 2464 were female. The value of school property was $8,780,076. There were 13 high schools, 16 collegiate institutes, and a normal school. The provincial university elected its first president, Dr. James A. MacLean, in 1913, and in 1914–15 had made rapid progress towards establishing a teaching faculty and accomplishing an extensive building programme. Formerly the university was only an examining and degree-conferring body. Several theological and other colleges are affiliated with it.

History. Sieur de la Verandrye (q.v.), a French Canadian explorer, twice visited the territory now included in Manitoba, building Fort de la Reine, on the site of Portage la Prairie, in 1733, and five years later Fort Rouge, on the site of Winnipeg. The fall of Quebec in 1759 opened to British fur traders and merchants a vast tract previously held by the French and stimulated fur trading in the vast regions controlled by the Hudson's Bay Company. The Northwest Company, founded in Montreal in 1795, became a powerful rival of the latter. A

race of half-breeds, sprung chiefly from the marriages of French and Scotch employees of the two companies with Indian women, began to settle along the banks of the Red and Assiniboine rivers, acquiring squatters' rights, which they afterward resolutely defended. In 1811 the Earl of Selkirk, a member of the Hudson's Bay Company, attracted by the fertility of the soil on the banks of the Red River, obtained from the company a grant of a large tract of land on both banks of the river, extending some distance within the present frontier of the United States. The following year he brought out a number of settlers from the Highlands of Scotland. The right of the Hudson's Bay Company to grant this land was, however, disputed by the Northwest Company, and when the settlers began to build they were driven off by the servants of the Northwest Company. Hostilities continued between the servants of the two companies for several years, and in 1816 there was a pitched battle between them. The Earl of Selkirk, arriving soon after, found his settlers scattered; but by his energetic measures, and by help of 100 disbanded soldiers from Europe whom he had brought with him, he secured for his old and new protégés a peaceful settlement. They established themselves near Fort Garry (now Winnipeg), and in 1817 the Earl obtained from the Indians a transfer of their right to the land 2 miles back from the Red River on both sides. Still the settlers had some difficulties to overcome, especially from visitations of grasshoppers. These were gradually surmounted; but the population, including now a large number of half-breeds, remained very isolated, having little communication with the outside world. The Northwest Company was amalgamated in 1821 with the Hudson's Bay Company. Between 1841 and 1867 the acquisition and organization of the vast territories exploited by the fur companies had been much discussed by statesmen of the old Province of Canada, but no decisive action was taken until 1869, two years after Confederation.

In that year the Hudson's Bay Company surrendered all their claims to the Northwest Territories to the British government, which in the following year transferred that region to Canada. While the proposed transfer to the British crown of the Hudson's Bay Company was pending this portion of their dominions was the scene of considerable contention and violence. The French-speaking population, led by Louis Riel (q.v.), a half-breed, organized a force, imprisoned their English and Scotch opponents, seized Fort Garry, established a provisional government, robbed the strong box, and dictated terms to the governor of the Hudson's Bay Company, to which he had to submit. A military force under Colonel Garnet (later Field Marshal Viscount) Wolseley arrived in the province in July, 1870, and Riel, fearing capture, fled, upon which the insurrection collapsed. In 1870 that portion of the Red River district between long. 96° and 99° W. and lat. 49° and 50° 30′ N. was organized as the Province of Manitoba, and its admission to the Confederation took place in July of the same year. Discontent among the Indians was allayed by several treaties (1871–77) under which reservations were allotted to them, with the option of living therein after the manner of the white population or of retaining their native customs. Canadian and American commissioners worked together to define the international boundary between the United States and Manitoba (1872). In 1873 the Royal Northwest Mounted Police was organized (see MILITARY POLICE), and two years later amnesty was granted to those who took part in the rebellion of 1869, excepting Riel and two of his confederates. Although the rights of the Indians were thus early safeguarded, the half-breeds were neglected, with the result that in 1885 there was another rebellion (see SASKATCHEWAN), likewise headed by Riel. The rebellion was suppressed the same year and Riel was captured and hanged. Manitoba became involved in the boundary dispute between the Dominion and Ontario. Sir John A. Macdonald, unfavorable to Ontario's assertion of provincial rights, procured in 1881 the passage of a bill extending the boundaries of Manitoba towards the west, which would have taken from Ontario part of the territory awarded to that province in 1878. Ontario vigorously opposed this threatened loss, proceeded in 1883 to assume full ownership and control of the disputed area, and was thus brought into political conflict with Manitoba. Besides the effort to enlarge her boundaries, Manitoba also contended for larger grants from the Dominion Treasury and freedom from the monopolistic construction privileges of the Canadian Pacific Railway. These privileges were abolished in 1888. The boundary claims of the province were rejected by a decision of the Judicial Committee of the Privy Council in 1884, but the dispute continued until 1912, when it was finally settled by the addition of 178,100 square miles to the old provincial area. The Dominion subsidies to Canada were also increased. In 1890 the question of parochial or separate schools went far to make Manitoba the storm centre of federal as well as provincial politics. In 1871 the province had established a system of separate schools under which Roman Catholic pupils were controlled by the Roman Catholic section of a general school board. Thomas Greenway (q.v.), the provincial Premier, procured the enactment of laws abolishing separate schools and the official use of the French language in the province. This was strongly resented by the Roman Catholic and French-speaking population, and a struggle ensued for the repeal of the obnoxious legislation. The French of Quebec and Roman Catholics throughout the Dominion sympathized with the minority in Manitoba. The case was taken eventually to the highest court of colonial appeal, the Judicial Committee of the Privy Council, whose decision referred to the Dominion government the duty and task of enforcing a remedial measure against Manitoba, according to the provisions of the British North America Act. The question thus became a federal issue and excited prolonged and bitter controversy. The Conservatives favored the forcing of Manitoba to change the new school law; the Liberals advocated a milder course. Upon the advent of Wilfrid Laurier to the Dominion premiership in 1896, his administration, together with the Manitoba administration of Thomas Greenway, arranged a compromise whereby, without the full restoration of separate schools, religious instruction was to be given after regular school hours to the children of either Protestant or Roman Catholic parents. This arrangement was agreeable to the party of provincial rights, but it did not placate the Roman Catholic population.

After 1896 a large increase in immigration and agricultural production gave rise to new economic and political problems. The Liberal and Conservative parties respectively in the province were in large part affiliated with the corresponding parties in Dominion politics; but both showed a greater readiness to increase government initiative in the ownership and supervision of public services, though the leading part therein was taken by the Conservatives. Prohibition of the liquor traffic became a party question, the Liberals generally advocating abolition of the bar and the Conservatives local option. In 1905 the Conservative administration of Sir R. P. Roblin (q.v.), who had become Premier in 1900, passed a high-license bill; but the movement for abolition of the bar was vigorously continued. Premier Roblin sought to conciliate the Prohibitionists by a measure for the earlier closing of saloons (1914). Reorganization of the Court of King's Bench, the creation of a Court of Appeal, and the compulsory display of the British flag on public schoolhouses had been effected by 1907. Railway extension to districts with few or no transportation facilities was also aided liberally, and in 1908 an important step in the ownership and regulation of public utilities was taken in the government's purchase and operation of the Bell telephone system. A workmen's compensation act was passed in 1910. An elaborate system of elevators for the storage of grain and the facilitation of shipments thereof under the Canada Grain Act (1912) had been organized in Ontario, the Northwest Provinces, and British Columbia; and Manitoba participated importantly therein on account of Winnipeg being one of the centres for grain inspection, the others being the great terminal elevators at Port Arthur and Fort William, Ontario. Consolidation and regulation of public utilities became the subject of notable legislation in 1912. See section on *Public Utilities Commission.*

The question of religious education in 1912–14 became more urgent on account of the increasing variety of immigration. The lingual provisions of the school compromise of 1897, and the giving of religious instruction after school hours, became more difficult because of the demands of German, Scandinavian, and Slav elements of the population. The law implied that teachers of children speaking other than English must qualify to teach them in their mother tongue as well as in English. The Liberals favored compulsory education and the strict enforcing of the teaching of English; the Conservative government, a liberal construction of the law. It was recognized that the question contained elements of future disturbance. The War in Europe (q.v.) aroused demonstrations of loyalty throughout the province; nevertheless, in certain German newspapers contrary sentiments and opinions were expressed until prohibited by the government. The Royal Northwest Mounted Police, part of which force is employed in the more unsettled parts of Manitoba, was increased by 500 men in order to deal more effectively with disturbing conditions due to the war.

The lieutenant governors of Manitoba since its incorporation into the Dominion in 1870 are: A. G. Archibald, 1870–72; Francis G. Johnston, 1872; Alexander Morris, 1872–76; Joseph E. Cauchon, 1876–82; J. C. Aikins, 1882–88; Sir John Schultz, 1888–95; J. C. Patterson, 1895–1900; Sir D. H. McMillan, 1900–11; Sir D. C. Cameron, 1911– .

The different premiers of provincial administrations since 1870 are: Alfred Boyd, 1870–71; Marc A. Girard, 1871–72; H. J. H. Clarke, 1872–74; Marc A. Girard, 1874; R. A. Davis, 1874–78; D. H. Harrison, 1878–88; Thomas Greenway, 1888–1900; Hugh J. (afterward Sir) Macdonald, 1900; R. P. (afterward Sir) Roblin, 1900– .

During the earlier years of provincial administration party lines were not very strictly drawn; but with the Liberal administration of Thomas Greenway and the Conservative administrations of H. J. Macdonald and R. P. Roblin Manitoba had developed a regular party system.

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MANITOBA, Lake. A body of water in the Province of Manitoba, Canada, intersected by the fifty-first parallel and the ninety-ninth meridian (Map: Manitoba, E 3). It is about 60 miles southwest of Lake Winnipeg, which receives its waters through the Saskatchewan, or Dauphin, River, which, near the middle of its course, expands into St. Martin's Lake. Manitoba Lake is about 125 miles long and about 25 miles wide; area, about 1900 square miles. It is 40 feet higher than Lake Winnipeg, and navigable for vessels drawing 10 feet of water. It abounds in fish, and its shores are resorted to by sportsmen for moose, elk, deer, and wild fowl. At its north end it receives the waters of several smaller lakes, and at the south those of the White Mud River. The scattered settlements around are inhabited chiefly by Norwegians and Icelanders.

MANITOU, măn'ĭ-to͞o. A town in El Paso Co., Colo., 6 miles northwest of Colorado Springs, on the Colorado Midland and the Denver and Rio Grande railroads (Map: Colorado, E 3). The centre of a region renowned for picturesque scenery, Manitou is situated about 6300 feet above the sea, at the junction of and in three cañons—Ute Pass, William's Cañon, and Engleman's Cañon—at the foot of Pikes Peak (q.v.). A number of important mineral springs, which are valued for their medicinal properties, and the many natural attractions of the vicinity, combine in making Manitou one of the most popular health and pleasure resorts in the United States. The varied features of interest are the Pikes Peak Cog Railway, which begins here, the

Cave of the Winds, cañons, falls, drives, Soda Spring Park, and the famous Garden of the Gods (q.v.), which contains picturesque formations of red and white sandstone. The town contains a Carnegie library and a tuberculosis sanitarium. Spring water is bottled and shipped in large quantities. The population in summer is estimated at between 10,000 and 15,000. Pop., 1900, 1303; 1910, 1357.

MANITOU, or **MANITO** (Algonquian Indian, mystery, supernatural). An Algonquin word now used in current writing to designate a special religious concept common to the Algonquin-speaking Indian tribes of the Great Lake region. These Indians believe in the existence of a cosmic mysterious property pervading the universe and manifest everywhere. In their sacred mythology this element is personified in various manlike gods spoken of as the manitous, but the Algonquin never ceases to feel that the real manitou property may and does reside in any and all things. It is fairly evident that there is not and never was in primitive Indian beliefs any conception corresponding to the modern civilized idea of God or Deity. The manitou might be a supernatural being of any grade however low, and, further, anything mysterious or beyond comprehension was manitou. Another term of Chinook origin, viz., tamanuus, is now widely used in the Northwest of North America to express much the same conception, and the cult of the tamanuus as a protecting spirit of an individual has thrown much light on shamanistic customs and beliefs. A similar conception is termed wakanda by the Sioux and orenda by the Iroquois. In Melanesia there is the strikingly similar notion of "mana." Mana is believed to effect anything outside the ordinary course of nature; thus, a strangely shaped stone is interpreted as containing mana, and any conspicuous success achieved by a person is ascribed to his possession of mana. The occurrence of this conception in two quite distinct culture areas has led a number of writers to ascribe to it an important place in the development of religious beliefs. It has been assumed by some that the Algonquian manitou is an essence or force, but Radin's most recent data indicate that this is an abstraction created by the investigators: "If a belief in a manito 'essence' or 'force' exists, it is as a characteristic of a manito" (being). This again strengthens the resemblance with mana, for, while impersonal, mana is always connected with some directing personal agency (Codrington). Consult: R. H. Codrington, *The Melanesians* (Oxford, 1891); Jones, "The Algonkin Manitou," in *Journal of American Folk-Lore* (Boston, 1905); F. W. Hodge (ed.), *Handbook of American Indians North of Mexico* (Washington, 1907–10); Saintyves, *La force magique* (Paris, 1914); Paul Radin, "An Introductive Enquiry into the Study of Ojibwa Religion," in *Ontario Historical Society, Papers and Records*, vol. xii (Toronto, 1914). See INDIANS, AMERICAN; TOTEMISM.

MANITOULIN (măn'ĭ-tōō'lĭn) **ISLANDS.** A group situated in Lake Huron, from whose north shore it is separated by North Channel, varying from 7 to 18 miles in breadth (Map: Ontario, B 2). It comprises Great Manitoulin, or Sacred Isle; Little Manitoulin, or Cockburn Isle, belonging to Great Britain; and Drummond Isle, belonging to the State of Michigan. Great Manitoulin is 90 miles long by 5 to 30 broad; Little Manitoulin is circular in shape and has a diameter of 7 miles; Drummond Isle is 24 miles long by from 2 to 12 broad. All are irregular and striking in their natural features; the first two are covered with large and dense forests of pine. The islands afford good fishing and the various villages on them are favorite summer resorts. Half of the resident population are Ojibwa Indians. Pop., 2000.

MANITOWOC, măn'ĭ-tō-wŏk'. A city and the county seat of Manitowoc Co., Wis., 75 miles north of Milwaukee, on Lake Michigan, at the mouth of the Manitowoc River, and on the Chicago and Northwestern, the Ann Arbor, the Minneapolis, St. Paul, and Sault Ste. Marie, and the Pere Marquette railroads (Map: Wisconsin, F 4). It has a fine harbor with good docking facilities and considerable lake commerce, the shipments being principally grain, flour, cheese, coal, etc. The city is chiefly interested in the building of ships; other industrial establishments include aluminium-ware factories, cigar factories, extensive malt houses, grain elevators, coal docks, planing mills, brick yards, furniture and canning factories, machine shops, and edge-tool and agricultural-implement works. The County Insane Asylum, the Holy Family Hospital, and a Polish orphan asylum are situated here. Other noteworthy features are the Training School for Teachers, public library, and three beautiful parks. Manitowoc was chartered as a city in 1870. The water works and electric-light plant are owned by the city. Pop., 1900, 11,786; 1910, 13,027; 1914, 13,553; 1920, 17,563.

MANIZALES, mä'nē-sä'lās. A town of Colombia, the capital of the Department of Caldas. It is situated 100 miles northwest of Bogotá, and at the junction of the main routes over the Central Cordillera, 6400 feet above sea level (Map: Colombia, B 2). It was founded in 1848 and has had a very rapid growth. The town is a thriving commercial centre and is of great strategic importance. It has gold-mining and stock-breeding industries, a bank, and a public library. Pop., 1905, 24,676; 1912, 34,720. The town was the headquarters of the rebels during the civil war of 1877–78.

MANKATO, măn-kā'tō. A city and the county seat of Blue Earth Co., Minn., 86 miles southwest of St. Paul, at the confluence of the Minnesota and Blue Earth rivers and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Chicago Great Western railroads (Map: Minnesota, D 6). It has a State normal school, a fine Federal building, Carnegie library, a ladies' seminary (Lutheran), a Catholic mother house, two commercial colleges, and Immanuel and St. Joseph's hospitals. Other places of interest are the spot where 38 Indians, convicted of murder, were hanged during the Sioux Indian outbreak in 1862; Minneopa State Park, which has picturesque falls; and Rapidan Dam. The city is in an agricultural region and has extensive quarries of stone. Excellent water power is afforded the industrial establishments, which include flour and knitting mills, foundries and machine shops, lime, brick, and cement works, woodworking plants, and manufactories of shirts, overalls, traction engines, cigars, candies, incubators, steam engines, tents, awnings, brooms, etc. Mankato adopted the commission form of government in 1910. The water works are owned by the city. Pop., 1900, 10,599; 1910, 10,365; 1920, 12,469.

MAN'LEY, or **MANLY**, JOHN (1733–93).

An American naval officer, born at Torquay in England. He removed to Marblehead, Mass., and at the outbreak of the Revolution joined the naval forces of the Colonies. Washington appointed him commander of the Massachusetts State cruiser *Lee*, in which capacity he rendered efficient service during the siege of Boston by intercepting British supplies. In 1776 he received from Congress a commission as captain of the new cruiser *Hancock*, and soon after putting to sea captured the British man-of-war *Fox*. The following year, while cruising in company with the *Boston*, he fell in with the two British men-of-war *Rainbow* and *Victor*, and, being deserted by his consort, was captured. In 1782 he was put in command of two privateers and the government frigate *Hague*, in which he was attacked by a superior British force, but managed to make his escape.

MANLEY, Mary de la Rivière (c.1663–1724). An English author, daughter of Sir Roger Manley, Governor of the Channel Islands, born in Jersey, or at sea between Jersey and Guernsey. Having been beguiled (about 1688) into a mock marriage with her cousin, John Manley of Truro, she lived for a time with the Duchess of Cleveland. Besides plays and short novels, she wrote many numbers of the *Examiner*, after Swift abandoned it. For some years she was the mistress of Alderman Barber. She died at Barber's printing house on Lambeth Hill, July 11, 1724. Mrs. Manley employed her talents mainly in depicting the scandalous life of the times. *Letters Written by Mrs. Manley* (1696) and the *Secret History of Queen Zarah and the Zarazians* (1705) were followed by the *New Atalantis*, of which two volumes appeared in 1709. With this famous work were afterward incorporated *Memoirs of Europe* (1710) and a further continuation. Among several plays which she wrote may be mentioned *Lucius*, played at Drury Lane (1717). In 1720 appeared a series of short tales called *The Power of Love, in Seven Novels*. Incidents in her own career Mrs. Manley related in the *Adventures of Rivella* (1714).

MAN'LIUS. A Roman gens, chiefly patrician, some of whose members played an important part in the history of the Republic. 1. Marcus Manlius Capitolinus, who was consul in 392 B.C. and two years later gained his surname by rescuing the Capitol from the attacks of the Gauls, after he was roused by the cackling of the sacred geese. Later, tradition says, he favored the lower classes, and, in consequence, in 381 was arraigned before the Comitia Centuriata on a charge of aspiring to be king, and sentenced to be thrown from the Tarpeian Rock. The name of Marcus was never after borne by any of the Manlian gens, who considered him a traitor to his family and class. 2. Lucius Manlius Imperiosus, dictator 363 B.C. 3. Titus Manlius Imperiosus Torquatus, son of Lucius, military tribune, twice dictator (353, 349 B.C.), and three times consul. His surname was derived from his having despoiled a gigantic Gaul of a golden chain (*torques*) after having slain him in single combat. In his last consulship he waged a successful war against the Latins and Campanians, defeating them in two battles near Vesuvius; in one his colleague, P. Decius Mus, devoted himself. Manlius, too, caused to be put to death his own son, who had disobeyed his orders by engaging in single combat with the enemy. 4. Titus Manlius Torquatus was consul in 235 and in 224 B.C., censor in 231, dictator in 208. In 235 he subdued Sardinia, which had been ceded to Rome by Carthage at the close of the First Punic War. In 224 he defeated the Gauls and crossed the Po. In 216 he was victorious over the Carthaginians when they tried to regain Sardinia. 5. Gneius Manlius Vulso, consul 189 B.C. He was victorious over the Galatians in Asia Minor.

MANLY, John. See Manley, John.

MAN'LY, John Matthews (1865–). An American scholar, born in Sumpter Co., Ala., and educated at Furman University and at Harvard, where he took the degree of Ph.D. in 1890. During the preceding six years he had been a teacher as well as a student; and after leaving Harvard he was successively associate professor and professor of English at Brown University (1891–98), and professor of and head of the department of English in the University of Chicago. In 1909 he was the Chicago exchange professor at the University of Göttingen. A contributor to the *Cambridge History of English Literature* and the *Encyclopædia Britannica*, he was also the editor of *Specimens of the Pre-Shakespearean Drama* (1897); *English Poetry* (1907); *English Prose* (1909). He also served as managing editor of *Modern Philology*.

MAN MILLINER, The. A nickname given to Henry III of France on account of his effeminacy and fondness for dress.

MANN, Sir Donald D. (1853–). A Canadian railway promoter. He was born at Acton, Ontario, and was educated at the public schools and privately. He studied for the ministry of the Presbyterian church, but later relinquished that aim and engaged in business as a railway contractor. He became associated with Sir William Mackenzie (q.v.) in the building of the Canadian Northern Railway, acquired a large fortune, and was made first vice president of that railway and president of, or director in, several industrial and financial corporations. He was appointed honorary lieutenant colonel of the Twentieth Regiment (1908) and was knighted in 1911.

MANN, Horace (1796–1859). An American educational reformer and philanthropist, born at Franklin, Mass., May 4, 1796. He was graduated at Brown University, 1819. Studying law, he was admitted to the bar in 1823; in 1827 he was elected to the State Legislature of Massachusetts and six years later to the State Senate, over which he was chosen to preside in 1836. From the beginning of his legislative career he became a leader in philanthropic and reform movements of various kinds. In 1837 the State Legislature, largely on the advice of Mr. Mann, appointed a board of education to revise the school laws and to reorganize the common-school system of the State. Of this board Mr. Mann was made secretary, and for 12 years he devoted to this cause all his time, often against the most bitter opposition. This was the great work of his life, for the movement begun under his leadership was not confined to Massachusetts, but affected the entire United States and led to the development of the free public-school system as it exists to-day. These reforms were instituted through various instrumentalities, chief among which were his annual *Reports* as secretary. The 12 volumes of these *Reports* (1837–48) have become educational classics, and were reprinted in Europe as well

as circulated throughout the United States. In addition to these he also founded and edited the *Common School Journal*, through which he advocated his reform ideas. Finally, through a very great number of teachers' institutes and meetings, to which he gave indefatigable attention, he inspired the teaching body to greater efforts and with higher ideals.

In the course of his reform efforts he visited the schools of continental European countries and introduced, against a storm of opposition, many of the advanced ideas of school work, especially those growing out of the Pestalozzian movement (q.v.). The immediate work of Mann, however, which was of the greatest importance, was the reorganization of the common-school system of Massachusetts. Since the dominance of the democratic sentiment during the latter half of the eighteenth century the unit of school organization had been the district instead of the town. In place of the district, Mann sought to restore the more centralized control of the town, which would give a broader public support, a greater freedom from factional quarrels, a better financial basis, a better prepared and better remunerated staff of teachers, and better equipment. Though the reform was not accomplished until after Mann's withdrawal from the secretaryship, and in fact not finally settled until after a bitter conflict lasting a quarter of a century, yet his efforts developed the public sentiment that finally established the more centralized control of education and gave to this organization when established a far better support than education had ever received. But one service to education rendered by Horace Mann is to be rated above even all these. It was owing to his efforts that the first normal school (q.v.) in the United States for the training of teachers was established. This first school was opened in 1839 at Lexington, Mass. In 1848 Mann was elected to Congress to fill the vacancy caused by the death of John Quincy Adams. There for two terms he continued the work begun by Adams in opposition to slavery. From 1852 to 1859 Mann was president of Antioch College, Yellow Springs, Ohio, where he again led in an advanced educational movement —that of the coëducation of the sexes.

Horace Mann was not a professional educator, however, but a publicist and statesman. His greatest work was the rather indefinite one of arousing public opinion to the importance of education and the directing of legislative effort to the improvement of educational conditions. He became the leader, or at least the forerunner, of the great educational movement which has reached from the middle of the nineteenth century to the present time.

In addition to his *Reports*, his published works include: *Lectures on Education* (1840); *Lectures on Education* (1845); *On the Study of Physiology in Schools* (1850); *Slavery, Letters and Speeches* (1850); and numerous lectures and addresses.

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MANN, James Robert (1856–). An American Congressman and lawyer, born near Bloomington, Ill. In 1876 he graduated from the University of Illinois and in 1881 from the Union College of Law at Chicago, where he thereafter practiced his profession with success. He was attorney of Hyde Park in 1888, alderman of the 32d Ward of Chicago in 1893–96, master in chancery of the Superior Court of Cook County in 1892–96, and attorney of the South Park Board in 1895. Participating in politics as a regular Republican, he was temporary chairman of the State Convention of that party in 1894 and chairman of the Cook County conventions in 1895 and 1902. He served as a member of the 55th to the 63d Congresses (1897–1915), and in 1911 was chosen floor leader of the Republican minority in the House. For one congressional term he was assisted by ex-Speaker Cannon. Mann's ability as a parliamentarian was highly praised by President Taft. In debate he led his party skillfully in its opposition to the tariff, currency, and canal tolls policies of the Democrats. He became known for his comprehensive grasp of and attention to the details of legislation and for his constant attendance at the sessions of Congress.

MANN, Matthew Derbyshire (1845–1921). An American obstetrician, born at Utica, N. Y. He graduated at Yale in 1867 and at the College of Physicians and Surgeons, New York, in 1871. After two years' study in Heidelberg, Paris, Vienna, and London he practiced in New York until 1879, then in Hartford until 1882, and thereafter until 1910 was professor of gynecology in the University of Buffalo. He became gynecologist at the Buffalo General Hospital, and in 1894 was president of the American Gynecological Society. He was one of the physicians who attended President McKinley after he had been shot by the anarchist Czolgosz. He wrote *Immediate Treatment of Rupture of the Perineum* (1874) and *Manual of Prescription Writing* (1878; 6th ed., rev., 1907); and edited an *American System of Gynecology* (2 vols., 1887–88).

MANN, Tom (1856–). An English labor leader. He was born at Foleshill, Warwickshire, and worked on a farm for two years before he was 11 and then for three years in the mines. He became an engineer in Birmingham and (1877) in London, where in 1881 he joined the engineers' union (Amalgamated Society of Engineers) and began his career as a trade-unionist. In 1885 he became a Socialist. He was the first secretary of the London Reform Union (founded 1892) and of the National Democratic League, and was one of the first English labor leaders to ally himself with syndicalism. In 1912 he was arrested for a speech urging soldiers to refuse to shoot at strikers. He was found guilty and sentenced to six months' imprisonment, but served only about six weeks.

MANN, William Julius (1819–92). An

American Lutheran theologian and author, born in Stuttgart, Germany. He studied there and at Tübingen and was ordained in 1841. Three years later he came to the United States with Dr. Philip Schaff and settled in Philadelphia. There he was assistant pastor (1850–63) and pastor (1863–84) of St. Michael's and Zion's Church. From its establishment in 1864 almost to his death he was professor of symbolics at the Lutheran Theological Seminary. With Dr. Schaff he edited *Der deutsche Kirchenfreund.* His own works include: *Plea for the Augsburg Confession* (1856); *Lutheranism in America* (1857); *Life and Times of Henry Melchior Muhlenberg* (1887). Consult his *Life* by his daughter, Emma T. Mann (Philadelphia, 1893).

MAN'NA (Heb. *mān*, Ar. *mann*, Gk. *μάννα, manna;* perhaps connected with the Egyptian *mennu*). According to the biblical account, the chief food of the Israelites during their 40 years' wandering in the desert (Ex. xvi; Num. xi. 6–9). It is described as falling from heaven like rain or with the dew; small, round and white, like coriander seed; in taste, sweet like honey, or like fresh oil. It was gathered in the morning and it melted when the sun arose. A sufficient amount was provided daily for each individual and no more; if a surplus was gathered it spoiled before the succeeding morning. On the sixth day, however, a double portion was provided, and none could be found on the Sabbath. It could be ground in a mill, beaten in a mortar, baked and made into cakes, or boiled. A command was given to preserve an omer of it in the ark of the covenant for future generations. (Cf. Heb. ix. 4.) The supply ceased on entrance into the promised land. (Josh. v. 12.) In Ex. xvi. 15 the name is explained by a reference to the exclamation of the Hebrews when they first saw the manna and knew not as yet what it was, *mān* being made equivalent to *mah,* "what is it?" This explanation is probably a species of popular etymology and indicates that the true origin of the word was unknown. In the later literature manna is called "corn" or "bread of heaven" and "angels' food." (Ps. lxxviii. 24–25, cv. 40; cf. John vi. 31; 1 Cor. x. 3.) Attempts have been made to explain the biblical manna as the exudation from the tarfa tree, a species of tamarisk (*Tamarix gallica mannifera*), or the camel's thorn, or as lichens. Manifestly such an explanation fails to satisfy all the conditions of the narrative. If it be believed, however, that the latter represents an early tradition with later embellishments, the view becomes plausible that the use of some such food by a small tribe or clan in time of need may have formed the basis of the narrative. The passage in Numbers is attributed to the Yahwistic writer, and hence is preëxilic; that in Exodus is found in the priestly narrative, but it probably embodies certain old fragments with considerable additions by the redactors. Consult the commentaries of Dillmann, Baentsch, and Strack on Exodus xvi. See Coccidæ.

MAN'NA. A sweet substance that exudes from incisions in the stems of *Fraxinus ornus* and other species of ash. The principal supply of manna comes from Sicily, where during July and August incisions are made in the trunks and larger limbs of the trees, and if the weather be warm the manna begins to ooze from the cuts and hardens into lumps or flakes which are removed by collectors. Manna is a light, porous substance of a yellowish color, not unlike dried honey. There are different qualities found upon the market, which vary in their purity and composition. Flake manna is obtained when there is an abundant flow from the upper incisions. It dries into flat pieces or tubes and differs somewhat in composition from the other varieties. Small, or talfa, manna occurs in tears from the lower incisions and is less crystalline and more gummy. Fat manna is brownish, viscid, noncrystalline, and is usually full of fragments of bark and other impurities. Manna is largely used in medicine as a laxative, demulcent, and expectorant, and is commonly administered with other medicines, as senna, rhubarb, etc. Its constituents, as reported by many investigators, are mannite 60 to 90 per cent, glucose, mucilage, fraxin, resin, etc. In addition to its value in medicine, manna has been extensively used for food, its value for this purpose depending upon the carbohydrates present.

In addition to that produced by various species of ash, manna or substances resembling it are excreted by many other species of plants. In Australia various species of Eucalyptus produce what is called manna or lerp. This saccharine substance is said to be without the laxative properties of true manna and is eaten as food. Similar substances are obtained in Australia from the tea tree (*Leptospermum scoparium*), sandalwood (*Myoporum platycarpum*), and Australian blue grass (*Andropogon annulatus*). During a famine in India a manna-like substance was exuded in sufficient abundance from a species of bamboo (*Dendrocalamus strictus*) to form an important food supply in some districts. It did not contain any mannite, the principal characteristic of true manna. Similar substances are obtained from the common larch of Europe (*Larix decidua*), the substance being known as Briançon manna; from *Quercus vallonea,* called Armenian manna; Persian manna from *Alhagi camelorum,* camel's thorn; tamarisk manna from *Tamarix gallica mannifera,* believed by some to have been the source of the manna of the Israelites, while others attribute it to a lichen, *Lecanora esculenta;* American manna, from the sugar pine (*Pinus lambertiana*); California manna, believed to be deposited from *Phragmites communis;* etc. Some insects, as *Lavinus mellificus,* secrete a similar material. All of these saccharine substances are usually grouped together as false manna. They contain as their principal constituent melitose or melezitose, but no mannite. A large number of plants yield small quantities of mannite. For a discussion of their chemical composition, consult Tollens, *Handbuch der Kohlenhydrate* (Breslau, 1895).

MAN'NA GRASS, Floating Fescue, Floating Sweet Meadow Grass, etc. (*Glyceria fluitans*). A perennial grass, 1 to 3 feet tall, found in marshes, ditches, and by the sides of stagnant pools in Europe, Asia, North America, and Australia. The stems are decumbent at the base and rooting at the joints; the leaves long and rather broad, the lower ones often floating; the inflorescence, a long, slender, nearly erect panicle. In irrigated meadows and in very wet grounds manna grass affords large quantities of cattle food. In many parts of Germany and Poland the seeds, which fall very readily out of the spikelets, are collected by spreading a cloth under the panicles and shaking them with a stick; they are used in soups and gruels, are very palatable and nutritious, and are known as Polish manna. There are a number of other

species of Glyceria, nearly all of which frequent moist soils. By some botanists they are all referred to the genus *Panicularia*.

MANNA INSECT. A scale insect (*Gossyparia mannifera*) which lives on tamarisk in many places in countries bordering upon the Mediterranean Sea and produces manna, which is a substance very like honey. It is surely a product of the insect and not a secretion of the plant, although formerly it was supposed to exude from the plant through punctures made by the insect. The insect is found in Algeria, Arabia, Armenia, and southern Russia. Formerly it was known as *Coccus manniferus*, or *Chermes mannifer*, the latter, the earliest name, having been proposed by Hardwick in 1822. See COCCIDÆ.

MAN'NERING, MARY (1876–). An American actress, born in London. She studied for the stage under Hermann Vezin and made her début as an actress at Manchester under her own name of Florence Friend in 1892. She appeared on the London stage in the same year and in 1896 was induced by Daniel Frohman to come to New York, where she began playing as "Mary Mannering" (the maiden name of her father's mother). She first starred at Buffalo, N. Y., in 1900, in the title rôle of *Janice Meredith*. Thereafter she played leading parts in *White Roses* (New York, 1901); *The Truants* (Washington, 1909); *The Independent Miss Gower* (Chicago, 1909); *A Man's World* and *The Garden of Allah* (New York, 1910). She was married to James K. Hackett (q.v.) and later to Frederick E. Wadsworth.

MAN'NERISTS. A term applied to painters and sculptors who make an exaggerated or unmeaning use of inherited or acquired forms, without independent study of nature and without understanding their significance. A work of art is mannered when the forms are inappropriate to the ideas expressed. The term Mannerists is most frequently applied to those Italian painters who were pupils of or immediately followed the leaders of the High Renaissance—especially Michelangelo, Raphael, Correggio—whose styles they imitated and exaggerated. See PAINTING.

MAN'NERS, CHARLES (1857–). An English basso and operatic impresario, born in London, his real name being Southcote Mansergh. Having studied in Dublin, London, and Italy, he began his career as a chorus singer in 1881. In the following year he made his début at the Savoy Theatre in Gilbert and Sullivan's *Iolanthe*. After a successful tour of the provinces he appeared at Covent Garden in 1890. On his return from a tour of South Africa he established the Moody-Manners Opera Company. His attempt to give opera in English met with such success in the provinces that in 1902 he gave a season in London, with the result that his season has become a fixture in the capital. Beginning with smaller works, the company gradually undertook works of a more exacting nature, until the repertory now includes all the great Wagner dramas, which thus were heard for the first time in the provinces. In 1890 he married Fanny Moody (born 1866), an excellent singer, who became the leading artist in his operatic company.

MANNERS, J. HARTLEY (?–). An American playwright, who was early an actor. His *Peg o' my Heart*, a comedy, played in New York from Dec. 20, 1912, to May 30, 1914, his wife, Laurette Taylor (q.v.), taking the leading rôle. It afterward had a long run in London. Manners's other plays include: *The Crossways; As Once in May; The Queen's Messenger; Zira*, with Henry Miller; *The Majesty of Birth; Ganton & Co.; The Girl and the Wizard; The Prince of Bohemia; The Girl in Waiting; A Woman Intervenes*. He published *Peg o' my Heart* in 1913, and *Happiness and Other Plays*, including *Just as Well* and *The Day of Dupes*, in 1914.

MANNERS, JOHN. A British general. See GRANBY, JOHN MANNERS, MARQUIS OF.

MANNERS, JOHN JAMES ROBERT, DUKE OF RUTLAND (1818–1906). An English statesman, born at Belvoir Castle, Leicestershire, Dec. 13, 1818. He was educated at Eton and at Trinity College, Cambridge. In 1841 he began his long parliamentary career in the Conservative interest, was twice Postmaster-General (1874–80 and 1885–86), and succeeded Earl Stanhope as chairman of the Copyright Commission. On the death of his brother (1887) he became seventh Duke of Rutland. Under Disraeli's influence he joined the Young England party, and with the former he toured the industrial districts of Lancashire, impelled by his zeal for industrial reform. In Disraeli's *Coningsby* (1844), *Sybil* (1845), and *Endymion* (1860) he figures more or less prominently. Among his publications are: *England's Trust and Other Poems; English Ballads and Other Poems* (1850); and notes of his Irish and Scottish tours of 1848–49. Consult Reginald Lucas, in *Dictionary of National Biography*, Second Supplement, vol. ii (London, 1912).

MANNERT, män'nērt, KONRAD (1756–1834). A German historian and geographer, born at Altdorf and educated at Nuremberg. In 1796 he became professor of history at Altdorf, in 1805 at Würzburg, in 1807 at Landshut, and in 1826 at Munich. His geographical works include the valuable *Geographie der Griechen und Römer* (10 vols., 1795–1825), with Ukert, and an edition of the *Tabula Peutingeriana* (1824); and among his historical labors the more important are: *Kompendium der deutschen Reichsgeschichte* (1803; 3d ed., 1819); *Kaiser Ludwig IV.* (1812); *Geschichte der alten Deutschen, besonders der Franken* (1829–32). Consult *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MAN'NES, DAVID (1866–). An American violinist, born in New York City. At the age of 10 he took up the violin, without a teacher, and made considerable progress. After systematic study under H. Brode and C. Ritcher, he earned his living by playing in theatre orchestras. During the summers he went abroad and studied at different times with De Ahna, Halir, and Ysaye. In 1891 he was discovered by Walter Damrosch, who engaged him as one of the first violins for the New York Symphony Orchestra. From 1899 to 1911 he was concert master of this organization. The Sonata Recitals which he began in 1905 with his wife (Clara Damrosch) soon were recognized as events of importance. He always took deep interest in the affairs of the Music School Settlement, of which he became director in 1910. In 1912 he founded the Music School Settlement for Colored People.

MANNFELD, mån'fēlt, BERNARD (1848–). A German etcher. He was born in Dresden and as a boy studied painting under Otto Georgi, but later acquired a knowledge of architecture, which led him to take up etching. He

designed for the Seiler Institute for Glass Painting (Breslau) from 1866 till 1873, when he removed to Berlin. Three years later he published his first cycle of original etchings, entitled "Durchs deutsche Land," containing 60 plates of views of cities, buildings, and picturesque spots in Germany and Austria. He continued to make a specialty of architectural subjects and romantic landscapes, constantly improving his technique by studying the work of foreign etchers, particularly that of Axel Haig. He was employed by the state to etch some of the monuments in the National Gallery, Berlin, and in 1896 was called to the Stadel Institute, Frankfort (professor in 1900). Among his finest plates are "The Castle of Heidelberg"; "The Rheingrafenstein in Nahetal"; "The Albrechtsburg in Meissen"; "The Cathedral at Aix-la-Chapelle"; "View of Dresden"; "Old Bridge, Frankfort"; "Interior of Frankfort Cathedral."

MANNHARDT, män'härt, WILHELM (1831–80). A German mythologist, born at Friedrichstadt in Schleswig. He was educated in the universities of Berlin and Tübingen and became editor of the *Zeitschrift für deutsche Mythologie und Sittenkunde* (1855). His books on Germanic myth include: *Germanische Mythen* (1858); *Die Götter der deutschen und nordischen Völker* (1860); *Roggenwolf und Roggenhund* (2d ed., 1866); *Die Korndämonen* (1868); *Klytia* (1875); and his great works, *Wald- und Feldkulte* (1875–77; 2d ed., by Heuschkel, 1904–05) and *Mythologische Forschungen* (ed. by Patzig, 1884). Consult *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MANNHEIM, män'hīm. The largest city of the Grand Duchy of Baden, at the confluence of the Rhine and Neckar, 43 miles southwest of Frankfort (Map: Germany, C 4). It is the third largest city on the Rhine, surpassed only by Cologne and Düsseldorf; since its connection by railroad with all important cities in the German Empire it has become the first commercial town in the Grand Duchy of Baden. The site of the town is low, and a high dike protects it from floods. The Rhine, which is here 1200 feet in breadth, is crossed by a railway bridge which connects Mannheim with Ludwigshafen; a chain bridge spans the Neckar. The town is remarkable for its cleanliness and is the most regularly built town in Germany; the main part is divided into 136 square sections and is encircled by a semicircular boulevard known as the Ring Strasse. Outside of the semicircle are numerous suburbs. The palace, built 1720–29, by the Elector Palatine Charles Philip, with a front of over 1700 feet, and 1500 windows, is one of the largest buildings of the kind in Germany. It has several museums, containing paintings by Van Ruysdael and Rubens, and a library of 66,000 volumes. The city contains a Gymnasium with a library, a botanic garden, an observatory, an ancient merchants' hall, the National Theatre, founded in 1776, in which Schiller's *Robbers* was first acted, and the large concert hall. Among notable public monuments are those of William I, Prince Bismarck, Schiller, and Moltke. The Schlossgärten, bordering on the Rhine, is the chief of the five public gardens surrounding the city. Since the construction of harbors (covering 240 acres) and extensive docks in 1875 and 1897, Mannheim has had a great and increasing trade in grain, coal, petroleum, tobacco, sugar, and ironware. Its metal and machine works, including the manufacture of agricultural implements, gasoline, and electric motors, give employment to 10,000 persons; 2000 are engaged in a celluloid factory. Cigars, varnish and rosin, carpets, rubber, cables, railway supplies, wire, stoves, chemicals, oil, furniture, brushes, mirrors, sugar, mattresses, glass and leather goods are also manufactured. Its institutions include Gymnasia, a reformatory, a trade school, a marine school, and a conservatory of music. Pop., 1885, 61,273; 1900, 140,384; 1910, 193,902. The United States is represented by a consul.

Mannheim is mentioned as a village as early as 764. Its prosperity dates from 1606, when, under the Elector Palatine Frederick IV, it became the refuge of religious exiles from the Netherlands. It suffered severely in the Thirty Years' War and was almost totally destroyed by the French in 1689. After being rebuilt it was again occupied by the French in 1795 and a large part of it burned. In 1802 it was given to Baden.

MAN'NING, DANIEL (1831–87). An American journalist, financier, and politician. He was born in Albany, N. Y., and at the age of 10 entered the printing office of the Albany *Atlas* as an apprentice. After the consolidation of the *Atlas* with the *Argus* he was appointed legislative reporter, in which capacity he made a wide acquaintance among politicians and became known as an authority on State political affairs. In 1865 he became editor and part owner of the *Argus*, and president of the company in 1873. In 1876 he was elected a member of the New York Democratic State Committee, of which he became secretary in 1879 and chairman in 1881. In this position he was associated closely with Grover Cleveland, to whose election as Governor of New York he contributed greatly in 1882. To Manning's astuteness and tact also was largely due the successful presentation of Cleveland's name as a candidate for the presidency in 1884, and to his personal supervision of the campaign was largely due the success of the Democratic ticket in the pivotal State of New York. President Cleveland occasioned considerable surprise when he appointed Manning Secretary of the Treasury. Manning remained in office until 1887, and his able administration justified his appointment. He retired shortly before his death, on account of ill health.

MANNING, HENRY EDWARD (1808–92). An English Roman Catholic prelate, one of the most notable figures in the Church life of his time. He was born July 15, 1808, at Totteridge, in Hertfordshire, and educated at Harrow and at Balliol College, Oxford, where he graduated in 1830. He was ordained in the Church of England in 1832, married in 1833, and in 1834 appointed rector of Lavington and Graffham in Sussex. His wife died in 1837. Manning devoted himself with increasing zeal, energy, and success to the work of his profession, and was recognized, though still a young man, as a leading figure in the group of Tractarian leaders. His appointment in 1840 as Archdeacon of Chichester gave him a still more influential position. Newman's secession affected him painfully and for a time seemed to increase his attachment to the Church of England; but in 1851 the decision in the noted Gorham case (see GORHAM CONTROVERSY), which seemed to claim for the crown authority over a purely doctrinal question, shook his allegiance. After long and arduous consideration he made his submission to the Roman

Catholic church in 1851. Only two months later —an unusual recognition of his gifts and his theological attainments—he was ordained priest by Cardinal Wiseman. He made some further studies in Rome, and from 1852 to 1856 was informally connected with the Jesuit Church in Farm Street, London, finding much to do in preaching and spiritual direction. In 1857 he developed an English congregation of priests known as Oblates of St. Charles, a revival of the community founded at Milan by St. Charles Borromeo, and became its first superior. The same year saw his appointment as provost of the Chapter of Westminster, which brought him into close relations with Cardinal Wiseman, then Archbishop. In the difficult circumstances connected with the insubordinate attitude of Archbishop Errington, Wiseman's coadjutor, Manning was a loyal supporter of the Cardinal and of great service. On the latter's death in 1865, Pius IX took the unexpected step of appointing Manning his successor as Archbishop of Westminster, and for the next quarter of a century he occupied a commanding position in the religious life of England. He not only did much to bring the Roman Catholic body out of the obscurity in which centuries of repression had left it, but he was indefatigable in all kinds of good works—the care of the poor, religious education, and very prominent in social and temperance work. In the Vatican Council of 1870 he took a prominent part, standing among the pronounced advocates of defining papal infallibility, and engaging in a controversy, famous at the time, with Monseigneur Dupanloup, Bishop of Orléans. His *Petri Privilegium* (1871) is an exposition of the doctrine and an account of the proceedings. On the same subject he also published (1875) an answer to Gladstone's expostulations, giving his views of the bearing of the Vatican decrees on civil allegiance; and in 1877 he wrote *The True Story of the Vatican Council.* Among Manning's other published works are: *The Temporal Mission of the Holy Ghost* (1865); *The Internal Mission of the Holy Ghost* (1875); *England and Christendom* (1867); *Sin and its Consequences* (1876). His manifold services were recognized by the gift of a cardinal's hat in 1875. He died in London, Jan. 14, 1892.

Bibliography. The fullest biography of him is by E. S. Purcell (2 vols., London, 1896), which is unfortunately disfigured by many misleading inferences and grave faults of taste; it may be corrected in particular as to the facts of the Errington case by Wilfrid Ward's *Life and Times of Cardinal Wiseman* (London, 1897). There is a shorter but in many ways more satisfactory biography by A. W. Hutton (Boston, 1892). Consult also: Francis de Pressensé, *Life of Cardinal Manning* (Philadelphia, 1897); P. H. Fitzgerald, *Fifty Years of Catholic Life and Social Progress* (London, 1901); I. A. Taylor, *The Cardinal Democrat* (St. Louis, 1908); Paul Thureau-Dangin, *English Catholic Revival in the Nineteenth Century* (2 vols., London, 1914); and a number of the biographical works cited under Oxford Movement.

MANNING, James (1738–91). An American educator. He was born in Elizabethtown, N. J., graduated at Princeton College in 1762, and was ordained to the Baptist ministry in 1763. Coöperating with an association of Baptist ministers in Philadelphia, he went to Rhode Island and proposed to the Baptists in Newport a plan for the establishment of a "seminary of polite literature, subject to the government of the Baptists." A charter was obtained in 1764. The next year Manning was appointed president of the institution, which was opened in 1766 as the College of Rhode Island (later Brown University). He served in that office (except during the Revolution, when the school was closed) till 1790, when he resigned. During the greater part of this period he was also pastor of the First Baptist Church in Providence, founded by Roger Williams. His chief educational publication, *Report in Favor of the Establishment of Free Public Schools in the Town of Providence,* indicates his activity in another direction. In 1786 he was elected to the Congress of the Confederation. He was an active Federalist, and it was due largely to his influence that Rhode Island adopted the Constitution and came into the Union. Consult R. A. Guild, *The Life, Times, and Correspondence of James Manning, and the Early History of Brown University* (Boston, 1864). See Brown University.

MANNING, Robert (1784–1842). An American pomologist, one of the pioneers in horticultural nomenclature. In order to determine the value of varieties he established at Salem, Mass., a fruit garden, in which he raised varieties of all fruits that could withstand the rigor of the climate of that State, and in which at the time of his death nearly 2000 varieties were growing. He published a descriptive catalogue, called *Book of Fruits,* in 1838. Manning was one of the founders of the Massachusetts Horticultural Society, and during his later years was recognized as an authority on horticultural matters, especially on fruit varieties.

MANNING, Thomas (1772–1840). An English traveler, born Nov. 8, 1772, at Broome, Norfolk, where his father was rector. In 1790 he entered Caius College, Cambridge, where he became distinguished in mathematics; but he left without a degree, owing to his unwillingness to take the oaths. From 1800 to 1803 he studied Chinese in Paris. In 1806 he went out to Canton as doctor. In 1810 he proceeded to Calcutta, whence he made his way into Tibet to Lhasa (1811). He was the first Englishman to enter the Holy City. On returning to England in 1817, after a visit to Peking, a shipwreck near the Sunda Islands, and a call on Napoleon at St. Helena, he lived for several years at a cottage called Orange Grove, near Dartford, in the midst of his Chinese books. There he was visited by the chief literary men of the day. One of his many eccentricities was a long, flowing beard. This he plucked out by the roots before leaving Orange Grove for Bath, where he died May 2, 1840. Manning was familiar with 15 languages and was esteemed the first Chinese scholar in England in his day. Charles Lamb made the acquaintance of Manning in 1799, and a memorable friendship ensued. Consult: Charles Lamb's *Letters* and *Essays of Elia* ("The Old and the New Schoolmaster" and "A Dissertation on Roast Pig"); also the *Narratives of the Mission of G. Boyle to Tibet and of the Journey of T. Manning to Lhasa,* edited with memoirs by Sir C. R. Markham (London, 1876); W. P. Courtney, in *Dictionary of National Biography,* vol. xxxvi (ib., 1893).

MANNING, Thomas Courtland (1831–87). An American jurist, born at Edenton, N. C. He was educated at the University of North Caro-

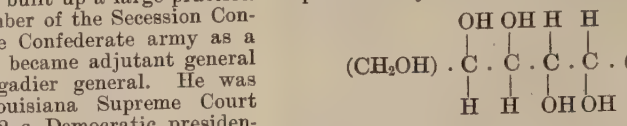
lina, was admitted to the bar, and practiced for a time in his native town. In 1855 he removed to Alexandria, La., and built up a large practice. After serving as a member of the Secession Convention, he entered the Confederate army as a lieutenant and in 1863 became adjutant general with the rank of brigadier general. He was a member of the Louisiana Supreme Court (1864–65) and in 1872 a Democratic presidential elector. In 1876 he was temporary chairman of the Democratic National Convention. He was a second time presidential elector in 1876 and in 1880 was appointed to the United States Senate, but the Committee on Elections and Privileges declined to consider his credentials. From 1877 until the adoption of the new Constitution he was Chief Justice of the State Supreme Court. From 1882 to 1886 he was again justice of the Supreme Court and during 1886–87 was United States Minister to Mexico, where he died. He was also trustee of the Peabody Fund from 1880 until his death.

MANNING, William Thomas (1866–). An American Protestant Episcopal clergyman. He graduated B.D. from the University of the South in 1893; was ordained a deacon in 1889 and a priest in 1891; and served as rector at Redlands, Cal. (1892), at Lansdowne, Pa. (1896–98), and at Nashville, Tenn. (1898–1903). For two years (1893–95) he was professor of dogmatic theology at the University of the South. In New York City he was vicar of St. Agnes's Chapel in 1903–04, assistant rector in 1904–08, and thereafter rector, of Trinity parish.

MANNINGTON. A city in Marion Co., W. Va., about 20 miles north of Clarksburg, on the Baltimore and Ohio Railroad (Map: West Virginia, D 2). It has a large pottery, extensive oil and gas interests, glassworks, machine shops, and rich coal mines. The water works are owned by the city. Pop., 1900, 1681; 1910, 2672.

MAN'NINOSE. See Clam.

MAN'NITE, or Mannitol (from *manna*), $C_6H_8(OH)_6$. A hexahydric alcohol found in the manna from *Fraxinus ornus* (Linné), which grows in the basin of the Mediterranean. It was discovered in that manna by Proust in 1806 and may be readily extracted from it with hot water or boiling alcohol. It is found also in many other vegetable products, including onions, celery, asparagus, many fungi, etc.; and it has been prepared artificially from the sugar mannose by reduction with sodium amalgam. Vice versa, careful oxidation of mannite with nitric acid yields mannose. A mixture of mannite and a very similar hexahydric alcohol called sorbite is produced when ordinary fructose (levulose) is reduced with nascent hydrogen (sodium amalgam). Mannite is also produced during alcoholic fermentation, particularly at higher temperatures, and a special mannitic fermentation often occurs in wines, changing the fructose contained in them into mannite. However, the amount of mannite generally discoverable in unspoiled wine is very small. Mannite may be obtained either in the form of rhombic prisms or in the form of silky needle-like crystals; it melts at 165–166° C. (329–330.8° F.), and it is readily soluble in hot water or alcohol, but only moderately soluble in cold water, and scarcely soluble at all in cold alcohol or in ether. Its pure aqueous solution has a very slight action on polarized light; the action is, however, greatly increased by the presence of free alkali as well as of certain salts, especially borax. The constitution and configuration of mannite are represented by the formula:



The hexahydric alcohols *sorbite* (see above), *dulcite*, *idite*, and *talite* have the same composition and constitution as mannite, and differ from it and from one another only in their configuration, i.e., in the arrangement of their atoms in space. (See Stereochemistry.)

MANNLICHER, män'lĭk-ĕr, Ferdinand von (1848–1904). An Austrian engineer and inventor. He was born at Mainz, Germany, and for many years served as chief engineer of the Imperial Northern Railroad (Kaiser Ferdinands Nordbahn). In 1899 he was called to the Austrian Upper House in recognition of his public services. He became widely celebrated through his many inventions and improvements in military small arms and to him was due the original Mannlicher rifle, which with modifications was used in the military services of several European and other nations. See Small Arms.

MANNS, mäns, Sir August (1825–1907). A German-English musical conductor, born at Stolzenberg, Pomerania. He received his early training in music from a village musician and from Urban, the town musician of Elbing. He became a member of a military band at Danzig, then at Posen, and in 1848 joined Gungl's orchestra in Berlin. Soon after he became conductor and first violin at Kroll's Garden, Berlin. In 1851 Von Roon, the War Minister, selected Manns as bandmaster of his regimental band, first at Königsberg, then at Cologne. In 1854 he became assistant conductor, and in 1855–1905 was conductor, at the Crystal Palace, London, where he accomplished important results in the furtherance of the newer romantic music of Germany. He also changed the original wind band into an orchestra and founded (1856) the famous Saturday concerts, which he continued till 1901. He conducted the Glasgow Choral Union (1879–92) and six triennial Handel festivals. He was knighted in 1903. Consult H. S. Wyndham, *August Manns and the Saturday Concerts: A Memoir and a Retrospect* (London, 1909).

MAN'NUS (according to some, connected with Goth. *manna*, AS., Eng., OHG. *man*, Ger. *Mann*, Skt. *manu*, man, the mythical father of the human race). According to Tacitus (*Germania*, chap. ii), the name given by the Germans to the son of the earthborn god Tuisto. From his three sons they derived their three great tribes, the *Ingævones*, the *Herminones*, and the *Istævones*. Mannus belongs, not to the Teutonic people alone, but to the great myth of the origin of the human race, common to the whole Aryan family, and, like the Hindu *Manu* (q.v.) or *Manus*, stands forth as the progenitor of the inhabitants of earth endowed with reason. Consult K. Müllenhof, *Deutsche Altertumskunde*, vol. iv (revised by M. Roediger, Berlin, 1900).

MANNY, Sir Walter, Baron de (?–1372). An English adventurer, born in Hainault, France. He first appeared in England probably in 1327 as an esquire of Queen Philippa. He was engaged in the Scottish wars in 1331–37 and again in 1341; had command of English fleets in 1337 and 1348; served under Edward

III in the wars in France between 1338 and 1360; and was second in command in the invasion of France by John of Gaunt in 1369. He served as a baron by writ in Parliament in 1347–71 and was knighted in 1359. Much space is given to his exploits in Froissart's Chronicles (Eng. trans., London, 1895). He is chiefly known as one of the founders of the Charterhouse in London.

MAN'NYNG, Robert (or Robert de Brunne) (flourished c.1290–1340). An English poet, native of Brunne, or Bourne, in Lincolnshire. In 1288 he joined the neighboring brotherhood of Gilbertine canons at Sempringham. There he wrote *Handlyng Synne* (1303), a free paraphrase of the *Manuel des Pechiez* by William of Wadington. It depicts, with much sharp satire, the social life of the time. The best manuscript (the Harleian), with the French original, was edited by F. J. Furnivall for the Roxburghe Club in 1862. In 1338 Mannyng, then resident in the Gilbertine priory of Sixhill, Lincolnshire, finished his *Chronicle of England.* It has little historical value, as it closely follows the earlier chronicles. The earlier part of the *Chronicle* was edited by Furnivall for the Rolls Series (London, 1887); and the latter part by T. Hearne in 1725. To Mannyng is also attributed *Meditacyuns of the Soper of oure Lorde Ihesus,* edited for the Early English Text Society (London, 1875). Consult T. L. K. Oliphant, *Old and Middle English* (London, 1878), and B. A. K. Ten Brink, *Early English Literature to Wiclif,* translated by H. M. Kennedy (New York, 1883).

MANOA, mȧ-nō'ȧ. A fabulous city said to have been built on an island in Parima Lake, Guiana, and governed by El Dorado (q.v.).

MANOANS. See Conibo.

MANOBO, mȧ-nō'bō. The Manobo is a powerful pagan tribe inhabiting the lower Agusan River valley in Mindanao. They closely resemble the Mandaya in bodily appearance and culture and, like them, are frequently tree dwellers. They practice a crude agriculture and are somewhat skilled in forging iron knives and spear heads. For centuries they have been slaveholders, and their extensive raids into the territory of neighboring tribes have caused them to be greatly dreaded. They probably number more than 50,000. See Philippine Islands.

MANOEL, mä'nō-ĕl'. The Portuguese form of Manuel (q.v.).

MANOEL DO NASCIMENTO, mä'nō-ĕl' dō nä'shĕ-mȧn'tō, Francisco. A Portuguese poet. See Nascimento, Francisco Manoel do.

MANŒUVRES, mȧ-nōō'vērz (Fr. *manœuvre,* OF. *manouvre, manovre,* from ML. *manuopera, manupera,* a working with the hand, from Lat. *manus,* hand + *opera,* work). Exercises of large or small bodies of troops, designed to teach in time of peace the duties of troops in war. Manœuvres are conducted in two ways: (1) by field exercises on the terrain itself, during which actual bodies of troops are manœuvred in accordance with the tactical principles involved; (2) on special maps, where the movements of troops are indicated by colored bits of paper. The latter are known as "map manœuvres" and are finding increasing favor in the instruction of officers in all armies. (See War Game.) In Europe field manœuvres are carried on in most great armies throughout the year, the grand manœuvres (of one or more army corps) usually taking place in the autumn, and simulating the conditions of war as closely as possible. In the United States there are similar operations, usually held in the fall, in which the regular army and the militia participate.

Naval manœuvres and the combined manœuvres of sea and land forces working in harmony are of more recent origin than their military counterpart. Frederick the Great of Prussia first conceived the idea of having sham battles between his troops, an idea which Napoleon utilized in the great camp of Boulogne in 1805, during his preparation for the invasion of England. It was Von Moltke, however, and the Prussian general staff who first developed the idea of manœuvres into its full modern significance, and in the combined naval and military operation around the city of Flensburg in Schleswig-Holstein (1890) set an example which was soon copied. The United States naval and military manœuvres held in 1902 in the vicinity of New York followed practically the same plan of campaign as did Germany in the instance already cited. England and France and the United States hold periodical naval manœuvres, the problem usually being the attack or defense of shore defenses. In naval manœuvres particularly, conditions may be created which are faithful replicas of actual battles and campaigns. Besides their value in the formulation of the most effective scheme of shore defense against attack or invasion, they are just as important in the training under war conditions of the naval personnel, besides which they afford commanders excellent experience in the practice of battle tactics and strategy. Flaws in methods and material which otherwise might not be discovered until too late are noted and subsequently remedied; new ideas in the application of strategical or tactical principles carried out; the employment of torpedoes, mines, destroyers, submarines, wireless telegraphy, searchlights, air craft, and the various experiments in coaling at sea thoroughly tested; and the whole carefully observed and noted by officers of the national government appointed for the purpose, whose report usually forms the basis for future naval legislation. See Tactics, Military; Tactics, Naval; War Game.

MAN OF BLOOD, The. A designation applied by the Puritans to Charles I of England.

MAN OF BLOOD AND IRON, The. A name given to Prince Bismarck, originating in a phrase used by himself in regard to the settlement of the differences of Prussia and Austria.

MAN OF DECEMBER, The. Napoleon III, so called because of his coup d'état of Dec. 2, 1851.

MAN OF DESTINY, The. A name given to Napoleon Bonaparte, who considered himself specially chosen and directed by fate.

MAN OF LAW'S TALE, The. One of Chaucer's *Canterbury Tales.* It is the story of Constance, told in Gower's *Confessio Amantis,* and taken from old French romances.

MAN OF MODE, The, or Sir Topling Flutter. A comedy by George Etherege, presented in 1676.

MAN OF SIN. See Antichrist.

MAN-OF-THE-EARTH. A weed. See Ipomœa.

MAN-OF-WAR. An armed naval vessel regularly commissioned by some acknowledged government and fitted for purposes of war. As such she possesses the privileges of war; her

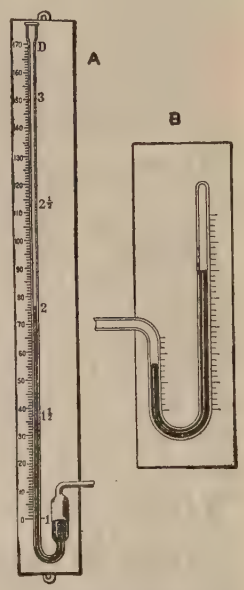
deck is, by a legal fiction, taken to be a portion of the soil of the nation whose flag she hoists; in time of war she is justified in attacking, sinking, burning, or destroying the ships and goods of the foe, and, by the law of nations, she may stop and search the merchant vessels of neutral powers which she suspects of carrying aid to her enemy. (See INTERNATIONAL LAW; CONTRABAND OF WAR; NEUTRALITY.) In case of being overpowered the crew of a man-of-war are entitled to the ordinary mercy granted to vanquished combatants lawfully fighting. Any vessel making war, but not belonging to an acknowledged government, is technically either a privateer (see MARQUE, LETTERS OF) or a pirate, but the naval war waged by vessels belonging to insurgents is not regarded as piracy if solely directed against the forces of the government they are fighting (see PIRACY). See BATTLESHIP; CRUISER; FRIGATE; SHIP, ARMORED; SHIPBUILDING; NAVIES; RAM; MORTAR VESSEL; TORPEDO BOAT.

MAN-OF-WAR, PORTUGUESE. See PORTUGUESE MAN-OF-WAR.

MAN-OF-WAR BIRD, or **HAWK** (so called from its predatory habits). A frigate bird (q.v.); but occasionally the term is applied to some other swift and predacious sea fowl, as a skua.

MAN'OGRAPH (from Gk. *μανός, manos,* thin, and *γράφειν, graphein,* to write). An instrument designed to render visible to the eye the varying pressure in an engine cylinder or other confined space in which the pressure changes with a cyclically varying volume. (See INDICATOR.) It is specially adapted for the high speeds and high temperatures of the internal-combustion motor. (See GAS ENGINE; INTERNAL-COMBUSTION ENGINE.) The fundamental principle is to have the pressures of the cylinder received upon a steel diaphragm of calibrated resistance to deformation by such pressure. The yielding of the diaphragm to pressure is measured by the motion of a very small mirror, which reflects a ray of light from an electric arc. The flexure of the diaphragm moves the mirror around an axis and causes the beam of reflected light to move vertically over a ground-glass surface in its path. The rise and fall of the spot of light measures the pressure on the diaphragm. To relate the position of the spot of reflected light to the position of the piston of the engine the mirror receives from the engine shaft a synchronous movement of rotation through a small angle around an axis at right angles to that of its motion from pressure. The position of the spot of light is therefore at any instant the resultant of the pressure and of the piston motion. The spot of light will therefore trace a diagram like an indicator diagram in which vertical ordinates are pressures and horizontal displacements or abscissas are the piston motions or cylinder volumes. If the ground glass for optical observation be replaced by a sensitized photographic plate a diagram of pressure and volume relations is photographically recorded. The manograph has very little inertia or friction; its motion is very small and the multiplication of motion is done optically and without complications. The objection to it is the uncertainty whether the known static pressures of calibration produce the same movement of the diaphragm as the dynamo's impact of the cylinder pressures, and whether the latter are translatable into the same units as the former.

MANOM'ETER (from Gk. *μανός, manos,* thin, rare + *μέτρον, metron,* measure). An instrument for measuring the density or pressure of the air or any gas. A barometer (q.v.) is one form of manometer, as the pressure of the atmosphere is measured by the height of the column of mercury which it supports. The manometer in its simplest form would be a glass tube open at both ends and bent into the form of a U and containing a sufficient quantity of some liquid to cover the bend and rise to a small height in each arm. The vessel containing the gas whose pressure is to be ascertained is connected with one arm of the tube, and if the gas is at the same pressure as the atmosphere the liquid will stand at the same level in both tubes. If the gas is at a greater pressure the liquid in the arm of the tube on which it acts will be at a lower level, and the pressure of the gas will be obtained by adding to the pressure of the atmosphere the weight of a column of the liquid whose height is equal to the difference in level in the two tubes. When the pressure of the gas is considerably greater than that of the atmosphere we use mercury on account of its high specific gravity, and when the pressures are sufficient a tube with one arm closed can be employed and the pressure determined by measuring the extent to which the air is compressed. Now, according to Boyle's or Mariotte's law, a pressure exerted on the column of mercury sufficient to force the air into half the space it occupies at the normal atmospheric pressure must become doubled, or 15 pounds to the square inch must be added. Again, to compress the air into half the remaining space, 30 pounds, or double the pressure required for the reduction to the first half, must be added, making in all a pressure of four atmospheres for the reduction to one-fourth the original volume. It is evident, therefore, that a graduated scale, to exhibit the degrees of pressure, must have its spaces decrease from below upward. If the gas is considerably rarer than the air, as, e.g., in the receiver of an air pump, we employ a shortened barometer consisting of a bent tube with one end closed but filled with mercury, which is supported by the pressure of the atmosphere. In this case the pressure is measured by the difference in level of the two columns, which would be zero were the vacuum perfect.

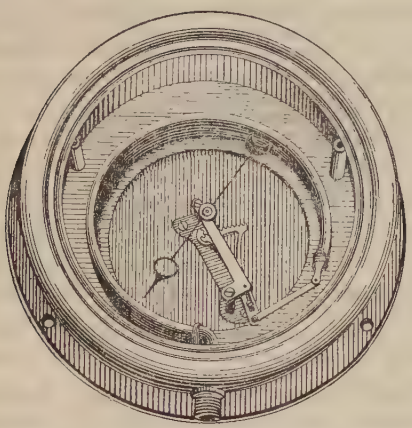


MANOMETER.

A, for pressures greater than one atmosphere; *B*, for pressures less than one atmosphere.

These manometers are of course constructed in various forms, depending upon the use to which they are to be put, and the tubes and air chambers are variously constructed. The most common form of manometer is the steam gauge, which may be either a piston actuated by the

pressure to move an indicator against the force of a spring, or more commonly a metal tube of elliptical cross section bent into circular shape. One end of this tube is permanently fastened to the case of the instrument and through it the steam or gas enters, while the other end is closed but free to move. It is connected with a spring



BOURDON PRESSURE GAUGE, WITH FACE REMOVED.

and a series of levers, so that its motion, which depends upon the pressure, is communicated to an indicator moving over a scale graduated usually in pounds in the United States and England and atmospheres in Europe. These steam gauges must of course be adjusted and calibrated by reference to some direct source of pressure, such as would be furnished by a column of liquid in a vertical tube. See MANOGRAPH.

MANON, mȧ′nôN′. An opera by Massenet (q.v.), first produced in Paris, Jan. 19, 1884; in the United States (New York), Dec. 23, 1885.

MAN ON HORSEBACK, THE. A name given to the French General Boulanger (q.v.), who usually appeared in public riding a black horse.

MANON LESCAUT, mȧ′nôN′ le-skō′. A noted romance by the Abbé Prévost. It was published in 1731 and was originally only an episode of his *Mémoires d'un homme de qualité.*

MANON LESCAUT. An opera by Puccini (q.v.), first produced in Turin, Feb. 1, 1893; in the United States (Philadelphia), July, 1894.

MAN'OR (Fr. *manoir,* from Lat. *manerium,* a dwelling place, from *manere,* to abide, to dwell). A district of land held by "some baron or man of worth" by freehold tenure of the king or of some mesne lord, within which the lord of the manor exercises a certain jurisdiction in addition to his rights as landlord. The term "manor" to describe such a lordship did not come into use in England till some time after the Norman Conquest, but the institution is found in a less-developed form among the Anglo-Saxons. The typical manor, in its later development, consisted of two parts: (1) the inland (demesne) or home estate, which the lord held in his own hands, upon which his house was built, and which was farmed by nonfree, peasant occupiers, and (2) the outland (geneatland), which was held, in part at least, by freemen as freehold tenants, holding of the lord at a rent, which might be money, or produce of the land, or military or other service. The tenants proper were freemen, but most of the occupiers who constituted the lord's dependents, belonged to one or more of the classes of the unfree (as villeins), who constituted the bulk of the peasant population. These for the most part dwelt together in villages and lived ordinarily by agriculture. It is held by writers like Gneist, Stubbs, and Freeman that originally there were few manors, but that they gradually increased in number, until in the twelfth century the prevailing system of society, outside the boroughs or incorporated towns, was that of manors with dependent peasants. The origin of the manor is obscure, some authorities, as Seebohm, holding it to be due to the imposition of the system of the Roman villa on the servile population by the Norman invaders; others, like Maitland, seeing in it a normal development of the village community.

As has been said, the lord of a manor might hold directly by grant of the king, who was, under the feudal system, the supreme landowner, the lord paramount, of all lands in the kingdom, in which case his customary jurisdiction, based upon and derived from the ancient customs of his manor, might be restricted or enlarged by the royal grant; or he might hold under some mesne lord, who in his turn held the manor, together with other lands, directly of the crown. With the growth of the process of subinfeudation, i.e., of the granting of lands by a tenant to be held of himself as overlord, the latter method of holding manors became common in the thirteenth and fourteenth centuries. Where one lord held two or more manors, whether of the king or of a mesne lord, the entire estate was known as a lordship or honor.

MANOR HOUSE. The residence of the lord of the manor. This was an important subject of architectural design under the Tudor kings in England, when such manor houses were built as Loseley, Westwood, Levens Hall, North Cadbury, and many others. Under Elizabeth and James I (1558–1625) the manor house was developed to imposing proportions upon monumental plans with sumptuous decorations and furnishings (Wollaton House, Longleat, Burghley, Aston, Bramshill, Hatfield, and scores of others).

MANO'RIAL COURT. See MANOR.

MANOURY, GENERAL. See SUPPLEMENT.

MAN-RAISING KITE. See MILITARY OR MAN-RAISING KITE.

MANRESA, mȧn-rā′sȧ. A town in the Province of Barcelona, Spain, 30 miles northwest of the city of that name (Map: Spain, F 2). It is picturesquely situated on the left bank of the Cardoner, and in an amphitheatre of hills crowned by a large Gothic cathedral of the fourteenth century. It has a high school, conducted by the Jesuits, and in the neighborhood are the convent of Santo Domingo, built near, and the church of San Ignacio, built over, the cave in which Ignatius of Loyola dwelt for a year, and which is on that account a place of pilgrimage. The surrounding region is irrigated by a canal fed by the Llobregat River. Manresa has manufactures of cotton and woolen yarns and silk fabrics. In 1811 it was set on fire by Marshal Macdonald. Pop., 1900, 23,416; 1910, 23,036.

MANRIQUE, mȧn-rē′kȧ, GÓMEZ (?1415–?1490). A Spanish poet, dramatist, soldier, and statesman, born of a noble family. Unfortunately, from a literary point of view, he was the nephew of the Marqués de Santillana (q.v.) and the uncle of Jorge Manrique (q.v.), both of

whom are more celebrated than he. None the less he played an important part in the disturbances of the reigns of John II, Henry IV, and Isabella II. In his earlier lyrics he adhered to the Gallegan methods, but he soon affiliated himself with the movement that aimed to Italianize Castilian poetical forms. He attained some success in the composition of the political satire, but the pathetic note is the most distinctive one in his lyrics. Gómez also essayed the drama in several pieces, the best of which is the liturgical play, *Representación del nacimiento de Nuestro Señor*. But he tried also a couple of *momos* that are not without merit. In short, he foreshadowed both the sacred and profane elements in the Spanish drama. Consult his *Cancionero*, edited by A. Paz y Melia (2 vols., Madrid, 1885–86), and Marcelino Menéndez y Pelayo, *Antología de poetas líricos castellanos*, vol. vi (ib., 1896).

MANRIQUE, Jorge (?1440–1479). A Spanish poet and soldier, nephew of Gómez Manrique (q.v.). He fell in the battle of the fortress of Garci-Múñoz, when yet hardly old enough to have attained the fullness of his poetical power. The greater part of his verse, preserved in the *Cancionero general* of 1511 and in other *cancioneros*, gives little evidence of any extraordinary merit in him, and his fame is really based on a single poem, that written in commemoration of the death of his father, the Maestre de Santiago. This suffices, however, to make his name one to be remembered as long as his language remains intelligible. In verses mournfully sweet of tone the exquisite *coplas* of this composition proclaim the vanity and brief duration of all things terrestrial and the necessity of yielding to death, as even the most powerful and exalted of human beings have had to do. Longfellow's graceful translation of the poem has preserved much of the dignity and pathos of the original. The Spanish text may be found in *Biblioteca de autores españoles*, vol. xxxv (Madrid, 1782), and in the *Bibliotheca Hispanica*, vol. xi (ib., 1902), Jorge Manrique, *Coplas por la muerte de su padre* (ed. R. Foulché-Delbosc). Consult also Marcelino Menéndez y Pelayo, *Antología de poetas líricos castellanos*, vol. vi (ib., 1896).

MANS, mäns, or **MAN-TSE**, män'tsĕ'. An aboriginal people occupying some of the mountainous parts of the Chinese provinces of Szechwan and Yunnan, portions of Tongking, etc., a division of the Mois (q.v.). During the last half century they have been forced more and more into the hills. The Mans are short in stature and mesocephalic. They are more or less nomadic and do not mix readily with other peoples of the country. They are looked upon as part of the aboriginal population of Szechwan, driven back into Yunnan about the third century A.D. by the advance of the Chinese, and now moving seaward along the heights of land. The Mans and the Lolos (q.v.) seem to be linguistically related. Consult Verneau in *L'Anthropologie* (Paris, 1896).

MANS, mäN, Le. The capital of the Department of Sarthe, and formerly of the Province of Maine in northwest France. It is situated in the centre of the department, on a hill above the left bank of the river Sarthe, 116 miles southwest of Paris (Map: France, N., F 4). It is an old town, but has some wide streets, many monuments, and several parks and promenades. The most notable building is the cathedral of St. Julien, which is one of the most beautiful churches of France. It was built in the period between the eleventh and the fifteenth centuries, and has a magnificent choir built in pure Gothic style and some beautiful stained-glass windows. It holds the tomb of Berengaria, the Queen of Richard Cœur de Lion. The church of Notre Dame de la Couture is also noted for its sculptures. The town has a seminary, two normal schools, a school of music, a lyceum, a museum of natural history, a public library containing 53,000 volumes and 600 manuscripts, and paintings by Corot, Constable, Ruysdael, and Troyon. There are also excellent museums of natural history, art, and archæology. The principal manufactures are chemicals (especially sulphuric acid), tobacco, sailcloth, instruments and clocks, cereals, cordage, oil, paints, leather, woolen goods, machinery, railway cars, agricultural implements, stained glass, chocolate, and candles. There is a chamber of commerce and of agriculture, and the town has considerable trade in cattle, poultry, eggs, fruit, grain, and wine. Pop. (commune), 1901, 63,272; 1911, 69,361. It is the headquarters of the Fourth Army Corps.

Le Mans existed before the Roman conquest. Its original name was Vindinum. It was the chief city of the Cenomani, from whom it received its present name. It was fortified by the Romans in the second century, and became one of the most important cities of the Frankish Kingdom. It was taken by William the Conqueror in 1063 and suffered many sieges during the long Anglo-French wars. The Vendeans were defeated here in December, 1793, and the city subjected to a massacre. In 1871 it was the scene of the defeat of Chanzy's army by the Germans under Prince Frederick Charles, in a battle lasting from the 10th to the 17th of January. It is the birthplace of Henry II, Duke of Normandy and afterward King of England.

MANSARD (män'särd) **ROOF**. A form of roof named after N. François Mansart (q.v.). It is constructed with a break in the slope of the roof, so that each side has two planes, the lower being steeper than the upper. This kind of roof has the advantage over the common single-slant form of giving more space in the roof for living room.

MANSART, mäN'särʹ, Jules Hardouin (1646–1708). A French architect, born in Paris, grandnephew of N. François Mansart, whose name he assumed in addition to his own family surname Hardouin. His father was peintre ordinaire du roi. He studied under his granduncle and under Bruant. The latter presented him to Louis XIV, to whose order he built the Château de Clagny for Madame de Montespan (1672). In 1675 he was admitted to the Académie d'Architecture, and from that time on, as architect of the King and contrôleur-général des bâtiments, he was occupied mainly with his two most important works, the dome of the Invalides (q.v.) and the palace at Versailles. The latter was almost wholly his design, though the core of the central block was the work of Levau under Louis XIII and the chapel was completed by De Cotte after Mansart's death. The Grand Trianon, the Château de Marly, and the Place Vendôme at Paris (but not its column) were also his work. The triple-shelled dome of the Invalides was completed from his design in 1735; it is regarded as his greatest and most original achievement.

MANSART, Nicolas François (1598–1666). A French architect, born in Paris, the son of a carpenter. Besides earlier works of less importance, he designed the extension of the Hôtel Carnavalet (1634); the Hôtel de la Vrillière (now the Banque de France) in 1635; the west wing (wing of Gaston d'Orléans) of the château of Blois (1635), and after 1645 the church of the Val-de-Grâce for Anne of Austria and the beautiful château of Maisons-sur-Seine for Louis XIV. Owing to his unreasoning extravagance in construction he was not permitted to complete the Val-de-Grâce, which was turned over to Jacques Lemercier (q.v.) for completion; but he erected a reduced replica of his design as a chapel for the Château de Fresnes. His work is noted for its classical refinement and purity of detail. His treatment of high roof stories gave rise to the term "Mansard roof" (*toiture à la Mansarde*). The spelling Mansard is not a correct form of the name.

MANSE. In Scots law, the dwelling house of a minister of the Established church. Every minister of a rural parish is entitled to a manse, which the heritors, or landed proprietors, are bound to build and maintain; and he is also entitled, as part of the manse, to a stable, cow house, and garden. The manse must, by statute, be near to the church. The amount fixed by law as the allowance for the manse has varied from time to time, and it may vary more or less according to circumstances, but it is now usually fixed at a value of £1000. It is only the ministers of rural parishes that are entitled to manses, and not ministers of royal burghs, where there is no landward district.

MAN'SEL, Henry Longueville (1820–71). An English metaphysician, born at Cosgrove, Northamptonshire. He graduated at St. John's College, Oxford, in 1843, and in 1855 was appointed reader in moral and metaphysical philosophy in Magdalen College. At Oxford he became Waynflete professor in 1859 and in 1867 professor of ecclesiastical history. In 1869 he was appointed dean of St. Paul's Cathedral, London. He belonged to the school of Sir W. Hamilton, whose lectures he edited (1859) with the assistance of Professor John Veitch. He was well versed in metaphysical philosophy and wrote in a clear and finished style. The best known of his publications is his *Bampton Lectures* (1858–59; 5th ed., 1867) on "The Limits of Religious Thought," in which, applying the idea developed in Hamilton's articles, "The Philosophy of the Unconditioned," he maintained that any attempt to arrive at an idea of the Absolute through the categories of substance or cause is attended by insurmountable difficulties. It was urged by many that the work, though purporting to be theistic, was really agnostic, and Spencer asserted (in the prospectus to his *Synthetic Philosophy*, 1860) that he was merely working out "the doctrine put into shape by Hamilton and Mansel." Controversies resulted between Mansel and F. D. Maurice and Goldwin Smith, and Mansel characterized his opponents' statements as misrepresentations. His further works include: *Prolegomena Logica: An Inquiry into the Psychological Character of Logical Processes* (1851; 2d ed., 1862); *The Philosophy of the Conditioned* (1866); *Letters, Lectures, and Reviews* (1873); *The Gnostic Heresies of the First and Second Centuries* (1875; ed. by J. B. Lightfoot, with biographical sketch by Lord Carnarvon). Consult the sketch referred to; also J. W. Burgon, *Lives of Twelve Good Men* (London, 1888), and A. W. Benn, *History of Rationalism* (ib., 1906).

MANSFELD, mäns'fĕlt, Ernst, Count (1580–1626). A German soldier, born in Luxemburg. He was the illegitimate son of Peter Ernst, Count of Mansfeld, and was educated by his godfather, Archduke Ernst of Austria. In return for valuable military services under his half brother in Austria he was legitimized by Rudolph II. The title and estates of his father were, however, withheld from him, and in revenge he joined the enemies of Austria in the Thirty Years' War as a stanch Protestant champion. He fought gallantly in Bohemia and on the Rhine for the Elector Palatine. His efforts failed, but brought him great renown. In 1625, under the leadership of Christian IV of Denmark and aided by English and French subsidies, he again attacked Austria. Wallenstein met and overcame his force at Dessau, April, 1626. But Mansfeld soon gathered a new army of 12,000 men and marched, in the summer of the same year, through Moravia and Hungary to join the forces of Bethlen-Gâbor (q.v.) of Transylvania. When the latter made peace with the Emperor, Mansfeld tried to escape to Venice, but died on the way, in Rakowitza, near Serajevo, before the close of the year. Consult: Reuss, *Graf Ernst von Mansfeld in böhmischen Krieg, 1618–21* (Brunswick, 1865); Villermont, *Ernest de Mansfeld* (Brussels, 1866); Grossmann, *Des Grafen Ernst von Mansfeld letzte Pläne und Taten* (Breslau, 1876).

MANSFIELD, măn'fēld. A market town and municipal borough in Nottinghamshire, England, 16 miles north of Nottingham, surrounded by the remains of the ancient forest of Sherwood (Map: England, E 3). The town is regularly built and has an early Norman church, a grammar school founded in 1561, 12 almshouses founded in 1693, and other charitable institutions. Its public buildings include a town hall and municipal offices, a mechanics' institute, free library and isolation hospital, and it owns water, gas, markets, bath, and pleasure grounds. It stands in the centre of a large manufacturing and coal-mining district. It manufactures shoes, machinery, lace, silk and cotton goods, and brick and tile. It is an important centre for cattle and agricultural produce. Many relics excavated in the vicinity point out that Mansfield was the site of a Roman station. Pop., 1901, 21,400; 1911, 36,888.

MANSFIELD. A town in Bristol Co., Mass., 24 miles south by west of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). Noteworthy features include the Memorial Library, the town hall, and the high school. Among the products manufactured are machinists' tools, chocolate and cocoa, straw and felt hats, and baskets. The municipality owns a fine water-supply system and the electric-light plant. Pop., 1900, 4006; 1910, 5183.

MANSFIELD. A city and the county seat of Richland Co., Ohio, 79 miles southwest of Cleveland, on the Baltimore and Ohio, the Erie, and the Pennsylvania railroads, and interurban lines connecting with points on the Big Four System (Map: Ohio, E 4). It is on the Lincoln highway, at an elevation of 1487 feet, and has the Ohio State Reformatory, a memorial soldiers' and sailors' building, a public library, Sherman-Heineman Park of 100 acres, and two smaller parks. The city is an important trade centre

for the adjacent agricultural country, and is noted for the diversity of its manufactures, which include threshing machines, farm tractors and small farm implements, boilers, engines, engine fittings and brass goods, stoves, pumps, interior sanitary appliances, chains, brick, automobile tires, steel sheets, buggies, cigars, webbing and suspenders, electrical and electric-railway supplies, etc. Mansfield is governed under the Ohio municipal code, which provides for a mayor, elected biennially, a city council, and administrative boards of public safety and of public service. The water works are owned and operated by the municipality; also a large sewage and garbage disposal plant. Settled in 1808, Mansfield was first incorporated in 1828. It was the home of John Sherman (q.v.). Pop., 1900, 17,640; 1910, 20,768; 1914, 22,100; 1920, 27,824.

MANSFIELD. A borough in Tioga Co., Pa., 36 miles southwest of Elmira, N. Y., on the Tioga River and on the Erie Railroad (Map: Pennsylvania, G 2). It is the seat of a State normal school with a library of nearly 6000 volumes, and has a Carnegie library. The annual county fair is held here in beautiful Smythe Park. Mansfield is a shipping point for hay, cattle, and dairy products, stock and farm produce, and there are manufactures of condensed milk and wood novelties. Pop., 1900, 1847; 1910, 1654.

MANSFIELD, Mount. The highest peak of the Green Mountains in the State of Vermont, situated in the northwestern part of the State, 20 miles east by north of Burlington (Map: Vermont, C 3). It rises 3000 feet above the surrounding country and has three peaks, the highest of which is 4364 feet above sea level. Its summit affords one of the finest views in New England, including Lake Champlain with the Adirondacks beyond, and a large part of the Green and White mountains.

MANSFIELD, Edward Deering (1801–80). An American author, born in New Haven, Conn. He graduated at West Point in 1818, but declined to enter the army and studied at Princeton, from which he graduated in 1822. In 1825 he was admitted to the Connecticut bar. He afterward removed to Cincinnati, and in 1836 became professor of constitutional law in Cincinnati College. Shortly afterward, however, he abandoned the legal profession to engage in journalism, and edited successively the Cincinnati *Chronicle* (1836–49), *Atlas* (1849–52), and *Railroad Record* (1854–72). While editing the *Chronicle* and *Atlas* he introduced many young writers to the public, among whom was Harriet Beecher Stowe. He was Commissioner of Statistics for the State of Ohio from 1859 to 1868, was a member of the Société Française de Statistique Universelle, and published: *Political Grammar of the United States* (1835); *Life of Gen. Winfield Scott* (1848); *History of the Mexican War* (1849); *American Education* (1851); *Memoirs of Daniel Drake* (1855); *A Popular Life of Ulysses S. Grant* (1868); *Personal Memories* (1870), an interesting social and political chronicle reaching to the year 1841.

MANSFIELD, Joseph King Fenno (1803–62). An American soldier. He was born in New Haven, Conn., graduated second in his class at West Point in 1822, was assigned to the Engineer Corps as brevet second lieutenant, and during the next 24 years was engaged almost continuously on engineering work for the government, his most important service being the construction of Fort Pulaski, for the defense of Savannah River, Ga., to which he devoted most of his time between 1830 and 1846. During the Mexican War he served throughout the northern campaign as chief engineer under General Taylor, with the rank of captain, constructing and aiding in the defense of Fort Brown, taking a prominent part in the battle of Monterey (where he was wounded) and in the battle of Buena Vista, and receiving the successive brevets of major, lieutenant colonel, and colonel. He then served as a member of the Board of Engineers for the Atlantic coast defense from March, 1848, to April, 1853, and of the board for the Pacific coast defenses from April to May, 1853, and from 1853 to April, 1861, was inspector general of the United States army with the rank of colonel. During the Civil War he was engaged in organizing companies of volunteers at Columbus, Ohio, in April, 1861; commanded the Department of Washington from April to July, 1861; was appointed brigadier general of volunteers in May; was in command of the city of Washington from July to October; then commanded successively at Camp Hamilton, Newport News, and Suffolk, Va.; captured Norfolk, Va., on May 10, 1862; was raised to the rank of major general of volunteers in July; commanded a division in the Army of the Potomac during the Maryland campaign, and was mortally wounded at Antietam on Sept. 17, 1862.

MANSFIELD, Richard (1857–1907). An American actor, born May 24, 1857, on the island of Helgoland, where his parents — Madame Rudersdorff (Mansfield), a prima donna, and Maurice Mansfield, a London wine merchant —were staying. He made his first appearance as an actor while at school in England, playing Shylock at a class-day exhibition. His mother wished him to become an artist, and after leaving school he studied painting at South Kensington; but at the age of 17 financial difficulties forced him to seek a surer means of support, and he came to America, where he obtained a position as clerk in a mercantile house in Boston. In 1875 he returned to England, hoping to sell some pictures he had painted in the intervals of his clerical work. Failing in this, he accepted an engagement with a company of strolling actors, and sang in Gilbert and Sullivan operas. He continued to act in England till 1878, when he returned to America and appeared, September 26, in the opera *Les manteaux noires*. In January, 1883, he won success as Baron Chevrial in *A Parisian Romance*. This was followed by a number of rôles which within 10 years gained him a leading place among American actors. Among his parts were Dr. Jekyll and Mr. Hyde (1887); Richard III, produced in London in 1889; Beau Brummell (1890); Arthur Dimmesdale in his own dramatization of *The Scarlet Letter* (1892); Shylock (1893); Bluntschli in *Arms and the Man* (1894); Dick Dudgeon in *The Devil's Disciple* (1897); Cyrano de Bergerac (1898); Henry V (1900); Monsieur Beaucaire (1901); Brutus in *Julius Cæsar* (1902); Prince Heinrich in *Old Heidelberg* (1903); and the leading parts in *Ivan the Terrible* (1904), *Don Carlos* (1905), Molière's *Misanthrope* (1905), and Ibsen's *Peer Gynt* (1906). Deep study and careful elaboration of detail characterized Mansfield's work.

Bibliography. McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); L. C. Strang, *Famous Actors of To-Day in America* (Boston, 1900); N. Hapgood, *The Stage in*

America in 1897–1900 (New York, 1901); P. Wilstach, *Richard Mansfield* (ib., 1908); W. Winter, *Life and Art of Richard Mansfield, with Selections from his Letters* (2 vols., ib., 1910).

MANSFIELD, William Murray, first Earl of (1705–93). A celebrated British jurist. He was born at Scone in Perthshire, Scotland, March 2, 1705, the fourth son of David, Viscount Stormont. He studied at Christ Church, Oxford, took the degree of M.A. in 1730, and was called to the bar in the same year. Through the facility and force of his oratory, as well as through the clearness of his understanding, he acquired a brilliant reputation and an extensive practice; in cases of appeal he was often employed before the House of Lords. In 1741 he was appointed by the ministry Solicitor-General, entered the House of Commons as member for Boroughbridge, and at once took a high position. In 1746 he acted, ex officio, as counsel against the rebel lords Lovat, Balmerino, and Kilmarnock; and in 1754 he was appointed King's Attorney. He became Chief Justice of the King's Bench in 1756. At this time he entered the House of Lords under the title of Baron Mansfield of Mansfield in the County of Nottingham. As his opinions were not those of the popular side, he was exposed to much abuse and party hatred. Junius, among others, bitterly attacked him; and in the Gordon riots of 1780 his house, with all his valuable books and manuscripts, was burned. He declined with dignity indemnification by Parliament. In 1776 he was made Earl of Mansfield. He worked hard as a judge till 1788, when age and ill health forced him to resign. His death occurred on March 20, 1793. He was a brilliant parliamentary debater, fluent, clear, and logical, and one of the greatest who ever sat on the bench. Consult: *Report of Cases Argued and Adjudged in the Court of the King's Bench during the Time of Lord Mansfield's Presidency in that Court* (Dublin, 1794); John Holliday, *Life of William, Late Earl of Mansfield* (London, 1797); *A General View of the Decisions of Lord Mansfield* (ed. by Evans, ib., 1803); J. M. Rigg, in *Dictionary of National Biography*, vol. xxxix (ib., 1894).

MANSFIELD COLLEGE. A theological college at Oxford, England, not incorporated with the university. It was founded in 1886 by the transfer to Oxford of Spring Hill College, Birmingham, and has been erected and supported by the Congregational churches for the study of theology, particularly for the education of Congregational ministers. The buildings consist of an open quadrangle with hall, common rooms, library, lecture rooms, and chapel, and are well designed in Gothic style. Consult W. B. Selbie, "Founding of Mansfield College," in his *Life of Andrew Martin Fairbairn* (New York, 1914).

MANSI, män'sē, Giovanni Domenico (1692–1769). Roman Catholic Archbishop of Lucca. He was born at Lucca, Feb. 16, 1692; taught theology many years at Naples; made literary journeys through Italy, France, and Germany; established an academy in Lucca over which he presided; was made Archbishop in 1765; and died in Lucca, Sept. 27, 1769. He is best known as the editor of the great work on the councils, *Sacrorum Conciliorum Nova et Amplissima Collectio* (31 vols., Florence, 1759 et seq.), which goes down to the middle of the fifteenth century. Consult his *Life* by Zatta (Venice, 1772) and Quintin, *J. D. Mansi et les grand collections conciliaires* (Paris, 1900).

MANSION, mäN'syôN', Paul (1844–). A Belgian mathematician, born in Marchin-le-Huy. He became professor of mathematics in the scientific faculty in the University of Ghent, resigning in 1910. In 1877, with Namur, he published valuable logarithmic tables. His important works on analytical geometry, calculus, etc., include: *Théorie de la multiplication et de la transformation des fonctions elliptiques* (1870); *Théorie des équations aux dérivées partielles du premier ordre* (1875); *Résumé du cours d'analyse infinitésimale, etc.* (1887); *Principes fondamentaux de la géométrie, etc.* (1895); *Mélanges mathématiques* (1874–82, 1883–98); *Introduction à la théorie des determinants, etc.* (1877; 3d ed., 1899); *Calcul des probabilités* (1906); *Sur la portée objective du calcul des probabilités* (1908). He also translated from the German into French, among such translations being *La divine comédie de Dante* (1887) by Hettinger.

MANSION HOUSE. The name given to the official residence of the Lord Mayor of London, situated opposite the Royal Exchange. It was built between 1739 and 1753 from designs by George Dance, and its hexastyle Corinthian portico is a notable example of the classic revival under George II. State banquets are given in its Egyptian Hall.

MAN'SLAUGH'TER. The unlawful killing of another without malice, express or implied. It is this absence of malice which distinguishes the act from murder. Not infrequently persons are charged with this crime who are admittedly free from any moral blame. At common law manslaughter is of two kinds, voluntary and involuntary. The former includes cases of intentional killing, upon sudden heat or passion due to provocation, which palliates the offense; as when the person killed grossly insults or wrongs the slayer or quarrels with him. *Involuntary manslaughter* occurs when the killing is not intended, but results from the commission of an unlawful act which falls below the grade of felony, or from the doing of a lawful act in an unlawful manner, as in cases of culpable negligence. A railroad engineer, a trolley-car motorman, or a horse-car driver, whose negligent misconduct causes the death of a human being is guilty of manslaughter. By modern statutes the offense has been extended to every kind of homicide which on the one hand is not murder and on the other is not justifiable or excusable. It has also been divided into degrees—the first degree including cases marked by unusual cruelty, or by unlawful conduct of a grave character, such as a deliberate assault or the use of dangerous weapons, or administering drugs to produce miscarriage; while the second degree embraces culpable acts and omissions which are less blameworthy. The common law treated manslaughter as a felony, but within the benefit of clergy. Modern statutes in England punish the more serious forms by penal servitude for life and the lighter forms by imprisonment or fine. In the United States manslaughter in the first degree is punishable by imprisonment for a term generally varying from five to 20 years; in the second degree, by imprisonment for a shorter term, or by a fine of a limited amount, or by both fine and imprisonment. See Criminal Law (consult the authorities there cited); Homicide; Murder.

MANSO, män'sō, Johann Kaspar Friedrich (1760–1826). A German philologist and historian, born at Blasienzell (Gotha). He studied at Jena and from 1790 until his death was rector

of an academy at Breslau. As a poet, he was a dry didactic and was ridiculed by Goethe and Schiller in their "Xenien." His translations from the classics—Vergil's *Georgics* (1783) and the *Œdipus Rex* of Sophocles (1785)—were not successful, but the *Geschichte des preussischen Staates bis zur zweiten pariser Abkunft* (3 vols., 1819–20) has more merit and was much read. Consult *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MANSON, George (1850–76). A Scottish water-color painter and engraver, born in Edinburgh. He at first worked as an engraver, and during this time and afterward studied painting in the Edinburgh School of Art, and etching in 1875, under Cadart in Paris. His pictures are usually of homely rustic subjects, treated with much delicacy and beauty of color and form; such are "Devotion," "What is it?" and "Milking Time." He was fond of painting children. As an engraver, Manson imitated the simple, direct methods of the Bewicks. Consult Gray, *George Manson and his Works* (Edinburgh, 1880).

MANSON, Sir Patrick (1844–1922). An English physician and parasitologist and writer on tropical diseases. He was born in Aberdeen, was educated there and in London, and first became known by his investigations into the pathology of filarial diseases. He was one of the first to suggest the hypothesis that the mosquito is an active agent in the propagation of malaria. He was dean of the College of Medicine for Chinese at Hongkong and for some years after 1897 was medical adviser to the British Colonial Office. He received many honors, including the K. C. M. G. in 1903 and the G. C. M. G. in 1912. In 1904 he investigated cachexial fevers, including kala azar (q.v.). Manson lectured on tropical medicine at the London School of Tropical Medicine and at the Charing Cross Hospital and Medical School, and was consulting physician to the British Seamen's Hospital. He published many monographs on tropical diseases. His most important works are *Filaria Sanguinis Hominis* (London, 1883) and *Tropical Diseases* (1898; 5th ed., rev., 1914). See Insects, Propagation of Disease by.

MANSURAH, mȧn-sōō′rȧ. A town of Lower Egypt, capital of the Province of Dakahlieh, situated on the right bank of the Damietta arm of the Nile, about 35 miles southwest of Damietta, on the Cairo-Damietta Railway (Map: Egypt, C 1). It has extensive cotton manufactures and carries on a large trade in raw cotton. The town was founded in 1222 and is noted as the place where Louis IX of France was defeated and made prisoner in 1250. Pop., 1907, 40,279.

MANT, Richard (1776–1848). An Irish bishop. He was born at Southampton, England; was educated at Winchester School and Trinity College, Oxford, taking his bachelor's degree in 1797; was elected fellow of Oriel College in 1798; was ordained priest in 1803; and was curate and vicar of several parishes in and near London, 1804–20. He was made Bishop of Killaloe and Kilfenoragh, Ireland, in 1820, and in 1823 was transferred to the see of Down and Connor, to which Dromore was added in 1842. Bishop Mant voted against Catholic emancipation in 1821 and 1825. In 1830 he was a member of the Royal Commission to inquire into ecclesiastical union. He was a prolific writer of poetry, as well as of historical and theological works; and some 20 of his hymns are found in many hymnals. With George D'Oyly (q.v.) he prepared the annotated edition of the Bible known as D'Oyly and Mant's Bible (1814), which had an immense sale in England and was republished in New York, with additions by Bishop Hobart. He also published *The Book of Common Prayer with Notes* (1820) and a *History of the Church of Ireland from the Reformation to the Union of the Churches of England and Ireland in 1801* (1840). His poetical works include a version of the Psalms (1824) and *Ancient Hymns from the Roman Breviary, with Original Hymns* (1837). Consult the memoir by his son, Walter Bishop Mant (Dublin, 1857).

MANTA, mȧn′tȧ. A port of the Province of Manabi, Ecuador, situated on the Pacific coast, 150 miles west-southwest of Quito (Map: Ecuador, A 4). Its harbor is deep enough for large vessels. Among the ports of the country in 1911 it held second rank in imports and third in exports, the former having a value of $22,629 and the latter $25,734. It exports straw hats, rubber, and coffee, and is the seat of a United States consular agent. Manta is the chief port of the province, serving especially the inland towns of Monticristi and Portoviejo. It was founded in 1535. Pop. (est.), 2500.

MANTA (Sp., blanket). A name about Panama of the huge ray (*Manta birostris*), more commonly known as devilfish (q.v.) or sea devil, which is greatly dreaded by the pearl fishers, "whom it is said to devour after enveloping them in its vast wings," sometimes 20 feet across, as in a blanket. See Plate of Rays and Skates.

MANTARO, mȧn-tȧ′rō. A river in Peru. It is formed at a height of 13,000 feet above sea level by the small head streams of Lake Chinchaycocha, in the western part of the Province of Junin. Thence it flows southeast past the towns of Jauja and Huancayo into the Province of Huancavelica, where it turns northeast, breaks through a deep gap in the eastern cordilleras, and joins the Apurimac to form the Ené, which joins the Quillabamba to form the Ucayalli. Its length is about 280 miles, and it is navigable a few miles above the junction.

MANTCHURIA, mȧn-chōō′rī-ȧ. See Manchuria.

MANTEGAZZA, mȧn′tȧ-gä′tsȧ, Paolo (1831–1910). An Italian physiologist and anthropologist, born at Monza. After studying medicine in the universities of Pisa and Milan, he received his doctor's degree at Pavia (1854), and then traveled extensively in Europe, India, and South America, where he practiced for a time in Paraguay and the Argentine Republic. In 1858 he returned to Milan, was appointed physician at the hospital in that city the following year, and became in 1860 professor of general pathology at Pavia. In 1870 he was made professor of anthropology at the Istituto di Studii Superiori in Florence, and there he founded the Museum of Anthropology and of Ethnology, the first in Italy, as well as the Italian Anthropological Society and a review, *Archivo d' Antropologia e d' Etnologia*. He was deputy for Monza in the Italian Parliament from 1865 until 1876, when he was appointed to the Senate. He was a prolific writer. His philosophical and medical works include: *La scienza e l' arte di guarire* (1859); *La generazione spontanea* (1864); *Elementi d' igiene* (1875); *Igiene dell' amore* (1878); *Fisiologia del dolore* (1880); *Fisiologia del piacere* (1881); *Fisonomia e mimica*

(1883); *Gli amori degli uomini: Saggio di una etnologia dell' amore* (1886); *Le estasi umane* (1887); *Fisiologia della donna* (1893); *Fisiologia dell' amore* (1896); *L' anno 3000* (1897); *L' amore* (1898). He also published travel sketches and political treatises: *Rio della Plata e Teneriffe* (1877); *Viaggio in Laponia* (1884); *India* (1884); *Studi sull' etnologia dell' India* (1886); *Ricordi d' un fantaccino al parlamento italiano* (1896); *Biblia della speranza* (1905); and among his novels may be mentioned *Il dio ignoto* (1876).

MANTEGNA, mán-tā'nyȧ, ANDREA (1431–1506). An Italian painter and line engraver of the early Renaissance, the chief master of the Paduan school. He was born at Vicenza, the son of one Biagio (Blasius), who seems to have been a peasant. After the death of his father he removed to Padua, where he received his intellectual and artistic education. He was adopted by the painter Squarcione, whose apprentice and pupil he became. They disagreed repeatedly and finally separated, when Andrea came under the influence of Jacopo Bellini and espoused his daughter Nicolosia in 1453. It is the tendency of the latest criticism to minimize the influence of Squarcione upon Mantegna's art; nevertheless, it is certain that we find all the characteristics of Squarcione's school in it. He was also influenced by the work of Donatello and Pizzolo, his assistant, by Paolo Uccello, and by Fra Filippo Lippi at Padua. At the age of 17 Mantegna was an independent master, practicing his art at Padua, where he remained until the end of 1459.

The chief works of this early Paduan period are his seven mural paintings in the chapel of Sts. James and Christopher, in the church of the Eremitani, in which the entire progress of his art can be traced. Mantegna's paintings are far superior to those of the other pupils of Squarcione in the chapel and were as important for northern Italy as the Brancacci frescoes for Florence. Five are from the life of St. James and two from the life of St. Christopher. His earliest known work is a wall painting representing Sts. Bernardinus and Antonius (1452), above the main portal of San Antonio in Padua. Others are the fine polyptych of St. Luke in the Brera, Milan (1453–54), containing panels of saints in arched frames, the most prominent of whom is St. Luke; "St. Euphemia," in the Museum of Naples; the "Presentation of Christ in the Temple"; and the portrait of Cardinal Luigi Scarampi, in the Berlin Museum. The altarpiece of St. Zeno, Verona (1457–59), has rich classical decoration of columns and garlands; in the centre is the Madonna, surrounded by angels and by a group of saints on either side. The predella contained a "Crucifixion" of infinite pathos, now in the Louvre, which was flanked by "Gethsemane" and the "Resurrection," at present in the Museum of Tours.

In 1459, after repeated invitations from Lodovico Gonzaga, Marquis of Mantua, Mantegna removed to that city, where he resided for the remainder of his life. Here he participated in a sumptuous court life (designing pageants), decorated palaces, and painted portraits of his patrons. Although very independent and sometimes irritable, he was treated with high honor and great consideration by the Marquis and his successor, Francesco II, under whose patronage he continued until his death. He was granted a coat of arms, raised to knighthood, built himself an imposing dwelling, and gathered a fine collection of antiques. In 1483 Lorenzo de' Medici visited him, and in 1488 Pope Innocent VIII summoned him to Rome to decorate the Belvedere Chapel, now destroyed. In 1490 he returned to Mantua, where he died Sept. 13, 1506. His last years were darkened by financial troubles which caused the sale of some of his antiques, particularly a bust of Faustina to Isabella d' Este for 100 ducats. He left sufficient wealth, however, to provide for a fine family chapel in Sant' Andrea, in which he was interred. It contains a "Madonna with Saints" by his hand and frescoes after his designs by his two sons, Ludovico and Francesco, both mediocre painters.

His chief work at Mantua was the decoration of the Camera dei Sposi, the marriage chamber of Duke Gianfrancesco and Isabella d' Este, in the Castello di Corte, finished in 1474. Two of the walls and the ceiling remain. One of these, which is partially damaged, is covered with a realistic group of the Marquis, his wife, and the entire court. The other shows a meeting of the Marquis with Cardinal Francesco Gonzaga, both attended by relatives. The figures are nearly all in profile and stiff in action, but intensely realistic and of monumental grandeur. The same wall contains a hunting scene, somewhat damaged, and a group of beautiful genii holding an inscription. The ceiling is richly decorated and contains a circular dome painted to represent the open sky, with angels and other figures looking over a parapet. Before going to Rome, Mantegna had also begun his nine cartoons, the "Triumph of Cæsar," now in Hampton Court, which he finished soon after his return to Mantua. They are drawn on paper in high colors, to represent, as if in bas-relief, a continuous triumphal procession, and were used as hangings. No other monument of the fifteenth century shows such knowledge and feeling for the antique. For Isabella d' Este, Marchioness of Mantua, he painted two pictures in the famous chamber which she furnished with paintings by prominent Italian artists, viz., the "Triumph of Virtue over Vice" and "Parnassus," the latter containing groups of graceful classical figures in a romantic landscape. Both are now in the Louvre.

Among his other works painted at Mantua are a fine triptych in the Uffizi, with the "Adoration of the Kings," the "Circumcision," and the "Ascension"; "St. Sebastian," in the Gallery of Vienna; "St. George," in the Academy of Venice; "Summer," "Autumn," and the "Triumph of Scipio," in the National Gallery, London; and the "Dead Christ," in the Brera, Milan, a marvel of foreshortening and realistic ugliness. In later life he painted a large number of Madonnas, of which there are good examples in the Uffizi at Florence, the National Gallery, London, the Dresden Gallery, and the Trivulzio collection, Milan. Particularly famous is the "Madonna della Vittoria" (1496), painted in commemoration of a supposed victory over the French and now in the Louvre. Under a canopy of fruit and leaves the Virgin, surrounded by saints, is represented blessing Francesco Gonzaga. In the United States, Mantegna is represented in the Gardner collection, Boston, by the "Infancy of Jesus," an early work; in the Metropolitan Museum (Altman collection) by an admirable "Holy Family"; in the New York Historical Society by a "Crucifixion"; in the

Johnson collection, Philadelphia, by an "Adoration of the Magi"—the last three being late productions.

Reared in the classical atmosphere of Padua, whose university was the centre of classical learning, Mantegna was a highly cultured man, well versed in classical literature, and numbered among his friends prominent humanists, like Felice Feliciano, who dedicated a book to him. No other painter of the Renaissance understood antique art as did Mantegna. His paintings were its sculpture transferred to canvas, and he mastered completely its decoration. The figures and draperies are sharp and rigid, and his archæology is sometimes more learned than artistic. Yet he was a profound student of nature and an intense realist. His portraits are full of strength and character, his ideal figures noble and grand. No artist of the early Renaissance had greater invention and imagination. His execution was careful, his composition good, and the excellence of his drawing is attested by the finished drawings in the Louvre, British Museum, Uffizi, and other collections. As a colorist, he did not stand on the same high level, although his color, whether in bright or quiet harmonies, is at best very impressive. All of his work was in tempera, and his wall paintings, which were painted upon dry plaster, are improperly called frescoes. His influence on North Italian and Venetian painting was profound. He inspired Tura, and his works taught the later Venetians, above all Correggio.

Mantegna was the greatest line engraver of northern Italy, and his influence upon that art was potent not only in Italy, but in Germany as well. Unlike Italian engravers before him, he engraved copper plates from his own designs. At first his technique was primitive, but it improved with the study of German engravings. In all cases his invention is more interesting than his technique. The best-known plates of his Paduan period are the "Flagellation of Christ" and "Christ at the Gates of Hell"; to the Mantuan period belong the "Resurrection of Christ," "Deposition from the Cross," and "Entombment." This last plate had a greater influence upon art than any other ever executed. Its composition was adopted by Raphael in his picture of the same name, by Holbein (q.v.) in the "Basel Passion" series, and the figure of St. John was used by Dürer in his "Crucifixion." Mantegna also engraved a number of classical subjects, the best known of which are two Bacchanals, two "Battles of Tritons," and several plates from the "Triumph of Cæsar." He had a large number of followers who developed his technique and engraved his compositions, the best known of whom was Jacopo de' Barbari.

Bibliography. The sources for the life of Mantegna are chiefly his correspondence and other documents published by Baschet, "Documents sur Mantegna," in *Gazette des Beaux-Arts*, vol. xx (Paris, 1866), in the appendix to Kristeller's work, cited below. Vasari (q.v.) is unreliable upon Mantegna. The best modern authority is Paul Kristeller, *Andrea Mantegna*, translated by S. A. Strong (London, 1901), containing a bibliography, a work as scholarly as it is critical. Among other monographs that by Maud Crutwell, *Andrea Mantegna*, in "Great Masters in Painting and Sculpture" (ib., 1901), is a good brief account, while Julia Cartwright, *Mantegna and Francia*, in the "Great Artists Series" (ib., 1881), is of a popular character. Other works on Mantegna are by Thode (Bielefeld, 1897); Yriarte (Paris, 1902); N. R. E. Bell, *Mantegna* (New York, 1911); also *Masters in Art*, vol. vi (Boston, 1905), containing an exhaustive bibliography; Fritz Knapp (ed.), "Andrea Mantegna," in *Des Meisters Gemälde und Kupferstiche*" (Stuttgart, 1910). For his engravings, see Hind, in the *Connoisseur*, vols. xv, xvi (London, 1906), and the volume of the "Great Engravers Series" entitled *Mantegna* (ib., 1910).

MANTELETTA, măn'te-lĕt'â. See COSTUME, ECCLESIASTICAL, and Plate.

MANTEL, or MANTELPIECE. The decorative composition which forms a frame and setting for a fireplace. Its name is derived from the wide projecting hood (*manteau* = mantle) which in the later Middle Ages served to gather and convey to the chimney flue behind it the smoke of the fire on the hearth. When, first in France and later in England, the fireplace formed in the masonry of the wall itself or of a chimney breast took the place of the primitive fire on the open hearth, the hood lost its importance and the mantelpiece became one of the chief features of interior decorative architecture, employing sculpture as an adjunct to architecture with great effect. Famous Renaissance examples are in the Doge's Palace, Venice; the Musée Cluny, Paris; the Château of Blois; and others, especially of the Jacobean period, in English manor houses. In the eighteenth century a huge mirror in an ornate gilt frame became in France the universal and dominant feature of the mantelpiece above its shelf, while in England carved wooden mantelpieces, or designs of stone below, with woodwork above framing a picture or mirror, became common. The refined beauty of many American Colonial mantelpieces of painted woodwork is well known. Modern designers employ brick and terra cotta, as well as stone, marble, and wood, in mantelpieces of the greatest variety.

MAN'TELL, GIDEON ALGERNON (1790–1852). A British geologist, born at Lewes in Sussex. He studied and practiced medicine and surgery, in which he was successful, but devoted himself chiefly to geology and paleontology. His excellent collection of fossils was bought by the British Museum. He investigated the fossils of the Wealden formations and discovered four of the five genera of dinosaurs known at the time of his death. He was elected F.R.S. in 1825. He wrote a large number of books, memoirs, and papers, many of the papers being published in the *Philosophical Transactions* and the *Geological Transactions*. Among his books were *The Wonders of Geology* (1838) and *The Medals of Creation* (1844).

MANTELL, ROBERT BRUCE (1854–). An American actor, born at Irvine, Ayrshire, Scotland. His parents intended him for the law, but he made so little progress in his studies that they decided on a commercial career for him, and he was apprenticed to a wine merchant. During his apprenticeship he happened to take part in some amateur theatrical performances, and meeting with unexpected success, he developed a desire to become an actor. His parents opposed him in this, and at the age of 20 he left home and took passage for Boston. Failing to obtain an engagement there, he returned to England in two weeks, where he joined a company under the management of Richard Edgar and made his début Oct. 21, 1876, at Rochdale, Lan-

cashire, as the sergeant in *Arrah-na-Pogue*. His next important rôle was Father Doolan in *The Shaughran*. He then toured the provinces with Charles Matthews, Barry Sullivan, and Dion Boucicault till 1878, when he returned to America and played juvenile rôles in the company of Modjeska. His first appearance in London was in July, 1880, at Saddlers Wells Theatre. He visited America again in 1882, touring the country in *Romany Rye*, in which he appeared as Jack Hearn. In 1883 he played Boris Ispanoff in *Fédora* with Fanny Davenport. Later he became a star and appeared with his own company in a large repertoire of classic and romantic plays, including *Hamlet*, *Richard III*, *Othello*, *Macbeth*, *Romeo and Juliet*, *Corsican Brothers*, *Lady of Lyons*, and *Richelieu*. In later years he confined himself almost exclusively to Shakespearian rôles. He appeared in New York in revivals of *King Lear* and *Macbeth* in 1905 and in 1911, and in 1915, with his wife, had a successful season there in repertoire. William Winter (q.v.) paid high tribute to Mantell's ability. He came to be known for consistently sincere and intelligent work and for adequate productions.

MANTES, mänt. A town in the Department of Seine-et-Oise, France, beautifully situated on the left bank of the Seine, 30 miles west-northwest of Paris by raïl (Map: France, N., G 4). A twelfth-century bridge crosses the Seine above the town, and modern bridges connect Mantes with an islet in the Seine and with Limay on the opposite river bank. The fine Gothic church of Notre Dame, dating from the twelfth century, occupies the site of the prior church burned during the siege of 1087; other buildings include the town hall, library, and palace of justice. Mantes has large tanneries, manufactures musical instruments and saltpetre, and has a considerable agricultural trade. Mantes was a Celtic town from which Julius Cæsar expelled the Druids; it is the Roman Medunta. William the Conqueror destroyed the town in 1087 and here received the injury which caused his death. Pop. (commune), 1901, 8034; 1911, 8821.

MANTEUFFEL, män'toi-fel, Edwin Hans Karl, Baron von (1809–85). A Prussian general. He was born at Dresden, entered the army in 1827, and became an officer a year later. He became in 1843 the personal aid of Prince Albrecht and in 1848 of King Frederick William IV. His promotion was rapid, and he played a prominent rôle in the great Prussian military reforms. He was a lieutenant general in the War of 1864 against Denmark, and in 1865 became the Governor of Schleswig and as such played a prominent rôle in the ultimate solution of the Schleswig-Holstein question. During the War of 1866 against Austria he commanded the Army of the Main, and during the Franco-Prussian War he commanded the First Army Corps and participated in the battles of Colombey-Nouilly and Noisseville. Later he became the commander in chief of the German troops in south France and operated effectively there, driving Bourbaki's army across the Swiss frontier. After the close of the war he was made commander in chief of the German army of occupation and was decorated with the Iron Cross and the Black Eagle. In 1873 he was created field marshal and later sent on important diplomatic missions to Russia. His last prominent post was that of Governor of the Imperial Province of Alsace-Lorraine.

MANTEUFFEL, Otto Theodor, Baron von (1805–82). A German statesman, born at Lübben. He studied jurisprudence and political science at Halle and became in 1845–46 a director of one of the departments in the Prussian Ministry of the Interior. When Count Brandenburg undertook the suppression of the revolutionary movement of 1848, he was appointed Minister of the Interior. In 1850, at the death of Count Brandenburg, he took office as Minister of Foreign Affairs and president of the cabinet and as such pursued a reactionary policy. In 1856 he was sent as Plenipotentiary to the Congress of Paris and in 1858 retired from the ministry. After 1864 he was a member of the Prussian House of Lords. From his literary bequest H. von Poschinger published *Unter Friedrich Wilhelm IV. Denkwürdigkeiten des Ministers Otto Freiherrn von Manteuffel* (Berlin, 1901) and *Preussens auswärtige Politik, 1850–58* (ib., 1902). For his biography, consult Hesekiel (Berlin, 1851), and *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884).

MANTI, măn'tī. A city and the county seat of Sanpete Co., Utah, 126 miles by rail south of Salt Lake City, on the Denver and Rio Grande Railroad (Map: Utah, C 3). The Mormon temple which cost about $2,500,000 is a noteworthy feature of the city, and there are two fine public school buildings, a public library, Manti Cañon, and municipally owned water works and electric-light plant. Manti is surrounded by a productive agricultural country, largely engaged also in sheep and cattle raising, and has flour mills, a candy factory, saw mills, stone quarries, and a creamery. In the vicinity are productive coal mines. Manti was settled in 1849 and incorporated two years later. The city was greatly damaged on several occasions by cañon floods, but by a system of patrol and regulation of various sections of the watershed this devastation has been stopped entirely. Pop., 1900, 2408; 1910, 2423.

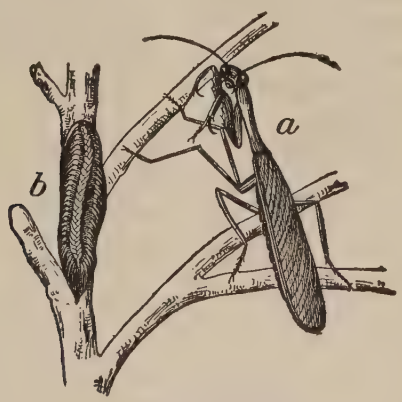
MANTINEA. See Mantineia.

MAN'TINE'IA, or **MANTINEA** (Lat., from Gk. *Μαντίνεια, Mantineia*). A city of Arcadia, in the Peloponnesus, on the high table-land west of Argolis (Map: Greece, Ancient, C 3). It was on the river Ophis, in a broad plain, and was at first a group of open villages, owning the supremacy of Sparta. Shortly after the Persian wars, under Argive influence the five villages united in a fortified city, which gained great military strength. Through its efforts to control the watershed of the river Alpheus (q.v.) and the two highways which led from Arcadia to the Isthmus of Corinth, it frequently came into collision with Sparta; in these struggles the city sought help from Argos. Mantineia fought frequently with Tegea (q.v.). The community was dissolved later by the Spartans, in 385 B.C., only to be reconstituted by the Thebans under Epaminondas after the battle of Leuctra. The plain in which Mantineia stood, from its strategic importance, was the scene of several battles, of which the most famous was that of 362 B.C., when Epaminondas defeated the Spartans and Athenians, but fell himself in the moment of victory. Later, Mantineia became less important than Megalopolis (q.v.). For a time the city belonged to the Achæan League (see Achæa), but in 222, having deserted the League, it was laid waste. Excavations conducted by the French School at Athens during 1887 and 1888 have clearly determined the course of the walls of Mantineia and laid bare the Agora and its surrounding

buildings, including a small theatre, interesting because built up from the level plain instead of being laid, in the usual Greek fashion, against a hillside. The site of the city is now called Palæopoli. Consult: Fougères, *Bulletin de correspondance hellénique* (Paris, 1890); id., *Mantinée et l'Arcadie orientale* (ib., 1898); J. Kromayer, *Antike Schlachtfelder in Griechenland* (Berlin, 1903); D. Worenka, *Mantineia* (1905); Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

MANTIQUEIRA, män'tē-kā'ē-rà, Serra da. A mountain range in southeast Brazil. It extends for about 200 miles parallel with the Atlantic coast and about 70 miles away from it, first along the boundary between the states of São Paulo and Minas Geraes, and then for a short distance into the latter, where it divides into two branches, the Serra dos Aimores continuing along the coast, and the Serra do Espinhaço extending through the centre of Minas Geraes. The name Mantiqueira is sometimes applied to this whole system, but is properly confined to the single range in the south. It is granitic in character, and the highest and roughest in Brazil. Its highest point, Mount Itatiaia, on the state boundary, has an altitude of 9739 feet. The range is the watershed of the Rio Grande, the principal head stream of the Paraná.

MAN'TIS (Neo-Lat., from Gk. *μάντις*, diviner, prophet; so called from the position of the fore-legs, which resembles the attitude of prayer). One of the popular names for any of the orthopterous insects of the family Mantidæ and the scientific name of the type genus. Other popular names are praying insect, soothsayer, prophet, rear-horse, mule killer. The family



THE REAR-HORSE.
a, adult male *Stagmomantis carolina*; *b*, egg case.

Mantidæ form the old group of the Orthoptera known as the Raptoria or graspers. They have the prothorax long and the front legs fitted for grasping their prey. The head is oblique and generally three-cornered. They are much more abundant in tropical regions than elsewhere and exhibit striking instances of protective resemblance and aggressive resemblance. The so-called "flower mantes" of tropical countries resemble the flowers of certain plants, and in these flowers they lurk awaiting the visits of the insects upon which they feed. The term "praying insects" has been derived from the attitude which they assume when at rest or when waiting to grasp another insect; the knees are bent and the front legs are held as though supporting a prayer book. The commonest North American species is the rear-horse or mule killer (*Stagmomantis carolina*), but the European (*Mantis religiosa*) has been introduced into the United States by accident and has become acclimatized. The eggs of the Mantidæ are laid in tough cases attached to the twigs of trees, where the young, when hatched, begin immediately to feed upon plant lice or other small soft-bodied insects, the size of the insects attacked increasing with the growth of the mantes. They have always been recognized as beneficial insects, but they are indiscriminate in their diet and will feed upon other beneficial insects as well as upon injurious forms. Their eggs are frequently parasitized by a very curious chalcis fly of the genus *Podagrion*, which by means of a long ovipositor is enabled to pierce the tough egg cases of the mantes.

These insects seem always to have been regarded with superstitious awe. They were used by the Greeks in soothsaying, and the Hindus display a reverential consideration of their movements and flight. In southern France the peasants believe that they point out a lost way; the Turks and other Moslems recognize intelligence and pious intentions in the actions of the mantis; a South African species is, or was, venerated by the Hottentots; the Chinese and the Javanese keep them in cages and cause them to fight for wagers.

MANTIS'SA. See Logarithms.

MANTIS SHRIMP, or Sea Mantis. A large burrowing crustacean (*Squilla empusa*), of the order Stomapoda, which lives in large irregular holes which it excavates at or near low-water mark of spring tides. It is so called from the resemblance of the great spiny claw to that of the mantis (q.v.). This claw is borne on the legs of the second pair, and instead of ending in a forceps-like claw, which is armed with a row of six sharp curved spines fitting into corresponding sockets, the terminal joint is turned back and is attached to the penultimate segment like the blade of a pocket knife to the handle. By means of these singular organs, says Verrill, the shrimps hold their prey securely and can give a severe wound to the human hand, if handled incautiously. It has large eyes, but, as it remains in its burrow constantly, it is blind, the facets of the eye being partly atrophied. It lives chiefly on annelid worms. The European species is used as food, and the American species is probably edible.

MAN'TLE (AS. *mæntel*, OF. *mantel*, Fr. *manteau*, It. *mantello*, Lat. *mantellum*). A long sleeveless cloak, worn in the Middle Ages over the armor and fastened by a fibula in front or at the right shoulder. The mantle was an important part of the official insignia of various orders of knighthood. Ladies wore mantles, often decorated with heraldic charges and bearing either the impaled arms of the lady and her husband or the husband's arms only. The Teutonic or White Knights were known as the *ordo alborum mantellorum* (order of white mantles) because of their white cloaks, and the robe of office worn by the electors of the Holy Roman Empire was called the electoral mantle. The name is still given to the robes of state of kings, peers, and knights.

MAN'TLING, Lambrequin, or Contoise. A heraldic ornament attached to the helmet. Sometimes it is cut into irregular strips and curls of the most capricious forms, supposed to indicate that it has been torn on the field of battle; but usually the strips fall in graceful,

flowing lines. In British heraldry the mantling of the sovereign is of gold lined with ermine; that of peers, ordinarily of crimson velvet lined with ermine; but sometimes the livery colors (see LIVERY) are adopted instead, as is generally the practice in continental heraldry. This kind of mantling, being inseparable from the helmet, cannot be used by ladies. See HERALDRY.

MANTRAS, măn'tráz. A people of the territory of Malacca and Rembau, formerly regarded as a Negrito people of the Malay Peninsula, but more recently described as Sakai-Malay half-breeds. The mixture of these peoples has resulted in giving the Mantras a somewhat taller stature than the Sakai and a whiter skin.

MAN-TSE. See MANS.

MANTUA, măn'tû-á (It. *Mantova*). A fortified city of Lombardy, Italy, situated on the Mincio, 25 miles by rail southwest of Verona and 100 miles southwest of Milan (Map: Italy, C 2). It was formerly the capital of the Duchy of Mantua and is now the capital of the province of the same name. It is the see of a bishop and the centre of a military district. It occupies two islands in the river and is elaborately fortified. Three lakes formed by the river half surround the town and there are marshes adjacent. It is not a healthful city. Architecturally it is interesting on account of the Renaissance churches and secular edifices, especially the church of Sant' Andrea, built towards the close of the fifteenth century after plans by Leon Battista Alberti (q.v.), also the chapel of San Sebastiano by Alberti. The old Ducal Palace, built 1302–28, is one of the largest of its kind in Europe. It is still more prominent in the world of painting, owing to the works of Mantegna and Giulio Romano, both of whom resided here. The inadequate population and the sullen massive grandeur of the edifices explain why the traveler in Mantua associates the city with a gloomy decadence. The streets are regular and spacious, but poorly paved. There are several fine squares. The spacious Sant' Andrea has been subjected to many changes during the centuries. Its white façade of marble is adorned with a portico and contrasts curiously with the adjacent red brick campanile. The interior (110 yards long) contains many frescoes by prominent artists. The cathedral of San Pietro is not attractive, but has a fine ceiling.

The Corte Reale, formerly the Ducal Palace of the Gonzagas and now consigned to military purposes, is a notable structure dating from the beginning of the fourteenth century. It was embellished with frescoes by Giulio Romano. Its apartments are of exceptional interest for their varied decorations, representing the most delightful Italian period of the art of interior ornamentation. Another fine old Mantuan palace is the Palazzo del Tè, constructed by Giulio Romano and adorned by him in a most artistic style. Some of the frescoes are excellent. The friezes in the loggia are by Primaticcio, who was educated in Mantua under Giulio Romano. In the old castle of the Gonzagas is a collection of archives. Among the frescoes here by Mantegna only two remain in a satisfactory condition. The Vergilian Academy of Arts and Sciences contains some specimens of art. The neighboring library in the Lyceum has a work by Rubens, who lived and studied in Mantua several years. In the adjacent museum are some good Greek busts and sarcophagi, and the Museo Partio possesses other antiquities. A statue of Dante and the house of Giulio Romano are shown as attractions to the visitor in Mantua. It was formerly an important military post, but owing to the swampy nature of the surrounding area was maintained with difficulty. The city has a theological institute, a botanical garden, an astronomical observatory, a public library with 75,000 volumes, founded in 1780 by Maria Theresa, and an excellent, commodious military hospital. The modern sections of the city have ironworks, oil and flour mills, tanneries, breweries, toy factories, etc. Pop. (commune), 1901, 29,142; 1911, 32,657.

History. Mantua was originally an Etruscan city. It became a Roman municipium just before the time of Vergil, who was born in the neighboring region of Andes, but very near to the town. In the sixth and seventh centuries the town was occupied by the Lombards. In the ninth century it was in the hands of the Church. The town rose to importance in the twelfth century, when it became one of the city republics and a member of the Lombard League. Towards the close of the thirteenth century began the rule of the house of Bonaccolsi, which was succeeded in 1328 by the house of Gonzaga. A century later Mantua with its territory was erected into a marquisate, and in 1530 the Gonzagas became dukes of Mantua. The state prospered greatly under this dynasty, its political power and territory being increased at the expense of Venice and Milan. The Gonzagas were liberal patrons of the arts and learning. After the Mantuan War of Succession (1628–30) the city began to decline. The last Duke was driven away in 1703 and died in 1708 and Mantua fell to Austria. The French took the city in 1797, but lost it again in 1799. The Treaty of Lunéville (1801) restored it to the French, who held it until 1814. The Austrians then held it until 1866, when it was ceded to Italy. During the Austrian occupation it was of great military importance and constituted one of the so-called quadrilateral of fortresses, the others being Verona, Legnago, and Peschiera. See GONZAGA, HOUSE OF.

MANTUAN (măn'tû-*an*) **BARD, MANTUAN SWAN.** Titles applied to Vergil in allusion to his birthplace, Mantua.

MANU, mä'nōō (from Skt. *manu*, man). An ancient mythical sage of India, the progenitor of mankind, according to the Hindus, and the reputed author of the great law book known as the Code of Manu (Skt. *Mānava-Dharma-Sāstra*).

There is no good ground for accepting the existence of Manu as a historical personage. In the *Rig-Veda* he is merely the ancestor of the human race, the first one to offer a sacrifice to the gods. In the *Satapatha Brahmana* and in the *Mahābhārata* he alone survives the universal deluge. In the first chapter of the law book ascribed to him he declares himself to have been produced by Viraj, who was an offspring of the Supreme Being, and to have created all this universe. Hindu mythology knows, moreover, a succession of Manus, each of whom created, in his own period, the world anew after it had perished at the end of a mundane age.

The *Mānava-Dharma-Sāstra*, written in verse, is a collection of religious ordinances, customs, and traditions, such as would naturally grow up by established usage and receive divine sanction in course of time. This work is not a mere law book in the European sense of the word; it is

likewise a system of cosmogony; it propounds metaphysical doctrines, teaches the art of government, and treats of the state of the soul after death. In short, it is the religious, secular, and spiritual code of Brahmanism. It is divided into 12 books. The chief topics are the following: (1) creation; (2) education and the duties of a pupil, or the first order; (3) marriage and the duties of a householder, or the second order; (4) means of subsistence, and personal morality; (5) diet, purification, and the duties of women; (6) the duties of an anchorite and an ascetic, or the duties of the third and fourth orders; (7) government, and the duties of a king and the military caste; (8) judicature and law, private and criminal; (9) continuation of the former, and the duties of the commercial and servile castes; (10) mixed castes and the duties of the castes in time of distress; (11) penance and expiation; (12) transmigration and final beatitude.

This Code of Manu, not improbably based on a *Mānava Dharma Sūtra*, is closely connected with the *Mahābhārata* (q.v.), of which three books alone (iii, xii, xvi) contain as many as 260 of its 2684 slokas. It probably assumed its present form not much later than 200 A.D.

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MANUA (mȧ-nōō'ȧ) **ISLANDS.** See Samoan Islands.

MAN'UAL (Lat. *manualis*, relating to the hand, from *manus*, hand). The keyboard of an organ played by the hands, in contradistinction to the pedal, played by the feet. The number of manuals varies from two to four according to the size of the organ. In older French organs even five manuals are found. The names of the different manuals are: (1) great organ; (2) choir manual; (3) swell manual; (4) solo manual; (5) echo manual. Each manual really is a separate organ in itself, having its own set of pipes and stops. By means of couplers any or all of the manuals can be connected, so that by striking a note on one manual the same note sounds on all the other manuals that are coupled. The usual compass of manuals is four octaves and a fifth, C-g^3.

MANUAL OF ARMS. The rules and explanations for the instruction of military recruits in the use of their arms and their care and preservation. They are part of the course of instruction given the soldier in the school of the soldier, which in turn is one of the several distinct courses of training included in the manual known as drill regulations (q.v.). The manual of arms owed much of its former elaborateness, both in the United States and England, to its German origin. In this connection it is interesting to note that the exercises in all three countries have been reduced in number and simplified. In the United States army all drills are prefaced and concluded with an examination of cartridge chambers, as a precaution against accidents, and for purposes of instruction the movements are divided into motions and executed in detail. The command of execution determines the prompt execution of the first motion, and the commands *Two*, *Three*, etc., the other motions. The commands and movements of the manual of arms are given after the soldier is in position with rifle at the *order*, and are as follows: (1) order arms; (2) present arms; (3) right shoulder arms; (4) port arms. Other movements are: (5) parade rest; (6) fix bayonets; (7) charge bayonets; (8) trail arms; (9) rifle salute; (10) inspection arms.

MANUAL TRAINING. This term, in spite of considerable criticism, has come to be generally applied to the use of constructive handwork in the schools, as a feature of general education. The term is broadly used to include the work of both boys and girls in various materials, in which case instruction in domestic arts and science is understood; but it is often used in a narrower sense as relating only to the work with tools commonly given to boys. The chief grounds of objection to the use of the term are that it emphasizes discipline rather than content. There is a tendency at present to use the term "handwork" or "handicrafts" for the actual constructive work and to introduce a new group of content subjects, which furnish information about industries in general, under the name of industrial arts. The two branches are intended to supplement each other, with the result that the type of constructive work is enriched and varied. The aim in general is not only to provide some acquaintance with industrial organization of the world, but also to afford boys and girls about to leave school some basis for selecting their future occupations. To this extent such courses are also prevocational.

The earliest official recognition of manual training as a legitimate part of school work was obtained in European countries. As early as 1858, Uno Cygnæus organized a plan of manual training for the primary schools of Finland, and in 1866 instruction in some branch of manual work was made compulsory in the training colleges for male teachers in that country and in all primary schools for boys in country districts. Sweden is, however, the country which contributed most towards the early development of manual training and from which has come the largest influence in its propagation. In 1872 the government reached the conclusion that schools for instruction in Sloyd were necessary to counteract the tendency towards concentration in cities and the decline of the old home industries. The schools first established had naturally an economic rather than an educational significance. This was changed, however, as the movement grew, until a thoroughly organized scheme of educational tool work for boys between 12 and 15 years of age was developed. In 1877 the work was introduced into the folk school, and the government granted aid in support of the instruction. The Sloyd Seminarium at Nääs, established in 1874 under the

direction of Otto Saloman, was not only an active and stimulating force in the development of the work in Sweden, but exercised a far-reaching influence upon the thought and practice of other countries. At present Sloyd is taught in all the regular normal schools of the country.

In France manual training was made obligatory in the elementary primary schools by the Law of 1882. The official programme for manual training is very complete and thorough, but its provisions are only partially realized because of the failure of communes to provide workshops and of the insufficient supply of trained teachers. In Paris about 200 schools were equipped with workshops in 1914, and at this time more than one-third of the regular teachers in the city schools had taken normal courses in manual training. A feature of the French work is the variety of materials and processes used and the fact that handwork instruction has been planned for every grade of the elementary primary school. The tendency here is to associate handwork with drawing and mathematics more closely than is done in other countries.

Germany, although the seat of a very active propaganda issuing from the German Association for Manual Training for Boys, has done very little towards incorporating manual training with the regular work of the common schools. A large number of workshops have been established in various parts of the Empire, supported mainly by individuals and societies, in which pupils of the public schools are given instruction out of school hours. The educational ministries of Prussia, Saxony, and Baden make annual contributions in aid of this instruction, but the work is obligatory in only a very few places. Manual work for girls, on the other hand, has been for a long time a compulsory branch of instruction in the common schools of Germany. The Manual Training Seminary at Leipzig, founded in 1887 by the Association for Manual Training for Boys, under the leadership of Dr. Waldemar Götze, is the active centre of the movement and the main institution for the training of teachers.

In England handwork received but little official encouragement until quite recently. It was taught here and there in elementary schools, but on no organized basis. The need of manual training was pointed out by the Royal Commission on Technical Education in 1882 and again in 1884, after it had met with success in Manchester and Sheffield. In 1890 it appeared in the code for elementary schools "as recognized for attendance purposes," and grants were paid for the subject by the Department of Science and Art from 1891 to 1898. The subject was taught and is still taught frequently in centres used by a number of schools; the instructors were often skilled craftsmen, but the tendency now is to give regular teachers training in handwork in special and summer courses. So far as aim is concerned, the movement has been from an emphasis on hand and eye training and the subject for its own sake to the present emphasis on handwork as a method of expression with possibilities of application to geography, nature study, history, arithmetic, and geometry. Handwork is now found generally in all classes of the elementary schools from the constructive work of the infant schools through the light woodwork in the middle stages to the manual training of the older pupils. The media used are clay, plasticine, paper, string, wire, cardboard, prepared wood, wood, and metal. In the secondary schools comparatively little attention has been given to manual training, which was for long regarded as an extra and was not infrequently taught by the school janitor or carpenter or any other person able to handle tools.

The history of manual training in the United States involves both the development of the idea and the development of practice. In the field of practice, little of a purely educational character appeared before 1878, at which time the Workingman's School was founded by the Ethical Culture Society of New York. This institution comprised a kindergarten and an elementary school, in which manual work formed from the first a vital and important part of the educational scheme. The general movement, however, took its large beginning, as has been the case with so many educational movements, at the top instead of the bottom of the school system. In 1880, through the efforts of Dr. Calvin A. Woodward, the St. Louis Manual Training School was opened in connection with Washington University. The work of this school attracted wide attention, and its success led to the speedy organization of similar schools in other large cities: Chicago, Baltimore, and Toledo, 1884; Philadelphia, 1885; Cleveland, Cincinnati, and Omaha, 1886. The first provision for girls' work in these schools was made in the case of the Toledo school and included sewing, dressmaking, millinery, and cooking. In 1895 the Massachusetts Legislature, under the lead of the State Board of Education, made it obligatory upon every city in the State of 30,000 or more inhabitants to establish and maintain manual training in a high school.

The rapid development of this type of secondary school resulted in the establishment of an institution peculiarly American. In other countries the introduction and spread of manual training has been confined to the elementary school, and no institution exists in Europe, of a purely educational character, that presents any parallel to the comprehensive and costly equipment of these schools. The shopwork comprised joinery, turning, pattern making, forging, and machine work, and sometimes foundry practice and tinsmithing. The nature of this work was very similar in the various schools, and until late years has been almost uniformly based upon the principles of the Russian System. The central idea of this system of shopwork instruction, developed in a technical school for the instruction of engineers, is the analysis of a craft into its elementary processes and constructions, and the presentation of these details in an orderly and sequential scheme as separate elements. This type of manual-training high school tended to become formal and scholastic and gradually lost its distinctive character. It has in recent years begun to be replaced by industrial or technical schools providing some definite vocational training, but the new type in turn is only in process of reorganization. In place of work that has been called "abstract, isolated, impractical, and unsocial in character," courses have been established in Cincinnati and Fitchburg which involve work under actual labor conditions, the students working for part time in school and part time in the shop. (See TECHNICAL EDUCATION.) Compared with the development of manual training in the high school, the introduction of the work in the public elementary school came at first but slowly. Experi-

mental classes in carpentry, the expense for which was borne by Mrs. Quincy A. Shaw, were conducted at the Dwight School in Boston in 1882. These were taken under the care of the city and transferred to temporary quarters in the English High School building in 1884, but the work did not receive a place in the course of study until 1888. In Springfield, Mass., sewing was introduced in the schools in 1884 and in 1886 a manual training school was established, at which pupils coming voluntarily from the elementary schools received instruction in knife work. In 1885 the Legislature of New Jersey passed a law providing that the State would duplicate any amount between $500 and $5000 raised by a city or town for instruction in manual training. This led to the early introduction of the work in a number of places in various parts of the State. In 1888 the city of New York began the introduction of a manual-training course of study, including drawing, sewing, cooking, and woodwork.

All this early work was crude and experimental, and it was not until the influence emanating from the Sloyd School of Boston began to be felt that tool work for boys in the elementary school took on a more definite character. A vital principle of the Sloyd work is the appeal to the interest of the worker through the construction of a finished object of definite use related, generally, to the needs of home life. This principle has gained general acceptance in the work of the elementary school and has to quite an extent modified the character of the work done in the high schools. From the upper grade of the grammar school with the provisions for shopwork for boys, and cooking and sewing for girls, handwork has made considerable progress in its way downward. Work in clay, paper, cardboard, sewing, weaving, basketry, bent iron, and simple wood construction are the processes most commonly employed. The aim has ceased to be one of purely disciplinary character; instead handwork is provided in the elementary schools to give practical expression and interpretation in concrete fashion to the bookwork of the classroom. Through it the pupil may be introduced to the social and industrial occupations of his environment; he may gain some idea of the development of industries or facility in giving concrete expression to an idea. As was mentioned earlier, the present phase aims to give a general acquaintance with the industrial organization of the world and to provide opportunities for selection of a vocation. At Gary, Ind., an experiment has been conducted which attracted considerable attention. Here, after the general preparatory handwork of the lower grades, the older pupils are given opportunities to learn and participate in those occupations necessary for equipping and repairing the school, which are going on all the year round. The pupils are practically apprentices to the expert workmen, who are selected for character, skill, intelligence, and teaching ability. In this way the pupils are trained not merely in exercises, but on genuine and real jobs, and come into contact with the work of carpenters, cabinetmakers, painters, plumbers, metal workers, engineers, electricians, printers, etc. In this way they may learn something about the different industries and try out their skill and inclinations in each until they are ready to select a vocation.

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MANU'CHE, or **MANUCCI,** mä-nōō'chē, Cosmo. An English dramatist, probably of the Florentine family of the Mannucci, originally. It appears that he was aided in his literary endeavors by James Compton, Earl of Northampton, of whose retinue he was a member. During the civil wars he was successively captain and major of infantry, and afterward he busied himself in the instructing of private pupils and the writing of plays. His poverty was somewhat relieved by application first to Cromwell and afterward to Charles II. Twelve plays, nine in manuscript and three printed, are generally ascribed to him. There is no evidence that any was presented. One, *The Just General* (1652), described as a "tragi-comedy," and considerable portions of others are written in a peculiar rhythmical blank verse, scarcely different from prose. Consult: Charles Lamb, *Specimens of the English Dramatic Poets* (London, 1808, and subsequent editions); F. G. Fleay, *A Biographical Chronicle of the English Drama, 1559–1642* (ib., 1891); Sidney Lee, in *Dictionary of National Biography,* first supplement, vol. iii (ib., 1901).

MAN'UCODE (Malay *Manukdevata,* bird of the gods). The name originally given to the king bird of paradise, but now applied to certain Papuan birds probably not relatives of the Paradiseidæ at all. They have glossy, steel-blue plumage and are remarkable for their vocal powers. Lesson, Forbes, and other ornithologists assert that they are able to pass through every note of the gamut. Eight or 10 species are known, of which *Manucodia viridis* is common throughout the entire Papuan region. It is described by Wallace as being powerful and active, clinging to the smaller branches of the trees on which it finds the fruit that constitutes its food. See Bird of Paradise.

MANUEL (măn'û-ĕl) **I, COMNE'NUS** (c.1120–80). Byzantine Emperor from 1143 to 1180. He was the youngest son of the Emperor

John II, or Calo-Johannes, whom he succeeded upon the throne. He became at once involved in an uninterrupted series of wars in Asia and Europe. In 1144 Raymond, Prince of Antioch, who had thrown off the Byzantine yoke, was compelled to submit again to vassalage. In 1147 the Crusaders, under Louis VII of France and Conrad III of Germany, marched through Manuel's dominions without serious hindrance on his part, as he was at this time entangled in a war with Roger, King of Sicily. This conflict proved a long and arduous one. For a time the Byzantine arms were victorious, but the fortune of war changed and no substantial gain resulted. Manuel was engaged in protracted wars with the Seljuks, who in 1176 defeated his forces in a great battle at Myriocephalon. He aided the enemies of Frederick Barbarossa in Italy. He also waged war with the Hungarians and with the Venetians, being unsuccessful against the latter. He died Sept. 24, 1180. The reign of Manuel was one of great splendor, but the expenses of the numerous wars and his policy of allowing the Italians special privileges in trade sapped the strength of the Empire. Consult: G. L. F. Tafel, *Komnenen und Normannen* (2d ed., Stuttgart, 1870); George Finlay, *History of Greece*, vol. iii (London, 1877); Hans von Kap-Herr, *Abendländische Politik Kaiser Manuels* (Strassburg, 1881); Ferdinand Chalandon, *Les Comnènes*, vol. ii (Paris, 1912).

MANUEL II, PA'LÆOL'OGUS (c.1350–1425). Byzantine Emperor from 1391 to 1425. He succeeded his father, John V, as sole ruler after he had been an associate in the Empire since 1374. Fearing that Constantinople would fall into the hands of the Turks, Manuel applied for aid to the western princes, whose army was defeated with great slaughter by Bajazet (q.v.) at Nicopolis, in 1396. In 1398 a nephew of Manuel with the aid of Bajazet rose in rebellion, and the Emperor was compelled to make him co-Emperor. He was known as John VII. Manuel was in constant peril until Bajazet was defeated by Timur at Angora, in 1402, and taken prisoner. After the death of Bajazet in 1403 Manuel reigned in peace for 18 years, for the young Sultan Mohammed I was his intimate friend. But when in 1421 Mohammed died and Amurath II came to the throne, the old contest was renewed. In 1422 Constantinople was besieged, and although the siege failed, Manuel had to sign a humiliating treaty. He retired to a monastery in 1423, after a severe illness, his son John VIII becoming practically the sole ruler. Manuel died in 1425. He was the author of several theological treatises. Consult: Xivrey, "Sur la vie et les ouvrages de l'empereur Manuel Paléologue," in *Mémoires de l'Académie des Inscriptions*, vol. xix (Paris, 1853); Karl Krumbacher, *Geschichte der byzantinischer Litteratur* (2d ed., Munich, 1897); Edwin Pears, *Destruction of the Greek Empire* (London, 1903).

MANUEL I, THE FORTUNATE (1469–1521). A King of Portugal, in whose reign that country attained the highest pitch of power and splendor. He succeeded John II in 1495, ruled throughout with the help of the Cortes, and did much for art and letters by his generous patronage. The only blot on his domestic administration was his persecution of the Jews. And yet, as evidence that he had some liberal leanings even in religious matters, we have the fact that he secured from the Pope authorization for a decree granting the right to marry to members of Portugal's two most distinguished orders—the Knights of the Order of Christ and the Knights of the Order of Santiago. But the same militant Christianity led him to attempt conquests in Africa, in which he was unsuccessful, to enter into diplomatic relations with many far-off lands, and to fit out great expeditions of exploration and conquest. It was Manuel who sent Vasco da Gama around the Cape, Cabral upon the voyage which resulted in the accidental discovery of South America, Cortereal to North America, and Almeida and Albuquerque to the East Indies, where a wide field was opened for Portuguese commerce.

MANUEL II (1889–). King of Portugal in 1908–10. He was born in Lisbon two years after the Crown Prince Luis, and had the title of Duke of Beja. There were scandalous stories of his wild living in Paris, and he seemed little fitted for the throne to which he succeeded upon the assassination, on Feb. 1, 1908, of his father King Carlos I and of his brother Luis. He was acclaimed King and took the oath on May 6, 1908. When the Republicans, in October, 1910, overturned the Portuguese monarchy, Manuel escaped to England, taking refuge there at Twickenham with the Duke of Orléans, brother of Manuel's mother, Marie Amélie, who was daughter of the Comte de Paris. Royalist uprisings in Portugal in 1911 were unsuccessful. In 1912 Manuel and Dom Miguel apparently came to an understanding and joined forces for the reëstablishment of the kingdom. In September, 1913, Manuel married Princess Augustine Victoria of Hohenzollern-Sigmaringen.

MANUEL, mȧ'nụ'ĕl', EUGÈNE (1823–1901). A French poet and prose writer, born in Paris of Jewish parents. From 1849 to 1871 he taught rhetoric in different Parisian lyceums. He was appointed chief of cabinet to the Minister of Public Instruction in 1871, a year later was made inspector of the Academy of Paris, and in 1878 inspector general. With his brother-in-law, E. Lévi-Alvarès, he published four volumes of lectures for the use of students, entitled *La France* (1854–55; 6th ed., 1868). Several of his verse collections were crowned by the Academy. They include: *Pages intimes* (3d ed., 1869); *Poèmes populaires* (1871); *Pendant la guerre* (1871); *Un voyage* (5th ed., 1890); *Poésies du foyer et de l'école* (16th ed., 1892). His play *Les ouvriers* (1870) also received academic honors, and Madame Sarah Bernhardt made her first appearance at the Comédie Française in his drama *L'Absent* (1873). Manuel edited the *Œuvres lyriques de Jean Baptiste Rousseau* (1852) and Chénier's *Poésies* (1884).

MANUEL, mä'nụ'ĕl', DON JUAN (1282–1349). A Spanish prince and author, born at Escalona. He was the nephew of Alfonso X, called "the Wise." His father died in his youth, and he was brought up by his cousin, Sancho IV, who was succeeded by Ferdinand IV. Upon his death Don Manuel was coregent for the young heir, Alfonso XI (1320). When the King was proclaimed of age (1325) he married Constanza, the daughter of Don Juan Manuel, appointed his father-in-law *adelantado mayor de la frontera*, and then repudiated Constanza, whom he imprisoned at Toro. This angered Don Juan Manuel, and from 1327 to 1335 there was active war between them, ending in the King's victory. He afterward received Don Juan Manuel into favor and made him general in chief of the army against the Moors. Don Juan Manuel is

better remembered now as author than as soldier, and despite the turbulence of his life he was a voluminous writer. His prose is clear, vigorous, and interesting. Several of his works may be found in Rivadeneyra's *Biblioteca de autores españoles*, vol. li (Madrid, 1884). The most important of them is *El Conde Lucanor*, first published, and with a commentary, by Gonzalo Argote de Molina in 1575. This consists of 49 stories, told somewhat in the Oriental manner, with a little moral in verse at the end of each tale. More modern editions of *El Conde Lucanor* are those of Stuttgart (1839), Barcelona (1853), Madrid (1860), Vigo (1898 and 1902), and Leipzig (1900). There is an English translation by James York (London, 1868 and 1888). For editions of his other works, and for studies about him and his works, consult James Fitzmaurice-Kelly, *Bibliographie de l'histoire de la littérature espagnole* (Paris, 1913).

MANUEL, mȧ'nụ'ĕl', Nikolaus, called Deutsch (1484–1530). A Swiss painter, poet, and magistrate, born at Bern. His early profession was probably that of an architect or painter and engraver, and in his youth he traveled much, probably visiting Italy, for his early paintings show the influence of the Paduan school. Upon his return to Bern he became a member of the Great Senate (1512), and afterward served in the French army. He was a pronounced supporter of the Swiss reformation. His writings include the fantastic satirical comedies *Vom Papst und seiner Priesterschaft, Der Ablasskrämer, Berbeli*, and *Elsli Tragdenknaben*, reedited by Tittmann in 1868 and Bachtold in 1878. His works as an artist are very interesting, although his natural genius and inventive power exceed his technical ability, his execution being often faulty; they consist of a few oil and tempera paintings, and a number of drawings, mostly of soldiers and troopers, best studied in the Basel Museum. His frescoes, "The Dance of the Dead," painted on the walls of the Dominican convent (1517–22) at Bern, were destroyed, but have been well copied in the 24 lithographs, *Niklaus Manuels Totentanz* (Bern, 1829–31). In the City Hall at Basel are a number of finely colored stained-glass windows which he designed.

MANUFACTURED ARTICLE. A thing which has been created by the application of labor to crude materials, whereby they are transformed into a new and different quality, shape, or form, having a distinctive name, character, or use, and capable of being used without alteration. The term is sometimes confused with manufactured products, such as pig iron or pig lead, which are merely iron and lead reduced from the native ores and freed from impurities, and which are, in law, considered as raw or crude materials, ready to be manufactured into articles. The word "article," therefore, in its technical legal sense means a thing adapted for use. The distinction between manufactured articles and crude or raw materials is of great importance under tariff and revenue acts where the former are assessed with a higher rate of duty than the latter. The distinction above mentioned has been adopted by the United States courts in the interpretation of tariff laws. For example, India rubber, which is a product obtained by reducing the juice or sap of certain tropical trees and plants to a solid form by dipping convenient molds into it and drying it over a fire made from a peculiar kind of nut, was held not to be a manufactured article under a tariff act taxing articles made of rubber. The court described it as a "raw material in a more portable, useful, and convenient form for other manufactures here." The court, however, held that rubber shoes, made by the same process, except that the mold was in the form of the human foot, were manufactured articles, as they were adapted for immediate use. Consult: Webster Elmes, *Treatise on the Law of the Customs* (Boston, 1887); W. W. Carr, *Judicial Interpretation by the United States Courts of the Acts of Congress Relating to the Tariff Acts* (Philadelphia, 1894); also the authorities referred to under Sale.

MANUFACTURERS, National Association of. An association of American manufacturers organized in Cincinnati in 1895 for the purposes of increasing their export trade, influencing legislation affecting their interests, and of coping with the demands of labor organizations. The association maintains a central office in New York which supplies members with information about foreign markets, prices, credit reports, and undertakes through its international freight bureau the shipment and delivery of foreign consignments. Its most conspicuous function is the energetic campaign which it wages against radical legislation and trade-unionism. The public measures with which the association has been most prominently connected are the reform of the patent law and of the consular and postal services. The association has placed itself on record as not being opposed to labor organizations as such, but maintains that employers must be free to employ their working people without interference on the part of individual organizations and that they must be unmolested in the management of their business and in the use of any methods or systems of pay which are equitable. The association provided for the organization of separate defense associations in the different lines of industry it represents. Provision was further made for the federation of these affiliated protected associations into a "permanent central organization that will create a clearing house for ideas and provide means for coöperation on matters of common interest." In 1907–08 the association aided in conducting a suit against the officers of the American Federation of Labor for participation in a boycott directed against the Bucks Stove and Range Company, whose president was also president of the National Association of Manufacturers. The case, which was regarded by the association as a test case, dragged out through several years; its outcome practically put an end to boycotting through the American Federation of Labor. The association conducts an educational campaign through the distribution of pamphlets, etc., in behalf of its labor and industrial policies. In 1913 it assumed an attitude of active hostility towards the I. W. W. While resistance to what it considers the unreasonable demands of labor is not the only object of the association, it is generally regarded in labor circles as essentially an anti-trade-union organization. The association publishes the *American Trade Index* and the *Confidential Bulletin of Inquiries from Foreign Buyers;* its organ is *American Industries*, published semimonthly at New York.

MANUFACTURES (ML. *manufactura*, from Lat. *manufactus, manu factus*, made by hand, from *manu*, abl. sing. of *manus*, hand, and *factus*, p.p. of *facere*, to make). In a broad sense of

the term, manufactures are such forms of industry as elaborate for economic use materials which are themselves the product of industry. Manufactures are thus distinguished from extractive industry, which procures wealth from nature in its primary forms. In practice it is difficult to draw a hard and fast line between these two types of industry, since many commodities which are commonly classed as raw materials have been subject to one or more elaborative processes, as, e.g., raw cotton, raw sugar, pig iron. The practice of American statisticians is to class with extractive industry processes which are directly connected with the exploitation of natural products. Butter and cheese which are made on the farm are treated as agricultural products; when produced in factories distinct from the farm they are classed with manufactures. A product in its earliest of products in the year under review, those working to the order of the individual customer, such as custom tailors, dressmakers, shoemakers, etc., but included large concerns doing special work, such as machine shops. Establishments engaged in the building industry other than those manufacturing building materials for the general trade, as well as so-called neighborhood industries and hand trades, such as blacksmithing, harness making, and tinsmithing, in which little, if any, power machinery was used, and which did usually only a local business, were excluded; furthermore, retail stores with incidental manufacturing on a small scale, which could not be distinguished from their mercantile business, and various eleemosynary and penal institutions engaged in manufacturing industries, were also excluded. These considerations must be borne in mind in considering the tables

GROWTH OF MANUFACTURING INDUSTRIES IN THE UNITED STATES

From Thirteenth United States Census

	Number of establishments	Capital	Wage earners (average number)	Wages	Cost of materials	Value of products
Factories and hand and neighborhood industries:						
1849 (census of 1850)	123,025	$533,245,000	957,059	$236,755,000	$555,124,000	$1,019,107,000
1859 (census of 1860)	140,433	1,009,856,000	1,311,246	378,879,000	1,031,605,000	1,885,862,000
Per cent of increase, 1849 to 1859	14.1	89.4	37.0	60.00	85.8	85.0
1869 (census of 1870) (gold value)	252,148	1,694,567,000	2,053,996	620,467,000	1,990,742,000	3,385,860,000
Per cent of increase, 1859 to 1869	79.6	67.8	56.6	63.8	93.0	79.5
1879 (census of 1880)	253,852	2,790,273,000	2,732,595	947,954,000	3,396,824,000	5,369,579,000
Per cent of increase, 1869 to 1879	0.7	64.7	33.0	52.8	90.6	74.5
1889 (census of 1890)	355,405	6,525,051,000	4,251,535	1,891,210,000	5,162,014,000	9,372,379,000
Per cent of increase, 1879 to 1889	40.0	133.8	55.6	99.5	52.0	74.5
1899 (census of 1900)	512,191	9,813,834,000	5,306,143	2,320,938,000	7,343,628,000	13,000,149,000
Per cent of increase, 1889 to 1899	44.1	50.4	24.8	22.7	42.3	38.7
Factories, excluding hand and neighborhood industries:						
1899 (census of 1900)	207,514	8,975,256,000	4,712,763	2,008,361,000	6,575,851,000	11,406,927,000
1904 (census of 1905)	216,180	12,675,581,000	5,468,383	2,610,445,000	8,500,208,000	14,793,903,000
Per cent of increase, 1899 to 1904	4.2	41.2	16.0	30.0	29.3	29.7
1909 (census of 1910)	268,491	18,428,270,000	6,615,046	3,427,038,000	12,141,791,000	20,672,052,000
Per cent of increase, 1904 to 1909	24.2	45.4	21.0	31.3	42.8	39.7
Per cent of increase, 1899 to 1909	29.4	105.3	40.4	70.6	84.6	81.2

merchantable form may then be classed with raw materials; when subjected to further processes of elaboration it becomes a manufactured commodity. For the technical legal distinction in this matter, see MANUFACTURED ARTICLE.

Again, many commodities undergo minor changes incidental to consumption. The preparation of food may be cited as a case in point. Such processes are not usually placed under manufactures. If the preparation of food is carried on in separate establishments with a view to supplying a market, it will fall under the head of manufactures. This distinction is obviously difficult to make in practice. The twelfth census of the United States excludes from manufactures proper most forms of order production, confining the term to production of standard commodities for a general market, while the thirteenth census by statute was "confined to manufacturing establishments conducted under what is known as the factory system exclusive of the so-called neighborhood household and hand industries." In other words, the thirteenth-census manufactures excluded the establishments producing less than $500 worth accompanying this article and other tables of manufactures in the United States for this census year under review.

In the *Census of Production* taken in Great Britain in 1908 of the work of the year 1907 and published in 1912, much the same plan was followed, but the general scheme was more comprehensive. Fisheries and agriculture were omitted, but the products of mines and quarries are included as well as other items.

From a theoretical point of view, however, it is better to include under manufactures all processes of elaboration of merchantable materials into commodities primarily designed for sale. In this sense of the term manufactures presuppose a considerably developed economic life. They did not exist when each household produced exclusively for its own consumption. In western Europe they were first carried on under the guilds (see GUILD), forming, however, but an insignificant part of the economic life. With the rise of capital in the fifteenth and sixteenth centuries manufactures were carried on more extensively under the domestic system. The capitalist-merchant put out materials to be

worked up at home by workmen whose chief occupation was usually agriculture. This form of manufacture still exists in America and England; it is widely practiced in France, Germany, and Russia; and in some European districts, notably in Norway, it is the prevalent form.

In the more advanced nations domestic manufacture has been largely supplanted by the factory system (q.v.). The extension of the market in early modern times, requiring a vastly increased production of goods of standard kinds, led first to excessive division of labor and later to the invention of machinery. The first industries to respond to these influences were the textile and the iron industries.

Manufactures in the United States. At the end of the Colonial period manufacturing industry in America was of slight importance. The principal salable articles were raw materials, such as the products of the forests. Each household provided itself with the chief commodities for consumption. In New England, however, the manufacture of rum was extensive, and the production of hats, coarse cloth, and nails was carried on under the domestic system of industry. The total value of the manufactures of America at the time of the adoption of the Constitution has been estimated at $20,000,000; but this includes much domestic production for home consumption.

Machine production scarcely existed before 1790. In that year a British mechanic, Slater, set up spinning machinery in Rhode Island. In 1794 Whitney invented the cotton gin, thus assuring a supply of raw materials for the new cotton manufacture. By 1810 machinery had been generally introduced in textile manufacture, although large quantities of goods were still produced under the older system. The value of textiles produced in that year was estimated at about $40,000,000.

The iron manufacture developed more slowly. Machinery of improved types was introduced in the first and second decades of the nineteenth century, but the greater part of the production and manufacture was carried on in a primitive fashion, until the fifth decade of the century, when anthracite began to be substituted for charcoal in smelting. From that time increase was rapid.

The value of the manufactures of the United States for the year 1810 was estimated by Tench Coxe to be $198,613,471. In 1820 the value was $268,000,000. The accompanying table, taken from the *Thirteenth Census, Manufactures*, vol. viii (Washington, 1913), shows the growth of manufactures from 1850.

In estimating the economic significance of the development of manufactures, shown in the table on page 37, it will be necessary to make allowance for the fact that a considerable number of operations are now carried on as manufactures

INDUSTRY (1909)	Number of establishments	WAGE EARNERS		VALUE OF PRODUCTS		VALUE ADDED BY MANUFACTURE	
		Average number	Rank	Amount (expressed in thousands)	Rank	Amount (expressed in thousands)	Rank
All industries	268,491	6,615,046	....	$20,672,052	....	$8,529,261	....
Slaughtering and meat packing	1,641	89,728	16	1,370,568	1	167,740	12
Foundry and machine-shop products	13,253	531,011	2	1,228,475	2	688,464	1
Lumber and timber products	40,671	695,019	1	1,156,129	3	648,011	2
Iron and steel, steelworks and rolling mills	446	240,076	6	985,723	4	328,222	4
Flour-mill and gristmill products	11,691	39,453	30	883,584	5	116,008	18
Printing and publishing	31,445	258,434	5	737,876	6	536,101	3
Cotton goods, including cotton small wares	1,324	378,880	3	628,392	7	257,383	7
Clothing, men's, including shirts	6,354	239,696	7	568,077	8	270,562	6
Boots and shoes, including cut stock and findings	1,918	198,297	8	512,798	9	180,060	10
Woolen, worsted, and felt goods, and wool hats	985	168,722	9	435,979	10	153,101	15
Tobacco manufactures	15,822	166,810	10	416,695	11	239,509	8
Cars and general shop construction and repairs by steam-railroad companies	1,145	282,174	4	405,601	12	206,188	9
Bread and other bakery products	23,926	100,216	14	396,865	13	158,831	14
Iron and steel, blast furnaces	208	38,429	31	391,429	14	70,791	30
Clothing, women's	4,558	153,743	11	384,752	15	175,964	11
Smelting and refining, copper	38	15,628	38	378,806	16	45,274	36
Liquors, malt	1,414	54,579	25	374,730	17	278,134	5
Leather, tanned, curried, and finished	919	62,202	23	327,874	18	79,595	27
Sugar and molasses, not including beet sugar	233	13,526	41	279,249	19	31,666	41
Butter, cheese, and condensed milk	8,479	18,431	36	274,558	20	39,012	39
Paper and wood pulp	777	75,978	17	267,657	21	102,215	21
Automobiles, including bodies and parts	743	75,721	19	249,202	22	117,556	17
Furniture and refrigerators	3,155	128,452	13	239,887	23	131,112	16
Petroleum, refining	147	13,929	40	236,998	24	37,725	40
Electrical machinery, apparatus, and supplies	1,009	87,256	18	221,309	25	112,743	20
Liquors, distilled	613	6,430	43	204,699	26	168,722	13
Hosiery and knit goods	1,374	129,275	12	200,144	27	89,903	23
Copper, tin, and sheet-iron products	4,228	73,615	20	199,824	28	87,242	25
Silk and silk goods, including throwsters	852	99,037	15	196,912	29	89,145	24
Smelting and refining, lead	28	7,424	42	167,406	30	15,443	43
Gas, illuminating and heating	1,296	37,215	32	166,814	31	114,386	19
Carriages and wagons and materials	5,492	69,928	21	159,893	32	77,942	28
Canning and preserving	3,767	59,968	24	157,101	33	55,278	31
Brass and bronze products	1,021	40,618	29	149,989	34	50,761	34
Oil, cottonseed, and cake	817	17,071	37	147,868	35	28,035	42
Agricultural implements	640	50,551	26	146,329	36	86,022	26
Patent medicines and compounds and druggists' preparations	3,642	22,895	35	141,942	37	91,566	22
Confectionery	1,944	44,638	27	134,796	38	53,645	32
Paint and varnish	791	14,240	39	124,889	39	45,873	35
Cars, steam-railroad, not including operations of railroad companies	110	43,086	28	123,730	40	44,977	37
Chemicals	349	23,714	34	117,689	41	53,567	33
Marble and stone work	4,964	65,603	22	113,093	42	75,696	29
Leather goods	2,375	34,907	33	104,719	43	44,692	38
All other industries	61,887	1,648,441	....	4,561,002	....	2,084,399	....

which formerly were a part of household industry. The increase in the net product of manufactures above cost of material is not wholly a net increase in national income, although the greater part may be so regarded. It is further to be kept in mind that the statistics of capital are based upon estimates which in the nature of the case are not very reliable.

The accompanying table shows the extent and rank in value of products of the more important manufacturing industries of the United States in 1909. The various manufacturing industries of the United States arranged in order of the amount of products in the census year 1909 are given in the accompanying table from the *Thirteenth Census, Manufactures*, vol. viii (Washington, 1913).

The four States New York, Pennsylvania, Illinois, and Massachusetts, as shown by the census of 1909, produce nearly one-half the manufactures of the United States. The greatest concentration of manufacturing industry is in southern New England and New York and eastern Pennsylvania, but there appears to be a general tendency towards extension of the area of manufactures. Consult sections on *Manufactures* in the articles on the various States; also under UNITED STATES and various other countries.

The United States occupies at present the foremost rank as a manufacturing nation. The successive stages by which it has reached this position are illustrated by the accompanying table, taken from the *Twelfth Census, Manufactures*, part i (Mulhall's estimates). These figures, which are as late as any statistician has presented on a comparative basis, must of course be considered with due regard to modern conditions when the annual value of manufactures has risen to over $20,000,000,000 in the United States and in the United Kingdom to over $8,750,000,000.

ANNUAL VALUE OF MANUFACTURES

	1820	1840
United Kingdom	$1,411,000,000	$1,833,000,000
France	1,168,000,000	1,606,000,000
Germany	900,000,000	1,484,000,000
Austria	511,000,000	852,000,000
United States	268,000,000	467,000,000
Other States	1,654,000,000	2,516,000,000

	1880	1894
United Kingdom	$2,808,000,000	$4,263,000,000
France	2,092,000,000	2,900,000,000
Germany	1,995,000,000	3,357,000,000
Austria	1,129,000,000	1,596,000,000
United States	1,907,000,000	9,498,000,000
Other States	3,455,000,000	5,236,000,000

For the manufacturing industries of Europe there are not available statistics compiled along the lines of the United States census. In 1908 there was taken in Great Britain a *Census of Production* for the year 1907, and the final report published in 1912 summarized the results.

While differences of classification and method do not permit exact comparison between the manufacturing industries of Great Britain and those of the United States, yet the final report of the *Census of Production* of the United Kingdom, referred to above, affords some statistics which may be of significance in this connection. During the census year 1907 the manufacturing industries of England and Wales, Scotland, and Ireland represented a gross output measured by selling value or value of work done of £1,765,366,000. The cost of materials used amounted to £1,028,346,000; the work given out, or the amount paid to other firms, aggregated £24,885,000. The net output of productive industries, obtained by deducting from the value of the gross output the cost of materials and the amount of work given out to other firms, was £712,135,000. In these various manufacturing industries there were employed, exclusive of outworkers, 6,984,976 persons, and the net output per person employed, excluding outworkers, was £102. The total horse power of the engines owned in the various manufacturing establishments was 10,755,009.

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MANUFACTURES, AMERICAN. See UNITED STATES, *Manufactures*.

MANUL, mä'nul (Malay word). A small wild cat (*Felis manul*) of Tibet and Siberia. It is whitish gray, with black marks on the chest and about the head and dark vertical bands across the loins. It has a very broad, round head. The cat is about 30 inches in length, the tail measuring a third of this. The chief character is the very dense and long fur adapted to the intense cold of the creature's haunts. Instead of being a jungle animal it makes its home among barren rocks, feeding on picas and other small mammals. It has been suggested that this is the ancestor of the Persian breed of domestic cats, but facts which rather negative this view are the smallness of the ears and the contraction of the pupils to circles instead of slits.

MANUMIS'SION (Lat. *manumissio*, from *manumittere*, to manumit, from *manus*, hand + *mittere*, to send). In Roman law, the enfranchisement of a slave. In the older law (*jus civile*) this could be accomplished: (1) *Vindicta*, i.e., by a fictitious action. In the later law the forms of suit were dropped and the master simply appeared before the magistrate and declared that the slave was to be set free. (2) *Censu*, i.e., by the entry of the slave's name, with the assent of the master, on the register of citizens. This form disappeared in the Im-

perial period. (3) *Testamento*, i.e., by a bequest of liberty in the master's will. When the Roman Empire became Christian a fourth mode of manumission was recognized—*manumissio in ecclesia*, by declaration of the master in the presence of priest and congregation. Informal manumissions "among friends," or "by letter," were originally void; but in the later Republican period individuals thus freed were protected by the magistrates and in the Imperial period they were recognized as legally free. These informal manumissions were regulated, under Justinian, by requiring five witnesses to prove the manumission. The right of a master to manumit his slaves was restricted in the Imperial period. Some of the restrictions were imposed in the interest of creditors; others in the interest of the public.

By manumission the slave usually became a citizen, but his political rights were restricted. Moreover, he remained for life in a relation of dependency; he was the "client" of his master and of his master's children and owed them certain semifeudal observances and services. He and his children were also debarred from marriage with free-born persons. Consult the authorities referred to under Civil Law.

Among the early Germans also the ordinary forms of manumission, by the act of the master alone, gave the freedman only a partial freedom; he was dependent upon his former master for protection. There were, however, methods of manumission which gave the former slave the full rights of a freeman, viz., his adoption into a kinship group or into the tribe.

MANURES AND MANURING (from OF. *manuœvrer*, *manovrer*, Fr. *manœvrer*, to manage, work by hand, from OF. *manouvre*, *manovre*, from ML. *manuopera*, *manopera*, a working with the hand, from Lat. *manus*, hand + *opera*, work). In a broad sense, the term "manure" is applied to any substance used to increase the productiveness of soil. The word is commonly used in a more restricted sense to mean the excreta (solid and liquid) of farm animals, either mixed or unmixed with litter, and more or less fermented. In this article the term is used in its broader sense. Manures may be direct or indirect in their effect. The former supply plant food which is lacking in the soil, the latter render active the insoluble fertilizing constituents already present and improve the chemical, physical, and biological conditions in the soil. The first class includes the so-called commercial or artificial fertilizers, such as superphosphates, nitrate of soda, etc.; the second embraces natural manures, such as the green manures, seaweed (q.v.), and animal manures. A third class includes the soil amendments or soil improvers, such as marl, lime, gypsum, salt (q.v.), etc., and the so-called catalytic or stimulant fertilizers, such as salts of manganese, aluminium, iron, boron, lead, zinc, etc., whose fertilizing value has not yet been definitely determined. Under certain conditions most of these manures may be both direct and indirect in their action.

Plants derive the larger part of their food directly or indirectly from the atmosphere. A small but very essential portion, however, is drawn from the soil. This includes the inorganic or ash constituents and nitrogen, which, however, is in certain cases derived indirectly from the air. Of the soil constituents which plants need those most likely to be exhausted by ordinary systems of cropping are nitrogen, phosphoric acid, potash, and, in some cases, lime and possibly sulphur. Direct manures supply one or more of these constituents. The fertility of the soil would remain practically unchanged if all the ingredients removed in the various farm products were restored to the land. This may be accomplished to a large extent by feeding the crops grown on the farm to animals, carefully saving the manure and returning it to the soil, and when practicable combining a judicious use of green manures with a system of stock feeding in which those farm products comparatively poor in fertilizing constituents are exchanged for purchased feeding stuffs rich in these substances. Under such practice the loss of soil fertility may be reduced to a minimum or there may even be an actual gain in fertility. Under ordinary conditions of farming, however, the manure produced on the farm is not sufficient to maintain its fertility. Roberts estimates that in ordinary mixed husbandry only about one-half of the fertility taken from the soil by crops is restored in farm manures. Hence the necessity for supplying the deficiency from other sources, resulting in the wide use of artificial or commercial fertilizers of various kinds.

Natural Manures. These include all manurial substances derived from natural sources without undergoing any specific treatment or process of manufacture, such as animal excreta, animal and vegetable refuse of the farm, and peat, as well as various factory wastes. The natural manures are, as a rule, bulky in character and contain small amounts of the essential constituents. The most important and useful of the natural manures is farmyard or barnyard manure. Its quality, which is very variable, depends upon the care taken in its preservation, the kind and age of the animal producing it, the quantity and quality of the food used, nature and amount of the litter added.

Mature animals, neither gaining nor losing weight, excrete practically all of the fertilizing constituents consumed in the food. Growing animals and milch cows excrete from 50 to 75 per cent of the fertilizing constituents of the food; fattening or working animals from 90 to 95 per cent. Roberts states that the value of the manure produced by animals is from 30 to 50 per cent of that of the food they consume. As regards the fertilizing value of equal weights of manure in its normal condition, farm animals probably stand in the following order: poultry, sheep, pigs, horses, cows. Poultry manure is the richest of the animal manures, because it consists of a mixture, in somewhat concentrated form, of both the solid (intestinal) and liquid (urinary) excreta. The liquid excretum of farm animals is the most valuable part of the manure, being especially rich in nitrogen and potash, but poor in phosphoric acid. Sheep manure is drier and hence richer in fertilizing constituents than pig, horse, or cow manure. Pig manure contains as much water as cow manure and more than horse manure, but is richer in nitrogen. Horse manure is a comparatively dry manure, which ferments rapidly. For this reason it is called a hot manure and is especially valuable for use in hotbeds and for forcing early crops. Cow manure is a wet cold manure, which ferments slowly. Its low percentage of fertilizing constituents is due to its high percentage of water. The amounts of fer-

tilizing constituents in animal manure stand in direct relation to those in the food. As regards the value of the manure produced the concentrated feeding stuffs, such as meat scrap or meal, cottonseed meal, linseed meal, gluten meal, and wheat bran, stand first; the leguminous plants (clover, peas, beans, etc.) second; the grasses third; cereals (oats, corn, etc.) fourth; and root crops, such as turnips, beets, and mangel-wurzels, last. High salting and succulent foods as a rule give watery and poor manure. With high feeding there is less complete digestion and hence richer manure. Highly nitrogenous foods give richer manures, although at the same time they increase the excretion of urine, thus requiring more bedding and reducing the value of the manure, if, as is frequently the case, the material used as litter is poorer in fertilizing constituents than the animal excreta. Animals kept in cold quarters probably digest their food more closely, and hence make poorer manure.

Barnyard manure rapidly deteriorates from two chief causes: (1) fermentation, which begins as soon as the manure is dropped; (2) weathering and leaching, which rapidly reduce the value of unprotected manure. Roberts reports experiments at Ithaca, N. Y., in which manure exposed in loose heaps of from two to 10 tons each lost from 42 to 62 per cent of its value in six months, and cow manure 30 per cent; while mixed and composted manure lost only 9 per cent. The loss from destructive fermentation may be considerably reduced by the use of proper absorbents (litter), but the most perfect preservation is secured by storing the mixed manure of different animals under cover and keeping it compact to exclude air. Extremes of temperature and moisture should be avoided to prevent "fire-fanging" and to secure a uniform, moderate, and harmless fermentation. Such fermentation, in fact, improves the quality of poor, coarse manure by rendering its constituents more available as plant food.

When practicable, it is best to avoid storage by hauling the manure directly to the fields and spreading it upon land occupied by plants. From 10 to 40 tons per acre is usually applied. Moderate applications at frequent intervals are preferable to large but infrequent applications, except when the purpose is to warm the soil to force early crops. Excessive use of manure, as in forcing-house work, sometimes causes the soil to become "manure sick." Heating the soil has been suggested as a remedy. The forcing effect of fresh manure renders it better suited to early garden truck, grasses, and forage plants than to plants grown for seed, such as cereals. Direct applications to root crops, such as sugar beets, potatoes, or tobacco, often prove injurious. This result can, as a rule, be avoided by applying the manure some months before the planting of the crop or by using only well-rotted manure. Barnyard manure is not applied to fruit trees with the same good results as in case of other crops. It does not stimulate fruiting to the same extent as the mineral fertilizers. This is probably due to the fact that it is poor in total and available mineral constituents and comparatively rich in nitrogen, which tends to produce large growth but a poor quality of fruit. As a rule, therefore, the best results are likely to be obtained by using barnyard manure in connection with commercial fertilizing materials, lime, gypsum, etc., either in compost (q.v.) or separately.

Other natural manures of secondary importance are peat, ashes (qq.v.), wool waste, which contains on an average 5.5 per cent of nitrogen, 1 per cent of phosphoric acid, and 2 per cent of potash; hair waste, containing 7 per cent of nitrogen and less than 1 per cent of phosphoric acid; felt waste, with about 8 per cent of nitrogen; leather, with about 7 per cent of nitrogen. Peat and the wastes mentioned are principally valuable for the nitrogen they contain, but this is very slowly available to plants and hence not of great value.

AMOUNT AND VALUE * OF MANURE PRODUCED BY FARM LIVE STOCK

(New York Cornell Experiment Station and other sources)

KIND OF ANIMAL	Amount of excrement per 100 pounds live weight per day	COMPOSITION AND VALUE OF MANURE (MIXED EXCREMENT AND LITTER)†			
		Nitrogen	Phosphoric acid	Potash	Value per ton
	Pounds	*Per cent*	*Per cent*	*Per cent*	
Sheep	34.1	.768	.391	.591	$3.30
Calves	67.8	.497	.172	.532	2.18
Pigs	56.2	.840	.390	.320	3.29
Cows	74.1	.426	.290	.440	2.02
Horses	48.8	.490	.260	.480	2.21
Poultry	‡	.500	.350	.850	7.07

* Valuing nitrogen at 15 cents, phosphoric acid at 6 cents, and potash at 4½ cents per pound.
† Fine-cut straw of known composition in sufficient quantity to keep the animals clean.
‡ According to the Maine Experiment Station each hen produces about 30 pounds per year of manure which can be saved.

Intermediate in character between the natural manures proper and artificial or commercial fertilizers are the soil amendments or soil improvers and the so-called catalytic or stimulant fertilizers, to which reference has already been made, and which are valuable as a rule for their indirect or stimulant effect rather than as direct sources of plant food.

Artificial or Commercial Fertilizers. With the continued sale of products from the farm the natural manures available are often insufficient, as already explained, to maintain the original fertility of the soil. In specialized intensive farming, moreover, there is a demand for an abundant supply in the soil of more active plant food than farm manures furnish, in order that the high-value crops grown under such conditions may be forced into early, rapid, and vigorous growth. Under such circumstances the more concentrated and available forms of commercial fertilizing materials are used to good advantage. There are numerous sources of supply of such

materials, which may be divided into three classes, viz., nitrogenous, furnishing nitrogen; phosphatic, furnishing phosphoric acid; and potassic, furnishing potash. It is assumed in the preparation of fertilizers that the constituents most likely to be deficient in soils are nitrogen, phosphoric acid, and potash. A fertilizer, therefore, containing all three of these is termed complete, one containing only one or two of them incomplete. The price of a fertilizer is based upon the price of the nitrogen, phosphoric acid, and potash it contains.

Nitrogen, the most costly ingredient of fertilizers, is derived mainly from organic matter, ammonium salts, and nitrates, but also in recent years from calcium cyanamide (see CYANAMID), containing about 20 per cent of nitrogen as offered for sale as a fertilizer. Nitrates furnish the most available form of nitrogen. The nitrate most commonly used as a fertilizer is nitrate of soda (Chile saltpetre), which contains on the average 16 per cent of nitrogen, although basic calcium nitrate, containing 13 per cent of nitrogen, a product obtained, like calcium cyanamide, from electrical fixation of the free nitrogen of the air, is also coming into use as a fertilizer and is considered somewhat more effective than nitrate of soda on soils in need of lime as well as nitrogen. The more valuable sources of organic nitrogen are dried blood and tankage, which are produced in large quantities in slaughterhouses and rendering establishments; dried fish, residue from fish oil and canning establishments; and cottonseed meal, a by-product of cottonseed-oil manufacture. (See table on page following for composition.) Nitrogen in the form of ammonium salts stands between that of nitrates and organic nitrogen as regards efficiency. It is obtained for use as a fertilizer almost exclusively as ammonium sulphate, prepared largely as a by-product of gas works, coke ovens, etc., and containing on an average about 20 per cent of nitrogen. The nitrates are readily available, but also very soluble, and hence likely to be rapidly leached out of the soil. The ammonia salts, however, while considered less efficient than nitrates, are not so readily leached out of the soil, although extremely soluble. When used with proper precaution the nitrogen of calcium cyanamide is considered about as efficient as that of ammonium salts. The organic forms of nitrogen are practically insoluble and unavailable until they have been converted into ammonia compounds and undergone nitrification (q.v.) in the soil. They vary widely with respect to the rapidity with which these changes occur, dried blood and meat products, freed as completely as possible from fat, standing first, cottonseed meal and similar vegetable products next, and leather, hair, horn, and hoof lowest.

Phosphoric acid of fertilizers is derived from bone, mineral phosphates, and phosphatic, basic, or Thomas slag, a by-product of the manufacture of steel from phosphatic ores. In these it is present mainly as calcium phosphate (tricalcium phosphate, $(CaO)_3 \cdot P_2O_5$, in the first two, tetracalcium phosphate, $(CaO)_4 \cdot P_2O_5$, in the last). It is found in fertilizers in three forms: (1) tricalcium phosphate, largely insoluble in water and other weak solvents, designated in fertilizer analysis as "insoluble" phosphoric acid; (2) soluble in water and readily available to plants, as the superphosphates, which are prepared from bones, bone black, mineral phosphates, etc., by grinding and treatment with sulphuric acid, thus converting the insoluble tricalcium phosphate into soluble monocalcium or acid phosphate, $CaO \cdot (H_2O)_2 \cdot P_2O_5$; (3) "reverted," or in form of dicalcium phosphate, $(CaO)_2 \cdot H_2O \cdot P_2O_5$, which is not soluble in pure water, but is soluble in weak solutions of organic acids and their salts. This form results from the tendency of soluble monocalcium phosphate to revert to a less soluble (dicalcic) form. In fertilizer analyses it is classed with the water-soluble as available.

Potash, as a constituent of fertilizers, exists in a number of forms, but chiefly as chloride or muriate and as sulphate. All forms are freely soluble in water and are believed to be nearly, if not quite, equally available, but it has been found that the chlorides may injuriously affect the quality of tobacco, potatoes, and certain other crops. The chief sources of potash are the potash salts from Stassfurt, Germany—kainite, carnallite, sylvinite, muriate of potash, sulphate of potash, and double-manure salt (sulphate of potash and magnesia). Wood ashes and cotton-hull ashes are also important sources of potash, and the Pacific coast kelps (see KELP), which are very rich in potash, have recently been exploited for this purpose. Kainite, carnallite, and sylvinite are crude products of the mines, and contain, in addition to potash, a number of other salts, chiefly sodium chloride and magnesium sulphate. Kainite and the sulphate and chloride are the principal salts on the market for fertilizing purposes. The potash in kainite, though in the form of a sulphate, produces an effect quite similar to that derived from the use of muriate, because of the large quantities of chlorides mixed with it. It contains on the average about 12½ per cent of actual potash. The muriate and sulphate are refined products and contain on the average not less than 50 per cent of actual potash. The chief impurity in the case of the muriate is common salt. High-grade double sulphate of potash and magnesia ("double-manure salt"), which is used to a limited extent as a fertilizer, contains about 26 per cent of actual potash, though much lower grades of this material are found. See also table of composition below.

The substances referred to above as the sources of nitrogen, phosphoric acid, and potash are the raw materials from which the various manufactured brands of fertilizers are compounded. The quality of a mixed fertilizer will depend upon the character of the raw materials selected, as regards both amount and availability of their fertilizing constituents, and upon the proportions in which they are mixed. For instance, in one brand the nitrogen may be entirely in the form of insoluble organic materials and the phosphoric acid as insoluble mineral phosphates, while in another all three forms of nitrogen may have been used, viz., nitrates, ammonium salts, and organic matter, with phosphoric acid entirely in the form of superphosphate. The total plant food may be just as large in the first as in the second brand, but its availability and the immediate effects from its use would be much larger in the second case than in the first. Since chemical analysis cannot always tell with certainty the source and availability of the essential constituents of fertilizers, especially of the organic nitrogen, it is often desirable to purchase the unmixed materials, either for use

separately or to be mixed on the farm as required.

To use fertilizers to the best advantage it is necessary to take into consideration a variety of conditions, among the more important of which are the character of the fertilizer itself, the character of the soil and its previous manuring and cropping, the climate, and the crop to be grown. In general, concentrated fertilizers prove most profitable on: (1) soils in good physical condition, i.e., well tilled and abundantly supplied with humus; and (2) high-value crops, such as are grown in market gardening. Different classes of farm crops vary in their the slow-growing beets and mangels; soluble phosphates in abundance for the turnip; and potash for potatoes, white and sweet. That is, while the fertilizers should contain all three elements, individual crops, because of their peculiarities of growth, require certain fertilizing constituents in greater relative amounts and in immediately available forms. Fruit trees are slow-growing plants and therefore do not need quick-acting fertilizers as a rule. Highly soluble manures, such as nitrate of soda, are likely to be washed out of the soil without being utilized. For this reason the use of nitrate of soda is not advised except where the growth of

COMPOSITION OF THE PRINCIPAL COMMERCIAL FERTILIZING MATERIALS

	Nitrogen	Available phosphoric acid	Insoluble phosphoric acid	Total phosphoric acid	Potash	Chlorine
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1. Supplying nitrogen:						
Nitrate of soda	15.5 to 16					
Calcium nitrate, basic	13					
Sulphate of ammonia	19 to 20.5					
Calcium cyanamide	20					
Dried blood (high grade)	12 to 14					
Dried blood (low grade)	10 to 11	.....	.....	3 to 5		
Concentrated tankage	11 to 12.5	.....	.....	1 to 2		
Tankage (bone)	5 to 6	.....	.....	11 to 14		
Dried fish scrap	7 to 9	.....	.....	6 to 8		
Cottonseed meal	6.5 to 7.5	.....	.....	1.5 to 2	2 to 2	
Castor pomace	5 to 6	.....	.....	1 to 1.5	1 to 1.5	
2. Supplying phosphoric acid:						
South Carolina rock phosphate	.....	.....	26 to 28	26 to 28		
South Carolina rock superphosphate (dissolved South Carolina rock phosphate)	.....	12 to 15	1 to 3	13 to 16		
Florida land rock phosphate	.....	.....	33 to 35	33 to 35		
Florida pebble phosphate	.....	.....	26 to 32	26 to 32		
Florida superphosphate (dissolved Florida phosphate)	.....	14 to 16	1 to 4	16 to 20		
Bone black	.....	.....	32 to 36	32 to 36		
Bone black superphosphate (dissolved bone black)	.....	15 to 17	1 to 2	17 to 18		
Ground bone	2.5 to 4.5	5 to 8	15 to 17	20 to 25		
Steamed bone	1.5 to 2.5	6 to 9	16 to 20	22 to 29		
Dissolved bone	2 to 3	13 to 15	2 to 3	15 to 17		
Thomas slag	.....	.....	.....	*11.4 to 23		
3. Supplying potash:						
Muriate of potash	.....	.....	.....	.....	48 to 52	45 to 48
Sulphate of potash (high grade)	.....	.....	.....	.....	48 to 52	.5 to 1.5
Sulphate of potash and magnesia	.....	.....	.....	.....	26 to 30	1.5 to 2.5
Kainite	.....	.....	.....	.....	12 to 12.5	30 to 32
Sylvinite	.....	.....	.....	.....	16 to 20	45 to 46
Cotton-hull ashes†	.....	.....	.....	7 to 9	20 to 30	
Wood ashes (unleached)†	.....	.....	.....	1 to 2	2 to 8	
Wood ashes (leached)†	.....	.....	.....	1 to 1.5	1 to 2	
Tobacco stems	2 to 3	.....	.....	3 to 5	5 to 8	
Giant kelps, Pacific coasts, dry	.....	.....	.....	.....	20	

* In good Thomas slag at least 80 per cent of the phosphoric acid should be soluble in ammonium citrate, i. e., available.

† Cotton-hull ashes contain about 10 per cent of lime, unleached wood ashes 30 to 35 per cent, and leached wood ashes 35 to 40 per cent.

fertilizer requirements. The cereals, maize excepted, and grasses are similar in their habits of growth and are able to utilize comparatively insoluble forms of mineral plant food, but are much benefited by nitrogen, especially nitrates, applied in time to carry them through the period preceding maturity. It is for the latter reason that nitrogen has been termed the ruling or dominant element for this class of plants. Leguminous plants—clover, peas, beans, etc.—which are capable of acquiring nitrogen partly from the air, make liberal use of the mineral constituents, especially potash and lime. Fertilizers for such plants should therefore contain an abundance of the mineral constituents only, potash being the dominant element. Root and tuber crops require an abundance of all the fertilizing constituents in readily available forms. Of the three classes of fertilizing constituents, the nitrogen is especially useful for nursery stock is to be forced or where bearing trees exhibit a lack of luxuriance in foliage. Frequently, however, it is desirable to stimulate the growth and fruitfulness of the trees, and for this purpose more active fertilizing materials than the above are needed. In selecting and mixing the latter the fact that fruits are potash feeders should be taken into consideration. The fertilizer requirements of small fruits are similar to those of orchard fruits, but, being as a rule more rapid growers, they can utilize to advantage heavier applications of soluble fertilizing materials and do not derive the same benefit as orchard fruits from slowly decomposing manures.

It may be said that in general crops grown on soils poor in decaying vegetable matter (humus) are as a rule benefited by applications of nitrogenous manures, while those grown upon soils well supplied with this substance are more

benefited by phosphates and potash. Upon heavy soils phosphates are likely to be more beneficial than nitrogen, while the reverse is the case on light dry soil. Sandy soils are as a rule deficient in potash, while clayey soils contain this element in larger quantities. Deep-rooting crops with long seasons of growth are able to acquire the necessary plant food where shallow-rooted and short-season crops would suffer. As regards the different forms of fertilizing materials it may be said that nitrates and soluble phosphates should be applied only a short time before they are required by the plant. Potash salts, ammonium sulphate, organic nitrogenous matter, and insoluble phosphates, being less likely to be converted into less available forms or leached out of the soil, may be safely applied weeks or even months before they are needed. In general farm practice the best results are likely to be obtained in the use of fertilizers by applying them systematically, i.e., by adopting a combined system of rotation and manuring which is adapted to the given conditions of crop, climate, and season, and which provides for the utilization to the best advantage of the home and local supplies of manures.

The preparation and use of commercial fertilizers on an extensive scale practically dates from the announcement of Liebig's theory of plant nutrition in 1840 and the publication soon after of the results of Lawes's experiment on the preparation and use of superphosphates as a fertilizer. Since that date the industry has grown to enormous proportions. A recent estimate values the world's consumption of fertilizers at $400,000,000.

The composition of the more important materials used in the preparation of fertilizers is shown in the table on the preceding page.

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MANUSCRIPT (Lat. *manu scriptum*, written by hand). A term applied to anything written by hand, on either hard or soft and flexible substances. The hard substances are principally stones, metals, bone, and wood, on which the writing is in the nature of engraving; the soft or flexible substances are especially papyrus, wax, parchment and other skins, textiles, and paper, while terra cotta or clay partakes of both classes. The instruments used were the wedge, stylus, brush, and graver for the hard, and the reed, quill, stylus, and metal pen for the soft substances. The stone chisel was used in rock writings. In the matter of inks, black was always the ordinary color, and red was used at an early date (e.g., in Egypt) for decorative purposes; other colors had a special meaning, as purple was the Imperial color of the Byzantine and Carlovingian emperors and yellow the Imperial color in China. For the history of the methods of production and preservation of various kinds of manuscripts, see Book; Codex; Cuneiform Inscriptions; Libraries; Paleography; Papyrus.

MANUSCRIPTS, Illuminated. See Illuminated Manuscripts.

MANUTIUS, mȧ-nū'shĭ-ŭs. The Latin name of a famous family of Italian printers.—Teobaldo Manucci, better known as Aldo Manuzio (Aldus Manutius), was born at Sermoneta, near Rome, in 1450. Having studied Latin at Rome under Gasparino da Verona and Greek at Ferrara under Battista Guarini, Manuzio went in 1482 to live at Mirandola with his old friend Giovanni Pico. Pico got Manuzio a place as tutor to his nephews, Alberto and Lionello Pio, princes of Carpi. Alberto supplied the funds with which Manuzio, in company with Andrea Torresano d'Asola, bought the press of Nicolas Jenson, and brought the great Aldine firm into existence. Manuzio, or Aldo, to use the name now most familiar, settled in Venice in 1490, and soon published the undated *Hero and Leander* of Musæus, the *Galeomyomachia*, and the Greek Psalter. In 1495 the first volume of Aristotle appeared. Nine comedies of Aristophanes followed in 1498. Thucydides, Sophocles, and Herodotus came out in 1502; Xenophon's *Hellenics* and Euripides appeared in 1503, Demosthenes in 1504. In 1513 Plato was issued, and Pindar, Hesychius, and Athenæus came out in 1514. Aldo's press now devoted itself to printing Latin and Italian works, including the *Divine Comedy*. These works (1495–1514) were printed with Aldine types, a style cast by Francesco da Bologna and quite absurdly, according to a legend originating in an error of A. Firmin Didot (1872), said to have been copied from the handwriting of Petrarch. Italic type was invented by Aldo, as is shown by his *Monitum* of March 16, 1503, reprinted in Renouard (vol. iii). Italics were soon adopted by Lyonese printers. Apparently the first book thus printed at Lyons was issued in 1501. Aldo was an ardent humanist, and the Academy of the Filelleni (better known as the Aldine Academy), which he gathered around him, has the distinction of being one of the most serious in purpose and accomplishment of the time. He loved the books that he printed and wished to make not only them but his manuscripts accessible to many. Symonds roughly estimates the current price of Aldo's pocket series of Greek, Latin, and Italian classics, begun in 1501, at two shillings a volume. It would seem that Aldo's books were cheaper than those of modern publishers, who have hardly surpassed him in quality at their best. In 1499 Aldo had wedded Maria, the daughter of his colleague Andrea Torresano. On Feb. 6, 1515, Aldo died, leaving three sons to help carry on his business.—Paulus Manutius (1512–74), born in Venice, June 12, 1512, took up in 1533 the task which had meanwhile been done mainly by his grandfather, Andrea Torresano. Paolo set up his own firm and devoted himself mainly to the Latin classics. He skill-

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MINIATURE FROM LATIN MANUSCRIPT BOOK OF HOURS OF THE BLESSED VIRGIN MARY.

fully edited Cicero's *Letters* and *Orations*, and published his own Latin version of Demosthenes. In 1561, at the invitation of Pius IV, he went to Rome, where he was to have 500 ducats a year and enough to defray the cost of his press. The profits were to be equally divided between Paolo and the Camera **Apostolica. Paolo seems** to have fared well under Pius IV, but the coldness of Pius V compelled him to leave Rome. He went back, however, and died there in 1574. His partnership with the papacy was more favorable to theological writers than to classic literature.—ALDUS MANUTIUS, the younger (1547-97), son of Paolo, was born Feb. 13, 1547, and died in Rome, Oct. 28, 1597. At the age of nine his name appeared on the title-page of the *Eleganze della lingua toscana e latina*. In 1561, whether with or without help we do not know, he produced a work on Latin spelling, *Orthographiæ Ratio*, which he completed with an *Epitome Orthographiæ* in 1575, both highly valuable books. In 1572 Aldo married Francesca Lucrezia, daughter of Bartolommeo Giunta, grandson of that Giunta who had established the famous Venetian press. This was a lucky alliance, for the Aldine press had been steadily declining, while the other was growing richer. In 1574 his father's death in Rome made Aldo the younger head of the firm. His commentary of the *Ars Poetica* of Horace (1576) maintained the family's traditional blending of good printing and scholarship. As a professor of belles-lettres Aldo went to Bologna (1585), and thence to Pisa (1587). There he printed Alberti's comedy *Philodoxius*, and attributed it strangely to Lepidus. In 1588 he went to Rome and again turned to printing, with Clement VIII as his patron, until his death.

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MAN WHO LAUGHS, THE. See HOMME QUI RIT, L'.

MAN WITHOUT A COUNTRY, THE. A story by Edward Everett Hale, first published anonymously in the *Atlantic Monthly* (1863).

MANX CAT. See *Domestic Cats*, under CAT.

MANX LITERATURE. The Celtic dialect still spoken by about 3000 persons on the west coast of the Isle of Man is closely related to Irish and Scottish Gaelic, standing nearer on the whole to the latter. (See CELTIC LANGUAGES.) Unlike both of them, Manx has abandoned the traditional Gaelic orthography and modeled its spelling rather upon English. Manx literature, so far as preserved, is scanty and confined to the modern period. The principal monuments are the translations of the Book of Common Prayer and of the Bible. The former was first published in 1765; the latter in 1771–75. But an older manuscript version of the Prayer Book, completed by Bishop Phillips in 1610, has been recently printed by John Rhŷs and A. W. Moore (Douglas, 1895). Moore has also published several books dealing with the history and popular traditions of the Isle of Man. The native literature, of which this author gives specimens, consists principally of ballads, and carvels (the local term for carols) sung on Christmas Eve.

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MAN-YO-SHU, mân'-yō-shōō' (Jap., Collection of a Thousand Leaves). The most ancient anthology in the Japanese language. It was formed in the eighth century A.D., being one of the first books written in Japan. It retains the highest place in the estimation of Japanese critics, and a whole literature has gathered around it. To the foreign student its chief value is in its facts and allusions, which make it a prime source for the study of ancient Japanese history and sociology.

MANZANARES, män'thà-nä'râs. A town in the Province of Ciudad Real, Spain, situated 98 miles south of Madrid, in a vast and arid plateau known as La Mancha, 1980 feet above the sea level (Map: Spain, D 3). The town is well built and contains a modern church of Gothic architecture and an ancient, moat-surrounded castle, built after the defeat of the Moors at Las Navas de Tolosa (1212). The country around is flat, requiring irrigation to render the soil productive. The climate is healthful and delightful; the chief industry is the raising of saffron and making Valdepeñas wine. There are manufactures of cloth, soap, and brandy. Pop., 1900, 11,181; 1910, 14,176.

MANZANILLO, män'sà-nē'lyō. A port in the Province of Santiago de Cuba, Cuba (Map: Cuba, H 6). It is situated on the west coast of the province, at the head of the Gulf of Guacanayabo, in a low and unhealthful region surrounded by mangrove swamps. Though not very attractive in appearance, it is regularly built, with straight and wide streets crossing at right angles. It has four high schools, several hospitals, and a good market. The roadstead,

protected by the Keys of Manzanillo, forms a capacious harbor. The city serves as the port of Bayamo, and is the outlet for the products of the fertile Cauto Valley, the chief of which are sugar, tobacco, and lumber. It is the seat of a United States consular agent. Pop., 1899, urban, 14,464, municipal, 32,288; 1907, urban, 15,819, municipal, 54,900.

MANZANILLO (*Puerto de Colima*). A seaport of the State of Colima, Mexico, situated on the beautiful bay of Manzanillo, an arm of the Pacific (Map: Mexico, G 8). The Mexican government has transformed the bay into an excellent harbor by the construction of an extensive breakwater and sea wall. It is served by a number of steamship lines, and a national railway connects it with Colima, the capital of the state, 40 miles inland. In 1913 its exports, consisting of bullion, hides, timber, and coffee, were valued at $306,317, and its imports, chiefly machinery and vehicles, amounted to $1,486,148. It is the seat of a United States consul. Pop., 1910, 1503. Consult P. F. Martin, *Mexico of the Twentieth Century* (New York, 1907).

MANZANITA, măn'zȧ-nē'tȧ. A California shrub. See ARCTOSTAPHYLOS and Plate of CALIFORNIA SHRUBS.

MANZONI, mȧn-dzō'nē, ALESSANDRO (1785–1873). An Italian poet and novelist, born at Milan, March 7, 1785. Having completed his early training at Milan and Pavia, he accompanied his mother (a daughter of Cesare Beccaria) to Paris in 1805, and with her he frequented some of the most fashionable salons, especially those in which the encyclopædic and rationalistic ideas of the preceding century still retained a hold. But the skeptical opinions that this Parisian sojourn gave him were not to last. His acquaintance with the French scholar Fauriel began at this time and greatly influenced his later artistic development. Back in Milan in 1808, he married Enrichetta Blondel, a follower of the Reformed religion. The couple went to Paris, and there in 1810 the marriage was resolemnized according to the rites of the Catholic faith, which the wife embraced and which Manzoni practiced from this time on with sincere ardor. After 1810 he made his home in the region of Milan. He was on terms of closest intimacy with such writers as Massimo d' Azeglio, who married his daughter, Tommaso Grossi, the novelist, and Berchet. During his later years he became the acknowledged leader of Italian thinkers and men of letters, among whom he had numberless friends and correspondents. Although an avowed patriot, he played no very public part in the struggles for political independence, so that he was included in no proscription. He became a Senator in 1860. He died May 22, 1873. During his youthful period Manzoni produced poems after the manner of the school of classicists, reflecting his earlier skeptical feelings, e.g., the *Trionfo della libertà*, obviously written under the influence of Monti; a composition in blank verse entitled *In morte di Carlo Imbonati*, and the *Urania*. The period between 1816 and 1825 was his most active one in the production of works in both prose and verse. To it belong the *Inni sacri*, which are full of exalted religious sentiment, one or two political *canzoni*, and the poem that made him really famous, the *Cinque maggio*, an ode on the death of Napoleon (1821). Of this same period are his dramatic compositions with which he hoped to inaugurate a reform in the Italian theatre. They are the *Conte di Carmagnola* and the *Adelchi*, the former published in 1820 and the latter in 1822 (at Milan). Admirable as literary performances, they are not adaptable to scenic production, and neither was well received at home, although Goethe warmly praised the *Conte di Carmagnola*. In connection with these pieces Manzoni enunciated the following principles: the dramatic composer should adapt the poetic invention to the historic fact and not follow the contrary practice; the unities of time and place need not be observed; the style and the dialogue should be perfectly natural; and the chorus, a sort of commentary on the events enacted, should provide a place in which the author may freely express his own feelings. Of the prose publications of Manzoni, noteworthy is the *Morale cattolico* (Milan, 1819), a reply to Sismondi's strictures upon Catholicism. His critical output is remarkable for its trenchancy and soundness. His masterpiece is the novel *I promessi sposi* (The Betrothed) (Milan, 1825–26). Somewhat cumbersome in plot, this romance, for its sage reflections on human nature, its graphic descriptions (especially that of the plague at Milan in 1631), and its masterly portrayal of characters, has deeply influenced mature minds of every nation: such a scholar as the American Andrew D. White calls it the best historical novel ever written. Many of its figures—the unnamed knight, repentant in the consciousness of sin, Fra Cristoforo, the monk of unswerving piety and sacrifice, the weak but very human priest Don Abbondio, Gertrude, the nun with no love for her calling—have become universal types. Aside from its artistic merit, the romance has great value as an historical study of the seventeenth century in Italy. In its revised form (1840) it became the illustration of Manzoni's theory of the national Italian language, as regards vocabulary and syntax (see ITALIAN LANGUAGE), and as such still figures as an important language text in Italian schools. It had numerous epigones among later novels (e.g., the *Monaca di Monza* of Rosini). The ode of *Pentecost* (from the *Inni sacri*) and the *Cinque maggio* (translated into English, Oxford, 1905) are masterpieces of the first order, and are the best reflections of the force of religion in Manzoni's intellectual outlook on life.

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MAORI, mä'ō-rī. The Polynesian race found in New Zealand by the first white men who discovered the island. Above the average in stature, they are more or less robust, with athletic frames. The head form is dolichocephalic. The women for the most part are strong and vigorous. Both sexes are adepts in swimming and the people are fond of bodily exercise. Some authorities hold, on insufficient grounds, that the

Maoris and other Eastern Polynesians are non-Malay, and Caucasic rather than Mongolic, although they admittedly speak dialects of the common Malayo-Polynesian speech. A few more venturesome inquirers have even sought to show that the Maori tongue is related to the Aryan family of languages. But all such efforts are vain. The Moriori of Chatham Islands are hardly more than a branch of the Maori, with perhaps more of a pre-Maori Melanesian intermixture, noticeable not only in physical characteristics, but also in art, weapons, etc. The Maoris are noted for their tattooing, their ornamental and decorative art, their epic poetry, legends, and mythology. In earlier times they were among the most cannibalistic of Polynesian peoples, despite their relatively high culture. Their long and valiant struggle with the British colonists, in the course of which they displayed some brilliant war tactics, gained for them the respect of their opponents, and they now have their representatives in the Legislature on the same basis as their white fellow countrymen. The Maoris, scattered over parts of the northern island and the northern portion of the southern island, seem, according to the last census, to be increasing in numbers. Considerable intermarriage has also taken place. There were two Maoris in the New Zealand cabinet of 1906.

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MAP (from Lat. *mappa*, napkin). The representation of the whole or a portion of the earth's surface, or of the heavens, upon a plane surface, usually on a greatly reduced scale. Map and chart (q.v.) are nearly synonymous terms, though the latter is now chiefly used to designate a map designed for navigational or astronomical purposes. The earliest maps of the simpler sort were doubtless prehistoric, as from the accounts of explorers of old as well as of modern times it has been found that many of the most ignorant and primitive savages make and use rude plans of their surroundings, whether of land or water, while Eskimo and American Indians have been found able to understand the charts of the white man in addition to making for themselves rude maps. The earliest historical record of map making is that of Sargon, King of Akkad, one of the states of Babylonia, which existed before the formation of the Babylonian or Assyrian Empire. The date of these maps is about 3800 B.C., and they are cadastral or topographical surveys, with a pretense at accuracy in the representation of lands, inasmuch as they were prepared for purposes of taxation. Other surveys in Babylonia and Assyria are depicted on clay tablets dating from 2300 to 2100 B.C., now in the British Museum. At least as early as 1300 B.C. map making was common in Egypt, as at the time of Ramses II (Sesostris of the Greek historians, 1333–1300 B.C.) a survey and map of the country were made in view of the necessity of apportioning land and the readjustment of the boundaries after the Nile floods. In fact, under these conditions the pharaohs had virtually to maintain a land office. According to Herodotus, such early work was the origin of geometry and surveying, with consequent map construction. The oldest map extant is an Egyptian papyrus of the thirteenth century B.C. in which some Nubian gold mines are shown.

One of the first students of the world-wide geography was Thales of Miletus (624–543 B.C.); and Anaximander (610–546), his pupil, is credited by Strabo with making the first map of the world, while Diogenes Laertius states that not only did he make a map of earth and sea, but also constructed a globe. According to Agathemerus and Herodotus, Hecatæus (550–475) of Miletus, who had traveled extensively in Egypt, Persia, Libya, Spain, and Italy, improved, corrected, and greatly extended the map of Anaximander. Thales is reported to have divided the earth into five climatic zones, much as they are recognized to-day, though this is also ascribed both to the Pythagoreans and to Parmenides of Elea (544–430 B.C.), and the latter was said to be the first to assert that the earth was of spherical form and at the centre of the universe. It is probable that Thales was the first to use meridians on a map and possibly the first to draw the equator; he is credited with the discovery that the plane of the ecliptic is inclined to that of the equator and made a rough measurement of the inclination.

Up to the time of Thales, and even later, the world was considered as a plane. Thales, however, is said to have suggested the spherical shape of the earth, and this is probable if he was the originator of the climatic zones; but we are told by Aristotle and Plutarch that, inasmuch as his pupil Anaximander considered the earth to be a disk or a section of a cylinder resting in the centre of the hollow celestial sphere, it is doubtful if Thales held more correct views. Very soon afterward the Pythagorean school of philosophy, if not Pythagoras himself, taught that the earth was spherical, though this hypothesis was based more upon ideas of symmetry than upon known facts. The proof of the earth's sphericity was left to Aristotle (384–322), who drew this conclusion from the shadow of the earth cast upon the sun in eclipses, and though he made no maps of which we have record, he may be said to have founded scientific geography and map making.

Dicæarchus of Messina, a pupil of Aristotle, constructed maps of Hellas and is said to have estimated the size of the earth on an oval map of the world he constructed. He is supposed to have been the first to draw a parallel of latitude on a map, such a line having been derived and drawn on his map from observations of the length of the shadow cast by the sun.

The first attempt to measure the actual size of the earth was made by Eratosthenes (c.275–195), from whom scientific geography may be said to date. (See ERATOSTHENES.) Appointed keeper of the Alexandrian Library by Ptolemy Euergetes in 245, he started his map making by determining the difference in latitude between Alexandria and Syene by measuring the shadow of the sun as cast by a gnomon or pillar at each

place on the same day, and then after computation determined in linear measure the length of the corresponding arc of meridian. He determined the latitude of Alexandria, Syene, and Meroë, through which he traced his initial meridian. He obtained the distance between Alexandria and Syene from maps made by Egyptian royal surveyors, as 5000 stadia, which corresponded to one-fifth part of a circle. From the data thus obtained, he concluded that the length of a degree of latitude was about 700 stadia. Assuming the stadium to have been 164 meters (Dorpfeld), this would give the length of a degree as 114,800 meters (61.9453 modern geographical miles of 6080.20 feet), which is 3992 meters (2.154 geographical miles) in excess of its real value. This difference may have been due in part to the fact that Syene and Alexandria are not on the same meridian or longitude as Eratosthenes supposed; but there was established the earliest system of geographical coördinates which is fundamental to all accurate mapping, either in whole or in detail. Notwithstanding the error, this was an enormous step forward towards accuracy, and the map he prepared from information obtained in the great library was far superior to that of any predecessor.

Crates of Mallus, who died in 145 B.C., was the first to construct a globe which represented the views of the earth held by the Stoic school of philosophy. In this the symmetry ideas of the Pythagorean school are found carried still further. Since land exists on both sides of the equator, he concluded that the known continent of Europe, Asia, and Africa must be balanced by another on the opposite side of the world. The resulting globe had an equatorial ocean and a meridional one, the two dividing the world into four parts each containing an inhabited continent. On this globe the existence of such continents as North and South America and Australia was anticipated. As showing the effect of this arrangement in modes of thought it may be said that such a globe so divided by bands early became typical as one of the insignia of royalty.

Hipparchus of Rhodes (fl. c.160 B.C.) compiled no maps, but his labors in the field of geography, astronomy, and mathematics were most important and helpful to map making. On the strength of his astronomical knowledge he criticized the work of Eratosthenes, describing its defects and their remedies. He showed the desirability of constructing large maps upon a rectangular projection or plan where the feature of a curved or spherical surface was represented on a plane in such a way as not so greatly to distort the areas at equal distances, devising what are known in map making as the orthographic and stereographic projections, described later in this article. He placed at equal distances the meridians and parallels which Eratosthenes had arranged somewhat arbitrarily, and in order to secure accuracy he showed that the positions of places—both in latitude and longitude—should be determined astronomically; he also pointed out that longitude could be determined astronomically by the eclipses of the sun and moon, instead of being based merely on the itineraries or estimated or roughly measured distances of travelers and sailors, as had been done hitherto. Though he constructed no maps, Hipparchus made a celestial globe which was in the Alexandrian Library in the time of Marinus, 300 years later; and by considering the earth a sphere and dividing it by great circles perpendicular to the equator and extending to the poles, and by parallel lines at equal distances from the equator to the poles, he not only made geography possible as an exact science, but provided the introduction to modern ideas of latitude and longitude.

During this long period map making does not appear to have progressed, though Strabo (50 B.C.–24 A.D.) added considerably to geographical science and knowledge, and the campaigns of the Romans, of which rough itineraries or crude maps were prepared, gave much information in regard to regions previously unknown. A military map of the Roman provinces was made under the order of Julius Cæsar by three surveyors, who began their work in 44 B.C. and continued it for 25 years. Such military maps and the itineraries of travelers, however, must be considered at their face value, for they did not represent places in their relative distances, as would a map based on latitude and longitude. Thus, in the Peutingerian Table, a Roman *itineraria picta*, in one of the oldest surviving mediæval maps, now in the Royal Library in Vienna, there is seen a thirteenth-century copy of an old Roman original showing the Roman world at the time of Theodosius (393 A.D.). It is some 18 feet in length and more than 1 foot in breadth, embracing the region from Spain to India. See ITINERARY; PEUTINGERIAN TABLE.

But, returning to more scientific maps, mention next may be made of the work of Marinus of Tyre (c.120 A.D.), which is known from the description furnished by Ptolemy. Marinus, who studied the work of his predecessors and all other accumulated geographical data, was the first to determine the geographical positions of places on his map by using a projection or plan based on their latitudes and longitudes. This plan was not really a projection as understood by modern geographers, as it had the parallels and meridians equidistant and at right angles; and as the relative lengths of the degrees of latitude and longitude were based on a central parallel for which the latitude of Rhodes was taken, regions to the north and south naturally were distorted both in area and shape. The errors of this chart were even further increased by his adopting the length of a degree of latitude, 500 stadia, as determined by the Stoic geographer Posidonius, instead of accepting the more accurate determination of 700 stadia made by Eratosthenes.

Claudius Ptolemy of Alexandria (c.190–270 A.D.) was one of the greatest geographers, astronomers, mathematicians, and map makers of all times; and fortunately most of his work, both the maps and the indexes of places, has come down to us, but only in copies with doubtful authentication. His knowledge of geography, astronomy, and mathematics eminently fitted him for map making, which was one of the least of his achievements, important as it was. He made maps largely by compilation, editing the work of previous geographers and particularly correcting many errors of Marinus and to a large degree the distortion of his maps. He also furnished descriptions of them with tables of geographical positions of places, so that the maps could be reproduced by others having copies of the original data, and in fact this was done extensively.

Ptolemy was responsible for two projections —one a modified conical, where the parallels were

THE WORLD ACCORDING TO CLAUDIUS PTOLEMY, CIRCA A. D. 150

WORLD MAP FROM THE ULM EDITION OF PTOLEMY, 1492

LARGE WORLD MAP OF MERCATOR, 1569

The First Drawn on this Projection

From photographs by Edward Luther Stevenson, Ph. D.

curved and the meridians straight, and the other also a modified conical, but having both parallels and meridians curved—both being seen in his maps of the world. In the first projection he preserves the correct relations between latitude and longitude at the equator and the extreme northern limit of his chart (latitude of Thule or the Hebrides). In the second plan he preserves the correct relations at the northern (Thule, about 65 degrees north) and southern (Agisymba, 20 degrees south) limits, at the equator, and at the parallels of Moroë (about 15 degrees north) and Syene (about 25 degrees north). Ptolemy's small maps, 26 in number, according to the oldest extant edition of 1478, are drawn upon a simple rectangular projection, their moderate areas not requiring the curve of the meridians or parallels to secure adequate accuracy.

Ptolemy's maps as planned and executed by him were a great advance upon those of his predecessors, but unfortunately he, like Marinus, followed the estimates of Posidonius instead of the more exact measurements of Eratosthenes as to the size of the earth, using 500 stadia as the length of a degree of latitude instead of 700. The known world was therefore unduly expanded in longitude (and at some places in latitude) on Ptolemy's charts, the east coast of Asia being shown to extend so far to the eastward as to place it 9000 miles or less from the west coast of Europe. Ptolemy's work, after being neglected for centuries, was revived in the fifteenth century, and his maps were known, copied, and extended. These maps were known to and studied by Columbus, and the comparative shortness of the distance from Europe to Asia was one of the reasons which led him to believe he could successfully reach China by sailing westward. While Ptolemy's work was of great value at this time, yet mariners and geographers, aided by geographical discovery during the fifteenth and sixteenth centuries, realized that the errors were both fundamental and detailed, so that his authority became undermined with the development of the more modern cartography.

Soon after the death of Ptolemy there came an end to nearly all development of science in the Christian world. The Church at this time included in its domain science as well as all other forms of learning, and the fathers, such as St. Augustine, then such theologians as Thomas Aquinas and the popes regarded the Bible as the sole repository of wisdom, scientific as well as spiritual, and adhered blindly to a literal interpretation of its text. The bishops of Alexandria destroyed the rehabilitated Alexandrian Library and the Serapeum and scattered the priceless records of previous scientific achievement. For a thousand years now the intellectuality of the Christian peoples reverted to the beliefs antedating the rise of Greek philosophy; geography and map making suffered with other branches of science. The clear and intelligible maps and scientific methods of Ptolemy were neglected and forgotten for a thousand years, and instead there were put forth grotesque and fanciful representations of land and water which form all the commentary necessary as to the intellectual state of the times. Some were rectangular, some circular, all consisted of fancifully shaped land surrounded by the "circumfluent ocean." Many contained fantastic figures of princes and scriptural characters as well as legendary beasts and monsters. The map still in existence in the cathedral at Hereford, England, and dating from 1283, is interesting as indicating an increasing knowledge of geography at this time while still preserving many of the absurdities of the patristic period.

Thus the Christian world—not so the Mohammedan. As soon as the blind fanaticism and fury of their early conquests were spent, the various Mohammedan rulers encouraged science, literature, and commerce. They sought learning and philosophy wherever it was to be found, and much that has survived of the work of Aristotle, Ptolemy, and of other Greeks and Egyptian learned men has come down through them. Moreover, they developed and greatly improved and practicalized the science and information they received. Among the many things with which they dealt were charts and maps, which they made more correct and more common.

Among the most important developments of this period were the so-called compass maps which were attached to the portolani or books of sailing directions for mariners trading in the Mediterranean. The distinguishing feature of these charts was a great number of lines radiating from one or more centres. The exact use made of these lines is uncertain, but it may be that they served to show the general directions of places from each other. As they were drawn without regard to land and water, they did not show practicable routes for vessels; and as they seem to have been common before the introduction of the compass, they were not designed for use with it. The origin of the portolani charts is unknown, but they show that much advance had been made in accuracy of knowledge concerning latitude and longitude since the days of Ptolemy. Some of these charts were more ambitious and covered as much of the earth as was known, and we know that one by Toscanelli, made about 1474 on the basis of the travels of Marco Polo, was sent to Columbus.

The discovery of America aroused interest in science and secular learning and caused a general skepticism as to previously accepted facts and a distrust of the hitherto accepted ideas as to astronomy, cosmogony, and geography. For nearly 1500 years science and the Church had been in opposition, and naturally this extended to map making. The Spanish conquistadores found that the Peruvians had ordinary maps and maps in relief, while the Mexicans had cadastral plans of villages and towns and a map of the coast; but the Spanish Conquest put an end to all development in that part of the world.

The discovery of America, which continent first appeared in the Waldseemüller map of 1507 and in Ruysch's map of 1508, upset views as to the shape of the earth, but the Church allowed the facts to spread but slowly and opposed the ideas of Copernicus and Kepler, but the truth necessarily prevailed in time. The result was a great impetus towards exploration and map making. The works of Ptolemy, Hipparchus, and Eratosthenes were again considered, especially in view of the fundamental principles upon which the work was executed, and maps began to be constructed upon real projections and with more attention to collecting the results of explorations. The map of the world made by Gerhard Kremer (Mercator) in 1569 is by far the best produced up to that time. Its principal errors are the undue width of North America and an extension of the Antarctic continent too

far to the northward—so far indeed as to connect it to Australia, of which the southern coast was then unknown. Mercator's charts were engraved on copper and were among the first in which reproduction by this method was employed.

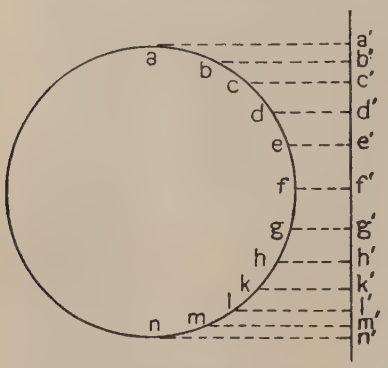


FIG. 1. ORTHOGRAPHIC PROJECTION.
Showing lines of projection.

Since the time of Mercator the development of map making has continued without a break, not only as regards scientific improvement of the projections and of the methods of reproduction but also as regards accuracy of delineation and of geographic positions, which has been rendered possible by the extension of geographic knowledge and the perfection of modern surveys. Map making has also been extended to cover geological, meteorological, and other terrestrial phenomena; to show elevations or depressions in the earth's surface by variations in color, contour lines, and maps in relief; and to exhibit by suitable means the mineralogical character of the earth's crust or its magnetic forces.

Most civilized countries now are quite accurately and more or less completely mapped on a large scale, the first attempt in this direction being made in 1733 by Cesar Cassini, the director of the astronomical observatory at Paris. Assisted at first by the French Academy of Sciences and afterward by a private company, he

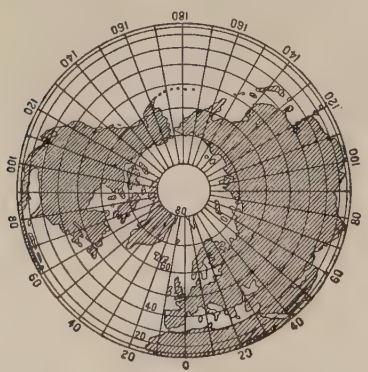


FIG. 2. ORTHOGRAPHIC PROJECTION.

undertook to map the entire area of France. The first sheets appeared in 1744 and the last were completed in 1793. The work aroused widespread interest in all civilized countries and so forcibly illustrated the value of accurate maps that the French government undertook an elaborate survey, an example that has been generally followed in Europe and America. In the United States the map-making establishments are the Geological Survey (q.v.), which is bringing out topographical and geological maps of the whole country, the Coast and Geodetic Survey (q.v.),

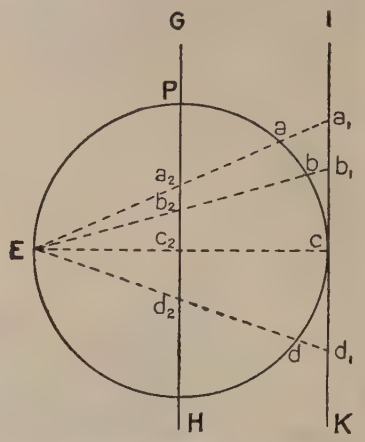


FIG. 3. STEREOGRAPHIC PROJECTION.
On the plane of a meridian and on a tangent plane, showing lines of projection.

which publishes charts of the coast and harbors, and the Hydrographic Office (q.v.) of the Navy, which publishes charts of the Great Lakes and of the oceans, coasts, and harbors of the world beyond the limits of the United States.

The number of types of projection used in the official and private maps of the different countries, as well as the difference in scales, nomenclature, symbols, character of information presented, etc., has caused much trouble to geographers, map makers, engineers, educators, and others throughout the world. Several international conferences have been called to consider the various geographic and constructional questions of general interest. The conference of 1909 took place in London. The United States and the principal European nations were represented. Among other matters decided upon was the con-

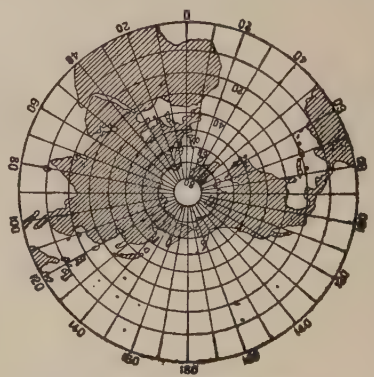
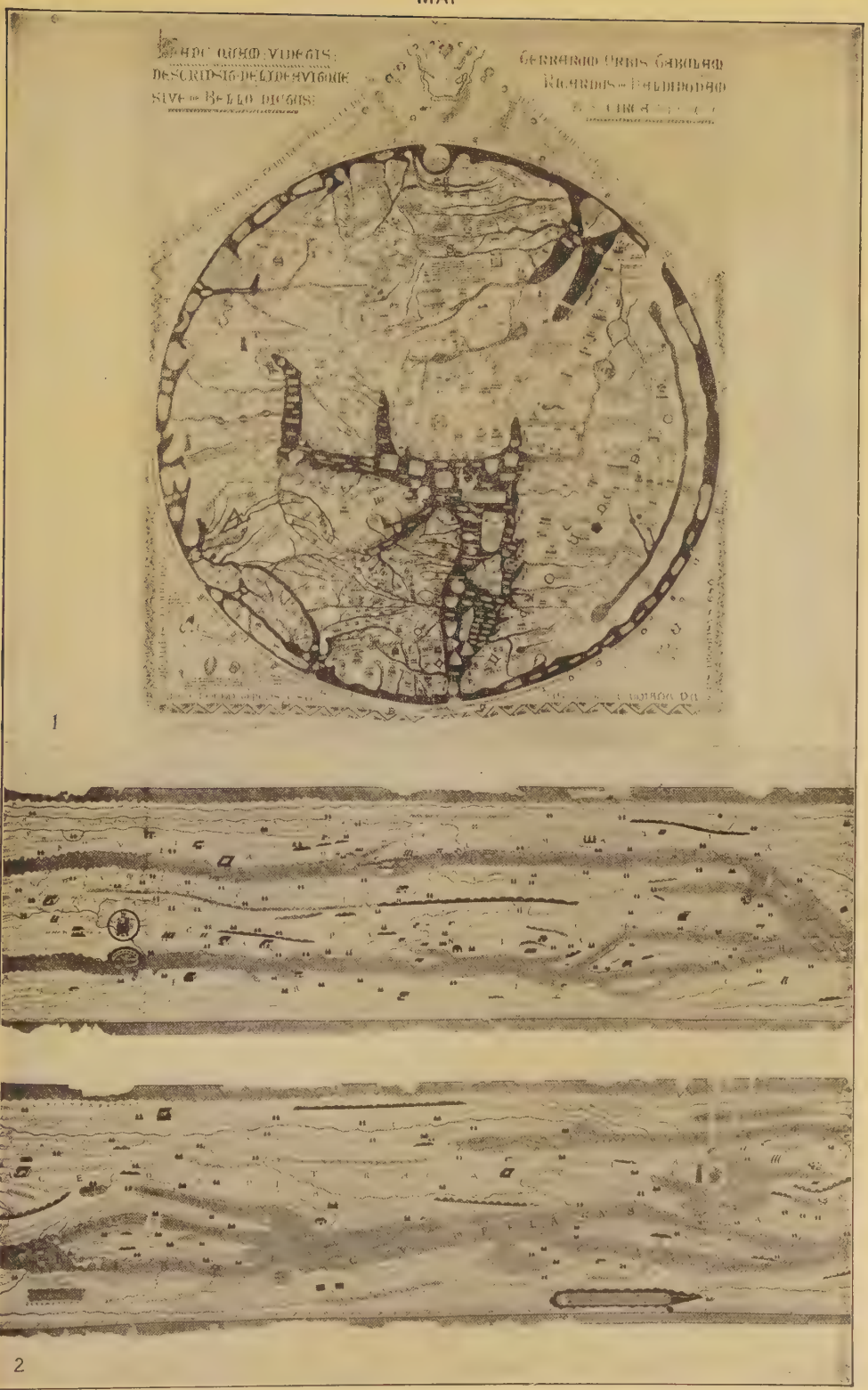


FIG. 4. STEREOGRAPHIC PROJECTION.

struction of an international map of the world on a uniform scale, each nation mapping its own areas.

This map is to be prepared on a modified polyconic projection (hereinafter described) with a scale of 1 in 1,000,000 (about 16 statute miles to the inch) and will be made up of sheets cov-



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2

1. HEREFORD WORLD MAP, 1283. A typical mediæval map on which are shown scriptural allusions as well as geographical myths and fables. It is preserved at Hereford Cathedral, England.

2. PEUTINGER TABLE A Thirteenth Century copy of an old Roman itinerary or road map. The upper section shows Italy, etc., and the lower the Balkan Peninsula, Rome, and Constantinople. This map is in the Royal Library, Vienna.

From photographs by Edward Luther Stevenson, Ph.D.

PORTOLAN CHART BY BARTOLEMEO OLIVES, 1552

From a photograph by Edward Luther Stevenson, Ph. D

ering 6° of longitude and 4° of latitude. The sheet containing New York City (40° to 44° N., 72° to 78° W.) is about 17.5 by 20 inches exclusive of border. By trimming off the border the sheets may be joined to form a large map covering any

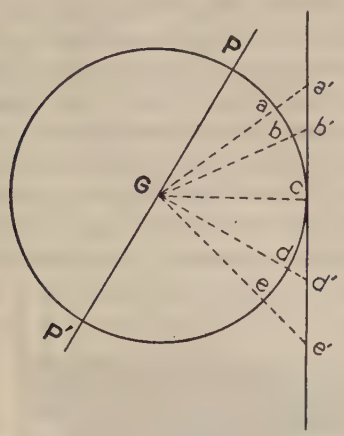


FIG. 5. GNOMONIC OR CENTRAL PROJECTION.
On a plane tangent at lat. 30° N., showing lines of projection.

desired area. The work is in progress in all countries which were represented at the conference and in some others which have since acceded to the plans. It was hoped that the map would be completed about 1920.

Relief maps are frequently made to show the topographical features of a country, district, watershed, canal, river, mountain range, etc. If the scale is small the altitudes are usually exaggerated in order to give a clearer appreciation of details. When the scale is large this is not so necessary. Some relief globes have been made, but they are not common except for instruction of the blind.

Theory of Map Construction. As the earth is a spheroid, it is impossible exactly to represent it, or even a small portion of it, upon a plane surface. In order to represent parts of it upon

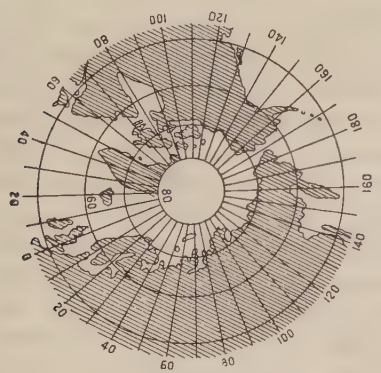


FIG. 6. GNOMONIC PROJECTION.
On plane tangent at the pole.

a plane with as little distortion as practicable, maps are prepared according to various systems of construction called projections. There are three classes of maps: (1) those made by perspective projection upon a plane, (2) those perspectively projected upon a curved surface of single curvature, such as a cone or cylinder, and the resulting projection developed (i.e., rolled out) upon a plane, and (3) arbitrary constructions. All are commonly termed projections, though only the first has any right to the designation (and even that is not a normal projection), while the third has no real claim to the title.

Projections of the first class may be divided into three groups—internal, surface, and external—depending upon the position of the point of sight, which may be inside, on the surface of, or outside the sphere. The only internal projection of importance is the gnomonic, and the only surface projection is the stereographic. The external projections are the orthographic, globular, Clarke's, James's, La Hire's, Parent's, etc. The developed projections are the simple conical and the cylindrical. Mercator's is sometimes placed in this class, but this is incorrect. The arbitrary constructions include Mercator's and a vast number of others designed for various uses.

In the central or gnomonic projection the eye

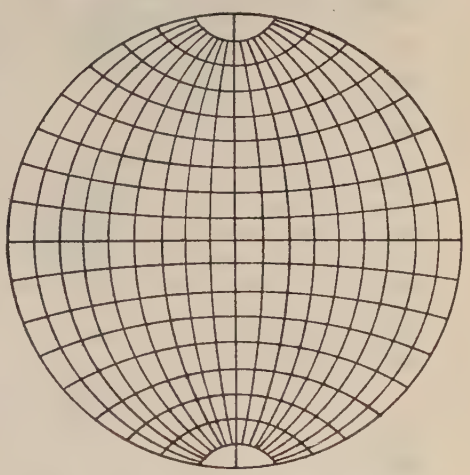


FIG. 7. GLOBULAR PROJECTION.
Showing meridians and parallels of latitude 10° apart.

is supposed to be at the centre of the earth and the plane of projection tangent to the surface—usually at the equator or about 30° north or south latitude. As the planes of all great circles pass through the centre of the sphere, they are projected as straight lines. All lines of sight on the earth and the path of the shortest distance between two points are shown as straight lines. Within 3° from the point of tangency of the projecting plane both distances and angles are quite accurately projected, but beyond 3° the errors increase rapidly. At 60° from that point the distortion is very great. This projection is suitable for surveying sheets and maps of moderate area and for charts of large area designed to give great-circle courses, tracks, and distances. See NAVIGATION.

In the stereographic projection the eye may be placed at any point in the surface of the sphere; the projection is made on any plane perpendicular to the diameter passing through the eye. The usual planes are the one which is tangent to the sphere at the opposite end of the diameter and the plane of the great circle of which the eye is the pole. In a sphere both

angles and shapes are projected in their true form, but in a spheroid this is not so, and the difficulties connected with the computations have prevented extensive employment of this projection in exact mapping of the earth.

The external projections are numerous, as there are certain advantages to be gained by selecting particular distances beyond the surface for the point of sight. The type most commonly used is the orthographic in which the eye is assumed to be at an infinite distance and the projecting lines are parallel and perpendicular to the plane. In Clarke's projection the distance of the point of sight is variable and is adjusted to the area in such a manner as to give the minimum deformation. In Parent's projections the distances from the centre of the sphere are 1.595 and 1.732 times the radius, while in La Hire's the distance is 1.707 times and in James's 1.5 times.

The developed projections are the simple conical and the cylindrical. In the conical the cone is tangent to the earth along some circle of latitude and the projection is perspective with the eye at the centre of the earth or where the normal cuts the minor axis. After receiving the projection the imaginary cone is supposed to be cut along one of its elements and rolled out flat upon the paper. The meridians are evidently straight lines and the parallels concentric circles. Near the circle of tangency the distortion is small, but it rapidly increases beyond a distance of 3° in latitude. In the cylindrical projection the points on the earth's surface are projected upon the cylinder by normals to the common diameter of the sphere and cylinder. The cylinder is supposed to be cut open along an element and rolled out flat on a plane. Cylindrical projections are also made perspectively with the eye at the centre of the sphere. The Mercator is popularly supposed to be developed in this way, but that is not so.

The arbitrarily constructed projections are the ones most commonly used. The different forms are designed to afford certain advantages —equivalent areas, similar shapes, equal angles, equal distances, great-circle routes, simplicity of construction, minimum errors of area, shape, angles, distances, etc., suitability for surveying purposes, for navigation, for representation of large areas, etc. Projections in which very small figures, angles, etc., are represented in the same shape as on the earth are called orthomorphic; those in which equal areas of the sphere are shown as equal (but perhaps slightly deformed) areas in the projection are called equivalent or equal-area projections; equidistant projections are those in which the distances, measured in certain directions, are the same as on the sphere.

The simplest form of the arbitrary projection is the ordinary globular. In a hemisphere on

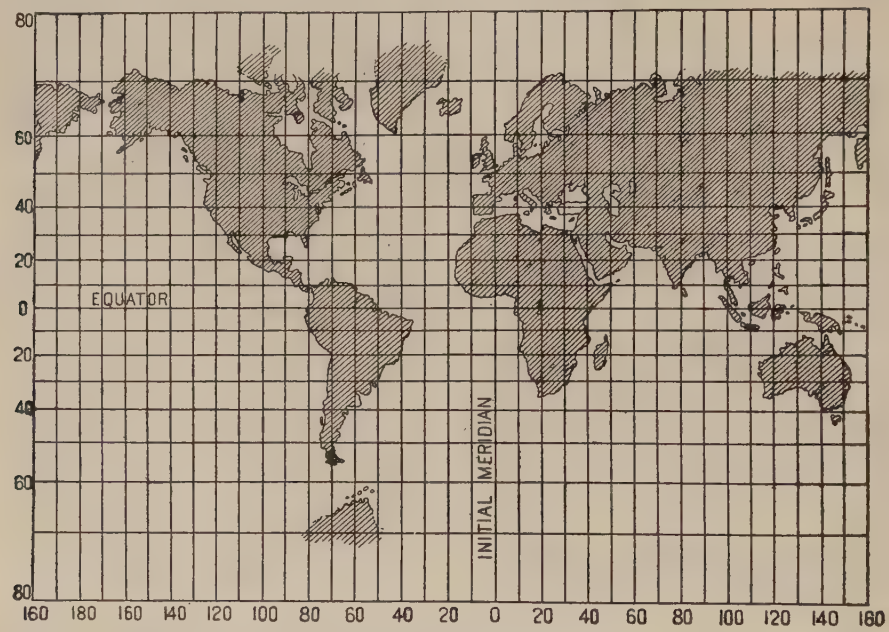


Fig. 8. A MERCATOR'S PROJECTION.

this projection the boundary is a great circle; the equator and central meridian are shown as straight lines. The other meridians are arcs of circles passing through the poles and cutting the equator at equidistant points; and the parallels of latitude are arcs of circles which divide the bounding meridian and the central meridian into the same number of equal parts.

Nearly all the other arbitrary projections of importance make use of an imaginary cone or cones in the construction, or may be regarded as modifications of conical projections. In the true conical projections the meridians are straight lines and the parallels are arcs of circles. In the polyconic the central meridian and equator are straight, other parallels and meridians are curved. In the modified conical either the meridians or the parallels are curved or they are both curved.

The most important of all projections is the Mercator. It may be regarded as constructed upon a cone of definite base (the equatorial great circle) and infinite altitude—in other words, a cylinder. The popular idea of this projection is that it is of the perspective type,

projected upon a cylinder tangent to the earth at the equator, the eye being at the centre of the earth; and that the projection so formed is developed by cutting along a meridian and rolling it out upon a plane surface. Such is not the case. The total extension of the meridian from 0° to 60° of latitude is only about 25 instead of 65 per cent as given by a perspective projection.

In sailing upon a fixed compass course this course necessarily cuts all meridians at a constant angle. The path of a ship so steered is not a straight line but a curve called a *rhumb line*. (See SAILINGS.) The rhumb line joining two points never exactly coincides with the great circle passing through them except when they are both on the equator or both on a meridian. The divergence between the two increases rapidly with the increase of difference of longitude between the points and with the mean latitude. When the points are 180° apart the great circle evidently passes through the nearest pole and it always lies nearer the pole

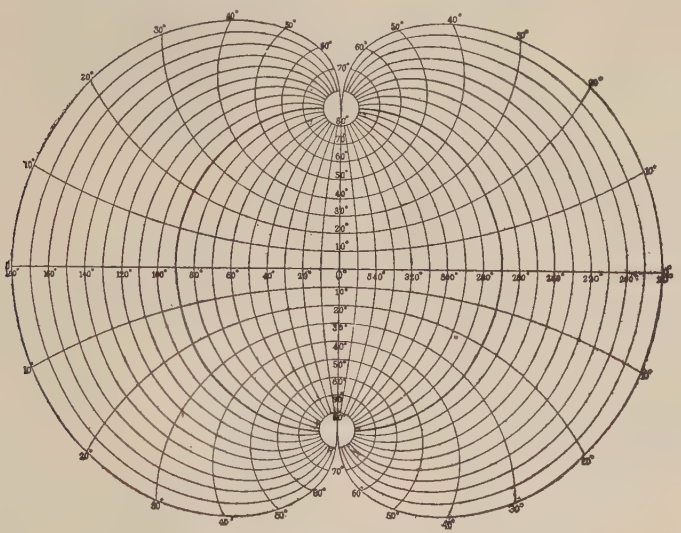


FIG. 9. POLYCONIC PROJECTION.

than the rhumb line. As the rhumb line cuts all meridians at a constant angle, it can only be represented as a straight line on a plane surface when the meridians are represented as straight lines and are parallel to each other; and the angle on the plane can only be equal to that of the sphere or spheroid when the projected latitudes are progressively increased so that the relation between the lengths of a minute of latitude and a minute of longitude at any point of a sphere is the same as that existing between similar lengths on the map.

If x is the distance (on the map) from the equator to any parallel of latitude L; and if R is the equatorial radius of the earth, M the modulus of common logarithms, and e the earth's eccentricity, then $x = \frac{R}{M} \log \tan (45° + \frac{1}{2}L) - R(e^2 \sin L - \frac{1}{3}e^4 \sin^3 L + \frac{1}{5}e^6 \sin^5 L \ldots)$.

For the sphere e becomes zero and the second term disappears. To express x in terms of minutes of equatorial longitude, substitute $R = 3437.74677$ and $\frac{1}{M} = 2.30258$. Tables showing the value of x for every degree and minute of latitude are published by the United States Navy Department. While the Mercator projection is invaluable for navigating charts it is not well adapted for charts of large areas except when the extent of latitude is moderate or when no part of the area is more than 30° from the equator. In charts of the world or of a hemisphere the relative exaggeration of areas beyond 45° of latitude is so great as to give very wrong ideas as to their extent.

The polyconic projection is quite largely used for surveying sheets and by the United States Coast Survey for nautical charts. For purposes of navigation these charts are not nearly so convenient as those on Mercator's projection, because the ship's track is not a straight line and charts of the same scale and latitude do not match at the edges. The polyconic projection is quite accurate as to distances, angles, and areas within 3° of longitude from the central meridian; beyond 60° of latitude its accuracy is fair throughout. The method of construction assumes a series of cones tangent to the sphere at equidistant parallels of latitude. These cones are rolled out both ways from the central meridian, each base forming a circle with the slant height of the cone as a radius. The successive bases form the parallels of latitude. On these the correct longitude is laid off from the central meridian and the points on adjacent parallels joined to form the other meridians.

One of the most useful projections is the orthomorphic conical projection with two standard parallels. This was devised by Lambert, but is commonly attributed to Gauss. It is of the simple conical type in which all the meridians meet at a point beyond the limits of the map. The correct meridional lengths are laid off along the central meridian. The parallels are circular arcs of large radius. Two parallels (at about one-sixth the total length of the chart in latitude from top and bottom) are selected as standards. The correct spheroidal lengths are laid off on these parallels and the meridians drawn through corresponding points. The other parallels are arcs of circles having the same centre, pass through the correct latitude points on the central meridian, and therefore intercept

the correct lengths on all meridians. This projection is well suited to the representation of the whole northern or southern hemisphere on a single sheet, and is very correct as regards areas, angles, shapes, and distances for a range of 40° in latitude and fairly so for a range of

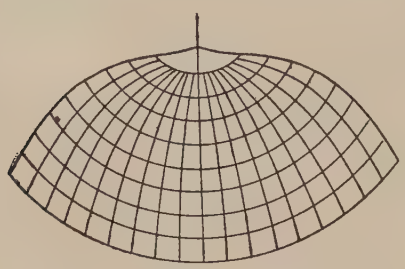


FIG. 10. BONNE'S PROJECTION.
Lat. 90°, long. 180°.

60°. It is particularly well suited for maps of smaller areas.

If for *two* standard parallels we substitute *one*, we get the simple conical projection. This has no particular merits, its range of accuracy being confined to a narrow belt of latitude on each side of the standard parallel.

Bonne's projection is much used in geographies and atlases. It is a modified conical. The central meridian is a straight line on which are laid off the correct spheroidal distances between parallels. The parallels are arcs of concentric circles. One of them is selected as the standard and this is struck with a radius of p cot L, in which p is the length of the normal to a meridian (which is an ellipse) intercepted between the circumference and the minor (polar of the sphere) axis and L is the latitude of the parallel. The other parallels are struck with the same centre and intercept correct intervals of latitude on the central meridian. On each parallel are marked the correct distances between meridians as derived from the spheroid. The

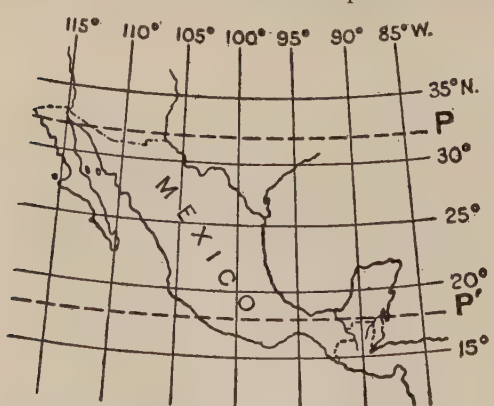


FIG. 11. MEXICO ON A CONICAL PROJECTION.
With rectified meridians and two standard parallels.

corresponding points are connected to form the meridians of the map. Bonne's projection is an improvement of one of Ptolemy's. It is an equal-area projection and is suitable for maps of not more than 120° of longitude and on one side of the equator; beyond 60° from the central meridian the distortion of shapes is considerable.

The sinusoidal or Flamsteed's projection is similar to Bonne's in construction except that the parallels are straight lines perpendicular to the central meridian. It also is an equal-area projection. It is suitable for a map of 180° of latitude and 120° of longitude; indeed it is probably the best of all projections for showing a hemisphere. No projection can show the whole world in a continuous projection without enormous distortion of polar areas.

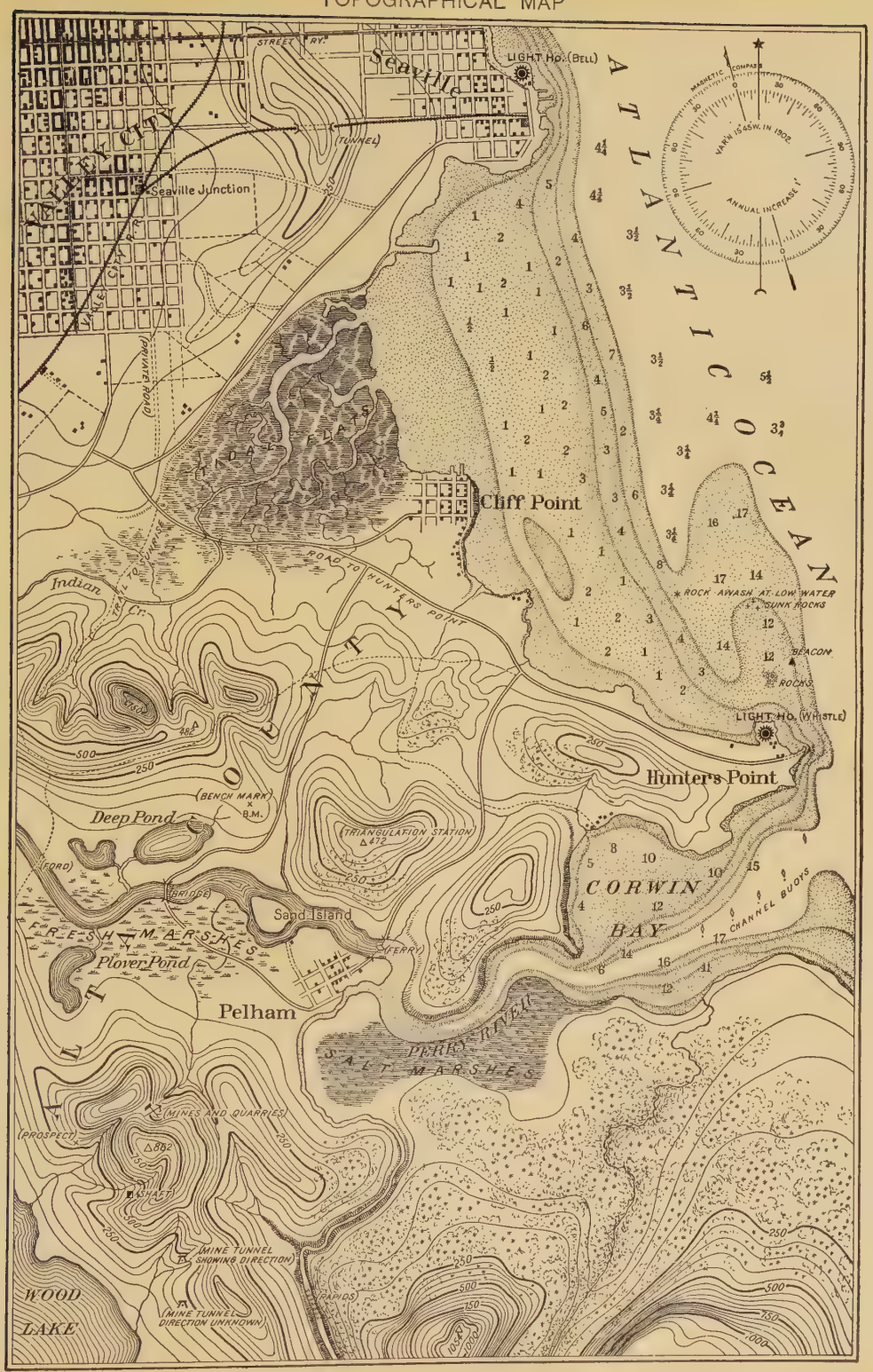
Zenithal projections may be perspective (all perspective projections are zenithal) or arbitrary. A point is selected for the centre of the map. All planes passing through this centre and the centre of the sphere cut straight lines in the projection and great circles in the sphere. The points of the sphere are laid out on the corresponding lines of the projection at distances depending upon the law of the particular projection. If perspectively, with the eye at the centre, we get the gnomonic; if the eye is in the opposite surface, the stereographic. Aside from these and other zenithal projections already described or mentioned, only two are very useful. One is the *equidistant zenithal* and the other the *equal-area zenithal*. In the equidistant zenithal the true lengths of the spheroidal arcs are laid off on the corresponding lines of the projection; in the other the lengths are so proportioned as to give equal areas. A third projection is Airy's, in which the errors of distance, shape, and direction are balanced so as to make them as small as possible in each direction without increasing them unduly in others. Zenithal projections are adapted to the representation of fairly large areas in any part of the world, but are chiefly (except as regards the gnomonic) employed in polar charts.

The projection selected for the International Map of the World is a modified polyconic. Each sheet is plotted independently on its central meridian, which is a straight line marked off in degrees in a manner hereinafter explained. Through the points so marked circles are drawn to represent the parallels. The centres of the circles are on the prolongation of the central meridian, and the radius of each circle is N cot L, in which N is the length of the normal intercepted between the curve and the minor (polar) axis of the meridional ellipse and L is the latitude of the parallel represented. Along the limiting parallels of each sheet (i.e., the circles at the top and bottom) the degrees of longitude are laid off in their true length to scale. Corresponding longitude points on the limiting parallels are joined by straight lines which represent the meridians. The meridians which are true to scale are those which are 2° to the east and west of the central meridian. The actual lengths on the central meridian are true to scale minus the small correction necessary to effect the adjustment, and this is given in a special table.

Practical Construction. The surveys (see SURVEYING; HYDROGRAPHY) having been completed, the results are transferred to the base map on a suitable projection; errors and discrepancies are eliminated or reconciled, and if certain localities need additional examination this is made. From the base maps and the original data drawings for the final map are prepared on the predetermined scale. In some cases it is practicable to obtain the suitable working plans by photo reduction from the base maps.

To facilitate projection of points, areas, me-

TOPOGRAPHICAL MAP



Scale: 1 ½ 0 1 2 3 Miles.

1 ½ 0 1 2 3 4 Kilometers.

RELIEF: Figures indicate heights in feet above datum.

Contour interval 50 feet. *Datum is mean sea level.*

HYDROGRAPHY: Figures over dotted areas show depths in feet, others in fathoms.

ridians, parallels, etc., tables have been prepared for all the principal projections, and these obviate the necessity for computation. After the working drawing is completed the maps or charts are prepared for reproduction by engraving them on plates, etching them on plates, or by photolithography. The engraved plates (copper or soft steel) give the best results, but are more costly; the etched plates are prepared by photographing on copper plates and etching with acid. The photolithographed charts are by far the cheapest, but are necessarily printed on inferior paper and will not stand much use.

The map shown upon the accompanying plate has been designed to illustrate the methods of delineation employed by the Coast and Geodetic Survey, the Geological Survey, and the Hydrographic Office of the Navy. The Geological Survey maps give certain additional data, as do some of the charts published by the Hydrographic Office.

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MAP, or MAPES, WALTER. A mediæval author, of Welsh descent, born probably in Herefordshire, England, about 1140. He studied in Paris from about 1154; was connected with the household of Henry II, whom he attended abroad; was sent on missions to Paris (1173) and Rome (1179); and was precentor of Lincoln, incumbent of Westbury, Gloucestershire, prebend of St. Paul's, and Archdeacon of Oxford (1197). He died about 1209. Map's one undoubted work is *De Nugis Curialium* (The Triflings of Courtiers), a curious and interesting medley of anecdotes, reminiscences, and stories, to which we owe most of our knowledge of Map's life. In several of the manuscripts of the prose *Lancelot*, *Grail*, and *Morte d'Arthur* his name occurs as the author. But recent scholarship places them at a later date. With some doubt the Golias poems are ascribed to him, satires in Latin on the clergy. Map was especially a foe of Jews and Cistercians. In this collection occurs the famous drinking song "Mihi est propositum in taberna mori," which was rendered into English by Leigh Hunt. Consult the *Latin Poems Attributed to Map* and *De Nugis Curialium*, edited by Wright, Camden Society (London, 1841, 1850), and Bardoux, *De Waltherio Mappio* (Paris, 1900).

MA'PLE (AS. *mapol, mapul, mœpel*, Icel. *mopurr*, OHG. *mazzaltra, mazzoltra*, Ger. *Masholder*, maple), *Acer*. A genus of trees of the family Aceraceæ, containing nearly 100 species, natives of north-temperate regions, especially abundant in North America and eastern Asia. They have opposite, lobed, or palmate leaves without stipules; flowers in small axillary racemes or corymbs, rich in nectar, and attractive to bees; fruits, two small winged nuts, one or two seeded. With a few exceptions the entire order is embraced in the genus *Acer*. The best-known European species are *Acer campestre* and

MAPLE LEAVES.

1, European maple (*Acer campestre*); 2, striped maple (*Acer pennsylvanicum*); 3, sugar maple (*Acer saccharum*); 4, cut-leaved form of Japanese maple (*Acer japonicum*, var. *dissectum*).

Acer pseudo-platanus. The common maple (*Acer campestre*), a shrub or small tree seldom attaining a height of 50 feet, is a native of many parts of Europe and Asia. Its wood is hard, fine-grained, takes a high polish, and is much used by turners and for carved work. The greater maple, sycamore, or plane tree of Europe (*Acer pseudo-platanus*) is extensively planted both in Europe and in America. It is a large tree with a spreading head, 70 to 90 feet tall, of rather

quick, vigorous growth. Its wood, which is white, compact, moderately hard, receives a fine polish and is much used by wheelwrights, turners, etc. Sugar is sometimes made from the sap.

The Norway maple (*Acer platanoides*), a native of Europe, is commonly planted in the eastern United States and elsewhere as a shade tree. It grows to a height of 100 feet and has a compact, round head that renders the shade very dense. It is by some preferred as a shade tree to the sugar maple, which it resembles.

RED MAPLE.
a, staminate flowers; *b*, pistillate flowers.

Among the American species perhaps the best known is the sugar maple (*Acer saccharum*), a large tree, 90 to 120 feet high, and found from Newfoundland to Georgia and westward to the northern shores of the Great Lakes, eastern Nebraska, and Kansas. The wood has a satiny appearance and is extensively used in cabinetwork and finishing houses. When the grain has a pronounced wavy appearance the wood is called bird's-eye maple and is used as veneer. From the sap of this tree large quantities of sirup and sugar are made. To obtain the sap, holes are bored into the tree for half an inch or more in the late winter or early spring. The sap, caught in vessels, is evaporated until the residue becomes sirupy or until a yellowish or brown sugar is obtained. Trees will yield from two to six pounds of sugar during a season, and if the tapping, as it is called, is properly done, the tree suffers little injury. The black maple (*Acer nigrum*), now regarded as a variety of *Acer saccharum*, is also an abundant producer of sugar. The tree is of similar habit and range to the former, and is distinguished from it by its black bark and generally duller appearance. The silver maple (*Acer saccharinum*, formerly known as *Acer dasycarpum*) is a large, rapidly growing tree of the same range as the last. It is an ornamental tree, with light, brittle wood, and is extensively planted as a shade tree, but, aside from its rapid growth, is not equal in this respect to the sugar maple. The tree is very

RED MAPLE (*Acer rubrum*).
Spray with fruits.

hardy and easily grown, but on account of its brittleness is especially liable to damage by winds and storms breaking its limbs. This species was named *Acer saccharinum* by Linnæus under the impression that it was the true sugar maple, a tree which it is now believed he never saw. Sugar is made from it, but the sap is less sweet than that of either of the two species most commonly tapped. The striped maple (*Acer pennsylvanicum*) is a small tree with greenish bark striped with white lines. Its compact habit of growth and large leaves make it an excellent shade tree. The red maple (*Acer rubrum*) has about the same range as the sugar maple. It somewhat resembles the silver maple in habit, but is of slower growth. Its timber is valuable, and the spring coloring of the flowers and fruits and the autumn coloring of the leaves make it a very ornamental tree. The mountain maple (*Acer spicatum*), a small tree in the eastern United States, the large-toothed or Oregon maple (*Acer grandidentata*), and the vine maple (*Acer circinnatum*) of the Rocky Mountains and Pacific coast are other common and well-known species possessing the habits and uses described above. All of the species are valuable for fuel, in this respect exceeding all other woods except hickory in popular estimation. Of many of the species there are numerous cultivated varieties differing in their habit of growth, color and character of foliage, etc. The autumn coloring of the maples, especially in the United States, is not surpassed by any other group of trees, the reds and yellows of their leaves adding greatly to the beauty of the autumn landscape.

Among the species of eastern Asia are a number that have been introduced into western countries, and some have proved valuable for planting, such as the famous Japanese maples, most of which are varieties of *Acer palmatum* and *Acer japonicum*. They are mostly small trees or shrubs, and on account of their great variety in color and the deep and often curious lobing of their leaves, they are extensively planted as ornamentals.

One section of the genus *Acer*, sometimes called ash-leaved maples, have compound leaves. There are representatives of this group in Japan and in the United States, the best known of which is *Acer negundo* (*Negundo aceroides*), the box elder (q.v.), coming to be a very common shade tree along streets.

MAPLE, Flowering. See Abutilon.

MAPLE, Sir John Blundell, Baronet (1845–1903). An English capitalist. He was educated at Crawford College and at King's College School. In 1862 he entered his father's furniture business, of which he was practically the head after 1880. The firm developed rapidly, and in 1891 it was changed into a limited liability company with £2,000,000 capital. Maple was a Conservative member of Parliament for Dulwich from 1887 until his death; was knighted in 1892; and was created Baronet in 1897. The owner of a large stud of blooded race horses, he won 544 races in 21 years with his entries, many of which were made under the name of "Mr. Childwick." He rebuilt University College Hospital, London, and left a fortune of £2,153,000.

MAPLE INSECTS. The different species of maple are greatly subject to the attacks of injurious insects, certain species, such as the silver-leaved maple, being more susceptible than others. Several insects bore in the trunks of these trees. The sugar-maple borer (*Glycobius speciosus*), a black, long-horned beetle which has yellow bands, destroys the sugar maple in the northern parts of the United States; the horntail borer (see Horntail) and the larva of a clear-winged moth (*Ægeria acerni*) also bore

SUGAR MAPLE (Acer saccharinum).

1. Tree In Bloom.

2. Tree In Full Leaf.

the trunks, the latter being especially abundant in the Mississippi valley. A buprestid beetle, *Dicerca divaricata*, in the larval stage bores in red-maple stumps, although undoubtedly originally an enemy of the beech. The principal bark borer of the sugar maple in the northern United States is *Corthylus punctatissimus*, one of the Scolytidæ. The striped maple worm (larva of *Anisota rubicunda*) is a widespread enemy of these trees, frequently feeding upon the leaves in such great numbers as entirely to defoliate long rows of shade trees. The tent caterpillar of the forest (*Malacosoma disstria*) is a decided enemy of all species of maples and has greatly damaged the sugar maples in New York and New England. The tussock moth's caterpillar (*Orgyia leucostigma*) and the fall webworm (*Hyphantria cunea*) frequently defoliate the shade trees of the larger cities. The cottony maple scale (*Pulvinaria innumerabilis*) is occasionally so numerous as to cause serious injury, and another scale insect (*Pseudococcus aceris*), probably introduced from Europe, is very abundant on the shade trees of certain cities. The so-called gloomy scale (*Aspidiotus tenebricosus*) has a southern range, and is frequently the unnoticed cause of the death of otherwise vigorous shade trees. Several species of plant lice, notably *Pemphigus acerifolii*, damage the leaves of early summer, and a gall mite (*Phytoptus quadripes*) disfigures the leaves with its massed reddish galls. Consult A. S. Packard, *Fifth Report of the United States Entomological Commission* (Washington, 1890), and publications of the United States Bureau of Entomology, especially the *Circulars* (ib., 1900 et seq.).

MAPLESON, mā'p'l-son, James Henry (1829–1901). An English operatic impresario, born in London. He studied the violin for two years at the Royal Academy of Music and then went to Italy for singing lessons; but soon after his return a throat affection made a vocal career out of the question, and he was engaged in the orchestra at Her Majesty's Theatre. After having made tours with several leading artists, in 1861 he succeeded E. T. Smith as manager of the Italian opera at the Lyceum in London. He controlled Her Majesty's Theatre (1862–69), and then went to Drury Lane until 1877, when he returned to Her Majesty's, and the following year he brought Italian opera to the United States. He was successor to Strakosch at the Academy of Music in New York City and introduced many of the greatest singers of his time to New York audiences. In 1888 he published his reminiscences in two volumes under the title *The Mapleson Memoirs* (Chicago).

MA'PLE SUGAR. See Sugar.

MAPLEWOOD. A city in St. Louis Co., Mo., adjoining the city of St. Louis on the west, and served by the Missouri Pacific Railroad. It is essentially a residential suburb of St. Louis. Pop., 1910, 4976.

MAPS AND MAPPING. See Geodesy; Map.

MAP TURTLE. One of the names of a common North American land turtle (*Malaco-clemmys geographicus*), also called geographic tortoise.

MAPU, mä'pōō, Abraham (1808–67). A Russian Hebrew novelist. He was born in a suburb of Kovno and achieved a reputation as a Talmudist by the time he was 12. A Latin psalter falling into his hands, he set about studying Latin with intense interest, and under the guidance of a friendly Polish curate made rapid progress. This opened the way for the study of the Latin classics, which left an indelible impression on Mapu's poetic nature. A knowledge of French, which he acquired next, introduced him to the French romanticists, with whose works—and especially the novels of Eugène Sue—he became infatuated. In 1848, having secured an appointment as teacher in a Jewish government school in Kovno, he came in touch with Senior Sachs, who inspired him with new enthusiasm for Hebrew literature and urged him to devote himself to it. The result of this advice and encouragement was the completion of a novel, *Ahabat Zéyon* (The Love of Zion) (1852), conceived some 20 years before. As this historical romance was the first of its kind in Hebrew literature, its importance cannot be overestimated. It recalls in glowing colors the golden age of ancient Judæa. In spite of its puerile technique and crude psychology this work had an immense success. While strictly orthodox rabbis condemned *The Love of Zion* as a profanation of the holy language, their students everywhere were entranced by its poetry and sentiment. Mapu's next work, *The Transgression of Samaria* (1865), is another historical romance dealing with the same period as the first and written in noble biblical style. Both have been translated, under various titles, into German, English, and Yiddish. A third historical romance was all but destroyed by the Russian censorship. Mapu's last and longest novel, *The Hypocrite* (1859–69), fell far short artistically of the earlier ones. Besides these, Mapu wrote also an excellent manual of Hebrew (containing suggestions for teaching it), a Hebrew grammar, and a Hebrew textbook for the study of French.

MAPURITO, mä'pōō-rē'tō. See Conepate; Skunk.

MAQUET, mȧ'kȧ', Auguste (1813–88). A French author, born in Paris. He was educated at the Collège Charlemagne, where he was for a time teacher. Having written the drama *Bathilde*, he was introduced to Alexandre Dumas, who, impressed by his talent, proposed their working together. It has generally been admitted that in this capacity of collaborator he furnished large portions of Dumas's most famous books and plays. Under his own name he published the romances *Beau d'Angennes* (1843), *La belle Gabrielle* (1853–55), and many others. For the theatre he prepared *Le château de Grantier* (1852), *Le comte de Lavernie* (1855), *La belle Gabrielle* (1857), and a number of others.

MAQUI, mä'kwē (Sp. *maqui*, from the Chilean name), *Aristotelia macqui*. One of a few species of a genus of plants sometimes referred to the family Elæocarpaceæ, a Chilean evergreen or subevergreen shrub of considerable size. The small green or yellow flowers, borne in axillary racemes, are followed by three-celled edible black acid berries about the size of peas, which are used by the Chileans to make wine. The wood is used for making musical instruments, and the tough bark for instrument strings. The maqui is frequently cultivated as an ornamental shrub, and in favorable conditions sometimes bears fruit in northern countries.

MAQUI. A peculiar type of xerophytic thicket characteristic of the Mediterranean region of Europe. The plants are chiefly evergreen shrubs and half shrubs and comprise a

large number of well-known plants, such as the myrtle, box, laurel, and oleander. It is similar in appearance to the *chaparral* found in the southeastern United States, which is composed of dwarf evergreen oaks together with various shrubs of the buckthorn and rose families. See THICKET; CHAPARRAL.

MAQUOKETA, mȧ-kō'kĕ-tȧ. A city and the county seat of Jackson Co., Iowa, 38 miles by rail northwest of Clinton, on the Maquoketa River and on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: Iowa, G 2). It has a Boardman reference and a Carnegie library, a sanitarium, and Ellisonian Institute. Maquoketa is a trade and industrial centre of considerable importance, its manufactures including lime, flour, foundry and machine-shop products, brick, lumber, cigars, butter tubs, etc. In the vicinity are valuable quarries of limestone. The water works are owned and operated by the municipality. Pop., 1900, 3777; 1910, 3570.

MAR, EARL OF. See ERSKINE, JOHN (1675–1732).

MARA, mä'rȧ, GERTRUDE ELIZABETH SCHMELING (1749–1833). A German singer, born at Cassel. She began to play the violin at such an early age that her father, a poor musician, gave her a few lessons and then exhibited her as a prodigy in Vienna and London. In the latter city she took a few singing lessons from Paradisi and was so successful that thereafter she devoted herself entirely to vocalization. Her first engagement was at Leipzig; she then sang at the Dresden Court Opera, and in 1771 accepted an engagement for life at the Berlin Court Opera. In Berlin she married the violoncellist Mara, who squandered her fortune. In 1780, owing to a series of annoyances, she broke her contract and went to Vienna, and from there, in 1782, to Paris, where her great rivalry with Todi (q.v.) became an historic event, and the French public was divided into "Maradists" and "Todists." With the exception of two visits to Italy, she spent the period from 1784 to 1802 in England. Upon leaving London she went to Paris and then, after an extensive tour, to Russia, where she lost her property at the time of the French invasion. Her voice had now failed her, and she became a singing teacher at Reval, where she died in great poverty. Consult Arnold Niggli, *Gertrud Elisabeth Mara* (Leipzig, 1881).

MARABOU (măr'ȧ-bo͞o') **STORK** (Fr. *marabout*, Sp. *marabú*, from Ar. *murābit*, hermit, from *rabaṭa*, to bind). The African name of a stork allied to the adjutant (q.v.) or argala of India. Both species belong to the genus *Leptoptilus*, which is remarkable for having the feathers of the anal region lengthened so as to conceal the true tail feathers, and these elongated feathers are the so-called marabou feathers which were formerly much used for trimming ladies' hats and dresses. The African species is *Leptoptilus crumeniferus*. It is white with the back and wings greenish slate color. The sausage-like pouch which hangs from its neck is capable of being inflated, giving the bird a strange appearance. It is gregarious in its wild state, frequenting the mouths of rivers and living upon animals too large for other storks to swallow. It is easily domesticated, but its exceeding voracity impels it on every occasion to purloin poultry, cats, and puppies, swallowing them whole.

MARABOUTS, măr'ȧ-bo͞ots'. The French form of the name of a Mohammedan sect, from which sprang the Almoravides (q.v.), who founded a dynasty in northwest Africa and in Spain during the eleventh century. In Arabic the term *al Murabituna* (the hermits) is derived from *ribat*, which designates a hermit hut and a fortified place, but came to be a name of not only the hermits themselves, but also of those who joined them in establishing the new dynasty. The descendants of the original ascetic missionaries form to-day a sort of order among the Berbers, leading a sanctified and contemplative life, though the appellation Marabout is generally given them only after their death. They are the western counterpart of the eastern *Mujāhid*, who, suppressing the passions, seeks union (*Ittihād*) with Allah, and of the saints (*wālis*) of the Sufis. They are often attached to mosques, chapels, or places of pilgrimage, explaining the Koran and providing the faithful with amulets. As their influence is very great, their orders are implicitly obeyed. There are various divisions among them; the higher Marabouts living in a sort of monastery (*Zāwiyah*) composed of a mosque, a domed building (*kubbah*), in which are the tomb of some saint, schools for children and for the teaching of the Koran and the sciences, as well as living rooms for scholars and travelers. The tomb of the saint is sometimes itself called a Marabout, and is an object of pilgrimage for the pious Mohammedans. Consult Rinn, *Marabouts et Khouans* (Algiers, 1884).

MARACAIBO, mä'rȧ-kī'bō. The capital of the State of Zulia, Venezuela, situated on a sandy plain on the west shore of the strait which connects Lake Maracaibo with the Gulf of Venezuela (Map: Colombia, C 1). It is a handsome town, with a hot but healthful climate, and has several fine buildings, notably the government palace, the city hall, and the school of arts. It has also a nautical school, several libraries, and a hospital well located on an island opposite the city. Its streets are lighted by electricity and traversed by a tramway system. It has manufactures of candles, soap, hats, boots, and lumber. Its importance, however, is due to its harbor, which has the finest dockyards in the Republic and is deep enough to admit the largest vessels; the entrance is, however, made difficult by a shifting bar. It is the only port of entry for western Venezuela and a part of eastern Colombia, with which regions it carries on an active trade. In 1912 it held first rank among the ports of the Republic in exports and second rank in imports, the former amounting to $2,293,802 and the latter $1,217,822. The chief articles of export are coffee, cocoa, quinine, dyewoods, sugar, and hides. Steamship lines run to the United States, and a United States consulate is established here. Pop. (est.), 55,000. Maracaibo was founded in 1571 by Alonso Pacheco.

MARACAIBO, GULF OF. See VENEZUELA, GULF OF.

MARACAIBO, LAKE. A large sheet of water in the northwestern part of Venezuela, connected with the Gulf of Venezuela (or of Maracaibo) by a strait nearly 9 miles wide (Map: Colombia, C 2). It is of nearly rectangular shape, with a length from north to south of 100 miles and a width of 50 to 60 miles. Its extreme depth in the northern part is 500 feet, but it shoals rapidly towards the south, where the shores are low and marshy and the water

shallow. The entrance is obstructed by a bar with only 7 to 14 feet of water, so that large vessels cannot enter. Owing to the narrow entrance and to the great number of rivers which discharge into it, the water of the lake is fresh and the tides are scarcely felt, so that, though its form is that of a marine inlet, it is to be considered as an inland lake. It occupies part of a much larger lake basin surrounded by lofty mountains. This basin has been partly filled up by alluvium, leaving a number of smaller lakes connecting by creeks with the main lake.

MARAGHA, mä'rȧ-gä'. An old town in the west of Persia, in the Province of Azerbaijan, on the Safi River, 80 miles south of Tabriz (Map: Asia, Central, B 4). It consists mostly of mud houses inclosed by a high, dilapidated wall. The town is celebrated as the site of an observatory which Hulaku Khan built for the astronomer Nasir ed Din. It is surrounded by vineyards and orchards, the produce of which is exported to Russia. Famous marble pits produce a nearly transparent marble. Pop., about 16,000.

MARAIS, mȧ'rȧ', LE. 1. A name given during the French Revolution to the centre party of the Legislative Assembly and of the Convention, usually called the Plain. 2. A quarter of Paris, built on marshy ground, east of the Rue Saint-Denis and including the Place des Vosges, formerly, as the Place Royale, the centre of aristocratic Paris. It contains fine buildings from the time of Henry IV and Louis XIII. 3. Vast plains in the west of France, reclaimed from the sea, consisting of two distinct divisions, the Breton or western and the Poitevin or southern.

MARAJÓ, mä'rȧ-zhō', or JOANNES. A large island formed by the estuaries of the Amazon and the Pará and the network of river arms connecting them (Map: Brazil, H 4). It is 165 miles long from east to west and 120 miles wide. Its surface is very low and flat; the northern part consists of immense swamps, while the western part is covered with forests, consisting largely of rubber trees. There are several large lakes in the interior, and in the wet season the greater part of the island is flooded. In the dry season it affords excellent grazing. The population is scanty, consisting largely of hunters and rubber gatherers visiting the island during the dry season. The principal settlement is Sauré, on the east coast.

MARAL, mȧ'räl'. A large species of deer (*Cervus maral*) of the Caspian provinces of Persia, which is closely related to the European red deer in structure and habits, but is probably distinct from that species. Its antlers always terminate in more than two tines. Consult Lydeker, *Deer of All Lands* (London, 1898).

MÁRAMAROS-SZIGET. A town of Hungary. See MÁRMAROS-SZIGET.

MAR'ANATH'A. An expression found in the New Testament near the close of Paul's First Epistle to the Corinthians (xvi. 22: "If any man love not the Lord Jesus Christ, let him be Anathema Maran-atha"; R. V., "anathema. Maran atha"). The term, not being Greek, but Aramaic, has occasioned much discussion. Interpreters ignorant of Aramaic, or in localities where there was no old tradition as to its meaning, considered it a threat of some sort. But ancient Eastern tradition and modern scholarship explain it as made up of two Aramaic words, *māranā* (Our Lord) and *thā* (come). It is therefore to be understood as a fervent prayer or exclamation, "Our Lord, come!" A parallel is found in Rev. xxii. 20: "Even so, come, Lord Jesus." Maranatha is also found in the *Didache* (see TEACHING OF THE TWELVE APOSTLES) apparently with the same sense, at the end of a thanksgiving prayer in connection with the Eucharist. The expression doubtless came into vogue very early in Palestinian circles in connection with the expectation of the speedy return of Jesus, and probably as a part of the celebration of the agapæ or love feasts. Consult: Schmidt, in the *Journal of Biblical Literature*, vol. xiii (Boston, 1894); Gustaf Dalman, *Grammatik des jüdisch-palästinischen Aramäisch*, p. 152 (Leipzig, 1894); James Hastings (ed.), *Dictionary of the Bible* (New York, 1909).

MARANHA, mȧ-rä'nyȧ, **MIRANHA**, or **MARIANA.** A fierce cannibal tribe of Arawakan stock (q.v.), ranging from the Jutahy River on the south, across the Amazon and Putumayo, to the Yapurá on the north, in western Brazil and the adjacent parts of Colombia and Peru. They wear wooden labrets and ear pendants, with nose pendants of shell, but do not tattoo. The boring of a child's lips is celebrated by a feast. When a boy is 12 years old four gashes are cut near his mouth by his father, and he must then fast five days. At a later period the boys whip themselves as a test of manhood. In fighting expeditions each man carries a small bag of salt as an antidote against poisoned arrows. The Mirahan dialect is believed by Rivet to be a much modified and differentiated form of the Tupi-Guarani. Consult A. Mochi in *Archives pour l'anthropologie*, vols. xxxii, xxxiii (Paris, 1902–03), and *Journal de la Société des Américanistes de Paris*, vol. viii (N. S., ib., 1911).

MARANHÃO, mä'rȧ-nyoun', or **MARANHAM.** A northern state of Brazil, bounded by the Atlantic Ocean on the northeast, the State of Piauhy on the southeast, Goyaz on the southwest, and Pará on the northwest (Map: Brazil, H 4). Its area is 150,795 square miles. The surface is only slightly elevated and traversed by a number of rivers. The coast land is generally low and subject to inundations. The climate is hot, the average for the year being 80° F., with very little variation. The boundaries with the states of Piauhy and Pará and most of that of Goyaz are formed respectively by the Parnahyba, Gurupy, and Tocantins rivers. The important rivers of the interior are the Itapicurú, Mearim, Grajahú, and Pundaré. The soil is very fertile and the whole state is well wooded. The chief products are cotton, sugar, tobacco, corn, rice, and cacao. The conditions of the state make it adaptable for stock raising, which is carried on extensively. Agricultural development is greatly handicapped by the scarcity of population, and efforts are being made to establish agricultural colonies for the natives as well as to attract foreign settlers by liberal grants of land. The chief exports are sugar, cotton, rice, rubber, tobacco, cattle, hides, and skins. Pop., 1900, 459,508; 1912 (est.), 520,000. The inhabitants are chiefly whites of Portuguese descent, but there are also a considerable number of negroes and mulattoes and about 20,000 Indians. The capital is Maranhão (q.v.).

MARANHÃO, or SÃO LUIZ DE MARANHÃO.

The capital of the State of Maranhão, Brazil, situated on an island lying between the bays of São Marcos and São José, 280 miles southeast of Pará (Map: Brazil, J 4). The climate is very warm, but is not unhealthful. The town is well built and clean and has handsome public buildings, a theatre, a hospital, a cathedral, and a fine bishop's palace. It has training, music, and normal schools, the latter being considered the best in Brazil. The originally good harbor has suffered from silting, but extensive port works were begun in 1908 to improve this condition. The city carries on considerable commerce. In 1913 the imports amounted to $258,677 and the exports $305,189. It is the seat of a United States consular agent. Pop. (est.), 1912, 45,000. The town was founded by the French in 1612. The birthplace of many statesmen and writers, it is renowned for the cultivation of science and letters and is called the Brazilian Athens.

MARANO DI NAPOLI, mȧ-rä′nō dē nä′-pō-lē. A town in the Province of Naples, Italy, situated about 5 miles northwest of Naples. It lies in a fertile region and produces wine, grain, and fruit. Pop. (commune), 1901, 10,317; 1911, 11,934.

MARAÑON, mä′rȧ-nyōn′. A name sometimes applied to the upper course of the Amazon (q.v.).

MARASCHINO, mä′rȧ-skē′nō (It., from *marasca,* a sort of cherry, from Lat. *amarus,* bitter). A liqueur distilled from the fermented juice of the marasca cherry and flavored with its pits. The marasca cherry is a small black fruit, so named from its bitterness. Maraschino is chiefly made in Zara, Dalmatia. See Liqueur.

MARASH, mȧ-räsh′. The capital of the sanjak of the same name in the Vilayet of Aleppo, Asiatic Turkey, situated at the foot of Mount Taurus, about 90 miles north-northeast of its port, Alexandretta (Map: Turkey in Asia, C 3). It is a well-built city with fine bazars and a considerable trade in Kurd carpets and embroideries. Besides mosques and Mohammedan schools there are a number of Christian churches, a college and schools attached to the American mission, and a Jesuit establishment. In the vicinity of the town are found traces of Roman fortifications and tombs with Greek inscriptions. Many Hittite monuments have also been discovered near Marash. The population is estimated at from 40,000 to 52,000, including many Armenians.

MARAS′MUS (Neo-Lat., from Gk. μαρασμός, *marasmos,* decay, from μαραίνειν, *marainein,* to weaken; ultimately connected with Skt. *mar,* to grind, *mlā,* weaken, OIr. *meirb,* AS. *mearu,* OHG. *murwi, murwi,* Ger. *mürbe,* soft). A term somewhat vaguely used by the older medical writers to designate those cases of general emaciation or atrophy for which they did not see any special cause. The word still has a definite connotation as applied to infantile atrophy and is employed to describe a form of wasting due to nutritional disorder combined with bad hygienic surroundings and not dependent upon constitutional diseases such as tuberculosis and syphilis, although these may be an underlying factor in some cases. Marasmus occurs in bottle-fed babies, chiefly among the poor in large cities and in institutions. The symptoms are similar to those of slow starvation; the child, as a result of improper feeding, soon becomes unable to assimilate the food that is given it. The temperature is subnormal, the eyes large and sunken, the skin hangs in loose folds, the limbs are wasted, and the face has an indescribable look of age. The outlook for children under six months old is unfavorable, but timely and appropriate treatment restores some babies to health. This consists in careful feeding, by a wet nurse when practicable, bathing, massage, and fresh air. (See Infants, Feeding of.) The term is also used occasionally as a synonym for *tabes mesenterica,* or tubercular disease of the mesenteric glands. See Tuberculosis.

MARAT, mȧ′rȧ′, Jean Paul (1744–93). One of the radical leaders of the French Revolution, born May 24, 1744, at Boudry, near Neufchâtel, Switzerland. In youth he made himself master of several languages; subsequently he studied medicine at Bordeaux and at Paris, and, after traveling extensively in Europe, removed to London. There he practiced medicine and published *An Essay on Man* (1772) and *The Chains of Slavery* (1776). Returning to Paris, he wrote on optical subjects and electricity and entered the service of the Count of Artois as a veterinary surgeon in 1777. The fruits of his studies in physics appeared in a number of publications on electricity and optics. Upon the outbreak of the Revolution, Marat soon came to the front as one of its most extravagant, passionate leaders, and won a large following. After several abortive journalistic experiments he established, Sept. 12, 1789, a journal, *Le Publiciste Parisien,* which as *L'Ami du Peuple* and, after Sept. 21, 1792, as *Le Journal de la République* became one of the most famous papers of the revolutionary period. In it Marat attacked the moderates of the Constituent Assembly and later the Girondists with such violence that he was compelled on several occasions to take refuge in England. Danton, who had found Marat useful in the preparation of the events which led up to the storming of the Tuileries (Aug. 10, 1792), made him a member of the Commune of Paris. It was in a great measure the influence of Marat which led to the cruelties and massacres of September, 1792, in the midst of which he was elected a member of the Convention. His journal became more radical and vehement than ever. During the King's trial he was urgent for his immediate execution, and in his journal called upon the people to slay 200,000 of the adherents of the old régime. On April 14, 1793, he was brought before the Revolutionary Tribunal on the charge of fomenting sedition, but was acquitted (April 24) and returned to the Convention more powerful than ever. He played probably the leading part in the events of May 31 to June 2, which brought about the downfall of the Girondists, who had long regarded him as their inveterate enemy. On July 13, 1793, Marat was stabbed in his own house by Charlotte Corday (q.v.). His death aroused tremendous public feeling. His bust was placed in the Hall of the Convention; the scene of his murder was painted by David; fêtes in perpetuation of his memory were held all over France; mothers named their children after the "martyr of the people," and in November the Convention decreed to Marat's remains the honors of the Panthéon.

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MARATHI, mȧ-rä'tē. A language spoken in western India, belonging to the southern group of the Indo-Aryan family, and closely related to Hindi, Gujarati, and other modern vernaculars of Indo-Iranian origin. It is the tongue of between 15,000,000 and 20,000,000 people and is divided into several dialects, which are comprised under the two great groups Dakhani and Konkani. The former of these is found, as its name implies, in the Deccan and contains the standard dialect, called Deshi, spoken near Poona. The district of the Konkani is along the coast in the southwestern portion of the country of the Mahrattas. It contains a considerable mixture of Dravidian words from the neighboring Kanarese, and around Goa it has numerous Portuguese loan words. Marathi as a whole, despite its importations from Persian and Arabic, has departed less from the Sanskrit form than almost any other New Indian language. It is probably descended from the vernacular form of the Maharashtri Prakrit dialect of mediæval India.

Marathi literature is abundant. It begins in the thirteenth century with Namdev, a predecessor of the famous Tukaram (1609 A.D.), who wrote religious poems of a pronounced Vishnuitic trend. Another poet almost as highly esteemed as Tukaram was Mayur Pandit, or Moropant, in the eighteenth century. Prose works in Marathi are comparatively unimportant. Modern literature in this language, under English influence, is copious but rather mediocre. The alphabet employed by the Marathi is the Devanagari, in which Sanskrit is written.

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MAR'ATHON (Lat., from Gk. Μαραθών). Anciently a small town on the coast of Attica, about 20 miles northeast of Athens (Map: Greece, Ancient, D 2). The modern village lies at the point where a valley opens into the plain of Marathon, which is surrounded by a semicircular range of mountains on the north, west, and south, while on the east it is washed by the Bay of Marathon. South of the valley of Marathon is another valley, in which is the little village of Vrana, while from the southern extremity of the plain, between the sea and the mountains, a road leads by a circuitous route between Mounts Pentelicus and Hymettus into the Attic plain. Along with three other towns, Probalinthos, Tricorythos, and Œnoe, Marathon belonged to the Tetrapolis, which claimed a very early legendary origin and independent existence until the time of Theseus. It is clear that the league continued to exist for religious purposes until at least the fourth century B.C., and probably for a longer time. The plain of Marathon is especially famous as the scene of the decisive battle in which Miltiades (q.v.) led the Athenians and the Platæans to victory over the army of Darius under the command of Datis and Artaphernes in 490 B.C. (See GREECE, *Ancient History.*) The details of the battle are not easy to determine, as the ancient accounts are confused. It is probable that the Athenians occupied the valley of Vrana and attacked the Persians either when they were preparing to reëmbark or to execute a turning movement by the road to the south. The Greek force seems to have numbered about 10,000, of whom 192 fell. The numbers of the Persians are unknown, but the traditional 100,000 is certainly much exaggerated; their loss is said to have been 6400. Contrary to custom, the Athenian dead were buried on the field, and over their remains was raised the great mound (or *soros*) which is still conspicuous in the southern part of the plain. Its identity, at one time much disputed, was proved by the excavations of the Greek Archæological Society under Stais, in 1890 and 1891, which brought to light, in a space 85 feet by 20 feet, human bones, ashes, vases of the early fifth century B.C., and a sacrificial trench, where offerings had been made before the earth was heaped up. Some of the remains found in the *soros* are to be seen now in the National Museum at Athens. The literature on Marathon is very extensive. Besides the standard histories of Greece, consult: Ἀρχαιολογικὸν Δελτίον (Athens, 1891); Fraser, *Pausanias*, vol. ii (London, 1898), containing a large bibliography; Milchhöfer's text to Curtius and Kaupert, *Karten von Attika* (Berlin, 1881–95); Macan, *Herodotus*, books iv, v, vi, especially vol. ii, pp. 149–248 (London, 1895); *Journal of Hellenic Studies*, vol. xix (ib., 1899); G. B. Grundy, *The Great Persian War* (ib., 1901); Baedeker, *Greece* (with map: 4th Eng. ed., Leipzig, 1909).

MARATHONIANS. See MACEDONIANS.

MARATTA, mȧ-rät'tȧ, or **MARATTI**, CARLO (1625–1713). An Italian painter of the Roman school, born at Camerano. He was a pupil of Andrea Sacchi and was influenced by the works of Raphael and the Carracci. Considered the most eminent painter in Rome, he long enjoyed the papal patronage. In 1702–03 Clement XI commissioned him to restore Raphael's frescoes in the Vatican, and Innocent XI appointed him superintendent of the paintings in the Vatican. He died at Rome as Prince of the Academy of St. Luke. Most of his pictures are small easel paintings in oil, the best being portraits. His design is academic, his color pleasing, his brushwork weak; his style resembles that of Guido Reni, but is even less original. He etched a number of important plates. Among his best paintings are the following: "Madonna," Palazzo Doria, Rome; "Annunciation," Turin Gallery; "Adoration of Shepherds," Basel Museum; "Holy Night," Dresden Museum; "St. John at Patmos," "Sleeping Child," "Portrait of a Cardinal," Old Pinakothek, Munich; "Presentation in the Temple," "Portrait of Clement IX,"

Hermitage, St. Petersburg; "Madonna in Glory," "Hagar and Ishmael," Madrid Museum; portrait of Cardinal Cerri, National Gallery, London.

MAR'AVE'DI, *Sp. pron.* mä'rä-vä'dē (Sp., from Ar. *Murābiṭīn,* name of a Moorish dynasty, pl. of *murābiṭ,* hermit). The name borne by certain Spanish coins. One of gold weighing about 60 grains was issued by the Moorish emirs in the eleventh and twelfth centuries; subsequently the maravedi constituted the lowest denomination in the Spanish coinage, varying in value from one-seventh to one-third of a cent.

MARBEAU, mär'bō', JEAN BAPTISTE (1798–1875). A French philanthropist, born at Brives. In 1841, while a city official at Paris, in making some investigations of the charitable institutions, he was struck with the lack of provision for the care of babies under two years of age whose mothers were compelled to go out to work. He wrote a book, *Des crèches,* advocating the establishment of day nurseries. The first was established at Chaillot, Nov. 11, 1844. An association of *crèches* was formed in 1846. Throughout the rest of his life, while specially interested in *crèches,* he took an active part in furthering various charities. Among his writings are: *Etudes sur l'économie sociale* (1844; 2d ed., 1875); *Des crèches, ou le moyen de diminuer la misère en augmentant la population* (1845; many later editions); *Du paupérisme en France et des moyens d'y remédier* (1847); *De l'indigence et des secours* (1850). He died at St. Cloud, Oct. 10, 1875.

MARBECK, mär'bĕk, or **MERBECK, MERBECKE,** JOHN (?–c.1585). An English musician and theologian, organist of St. George's Chapel, Windsor, in the reign of Henry VIII and his successor. He early read Calvin's writings, adopted his views, and joined an association in support of the Reformed doctrines. Among the members were a priest, a chorister of St. George's Chapel, and a tradesman, and these men, together with Marbeck, were arrested on a charge of heresy. Their papers were seized, and in Marbeck's handwriting were found notes on the Bible, materials for a concordance in English, and a copy of an epistle of Calvin against the mass. They were all condemned to the stake, but Marbeck, on account of his musical talents and through the interposition of Gardiner, Bishop of Winchester, was pardoned and restored to his place as organist. His trial is related in Foxe, *Acts and Monuments,* book viii (London, ed. of 1857, vol. v). He lived to see the triumph of his principles and to publish his work, *The Boke of Common Praier Noted* (1550), an adaptation of the plain chant of the older rituals to the first liturgy of Edward VI; reprinted in facsimile (1844) and in Jebb's *Choral Responses and Litanies* (1857). He published also his *Concordance* to the Bible (1550), which was the first work of the kind in English on the entire Bible. A Te Deum of his and a mass of five voices are found in Smith's *Musica Antiqua,* now in the British Museum. In 1574 was published *The Lyves of Holy Sainctes, Prophetes, Patriarches, and Others* and subsequently *The Holie Historie of King David, drawn into English meetre* (1579) and *A Ripping Up of the Pope's Fardel* (1581).

MARBELLA, mär-bā'lyä. A port of south Spain in the Province of Malaga (Map: Spain, C 4). It is situated amid picturesque surroundings on the shore of the Mediterranean, 35 miles northeast of Gibraltar. It is well built, with a notable church of the Incarnation and the ruined castle of San Luis, its former defense, on the adjoining hill. In the neighborhood are granite quarries and mines of sulphur, lead, and iron; the town has iron foundries and sugar refineries. The harbor is used principally in local coasting trade; it is an ill-sheltered, open roadstead, but equipped with a large iron pier reaching into deep water and a lighthouse visible for 12 miles. The principal exports are iron, grain, sugar, cork, and fish. Pop., 1900, 9075; 1910, 10,286.

MAR'BLE (OF. *marble, marbre,* Fr. *marbre,* Prov. *marme, marbre,* from Lat. *marmor,* marble, from Gk. *μάρμαρος, marmaros,* bright stone, marble, from *μαρμαίρειν, marmairein,* to sparkle). In a strict sense a crystalline limestone having a granular structure. The term has, however, become broadened as a result of commercial use and now includes any limestone, either crystalline or noncrystalline, which will take a polish. Marbles vary considerably in their texture and color. Some are extremely fine-grained, like those of Vermont, while others are coarsely granular, as some Georgia ones. Those composed entirely of calcite or dolomite are pure white, but many are colored gray or blue by carbonaceous or graphitic matter, and sometimes grayish or greenish by fine scales of micaceous minerals. Others exhibit beautiful shades of pink, yellow, red, and brown, due to iron compounds. The mineral impurities which give the varied colors to the stone are often disposed in patches or wavy bands, and highly ornamental effects are sometimes obtained by properly matching these banded slabs. The presence of fossil remains may also add to their beauty. Marbles are usually found in regions of metamorphic rocks (see GEOLOGY), and hence the rock has been at times subjected to crushing forces. These have developed fissures in the rock, which subsequently became filled by foreign mineral matter, and it is to this that much of the beautiful marking or veining of many ornamental marbles is due.

Marble occurs in many geological formations, but in the United States it is obtained mostly from the Paleozoic rocks. The best-known deposits are found in the Eastern States. In western Vermont, at West Rutland, Proctor, Brandon, and other localities, some of the quarries have reached a depth of 400 feet and contain many grades, varying from the purest white statuary marble to the gray, or "true blue" variety, as it is called. In recent years gray and green banded marbles have been quarried to an increasing extent for decorative work. A fine-grained, white, dolomitic marble is quarried at Lee in western Massachusetts, and a medium-grained gray marble for structural work is obtained from St. Lawrence Co., N. Y. Cockeysville, Md., furnishes white marble, but is the most important Southern producer of gray and white stone for structural and decorative purposes. Near Swanton, Vt., there occurs a deposit of variegated marble much used for wainscoting and floors. Some of the varieties found here resemble imported marbles. The pink and brown marbles are widely used for wainscoting and flooring. Aside from the above areas, marble of white and gray striping is quarried in Inyo Co., Cal., and a white marble is now being quarried in Colorado. Two types which have attracted some attention are the serpentine, or verde antiques, found in eastern

SUTHERLAND FALLS QUARRY OF THE VERMONT MARBLE CO., AT PROCTOR, VT.

Pennsylvania, and the onyx marbles from Arizona, Colorado, and California. These latter are not true onyx, but a travertine, composed of carbonate of lime, and formed in caves or around calcareous springs. Serpentine marble, although of high ornamental value, should not be used exteriorly in severe climates.

Many ornamental marbles are imported into the United States from various European countries. Among the more important types are: *Skyros* from Greece, the brecciated variety being much employed; *Black and Gold*, a black Italian limestone veined with yellow; *Brocatelle*, a light-yellow marble with red cloudings, obtained from the Pyrenees; *Carrara*, the white marbles quarried at Carrara, Italy; *Giallo antico*, a yellow marble much sought after by the ancient Greeks and Romans; and *Griotte*, a bright-red variety, obtained in the Pyrenees. The last named is also found at Swanton, Vt. *Landscape* marble is a variety containing coloring matter dispersed through it in such a manner as to resemble a landscape. *Nero antico* is a greenish-black serpentine marble; *Numidian* marble is an African variety, often of yellow color; *Parian*, a white marble much used by the ancient Greeks and obtained from the island of Paros; *Pentelic* is another white marble used by the ancient Greeks, occurring near Athens; *Rosso antico*, a red marble; *Siena*, a yellowish marble, often with veins or patches of gray or purple.

The most famous marble known to the ancients was the Parian marble, which was a finely granular and very durable stone, of waxy appearance when polished. Some of the finest Grecian sculptures were formed of this marble, among them being the Venus de' Medici. The Pentelic marble was at one time preferred by the Greeks to Parian, because it was whiter and finer grained. The Parthenon was entirely built of it. It does not resist the weather well. The quarries at Carrara were known to the ancients, but their chief importance has been in modern times. The temple of Jupiter Serapis near Naples was constructed of a gray-streaked micaceous marble, much used by the ancients and known as *cipolino*.

Marble suitable for structural work sells for about $1.30 to $1.50 rough per cubic foot, while monumental stone brings a little more, but good statuary marble may bring as much as $10 per cubic foot. Marble must commonly meet certain requirements as to strength, color, texture, freedom from flaws, and durability in the open air. Its crushing strength is commonly from 10,000 to 12,000 pounds per square inch.

The opening of a marble quarry is usually expensive and attended with financial risks, as a thickness of from 10 to 30 feet of rock usually has to be taken off before sound marble is reached. After a sufficient area of surface has been prepared by the removal of the imperfect stone, channeling machines, which may be either percussion or diamond drills, are set to work and rectangularly crossed channels are cut to a desired depth, say from 5 to 7 feet. One of the blocks, called the key block, is then broken off at the base by wedging and lifted out with a crane. This gives ready access to the others, which are then drilled as circumstances may require, the quarry being worked out in floors. The blocks removed commonly run 4 feet, 6 inches by 6 feet, 6 inches, but much larger ones are sometimes extracted on special demand. The marble after quarrying is taken to the mill and sawed into blocks or slabs or chiseled into monumental pieces. The first smoothing is done with sand and water, but the final polishing with a mixture of putty powder and weak acid rubbed on with a flannel-covered revolving buffer. The value of marble produce in the United States in 1913 was as follows:

Sold by producers in rough state	$3,645,863
Dressed for:	
Building (exterior)	829,244
Ornamental purposes	34,850
Monumental work	1,135,658
Interior decoration	1,869,262
Other uses	356,013
Total, United States	$7,870,890
Imports, 1913	1,367,607
Total consumption	$9,238,497

Of the total United States value, Vermont produced 44.64 per cent, Tennessee 18, and Georgia 14. See BUILDING STONE.

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MARBLE, MANTON (1834–1917). An American journalist. He was born at Worcester, Mass.; graduated at the University of Rochester in 1855; and became a journalist in Boston, where he was assistant editor for a year of the *Journal* and editor for another year of the *Traveler*. He removed to New York in 1858 and was employed during the next two years on the editorial staff of the *Evening Post*. In 1860 he united with others in founding the *World*, of which he was proprietor and editor from 1862 to 1876. The publication of the *World* was temporarily suspended by President Lincoln for the printing of false dispatches in 1864. Marble wrote the Democratic State platform of 1874, the Democratic national platform of 1876, and most of the national platform of 1884. In 1878 he published *A Secret Chapter of Political History*, in which he upheld Tilden's claim to the presidency. In 1885 he was appointed a special envoy to Great Britain, France, and Germany on bimetallic questions.

MARBLED GODWIT. See GODWIT.

MARBLED TIGER CAT. A very distinct and beautiful wild cat of the eastern Himalayas and Malayan region (*Felis marmorata*), which in appearance is a miniature of the clouded leopard. It is about the size of the domestic cat and has unusually soft and warm fur and a long tail, not ringed, but spotted. The ground color is dull reddish yellow, marked with numerous elongate, wavy black spots, somewhat clouded or marbled. There are dark lines on the head, and the flanks and legs are thickly spotted with black, while the belly is yellowish white. It has a Tibetan variety. Its habits are little known, but are supposed to be mainly arboreal.

MARBLE FAUN, THE. A romance by Haw-

thorne (1860). The title originally proposed was *The Transformation of the Faun*, changed in the English edition to *Transformation*, and in the American to *The Marble Faun*.

MARBLEHEAD'. A town, including the villages of Clifton, Devereux, and Marblehead Neck, in Essex Co., Mass., 18 miles northeast of Boston, situated on a rocky peninsula in Massachusetts Bay and on the Boston and Maine Railroad (Map: Massachusetts, F 2). It is a port of entry and has a deep and safe harbor, is a popular yachting and summer resort, and possesses many pre-Revolutionary buildings and other features of historic interest. In Abbot Hall are the town offices, the public library, and an art gallery. There are Crocker, Fort Sewall, and Fountain parks. The principal industries include boat building and the manufacture of shoes and aëroplanes, though fishing and seed growing are of some importance. The government is administered by town meetings. There are municipal water works and electric-light plant. Pop., 1900, 7582; 1910, 7338. Settled in 1629 by emigrants from the east and south of England, and later by people from the islands of Jersey and Guernsey, Marblehead was under the jurisdiction of Salem until 1649, when it was incorporated as a separate town. It ranked for a time next to Boston in its maritime and fishing trade. Marblehead was the birthplace, and for many years the home, of Elbridge Gerry and Judge Story. Consult Roads, *The History and Traditions of Marblehead* (Marblehead, 1897).

MARBLEHEAD. A sailors' name for the North Atlantic fulmar (q.v.).

MAR'BLE PLAN. See FORMA URBIS ROMÆ.

MARBLES AND MARBLE PLAYING. Marbles are little balls of marble or some other hard substance and are used as playthings by children. They have been in use from the earliest times and are to be found among all the peoples of the world. They are manufactured in large quantities in Saxony and are exported to India, China, Africa, and practically every nation of Europe and America. There is an endless variety of games of marbles.

MAR'BO, or **MAROBO'DUUS** (c.11 B.C. –41 A.D.). A Germanic chief, King of the Marcomanni. See MARCOMANNI.

MARBOD, mär'bō', or **MARBODIUS** (c.1035–1123). A French bishop and author. He was born at Angers, the son of a merchant, and taught with great success, becoming in 1067 head of the diocesan school, in which he trained many prominent scholars and statesmen. Marbod was made Archdeacon in 1081 and Bishop of Rennes in 1096. In 1104 he took part in the Council of Tours, and in 1109 he was administrator of the diocese of Angers during the absence of the Bishop. His works include biographies, hymns, the *Versus Canonicales*, valuable as giving a picture of the monkish life of the period, and *De Lapidibus Pretiosis*, which, following a Greek original, treats of the mysterious properties of gems. Marbod's works are contained in Migne, *Patrologia Latina*, vol. clxxi (1854). His hymns are to be found in Blume and Dreves, *Analecta Hymnica* (Leipzig, 1907).

MARBOIS, mär'bwä', FRANÇOIS, MARQUIS DE BARBÉ. A French statesman. See BARBÉ-MARBOIS.

MARBURG, mär'burk. A town in the Crownland of Styria, Austria, 37 miles south-southeast of Gratz, in the wooded plain on the left bank of the navigable Drave (Map: Austria, D 3). The town has a sixteenth-century cathedral, a mediæval castle, an episcopal palace, and a casino. It is the seat of the Prince-Bishop of Lavant. Its educational institutions include schools of theology and pedagogy, a pomological school, and a school for vintners. The chief industries are the manufacture of leather, footwear, iron, cement, cutlery, flour, and spirits. The extensive workshops of the Southern Railway are situated in the suburb of Sankt Magdalena. Marburg carries on an extensive trade in wine, grain, poultry, and lumber, the chief products of the surrounding country. Pop., 1900, 24,501; 1910, 22,994, mostly Germans. Consult Bücking, *Geschichtliche Bilder aus Marburgs Vergangenheit* (Marburg, 1901).

MARBURG. A town in the Province of Hesse-Nassau, Prussia, on the Lahn, 60 miles north of Frankfort (Map: Germany, C 3). The town is built on terraces from the river up to a thirteenth-century castle on the summit. The castle was originally the residence of the landgraves of Hesse, later a state prison, and is now a repository for the Hessian state archives. In its Rittersaal the disputation concerning transubstantiation between Luther and Zwingli took place in 1529. Its thirteenth-century church of St. Elizabeth, a perfect specimen of early Gothic architecture, was erected by the Teutonic Knights and contains the fine tomb of the saint, as well as numerous monuments to the Hessian rulers and Teutonic Knights. Noteworthy are also the Rathaus (1512), the fourteenth-century Lutheran church, and the government buildings. The educational institutions of Marburg include the university with a library of 260,000 volumes (see MARBURG, UNIVERSITY OF), a Gymnasium, a Realschule, a nurses' school, and an agricultural school. The chief manufactures are leather, pottery, machinery, surgical instruments, pewter ware, toys, cornets, carpets, and tobacco. The environs are of great natural beauty. Pop., 1900, 17,527; 1910, 21,860, chiefly Protestants.

First mentioned in 1140, Marburg was endowed with municipal rights by the Landgrave Louis of Thuringia in 1227, and after his death became the residence of his widow, Elizabeth of Hungary. During the fifteenth and sixteenth centuries Marburg was one of the residences of the landgraves of Hesse. It passed with Hesse-Cassel to Prussia in 1866. The fortifications were demolished by the French in 1810–11.

MARBURG, KONRAD VON. See KONRAD VON MARBURG.

MARBURG, THEODORE (1862–). An American publicist, born at Baltimore, Md. He studied at Johns Hopkins (1880–81), at Oxford, England (1892–93), at the Ecole Libre de la Science Politique, Paris (1893–95), and at the University of Heidelberg (1901 and 1903). He became active in various economic, political, law, art, and peace societies; became trustee of Johns Hopkins; and was United States Minister to Belgium in 1912–13. He translated Emile Levasseur's *Elements of Political Economy* and published: *In the Hills* (1895), a poem; *The World's Money Problem* (1896); *The War with Spain* (1898); *Expansion* (1900); *The Peace Movement Practical* (1910); *Salient Thoughts —Judicial Settlement Conference* (1911); *Philosophy of the Third American Peace Congress* (1912).

MARBURG, UNIVERSITY OF. The first Protestant university of Germany, founded by Philip,

Landgrave of Hesse, in 1527, and endowed with the income of 13 suppressed monasteries. The Imperial assent was given in 1541. The new foundation drew largely from Wittenberg for its early teaching staff, became a stronghold of Lutheran doctrine, and flourished accordingly. In 1607 Landgrave Moritz converted it into a Calvinistic school, which conversion resulted in the departure of many professors and students and the foundation of the University of Giessen. The Thirty Years' War nearly ruined the university, which was reconstituted in 1653. Since the incorporation of Hesse-Cassel with Prussia it has flourished greatly. The university developed especially the provision of facilities for the study of modern languages and philology and maintained a strong summer school in these subjects. In 1913 it had a budget of nearly 1,500,000 marks, and 2406 students, including 163 women, in theology, medicine, law, and philosophy, the majority being in the two latter faculties. Its library contains about 260,000 volumes and 200,000 dissertations.

MARBURY vs. MAD'ISON. The title of a famous decision rendered by the Supreme Court of the United States in 1803 and reported in the first volume of *Cranch's Reports*. Its importance in the constitutional development of the United States lies in the fact that this was the first instance in which the Supreme Court assumed the right to declare a statute of Congress null and void on account of its repugnance to the Constitution. It is popularly regarded as the chief basis for the American doctrine of the right of the courts to disregard unconstitutional statutes, although the right had been asserted by State courts in some half a dozen instances before the adoption of the Federal Constitution. The case of Marbury *v.* Madison arose out of an attempt of the plaintiff to secure a writ of mandamus from the Supreme Court to compel James Madison, then Secretary of State, to deliver to him a commission as justice of the peace of the District of Columbia. Marbury had been appointed to this office by President Adams, the Senate had confirmed the nomination, and his commission had been made out, signed and sealed, but had not been delivered. When Madison entered upon his duties as Secretary of State he found the commission and refused to deliver it. Marbury, in bringing his suit, relied upon an act of Congress which empowered the Supreme Court to issue the writ of mandamus to executive officers to compel them to perform their duties in certain cases. But as the Constitution expressly enumerates the cases in which the Supreme Court shall have original jurisdiction and nowhere mentions the right of issuing the writ of mandamus, the congressional act in question was clearly without constitutional warrant. This evident repugnance of the statute to the Constitution was the first question decided by the court. The second point in the decision related to the power of the court to declare the act null and void and to refuse to be bound thereby when its repugnance to the Constitution was once established. Chief Justice Marshall, who delivered the opinion of the court, declared that if two laws conflict with each other, the courts must decide on the operation of each, and if a law be in opposition to the Constitution so that the court would have to decide the case conformably to the law disregarding the Constitution or conformably to the Constitution disregarding the law, the court must decide which of these conflicting rules governs the case. If then, he said, the courts are to regard the Constitution, and if the Constitution is supreme over any ordinary statute, the Constitution and not the statute must govern the case to which they both apply. Marshall's argument was readily accepted as the only correct and just rule, and thus was laid the foundation of a judicial prerogative which has immensely influenced the legal and constitutional development of the United States. Consult: T. M. Cooley, *Constitutional History of the United States* (New York, 1889); J. B. Thayer, *John Marshall* (Cambridge, 1904); id., *Legal Essays* (Boston, 1908). See CONSTITUTIONAL LAW.

MARCA, mär'kä', PIERRE DE (1594–1662). A French historian and ecclesiastic, born at Gan, near Pau. He studied law at the University of Toulouse, and for his zealousness in reëstablishing the Catholic faith in Béarn he was appointed president of Pau in 1621 by Louis XIII. After the death of his wife in 1631 he studied theology, in 1639 he became a member of the Council of State, and in 1641 the King made him Bishop of Couserans. From 1644 to 1651 he was Intendant or Governor of Catalonia, then held by the French, and in 1652 he became Archbishop of Toulouse. During the uprising of the Fronde Marca supported Louis XIV in opposition to the Pope, and he succeeded Retz, who resigned, as Archbishop of Paris in 1662. His historical writings include: *Histoire de Béarn* (1640); *De Concordia Sacerdotii et Imperii seu de Libertatibus Ecclesiæ Gallicanæ* (1641); *Marca Hispanica seu Limes Hispanicus* (1688).

MAR'CASITE (Fr. *marcassite*, Sp. *marquesita*, from Ar. *marqashītha*, from *raqasha*, to speckle, to embellish). An iron disulphide that crystallizes in the orthorhombic system, has a metallic lustre, is of a pale bronze-yellow color, and resembles pyrite, from which it differs only in crystalline form. It is found in Bohemia, Saxony, Hungary, and in the United States at various localities in New York, Massachusetts, Connecticut, and New Hampshire. The mineral is mined in some parts of Europe for its sulphur and for the ferrous sulphate that may be made from it. The word was applied indifferently to crystallized varieties of iron sulphide until 1845, when it was retained exclusively for the orthorhombic variety.

MARCATO, mär-kä'tō (It., marked). In music, a term signifying in a strongly accentuated manner.

MARCEAU, mär'sō', FRANÇOIS SÉVERIN, called MARCEAU-DESGRAVIERS (1769–96). A soldier of the French Revolution, born at Chartres. He joined the army as a private at the age of 16, participated actively in the capture of the Bastille, and in 1792 was in the Army of the Ardennes commanded by Lafayette. His services under Westermann in La Vendée made him general of division in 1793. With Kléber he crushed the rebellion at Cholet, then fought under Jourdan in 1793–94. A Prussian sharpshooter mortally wounded him at Altenkirchen. In 1889 his remains were placed in the Panthéon at Paris.

MARCEL, mär'sĕl', ETIENNE (?–1358). Provost of the merchants of Paris. After the battle of Poitiers (q.v.), in 1356, Marcel took the government of Paris into his own hands. To check the abuses to which the citizens were subjected he had two of the most prominent officials

of the King put to death. In order not to be obliged to obey the commands of King John, who was a prisoner in the hands of the English, Marcel induced the Dauphin to take the regency. Finding the Regent opposed to him, he sought aid from Charles the Bad, King of Navarre, and from the Jacquerie (q.v.). This made him unpopular and he was slain by a rising on July 31, 1358. For a few months he had been the most powerful man in France. It is impossible now to judge his conduct or his aims with certainty. Consult Ernest Lavisse, *Histoire de France depuis les origines jusqu'à la révolution*, vol. iv, part i (Paris, 1902), and the works cited there.

MARCELINE, mär'sĕ-lēn'. A city in Linn Co., Mo., 106 miles northeast of Kansas City, on the Atchison, Topeka, and Santa Fe Railroad (Map: Missouri, C 2). It is in a rich coal and oil region, having three mines and an oil and gas pumping station. There are railroad shops and roundhouse of the Santa Fe System, and a concrete-block factory. Marceline contains a sanitarium and municipal water works and electric-light plant. Pop., 1900, 2638; 1910, 3920.

MAR'CELLI'NUS, Saint. Bishop of Rome, or Pope, 296–304. He was born in Rome, but little is known of his life or administration. There is an account of a synod held at Sinuessa in 303 or 304, at which Marcellinus is said to have confessed that, at the instance of Diocletian, he had offered incense to Vesta and Isis. The synod is said to have deposed Marcellinus, who, with many members of the synod, was put to death by Diocletian. The story is denied by Augustine and Theodoret and is not credited by either the Roman Catholics or the Protestant controversialists. The Roman church commemorates Marcellinus on April 24. Consult J. J. I. von Döllinger, *Fables Respecting the Popes of the Middle Ages* (New York, 1871).

MARCELLO, mär-chĕl'lō, Benedetto (1686–1739). An Italian composer. He studied music under Gasparini and Lotti and is chiefly known for the music to Giustiniani's paraphrase of 50 Psalms. He also wrote an opera *Le Fede riconosciuta*, an oratorio *Giuditta*, five *concerti*, and a number of sonatas. The characteristics of his musical style are melody, simplicity, and a sound good taste. He was also an instructor of wide reputation, and a conservatory at Venice is named after him. He wrote the satire *Il teatro alla moda* (1720). Consult Enrico Fondi, *Benedetto Marcello* (Rome, 1909).

MARCEL'LUS. The name of two popes. —Marcellus I, Saint, Pope, 308–309, a Roman by birth, elected after an interregnum of four years due to the persecution of Diocletian. A new outbreak under Maxentius drove him from Rome, the attention of the heathen authorities being directed to him by his severity against the lapsed. He died in exile, but his body was brought back to Rome and buried in the cemetery of Priscilla with that of his predecessor, Marcellinus. His feast day is January 16.—Marcellus II, Pope, 1555, Marcello Cervini degli Spannocchi. He was born in 1501 at Montepulciano and made Bishop of Nicastro and Cardinal in 1539. He was one of the legates appointed to preside over the Council of Trent, and was elected Pope in spite of the opposition of the Imperial party. His reign, however, for which his character and learning had given great hopes, lasted only 22 days. Palestrina's famous "Missa Papæ Marcelli," written in 1562, was named in his honor, and the name gave rise to the story that it was sung in his presence and won the Pope's regard for polyphonic music.

MARCELLUS, Marcus Claudius (c.268–208 B.C.). 1. A famous Roman general. He belonged to a distinguished plebeian family. He was consul for the first time in 222 B.C., and obtained a decisive victory over the Insubrians in Cisalpine Gaul, slaying with his own hand their King, Britomartus or Viridomarus, whose spoils he dedicated to Jupiter; for this he was honored with a triumph. This was the third and last occasion in Roman history on which *spolia opima* were offered to Jupiter Feretrius. In the Second Punic War, after the defeat of the Romans at Cannæ, Marcellus fought as prætor, in 216 B.C., against Hannibal at Nola in Campania; and the victory which he gained there was the more important as it showed that Hannibal was not invincible, and that the Romans had not been irreparably overthrown at Cannæ. In the course of two years he thrice repulsed the Carthaginian general at this place. Being consul again in 214 B.C., he was intrusted with the command of the war in Sicily. He took Leontini, massacring in cold blood 2000 Roman deserters whom he found there, and then advanced against Syracuse, which he tried to storm. All his efforts were rendered unavailing by the skill of Archimedes, and he was compelled to blockade the city. Famine, pestilence, and ultimately treachery on the part of the Spanish auxiliaries of the Syracusans enabled Marcellus to make himself master of the place (212 B.C.), after which the remainder of Sicily was soon brought under the dominion of the Romans. In 210 B.C. he was again consul and was again opposed to Hannibal, with whom he fought an indecisive battle at Numistro in Lucania, and by whom he was defeated at Canusium in Apulia in 209 B.C. On the following day, however, he retrieved the defeat. In 208 B.C. he was for the fifth time elected to the consulate, and assumed once more the command of the Roman army against Hannibal. When out reconnoitring one day he fell into an ambuscade near Venusia and was slain. Consult Livy, books xxiii–xxvii, passim, and the article "Claudius 45," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). 2. A distinguished Roman orator, a vigorous opponent of Julius Cæsar, who, when consul in 51 B.C., proposed that Cæsar's command in Gaul should end in March, 49. In January, 49, when Pompey's supporters were keen for war with Cæsar, he urged delay till a suitable army could be prepared, but unsuccessfully. He went to Greece with Pompey, but after the battle of Pharsalus he retired to Mytilene, to study rhetoric and philosophy. In 46 the Senate appealed to Cæsar to pardon him; in support of this appeal Cicero delivered his speech *Pro Marcello*. When the pardon was granted Marcellus started for Rome, but was murdered at Athens by one of his retinue. 3. The son of Augustus' sister Octavia, and C. Marcellus; he was born in 43 B.C. In 25 B.C. the Emperor adopted him as his son and successor and married his daughter Julia to him, but two years later the young man died, at Baiæ. In certain famous lines (*Æneid*, vi, 860–886) Vergil refers to his death. Augustus named a theatre in Rome in his honor.

MARCELLUS, Nonius. See Nonius Marcellus.

MARCELLUS, Theatre of. A theatre in Rome, begun by Julius Cæsar, completed by

Augustus in 13 B.C., and named for his nephew and son-in-law Marcellus. (See MARCELLUS, 3.) The stage lay towards the river. Of the semicircular structures which carried rows of seats a large portion, comprising 12 arches in two tiers, is still standing. This portion is similar in general external appearance to the Coliseum, and is built of travertine with Doric arcades in the lower tier and Ionic in the upper. The arrangements of the cross walls and seats within the theatre were also duplicated in the Coliseum. The pilasters of the third story were Corinthian and the windows were rectangular. The theatre, according to ancient authorities, could seat about 13,500 spectators; Ch. Huelsen, in *Bullettino della commissione archeologica comunale di Roma* (1894, p. 312), gives the seating capacity as 9000 to 10,000. In the fourth century some of the travertine blocks were used in restoring the Cestian bridge. In the eleventh century the building was turned into a stronghold of the Pierleoni, and in the fourteenth century it was purchased by the Savelli, upon whose extinction it passed to the Orsini in 1712. The palace of the latter family stands upon the stage and the seats, which are buried under 15 feet of modern soil. Many corridors and chambers of the original building are preserved and are used as offices of the palace. The remains of the Doric arcades are used as low shops. Consult: R. A. Lanciani, *The Ruins and Excavations of Ancient Rome* (Boston, 1897); S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., ib., 1911); Charles Knapp, "The Roman Theater," in *Art and Archæology*, vol. i (New York, 1915).

MARCH. See MARCHING.

MARCH. See MONTH.

MARCH (OF., Fr. *marche*, from Goth., OHG. *marka*, Ger. *Mark*, AS. *mearc*, border; connected with Lat. *margo*, OIr. *brú*, Welsh, Corn. *bro*, Av. *mərəzu*, boundary). A term applied in England during the early Middle Ages and later to the frontier or border line between England and Wales and between England and Scotland. In Anglo-Saxon times the word appears under the form Mercia as the name of the most western of the English kingdoms. See MARK.

In Scotland the word came into common use to designate the boundaries of real property, corresponding to the English term "boundary" (q.v.).

MARCH, märk (Lat. *Marus*, Slav. *Morava*). A tributary of the Danube and the principal river of Moravia (Map: Austria, E 2). It rises in the Sudetic Mountains on the boundary of Silesia, and runs southward, forming in its lower course the boundary between Austria and Hungary, and entering the Danube 26 miles east of Vienna, after a course of about 217 miles, for the last 80 of which it is navigable. Its headwaters lead to the Moravian Gap or Gate. See MARCHFELD.

MARCH (Fr. *marche*, from *marcher*, to walk, march, probably from OF., Fr. *marche*, boundary; or possibly from Lat. *marcus*, hammer; connected with Skt. *mar*, to grind, on account of the beat of the feet). A musical composition having primarily as its object the regulation of the steps of a large number of persons in motion. Even in remote antiquity solemn processions were always accompanied by music. In the Greek tragedy the entrance as well as the exit of the chorus was so accompanied. The military march undoubtedly was developed from soldiers' songs. The ordinary march used for parades, drills, etc., has about 75 steps to the minute, the quickstep about 100, and the double quick or charge about 120. The march as an art form was developed from the dance forms during the seventeenth century. Lully in his operas and F. Couperin in his piano works established the march form as consisting of two reprises of eight or 16 measures. To this was added, somewhat later, a portion distinguished by repose and broad melodic outline, generally in a closely related key. This was called the trio, because at first it was in three-part writing as against the two-part writing of the first section. After the trio the first section is repeated. To-day the art form of the march is highly developed and employed on various occasions. A special kind of march is the funeral march. It is written in very slow time (grave, lento, adagio) and always in the minor mode. The trio is in the relative or corresponding major. Beethoven's great funeral march in the *Eroica Symphony* is in C minor with trio in C major; Chopin's funeral march in the Sonata op. 35 is in B flat minor with trio in D flat major.

MARCH, ALDEN (1795–1869). An American surgeon, born at Sutton, Mass. He attended medical lectures in Boston and at Brown (M.D., 1820). Subsequently he served as professor in the Vermont Academy of Medicine (1825–31), in Albany Medical Seminary (1827–33), and in Albany Medical School (1833–34). In 1834 he established a school of practical anatomy and in 1839 he founded the Albany Medical College, which absorbed the other medical schools of that city. In this new institution March held the chair of surgery from 1839 until his death. The growth and development of the college are largely to be attributed to his work. He was also the founder of the Albany City Hospital. March was president of the New York State Medical Society (1857) and a founder of the American Medical Association, of which he was president in 1864. He was a successful operator and originated several well-known surgical appliances, such as an improved splint for use in hip disease (1853), an improved harelip forceps (1855), instruments for the removal of dead bone (1860), and a new instrument for the removal of urinary stones. He contributed largely to medical journals and is the author of *Wounds of the Abdomen and Larynx* (1854).

MARCH, AUSIAS (?1397–1459). A Catalan poet, born in Valencia, probably before the end of the fourteenth century. He was admired and praised not only by his fellow citizens in Cataluña, but also by noted Spanish authors. In March's chief works, the *Cants d'amor* and the *Cants de mort*, he is visibly under the influence of Petrarch, as are so many of his contemporaries. He avoided all close imitation, however, and may safely stand on his own merits. Liveliness of fancy and genuineness of sentiment are among his best traits; his chief defect is a certain obscurity of expression. Consult the edition of his poems by Pelayo y Britz (Barcelona, 1864) and that of Barcelona, 1888, neither of them a good reproduction of the sixteenth-century editions; J. Rubió y Ors, *Ausias March y su época* (ib., 1862); A. Pagès, "Documents inédits relatifs à la vie d'Ausias March," in the *Romania*, vol. xvii (Paris, 1888). The best edition of his works is that by Amadeu Pagès, *Les obres d'Auzias March* (3 vols., Barcelona, 1912 et seq.).

MARCH, Earl of. See Wemyss.

MARCH, Earl of. See Mortimer, Roger de.

MARCH, Field of. See Champ de Mars.

MARCH, Francis Andrew (1825–1911). An American philologist and author, born at Millbury, Mass. He graduated in 1845 at Amherst, where he was tutor in 1847–49, and, after studying law in New York, was in 1850 admitted to the bar. He taught at Fredericksburg, Va., from 1852 to 1855 and from 1856 to 1906 was professor of English language and comparative philology in Lafayette College. He became honorary emeritus professor under the Carnegie endowment in 1907. In 1873–74 and 1895–96 he served as president of the American Philological Association, from 1876 to 1905 as president of the Spelling Reform Association, and in 1891–93 as president of the Modern Language Association of America. He received honorary degrees from Princeton, Amherst, Columbia, Oxford, and Cambridge. In 1879 he was chosen to be the head of the American staff of *A New English Dictionary on Historical Principles,* prepared under the direction of the Philological Society of London. March's article "On Recent Discussions of Grimm's Law," which was published in the *Transactions* of the American Philological Association of 1873, anticipated to a great extent the law of vocalic accent discovered by Verner in 1877. His publications include: *A Method of Philological Study of the English Language* (1865); *Anglo-Saxon Reader* (1870); *Comparative Grammar of the Anglo-Saxon Language* (1870); and a *Thesaurus Dictionary of the English Language* (1903). He also edited a series of textbooks of Greek and Latin authors, and was consulting editor of the Standard Dictionary (1890–94). Consult *Addresses in Honor of Prof. F. A. March,* delivered at Easton, Pa., on Oct. 24, 1895, and J. W. Bright, "Address in Commemoration of Francis Andrew March," in *Modern Language Association of America, Publications,* vol. xxix (Cambridge, 1914).

MARCHAND, mär'shän', Félix Gabriel (1832–1900). A Canadian statesman, born at St. John's, Quebec. He studied at St. Hyacinthe College and was admitted a notary in 1855. In 1867 he was elected a Liberal member of the Legislative Assembly of the Province of Quebec, from 1878 to 1879 was Provincial Secretary, and in the latter year was also Commissioner of Crownlands. From 1887 to 1892 he was Speaker of the Assembly, in 1892 succeeded Honoré Mercier (q.v.) in the leadership of the Liberal party in the Legislature, and in 1897 was appointed Premier and Treasurer. In 1860 he established *Le Franco-Canadien,* which he edited for many years. He wrote: *Fatenville* (1869); *Erreur n'est pas compte* (1872); *Un bonheur en attire un autre* (1884); *Les faux brillants* (1885).

MARCHAND, Jean Baptiste (1863–). A French officer and explorer, born at Thoissey, Ain. He entered the army in 1883, received a commission in 1886, and from 1888 to 1899 he explored parts of Africa. His explorations in search of an improved route to the Gulf of Guinea from the valley of the Niger resulted in a scheme for the Transnigerian Railway between the Bandama and Niger rivers. In 1898 he established on the White Nile the post of Fashoda, which resisted attacks from the dervishes, but found a more formidable foe in General Kitchener, who, with British forces fresh from their victory over the Mahdi, was determined to take possession of the country. Major Marchand refused to withdraw, and international complications ensued; but the affair was settled when the French government retired from the position while Marchand was on his way home to report. He took part in the expedition for the relief of Peking in 1902 and was promoted to the office of colonel, but resigned in 1904, not being permitted by his government to enter the Russian army during the Russo-Japanese War. He was made a Commander of the Legion of Honor. Consult Murphy, *Le commandant Marchand et ses compagnons d'armes à travers l'Afrique* (Paris, 1900). See Kodok.

MARCHANT, mär'chant, James (1867–). An English reformer. From 1889 to 1894 he was evidential lecturer to the Bishop of St. Albans and then preached in Trinity Presbyterian Church, London, in 1895–97, and at St. Andrew's, Chatham, in 1900–02. In 1903–06 he was secretary of Dr. Barnardo's Homes and with Mrs. Barnardo he edited *The Memoirs of Dr. Barnardo* (1907). Becoming greatly interested in hygienics and eugenics, in 1911 he was consecrated for the work of public morals in Westminster Abbey by the Lord Bishop of Durham and F. B. Meyer; and he became director of the National Council for Race Regeneration and editor of *Prevention,* an organ of the movement. He wrote: *Theories of the Resurrection* (1899); a *Life of Dr. Paton* (1909); *The Nation's Morals* (1910); a sketch of A. Russel Wallace in Wallace's *Revolt of Democracy* (1913); *The Master Problem* (1915).

MARCHANTIA, mär-kăn'shĭ-à. One of the bryophytes (q.v.).

MARCHANTIALES, mär-kăn'shĭ-ā'lēz. See Hepaticæ.

MARCHE, Albert Lecoy de La. See Lecoy de La Marche, Albert.

MARCHENA, mär-chā'nà. A town of south Spain in the Province of Seville, situated 28 miles east of Seville, on the railroad between Cadiz and Cordova (Map: Spain, C 4). It is a picturesque old town, partly surrounded by the grass-covered remains of Moorish fortifications, and contains a half-ruined palace of the dukes of Arcos (within the close of which is an old Moorish building) and two notable Gothic churches. In the neighborhood are sulphur springs. The surrounding region is fertile, growing fine olives. Pop., 1900, 12,255; 1910, 13,590.

MARCHENA RUIZ DE CASTRO, rōō-ēth' dā käs'trō, José (1768–?1821). A Spanish author and journalist, who studied the humanities at the University of Seville, took minor orders, and was for a while professor at the seminary of Vergara. Having been strongly influenced by the theories of the French philosophers, his writings became such that he had to escape to France in order to avoid arrest by the Inquisition in 1792. In France he became intimate with persons of influence, continued his writings, was expelled from France in 1799, declared himself a Bonapartist in 1804, accompanied Murat to Spain in 1808, and was imprisoned by the Inquisition and released by Joseph Bonaparte, who appointed him editor of the *Gaceta.* From 1813 to 1820 he was again an exile. In his day Marchena was one of the best Latinists in the world. As an amusement he published at Strassburg in 1800 what he claimed was a fragment of Petronius' *Cena Trimalchionis* that he had found. After the Latinists of the world had admitted that they could find no fault with the text, ex-

cept his refusal to show the original he claimed to have found and copied, Marchena acknowledged that he had written it himself.

MARCHES, THE (It. *Le Marche*, the boundaries). A name frequently occurring in Italian history as applied to a stretch of territory in the central part of the peninsula, comprising the present provinces of Ancona, Ascoli-Piceno, Macerata, and Pesaro e Urbino (Map: Italy, D 3). The use of "marches" for waste land separating two tribes where the need of rigid boundaries is not felt was common in mediæval Europe.

MARCHESA COLOMBI, mär-kā'zȧ kô-lôm'bē. A pseudonym of the Italian author Maria Torelli-Torriani (q.v.).

MARCHESI, mär-kā'zē, MATHILDE, *née* GRAUMANN (1826–1913). A German-French singing teacher, born at Frankfort-on-the-Main. She studied under Nicolai in Vienna and with Manuel García in Paris, afterward appearing as a concert singer in London and on the Continent. Her voice was pleasing but not remarkable. In 1852 she married Signor Salvatore Marchesi (q.v.) and taught singing at the Vienna Conservatory from 1854 to 1861, after which she moved to Paris and succeeded in making her salon one of the most important circles of musical life in the city. She taught at Cologne from 1865 to 1868, then at Vienna for a number of years, but ultimately settled in Paris. She published an *Ecole de Chant* and 24 books of *Vocalises*. In English appeared *Ten Singing Lessons* (1901). Among her pupils were Tremelli, Caroline Sulla, Emma Schuk-Proska, Gerster, Melba, Eames, Calvé, Sibyl Sanderson, and her own daughter Blanche, who afterward sang, especially in opera, in England and on the Continent. Consult the autobiographical *Marchesi and Music: Passages from the Life of a Famous Singing Teacher*, with introduction by Massenet (New York, 1897).

MARCHESI, POMPEO CAVALIERE (1789–1858). An Italian sculptor. He was born at Saltrio, near Milan, and studied at Rome under Canova. He was for many years professor of sculpture at the Academy of Milan. Some early and rather clumsily executed statues by him are in Como Cathedral, which also contains a relief of the "Death of St. Joseph," his latest and one of his most admired works. He contributed largely to the decoration of the Arch of Peace at Milan, the relief commemorating the "Battle of Leipzig" and "Drowning of Prince Poniatowsky" deserving special mention. His later works include the sitting statue of Goethe for the Frankfort Library, a statue of Emperor Francis I of Austria for Graz, and another for the Hofburg in Vienna. One of his largest but not most pleasing works is the colossal group for the church of San Carlo at Milan, in which is the figure of the famous "Mater Dolorosa." The excessive sentimentality which characterizes most of his religious compositions is particularly visible here. Much better is the sepulchral monument for Duke Emmanuel Philibert of Savoy (1843) in the Turin Cathedral.

MARCHESI, SALVATORE (1822–1908). A celebrated Italian barytone and singing master, born at Palermo. He was a nobleman, his full title being Cavaliere di Castrone, Marchese della Rajata. While studying law and philosophy at Palermo he also had his voice cultivated by Raimondi. In Milan he continued his musical studies under Lamperti and Fontana. Because of participation in the revolution of 1848 he had to flee, and came to America. His operatic début made in New York, he went to London for further study under García. After his marriage to Mathilde Graumann, who later became famous as Madame Marchesi, he and his wife appeared with great success in concert and opera in England and on the Continent. In 1854 both accepted positions at the Vienna Conservatory, but soon went to Paris. In 1865 they were called to the Cologne Conservatory, and in 1869 once more to Vienna. From 1881 to his death he resided in Paris. He wrote a number of successful songs, vocalises, and a *School for Singing*.

MARCHFELD, märK'fĕlt. A large plain on the north bank of the Danube, opposite Vienna. It is bounded on the east by the river March. It contains only a few villages. Because of the physical characteristics this has been a noted battlefield. Here Marcus Aurelius contended with the Marcomanni. In 1260 King Ottokar of Bohemia defeated Béla IV of Hungary on the Marchfeld. On the same plain in 1278 Ottokar was defeated by Rudolph of Hapsburg and slain. In modern times the most important battles fought on the Marchfeld were those of Aspern (q.v.) and Wagram (q.v.) in 1809.

MARCH FLY. Any one of the dipterous insects of the family Bibionidæ, so called because these flies are most common in the early spring. They are of medium size, rather thick-bodied and rather hairy, but they are weak fliers. The wings are frequently fuscous. More than 300 species are known. The larvæ feed upon excremental or vegetable substances and are supposed to attack the roots of growing grass. The larvæ of some species have been found on the surface of snow. One of the commonest species in the United States is the white-winged bibio (*Bibio albipennis*), which sometimes occurs in enormous numbers. The smallest forms belong to the genus *Scatopse* and breed in decaying animal and vegetable matter.

MARCHIENNE-AU-PONT, mär'shĕ'ĕn'ō'-pôN'. A town in the Province of Hainault, Belgium, 2 miles west of Charleroi, on the Sambre River (Map: Belgium, C 4). It is an important coal-mining centre, has an industrial school and manufactures of iron, machinery, and glass. Pop., 1900, 18,461; 1910, 21,635.

MARCH'ING. General Principles. A successful march, whether in peace or war, is one that places the troops at their destination at the proper moment and in the best possible condition. In war marches are of daily occurrence, and success depends in a great measure upon the skill with which they are conducted. Good marching is secured by careful preparation, strict discipline, and the due observance of march sanitation. While conforming to other requirements, marches are conducted so as to reduce to a minimum the hardships of the troops. When possible ample notice is given so that preparations can be made without haste. The march is habitually at route order. Troops are informed of the length of halts so that they can take full advantage of the same. The men are not kept under arms longer than necessary, nor required to carry heavy burdens when transportation is available. Special care is paid to the feet of the men and to the hoofs and backs of animals. In prolonged marches at least one day in seven should be a day of rest. A forced march is never undertaken unless the situation requires it. As a rule troops on the march pay no compliments; individuals salute

when they address, or are addressed by, a superior officer. The conduct of a march (forming the column or columns, distribution of troops, start, rate, length of march, etc.) is controlled by the situation and object to be accomplished. *Forming the Column.*—To form the column a "march order" is issued by the superior commander. This order states the object of the march, gives the distribution of the troops, order of march of the main body, and the manner of forming the column. In drafting such orders the road space and rate of march of the different fractions of the command and their distances from the *initial point* must be considered. With foot troops and cavalry marching four abreast, artillery and trains in single column of carriages, the following may be assumed for approximate calculations: two men per yard for foot troops, one man per yard for each mounted man, 20 yards for each gun, caisson, or wagon, and 12 yards for each auto truck. *Distribution of Troops.*—The order of march of a column is controlled mainly (1) by tactical considerations, which are paramount in the presence of the enemy, and (2) by the rule requiring the hardships of troops to be reduced to a minimum. During an advance the order of march of a column is generally as follows, the necessary security being provided: combatant troops (with combat trains): 1, cavalry and horse artillery; 2, infantry and light or mountain artillery; 3, engineers and signal troops; 4, trains, etc. During a retreat this order of march is reversed. A detachment of engineers marches near the head to repair bridges, etc. Infantry usually marches in column of squads, column of twos when necessary; cavalry in column of fours on good roads, otherwise in column of twos; artillery in section or double-section column, depending on the width of the road. *The Start.*—When practicable, marches begin in the morning, ample time being allowed for the men to breakfast, animals to feed, and the animals and wagons to be packed. Foot troops do not start before broad daylight; mounted troops, when practicable, about an hour after broad daylight. Too early a start is inadvisable, as both men and animals rest better in the early morning hours.

Rate and Length of Marches. The rate of march of a mixed command is regulated by that of the foot troops. For *infantry* the rate prescribed for *drill* is 100 yards a minute or 3.4 miles an hour; *on the road* the maximum to be counted on is 88 yards a minute or 3 miles an hour; including halts this rate is reduced to 2½ to 2¾ miles. The rate of infantry columns under average road conditions may be assumed at 2¼ to 2½ miles per hour. The average march of infantry is 15 miles a day; large bodies, 12 miles. Small bodies under favorable conditions may average 20 miles. For *cavalry* the *drill* rate is: walk, 4 miles; trot, 8 miles; gallop, 12 miles per hour. The average walk of a horse is at the rate of a mile in 16 minutes, or 3¾ miles an hour; the average trot a mile in 8 minutes, or 7½ miles an hour. *In the field* the usual gait is the walk of 3¾ miles per hour; including halts, 3¼ to 3½ miles per hour. The average march of cavalry, after men and animals are hardened, is 25 miles a day.

The daily march of *field artillery* is the same as that of the command of which it forms a part; if alone, it covers from 15 to 20 miles.

The rate of a *wagon train* under average conditions in long columns is about 2 miles per hour, including halts. Small trains may make 2½ miles. The daily march is the same as infantry.

The average load of a *pack mule* is 250 pounds, and thus loaded a pack train can travel 20 to 25 miles a day over ordinary roads; over rough country, 10 to 15 miles. The rate of auto trucks varies with the road and truck. *Halts.*—As a rule infantry halts 15 minutes after the first three-quarter-hour march; thereafter 10 minutes every hour. Cavalry 5 minutes every hour. Artillery from 5 to 10 minutes.

Marches may be classified as follows: 1. *Marches in peace,* which include changing station and practice marches. 2. *Marches in campaign,* which include concentration marches, marches in the presence of the enemy, forced marches, and night marches. In *changing station* marches are conducted almost solely with reference to the comfort of men and animals and facility of supply and camping, as such marches do not involve tactical considerations. *Practice marches* have for their purpose hardening the men and animals and instructing officers and men in campaign duties. *Concentration marches* assemble at a certain time and place bodies of troops from different localities. Computation of time and road space is important. *Marches in the presence of the enemy* are controlled solely by tactical considerations, and require the use of certain troops, for information and security, disposed as advance, flank, and rear guards, for the protection of the main body of troops. If the command is a division the following is a not unusual disposition: *advance guard,* consisting of one brigade of infantry, all of the divisional cavalry, one battalion of artillery, one company of engineers, a detachment of signal troops, and a detachment of the sanitary train. Following this, with a distance of from ½ to 1 mile, is the *main body,* in order of march as follows: one regiment infantry, one battalion of artillery, a regiment of artillery, two brigades infantry (less one regiment), engineers, signal troops, artillery combat trains, trains. A division at war strength consists of 22,000 men, 7500 animals, and 900 vehicles. With its field trains, closed up without distance, a division will occupy about 12 miles of road.

Forced Marches are not made unless absolutely necessary, as they seriously impair the fighting power of the best troops. A maximum day's march of infantry and trains is about 28 to 30 miles. Such a march should not be prolonged more than 36 hours. Under favorable conditions cavalry and field artillery may march at a rate of 50 miles in 24 hours for three or four days. Under very favorable conditions a *single* march of 100 miles can be made in from 24 to 30 hours.

Night Marches are sometimes made in hot weather, but usually to surprise the enemy or to secure a favorable position to attack at night or at dawn. Special precautions must be taken to keep the units in touch and in the proper roads or trails. If secrecy is required special instructions are given with regard to smoking, lights, talking, etc. Cavalry follows infantry; the artillery is in rear with a special infantry escort.

French infantry has always had a reputation for rapid marching. In June, 1914, the 166th regiment of (fortress) infantry marched 55.8 miles in 36 hours without having a man drop out. During former Indian campaigns troops

and squadrons of United States cavalry were credited on their records, on more than one occasion, with a distance of 110 miles in 24 hours. Consult *Field Service Regulations, United States Army* (Washington, 1914).

MARCHING THROUGH GEORGIA. A widely popular ballad of the Civil War, beginning "Bring the good old bugle, boys." It commemorates Sherman's famous march to the sea and was written by H. C. Work soon after the march commenced, on Nov. 16, 1864.

MARCHIONESS, märʹshŭn-ĕs, THE. In Dickens's *Old Curiosity Shop*, a small servant to Sampson Brass, and a friend of Dick Swiveller.

MARCHMONT, märchʹmont, ARTHUR WILLIAMS (1852–). An English novelist, born at Southgate, Middlesex, and educated privately and at Pembroke College, Oxford. In 1888 he entered Lincoln's Inn. Up to 1894 he devoted himself to journalism in London and the provinces, editing at one time the *North Eastern Daily Gazette* and later the *Lancashire Daily Post* and contributing constantly to reviews and magazines. In 1894 journalism was abandoned for fiction, in the production of which this author was prolific; witness, among others, the novels: *Isa* (1887); *By Right of Sword* (1897), dramatized, and produced in America (1902); *Sarita the Carlist* (1902); *The Queen's Advocate* (1904); *The Man who was Dead* (1907); *An Imperial Marriage* (1909); *In the Name of the People* (1911); *The Mystery of Eagrave Square* (1912); *When Love Called* (1913); *The Heir to the Throne* (1914).

MARCIANISE, märʹchâ-nēʹzâ. A town in the Province of Caserta, Italy, 18 miles by rail from Naples, in a low, unhealthful plain, where are several small lakes. Weaving of flax and hemp and the raising of fruits and grain constitute the principal industries. Pop. (commune), 1901, 12,785; 1911, 13,465.

MARCIL, märʹsēlʹ, CHARLES (1860–). A Canadian journalist and statesman. He was born at Ste. Scholastique, Province of Quebec, was educated at Ottawa College, and in 1879–81 was on the staff of the Montreal *Gazette*. He was with the Montreal *Herald* (1882–86), the Montreal *Post* (1886–96), and afterward with *La Patrie* and the *Star*, of the same city. He was an unsuccessful Liberal candidate for the Quebec Legislative Assembly (1897), but was elected to the House of Commons for Bonaventure in 1900. He became Deputy Speaker of the House in 1905, and was Speaker thereof in 1909–11. In 1911 he was appointed a member of the King's Privy Council for Canada, and in the same year was made an honorary vice president of the Universal Races Congress at London, England. He acquired a wide reputation as a public speaker.

MARCION, märʹshon. A second-century Christian, classed among the heretics. He was born in Sinope, Pontus, and died after 160. About the year 140 he came to Rome, where he fell under the influence of the Syrian Cerdo (see CERDONIANS), from whom his Gnostic ideas were perhaps derived, and here he founded his church. He afterward traveled through the East, visiting Rome again in the episcopate of Anicetus (154–165). Nothing is known of his later life. His disciples, chief among whom was Apelles, continued his work, and Marcionite churches were soon to be found scattered over north Africa, Gaul, Asia Minor, and Egypt.

It is said that Polycarp (q.v.) once met Marcion in the streets of Rome and saluted him as "the first-born of Satan." In this he gave expression to the general sentiment of the Church, for Marcion was attacked by almost every orthodox writer from Justin onward. Yet Marcion regarded himself in the light of a reformer. He believed that Christianity marked an essentially new departure, but that it had already become corrupted through the admixture of Jewish elements. These must be purged out. For him Paul was the only true Apostle, because he alone thoroughly abjured Judaism. These principles appear in Marcion's Scripture canon—the earliest Christian collection known—which embraced one Gospel (Luke, without the story of the infancy, which was "Jewish") and 10 of Paul's Epistles (omitting those of Timothy and Titus). Church writers accused him, with apparent justice, of "mutilating" the Scriptures. His own chief work, entitled *Antitheses*, set forth the alleged contradictions between Law and Gospel. The Creator of the Old Testament was represented as a cruel and vindictive being, wholly different from the God of love revealed through Christ. Marcion's Christology was docetic, i.e., he taught that Christ suffered only in appearance, for neither suffering nor a material body could be supposed of the Divine. (See DOCETÆ.) Since matter was regarded as evil, his ethics resulted in a severe asceticism. His Gnostic tendency appears in the dualistic tenet that man's body cannot be saved, only his spirit, which is the opposite of matter. This was a striking departure from the common Christian belief. An attempt has recently been made to prove that the old Roman symbol, which lies at the basis of the Apostles' Creed, was formed to combat Marcion's Gnosticism. The Marcionite church was completely organized, having its clergy, its rites, and its Scriptures. The sacrament of baptism was administered much as in the orthodox Church, but in the Eucharist water was substituted for wine. In the East Marcionite churches are found as late as the sixth century, but in the West they disappeared earlier, being absorbed by the more virile Manichæans. (See MANICHÆISM.) Their downfall was due in part to ecclesiastical opposition and in part to hostile legislation under Christian emperors from Constantine onward. In the persecutions through which they passed not a few Marcionites suffered a martyr's death, and the property of their churches was declared forfeited to the Catholic church. Consult, for information as to the surviving fragments of Marcion's works, C. T. Cruttwell, *Literary History of Early Christianity* (London, 1893), and Gustav Krüger, *History of Early Christian Literature* (New York, 1897). Among the sources, consult the interesting work of Tertullian, *Against Marcion*, translated in *The Ante-Nicene Fathers*, vol. iii (New York, 1905). In general, consult: Adolf Harnack, *History of Dogma*, vol. i (Boston, 1894), and Wace and Piercy (eds.), *Dictionary of Christian Biography and Literature* (ib., 1911).

MARCKE, EMILE VAN. See VAN MARCKE, EMILE.

MARCKS, ERICH (1861–). A German historian, born in Magdeburg and educated at the Gymnasium there and in the universities of Strassburg, Berlin, and Bonn and in Paris and London. He was docent at Berlin (1887–92) and became professor of modern history at Freiburg (1892), Leipzig (1894), Heidelberg (1901),

Hamburg (1907), and Munich (1913). At Leipzig he was an editor of *Leipziger Studien aus dem Gebiet der Geschichte.* With the exception of an incomplete biography of Coligny (1892), a study of Queen Elizabeth of England (1897), and some local historical works, Marcks's published books deal with modern personages and problems, especially in Germany and England. They include: *Kaiser Wilhelm I.* (1897; 7th ed., 1910); estimates of Ludwig Häusser (1903) and of Treitschke (1906); several volumes on Bismarck, notably the first volume of a biography (1909); *Deutschland und England* (1900; also in English as *England and Germany,* 1900); *Die imperialistische Ideen in der Gegenwart* (1903); *Biographical Essays* (1905–08); *Einheitlichkeit der englischen Auslandspolitik* (1910); the popular *Männer und Zeiten* (1911); *Historische und akademische Eindrücke aus Nordamerika* (1913).

MARCO BOZZARIS. A well-known poem by Fitz-Greene Halleck on the death of the Greek patriot Bozzaris (q.v.). It appeared in the *New York Review* in 1825.

MARCO DA OGGIONE, mär'kô dä ŏd-jō'nâ. An Italian painter. See OGGIONE, MARCO DA.

MAR'COMAN'NI (Lat., from OHG. **Markaman,* border man, from *marca,* border + *man,* man). An ancient German people who, in the time of Cæsar, lived along the banks of the Rhine, but afterward, as appears from Tacitus and Strabo, settled in Bohemia, from which they expelled the Boii. Their King, Maroboduus, entered into an alliance with the tribes living around them to defend Germany against the Romans. The combined forces of the alliance numbered 70,000 men, and the Emperor Tiberius signed a treaty with them in 6 A.D.; but the Marcomannic alliance was defeated 11 years later by the Cherusci and their allies; and in 19 the Gothic Catualda drove Maroboduus from the throne and himself usurped the sovereignty. But he was soon overthrown and the native dynasty established, under whose rule the Marcomanni extended their territory up to the Danube, till their encroachments alarmed the Romans, who attacked them in the time of Domitian. This war, which subsided for a time in the reigns of Trajan and Hadrian, broke out again under Marcus Aurelius, and was carried on with bitterness from 166 to 180, when it was ended by the Peace of Commodus. The Marcomanni continued to make raids into the provinces of Noricum and Rhætia, and in 270 invaded Italy as far as Ancona. In the fourth century their name fades away from history; it has been held that the Marcomanni were merged with the Boiarii or Baiouarii, later known as the Bavarians. See BAVARIA, *History.*

MARCONI, mär-kō'nē, GUGLIELMO (1874–). An Italian electrical engineer, inventor of the wireless telegraph. He was born of an Italian father and an Irish mother at Bologna, April 25, 1874. After study under Rosa at Leghorn he entered the University of Bologna. There he came in contact with Professor Righi, who had long been interested in the nature of the Hertzian waves. The young man saw the possibilities of using these waves for the transmission of messages, improved the coherers of Onesti and Branly, made several successful experiments at Griffone in 1895, and in 1896, having failed to interest the Italian government in his behalf, went to England, where his plans were laid before the post-office authorities. There his project was well received and successful tests were made between Penarth and Wiston. Sir William Preece, engineer in chief of the British telegraph system, who had himself made experiments in 1893 and 1894, took up the new method, tested it, and declared it successful, but limited in application. Almost immediately afterward tests of the Marconi method were made by the Italian Ministry of Marine at Spezzia. In 1897 the Marconi Wireless Telegraph Company, Limited, was founded and two years later signals were successfully exchanged across the English Channel, and the system was established pretty generally in the British and Italian navies, although at the time some insular jealousy was aroused in England that the scheme of a foreigner should be adopted in view of Preece's early study of the problem.

In December, 1901, Marconi sent signals to Newfoundland from his station at Poldhu on the coast of Cornwall, and on Dec. 19, 1902, he succeeded in transmitting messages between Poldhu and the permanent station erected at Glace Bay, Nova Scotia, this being the first occasion of the transatlantic transmission of wireless messages. Previously, however, in February, 1902, Marconi had been able to maintain communication between the transatlantic steamship *Philadelphia* and Poldhu for a distance of 2099 miles in the case of test letter signals and for 1551 miles for actual messages. These experiments proved the possibility of constant long-distance communication between vessels at sea and the mainland, as well as the general advance of the art. By 1903 Marconi was able to begin the transmission of news messages between America and Great Britain for the London *Times,* and during the same year continuous communication was maintained between land and the steamship *Lucania* during her entire crossing, so that news messages could be supplied to the vessel. Similar communication was maintained between Poldhu and the British warship *Duncan.* By 1904 over-sea transmission was developed to a point of efficiency and reliability, so that a daily newspaper containing the news of both Europe and America could be published on the vessels of the Cunard line. In 1907 a limited commercial service across the Atlantic for public use was established, and from that time its use increased without, however, making any serious inroads into the business of the submarine telegraphs. In the meantime his experimental work continued and he invented a directive system of wireless, as well as a new persistent wave system, which was brought out in 1906. The underlying physical considerations were studied and apparatus—notably new detectors and generators giving the form of wave desired—was evolved which increased the efficiency of the transmission and reception of messages.

About 1910 Marconi brought out a new valve receiver and a new electrolytic detector. He also developed about this time a duplex system by which the sending and receiving devices are rendered operative and inoperative alternately in rapid succession, avoiding synchronism at the two stations. By this time the Marconi Company had developed its transatlantic service on a practical basis, and its station in Argentina was able to receive signals from Nova Scotia and from Ireland, a distance of 5600 miles, which was extended to other South American stations, making an aggregate of 7000 miles.

The promotion of the Marconi companies both

in Great Britain and in the United States was not free from unfavorable comment. In fact, in 1912 charges were made that Premier Asquith, Chancellor Lloyd George, and other members of the British cabinet had corruptly favored the Marconi Wireless Telegraph Company and had benefited through speculation in its stock. The subject was investigated by a parliamentary committee and in May, 1913, Marconi was placed on the stand. He replied vigorously to the various charges and insinuations both technical and commercial. No general blame attached to him in this connection and the cabinet members were regarded as having been only indiscreet, but for the time being the incident was conspicuous in British politics.

On May 1, 1913, an advisory committee of Parliament reported that the Marconi system alone was certainly capable of meeting the requirements for the Imperial wireless chain, but that the company need not be employed as contractors for all the work, and that it was not necessary to employ exclusively the apparatus of the company then in use, as further developments might be reasonably expected. In the meantime the business of the Marconi system had developed broadly and it was employed generally on the vessels of the British merchant marine and at various colonial stations, as well as throughout the United Kingdom. When Italy entered the European War (June, 1915), Marconi took charge of the wireless for his government. He was decorated with the Russian Order of St. Anne, the Italian Order of St. Maurice and St. Lazarus, and with the Grand Cross of the Crown of Italy; and he received the freedom of the city of Rome (1903). In 1904 Oxford and Glasgow gave him honorary degrees; he became a Chevalier of the Civil Order of Savoy (1905); received the Grand Cross of the Order of Alphonso XII; and with Ferdinand Braun shared the Nobel prize for physics (1909). He received the British G.C.V.O. in 1914 and in the next year was nominated a Senator of the Kingdom of Italy. See WIRELESS TELEGRAPHY.

MARCO POLO. See POLO, MARCO.

MARCOS, FRAY. See NIZA, MARCOS.

MARCOT, mär'kō', JEAN BAPTISTE ANTOINE MARCELIN, BARON DE (1782–1854). A French soldier, born at La Rivière, Corrèze. He left the Collège de Sorèze in 1799; served in the Republican army in Italy under his father, Gen. Jean Antoine Marcot; and was rapidly promoted until he became aid-de-camp to Marshal Augereau in the Russian and Prussian campaigns of 1806–07. He was with Lannes and Massena in the Peninsular War, and in 1812–13 was colonel of light cavalry in the Russian and German campaigns. During the Hundred Days he served as a general of brigade under Napoleon, and for this was exiled upon the Second Restoration. He returned to France in 1819; became a maréchal de camp in 1830 and a lieutenant general in 1836; was made a peer of France in 1845; and retired in 1848.

MARCOU, mär'kōō', JULES (1824–98). A French geologist, born in Salins in the Department of Jura. He was educated in Paris and, after completing his course at the Collège St. Louis, made geological excursions through the Alps. In 1846 he was attached to the mineralogical department of the Sorbonne and conducted geological investigations in various parts of Europe and from 1848 to 1850 in the United States and Canada. In 1853–54 he was employed by the United States government in surveying the Rocky Mountains, but he returned in 1855 to Europe to accept the chair of paleontological geology in the Polytechnic School of Zurich. In 1860 he again visited the United States and was engaged with Prof. Louis Agassiz in paleontological researches, and afterward entered the government service. He died at Cambridge, Mass. He published two fine geological maps, one of the United States in 1853, another of the world in 1862 (2d ed., 1875). Marcou became best known, perhaps, for his *Recherches géologique sur le Jura salinois* (1848) and *The Taconic System and its Position in Stratigraphic Geology* (1885). He published many scientific papers besides the following more extended works: *Geology of North America* (1858); *De la science en France* (1869); *Origin of the Name America* (1875); *First Discoveries of California, and the Origin of its Name* (1878).

MARCOUX, mär'kōō', JOSEPH (c.1770–1855). A Canadian missionary. He was born in Canada, was educated for the Catholic priesthood, after his ordination was sent as a missionary to the various Iroquois tribes, and in 1819 settled among them at Caughnawaga, on the south shore of the St. Lawrence River. His persevering labors resulted in imparting a considerable degree of civilization to the Indians, and he built a schoolhouse and church at Caughnawaga for their benefit. He became a master of the Iroquois language, of which he wrote a grammar and dictionaries. He also published in that language: *The Life of Christ; Letters to Iroquois Chiefs* (1848–49); *Prayer Book* (1852); *Catechism* (1854).

MARCOUX, VANNI (1879–). A French basso, born at Turin, Italy. Having received a liberal education, he was admitted to the bar and began to practice law; but, as his musical talent showed itself early, he also devoted much time to the serious cultivation of music, studying with Collino of Turin and later with Boyer at Paris. At his début in Paris he immediately attracted attention because of his striking and quite exceptional power of characterization. From 1905 to 1912 he appeared every season at Covent Garden in London. In 1912 he became a regular member of the Boston Opera Company. His repertory is very extensive, including almost all the important rôles in older and modern French and Italian operas. He created the title rôle in Massenet's *Don Quichotte.*

MAR'CUS, SAINT. Bishop of Rome, or Pope, Jan. 18 to Oct. 7, 336. He was a native of Rome and is said to have had a share in the building of two churches, one of which still remains as San Marco, although frequently altered and repaired.

MAR'CUS AURE'LIUS ANTONI'NUS. See AURELIUS.

MARCUS AURELIUS CLAUDIUS. See CLAUDIUS II.

MARCUS AURELIUS OLYMPIUS NEMESIANUS. See NEMESIANUS.

MAR'CY, MOUNT. The loftiest of the Adirondack Mountains and the highest point in New York State, situated in Essex Co., 10 miles south of Lake Placid (Map: New York, G 2). It is 5344 feet high and was known to the Indians as *Tahawus,* the "cloud divider." Within a few miles of it are many other famous Adirondack peaks, such as McIntyre Mountain (5112 feet), Mount Skylight (4920 feet), Mount Hay-

stack (4918 feet), Basin Mountain (4825 feet), Mount Redfield (4606 feet), and Saddleback Mountain (4530 feet).

MARCY, HENRY ORLANDO (1837–). An American surgeon, born at Otis, Mass. In 1863 he volunteered in the Union army as assistant surgeon. He was assistant in chemistry at Harvard after the close of the war; then studied surgery at Berlin (1869) and in England under Lister, and devoted himself especially to the bacteriology of wounds. He was president of the American Academy of Medicine in 1884, and of the American Medical Association in 1892. Marcy wrote *Best Methods of Operative Wound Treatment* (1882), *The Perineum: Its Anatomy and Surgical Treatment* (1889), and the very valuable work *Anatomy and Surgical Treatment of Hernia* (1892).

MARCY, RANDOLPH BARNES (1812–87). An American soldier, born at Greenwich, Mass. He graduated at West Point in 1832. He was assigned to the United States regular infantry, and was chiefly engaged against the Indians until the outbreak of the Mexican War, for his services in which he was promoted captain (1846). Subsequently he was engaged in explorations in the Red River country (1852), in operations against the Seminoles (1857), and in the Utah expedition of 1857–58. He was appointed paymaster, with the rank of major, in 1859, and inspector general, with the rank of colonel, in 1861. During the Civil War he was chief of staff to General McClellan (his son-in-law), in West Virginia, on the Peninsula, and in Maryland; and in 1865 was brevetted major general in the regular army for faithful and meritorious services during the war. In 1869, after performing inspection service in a number of military departments and as inspector general of the military division of Missouri, he was appointed inspector general of the United States army, with the rank of brigadier general, and was president of the Army Regulation Board until Jan. 1, 1881, when he retired from active service. He contributed largely to magazines, and published: *Exploration of the Red River* (1853); *The Prairie Traveler* (1859); *Thirty Years of Army Life on the Border* (1866); *Border Reminiscences* (1871).

MARCY, WILLIAM LEARNED (1786–1857). An American statesman, born Dec. 12, 1786, at Southbridge, Mass. He graduated at Brown University in 1808 and entered upon the practice of law at Troy, N. Y., in 1810. At the opening of the War of 1812 he entered the volunteer service as a lieutenant, and on Oct. 22, 1812, led a successful attack upon St. Regis, a Canadian post. For this he was soon afterward promoted to be captain. Before the end of the war he returned to Troy, where he was active as a newspaper writer and politician, supporting the Tompkins faction against the Clintonians, and allying himself with the "Albany Regency" (q.v.). After filling several minor offices, and after a service of six years as Comptroller of the State, he was made an associate justice of the New York Supreme Court in 1829. In 1831 he was elected Senator of the United States by the Democratic party, but resigned the office upon being chosen Governor of New York in 1832. In the Senate he served as chairman of the Judiciary Committee, and gained distinction by his defense of Martin Van Buren against the attacks of Henry Clay. In the course of a speech on the question of appointment to office he upheld the right of the President to bestow the offices upon his political supporters, saying, "We can see nothing wrong in the maxim that to the victors belong the spoils," thus associating his name in history with the spoils system. He was, however, much more than a spoilsman: "he was a hard-headed, aggressive Democratic partisan, with none of the popular power of his younger rival, Douglas, but with much more caution and political shrewdness." He served as Governor for three terms, and was nominated for a fourth term in 1838, but was defeated by William H. Seward (q.v.). He was then appointed a commissioner on claims against the Mexican government, serving in that capacity until 1842. In 1845 he became the Secretary of War in President Polk's cabinet. His ability in this position was severely tested by the Mexican War. In the presidential campaign of 1848 he supported General Cass. The last and most important public station in which he served was that of Secretary of State during Pierce's administration (1853–57). Among the foreign complications or treaties which demanded action on his part in this capacity were the settling of the Mexican boundary, the Canadian reciprocity treaty, Commodore Perry's negotiations with Japan, the British fishery dispute, the Ostend Conference, and the so-called Koszta Affair (q.v.), which added much to his popularity. In these and in other matters Marcy successfully defended the interests of his country and displayed the qualities of a trained statesman and accomplished diplomat. One of his notable diplomatic papers was his instructions to the American ministers abroad to appear at court "like Franklin in the simple costume of an American citizen" when this could be done without detriment to the interests of the United States. Marcy's death occurred at Ballston Spa, N. Y., but a few months after the expiration of his term of office. He is entitled to high rank as a statesman, while as a shrewd politician he was at his time almost unsurpassed. Consult: J. S. Jenkins, *Lives of the Governors of the State of New York* (Auburn, 1851); J. F. Rhodes, *History of the United States from the Compromise of 1850*, vols. i and ii (New York, 1892); S. Webster, "Mr. Marcy, the Cuban Question, and the Ostend Manifesto" in vol. iii of the *Political Science Quarterly* (ib., 1893); De A. S. Alexander, *Political History of the State of New York* (ib., 1906).

MARCZALI, mär'tsä-lē, HENRY (1856–). A Hungarian historian, born in Marczali, County Somogy. He was educated at the University of Budapest and, after studying in Berlin, Paris, and London, became lecturer (1880) and professor (1895) of the Historical Seminary of the University at Budapest. He contributed to the great millennial history (in Magyar) of Hungary (1895–1901), edited by Szilagyi; and himself published: *Ungarns Geschichtsquellen* (1882–88); *Hungary in the Times of Joseph II* (1891); *Mary Theresia* (1900–04); *Enchiridion Fontium Historiæ Hungariorum* (1902), in Latin and Magyar; *Hungary in the Eighteenth Century* (1910); *Ungarische Verfassungsgeschichte* (1910); *Ungarisches Verfassungsrecht* (1911).

MARDI GRAS, mär'dē' grä'. See CARNIVAL.

MARDIN, mär-dēn'. The capital of a sanjak in the Vilayet of Diarbekir in north Mesopotamia, Asiatic Turkey (Map: Turkey in Asia, D 3). It is strikingly situated on the steep slopes of a conical hill 5000 feet above sea

level, crowned by the ruins of an old castle. It has a number of mosques, bazars, and baths, as well as Christian churches and monasteries, and is the seat of an important American mission with a church and a school. It is also the seat of the Jacobite Patriarch of Antioch, who occupies an ancient and interesting monastery not far from the city. It is also the headquarters of a Roman Catholic archbishop. Pop., about 25,000, of whom less than one-half are Moslem Kurds; the rest are Christians of various Eastern sects.

MARDO'NIUS (Lat., from Gk. Μαρδόνιος, *Mardonios*, from OPers. *Marduniya*). A Persian general, son of Gobryas and son-in-law of Darius Hystaspes. In 492 B.C. he commanded an expedition sent out by Darius to punish the Eretrians and the Athenians for the aid they had given to the Ionians. (See GREECE, *Ancient History.*) Near Mount Athos, however, his fleet was destroyed by a storm, and when, shortly afterward, his land forces were cut to pieces, he returned to Asia and was relieved of his command by Darius. On the accession of Xerxes he was restored to favor and was appointed one of the generals of the expedition against Greece. After the battle of Salamis (480 B.C.) he was left by Xerxes with 300,000 men to conquer Greece. In the following year, 479 B.C., he was defeated and probably slain in the battle of Platæa, by the Greeks under Pausanias. Consult Herodotus, vi, 43–45, 94; vii, 5, 9, 82; viii, 100 et seq., 113 et seq., 133–144; ix, 1–4, 12–15, 38–65, and the editors on these passages. Consult also the standard histories of Greece.

MAR'DUK. See MERODACH.

MARDUK, mär'dŏŏk. The chief god of Babylon. An older form of the name seems to have been *Maruduk*. He was manifestly a Sumerian divinity. Since he is represented as a son of Ea, the god of Eridu, it is possible that a dynasty of Eridu established itself in Babylon between the dynasty of Uruk and Ur Engur of Ur, with Marduk as its chief god. For some centuries previous to this the city probably had a prevailingly Akkadian population, as the Semitic god Nabu appears to have established for himself so strong a position that it had to be recognized even in later times. With the growth of Babylon the importance of its great god increased. When Hammurapi's conquest of Larsa, made in 2094 B.C., made it the capital of all Babylonia, Marduk naturally tended to become the head of the Babylonian pantheon, and he was greeted as "King of the gods," "King of heaven and earth," "Lord of lords, king of kings." The Semitic population also seems to have called him Bel, he is addressed as Bel at the end of the Code of Hammurapi and elsewhere, and hence the Hebrews also spoke of him as Bel or Bel Merodach (q.v.). In Eridu Marduk seems to have been a sun god, and it was probably there that the myth developed according to which he became the creator of the present world and of mankind after his conquest of the chaos monster Tiamat. This myth spread from Babylon to Assyria and even to Syria. In the city of Assur this mighty deed is ascribed to Assur in the time of Sennacherib. Among the Hebrews it is Yahwe who violates Rahab, overcomes Tehom, punishes Leviathan, and creates the world. Later the struggle is transferred to Michael and the Dragon and St. George and the Dragon. In the astral system of the Babylonian sages, which identified the chief deities with the great stars, Marduk was thought of as connected with the planet Jupiter. The Marduk of Babylon therefore seems to have lost to some extent the solar character that Marduk of Eridu possessed. The spiritual nature ascribed to him as lord of gods and men comes to view in many hymns. In one of these the worshiper prays: "Put truth into my mouth, let good thoughts be in my heart." The great temple of Marduk in Babylon was known as E-sag-ila (the lofty house), and to him was also dedicated the temple tower, called E-temen-an-ki (the house of the foundation of heaven and earth). Both have been laid bare by the excavations of the Deutsche Orientgesellschaft. (See BABYLON; BABEL, TOWER OF.) Consult: Zimmern, in Schrader, *Die Keilinschriften und das alte Testament* (3d ed., Berlin, 1902); Jastrow, *Die Religion Babyloniens und Assyriens* (Giessen, 1902–12); Jeremias, *Das alte Testament im Lichte des alten Orients* (Leipzig, 1906); Rogers, *The Religion of Babylonia and Assyria* (London, 1908); Condamin, in Huby, *Christus: Manuel d'histoire des religions* (Paris, 1913).

MARE AU DIABLE, mär ô dyâ'bl', LA (the devil's pool). A romance by George Sand (1846).

MARÉCHAL, mà-rā'shàl', PIERRE SYLVAIN (1750–1803). A French atheistic writer, born in Paris. He studied law, but became sublibrarian at the Collège Mazarin and held that position until 1784. His parody on the Psalms (1784) caused his dismissal, and four years afterward his *Almanach des honnêtes gens*, a sort of calendar, in which the names of celebrated men were substituted for those of saints, earned him four months in prison. His other works include: *Les voyages de Pythagore* (1799) and a *Dictionnaire des athées anciens et modernes* (1800), in which he was assisted by Lalande, the astronomer.

MARE CLAUSUM, mā'rē klą'sŭm *or* mä'rā klou'sum (Lat., closed sea). In international law, a body of water, as a bay, a sea, or a great lake, which is under the exclusive jurisdiction of a single power. Usually such a body of water is *mare clausum* when its shores are exclusively possessed by a single power, as is the case with Lake Michigan, which lies wholly within the territory of the United States, and as was formerly the case with the Black Sea before Russia had wrested its northern and eastern shores from Turkey. The doctrine that a nation may by appropriation convert a portion of the open sea into a *mare clausum* was formerly maintained by Great Britain with respect to the Narrow Seas, the North Sea, and the Atlantic from Norway to Spain, by Russia with respect to Bering Sea within 100 miles of the Alaskan and Siberian coasts, and by Sweden and Denmark with respect to the Baltic and Arctic seas, but these pretensions were always disputed and have long since been abandoned. See HIGH SEAS; BERING SEA CONTROVERSY.

MAREE, mà-rē', LOCH. A beautiful lake in Ross and Cromartyshire, northwestern Scotland (Map: Scotland, C 2). It is about 12 miles long by 2 miles wide, and very deep. It is studded with islets, and surrounded by mountains 3000 feet high. It drains by the Ewe over an artificial dam to Loch Ewe.

MAREI'A, or **MA'REO'TIS** (Lat., from Gk. Μαρεώτις). A salt lake of the Nile delta in the north of Egypt, separated from the Mediterranean by a narrow isthmus of sand on which

is situated the city of Alexandria (Map: Egypt, E 1). Its modern name is Birket or Behêret Maryut. It is some 12 miles long, with width of about the same extent, but in antiquity it is said to have been somewhat larger. The surrounding district was anciently very fruitful and the Mareotic wine had a high reputation. During the Middle Ages the lake dried up because the canals flowing into it from the Nile were choked with sand. In 1801 the English, during the siege of Alexandria, cut through the isthmus west of Abukir, allowed the sea to flow in, and destroyed 150 villages. Mehemet Ali tried to reclaim the resulting salt marsh (6 to 10 feet deep), but with little success. The water of the lake is used for the manufacture of salt by evaporation. Consult Stanley Lane-Poole, *History of Egypt in the Middle Ages* (New York, 1905), and Baedeker, *Egypt* (6th ed., Leipzig, 1908).

MARE ISLAND. An island, about 2 miles long, in Solano Co., Cal., at the east end of the Bay of San Pablo and opposite the city of Vallejo, from which it is separated by a strait half a mile wide. It has ferry connection with that city. On its west shore is situated the Pacific station of the United States navy, its yard being one of the largest in the country. It has a naval arsenal, sectional floating dock, an observatory, and a lighthouse of the first order.

MARE LIBYCUM. See LIBYAN SEA.

MAREMMA, mȧ-rĕm'mȧ (corruption of *Marittima*, "situated on the sea"). A vast marshy region of Tuscany, west Italy, extending along the coast, from the mouth of the Cecina to Orbetello and 15 to 20 miles inland (Map: Italy, C 3). In ancient times these districts were drained, cultivated, and inhabited, but the neglect of watercourses has brought about their malarial condition, which is, however, being again improved, since Leopold of Tuscany in the early part of the nineteenth century began drainage canals. The railway line along the coast has greatly contributed to the improvement of the district.

MARENCO, mȧ-rĕn'kō, CARLO, COUNT (1800–46). An Italian Romantic dramatist, born at Cassolnuovo, resident and mayor of Ceva, Piedmont. He was the author of some 15 tragedies, dealing with mediæval subjects and revealing the influence of Alfieri, and more directly that of Pellico, as well as a tendency to adopt the methods of the historical drama of Romanticism. The most popular of his plays were *Buondelmonte*, *Pia de' Tolomei*, and *Arnaldo da Brescia*. Of these the *Pia* still enjoys some vogue, after being immensely popular in its own day, interpreted by Adelaide Ristori. The *Arnaldo* was overshadowed by Nicolini's famous tragedy of the same title. Consult the edition of his *Tragedie* (Turin, 1837–44); the *Tragedie inedite, etc.* (Florence, 1856); Orlandi, *Il teatro di C. M.* (Florence, 1900).

MARENCO, LEOPOLDO, COUNT (1831–99). An Italian dramatist, born at Ceva, Piedmont. He was the son of Carlo Marenco (q.v.) and wrote his play *Isabella Orsini* when only 20 years old. In 1871 he scored decided triumphs with *Il falconiere di Pietro Ardena* and *Celeste*. His plays, which affect, when most distinctive, a sentimental tone and a mediæval stage setting, include: *Piccarda Donati* (1869); *Saffo* (1880); *Rosalinda* (1884); *Lo spiritismo* (1869); *Il ghiacciaio di Monte Bianco* (1870); *Quel che nostro non è* (1877); *Giorgio Gandi* (1882); *Bice* (1884). His collected works were published in 20 volumes (1884 et seq.) at Turin.

MARENGO, mȧ-rĕn'gō. A locality near Alessandria, Italy, the scene of one of the most famous of Napoleon's battles, fought on June 14, 1800, in which the French completely defeated the Austrians under General Melas (Map: Italy, B 2). After Napoleon got control of the government he determined to wage a vigorous war against Austria so that she would be unable to help England and Russia. Moreau (q.v.) was sent to Germany, while Napoleon himself crossed the Great St. Bernard Pass into Italy with about 40,000 men. On June 14 Melas crossed the Bormida from Alessandria, assailed the French, and at first was successful, because Napoleon had scattered his troops in an effort to find the Austrians. But at five in the afternoon Desaix (q.v.) and Kellermann (q.v.) appeared with fresh troops and swept all before them, though the former lost his life in the charge. The French lost about 7000 in killed, wounded, and prisoners, while the Austrians lost about 10,000. The battle firmly established Napoleon's supremacy in France. General Melas was compelled to sign the Convention of Alessandria, by which he surrendered Genoa, Piedmont, and the Milanese, and promised to withdraw the Austrian garrisons from all cities to the west of the Mincio. Military critics have generally maintained that the Marengo campaign was one of the most brilliant conceptions in the history of warfare. See NAPOLEON I.

MARENHOLTZ-BÜLOW, mä'ren-hôlts-bụ'lō, BERTHA VON (1810–93). A German educator and author, born near Brunswick. Attracted by the ideas of Friedrich Fröbel (q.v.), whom she met in 1850, she became his disciple and devoted her life to founding kindergartens in Germany and many other European countries. Her activity in London attracted much attention and is noticed by Dickens in *Household Words*. Among her writings are: *Beiträge zum Verständnis Friedrich Fröbels* (1876); *Der Kindergarten* (2d ed., Dresden, 1878); and a number of pamphlets on the kindergarten, several of which have been translated into English. Consult Goldschmidt, "Bertha von Marenholtz-Bülow," No. 239, in the *Sammlung wissenschaftlicher Vorträge* (Hamburg, 1896), and *Life of Baroness Bertha Marenholtz-Bülow*, by her niece of the same name (New York, 1901).

MARENZIO, mȧ-rĕn'tsī-ō, LUCA (c.1555–99). An Italian composer of madrigals, born at Coccaglio, between Bergamo and Brescia. He was a chorister in the Brescia Cathedral and received musical instruction from its organist, Giovanni Contini. He began publication in Venice (1581), with a collection of madrigals for five voices, and he issued nine books of the same within 10 years. About 1584 he was living in Rome, employed by Cardinal d'Este as maestro di cappella, and in 1587 he had a post at the Polish court, but went back to Rome (1595), and received an appointment in the chapel of the Pope. He composed a quantity of Church music, but it is on account of the great advance he made upon his predecessors in the production of madrigals that he is chiefly remembered. Six books of them for six voices were published in Venice (1582–1609), and he wrote others for three, four, eight, and twelve voices.

MAREOTIS, mȧr'ē-ō'tĭs. See MAREIA.

MARET, mȧ'rĕ', Hugues Bernard, Duke of Bassano (1763–1839). A French statesman. At the beginning of the Revolution he was editor of the *Bulletin* (the original of the *Moniteur*), containing the proceedings of the Constituent Assembly, a position which gave him much political influence. At first inclining to the Jacobins, he subsequently favored a constitutional monarchy. In 1792 he became chief of a bureau in the Ministry of Foreign Affairs, and after Aug. 10, 1792, was employed in various diplomatic missions—as Envoy to England, to Naples (1793), and to England again (1797). He coöperated with Napoleon in the coup of the 18th Brumaire (1799). He became Napoleon's confidential adviser, and later his Secretary of State for Foreign Affairs. During the Hundred Days, Napoleon made him Duke of Bassano. He was in exile during the Restoration; but Louis Philippe restored him to the peerage in 1831, and made him the head of a short-lived ministry.

MARETZEK, mä'rę-tsĕk, Max (1821–97). A German-American composer, director, and impresario, born in Brünn, Moravia. He studied music there and also at Vienna and Paris. In 1843 he composed the opera *Hamlet*, which secured him the place of music director at the Royal Opera in London. In 1847 he went to New York, and in 1848 was the musical director at the Astor Place Opera House. In 1849 he commenced his career as an impresario of Italian opera in New York, and continued it until 1878, subsequently teaching. He published in 1855 *Crochets and Quavers: or, Revelations of an Opera Manager in America;* composed the opera *Sleepy Hollow* (1879); and wrote chamber and orchestral music. He died on Staten Island, N. Y.

MAREY, mȧ'rā', Etienne Jules (1830–1904). A French physiologist, born at Beaune (Côte-d'Or). He went to Paris when 20 years old, took the degree of doctor of medicine in 1860, and the same year began work in physiology at the Collège de France. In 1864 he established a physiological laboratory, and in 1867 was appointed adjunct professor of physiology in the Collège. He became a lauréat of the Institute and a member of the Academy of Medicine (1872) and of the Institute (1878). He began to publish scientific tracts as early as 1857, and worked on the experimental physiology of the heart and circulation, on animal heat, on the electric phenomena which provoke or accompany movements in animals, and on the action of poisons which especially concern the nerves and muscles. In 1863 he invented the sphygmograph, which has been an important laboratory instrument. His studies and works on motion in animals, especially on the flight of birds and insects, have given him a wide reputation, since he devised photographic methods of recording the motions of the wings. His most important publications were: *Physiologie medicale de la circulation du sang* (1860–64); *Physiologie du système circulaire* (1866); *La methode graphique dans les sciences experimentales* (1878); *Developpement de la methode graphique par l'emploi de la photographie* (1885); *Physiologie du mouvement: le vol des oiseaux* (1890); *Le mouvement* (1894).

MARGADANT, mär-gȧ-dänt', Simon Lemm. The real name of the German humanist Simon Lemnius (q.v.).

MAR'GARET (1353–1412). Queen of Denmark, Norway, and Sweden. She was the second daughter of Valdemar IV, King of Denmark, and the wife of Haakon VI, King of Norway, whom she married in 1363. On the death of her father without direct male heirs, the Danish nobles, after an interregnum, offered the crown in 1376 to Margaret and her husband in trust for their infant son Olaf. By the death of Haakon in 1380 Margaret became sole guardian of the young Prince, who died in 1387. Such was the skill with which she had conducted the government that the estates of both kingdoms concurred in electing her as their joint sovereign. She nominated her cousin, Eric of Pomerania, her successor; and although, owing to Eric's infancy at the time, and his subsequent incapacity, the real power rested in the hands of Margaret, she contented herself from that time with the title of "Margaret, by the grace of God, daughter of Valdemar, King of Denmark." At the moment that Margaret was cementing the union of Norway and Denmark, the condition of affairs in Sweden opened the way for a further extension of her power. The Swedish King, Albert of Mecklenburg, had so thoroughly alienated the affections of his subjects that the nobles declared the throne vacant and offered to acknowledge Margaret as their ruler. The Queen lost no time in sending an army into Sweden to support her pretensions, and defeated the King's German troops at Aasle near Falköping in 1389, where Albert fell into her hands. The King remained in prison till 1395, during which time Margaret continued the work of subjugating Sweden. In 1397 she effected the so-called Union of Kalmar (q.v.), by which the crowns of the three Scandinavian kingdoms were henceforth to remain united. Eric, who was in his sixteenth year, was invested with the triple dignity. Margaret continued to exert great influence in the government. She died towards the close of 1412, while she was attempting to bring about peace between Eric and the Duke of Holstein. Consult M. Hill, *Margaret of Denmark* (London, 1898).

MARGARET, or **MARGUERITE,** mär'g'rēt' (variously called of Angoulême, of Orléans, of Alençon, and of Navarre) (1492–1549). A daughter of Charles of Orléans, Count of Angoulême, sister of King Francis I of France. She was born at Angoulême, April 11, 1492. In 1509 she married the Duke d'Alençon, and two years after his death (1527) Henri d'Albret, titular King of Navarre. His small dominions, for Francis I failed to reconquer the entire Kingdom as he had promised, she governed after his death in 1544. Their daughter, Jeanne d'Albret, became mother of Henry of Navarre (Henry IV of France). Margaret was active in politics, in religious reform, and in literature. Of a strong mystical tendency, she favored religious liberty rather than Protestantism, and was the leading exponent of the Neoplatonic movement which was cultivated for a while within a restricted milieu. During the ascendancy of her influence with her brother, she was an effectual defender and patron of humanists and men of letters of such varied complexion as Rabelais, Marot, Des Périers, Dolet, Peletier, Brodeau, and many others. Her little courts at Nérac and at Pau, for a time the most brilliant intellectually in Europe, roused seemingly groundless slander. After undergoing many disappointments she died at Odos in Bigorre, the 21st of September, 1549. Her affection for her

brother was especially beautiful. During his captivity in Spain in 1525, she went to console him and tried in vain to secure less rigorous conditions of release from Charles V. Though a victim of much slander on the part of her enemies, no charges have been brought against her personal character that can be supported by investigation. Her literary work comprises *Le Miroir de l'âme pécheresse* (Alençon, 1531), which was translated into English prose in 1544 by Queen Elizabeth, then eleven years of age. This translation was reproduced in facsimile by Ames (London, 1897). In 1547 some of the religious and dramatic poems of Margaret of Navarre were collected together in a volume entitled *Les Marguerites de la Marguerite des Princesses*, reprinted in 1873 in four volumes. While her poems are usually written in an easy, flowing style, there hovers over them a veil of mysticism which at times obscures the thought. Her *Letters*, of considerable interest from the historical or literary point of view, were published by Génin in 1841–42 (2 vols., Paris). Other poems, consisting of two *comédies*, *Les prisons*, *Le navire*, and a number of shorter pieces, were discovered in the National Library in 1895 and published by Lefranc under the title *Dernières poésies* (Paris, 1896). As a prose writer Margaret is probably deserving of even greater praise than as a poet. Though some have attempted to cast doubt upon the authorship of the *Heptameron* (q.v.), it is very probable that Margaret dictated the work to her secretary Des Périers, or at least the greater part of it. It was originally printed in 1559 at the order of Jeanne d'Albret. Though apparently of no great personal beauty, Margaret's character was marked by a sweetness of disposition combined with intellectual strength as well as a scrupulous morality free from all prudery; and she probably contributed more to the renaissance of learning in France than any other individual at that time, not even excepting Francis himself.

Bibliography. Margaret has been the subject of a considerable number of studies in recent years, due to a certain extent to the large number of her inedited works that are being published. She forms the subject of one of Brantôme's discourses in *Les dames illustres* (vi, 1665–66). Other works worthy of note are Leroux de Lincy, *Essai sur la vie et les ouvrages de Marguerite d'Angoulême* (Paris, 1853); Ferdinand Lotheissen, *Königin Margarete von Navarra* (Berlin, 1885); M. W. Freer, *The Life of Marguerite d'Angoulême* (London, 1895); Rasmussen, *Marguerite of Navarre* (Copenhagen, 1901); Courteault, *Marguerite de Navarre* (Paris, 1904); M. G. Fawcett, *Five Famous French Women* (London, 1905); M. B. Ryley, *Queens of the Renaissance* (Boston, 1907); Cristina Garosci, *Margherita di Navarra* (Turin, 1908); and Madame Darmesteter, *Marguerite d'Angoulême, reine de Navarre* (Paris, 1910). For a critical estimate of her, see Cabantous, *Marguerite d'Alençon et les débuts de la réforme* (Montauban, 1898), and A. J. M. Lefranc, *Grands ecrivains de la renaissance* (Paris, 1914). For the most recent discovery of inedited poems by her, see F. Gohin, "Huitains inédits de Marguerite de Navarre et d'un amant platonique," in the *Mélanges Emile Picot*, vol. i (Paris, 1913).

MARGARET, Saint (c.1045–93). A queen of Scotland. She was the daughter of Edward the Exile, son of Edmund Ironside, and was born, according to tradition, in Hungary. In 1067 she came to Scotland with her brother Edgar Atheling (q.v.) and soon after became the wife of King Malcolm III. She appears in the chronicles as a woman of almost angelic character and saintly virtues, and numerous instances are recorded of her works of piety and unceasing devotion to the cause of the Church. She exercised a refining influence on the rough manners of the Scottish court by the example of her stainless life, and advanced the welfare of her people by her wide beneficence to the crippled, the orphaned, and the poor. She died Nov. 17, 1093, after receiving news of the death of her husband and her eldest son in a border raid. She was canonized by Pope Innocent IV. Consult: W. F. Skene, *Celtic Scotland*, vol. i (Edinburgh, 1876); Andrew Lang, *History of Scotland from the Roman Occupation*, vol. i (2d ed., New York, 1900); R. S. Rait, *Five Stuart Princesses* (ib., 1908).

MARGARET GRUNT. See Margate Fish.

MARGARET OF ANJOU, ăn'zhōō' (1430–82). Queen Consort of Henry VI of England. She was born on March 23, 1430, and was the daughter of René the Good of Anjou, titular King of Naples and Jerusalem. When in 1439 the peace party in England, headed by Cardinal Beaufort, came into power, they sought to end the Hundred Years' War, and as a step in this direction looked around for a suitable French princess as a wife for the young Henry VI. Their choice fell upon Margaret, and in 1445 the marriage took place. She became, however, rapidly unpopular, the loss of the English possessions in France being charged against her. When in 1453 a son was born to her, Richard, Duke of York, gave up all hope of succeeding peacefully to the crown. Just before the birth of the son Henry had become insane and York had been made Regent; but on the King's recovery in 1455 he led the Yorkists in arms against the house of Lancaster, inaugurating the Wars of the Roses. Margaret became leader of the Lancastrians. In 1460 she was victorious at Wakefield, where the Duke of York fell, but the battle of Towton (q.v.) in 1461 was disastrous to the Lancastrian cause. In 1462 and 1463 Margaret made attempts to restore the fortunes of her house and invaded England without success; and in 1464 her adherents were defeated at Hexham. In 1470 Warwick (q.v.) joined the Lancastrians and restored Henry VI to the throne, but in 1471 Edward IV won a decisive victory at Barnet; Henry was recaptured, and spent the remaining weeks of his life in the Tower. Meanwhile Margaret had landed in England, but was defeated and taken at Tewkesbury in 1471, while her son lost his life on the battlefield. She remained in captivity for about five years, till Louis XI redeemed her for 50,000 crowns. She then retired to France, and died at the château of Dampierre, near Saumier in Anjou, on Aug. 25, 1482.

Bibliography. M. A. Hookham, *Life and Times of Margaret of Anjou, Queen of England and France* (2 vols., London, 1872); Sir J. H. Ramsay, *Lancaster and York*, vol. ii (Oxford, 1892); C. W. C. Oman, *Political History of England*, vol. iv (London, 1906); Schmidt, *Margareta von Anjou* (*Palaesta*, vol. liv, Berlin, 1906); Gairdner's introduction to the *Paston Letters*, vol. i (Edinburgh, 1910); Edgcumbe Staley, *King René d'Anjou and his Seven Queens* (New

York, 1912). See ROSES, WARS OF THE; HENRY VI.

MARGARET OF AUSTRIA (1480–1530). A daughter of Maximilian I of Austria and of Mary of Burgundy. She was born at Brussels and brought up at the French court. Affianced to the Dauphin, afterward Charles VIII, by the Treaty of Arras (1482), she was sent back in 1491 by the King, who married Anne of Brittany. About five years later she married John, Prince of Asturias, heir to the Spanish throne, but he died the next year. In 1501 she became the wife of Philibert II, Duke of Saxony, who died three years later. In 1507 her father made her Regent of the Netherlands. In this office she displayed great ability, carried on the policy of centralization, repressed heresy, but watched also over the material welfare of the country. She participated in the conference at Cambrai in 1508, and negotiated with Louise of Savoy the Peace of Cambrai (1529), called the *Paix des Dames* (Ladies' Peace). Consult Christopher Hare, *High and Puissant Princess Marguerite of Austria* (New York, 1907), and E. E. Tremayne, *The First Governess of the Netherlands: Margaret of Austria* (London, 1908).

MARGARET OF FLANDERS, or OF CONSTANTINOPLE (c.1200–80). Countess of Flanders and Hainault. She was the younger daughter of Baldwin IX, Count of Flanders and Hainault, who died without male issue, the succession passing to her elder sister, Joanna. Margaret, who was usually called "Black Meg," married Bouchard d'Avesnes, bailiff of Hainault, in opposition to the King's wishes, and after a number of years the marriage was annulled, owing to the fact that Bouchard in early life had taken the lower orders of priesthood. In 1223 Margaret married William of Dampierre, and between the children of the two marriages bitter strife ensued for the succession to the lordship over the two counties, which Margaret had obtained in 1244, on the death of her sister. The dispute was referred to the arbitrament of Louis IX of France, who decided that after the death of Margaret Hainault should go to the sons of d'Avesnes, while the children of the second marriage were to receive Flanders. Margaret's reign of 35 years seems to have been one of prosperity for her subjects. Consult Charles Duvivier, *La Querelle des d'Avesnes et des Dampierre* (2 vols., Brussels, 1894).

MARGARET OF PAR'MA (1522–86). Regent of the Netherlands. She was an illegitimate daughter of the Emperor Charles V and was born and brought up in Brussels. In 1536 she married Alessandro de' Medici, Duke of Florence, who was murdered in 1537; and in 1542 Ottavio Farnese, who became Duke of Parma and Piacenza. She was appointed by Philip II in 1559 to govern the Netherlands with Granvelle (q.v.) as her chief adviser. Though well inclined personally to the people of the Netherlands and their liberties, she yielded readily to the fanatic orders of Philip and the counsels of Granvelle. The attempt to introduce the Inquisition into the country brought about the revolt of 1566, which was the beginning of the long struggle for independence in the Netherlands. In 1567 Alva (q.v.) was sent to crush out all opposition and Margaret resigned her office.

MARGARET OF VALOIS, vä'lwä', or OF FRANCE (1553–1615). A French princess, daughter of Henry II of France and Catharine de' Medici, and wife of Henry IV. She was born at Saint-Germain-en-Laye, May 14, 1553, and received an excellent education. Her marriage to Henry of Navarre at Paris on Aug. 18, 1572, was intended to be a bond of perpetual reconciliation between Catholics and Huguenots, but was followed after a week by the Massacre of St. Bartholomew. With no love lost on either side, husband and wife, during Henry's forced sojourn at the French court, lived in good-natured toleration of each other's transgressions. After the flight of Henry of Navarre in February, 1576, she was detained for some time as a hostage, but in 1578 rejoined her husband at Pau in Gascony. There she remained for four years and then returned to Paris. Her intrigues at court aroused the resentment of Henry III, who subjected her to repeated humiliations, imprisoned her, and finally instituted a public investigation into her conduct (1583). From 1587 to 1605 she lived at the château of Usson in Auvergne, and there wrote her *Mémoires*. In 1599, after the death of Gabrielle d'Estrées, the favorite of Henry IV, she consented to a divorce from the King, who for a number of years had been desirous of an heir. In 1606 she returned to Paris, where she lived on the best of terms with Henry, attending the coronation of her successor, Maria de' Medici, in 1610. Her *hôtel* in the Rue de Seine was a centre for Paris learning and fashion until her death. With her the house of Valois became extinct. Her *Mémoires, Poésies,* and *Letters* were published by Guessard (Paris, 1842). Consult: Leo de Saint-Poncy, *Histoire de Marguerite de Valois* (Paris, 1887); C. Merki, *La reine Margot* (ib., 1905); Albert Savine, *La vraie Reine Margot d'après les documents d'archives et les mémoires* (ib., 1908); H. N. Williams, *Queen Margot, Wife of Henry of Navarre* (London, 1911).

MAR'GARET TU'DOR (1489–1541). The wife of the Scottish King James IV (q.v.). She was born at Westminster, Nov. 29, 1489, the daughter of Henry VII by Elizabeth of York. She was married after considerable negotiation to King James IV of Scotland on Aug. 8, 1503. She played a considerable rôle in the shifting politics of her time, especially after the death of her husband in 1513, but her importance to posterity consists chiefly in the fact that from her James VI of Scotland derived his claims to the English throne, which he ascended as James I of England in 1603.

MARGAR'IC ACID (from Lat. *margarita,* from Gk. μαργαρίτης, *margaritēs,* pearl, from μάργαρος, *margaros,* pearl oyster; so called from being deposited as pearly scales during cooling in alcohol in which it has been dissolved), $C_{16}H_{33}COOH$. An artificial solid fatty acid, similar to stearic acid and melting at about 60° C. It has been found in the wax of lichens. An acid having the same molecular composition as margaric acid, but melting at a somewhat lower temperature (55° C.), has been found in the seeds of *Datura stramonium* Linné, and is therefore named *daturic acid.* The name margaric acid was formerly applied to a mixture of palmitic and stearic acids that occurs in certain natural products. The fact that this substance was a mixture, and not a definite chemical compound, was demonstrated by Heintz.

MARGARITA, mär'gȧ-rē'tȧ. An island in the Caribbean Sea near the coast of Venezuela, to which country it belongs. Together with other neighboring islands, it forms the State of

Nueva Esparta (Map: Colombia, E 1). It is about 45 miles long and from 5 to 20 miles broad, with an area of 444 square miles. It consists of two mountain ranges, one of them over 4000 feet high, united by a low isthmus. There is a little agriculture and cattle raising, but the principal industries are fisheries and the production of salt. The valuable pearl fisheries of the island are a government monopoly, leased for a term of years to a private company, which is restricted so as to prevent the extinction of the pearl-producing oysters. The population is estimated at 50,000, mostly civilized Indians. The island was discovered by Columbus in 1498. The capital is Asunción (pop., 1933) and the chief port is Pampatar.

MAR'GARITE (OF. *marguerite*, Fr. *margarite*, *marguerite*, pearl, from Lat. *margarita*, pearl), or PEARL MICA. A hydrated calcium-aluminium silicate, closely related to the mica group and crystallizing in the monoclinic system. It is of a light-gray, red, or yellow color and is found associated with corundum, especially in the emery deposits in Asia Minor and the islands of the Grecian archipelago; also in Chester, Mass., Unionville, Pa., and localities in North Carolina.

MARGARITONE D' AREZZO, mär'gȧ-rē-tō'nȧ dȧ-rĕ'tsô (c.1236–89). A prominent Tuscan painter of the late mediæval epoch, a native of Arezzo. His frescoes in San Clemente at Arezzo have perished, but his Madonna and his Crucifix at San Francesco, his altarpiece at the National Gallery, and his various portraits of St. Francis show crude color, childish drawing, and lack of life; he was a representative of the end of the Italo-Byzantine decline rather than a herald of the Giottesque revival. Portraits of St. Francis were his favorite theme; several remain, both signed and unsigned, in the Vatican, at Siena, Florence, Pisa, Castiglione, and elsewhere. Vasari's contention that he excelled as a sculptor and architect is open to doubt, as the works he attributes to him—the church of San Ciriaco at Ancona and the monument of Gregory X at Arezzo—are not of his age or manner.

MAR'GATE. A popular watering place and municipal borough in the Isle of Thanet, Kent, England, 74 miles east of London and contiguous to Westgate and Broadstairs (Map: England, H 5). It has important fisheries, but is more noted as a pleasure resort for Londoners, with a theatre, baths, libraries, zoölogical gardens, esplanade, and excellent hotels. It has many London seaside charitable institutions. The town owns its water supply. Its ancient name was Meregate—the gate to the sea. Its parish church of St. John the Baptist was founded in 1050. Pop., 1901, 23,000; 1911, 27,085.

MARGATE FISH, or MARGARET GRUNT. A food fish (*Hæmulon album*), one of the grunts or roncos of the Gulf of Mexico and southward, where it is common in water of moderate depth and reaches a length of 2 feet or more. It is white, with olive-colored back and fins and indistinct spots; the mouth is orange. In some places no one will eat it, but at Pensacola and Key West, and in Nassau and other parts of the British West Indies, it is commonly sold in the markets, frequently under the name "porgy."

MARGAY, mär'gȧ (Brazilian name). A wild cat (*Felis tigrina*) of the forested parts of tropical America. The animal is so variable in size, color, and markings that several species have been described from its varieties. It seems to differ little from cats generally in its habits, and occasionally is domesticated.

MARGELAN, mär'ge-län', or MARGILAN, OLD and NEW. Two towns in the Territory of Ferghana, Russian Turkestan (Map: Asia, Central, O 2). Old Margelan, about 40 miles east of Khokand, is an Asiatic city, surrounded by a wall and containing mosques and bazars, etc. It has some trade in locally woven camel's-hair cloth and is the centre of a rich agricultural district. Pop., in 1912, 43,586, mostly Sarts, Tajiks, and Jews. New Margelan, situated about 10 miles south of the old town, is the seat of the administration of the territory, and had in 1912 a population of 10,751, mostly Russians.

MARGGRAF, mär'gräf, ANDREAS SIGISMUND (1709–82). A German chemist. He was born in Berlin; studied at Berlin, Strassburg, Halle, and Freiberg; and in 1735 became an assistant to his father, a chief apothecary. Elected a member of the Berlin Academy of Sciences in 1738, he was placed in charge of its chemical laboratory after 1754 and of its physics class after 1760. He made valuable observations on phosphoric acid and made improvements in metallurgical processes. His most important contribution, however, was in connection with the discovery of sugar in beet roots, and in 1747 he published an account of his experiments in extracting this sugar. He published also *Chymische Untersuchungen eines sehr merkwürdigen Salzes, welches das Saure des Phosphors in sich enthält* (1757) and *Chymische Schriften* (2 vols., 1761–67).

MARGGRAFF, HERMANN (1809–64). A German poet and humorous author. He was born at Züllichau; studied at Berlin; and, devoting himself to journalism, lived and wrote in Leipzig, Munich, Augsburg, and Frankfort, finally settling in Leipzig (1853) as editor of the *Blätter für literarische Unterhaltung*. He wrote the critical essay, *Deutschlands jüngste Kultur- und Litteraturepoche* (1839); several plays, as, e.g., *Das Täubchen von Amsterdam;* humorous novels, including *Justus und Chrysostomus*, *Gebrüder Pech* (1840), *Johannes Mackel* (1841), and *Fritz Beutel* (1855), after the fashion of Münchhausen; a biography of Ernst Schulze (Leipzig, 1855); *Schillers und Körners Freundschaftsbund* (1859); *Gedichte* (1857); *Balladenchronik* (1862).

MARGHERITA, mär'gȧ-rē'tȧ (MARIA MARGHERITA TERESA GIOVANNA DE SAVOIA) (1851–). Queen Dowager of Italy, the daughter of Ferdinand, Duke of Genoa. She was married in 1868 to her cousin, Humbert, the Prince Royal, who succeeded his father, Victor Emmanuel I, as King of Italy, Jan. 9, 1878, and who was assassinated at Monza on July 29, 1900. Her charm of manner and sweetness of disposition made her extremely popular in Italy.

MARGIN DEALS (OF. *margine*, from Lat. *margo*, boundary). Transactions in which one person, in the character of purchaser, puts up collateral security for the performance of his agreement to purchase securities or other property of fluctuating value. For example, a person employs a broker to purchase stock or other property for him. The buyer not having the money with which to pay the price, the broker advances it, upon receiving from the buyer (his principal) the deposit of a specified sum (margin) and an agreement that he (the broker) may sell the stock in case it depreciates so

that the stock and margin are no longer ample security for his advance. Such a transaction is perfectly valid and enforceable at common law. By constitutional or statutory provisions in some of the United States, however, even margin deals of this sort have been put under the ban and are void as tending to encourage speculative dealing in shares of corporations or in the necessaries of life, and thus to enhance their price to the nonspeculative buyer. In such jurisdictions the buyer may repudiate the agreement and recover from the broker any moneys put into his hands as a margin.

The term is more frequently applied to contracts entered into, and deposits made, to disguise gambling transactions in stocks or in property sold for future delivery. Deals of this sort are illegal and void at common law. Not only is the contract itself unenforceable, but negotiable paper or other securities given as a part of the transactions are void, and property deposited as a margin may be recovered. Margin deals of this kind, being in reality gambling transactions, are punishable in some of the States as criminal offenses. Consult F. R. Mechem, *The Law of Agency* (Chicago, 1889), and J. R. Dos Passos, *Treatise on the Law of Stock Brokers and Stock Exchanges* (2d ed., 2 vols., New York, 1905).

MARGITES, mär-jī'tēz. A mock-heroic epic, ascribed to Homer by Aristotle and by him considered to be the germ of comedy. It has also been attributed to Pogres of Halicarnassus, the brother of Queen Artemisia. It describes the various predicaments in which Margites, a foolish young fellow, was placed.

MARGOLIOUTH, mär-gō'lī-ōōt, David Samuel (1858–). An English Arabic scholar, born in London. He studied at Winchester and at New College, Oxford, became fellow of New College (1881), and in 1889 was appointed Laudian professor of Arabic at Oxford. He also held the post of assistant keeper of Oriental books and manuscripts in the British Museum. In 1912 he represented the British government at the Oriental Congress at Athens. He wrote: *Analecta Orientalia ad Poeticam Aristoteleam* (1888); *Jepheth Ben Eli, Commentary on the Book of Daniel* (1889); *Arabic Papyri of the Bodleian Library* (1893); *Chrestomathia Baidawiana* (1894); *Letters of Abul 'Ala* (1898); *Lines of Defense of the Biblical Revelation* (1900; 3d ed., 1903); *Mohammed and the Rise of Islam* (1905); *Cairo, Jerusalem and Damascus* (1907); *Mohammedanism* (1911); *The Early Development of Mohammedanism,* Hibbert lectures (1914); and he edited Yakut's *Dictionary of Learned Men* (1907–13) and Aristotle's *Poetics* (1911).

MARGO'LIS, Max Leopold (1866–). An American Hebrew philologist, born at Merech, Vilna, Russia, and educated at the Leibnitz Gymnasium, Berlin, and at Columbia University, New York (A.M., 1890; Ph.D., 1891). He was lecturer on Jewish literature at the Glenmore School for Cultural Sciences at Keene, N. Y., in 1892, assistant professor of Hebrew and biblical exegesis in 1892–97 and professor of biblical exegesis in 1905–07 at the Hebrew Union College, Cincinnati, Ohio, and assistant professor of Semitic languages and literatures (1897–98) and associate professor (1898–1905) at the University of California. After visiting Europe in 1907–08, he served for a year as editor in chief of Bible translation for the Jewish Publication Society of America, and in 1909 he became professor of biblical philology at Dropsie College for Hebrew and Cognate Learning, Philadelphia. He published: *The Columbia College Manuscript of Meghilla* (1892); *An Elementary Text-Book of Hebrew Accidence* (1893); *The Theological Aspect of Reformed Judaism* (1904); *A Manual of the Aramaic Language of the Babylonian Talmud* (1910).

MAR'GRAVE (Ger. *Markgraf,* border count). In early mediæval times the military chieftains or guardians to whom was intrusted the defense of the border, with the government over such frontier provinces, known as marks or marches. In continental Europe these margraves at first held their offices only during life, but, as they became more independent and powerful, their positions and titles became vested in the same line, and they were established as a powerful hereditary order of nobility. In England the lords or wardens of the marches were appointed to guard the frontiers of Wales and Scotland, and the office was long regarded as special or temporary; the term "marquis" was not applied to the office until 1395. See Graf; Mark; Marquis.

MARGRY, mär'grē', Pierre (1818–94). A French historian, born at Paris. He became as a young man adjunct curator of the archives of the department of the Minister of Marine, and in 1842 was intrusted with the task of studying the colonial history of France in America. Among his works are: *La navigation du Mississippi et les précurseurs de Fulton aux Etats-Unis* (1859); *Les Normands dans les vallées de l'Ohio et du Mississippi* (1860); *Les navigateurs français et la révolution maritime du XIVème au XVIème siècle* (1867); *Relations et mémoires pour servir à l'histoire de la France dans les pays d'outre mer* (1867); *Les seigneurs de la Martinique* (1879); *Découvertes et établissements des Français dans l'Amérique septentrionale* (1879–88); *Le conquérant des îles Canaries* (1880). He edited *Les souvenirs d'un homme de lettres,* based on Augustin Jal's manuscripts (1877).

MARGUERITE, mär'ge-rēt'. A garden plant. See Chrysanthemum.

MARGUERITE, or **MARGARET.** The principal female character in Goethe's *Faust.*

MARGUERITE DE VALOIS. See Margaret of Valois.

MARGUERITTE, mär'g'-rēt', Paul (1860–) and Victor (1866–). French novelists, brothers, sons of a general who fell at Sedan. Both were born in Algeria. Paul made his début as a naturalist writer, but turned more and more towards introspection and problems of morality. Alone he wrote: *Tous quatre* (1885); *La confession posthume* (1886); *Maison ouverte* (1887); *Pascal Gefosse* (1887; 2d ed., 1912); *Jours d'épreuve* (1889); *Amants* (1890; 2d ed., 1908); *Ma grande* (1892; 2d ed., 1911); *La tourmente* (1894); *L'Essor* (1896; 2d ed., 1910); *A la mer* (1906); *La flamme* (1909); *La faiblesse humaine* (1910); *La maison brûle* (1913). Victor, who had been an officer of cavalry, had published some verse and the novels *Le carnaval de Nice* (1897) and *Poum* (1897) before he joined his brother in one of the most notable collaborations in literary history. Alone he wrote in later years: *Prostituée* (1907); *Jeunes filles* (1909); *L'Or* (1910); *Pour mieux vivre* (1910); *L'Imprévu* (1910), a comedy;

Les frontières du cœur (1912); *Le journal d'un mollot* (1912); *La rose des ruines* (1913). Together the brothers produced a series of romances dealing with the Franco-German War, including *Le désastre* (1898), *Les tronçons du glaive* (1900), *Les braves gens* (1901), and *La commune* (1904). Their views on the social position of women are embodied in *Femmes nouvelles* (1899), *Les deux vies* (1902), and *Le prisme* (1905), the second of which was dramatized with great success as *Le cœur et la loi* (1905). They published a popular history of the war with Germany (1903); a volume of miscellaneous essays, *Quelques idées* (1905); *Sur le vif* (1906); *Vanité* (1907); *L'Autre*, a drama (1908); *Alphonse Daudet* (1908); *L'Eau souterraine* (1908; 2d ed., 1910); *Nos tréteaux* (1911). Paul Margueritte was one of the original members of the Académie Goncourt. Consult Pilon, *Paul et Victor Margueritte* (Paris, 1905).

MARHEINEKE, mär-hī'ne-ke, PHILIPP KONRAD (1780–1846). A German theologian. He was born at Hildesheim, May 1, 1780; educated at Göttingen; became repetent there, 1804; professor extraordinary of theology at Heidelberg, 1805; professor ordinary there, 1809; and in 1811 was called to the same position at Berlin and chosen pastor of the church of the Trinity, where he became a colleague of Schleiermacher. His studies lay principally in the direction of Christian symbolism and dogmatics. To the former he devoted his *Christliche Symbolik* (1810–14) and his *Institutiones Symbolicæ* (1812); to the latter, his *Grundlehren der christlichen Dogmatik* (1st ed., 1819; 2d ed., 1827). The second edition of this work is strongly Hegelian, and all his later work was done under Hegelian influence. The positive form of his theology may be found in his *Entwurf der praktischen Theologie* (1837). He wrote many books besides those named, including the important *Geschichte der deutschen Reformation* (1816) and *Die Reformation, ihre Entstehung und Verbreitung in Deutschland, dem deutschen Volke erzählt* (1846). He died in Berlin, May 31, 1846. His *Theologische Vorlesungen* appeared posthumously (1847–49), with biographical sketch. Consult Weber, *Le système dogmatique de Marheineke* (Strassburg, 1857), and Otto Pfleiderer, *Development of Theology in Germany* (3d ed., New York, 1909).

MARÍA CHRISTINA, mä-rē'ä krīs-tē'nä (1806–78). Queen of Spain. She was a daughter of Francis I, King of the Two Sicilies, and was born in Naples, April 27, 1806. In 1829 she became the fourth wife of Ferdinand VII of Spain. In 1830 Ferdinand restored the law by which, in default of male issue, the right of inheritance was given to females. In October of that year the Queen gave birth to a daughter, Isabella. The Spanish Liberals gladly embraced the cause of the Queen, rejoicing to see Ferdinand's brother, the reactionary Don Carlos (q.v.), further removed from the succession to the throne. Ferdinand died Sept. 29, 1833, and by his testament his widow was appointed guardian of her children—the young Queen Isabella and the Infanta Louisa (born 1832)—and Regent until the Queen should attain the age of 18. A civil war at once broke out in Aragon and the Basque Provinces between the opposing parties known as Carlists and Cristinos, but the Queen mother seemed indifferent to everything except the company of Don Fernandez Muñoz (1808–73), one of the royal bodyguard, whom she made her chamberlain, and with whom she was united in December, 1833, in a morganatic marriage. Her practice as Regent was to adopt the course agreeable to the Minister of the day, and thus her government was despotic under one ministry and liberal under another. She contrived, however, upon many occasions to embrace the proceedings of her more liberal or constitutional ministers; but when she sanctioned by her signature the law which deprived the communes of the right to elect their councils, a popular commotion ensued and she was compelled to resign the regency, being succeeded by the Prime Minister, Espartero. She retired to France, but continued to interfere in the affairs of Spain. After the fall of Espartero she returned to Madrid (1843) and in October, 1844, her marriage with Muñoz, who was now made Duke of Rianzares, was publicly solemnized. Her participation in the schemes of Louis Philippe in the matter of the marriage of her daughters, in 1846, and the continued exercise of all her influence in a manner unfavorable to constitutional liberty, made her the object of great dislike to the whole Liberal party in Spain. At length, in July, 1854, a revolution expelled her from the country, and she again took refuge in France. She returned to Spain in 1864, only to retire again in 1868. She died at Havre, Aug. 22, 1878. Consult Hélène Vacaresco, *Kings and Queens I have Known* (New York, 1904), and E. B. d'Auvergne, *A Queen at Bay: The Story of Cristina and Don Carlos* (ib., 1910). See SPAIN.

MARÍA CHRISTINA (1858–). A Queen of Spain. She was the daughter of Archduke Karl Ferdinand of Austria, and in 1879 married Alfonso XII of Spain, to whom she bore a posthumous son in 1886, Alfonso XIII. She acted as Regent until Alfonso XIII was declared of age, May 17, 1902, carrying on the government with much ability and tact, and so training the young King that he was often spoken of as "the best-brought-up" boy in Europe.

MARIA DE' MEDICI, mä-rē'ä dā mā'dē-chē, MARIE DE' MEDICI in English and MARIE DE MÉDICIS in French (1573–1642). The second wife of Henry IV of France. She was the daughter of Francis I, Grand Duke of Tuscany, and was born at Florence, April 26, 1573. She was married to Henry IV in 1600, and in 1601 gave birth to a son, afterward Louis XIII. Maria, though beautiful, was an obstinate, ambitious, passionate, and stupid woman. Her quarrels with Henry over her favorites and the King's gallantries became the talk of Paris. Two Italians, Leonora Galigai and her husband, Concini (see ANCRE), exercised a powerful influence over her mind and encouraged her dislike to her husband, who on his part avoided her as much as possible. She was not publicly crowned as Queen until the day before Henry's assassination (May, 1610). For the next seven years she governed as Regent, but proved incapable as a ruler. After the murder of Concini, in 1617, Louis XIII assumed royal power, aided by his favorite, the Duke de Luynes, who had put Concini out of the way. Maria was kept under surveillance in the castle at Blois. She escaped in 1619, and began a war against the King and court, being allied with certain of the disappointed nobles. The conflict was brief, and ended in the complete overthrow of Maria. In 1621 the death of Luynes led to her return to court. Maria hoped to win over Richelieu to her

party, and he was created Cardinal and Minister of State, partly through her influence. She soon found out, however, that he did not care to be ruled by her, whereupon she resolved to undermine his influence with the King. Her intrigues for this purpose in 1630 failed, and she was imprisoned in Compiègne, from whence she escaped to Brussels in 1631. She finally found her way to England to the court of her son-in-law, Charles I, but was compelled to leave London in 1641. She died at Cologne on July 3, 1642. Maria de' Medici was a lover and patron of the fine arts, and Paris owes to her the Luxembourg Palace and other public works.

Bibliography. B. Zeller, *La minorité de Louis XIII: Marie de Médicis et Sully, 1610–1612* (Paris, 1892); id., *La minorité de Louis XIII: Marie de Médicis et Villeroy* (ib., 1897); Julia Pardoe, *Life of Marie de Médicis, Queen of France* (3 vols., New York, 1902); A. P. Lord, *The Regency of Marie de Médicis* (ib., 1903); Louis Batiffol, *Marie de Médicis and the French Court in the Seventeenth Century*, translated by Mary King (ib., 1908); F. A. d'Estrées, "Mémoires du maréchal d'Estrées sur la régence de Marie de Médicis, 1610–1616, et sur celle d'Anne d'Autriche, 1643–1650," in *Société de l'histoire de Paris, publication*, vol. cccxlix (Paris, 1910). See HENRY IV; FRANCE.

MARIAGE DE FIGARO, mȧ'rē-äzh' de fē-gȧ'rō', LE, OU LA FOLLE JOURNÉE. A comedy by Beaumarchais, produced at the Comédie Française in 1784. It forms the continuation of *Le barbier de Séville*.

MARIAGE FORCÉ, mȧ'rē-äzh' fôr'sȧ', LE (Fr., the forced marriage). A one-act prose comedy ballet by Molière (1664). The piece bore the name "ballet du roi," because Louis XIV danced in it as a gypsy.

MA'RIA GENS. A plebeian gens at Rome. It was never divided into families. Its most celebrated member was Gaius Marius (q.v.), conqueror of the Cimbri and the Teutones.

MARIAGER, mä'rē-ä'gēr, PETER (1827–94). A Danish novelist, born at Nyborg. He became known through translations from the French and German, such as that of Flammarion's *Inhabited Worlds*. His original works are: *Fra Hellas, Fem antike Fortœllinger* (1881); *Den sidste Lamia, og andre antike Fortœllinger* (1884); *Magthaveren paa Rhodos* (1886); *Sybaris* (1887), a drama; *Dronningen af Kyrene, og andre antike Fortœllinger* (1890); *Et Bryllup i Katakomberne* (1893); *Sparta* (1895). All his stories relate to Greek and Roman subjects, and some were translated into English, German, Swedish, Dutch, and Greek.

MARIA II DA GLORIA, mȧ-rē'ȧ dȧ glō'-rē-ȧ (1819–53). A Queen of Portugal. She was a daughter of Dom Pedro I, Emperor of Brazil, and a granddaughter of King John VI of Portugal. She succeeded to the Portuguese throne in 1826 on the death of her grandfather (her father Dom Pedro renouncing his claim to the throne in her favor), and, though only a child, was promised in marriage to her uncle, Dom Miguel, who was to act as Regent. The latter, however, in 1828 usurped the throne. In 1832–33 Dom Pedro successfully attacked Dom Miguel by land and sea, and in 1834 the usurper, yielding to the threats of England and France, submitted. Maria was established on the throne, and in 1835 she married the Duke Charles Augustus of Leuchtenberg, who died a few months later. The next year she married Duke Ferdinand of Saxe-Coburg-Gotha-Kohary. She was succeeded by her eldest son, Pedro V.

MARIA LESZCZYNSKA, lĕsh-chĭn'skȧ (1703–68). Wife of King Louis XV of France. She was the daughter of Stanislas Leszczynski, King of Poland, and was born in Breslau before he came to the throne. Maria accompanied her father in his wretched wanderings after his expulsion from Poland. He settled in Alsace in 1719, and there the Duke of Bourbon saw Maria and arranged her marriage with Louis XV, who was seven years her junior. She lived in retirement, devoting herself to acts of piety and charity, and died at Versailles. Consult: D'Armaille, *La reine Marie Leszczynska* (2d ed., Paris, 1870); De Nolhac, *La reine Maria Leczinska* (ib., 1900); id., *Louis XV et M. Leczinska* (ib., 1902).

MARIA LOUISA (1791–1847). The second wife of the Emperor Napoleon I. She was born Dec. 12, 1791, the daughter of the Archduke Francis, afterward the Emperor Francis I of Austria, and was married to Napoleon on April 2, 1810. The marriage seemed to give stability to the Bonaparte dynasty, and in some measure to afford a prospect of peace to Europe. On March 20, 1811, she bore a son, who was called King of Rome. On the abdication of Napoleon she was not permitted to follow her husband, but went with her son to Schönbrunn, where she remained during the Hundred Days and until 1816, when she received the duchies of Parma, Piacenza, and Guastalla. In 1822 she contracted a morganatic marriage with her chamberlain, Count von Neipperg, who had been her lover before and by whom in 1821 she had a son, the Duke of Montenuovo. Count von Neipperg died in 1829. In 1833 she entered into a secret marriage with Count Bombelles, likewise her chamberlain. She died at Vienna, Dec. 17, 1847.

Bibliography. A. L. Imbert de Saint-Amand, *The Happy Days of the Empress Marie Louise* (New York, 1890–91); id., *Marie Louise and the Invasion of 1814* (ib., 1892); id., *Marie Louise et le Duc de Reichstadt* (Paris, 1892); id., *Marie Louise, the Island of Elba, and the Hundred Days* (New York, 1894); id., *Marie Louise and the Decadence of the Empire* (ib., 1902); H. A. Guerber, *Empresses of France* (ib., 1906); E. E. Cuthell, *An Imperial Victim* (2 vols., ib., 1912). See NAPOLEON I.

MARIA LOUISA, ORDER OF. A Spanish order founded by Charles IV, in 1792, and bestowed by the Queen on women of the old nobility. The recipient is expected to devote herself to charitable and pious works. The order has one class.

MARÍA LUISA, mȧ-rē'ȧ lo͞o-ē'sȧ (1751–1819). Daughter of Duke Philip of Parma and wife of King Charles IV of Spain (q.v.), whom she married in 1765 while he was still Prince of Asturias. When he succeeded to the crown in 1788 she and her lover, Godoy, Duke of Alcudia, managed to secure practical control of the government. After the revolution in 1808, which placed Ferdinand VII on the throne of his father, she and her husband fled to France and appealed to Napoleon, who induced the young King to restore the crown to his father and then persuaded the latter to cede it to him; whereupon he promptly bestowed it on his brother Joseph (q.v.). María spent the remainder of her life in exile at Marseilles and Nice and latterly at Rome, where she died.

MARÍA LUISA (1782–1824). Queen of Etruria, daughter of Charles IV of Spain (q.v.) and María Luisa of Parma (q.v.). She married Louis, eldest son of Duke Ferdinand of Parma, in 1795. In 1801 her husband was invested by Napoleon with the Kingdom of Etruria (Tuscany), the consideration being that Parma should revert to France on the death of Ferdinand. When Louis died in 1803, her son, Charles Louis, succeeded to the Etrurian throne under her regency, but the Kingdom was incorporated in 1807 in the French dominions. She then retired to Spain, but after her father's abdication lived in Parma and later in Nice. An attempt to flee to England was frustrated in 1811, and she was forced to seek refuge in a cloister in Rome, where she remained until 1814. The Congress of Vienna in compensation gave to the young Prince the city of Lucca, which his mother governed as Regent until he came of age, and in a subsequent treaty it was stipulated that Parma should revert to him on the death of the ex-Empress Maria Louisa. She was beatified by the Pope in 1876. The Queen's memoirs were published by d'Argy, entitled *Mémoires de la reine d'Etrurie* (Paris, 1814).

MARIAMNE, mā'rī-ăm'nē. Wife of Herod the Great (q.v.). She belonged to the family of the Hasmonæans or Maccabees (q.v.), being the granddaughter of Hyrcanus II. Although she was deeply beloved by her husband, he had her put to death in a fit of jealousy, and remorse for the act embittered the later years of his life. She is famed for her beauty as well as her tragic fate.

MARIAMNE. The title of plays by Alexandre Hardy (1610), Tristan l'Ermite (1637), and Voltaire (1723), based on the story of Mariamne, wife of Herod the Great.

MARIANA, mä'rē-ä'nä. A tribe of South American Indians. See MARANHA.

MARIANA, mā'rī-ăn'ă. In Shakespeare's *Measure for Measure*, the charming and womanly lover of Angelo. Tennyson's *Mariana in the Moated Grange* and *Mariana in the South* were based on her character.

MARIANA. The name given by Capt. John Mason to the land granted him by the Council for New England on March 9, 1621–2. The patent, which was the second granted by the Council, covered the lands lying between the Naumkeag (Salem) and Merrimac rivers, with the islands within 3 miles of the shore, and was included in the present territory of Massachusetts.

MARIANA, mä'rē-ä'nä, JUAN (1536–1623 or 1624). A distinguished Spanish historian and scholar, born at Talavera. In 1553 he entered the Order of the Jesuits. His early studies in languages and theology were so brilliant that he was appointed to teach in the schools of his order, first at Rome (where the celebrated Bellarmine [q.v.] was one of his scholars) in 1561, afterward in Sicily in 1565, and finally in Paris in 1569. After a residence there of seven years he settled at Toledo, where he resided till his death, at an extreme old age. His retirement, however, was passed in sustained literary activity. From an early period he devoted himself to writing a history of Spain (1592–1605). The original of this history was Latin, the elegance and purity of which have secured for Mariana a place among the most distinguished of modern Latinists. Mariana himself published a Spanish translation, which still remains one of the classics of the language. Among his other productions are his scholia of the Bible and an edition of the works of Isidore of Seville. But the most celebrated of the works of Mariana is his well-known treatise, *De Rege et Regis Institutione* (1599), in which is raised the important question whether it is lawful to overthrow and kill a tyrant. Mariana decides that it is right for every man to do so, even where the tyrant is not a usurper, but a lawful king, and esteems Jacques Clément (q.v.) equally with Brutus. Mariana's views on other subjects were broad-minded and liberal. In 1609 he published a volume *Tractatus VII Theologici et Historici*, which was placed upon the Index Expurgatorius and caused his arrest by the Inquisition. His *Discursus de Erroribus qui in Forma Gubernationis Societatis Jesu Occurrent* (Bordeaux, 1625) was reprinted by Charles III as a defense of his order banishing the Jesuits from Spain in 1767. Consult: Juan Mariana, *Historia general de España: ilustrada en esta nueva impresión de tablas cronológicas, notas, y observaciones críticas: con la vida del autor* (9 vols., Valencia, 1783–96); Leopold von Ranke, *Zur Kritik neuerer Geschichtschreiber* (Leipzig, 1874); Georges Cirot, *Mariana, historien* (Paris, 1905).

MARIANA ISLANDS. See LADRONE ISLANDS.

MARIANI, mä'rē-ä'nē, ANGELO (1822–73). A famous Italian orchestral conductor, born at Ravenna. He received his entire musical education at the Liceo Filarmonico in Bologna, where he was a pupil of Rossini. In 1844 he began his career as conductor in Messina, whence he went to Milan. Here he found ample opportunity to display his remarkable gifts, so that in 1847 he was called to Copenhagen as court conductor. At the outbreak of the revolution of 1848, however, he hastened back to his native country and joined the colors. In 1852 he became conductor at the Teatro Carlo Felice in Genoa. Before long he had won the reputation of being the greatest conductor in all Italy. About 1860 he was called to the municipal theatre of Bologna, where he began a propaganda for Wagner, at a time when in Italy Lohengrin was regarded as a monstrosity. In 1873 he returned to Genoa, where he died a few weeks after his arrival. He composed a *Requiem* and several cantatas.

MARIANISTS. See MARISTS.

MAR'IAN'NA. A city and the county seat of Lee Co., Ark., 43 miles southwest of Memphis, Tenn., on L'Anguille River, at the head of navigation, and on the St. Louis, Iron Mountain, and Southern Railroad (Map: Arkansas, E 3). It carries on a considerable trade in cotton, and has cotton gins, cottonseed-oil mills, lumber mills, and manufactories of headings, box shooks, and spokes. The city contains an Elks' Home, courthouse, public park, and fine city hall building. The water works are owned and operated by the municipality. Pop., 1900, 1707; 1910, 4810.

MARIANNE, mä'rē-än', OU LES AVENTURES DE LA COMTESSE DE. . . . An unfinished romance by Marivaux (1731–41), to which a second part was added in 1755 by Madame Riccobini. The novel has been said to be the origin of *Pamela*. It is important as the first novel of analysis rather than of incident, and contains minute pictures of bourgeois and conventual life.

MARIANNE (mā'rī-ăn') **ISLANDS.** See LADRONE ISLANDS.

MAR'IA'NUS SCO'TUS (1028–c.1082). An Irish chronicler, whose real name was Moelbrigte. He took the vows of a monk at the age of 24 and, leaving Ireland, entered the monastery in Cologne in 1056. There he remained for two years. He became a recluse in Fulda in 1059, and continued as such all the rest of his life, which, after 1069, was spent at Mainz. His claim to remembrance rests upon a *Chronicon Universale*, extending from the birth of Christ to 1082, which contains extracts from Bede and other chroniclers, besides new material. The first printed edition was made at Basel in 1559, and five have appeared since then, including one published with translation at Dublin in 1892.

MARIANUS SCOTUS (died probably 1088), the contemporary and namesake of the above, was first abbot of the monastery of St. Peter, Ratisbon, of which he was one of the founders. He was born in Ireland. His calligraphy made him famous, and he is known as a saint.

MARIA (mȧ-rī'ȧ) **OF AUSTRIA** (1505–58). A Queen of Hungary, a daughter of Philip the Fair of Burgundy and Joan of Castile, and sister of the emperors Charles V and Ferdinand I of Hapsburg. Born at Brussels in 1505, she married Louis II of Hungary at 17 and was widowed at 21, her husband being killed by the Turks at Mohács. In 1530 she was appointed Governor-General of the Netherlands by Charles V, succeeding Margaret of Austria. There she ruled ably and firmly for 24 years. In general, she aided Charles in his foreign policy, often acted as mediator between him and Ferdinand, and resigned from her office in the Netherlands upon the abdication of Charles (1555). She retired to Spain, and died at Cigales. Maria was a patron of arts and letters, and left a valuable collection of manuscripts now in the Burgundian Library of Brussels. Consult T. Juste, *Les Pays-Bas sous Charles V; Vie de Marie de Hongrie* (Brussels, 1861).

MARIA PIA, mȧ-rē'ȧ pē'ȧ (1847–1911). A Queen of Portugal, daughter of Victor Emmanuel II of Italy, born at Turin. In 1862 she married Luiz I of Portugal. Upon the accession to the throne of her son Carlos I (Oct. 9, 1889), she became the dowager Queen. On Feb. 1, 1908, King Carlos and Prince Luiz, the heir apparent, were assassinated in the streets of Lisbon and Maria Pia's grandson Dom Manuel ascended to the throne. Of a very kindly disposition, she lived in close retirement after the accession of Manuel and devoted herself to charitable and philanthropic work. When Manuel was overthrown, in 1910, she went to live with her sister, Princess Clotilda, near Turin, Italy.

MARIA STUART, mȧ-rē'ȧ stōō'ȧrt. A tragedy by Schiller, printed and presented in 1800.

MARIA THERESA, mȧ-rī'ȧ te-rē'sȧ (1717–80). Queen of Hungary and Bohemia, Archduchess of Austria, and wife of the German Emperor Francis I. She was the daughter of the Emperor Charles VI (q.v.) and was born at Vienna, May 13, 1717. By the Pragmatic Sanction (q.v.) her father sought to secure from the European Powers her undisputed succession to the Hapsburg dominions in the absence of a male heir. On Feb. 12, 1736, she married Francis Stephen, Duke of Lorraine (soon after Grand Duke of Tuscany), and on the death of her father, Oct. 20, 1740, she succeeded to the hereditary possessions of the house of Austria, which, in addition to the German, Hungarian, and Slavic lands, included Lombardy and the Belgian Netherlands. She found the monarchy exhausted, the finances embarrassed, the people discontented, and the army weak; while Prussia, Bavaria, Saxony, Naples, and Sardinia, stirred up by France, put forward claims to portions of her dominions, chiefly founded on the extinction of the male line of the house of Hapsburg and in contravention of the Pragmatic Sanction. The War of the Austrian Succession (1740–48) ensued, in which England supported Austria. (See SUCCESSION WARS.) Frederick II of Prussia soon made himself master of Silesia; Spain and Naples laid hands on the Austrian dominions in Italy; and the French, Bavarians, and Saxons overran the hereditary Austrian territories. The young Queen was in the utmost danger of seeing her realms dismembered, but was saved by the chivalrous fidelity of the Hungarians, the assistance of England, and most of all by her own resolute spirit. Her enemies quarreled among themselves, and the War of the Austrian Succession was terminated by the Peace of Aix-la-Chapelle in 1748. Maria Theresa lost Silesia and Glatz and the duchies of Parma, Piacenza, and Guastalla. In 1745 her husband (Francis 1) had been raised to the Imperial throne of Germany on the death of Charles VII. During the period of peace that followed she initiated great financial reforms. Agriculture, manufactures, and commerce flourished, the national revenues greatly increased, and the burdens of the peasantry were diminished. All this time she was strengthening her resources in anticipation of a renewal of the war with Frederick the Great. Her indomitable pride and her devout Catholicism would not permit her to relinquish Silesia as long as she could fight for it. She found in Kaunitz (q.v.) a minister possessed of the wisdom and energy requisite for the conduct of affairs, and in him she placed almost unlimited confidence. He effected the alliance with France which disturbed all existing international arrangements (1756). In the Seven Years' War (q.v.) which followed Maria Theresa and her allies well-nigh achieved the ruin of Frederick the Great, but the generalship of the indomitable Prussian King, the incapacity of the generals of Louis XV, and Russia's abandonment of the cause of Maria Theresa enabled Frederick to emerge from the struggle with his dominions intact. The war reduced Austria to a state of great exhaustion, but when it was concluded Maria Theresa renewed her efforts to promote the national prosperity, and made many important reforms, ameliorating the condition of the peasantry and mitigating the penal code. Her son, Joseph II, became Holy Roman Emperor on the death of her husband in 1765. Maria Theresa associated him with herself in the government of her hereditary states, but in reality committed to him the charge only of military affairs. She joined with Russia and Prussia in the first partition of Poland (1772), Galicia falling to her share. She also compelled the Porte to give up Bukowina to her (1777). The brief War of the Bavarian Succession (1778–79) ended in her acquisition of a district along the Inn (Innviertel), but led to the formation of the Fürstenbund, or League of German Princes, which set bounds to the Austrian power in Germany. Maria Theresa died in Vienna, Nov. 29, 1780. Throughout her reign she displayed a resolute and masculine charac-

ter. Although a zealous Roman Catholic, she maintained the rights of the crown against the papal power and endeavored to correct some of the worst abuses in the church. She prohibited the presence of priests at the making of wills, abolished the right of asylum in churches and convents, and suppressed the Inquisition in Milan. Her son succeeded her as Joseph II (q.v.).

Bibliography. Kern, "Die Reformen der Kaiserin Maria Theresias," in *Historisches Taschenbuch*, xi (Leipzig, 1809); Adam Wolf, *Aus dem Hofleben Maria-Theresias* (Vienna, 1859); Alfred von Arneth, *Geschichte Maria Theresias* (10 vols., ib., 1863–79); C. J. V. A. Broglie, *Frederick the Great and Maria Theresa* (2 vols., London, 1883); id., *Marie Thérèse impératrice, 1744–46* (Paris, 1888); Villermont, *Marie Thérèse, 1717–80* (ib., 1895); J. F. Bright, *Maria Theresa* (London, 1897); Hans von Zwiedineck-Südenhorst, *Maria Theresia* (Bielefeld, 1905); M. M. Moffatt, *Maria Theresa* (New York, 1911), containing an exhaustive bibliography. Her correspondence has been edited by Kervyn de Lettenhove, *Lettres inédites de Marie Thérèse et de Joseph II*, Royal Academy of Belgium, and by Alfred von Arneth (Vienna, 1867–81).

MARIA THERESA, Order of. An Austrian order conferred exclusively for distinguished conduct in war, founded in 1757. The monarch is the head of the order. Pensions ranging from 600 to 6000 florins are given to members. The distinction is very sparingly conferred.

MARIA-THERESIOPEL. See Theresiopel.

MARIAZELL, mä'rē-ä-tsĕl'. A village in the Crownland of Styria, Austria, 2810 feet above the sea, 58 miles southwest of Vienna (Map: Austria, D 3). It is the greatest pilgrim resort of Austria-Hungary, being visited annually by about 150,000 people. The church containing a famous carved wood image of the Virgin was originally founded in 1363 and rebuilt in 1827. It contains a valuable Madonna by an unknown Italian master and a silver altar. In the vicinity there are large iron-foundry and paper-pulp works. Pop., 1900, 1499.

MARIBOJOC, mä'rē-bō-hōk'. A town of Bohol, Philippines, situated on high ground on the southwest coast, 8 miles north of Tagbilaran. It is an important road centre. Pop., 1903, 11,830.

MARICOPA, mä'rē-kō'pȧ, or Coco-Maricopa. A tribe of Yuman stock (q.v.), formerly living about the junction of the Gila and Colorado rivers, southwestern Arizona. About 70 years ago, on account of the hostility of the Yuma, they moved up the Gila and confederated with the Pima (q.v.), with whom they are now living upon the Gila River reservation. They depend upon agriculture by irrigation and formerly raised large crops. They live in houses of cornstalks and straw woven upon a framework of poles, with storehouses and arbors surrounding. Their women are superior potters, basket makers, and weavers of native cotton. The men formerly wore only the G string, while the women wound a strip of cotton cloth about the waist. The hair was worn flowing and cut across the forehead. At present they are practically civilized through missionary effort and have a high reputation for industry and general good qualities. They number about 386. A sample of their work is shown on the Plate of Indian Baskets. See Yuman Stock. Consult Frank Russell, "Pima Indians," in *United States Bureau of American Ethnology, Twenty-Sixth Annual Report* (Washington, 1908).

MARICOURT, mȧ'rē'kōōr', Sieur de. See Le Moyne, Paul.

MARIE (Adélaïde Thérèse Hilda Antoinette Wilhelmine), mȧ'rē' ȧ'dȧ'lȧ'ĕd' tȧ'rĕz' ĕl'dȧ' ăn'twȧ'nĕt' vĕl'ĕl'mēn' (1894–), Grand Duchess of Luxemburg. She was the daughter of William Alexis (1852–1912), whose father, Adolphus of Nassau, became Grand Duke of Luxemburg in 1890 under the rule incorrectly termed the Salic Law (q.v.) upon the death of William III of Holland and the failure of the direct male line. In 1907, when her father had been Grand Duke for two years, as he had no direct male heir, the succession was made hers. Her father died on Feb. 25, 1912, and she succeeded on June 18 of that year. Her mother was Maria Anna (born 1861), daughter of Dom Miguel (1802–66) of Portugal. The young Grand Duchess bitterly objected to the breach of the neutrality of Luxemburg by Germany in 1914 and was even said to have attempted in person to stop the entry of German troops.

MARIE AMÉLIE DE BOURBON, mȧ'rē' ȧ'mȧ'lē' *de* bōōr'bôn'. Queen of the French. See Amalie, Marie.

MARIE ANTOINETTE, ăn'twȧ'nĕt' (1755–93). Queen of France and consort of Louis XVI. She was the youngest daughter of Emperor Francis I and Maria Theresa and was born at Vienna, Nov. 2, 1755. At the age of 14 she was betrothed to the French Dauphin and in the following year was married at Versailles. Her reception by her husband and the King, Louis XV, was flattering, but her naïveté, unceremonious pleasantry, and detestation of rigid etiquette scandalized Versailles. Soon after the accession of Louis XVI (1774), her enemies, of whom the chief was the Count of Provence, younger brother of the King, who subsequently ruled as Louis XVIII, circulated libels accusing her of constant intrigues. Her love of luxury and extravagance and her indifference to the miseries of the people, combined with her attempts to use her influence with Louis XVI to shape the foreign policy of France in accordance with the interests of Austria, made her unpopular with the people and gained her the epithet of "the Austrian woman" (*l'Autrichienne*). The affair of the Diamond Necklace (q.v.), in 1785, hopelessly compromised her good name in the eyes of the public. Her influence on the internal politics of the country was not more fortunate. Loménie de Brienne and Calonne were ministers of her choice, and she shared the opprobrium called down upon them for their reckless squandering of the national finances. She strongly opposed the summoning of the Notables (1787) and of the States-General (1789); and she had good reason to dread their convocation, for one of the very first things the Notables did was to declare the Queen the cause of the derangement of the finances. From the first hour of the Revolution she was an object of fanatical hatred to the mob of Paris, who knew that she was conspiring with her brother, Leopold II of Austria, for the reëstablishment of the absolute monarchy. In hours of crisis her resolute bearing spurred on the weak-willed Louis XVI to spasmodic assertions of his authority without bringing him to take a decisive step in defense of his rights. After the removal of the royal

family from Versailles to the Tuileries (Oct. 6, 1789) she attempted on various occasions to conciliate the good will of the people, but failed before the vindictive enmity of the Parisian populace. Out of personal antipathy to Mirabeau she could not be brought to accept the aid of the man who alone might have saved the monarchy from destruction. At last she resolved on flight. Her husband long refused to abandon his country, but she could not go without him, and finally the King consented. The flight took place on the night of June 20, but the royal fugitives were recognized and turned back at Varennes. The flight to Varennes only served to confirm the popular belief as to the Queen's intrigue with foreign powers, and, as a matter of fact, there is no doubt that Marie Antoinette had corresponded and continued to correspond with her brother relative to the invasion of France by an Austrian army for the purpose of rescuing the royal family. On June 20, 1792, a mob invaded the Tuileries, forced Louis XVI to don a liberty cap, and heaped insults on the Queen as they filed past her. On August 10 came the final storming of the Tuileries. Marie Antoinette's guards were murdered at her chamber door, and the unhappy Queen was compelled to seek refuge with her husband in the hall of the Convention, whence they were consigned on the 13th as prisoners to the Temple. Louis XVI was executed on Jan. 21, 1793. Marie Antoinette was separated from her son July 3, 1793, and on August 1 was removed to the Conciergerie. Twice while she was a prisoner in the Temple were unsuccessful attempts made to effect her escape. On October 14 she was brought before the Revolutionary Tribunal and charged with fomenting civil war and lending counsel to the foreign enemies of France. Testimony against her was given by Hébert, who sought to blacken her personal character with trumped-up charges. She was found guilty of treason after a two days' trial, was condemned to death on October 16, and was executed the same day.

The tragic fate of Marie Antoinette has given rise to a voluminous literature, in which the Queen has been depicted now as the victim, the sainted martyr, of the Revolution, now as the embodiment of the luxury, stupidity, and apathy towards the miseries of the people which characterized the powers of the old régime.

Bibliography. The memoirs of Madame de Campan, lady in waiting to the Queen, are inaccurate but important. They were first published in France in 1822 and have since appeared in numerous French and English editions. The latest edition in English is entitled *Memoirs on Marie Antoinette and her Court* (2 vols., Boston, 1909). Much of the Queen's correspondence has been published by Von Arneth, D'Hunolstein, De Reiset, F. Feuillet des Coucher, and Geffroy. The memoirs of the Prince de Ligne and the Duke de Choiseul are of value. Other memoirs by contemporaries are: J. Weber, *Mémoires concernant Marie-Antoinette* (London, 1804–09); *Mémoires de M. le baron de Besenval* (Paris, 1805); *Mémoires de la baronne d'Oberkirch* (ib., 1853); E. Bavoux, *Mémoires secrets de J. M. Augeard, secrétaire des commandements de la reine Marie-Antoinette* (ib., 1866); Madame Vigée-Le-Brun, *Mes souvenirs* (ib., 1867); *Mémoires de Mme. la duchesse de Tourzel* edited by the Duc de Cars (ib., 1883). Consult also: Jacob, "Ueber den politischen Einfluss der Königin Marie Antoinette von Frankreich," in *Historisches Taschenbuch*, vol. ix (Leipzig, 1838), with a list of authorities; E. and J. de Goncourt, *Histoire de Marie Antoinette* (6th ed., Paris, 1884); A. L. Imbert de Saint-Amand, *Marie Antoinette and the End of the Old Regime* (New York, 1896); A. L. Bicknell, *The Story of Marie Antoinette* (ib., 1897); A. L. Imbert de Saint-Amand, *Marie Antoinette at the Tuileries* (ib., 1897); Pierre de Nolhac, *Marie Antoinette, dauphine* (Paris, 1897); id., *La reine Marie Antoinette* (ib., 1898); A. L. Imbert de Saint-Amand, *Marie Antoinette and the Downfall of Royalty* (New York, 1898); Hilaire Belloc, *Marie Antoinette* (ib., 1909); A. C. P. Haggard, *Louis XVI and Marie Antoinette* (2 vols., London, 1909); Pierre Ladoué, *Les panégyristes de Louis XVI et de Marie Antoinette depuis 1793 jusqu'à 1912: essai de bibliographie raisonnée* (Paris, 1912); O. G. von Heidenstam, *Marie Antoinette, Fersen, et Barnave: leur correspondance* (ib., 1913).

MARIE CHARLOTTE AMÉLIE. See CARLOTTA.

MARIE DE FRANCE, *de fräns* (?twelfth century). The earliest French poet. She was born in France. She dedicated her fables to a certain William, whom some have identified with William Longsword of Salisbury; and she alludes in her *Fables* to a king, sometimes identified with Henry III of England. If these hypotheses be correct, it would appear that she lived in England and in the early thirteenth century, but textual evidence points to an earlier date. She wrote *Lais* and a collection of animal fables, a so-called *Ysopet*. A poem of 2300 lines on St. Patrick's purgatory (*L'Espugatoire Seint Patriz*) she derived from a Latin treatise by Henry of Saltrey, written before 1185. The *Lais* are 14 narrative poems, ranging in length from 100 to 1200 verses. Of these the best known is the *Chèvrefeuille*, describing an episode in the loves of Tristan and Iseult (Isolde); the finest is *Eliduc*. Noteworthy also are *Le rossignol, Les deux amants, Yonec* (a fairy tale of the bluebird), and *Lanval*. These Marie got from Kymric sources. Marie says she translated her 103 fables from an English version by King Alfred (*roi Alvrez*), or, as two manuscripts read, "King Henry." The English version from which she worked is lost; the Latin that stood behind it comprised nearly all the collection of Romulus (ninth century), supplemented from the Jewish-Oriental fables preserved in the collection of Berachyah and Pisore Alphonse, and apparently also from early native sources. The poems of Marie de France are edited by Roquefort (Paris, 1820), and better by Warnke in vol. iii of *Bibliotheca Normannica*, with an essay by Röhler (Halle, 1885). Consult: Bédier, "Les Lais de Marie de France," in *Revue des Deux Mondes* (Paris, 1891), and on the *Ysopet*, a chapter by Sudre in Petit de Julleville, *Histoire de la langue et de la littérature française*, vol. ii (ib., 1896); also: Warnke, *Die Quellen des Esope der Marie de France* (Halle, 1900); *Marie de France: Seven of her Lays Done into English, by Edith Rickert* (London, 1901); *Three Lays of Marie de France Retold in English Verse*, by F. B. Luquiens (New York, 1911), containing a bibliography; Alice Kemp-Welch, *Of Six Mediæval Women* (London, 1913).

MARIE DE' MEDICI. See MARIA DE' MEDICI.

MARIE GALANTE, *gä'länt'*. An island in the West Indies, one of the Lesser Antilles. It

belongs to France and lies 17 miles southeast of Guadeloupe, of which it is an administrative dependency (Map: West Indies, G 4). It is nearly circular in shape; area, 58 square miles. It consists of a limestone plateau, 300 to 600 feet high, surrounded by steep rocky shores. The climate is healthful and the soil is fertile, the chief products being sugar, coffee, and cotton. The chief town is Grandbourg, on the southwest coast. The population in 1901 was 15,181, consisting mostly of negroes and mulattoes. Marie Galante is so called from the name of the ship commanded by Columbus when he discovered the island in 1493.

MARIENBAD, mȧ-rē′en-bät. A famous watering place of Europe, situated near the west border of Bohemia, Austria, amidst pine-clad hills, at an altitude of 2060 feet, 36 miles northwest of Pilsen (Map: Austria, C 2). The visitors number about 30,000 annually. It is a small town, with a fine Roman Catholic church (1844–50) in Byzantine style, a tasteful synagogue, English and Russian churches, a theatre, four baths, including the Neubad, built in 1895, and a military Kurhaus. Its fine promenading grounds are adorned with monuments. Its 10 springs containing Glauber's salt do not differ essentially from those of Karlsbad except that they are cold. They range in temperature from 48° F. to 53° F. The principal springs are the saline Kreuzbrunnen and Ferdinandsbrunnen, used both for bathing and drinking. They yield yearly over a million bottles for export. The Marienquelle is used only for bathing, and contains a large proportion of carbonic acid. The chalybeate Ambrosius- and Karolinenbrunnen are used both for drinking and for bathing. Besides the above-mentioned springs there are mud baths and a hydropathic establishment. Considerable quantities of salt are exported. Although the springs of Marienbad enjoyed a local reputation long before the nineteenth century, it was only in 1808 that the first bathing establishment was opened and the place assumed its present name. Pop., 1900, 4588; 1910, 6280, chiefly Germans.

MARIENBURG, mȧ-rē′en-bŭrg. An old town in the Province of West Prussia, 30 miles south-southeast of Danzig, on the Nogat River (Map: Germany, H 1). It is chiefly interesting because it was for one and a half centuries the seat of the grand masters of the Teutonic Order. These knights built the Marienburg Schloss, one of the largest and most strongly fortified buildings in Germany and one of the most remarkable secular buildings of the Middle Ages. It has a sixteenth-century town hall, a notable monument to Frederick the Great, a teachers' seminary, a Gymnasium, and an agricultural school. Marienburg remained in the hands of the Knights till 1457, when it was taken by the Poles. Marienburg was occupied by the Russians during their first offensive campaign against the Germans in the European War which began in 1914. They were later compelled to evacuate it. (See WAR IN EUROPE.) The town has large wool-cleaning works and manufactures machinery, chemicals, pottery, bricks, and cotton wadding. It trades in grain, wood, linen, and horses. Pop., 1900, 10,732; 1910, 14,019. Consult Bergau, *Das Ordenshaupthaus Marienburg in Prussia* (Berlin, 1871).

MARIENWERDER, mȧ-rē′en-vĕr′dĕr. A town in the Prussian Province of West Prussia, on a tributary of the Vistula, 45 miles south of Danzig (Map: Germany, H 2). It has a fourteenth-century cathedral with tombs of the grand masters of the Teutonic Order and a castle built by the Teutonic Knights, the founders of the town in 1233. The principal industries are sugar refining and the manufacture of cloth, machinery, lumber, print goods, soap, vinegar, and dairy products. There is a considerable trade in fruit. Pop., 1900, 9686; 1910, 12,983.

MARIE THÉRÈSE, mȧ′rē′ tȧ′rĕz′, OF AUSTRIA (1638–83). A wife of Louis XIV of France, daughter of Philip IV of Spain, born in Madrid. By the terms of the Peace of the Pyrenees (1659) she was married to Louis XIV (1660), giving up all claims to the Spanish throne. She lived very unhappily with Louis, but at length seemed to find comfort in religion. Consult H. L. Duclos, *Mme. de la Vallière et Marie Thérèse* (2d ed., 2 vols., Paris, 1870).

MARIETON, mȧ′rē′ȧ′tōn′, PAUL (1862–1911). A French poet and critic, born at Lyons. He early became associated with the Provençal movement in southern France and took a prominent part in that revival. (See FÉLIBRIGE.) He was the founder and editor of the *Revue Félibréene*. His writings include: *Souvenance* (1884); *La viole d'amour* (1886); *Hellas* (1888); *La terre provençale* (1890); *Le voyage des Félibres et des Cigaliers sur le Rhône et le littoral* (1892); *Le livre de mélancolie* (1896); *Une histoire d'amour: George Sand et Alfred de Musset* (1897; 2d ed., 1903); *Le voyage des Félibres et des Cigaliers sur le Rhône et Vaucluse* (1895); *Jasmin* (*1798–1864*) (1898); *Hippolyta* (1902); *Le théâtre antique d'Orange et ses représentations* (1903, 1908); *Les epigrammes* (1909).

MARIETTA, mă′rĭ-ĕt′ȧ *or* măr′ĭ-. A city and the county seat of Cobb Co., Ga., 20 miles north by west of Atlanta, on the Louisville and Nashville, the Nashville, Chattanooga, and St. Louis, and the Western and Atlantic railroads (Map: Georgia, B 2). It has the Clarke Library and a city park. In the large National Cemetery here there are 10,532 graves, 2967 of unknown dead. Kenesaw Mountain (q.v.) is situated a short distance west. The city is the centre of a farming and stock-raising district and has extensive marble works, chair factories, knitting mills, machine works, table factory, etc. Marietta, first incorporated in 1852, is governed, under a charter of 1885, by a mayor, elected biennially, and a city council, chosen at large. The water works and electric-light plant are owned by the municipality. Pop., 1900, 4446; 1910, 5949.

MARIETTA. A city and the county seat of Washington Co., Ohio, 115 miles by rail southeast of Columbus, at the junction of the Ohio and the Muskingum rivers, the former being spanned by a bridge connecting with Williamstown, W. Va., and on the Baltimore and Ohio, the Pennsylvania Company, and the Marietta, Columbus, and Ohio railroads (Map: Ohio, H 7). It is the seat of Marietta College (q.v.), with a large library, and has a city park, set apart in 1788, and the oldest church organization and the oldest building in the Northwest Territory. The latter, known as the "Two-Horned Church," was once the office of the Ohio Land Company. It was destroyed by fire in 1905, but has since been rebuilt of brick along its original lines. In the cemetery here are buried many Revolutionary soldiers. The city is in an agricultural, petroleum, and coal region,

has large commercial interests through its river trade, and it manufactures flour, lumber products, stoves, tables and furniture, cars, tanned leather, carriages and wagons, refined petroleum, boats, oil-well tools, boilers, wooden bicycle rims, brick, harness, glass, caskets, etc. The government is administered under the Ohio municipal code of 1902 by a mayor, a unicameral council, a board of public safety appointed by the mayor with the concurrence of two-thirds of the council, and a board of public service elected by the people. All these officers are chosen for a term of two years. The city owns and operates the water works and electric-light plant. Pop., 1900, 13,348; 1910, 12,923; 1920, 15,140.

Marietta, the first settlement within the present limits of Ohio, was founded in 1788 by Rufus Putnam and a colony from New England under the authority of the Ohio Company (q.v.). It was named in honor of Marie Antoinette. In July, 1788, the Northwest Territory was formally organized here by Governor Arthur St. Clair. Blennerhasset Island, 12 miles below, was the scene of various incidents in the Burr Conspiracy. Marietta was first incorporated, as a town, in 1800. In 1890 the village of Harmar, where, in 1785, Fort Harmar had been built, was annexed. Consult Hoar, *Oration at the Celebration of the Centennial of the Founding of the Northwest at Marietta* (Washington, 1888).

MARIETTA COLLEGE. A coeducational institution of learning at Marietta, Ohio, founded as Muskingum Academy in 1797 by pioneers of the Ohio Company, chartered in 1835. It has a regular college course leading to the B.A. degree. The library, of over 60,000 volumes, is especially strong in the history of the old Northwest Territory. In 1914–15 the college had a faculty of 17 instructors and an attendance of 200. Its endowment was $700,000, its income $40,000, the value of its grounds and buildings $350,000, and the total value of the college property $1,000,000. The president in 1915 was George W. Hinman, Ph.D.

MARIETTE, mȧ′rē′ĕt′, Auguste Edouard (1821–81). A French Egyptologist, born at Boulogne-sur-Mer. He became in 1849 assistant in the Egyptian museum at the Louvre. He was sent to Egypt to collect Coptic manuscripts, but there became interested in the ruins of Memphis and in excavations. Aided financially by the French government and by the Duke de Luynes, he excavated, in 1851, the Serapeum near the modern Sakkara and the tombs of the Apis bulls, finding thousands of inscriptions and statues, as well as many mummies of sacred bulls and cows, which went chiefly to Paris. In 1854 he returned to Paris and was made curator in the Egyptian Museum. In 1858 he went to Egypt and became director of the governmental excavations and curator of the monuments. Acting in this capacity, he cleared most of the ancient temples, the great Sphinx, the tombs at Sakkara, and other historic spots from sand and rubbish, and formed the Egyptian National Museum. In 1873 he received the biennial prize of 20,000 francs from the Institute of France. The Egyptian government gave him the title of Bey, later that of Pasha. He died in 1881 and was buried in a huge stone sarcophagus standing before the museum. He produced, with the aid of collaborators and draftsmen, many books, among them: *Mémoire sur la mère d'Apis* (1856); *Renseignements sur les 64 apis trouvés dans les souterrains du Sérapéum* (1856); *Choix de monuments et de dessins, découverts ou exécutés pendant le déblayement du Sérapéum de Memphis* (1856); *Le Sérapéum de Memphis* (1857 et seq.); *Aperçu de l'histoire d'Egypte* (1867); *Abydos* (1870); *Les papyrus égyptiens du musée de Boulaq* (1872–77); *Denderah* (1869–75); *Monuments divers* (1872–82); *Deir-el-Bahari* (1877); *Karnak* (1875); *Voyage dans la Haute Egypte* (1878; 2d ed., 1893); *Catalogue des monuments d'Abydos* (1880); *Les Mastabas de l'ancien empire* (1881–89). The *Œuvres diverses d'Auguste Mariette*, edited by Maspero, began to appear in Paris in 1904. Consult Edouard Mariette, *Mariette Pacha* (Paris, 1904), and G. C. C. Maspero, *Notice biographique sur Auguste Mariette* (ib., 1905).

MARIGLIANO, mä′rē-lyä′nō. A town in the Province of Caserta, Italy, 10 miles northeast of Naples. It has a fine church and a palace. It manufactures spirits and markets grain and wine. Pop. (commune), 1901, 12,491; 1911, 12,502.

MARIGNANO, mä′rē-nyä′nō. See Melegnano.

MARIGNOLLI, mä′rēn-yōl′lē, Giovanni de' (fl. 1290–1357). An Italian traveler, born at Florence. He was one of four legates of Pope Benedict XII to the court of the Khan of Cathay. Starting in 1338 he reached Peking in 1342 and remained there three or four years. He traveled in eastern China; after leaving that country he discovered a church of the Latin communion at Columbum in Malabar in 1348; made a long sea voyage down the coast and probably to Java; and on his return voyage was detained in Ceylon by a native ruler. By 1353 he had returned to Europe and delivered a letter from the Khan to Pope Innocent VI. He became a chaplain of Emperor Charles IV in 1354 and Envoy to the Pope from Florence in 1356. The story of his travels was brought to light by J. G. Meinert in 1820.

MARIGNY, mȧ′rē′nyē′, Enguerrand de (1260–1315). A French statesman and financier, born at Lyons-la-Forêt, Normandy. He became grand chamberlain and chief minister of Philip IV the Fair in 1304. He received many favors from Philip and from Edward II of England, but his share in the debasement of the French coinage made him unpopular. When Philip died in 1314, Marigny became a victim of the feudal reaction against the increasing royal power. He was accused of malfeasance in office and of treachery to the King, but his accounts were found to be correct. Louis X, however, permitted him to be convicted on a charge of sorcery, and he was hanged.

MARIGOLD (*Mary*, in allusion to the Virgin Mary, *gold*). A name given to certain plants of the family Compositæ, chiefly of the genera *Calendula* and *Tagetes*. The genus *Calendula* comprises about 20 annual and perennial herbs and shrubs, of which some of the former are found in the countries bordering on the Mediterranean, the latter chiefly in South Africa. Pot marigold (*Calendula officinalis*) is a common cultivated annual, native of southern Europe, with an erect stem, 1 to 2 feet high, obovate lower leaves on long stalks, and large, deep-yellow flowers. There are a number of varieties, some of which have double flowers. The whole plant has a slight aromatic odor and a bitter taste. The dried florets are often employed to adulterate saffron and sometimes for coloring butter or cheese. They are also used

in the preparation of soups. The plants are propagated by seeds sown in spring in ordinary garden soil in sunny or half-shady places. Later they are thinned to about one foot apart. The genus *Tagetes* consists of annual and perennial herbs, natives of the warmer parts of America from Arizona to Argentina. Although *Tagetes erecta*, one of those most frequently cultivated, bears the name of African marigold, and *Tagetes patula*, another well-known annual, is called French marigold, both species are Mexican. Corn marigold is *Chrysanthemum segetum*. Marsh marigold (*Caltha palustris*) has no botanical affinity with the true marigolds. *Bidens beckii* is called water marigold.

MARIKINA, mär'ĭ-kē'nâ. See MARMOSET.

MARILLAC, má'rē'yák', CHARLES DE (1510–60). A French diplomat, born in Auvergne. He became an advocate in Paris; in 1535 went to Constantinople, where he became Ambassador shortly after; and in 1538–43 was Ambassador to Henry VIII of England. From 1547 to 1551 he served in the same capacity in Switzerland and at the court of Emperor Charles V, and in 1555 was one of the negotiators of the Peace of Ardres with England. In recognition of his services he was made Bishop of Vannes in 1550, Archbishop of Vienne in 1557, and a Councilor of State. He played a leading part in the Assembly of Notables at Fontainebleau in 1560, but his policies aroused the enmity of the Guises. He wrote *Discours sur la roupture de la Trefve en l'an 1556* (1556).

MARINA, mâ-rē'nâ, or MALINTZIN, mä'lĕn-tsēn'. A Mexican woman. She was born in Coatzacoalcos, probably in the early years of the sixteenth century. She was of a noble family, but when a child was sold in slavery to the Tabascan Indians. Soon after Cortés invaded Mexico she became his interpreter and his mistress. She constantly acted as intermediary between the Spanish and the natives, and thus became prominent in all the affairs of the Conquest. Their son, Don Martín Cortés, attained considerable importance in Mexico. She was afterward married to Juan de Jaramillo and was living as late as 1550.

MARINDUQUE, mä'rĕn-dōō'kâ. One of the Philippine Islands, situated in the Visayan Sea, 19 miles south of the Isthmus of Tayabas, separating North from South Luzon (Map: Philippine Islands, C 4). It is roughly circular in shape, with a diameter of 24 miles and an area of 667 square miles. Its coast line has four good harbors. Its surface is hilly, with a maximum altitude near the centre of probably 2500 feet. The interior is forested, with some fine grazing grounds. The principal occupations of the inhabitants are cattle raising and the cultivation of rice, coconuts, and hemp. Copra is manufactured and exported. Pop., 1903, 51,674, almost entirely Tagalog. Marinduque was a separate province until June 23, 1902, when the large island of Mindoro (q.v.) was annexed to it; it forms now a subprovince of the Province of Tayabas, Luzon. The capital is Boac (q.v.). Marinduque is a port of call on the main line of communication between Luzon and Mindanao.

MARINE, mâ-rēn', MERCHANT, OF THE UNITED STATES. See MERCHANT MARINE OF THE UNITED STATES; UNITED STATES, passim; SUBSIDIES; SHIPBUILDING.

MARINE CITY. A city in St. Clair Co., Mich., 46 miles (direct) northeast of Detroit, on the St. Clair River and on the Rapid Railroad, a freight line (Map: Michigan, G 6). It is a residential city and summer resort. Important industries are the manufacture of salt and beet sugar and the building of wooden vessels for the Great Lakes. The water works are owned by the municipality. Pop., 1910, 3770.

MARINE CORPS (OF., Fr. *marin*, from Lat. *marinus*, pertaining to the sea, from *mare*, sea; connected with Goth. *marei*, AS. *mere*, OHG. *marī*, Ger. *Meer*, Ir. *muir*, OChurch Slav. *morye*, Lith. *máres*, sea; possibly connected with Gk. *βρύξ*, *bryx*, sea depth). A body of soldiers enlisted for service in the navy. While the marines, as they are called, are by many regarded as a relic of the days when the fighting complement of ships consisted of soldiers, this is not strictly true. Three hundred years ago, when the heavy gun displaced the ram as the principal naval weapon of offense, the soldiers on board ship rapidly decreased in numbers and importance and soon disappeared from the ships altogether. After a few years' absence they were brought back again. In 1653 Admiral Blake embarked a number on his ships to act as riflemen in his action against Van Tromp. Their efficiency probably led to the establishment of the British marine corps in 1664, but afterward it was several times wholly or partly abolished.

The value of well-trained and expert riflemen in the close-fought actions and frequent hand-to-hand encounters of the seventeenth, eighteenth, and nineteenth centuries was so great as to cause marines to form important parts of the complements of all men-of-war of those days. They were, moreover, of much use as a police force for controlling the mixed, ignorant, and often mutinous sailors who composed the crews in the days of the press gang and indiscriminate enlistment.

The United States marine corps was established by Act of Congress dated June 25, 1776, and provided for the appointment of one major (Samuel Nichols), nine captains, and ten first lieutenants. After the close of the Revolution the navy was practically abolished, and, with the other branches of the service, the marine corps disappeared. When the reorganization of the navy took place in 1798, the marine corps was again established with an authorized strength of 881 officers and men commanded by a major.

During the first 75 years of the nineteenth century the marine corps was one of the most important and distinguished parts of the navy, both afloat and ashore. Its officers and men added lustre to their name in the naval operations on the Barbary coast, in the War of 1812, and in the Civil War. But with the advent of the high-power gun the battle range increased to such an extent that riflemen were no longer of use in naval action, and the removal of marines from ships began to be urged. The arguments to this end were given added force by the fact that marines were no longer needed for ship-board police on account of the greatly improved character of the enlisted force of the navy. The removal might have taken place but for the contemporary total abolition of sails on fighting ships, which obviated the necessity for a ship's company composed wholly of sailors of the old type. It was therefore possible to find a place for a limited number of well-trained riflemen who could be utilized at the smaller guns. Then came the Spanish War and furnished its lesson as to the value of a military expeditionary force

to accompany the fleet, not only wholly under naval control, but thoroughly conversant with the practical needs of the vessels and of the service generally. The marine corps, therefore, shared in the general naval expansion which followed the war and has continued to increase as the navy has developed.

At present marines form about 10 per cent of the complements of large ships in the United States navy and are found most useful in landing operations for the protection of American citizens and their property in regions disturbed by war or insurrection. The sailors are drilled as infantry and artillery, but as their chief duties are connected with the main battery of the ship, when they are landed the battle organization of the vessel is entirely broken up, so that they cannot be spared without greatly weakening the efficiency of the ship.

Less than one-third the marine corps is on shipboard. The remainder is distributed in barracks in or near the principal naval stations. During the prevalence of ordinary conditions they act as guards and military police forces at these stations, but they are organized and trained as regiments or parts of regiments and are ready for mobilizing at any time as an expeditionary force of one to six regiments (two are usually in the Philippines) for immediate service wherever American interests are threatened by revolutionary disturbances abroad; or, in case of war, to be sent to seize certain foreign places, to establish a fortified advance base, or to protect weak or threatened points. They are carried in naval transports, conveyed by fighting ships, and accompanied by freight and supply ships if advance base and other materials are needed in quantities to make this necessary.

The commandant of the corps is a major general. The staff consisted (1915) of one adjutant and inspector, one quartermaster, and one paymaster, all with the rank of colonel. As assistants in these staff departments there are: 5 lieutenant colonels, 8 majors, and 13 captains. The line consists of 8 colonels, 7 lieutenant colonels, 8 majors, 94 captains, 97 first lieutenants, 89 second lieutenants, and 9921 noncommissioned officers and privates. Consult: J. F. Cooper, *History of the Navy* (New York, 1866); R. S. Collum, *The History of the Marine Corps* (ib., 1902); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (ib., 1914); also, the works of Maclay, Spears, and other naval historians.

Marine Corps in Foreign Navies. France, Austria, Spain, Japan, and Greece have no marines. Argentina, Brazil, Italy, Germany, and the Netherlands have marine infantry. Chile has marine infantry and artillery. Denmark has marine artillery. Russia has marine infantry and artillery in large numbers. Most of the troops of these countries are used at naval stations and in the colonies; few are used on board ship except in the Russian navy. The British marine corps is very similar to the American, except that it is divided into marine infantry and marine artillery. It was established in 1664 and was at first called the Admiral's Regiment. At this time the irregular methods of obtaining crews for men-of-war and the lack of regulation of the naval forces made the presence of such a disciplined force necessary. Impressment and the dissatisfaction engendered by the various methods of forced service continued the necessity for nearly 200 years. While no longer required for their original purpose, they still form a valuable part of the British navy. The budget for 1914–15 provided for 428 commissioned officers, 85 warrant officers, 1353 staff sergeants and sergeants, 1801 band ranks, buglers, and music, 227 band boys, and 14,691 rank and file.

MARINED, mȧ-rēnd′. A term in heraldry, applied to an animal whose lower extremity terminates in a tail like that of a fish. See HERALDRY.

MARINE DISASTERS. See SAFETY AT SEA.

MARINE ELEVATOR. See GRAIN ELEVATOR.

MARINE ENGINEERING. That branch of the science and art of engineering which concerns itself with the propulsion of ships and the design and operation of ship machinery of all kinds. At one time it was solely concerned with steam engineering, but such is no longer the case, for ships not only have auxiliary machinery driven by electric power or internal-combustion engines, but many ships are propelled by them. The different parts of the subject are considered or treated under the heads of BOILER; DYNAMO-ELECTRIC MACHINERY; INTERNAL-COMBUSTION ENGINE; SCREW PROPELLER; SHIP; SHIPBUILDING; SHIPPING; STEAM ENGINE.

MARINE GLUE. See CEMENT; GLUE.

MARINE HOSPITAL SERVICE. See PUBLIC HEALTH SERVICE.

MARINE INSURANCE. The practice of marine insurance, at least on a purely commercial basis, antedates by centuries the application of the insurance principle to other kinds of risks. Even in ancient times there was developed a system of quasi-insurance in the form of loans on bottomry by which risks were at least partially transferred. In the Middle Ages marine insurance on a commercial basis first appeared as early as the thirteenth century in Flanders and in Portugal. The oldest legal document relating to insurance which has come down to us consists of the ordinances issued by the magistrates of Barcelona in 1435 to regulate the business of marine insurance. Marine underwriting appears to have been introduced into England by the Lombards early in the sixteenth century. By the eighteenth century that country had obtained the leading position in the business, which she has since maintained.

For many years marine underwriting in England was carried on exclusively by unassociated individuals and continued to be conducted on a strictly individual basis until late in the eighteenth century. The first step towards the regulation of marine underwriting by the Lloyds Association (see LLOYDS) was taken in 1779, when a printed form of policy was adopted, practically the same as the one still in use. In 1871 the Lloyds Association was incorporated by Act of Parliament, the articles of incorporation stating as the main objects of the organization the conduct of the business of marine insurance, the protection of the interests of the members of the association, and the collection and publication of information in regard to shipping. It is for the accomplishment of the last-named purpose that the association has developed its remarkable system of agencies, whose intelligence and dispatch in gathering and reporting shipping news are unequaled in any similar organization. Marine underwriting at Lloyds is still exclusively an individual transaction, though under the general supervision of the association. The

method of transacting business is as follows: A merchant having a ship to insure sends through a broker a slip setting forth the characteristics of the risk he desires insured. Any underwriter who desires to assume a part of the risk places on the slip his initials and the amount he is willing to assume. No one underwriter assumes very large risks, a ship and cargo being usually underwritten by a large number of individuals, each of whom carries from £100 to £500. The responsibility of each underwriter is limited to the amount for which he has subscribed. When the entire amount has been subscribed, the policy is made out and signed by those who have already put their initials on the slip.

In the seventeenth century two insurance companies, the Royal Exchange and the London, were authorized to transact a marine business, while the privilege was denied to all other companies. These two companies appear to have done little marine underwriting. In 1824 the monopoly restriction was removed, and since that time many companies have gone into the business. Even these companies, however, find it advantageous to work through Lloyds, each of them having a representative on the floor of that association.

In America marine insurance was the first form to be written. In 1759 the first office was established, although a large amount of individual underwriting had previously been carried on. This office was opened in New York and was known as the Old Insurance Office. The method of conducting business was by individual underwriting, after the manner of the English Lloyds.

It was not until near the end of the eighteenth century that corporations took up the business of marine underwriting. The first in the field were the Insurance Company of North America and the Insurance Company of the State of Pennsylvania. Both were located in Philadelphia, and both began marine underwriting in 1794. The growth of the business was rapid and was greatly stimulated by the expansion of American shipping during the period of the Napoleonic wars in Europe. The companies rapidly absorbed the entire business of the country, and by the year 1825 individual underwriting was practically at an end in the United States.

The period of the Civil War subjected the marine companies to a severe strain, and several of them succumbed. Since that time the condition of marine underwriting has reflected the condition of the shipping industry of the country. The great growth of the business has been seen, not in the insurance of risks on the high seas, but in the insurance of risks on inland waters. The headquarters for the insurance of shipping on the lakes is Chicago. The business is especially hazardous on account of the limited area over which the operations extend and a consequent great fluctuation in loss rate.

Upon the outbreak of the European War in 1914 the difficulties encountered by American shipping led to the passage by Congress of an Act to establish a bureau of war risks in the Treasury Department. The Act was signed by the President on Aug. 19, 1914, and went into effect immediately. The Secretary of the Treasury was authorized to appoint a director and other officers of the bureau and to aid the bureau in fixing premiums and in adjusting payments for losses. The function of the bureau was to insure American ships and cargoes therein against loss or damage by risk of war whenever it appeared to the Secretary impossible for American shippers to secure war-risk insurance on terms substantially equal to those given foreign vessels or cargoes by their respective governments. An appropriation of $5,000,000 was made to inaugurate the system, in addition to $100,000 to defray the expenses of the bureau. The President was authorized to suspend the operation of the Act as soon as the necessity of war-risk insurance should disappear. In any event the Act was limited to two years from the date of enactment.

The general principles on which marine insurance is based are not different from those underlying other forms of insurance, but in practice the former presents a number of peculiar features.

The Policy. The common form of marine policy is the voyage policy, i.e., a policy to be in force for a voyage from one specified port to another. Occasionally, however, a ship is insured under a time policy, which is to be in force for a specified time, usually a year. The chief practical distinction between the two is that with a voyage policy there is always a warranty, express or implied, that the ship is seaworthy at the beginning of the voyage, while with a time policy no such warranty is implied.

An open policy is one which provides that in case of total loss the amount of the indemnity shall be determined by ascertaining the amount of loss actually suffered. It is incumbent upon the insured to prove the value of the destroyed property. A valued policy, on the other hand, provides that in case of total loss the amount stated in the policy shall be regarded as the value of the insured property and paid as indemnity. Valued policies are more frequently issued on the ship, while the cargo is more commonly covered by an open policy. The use of the valued policy has undoubtedly tended to increase the amount of overinsurance and deliberate destruction of vessels. This practice is especially easy under the system of individual underwriting prevailing at Lloyds, since the underwriter frequently knows little or nothing about the ship he is insuring beyond what is stated in the slip.

Objects. The objects most commonly insured under a marine policy are ship, cargo, and freights. Sometimes other objects are covered, such as the expected profits of the voyage or, more frequently, the liability for damages on account of collision. The insurance of freight is an illustration of a peculiar feature of marine insurance. In all other forms of insurance of property the amount of indemnity that can be recovered in case of loss is determined by the value of the property destroyed, *damnum emergens*. In marine insurance it is possible to insure an expected gain and to obtain indemnity if the occurrence of any of the events covered by the policy makes it impossible to realize the gain, *lucrum cessans*.

Dangers. A marine policy covers a far greater number and variety of dangers than any other form of policy issued. Besides the more characteristic perils of the seas, such as wind and wave, fire, collision, stranding, jettison, and the like, the policy covers three distinct kinds of danger—war risks, including detention as well as capture or destruction; pirates, rovers, and thieves; and barratry, or illegal acts of captain

or crew. As to the losses caused by the perils of the sea, they must be due to extraordinary action of wind and wave or to some other unusual cause. The losses caused by ordinary forces are known as wear and tear and are not covered by the insurance. The distinction between the two kinds of losses has been the subject of much litigation, and the present condition of the law of the subject is precise but complex. Modern policies cover some further kinds of loss, especially liability for damages on account of collision.

Insurance after the Loss. Uncertainty as to the fate of a vessel may continue for an indefinite time after the loss has occurred. Insurance may be taken out on an overdue ship, and even though it should afterward appear that the vessel had already suffered shipwreck at the time when the insurance was effected, the indemnity could still be collected. The premium rate on an overdue ship indicates the judgment of the underwriters as to the probability that the vessel has already suffered disaster.

Reinsurance. Individual underwriters enjoy only to a limited extent the advantages that come from the combination of a large number of risks in a group, and consequently single losses may involve a considerable share of their capital. They avoid this danger partly by underwriting only a small portion of the value of each ship they insure and partly by resorting to reinsurance. As it is always possible to insure a ship so long as it is unknown whether she suffered disaster or not, it is customary for those who have insurance in force on a vessel that is overdue to protect themselves by reinsuring her. They are naturally obliged to pay higher premiums than they themselves received. If this process of reinsurance is repeated several times, as is frequently the case, the effect is that a loss is distributed in small proportions over a large number of underwriters.

The Loss. Loss may be complete or partial. When it is complete the settlement between the insured and the underwriters is comparatively simple. On a valued policy an insurer becomes liable for the amount stated in the face of the policy. In the case of an open policy it is necessary for the insured to prove the value of the property destroyed or the amount of freight lost. Unless otherwise agreed, the value of the ship is its value at the time of starting on the voyage with the value of the ship's stores included; the value of the cargo is its invoice value with the addition of insurance premium and other charges; and the value of the freight is the amount the ship would have earned if she had reached her destination in safety.

Abandonment. A peculiar feature of marine insurance is the practice of abandonment, when the insured surrenders or abandons to the underwriters the property covered by the policy and demands his entire indemnity. This right does not always exist, but arises only when the insured property has suffered so serious damage from perils covered by the policy that it amounts to constructive total loss. With regard to the ship or the cargo there is held to be constructive total loss when the damage exceeds one-half the value of the vessel or cargo respectively and when the vessel is captured by the enemy or detained by embargo. There is constructive total loss of cargo when it is so badly injured that it has to be sold at some other place than its original destination. There is constructive loss of freight when the ship is unable to complete her voyage, or the goods on which the freight is to be paid are so badly damaged that they cannot be carried to their original destination.

When the conditions are such as to give a legal right to abandon, it is optional with the insured whether he will take advantage of the right or not. If he decides to do so he must give notice to the insurer within a reasonable time; and having once elected to abandon, it is impossible for him to draw back. The effect of abandonment is to vest the title to the insured property in the underwriter and to convey to him all rights and claims on account of the ship and cargo.

Average. When there is partial loss and the insured cannot or does not elect to abandon and receive the entire indemnity, it becomes necessary to ascertain the amount for which the insurer is liable. Such partial losses are known by the name of "average," a term borrowed by marine insurance from general maritime law. It is frequently necessary to sacrifice some part of the ship or cargo in order to save the rest. It is obviously unjust to have the entire burden of loss under such circumstances fall upon the party whose property is thus voluntarily destroyed or injured. Maritime law, therefore, prescribes the way in which such losses shall be apportioned or averaged among all the interests at stake. The term "average" was later extended to include losses of all kinds. To distinguish those losses which are of such a nature that they ought to be apportioned among all the parties from those which ought to be borne entirely by the party whose property is damaged, the former kind of loss is called general average, the latter particular average. In the case of the ship, the voluntary cutting away of a mast to save the ship would be general average; the loss of a mast through the violence of the wind would be particular average. There is general average on the cargo when a part of it is jettisoned or thrown overboard to lighten the ship; there is particular average when a part of it is damaged as the result of the action of forces which are included in the policy. So far as the insurance is concerned, it is the general rule that the insurer is liable for all general averages under all conditions, in the absence of fraud. His liability for particular average, however, is usually limited in the policy. For certain kinds of commodities the policy exempts the insurer from all liability; for others, from liability for losses of less than 5 per cent or some other specified proportion, unless the ship be stranded; while for all other commodities and for ship and freight, liability does not attach unless the loss exceed 3 per cent or the ship be stranded. When several successive losses are experienced during the same voyage, the sum of all the losses is the amount considered in determining whether the percentage of loss is high enough to render the underwriters liable.

The measure of the liability of the insurer for particular average on the ship is the cost of repairs, including all extra expenses which they involve, with a deduction, usually of one-third, from the value of new material used in repairing the ship; in the case of freight it is the amount actually lost through the diminution in the weight of the cargo; and for the cargo it is that part of the invoice value of the damaged goods which remains after there has been subtracted from their total value such a proportion

of the total value as the gross value of the damaged goods at the port of destination is of the gross value of similar goods in a sound condition.

General Average. In the absence of insurance general average would be apportioned among all the owners of ship, cargo, and freight. Each party, including the one whose property was sacrificed, would make contribution in proportion to the value of the property he had at stake. In estimating that value the value of ship and cargo is usually taken at their actual value when they reach their destination, while the value of the freight is ascertained by subtracting the wages of captain and crew from the gross amount received as freight. When the different parties are insured, general average is paid by the underwriters and not by the owners of the property. So far as general average is concerned, insurance is a transfer from owners to underwriters of liability for contributions to reimburse those whose property has been sacrificed for the general good.

Sue and Labor. When loss or disaster threatens a ship or cargo, the master of the vessel is bound to do everything in his power to avoid the danger or avert the loss. Whatever expense is incurred for that purpose the underwriters are responsible for, under the so-called suing and laboring clause, which reads as follows: "In case of any loss or misfortune, it shall be lawful to the assured, their factors, servants, and assigns, to sue, labor, and travel for, in, or about the defense, safeguard, and recovery of the said goods and merchandise, or ship, or any part thereof, without prejudice to this insurance: to the charges whereof, we, the assurers, will contribute, each one according to the rate and quantity of the sum herein insured." While the clause says that the insured "may" so sue and labor, it is the established rule of law that he is bound so to act. The general rule is that, in case of damage or partial loss, the insured is bound to act as a prudent man would act under the circumstances if he were uninsured.

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MARINE LABORATORY. See LABORATORY.

MARINE METEOROLOGY. See METEOROLOGY.

MARINE RAM. See RAM, MARINE.

MAR'INER'S COMPASS. See COMPASS.

MARINE SAFETY. See SAFETY AT SEA.

MARINE SURVEYING. See HYDROGRAPHY.

MARINETTE, măr'ĭ-nĕt'. A city and the county seat of Marinette Co., Wis., 178 miles north of Milwaukee, on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Wisconsin and Michigan railroads (Map: Wisconsin, F 3). It is situated at the mouth of the Menominee River, on Green Bay, opposite Menominee, Mich., with which it is connected by bridges and by steam and electric trams. Marinette has a fine harbor and carries on an extensive lake commerce, and its good water power and proximity to valuable forests have developed its extensive lumber interests. It is, moreover, growing in favor as a summer resort. There are also large box factories, knitting mills, granite works, several establishments making various cedar products, pail and broom factories, paper and pulp mills, ironworks, and manufactories of steam threshing machines, gloves, cutlery, pianos, cooperage supplies, and gas and traction engines. Settled about 1850, Marinette was incorporated in 1887. The government is administered under a general charter of 1898, which provides for a mayor, elected every two years, and a unicameral council. Pop., 1900, 16,195; 1910, 14,610; 1920, 13,610.

MARINETTI, mär'ē-nĕt'tē, FRANÇOIS (1878–). A poet, born at Alexandria, Italy, but a resident of France. He founded and directed the international review, *Poesia*, and initiated and became the advocate of a literature of "futurism." Among his works are: *Le roi Bombance* (1905), satirical tragedy; *La conquête des étoiles* (1902; 2d ed., 1908); *La ville charnelle* and *Les dieux s' en vont, d' Annunzio reste* (1908); *Poupées électriques* (1909), a drama; *Mafarka-le-futuriste* (1910); *Le futurisme* (1911), the manifesto of his school; *La bataille de Tripoli* (1912); *Le monoplan du pape* (1914).

MARINI, mä-rē'nē, GIAMBATTISTA (1569–1625). An Italian poet, born at Naples, Oct. 18, 1569, frequently called simply Cavalier Marino. He began the study of jurisprudence, but lived so wildly that his father eventually banished him from home. He was received by the chief admiral of Naples as secretary, but the part he played in connection with an abduction forced him to flee to Rome. There he prospered, and before long (1603) he was able to undertake a journey to Venice to superintend the publication of his verse. Attached to the household of Cardinal Aldobrandini, he traveled with him in Italy and, under his auspices, came into contact with many men of letters of the time. He next won the favor of the ducal ruler of Turin, Charles Emmanuel I, but, as a result of one of his many quarrels growing out of literary jealousies, he was arrested, and upon his release went to Paris, where he won the good graces of Maria de' Medici. He remained in France from 1615 to 1623, and then, returning to Italy, he was everywhere received with extraordinary honor. He died at Naples, March 25, 1625. Before his twentieth year Marini had gained considerable repute by his *Canzone de' baci*. The first collection of his verse was that of Venice (1602–14), entitled *La lira*, in which there is an erudite imitation of Ovid, Tibullus, Spanish writers, and earlier Italian poets. Not to mention his *Sampogna*, his *Strage degl' innocenti*, his *Gallerie* and minor lyrics, his most noted production is the *Adone* (Venice, 1623), a long poem in octaves, ostensibly on the love of Venus and Adonis, but containing long digressions. What most attracts modern attention in this work is its mannerisms, the excess of imagery, and its overwrought style; with its contemporaries it aroused unbounded admiration, as well as bitter criticism among Marino's enemies. Of these the most venomous was

Tommaso Stigliani, whose *Occhiale* initiated a polemic lasting over half a century. The *Adone* is the most brilliant and most characteristic specimen of the concettistic literature of the Italian seventeenth century. As regards form, it shows the extreme development of the Renaissance theory of ornament as the essence of style; as regards substance, it reflects the sensualistic æstheticism of its time with a genius somewhat similar to that of our contemporary D' Annunzio.

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MARIN INDIANS. See Miwok Stock.

MARINO FALIERO, mȧ-rē′nō fȧ-lyā′rō. A drama by Byron (1820).

MARINONI, mä′rē-nō′nē, Hippolyte (1823–1904). A French inventor, born at Paris. He invented a rotary press which could print 40,000 impressions in an hour and was extensively used, and another which printed polychromes in six colors at the rate of 20,000 an hour, as well as many other improvements in printing. After 1883 he was editor of the *Petit Journal.*

MARIO, mä′rē-ō, Giuseppe, Marquis di Candia (1810–83). An Italian dramatic tenor singer, born at Cagliari, Sardinia. In 1830 he received his commission as officer in the chasseurs Sardes, but abandoned his commission and fled to Paris, where he later secured the appointment of first tenor at the opera. At the same time he adopted the name Mario. After two years' study at the Conservatory he made his début in 1838 in *Robert le Diable* and achieved the first of a long series of operatic triumphs. From 1845 to 1850 he fulfilled an engagement in Russia and on his return appeared in London, and in 1854 he went to America. In his private life he was known for generosity to struggling artists. His repertoire embraced all the staged operas of Rossini, Bellini, Donizetti, and Verdi. In 1844 he married the singer Grisi. He died in Rome. Consult Judith Gautier, *Le roman d'un grand chanteur* (Paris, 1912).

MARION, măr′ĭ-on *or* mâr′-. A town and the county seat of Perry Co., Ala., 28 miles northwest of Selma, on the Southern Railway (Map: Alabama, B 3). It has the Judson Female Institute (Baptist), opened in 1839; Marion Female Seminary, opened in 1836; Marion Military Institute; the Lincoln Normal School for colored pupils (Congregational); and a Carnegie library. An agricultural country surrounds the town. There are municipally owned water works. Pop., 1900, 1698; 1910, 1834.

MARION. A city and the county seat of Williamson Co., Ill., 114 miles southeast of St. Louis, Mo., on the Illinois Central, the Chicago and Eastern Illinois, the St. Louis, Iron Mountain, and Southern, and the Eldorado, Marion, and Southwestern railroads (Map: Illinois, G 10). It has a trade in grain and live stock, and manufactures of flour, cigars, canvas gloves, shoe machinery, novelties, etc. In the vicinity are fine timber lands and deposits of coal, the mining of which constitutes the leading industry. Pop., 1900, 2510; 1910, 7093.

MARION. A city and the county seat of Grant Co., Ind., on the Mississinewa River, 68 miles (direct) northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Pittsburgh, Cincinnati, Chicago, and St. Louis, the Toledo, St. Louis, and Western, and the Chesapeake and Ohio of Indiana railroads (Map: Indiana, F 3). Interurban electric lines connect the city with Indianapolis and other cities and towns. Marion has a Federal building, fine courthouse, a large normal college, hospital, and Carnegie library. A National Soldiers Home, which cost $1,500,000, is 3 miles to the south. The city is the centre of a farming region and has a supply of natural gas. There are extensive manufactories of glass products; also flouring, saw and planing, linseed-oil, and pulp and paper mills; foundries, cornice and brick works; and manufactories of bedsteads, motor trucks, railway supplies, furniture, cement posts and blocks, forgings, engines and boilers, paper-mill machinery, shoes, and gasoline motors. The government is vested in a mayor, elected every four years, and a unicameral council. Marion owns and operates its water works. Pop., 1900, 17,337; 1910, 19,359; 1914 (U. S. est.), 19,656; 1920, 23,747.

MARION. A city and the county seat of Linn Co., Iowa, 5 miles northeast of Cedar Rapids, at the junction of divisions of the Chicago, Milwaukee, and St. Paul Railroad (Map: Iowa, F 2). It is situated in a fertile agricultural country, is a healthful residential city, and has the county buildings, a Carnegie library, sulphur springs, a park in the centre of the city, and a septic sewer system. There are large freight yards and repair shops of the Chicago, Milwaukee, and St. Paul Railroad; also a flouring mill, a broom factory, cement block and vault works, and two greenhouses. Marion was settled in 1839 and was incorporated in 1852. Pop., 1900, 4102; 1910, 4400.

MARION. A city and the county seat of Marion Co., Ohio, 46 miles north of Columbus, on the Hocking Valley, the Cleveland, Cincinnati, Chicago, and St. Louis, the Pennsylvania, and the Erie railroads (Map: Ohio, D 4). There are division headquarters of the Erie Railroad, a Carnegie library, a normal school, the Marion County Children's Home, Old Ladies Home, Elks Home, and a fine Federal building. Marion is the centre of a farming district and has lime works, malleable iron works, silk mills, a piano factory, and manufactories of engines, steam shovels, dredges, shoes, agricultural machines, racing sulkies, etc. Pop., 1900, 11,862; 1910, 18,232; 1914 (U. S. est.), 22,032; 1920, 27,891.

MARION. A city and the county seat of Marion Co., S. C., 103 miles east of Columbia, on the Atlantic Coast and the Raleigh and Charleston railroads (Map: South Carolina, E 2). It is in a fertile region interested chiefly in cotton and tobacco growing and has cotton and cottonseed-oil mills, a foundry, large lumber mills, etc. There is a Carnegie library and a well-kept city park. Pop., 1900, 1831; 1910, 3844.

MARION. A city and the county seat of Smyth Co., Va., 107 miles west by south of Roanoke, on the Norfolk and Western Railroad, at the terminus of the Marion and Rye Valley Railway (Map: Virginia, C 5). It is the seat of the Southwestern State Hospital for the Insane, accommodating about 700 inmates, and of the Marion Female College (Lutheran). The principal industries are woodworking, milling, mining, and stone quarrying. Settled in 1832, Marion was first incorporated in 1871. The

town has its own water supply, obtained by the gravity system from springs which are about 3 miles distant. Pop., 1900, 2045; 1910, 2727.

MARION, Francis (1732–95). An American soldier. He was born at Winyah, near Georgetown, S. C., in which neighborhood his grandfather, a Huguenot refugee, had settled soon after the revocation of the Edict of Nantes in 1685. In 1759 he removed to Pond Bluff, near Eutaw. In 1775 he represented St. John's Parish, Berkeley County, in the Provincial Congress, which adopted the Bill of Rights, and voted to raise forces after the battle of Lexington. He was commissioned a captain in Colonel Moultrie's regiment June 21 and took part in the occupation of Fort Johnson, which caused the flight of the royal Governor, Lord William Campbell. After his promotion to major, in 1776, he was stationed at the unfinished Fort Sullivan (afterward called Fort Moultrie), in Charleston harbor. He showed great coolness during Sir Peter Parker's bombardment, June 28, 1776, and was made lieutenant colonel in the regular service. For a time he was in command of Fort Moultrie, and then took part in the unsuccessful attack of D'Estaing and Lincoln on Savannah in 1779. When the British captured Charleston in 1780 and began to overrun the State, Marion fled to North Carolina, where he met General Gates, who received him coldly. Soon he was asked to command four companies of irregular cavalry, which had been raised around Williamsburg, S. C., and in August, 1780, Governor Rutledge gave him a commission as brigadier general of State troops. His irregular force was ill-equipped and ill-fed, yet Marion demonstrated himself the greatest of partisan leaders, in spite of many obstacles and disadvantages. After the defeat of Gates at Camden and of Sumter at Fishing Creek, this was for a time the only American force of any strength in the State. The men furnished their own equipment and came and went almost at will, as it was necessary to protect their families from the Tories and to plant their crops.

The first important action was on Aug. 2, 1780, at Nelson's Ferry, where two companies of British regulars were routed and 150 Continental soldiers taken at Camden were recaptured. Marion's men caused much trouble to Cornwallis by intercepting communications, capturing foraging and scouting parties, and intimidating the Tories. Major Wemyss and Colonel Tarleton were especially instructed to take him. For a time Marion was forced to retreat towards North Carolina, but in 1781 he established himself at the confluence of Lynch's Creek and the Pedee River, in a swampy forest known as Snow's Island. He took Fort Watson in conjunction with Col. Henry Lee, captured Fort Motte and Georgetown, fought at Quinby's Bridge and Parker's Ferry and at Eutaw Springs. The force was not disbanded until after the British evacuation, in December, 1782. In June, 1782, Marion put down a Loyalist uprising on the banks of the Pedee River, and in August he left his brigade and returned to his plantation. Marion was elected to the General Assembly in 1782 and was publicly thanked by that body in 1783. As he had been impoverished by the war, the sinecure of commandant of Fort Johnson was created for him with a salary of £500 per annum. After his marriage to a wealthy woman, Mary Videau, he represented St. John's in the State Senate and in the Constitutional Convention of 1790. Consult: Sir Banestra Tarleton, *History of the Campaigns of 1780–1781 in the Southern Provinces of North America* (Dublin, 1787); Horry and Weems, *Life of General Francis Marion* (Philadelphia, 1852); W. G. Simms, *Life of Francis Marion* (ib., 1860); Edward McCrady, *History of South Carolina in the Revolution* (New York, 1901–02); and a "Study of Marion's Ancestry and Early Life," in *Southern and Western Monthly Magazine and Review*, vols. i, ii (Charleston, 1845).

MARION DELORME, mȧ'rē-ôN' de-lôrm'. A drama by Victor Hugo (1831), based on the life of the notorious courtesan of that name. She appears in De Vigny's *Cinq-Mars* and in Bulwer's *Richelieu*.

MARIONETTE, măr'ĭ-ō-nĕt' (from It. *morio*, a fool or buffoon, or possibly from *mariolette*, meaning a diminutive figure of the Virgin Mary). A small, jointed figure, representing a character in the miniature drama of a puppet theatre. See Puppet.

MARIOTTE, mȧ'rē-ŏt', Edme (c.1620–84). A distinguished French natural philosopher. He was born in Burgundy and was the prior of St. Martin-sous-Beaune, near Dijon. He was active in developing experimental research in France and was one of the first members of the Académie des Sciences, founded in 1666. He repeated Pascal's experiments on gravitation and detected some peculiarities which had escaped that philosopher; confirmed Galileo's theory of motion; discovered through experiment an approximate formula for determining heights by the barometer; enriched hydraulics with a multitude of discoveries; and finally made a thorough investigation into the subject of the conduction of water and calculated the strength necessary for pipes under different circumstances. His collected works were published at Leyden in 1717 and at The Hague (2 vols., 4to) in 1740. His *Traité du mouvement des eaux* was published at Paris in 1686. Mariotte's name is associated with the law of gases discovered 14 years previously by Robert Boyle, this law being always known in France as Mariotte's law. It was published in a treatise, *Sur la nature de l'air* (1676). It is, in substance, that the volume of a gas varies inversely as the pressure it is under.

MARIOTTE'S LAW, usually referred to as the law of Boyle and Mariotte. See Boyle's Law; Gases, General Properties of.

MAR'IPO'SA (Sp., butterfly). A local name in California for the opah (q.v.).

MARIPOSA GROVE. A tract of land 4 square miles in extent in Mariposa Co., Cal., containing two groves of the *Sequoia gigantea*, consisting of about 465 fine specimens. The largest of the trees, the Grizzly Giant, has a circumference of 94 feet, and its main limb, at a height of 200 feet, is 6½ feet in diameter. The road between the groves passes through an opening 9½ feet wide, cut through the heart of one of the trees. The tallest tree is 272 feet high, and a number exceed 250 feet. The tract is reserved as a State park.

MARIPOSA LILY. See Calochortus; Liliaceæ and Plate.

MAR'IPO'SAN, or Yokut. A linguistic stock or family of North American Indians, formerly located in southern California, about Tulare Lake, and extending as far north as the junction of the Fresno with the San Joaquin.

Twenty-four subtribes are mentioned by Powell. Of these there survive: Choinimni, Chookiminah, Chukchansi, Kashowoo, Tachi, Wechikht, Wikchamni, Yokuts, and Yowdanchi, 533 individuals in all. Every village consisted of a single row of wedge-shaped huts of tule, with an awning of brush stretched along the front. These houses were used for sleeping purposes only. The mountainous condition of the country was naturally productive of a series of isolated areas, in which each camp with its separate captain and medicine man resided. The main sources of their food supply were fishing, hunting, and gathering acorns. Their weapons were sinew-backed bows and excellent arrows. There are no more delicate and beautiful baskets made anywhere than in the villages of this stock, and specimens are to be seen in every fine collection, together with fish weirs, fishing booths, fish traps, and tule boats. Consult Stephen Powers, *Contributions to North American Ethnology*, vol. iii (Washington, 1877), and J. W. Powell, *Seventh Annual Report of the Bureau of Ethnology* (ib., 1891).

MARIQUINA, mä'rē-kē'nä. A town of Luzon, Philippines, in the Province of Rizal. It is situated 7 miles northeast of Manila, at the intersection of several important roads, and has manufactures of shoes and other leather work. In the neighborhood are the medicinal iron springs of Chorillo. Pop., 1903, 8187.

MARIS, mä'rĭs. The brothers JACOB, MATTHIJS, and WILLEM, three of the most distinguished among modern Dutch painters. JACOB (1837–99), the eldest, was born at The Hague, studied under Stroebel, Van Hooc, and at the Antwerp Academy, also for a short time under Hébert in Paris. After his return from France he lived chiefly at The Hague. His art is essentially Dutch, owing most to Vermeer and Rembrandt; it is purely pictorial, powerful yet graceful. The color is soft, lucid, and delicately harmonious. His subjects are usually views of Dutch cities, canals, windmills, and the seashore. Twenty-four pictures by him, including the admirable "View of a Dutch Town" and "The Shell Gatherers," are in the Rijks Museum, Amsterdam. There is also a beautiful "View of a Village" in the Dordrecht Museum. Other fine landscapes are "The Bridge" (Frick collection, New York) and "Canal in Holland" (Metropolitan Museum, New York). Good examples of his figure paintings are the "Young Mother" (Rijks Museum) and "The Bird Cage."

His younger brother, MATTHIJS (Matthew) (1839–), was also born at The Hague, studied there at the Academy under Louis Meijer and at the Antwerp Academy. He followed his brother to Paris in 1869, but after 1872 lived chiefly in London. Possessed of a romantic imagination strongly tinged with mysticism, he lived the life of a recluse, painting in a vague, mysterious, yet intensely personal manner. His art is characterized by purity of line and charm of color. His type of woman is unique—monumental yet childlike, mysterious yet intensely living. Among his most celebrated paintings are "The Bride" and the "Cake Baker," both in the Mesdag collection, The Hague; "Butterflies"; "Primavera"; "Siska"; "In the Slums"; and "Revery" (Metropolitan Museum, New York). His landscapes include "Souvenir of Amsterdam," "The Four Windmills," and "Lausanne." His etchings and drawings are no less individual and charming than his paintings.

WILLEM (1844–1910) was almost equally as distinguished in landscape and cattle painting as his elder brothers, under whom he studied. His work is brighter and warmer in color but less virile and varied than Jacob's. He delights in gray-green tones, rich landscapes with sunlight effects. His subjects are usually landscapes with gleaming water, in which are cows or ducks, although he sometimes paints pure landscapes. The collection of James G. Shepard, in New York, possesses five of such paintings; the Rijks Museum, Amsterdam, six. The Shepard collection also possesses a like number of paintings by each of his brothers. Consult: Eduard Rooses, *Dutch Painters of the Nineteenth Century*, vols. ii and iv (London, 1898–1901); D. C. Thomson, *The Brothers Maris* (New York, 1907); Marius, *Dutch Painting of the Nineteenth Century*, English translation (London, 1908).

MARISMAS DEL GUADALQUIVIR, mä-rēs'mäs dĕl gwä'dăl-kē-vēr', MARQUÉS DE LAS. See AGUADO, ALEJANDRO MARÍA.

MARISTS, mā'rĭsts, and **MARIANISTS**, mā'rĭ-*an*-ists (Neo-Lat. *Marista*, from Lat. *Maria*, Mary). The Society of Marists was founded by the venerable Jean Claude Marie Colin (born 1790 and died 1875), who obtained canonical approbation for his society from Gregory XVI in 1836 and was Superior General from 1836 to 1854. Many missionary houses and colleges were established in France and all Oceanica was put under the care of the fathers. A province was erected in the United States in 1889, where they have, according to the official Catholic Directory of 1915, 123 priests, 36 scholastics and novices, 50 aspirants, 21 parishes, and 4 colleges. The *Marianists*, a distinct community, was begun in 1817 in France by William Joseph Chaminade, born in 1761. His society was approved by Leo XIII in 1891. The order has increased rapidly and expanded widely. They are to be found in Belgium and in many other European countries, as well as in China, Japan, Mexico, Canada, and the United States, where since their entrance in 1849 they have more than 50 establishments, including colleges, normal and parochial schools.

MARITANA, mä'rē-tä'nä. An opera by Wallace (q.v.), first produced in London, Nov. 15, 1845; in the United States, May 4, 1848 (New York).

MARITIME LAW (Lat. *maritimus*, relating to the sea, from Lat. *mare*, sea). In its broadest sense, that system of law, both public and private, which relates to commerce and navigation upon the high seas or other navigable waters. The sources of the law of the sea as now applied in England and the United States are more ancient and perhaps more complex than those of any other branch of our law. Some of its doctrines, as the law of general average, are traceable to the Rhodian laws, dating back to the eighth century B.C., from which they were adopted into the civil law of Rome, and by it spread over modern Europe. Many of its doctrines may be attributed to customs established by the revival of trade in the countries bordering the Mediterranean and in southwestern Europe in the thirteenth and fourteenth centuries. During this period the commercial states and cities began the compilation of the usages and customs of sea commerce and the judgments of the various maritime courts. The earliest of these is the *Consolato del mare* (q.v.). A later compilation, having even greater influence upon

English law, was that known as the laws of Oléron. (See OLÉRON.) The laws of Wisby, a compilation of mercantile customs and usages adopted by a congress of merchants at Wisby in the island of Gotland in the Baltic Sea, about 1288, which became the basis of the ordinances of the Hanseatic League, were also of great influence in the development of the modern laws of the sea; as were also the Hanseatic ordinances and the French marine ordinance, promulgated by Louis XIV in 1681, by which the whole law of shipping, navigation, marine insurance, bottomry, etc., was collected and systematized. The local ordinances of Barcelona, Florence, Amsterdam, Antwerp, Copenhagen, and Königsberg were also not without influence.

The earliest English compilation of maritime law appears to have been the Black Book of the Admiralty, supposed to have been published during the reign of Edward III. It was based substantially upon the laws of Oléron. The British Parliament has never passed general maritime ordinances, but the maritime law drawn from the sources here indicated has been embodied in a series of decisions of the courts of admiralty jurisdiction, which, with the decisions of our own Federal courts rendered since the American Revolution, constitute the maritime law of the United States.

Maritime law is administered in England by the courts of admiralty; in the United States by the Federal courts, which, by the Constitution, have jurisdiction over all causes in admiralty. This jurisdiction of the Federal courts is not, however, exclusive, and a suitor may seek his remedy at common law in the State courts wherever the common law is competent to give a remedy. In England maritime causes are said to be those which directly affect commerce or navigation upon waters in which the tide ebbs and flows. In the United States, where the conditions are different, maritime causes are deemed to be those directly affecting commerce upon navigable waters which in themselves or by means of other waterways form a continuous highway to foreign countries. Hence the fact that commerce in a given case is carried on only upon waters within a single State does not necessarily affect jurisdiction of the Federal courts, and such jurisdiction is not dependent upon the constitutional power of Congress to regulate commerce. As maritime jurisdiction depends upon the subject matter and not the parties, a United States court may take jurisdiction over a maritime cause arising in a foreign vessel between foreigners. The exercise of jurisdiction over foreigners is, however, purely discretionary, and may be refused; and it is a general principle that a maritime court will not take jurisdiction over a ship of war of a friendly foreign nation.

Liability for torts, or common-law wrongs, is recognized and enforced by the maritime law. Maritime torts include all wrongful acts or direct injuries arising in connection with commerce and navigation occurring upon the seas or other navigable waters, including negligence and the wrongful taking of property. The maritime law, however, regards only actual damages and allows no recovery for merely nominal injury. The test for determining whether a tort is of a maritime nature is the locality where the tortious act is consummated or takes effect. Thus, an injury to a bridge or wharf by a ship, inasmuch as the injury is effected upon land, is not within the jurisdiction of the admiralty court, but an injury to a ship by a drawbridge is a maritime tort, of which the admiralty court has jurisdiction. The maritime like the common law does not recognize a right of recovery for wrongful death, but a statute may confer the right, which will then be recognized in admiralty in accordance with the settled principle that both the Federal courts of admiralty and of equity will provide a remedy for new substantive rights created by State statute. Such statutes have been enacted both in England and the United States. See COLLISIONS OF VESSELS; BOUNTY; BARRATRY.

The maritime law also recognizes and enforces contracts by awarding damages or enforcing liens which it recognizes as created on the basis of contract. In general the essential elements of a contract are the same under the maritime as at the common law. The maritime law differs from the common law only in the method by which it may enforce the contract and in attaching to the various classes of contracts certain legal incidents peculiar to each class. A contract is deemed to be of a maritime nature so as to be within the jurisdiction of an admiralty court when in its essence it is purely maritime, relating to commerce and navigation upon navigable waters as already defined, as contracts for the betterment of a vessel in aid of navigation or for the sustenance and relief of those engaged in conducting commercial operations at sea. Thus a contract of partnership in a vessel is not a maritime contract, neither is a contract to build a vessel, nor is a preliminary agreement leading to a maritime contract, as a contract to procure marine insurance, within the jurisdiction of the admiralty court. For a fuller discussion of the various forms of maritime contracts and their incidents, see such special articles as BOTTOMRY BOND; RESPONDENTIA; CHARTER PARTY; AFFREIGHTMENT; MARINE INSURANCE; SALVAGE; WHARFAGE; DEMURRAGE.

The jurisdiction of maritime courts also extends to all prize causes growing out of captures of vessels, of ships of war or privateers, made upon navigable water, or started there, although consummated on land. In England the law of prize is administered in a separate department of the admiralty court, as distinguished from the instance court in admiralty. In the United States no distinction is made between prize and other admiralty causes, all being within the jurisdiction of the district courts of the United States. By act of Congress captures made upon inland waters of the United States are deemed not to be prizes, and consequently are not within the admiralty jurisdiction of the United States courts. See PRIZE; INTERNATIONAL LAW.

The adjustment of the rights of the parties to a maritime venture in accordance with the principles of general average is also an important function of maritime courts, and the doctrines of general average are among the most important of the maritime law. (See MARINE INSURANCE, *Average.*) The English admiralty courts have by statute acquired jurisdiction over crimes committed on the high seas outside the marine league. Similar jurisdiction has by act of Congress been conferred on the United States district courts.

The peculiarities of maritime law and the character of the jurisdiction exercised by maritime courts are best illustrated by the law relating to maritime liens, which are enforced by proceedings in rem. A maritime contract may

give rise to a maritime lien when made for the benefit or assistance of a marine venture, and when made on the credit of the vessel rather than on the credit of the owner or charterer. There is a presumption that all contracts for necessary supplies and repairs to a vessel are made on the credit of the owner if in a home port, but upon the credit of the vessel if in a foreign port. The seamen and subordinate officers, but not the master of the ship, have a lien upon the ship for wages due. The marine carriers also have a lien for freight and demurrage.

Analogous to the contract lien, although strictly not based on contract, is the lien which any party to a maritime venture who has made a general average sacrifice has upon vessel or cargo, or both, to secure contribution in general average. Maritime liens may also arise *ex delicto* for all wrongs or injuries caused by the ship, or by collision, or by failure of the ship as a common carrier to carry or deliver goods safely.

It is a general principle of the maritime law that the master has the power, when necessity arises and he is unable to communicate with the owners, to sell both ship and cargo and confer a valid title on the purchaser to sell free of liens, which then attach to the proceeds. Lienors do not share pro rata in the subject of the liens, but have priority according to their importance as contributing to the safety or preservation of the property. Thus, as between different voyages, liens have priority in the inverse order of their creation. In the same voyage the order of priority is as follows: (1) costs of litigation; (2) salvage; (3) salary of seamen, cost of supplies and repairs, bottomry and respondentia, pilotage and towage.

The procedure of maritime law is extremely simple, never having been characterized by complex and technical rules, as was the procedure at common law. The most distinguishing characteristic is the power of the plaintiff to make the proceeding purely one in rem, i.e., one directed solely towards the property which the plaintiff wishes to subject to the maritime lien which he claims. The procedure may, however, at the plaintiff's option, be an action in personam, i.e., one in pursuance of which a personal judgment may be recovered against the master or owner; or, in the absence of rules of court to the contrary, it may be both in rem and in personam. The proceeding in admiralty is begun by filing a libel (q.v.) corresponding to the declaration or complaint in a common-law action. Upon filing of the libel the court issues its writ or mesne process, which is executed by the marshal or corresponding officer by attaching the *res*, i.e., the ship or cargo, if the proceeding is in rem, or by citing the respondent to appear and answer, if the proceeding is in personam. The respondent is then required to file his answer, or he may file exceptions, which correspond to the demurrer in an action at law. The issues raised are laid before a judge without a jury, or, as is more usually done, the testimony in the case is taken before a commissioner or corresponding officer, who reports it to the judge. The judge does not usually assess damages, but refers that question to a commissioner by an interlocutory judgment, and upon the commissioner's report renders a final judgment fixing the rights of the parties.

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MARITIME PROVINCE (Russ. *Primorskaya Oblast*). A name given to the former Province of Primorskaya, which extends from the Arctic Ocean, where it reaches as far west as Tchaun Bay, to the north boundary of Korea. Its west boundary runs along the Stanovoi Mountains to about long. 130° E., then southeast and south to the Amur (which traverses the province in a northeasterly direction), then along the Usuri, which forms part of the boundary of Manchuria, and finally southwest to the Korean border, along the east frontier of Manchuria to Korea (Map: Asia, O 3). Its area is made up of the provinces of Kamchatka (q.v.) (502,424 square miles), Sakhalin (14,668 square miles), and Primorskaya (226,486 square miles). The northern portion, forming the northeast extremity of Asia, is a barren plateau from 1000 to 2000 feet in elevation and watered by the Anadyr and many other rivers. Its coasts are deeply indented and present a number of promontories towards Bering Strait and Bering Sea. The plateau is bordered on the north by mountains which rise to 8000 feet. The central part of the province is a narrow strip of land, 40 to 60 miles wide, along the Sea of Okhotsk, occupied by the Stanovoi Mountains and intersected by numerous short streams.

The southern part is somewhat lower west of the Amur, while the portion east of that river is occupied to some extent by the mountainous district of Sikhota Alin, rising above 5000 feet in its highest peaks. The flora of the northern part is extremely poor, consisting only of some lichens, mosses, and dwarf trees. The lower mountain slopes of the central portion of the province and the deep river valleys are thickly wooded. The same is true of the mountains in the southern part, where the lowlands are covered with thick grass, and some plants peculiar to warmer regions, such as the wild vine, are found. Northern Siberia has long been famous for its rich fauna, but many species, such as the blue fox, the black sable, the sea otter, the sea lion, the sea cow, and the whale, have either entirely disappeared or are rapidly approaching extinction. The fauna of the southern region is remarkable for its variety, including such different species as the tiger and the bear. The rivers in this part of the country are exceedingly rich in fish, the Amur and the Usuri being filled with salmon in August, and it is along their banks that the population of the province is concentrated. The northern part of the province is inhabited chiefly by the Tchuktches, who are engaged in fishing on the coast and in reindeer breeding and hunting in the interior. Besides the Tchuktches there are found some Koryaks on the coast. The central part of the province is inhabited only by a few Tunguses.

The climate presents great variety, owing to

the large extent of the region, but even in the south it is very severe. The temperature at Vladivostok, at the southern end of the province, averages only 39.5° F., while at Nikolayevsk, at the mouth of the Amur, it is below the freezing point. The summers in the southern part are extremely wet, and inundations are frequent.

Agriculture is confined by natural conditions to the southern portion of the province and is progressing very slowly. Hunting and fishing are still the chief occupations. Some gold is produced along the Amur. Immigration has made wonderful strides since the beginning of the twentieth century, as the population figures show. This is due chiefly to the Trans-Siberian Railway, which was completed in 1898. Many Little Russian peasants and Cossacks from the Don territory and Orenburg have been transported to the province by the government. Roads are very scarce, but a branch of the Trans-Siberian line traverses the province from Khabarovsk to Vladivostok for a distance of 469 miles. Nikolskoye, 69 miles north of Vladivostok, is the eastern terminal of the Manchurian branch of the Trans-Siberian line. The population in 1897 was 223,336, including about 45,000 natives, more than 23,000 Koreans, and over 29,000 Chinese; in 1912 the population was 572,000, the density per square mile being 2. The Russians constitute over one-half of the entire population. The original Russian population are organized on a military basis, and are known as Cossacks. The capital of the province is Khabarovsk (q.v.), but the most important town is Vladivostok (q.v.).

MARITZA, mȧ-rē'tsȧ (Lat. *Hebrus*). A river of the Balkan Peninsula (Map: Balkan Peninsula, F 4). It rises in the Balkans in Bulgaria, flows southeast through eastern Rumelia past the town of Philippopolis, and continues in that direction until it enters Turkey above Adrianople, where it bends south and falls into the Ægean Sea near its northeast corner. It is 300 miles in length, and is navigable for small boats to Adrianople, about 100 miles from its mouth. The treaty of Sept. 18, 1913, between Bulgaria and Turkey makes the lower reaches of the river below Mandra the new frontier.

MARIUPOL, mä'rē-o͞o'pôl-y'. The capital of a district of the same name in the Government of Ekaterinoslav, Russia, situated on the north shore of the Sea of Azov, 63 miles west of Taganrog (Map: Russia, E 5). It has two Gymnasia, a theatre, and a customhouse. Soap and leather are its chief manufactures; it carries on a considerable trade in grain. Its harbor is visited annually by over 1300 coasting and about 100 seagoing vessels. Mariupol was founded in 1779 by Greek emigrants from the Crimea. Pop., 1911, 53,100, chiefly Greeks and Jews.

MA'RIUS, Gaius (c.156–86 B.C.). A Roman general, born of an obscure family of the Maria Gens, at the village of Cereatæ (modern *Casamare*), near Arpinum, about 156 B.C. (See Isola del Liri.) In the Numantine War (134–133 B.C.) he served with great distinction under the younger Scipio Africanus. In 119 B.C. he was elected tribune of the plebs, and vigorously opposed the nobles, by whom he was intensely hated. He acquired social standing and political influence by his marriage with Julia, aunt of Julius Cæsar. In 114 B.C. he went to Further Spain as proprætor, and cleared the country of the robbers who infested it. He accompanied Q. Cæcilius Metellus Numidicus to Africa in 109 B.C., was elected consul two years after, and intrusted with the conduct of the Jugurthine War, which he brought to a successful close in the beginning of 106 B.C. Marius sent Sulla, then his quæstor, to receive Jugurtha, and this laid the foundation of future personal enmity. Numidia Marius thoroughly subdued and annexed to Rome. The military success of Marius had now made him the most conspicuous officer in the Roman army, while he had aroused enthusiastic admiration among his soldiers. Meanwhile an immense horde of Cimbri, Teutones, and other northern barbarians had burst into Gaul and repeatedly defeated the Roman forces with great slaughter. In consequence Marius was again called to the consulate for the year 104 B.C., and for the third, fourth, and fifth times in 103–101 B.C., for it was felt that he alone could save the Republic. The war against the Teutones in Transalpine Gaul occupied him for more than two years; but he finally annihilated them in a battle of two days' duration at Aquæ Sextiæ, now Aix, in Provence, where 200,000—according to others, 100,000—Teutones were slain. After this he assumed the chief command in the north of Italy against the Cimbri (q.v.), whom he overthrew on the Raudian Fields, near Vercellæ, with a like destruction (101 B.C.). The people of Rome knew no bounds to their joy. Marius was declared the savior of the state, the third founder of Rome, and his name was mentioned along with those of the gods at banquets. He was made consul for the sixth time in 100 B.C. In the next 10 years, however, his prestige waned, particularly because of his association with Saturninus (q.v.). In the Social War (q.v.) he twice defeated the Marsi. When Sulla, as consul, was intrusted with the conduct of the Mithridatic War, Marius, who had long manifested an insane jealousy of his patrician rival, and was himself an aspirant for the command of this war, attempted to deprive him of the command, and a civil war began (88 B.C.). By procuring a new organization of the Roman tribes, through passage of a law to distribute the Italian allies among all the tribes, Marius secured an election to the command of the war. Sulla fled to his army at Nola, refused to resign the command, and marched on Rome. Marius was soon forced to flee, and after enduring the greatest hardships, and making numerous hairbreadth escapes, he reached Africa, where he remained until a rising of his friends took place under Cinna (q.v.). He then hurried back to Italy, in the absence of Sulla, and, along with Cinna, marched against Rome, which was obliged to yield. Marius was delirious in his revenge upon the aristocracy; a band of 4000 slaves is said to have carried on the work of murder for five days and nights. Marius and Cinna were elected consuls together for the year 86 B.C. Marius was, however, already in his seventy-first year, and died after he had held office only 17 days.

Unlettered, arrogant, and rude of manner, Marius did not possess the qualifications requisite for maintaining influence in times of peace. The effect of his personal presence is illustrated by the scene when, during his flight to southern Italy, near Minturnæ, a barbarian entered his room with drawn sword to assassinate him. When Marius called out, "Man, durst thou murder Gaius Marius?" the intruder, awed by the fiery eyes of Marius, dropped his sword in terror and fled. Consult: Beesly, *Marius and Sulla*

(New York, 1878), and the article "Marius I," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MARIUS, Mercator (c.390–c.451). An ecclesiastical writer of the earlier half of the fifth century, born in Africa. He was living in Rome, 418, and 10 years afterward in Constantinople, where he stayed until about 448, but authorities differ as to whether he was priest or layman. He is known to have been a friend and defender of Augustine, a denouncer of the Pelagian and Nestorian doctrine. His determined opposition to the promulgators of these heresies bore fruit in their expulsion from Constantinople. He made Latin translations of Nestorius, Theodosius of Mopsuestia, Cyril of Alexandria, Proclus, Theodoret, Pelagius, and other Greeks which are invaluable to students of Church history. These, together with his own controversial writings, were twice edited in Paris —in 1673 by Garnier and in 1684 by Baluze.

MARIVAUX, mȧ′rē′vō′, Pierre Carlet de Chamblain de (1688–1763). A French dramatist important in the development of French comedy, and a novelist, epoch-making in the evolution of French fiction. He was born in Paris, Feb. 4, 1688. His father was a Norman, director of the Mint at Riom in Auvergne, where and at Limoges Marivaux passed his youth. His literary taste developed early. At 18 he had written a play, *Le père prudent et équitable* (published 1712), and between 1713 and 1715 he produced three romances, *Effets surprenants de la sympathie, La voiture embourbie,* and *Le Don Quichote moderne,* all wholly out of key with his later work. Then, falling under the influence of the parodist La Motte, he undertook to travesty Homer and Fénelon, but turned from this ignoble task to the production of essays in the vein of the *Spectator* for the journal *Le Mercure* (1717). These showed keenness, but also preciosity. The year 1720 marks a turning point in Marivaux's genius and fortune. He lost his considerable wealth in the Mississippi Scheme, became dependent on his pen, wrote a poor tragedy, *Annibal,* and a good comedy, *Arlequin poli par l'amour,* and started the *Spectateur Français,* a weekly "Spectator," that might have succeeded if his unmethodical habits had allowed it to appear regularly. For the next 20 years he supported himself as a playwright, succeeding in comedy at the Italian Theatre and failing in tragedy at the Théâtre-Français. The more noteworthy of his 30 plays are: *Les surprises de l'amour* (1722); *Le triomphe de Plutus* (1728); *Le jeu de l'amour et du hasard* (1730); *Le legs* (1736); and *Les fausses confidences* (1737). He founded two other unsuccessful journals, and in 1731 began the publication of a novel, *Marianne,* which he left incomplete at its eleventh part in 1742. Madame Ricciboni finished it. In 1735 he began *Le paysan parvenu,* which also remained a torso. Yet these are his most important works. In 1736 he was elected to the Academy. Late in life he received a pension from Helvétius (q.v.) and another from Madame de Pompadour (q.v.). He died Feb. 12, 1763. Marivaux shows himself in his dramas and in his fiction interested primarily in the analysis and display of human feeling. He drew in both his novels pictures of contemporary society and of Parisian street life that remained unequaled for a century in their impressionistic realism, but his delight is in verbal surprise—a somewhat affected style known in French literature as *marivaudage.* Marivaux's *Works* are in ten volumes (Paris, 1827–30). There is a modern edition of the plays by Fournier and also of *Marianne.*

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MAR'JORAM (OF. *marjolaine, margelyne,* Fr. *marjolaine,* It. *majorana, maggiorana,* from ML. *majoranca,* from Lat. *amaracus, amaracum,* from Gk. *ἀμάρακος, amarakos, ἀμάρακον, amarakon,* marjoram, probably connected with Heb. *māraq,* to purify; influenced by popular etymology with Lat. *major,* greater), *Origanum.* A genus of annual, perennial, and shrubby plants of the family Labiatæ, natives chiefly of the East and of the Mediterranean region. Some of the species abound in a yellow essential oil, marjoram oil or oil of origanum, which is obtained by distillation. The common marjoram (*Origanum vulgare*), which has become naturalized in the United States, is a perennial plant, 1 foot high, with ovate leaves and roundish, panicled crowned heads of purple flowers, with large bracts. It is used, as are also other species, as a seasoning in cookery, and is said to be stimulant and tonic. Sweet marjoram (*Origanum majorana*) is an annual plant, a native of Greece and the East, with ovate grayish-green leaves, wrinkled bracts, and small white flowers. Its uses are similar to those of the common marjoram.

MARJORIBANKS, märch′bănks, Edward, second Baron Tweedmouth. See Tweedmouth.

MARK, märk (Ger., border, march). A German geographical term, signifying primarily the *mark* of a country's limits (the *march*), and hence applied as a designation of the border districts of the German Empire. Prussia began its existence as the north mark, erected against the invasion of the Wends, while Austria arose from the east mark, erected against the Hungarians. The governor intrusted with the charge of one of these border districts was called *markgraf,* or margrave (q.v.). There has been a long dispute among scholars as to the original meaning of *mark.* On this dispute, consult Maurer, *Geschichte der Markenverfassung in Deutschland* (Erlangen, 1856), and Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France* (6 vols., Paris, 1888–1908).

MARK (AS. *marc,* Ger. *Mark;* perhaps identical originally with *mark,* token, boundary). Originally the term appears to have been used to designate a unit of weight, most commonly of gold or silver. It was about equal to eight ounces, but it varied from country to country. In 1524 the Cologne mark was made the standard weight for gold and silver throughout the Holy Roman Empire, but the standard was never properly enforced. In Anglo-Saxon times the term "mark" was used to designate a money of

account, consisting of 100 pennies—in the twelfth century, 160 pennies. In 1663 a silver mark was issued in Scotland which was valued at 13s. 1d. English money. In the nineteenth century the mark was a common small coin among the German states, varying considerably in the different parts of Germany. In 1873 the gold mark of 100 pfennige was adopted as the monetary unit of the German Empire. It represents 0.3982 gram of gold (900 fine) and is valued at $0.23821 in American money.

MARK (Lat. *Marcus*, Gk. Μάρκος, *Markos*), or JOHN, with the surname MARK (Acts xii. 12). The writer of the second Gospel. The incidental notices in the New Testament give the following facts: Mark was the son of a certain Mary, a householder of Jerusalem, at whose home the early Christians held meetings in the days of persecution (Acts xii. 1–12). He was a cousin of Barnabas (Col. iv. 10), hence, possibly, in case the relationship was on the father's side, of Levitical descent. An old tradition says that he had his thumbs cut off so as to be unfit for the priesthood. Peter calls him his "son" (1 Pet. v. 13), which means probably that he was converted to Christianity under Peter's ministry in Jerusalem. He came to Antioch from Jerusalem with Barnabas and Paul (Acts xii. 25), and accompanied them as an assistant on their first missionary journey (Acts xiii. 5). But he left them at Perga and returned to Jerusalem (Acts xiii. 13; cf. xv. 37–39). His action cost him Paul's confidence, and when Barnabas proposed to take him on a second journey Paul refused. The result was a separation, and Barnabas took Mark and went to Cyprus (Acts xv. 37–40). This was about 50 A.D. We hear nothing more of him until Paul's first Roman captivity (c.60 A.D.), when we learn (Col. iv. 10; Philem. 24) that he was then in Rome, reconciled to Paul and esteemed by him, and was about to visit Asia Minor. He may have come to Rome with Peter, who mentions him (1 Pet. v. 13) as with him in the city. The proposed journey to Asia was probably undertaken, as he was in the East when Paul wrote from Rome (c.65) to Timothy at Ephesus (?) asking him to bring Mark with him (2 Tim. iv. 11). At Rome, according to early tradition, he wrote his Gospel, not altogether as his own work, but as containing the substance of Peter's preaching. Another tradition makes him the organizer and first Bishop of the Alexandrian Church. In the nature of the case such traditions are difficult of proof. Consult the commentaries on Mark, especially that of Swete (London, 1898), and Zahn, *Einleitung in das neue Testament*, vol. ii (Leipzig, 1900). See MARK, GOSPEL OF.

MARK, EDWARD LAURENS (1847–). An American anatomist, born at Hamlet, N. Y. He graduated at the University of Michigan in 1871 and in 1872–73 acted as assistant astronomer on the United States Northwest Boundary Survey. He then studied zoölogy in Europe under Leuckart, Haeckel, and others, and obtained his Ph.D. at Leipzig in 1876. In 1877 he was appointed instructor at Harvard College, in 1883 assistant professor of zoölogy, in 1885 Hersey professor of anatomy, and in 1900 director of the Zoölogical Laboratory. In 1903 he became director of the Bermuda Biological Station for Research. In 1904 he was elected president of the American Society of Naturalists. His publications include: *Maturation, Fecundation, and Segmentation in Limax campestris* (1881); *Simple Eyes in Arthropods* (1887); *Trichinæ in Swine* (1889); *Studies on Lepidosteus* (1890); a translation from the German of O. Hertwig, *Text-Book of the Embryology of Man and Mammals* (1892), and a translation of Korscheldt and Heider, *Text-Book of the Embryology of Invertebrates* (1895–1900). Consult Parker (ed.), *Mark Anniversary Volume* (New York, 1904).

MARK, GOSPEL OF. The second of the New Testament Gospels. Its first verse opens with a phrase ("The beginning of the gospel of Jesus Christ") that is evidently intended to be a caption for the narrative which follows. The narrative is arranged simply and in an order which, while not always exact, is usually the normal chronological order of the Gospel events. There is first the preliminary history reciting the ministry of John the Baptist and the entrance of Jesus upon his work, through the symbolic act of the baptism and the personal experience of the temptation (i. 2–13). There then follows the main portion of the narrative, which gives, first, Jesus' popular work in Galilee (i. 14–vii. 23) and his similar work in the region north of Galilee (vii. 24–viii. 26), and then breaks in upon this northern work with a presentation of it in the light rather of a work of instruction, chiefly to his disciples, than a work of construction among the people (viii. 27–ix. 29). This new character of Jesus' work is carried on into what may be generally considered his journey towards Jerusalem (ix. 30–x. 52). The event that marks this change is the disciples' confession of Jesus' Messiahship given in the neighborhood of Cæsarea Philippi, which was followed by Jesus' first clear declaration of his coming death (viii, 27–ix. 1). This is evidently considered by the Evangelist as the turning point in Jesus' work, leading him to a change in its character and method. Chapters xi–xiii are given to the final work in Jerusalem, which Mark, in common with the other Evangelists, presents as a work in which Jesus' Messianic claims are openly laid before the nation's religious leaders. The narrative closes, as in all the Gospels, with the Passion and Resurrection (xiv–xvi).

It is universally held that verses 9–20 of the last chapter (xvi) are a later addition to the Gospel, the original ending being generally regarded as lost. Just how much further the narrative went and whether it included, as Luke alone can be possibly said to do, an account of the Ascension, can only be conjectured.

In comparison with the other Synoptists Mark is quite distinctly the shortest Gospel, considerable portions of the history appearing in Matthew and Luke being absent from Mark—such as the Nativity, the Sermon on the Mount, and that part of Luke which is devoted apparently to a story of Jesus' last journeyings to the Holy City; and yet where Mark gives the narrative in common with the other two he gives it with a fullness of graphic detail which the others do not possess. It is also characteristic of Mark that, though he has an account of the parables by the Sea of Galilee, he does not give the discourses of Jesus in a measure equal to that of Matthew and Luke. In the opinion of most critics this indicates that Mark had not access to, or at least did not make use of, the Logia collection of Matthew, though some hold that he made a moderate use of it. See MATTHEW, GOSPEL OF.

It is plain that this Gospel was written by a

Jewish Christian—not because of any Jewish cast of the Gospel, as in the case of Matthew, for such a cast it does not possess—but because (*a*) of the author's familiarity with Jewish things and his ready ability in explaining them (cf. ii. 18; vii. 3 et seq.; xii. 18; xiv. 12; xv. 6, 42), and (*b*) because of his acquaintance with the Aramaic language, expressions from which he frequently uses (cf. iii. 17; v. 41; vii. 11, 34; ix. 43; x. 46; xiv. 36; xv. 22, 34). On the other hand, it is clear that the readers were Gentile Christians—not simply because they were unacquainted with Palestinian customs and speech, but because this ignorance seems to be surrounded by a very general Latin atmosphere, as though the readers not merely needed the above interpretations and explanations, but needed them cast in this mold (cf. v. 9; vi. 27, 37; vii. 4; xii. 42; xv. 16, 39). As to the place of the Gospel's origin there is nothing definite to be gathered from the contents, though many modern scholars accept the opinion of Clement that it was written at Rome. The Latin atmosphere would most easily be thrown around the narrative in a Latin country. As to date, 64 to 70 A.D. are limits often suggested; but it is universally admitted that whatever may be the year of its composition, it gives every evidence of being the earliest of all the Gospels. In fact, a comparison of Mark's order of narrative with that of Matthew and Luke shows that Mark's order was that which Matthew and Luke had before them when they wrote. See MATTHEW, GOSPEL OF; LUKE, GOSPEL OF.

Early church writers, almost without exception, ascribe the authorship of this Gospel to Mark (q.v.), the cousin of Barnabas, and to Mark as in some way connected in the writing with Peter. Some of the Fathers, as Jerome and Origen, make the relation of Mark to Peter that of an amanuensis; others, as Eusebius, that of a reporter; others again, as Clement of Alexandria, Justin Martyr, and Irenæus, that simply of a disciple recalling his master's words. The earliest and most explicit testimony, and that which seems to bear upon its face the strongest proof of credibility, is the testimony from Papias, who describes Mark as the interpreter of Peter's preaching, and Mark's Gospel as his conscientious reproduction of what Peter's discourses contained. This testimony of Papias would agree with the original Greek character of the Gospel's composition; for, according to this testimony, the service which Mark rendered to Peter was evidently that of interpreting his Aramaic discourses into the Greek, which his audiences could understand. It would further agree with the fresh and vivid style of the Gospel's narrative; since such immediate contact with Peter's reminiscences as Mark must have had would give the stamp of an eyewitness to all his record. And it would yet further agree with a certain Petrine element which seems to be present at frequent points in the Gospel, since, however Mark may have reconstructed these discourses of Peter, he is not likely to have lost out of them altogether the personal element they must have contained.

Accordingly, the general verdict of criticism is that the second canonical Gospel is from the hand of Mark and in part reproduces Peter's personal knowledge of and participation in the Gospel events. At the same time this verdict attaches only to the substance of the Gospel, since there are clear traces of documentary sources in the latter part of the Gospel, as in the discourse regarding the future in chap. xi, which could not come from Peter's oral stories. The question also arises whether Mark as we now have it may be an enlarged edition of the original Mark. On this subject there is not a unity of opinion; but, since the enlargement was in any case not great, the question is relatively unimportant.

Naturally in proportion as Mark's Gospel is the reproduction of Peter's preaching, so far must its purpose be a homiletic rather than a purely historical one. This purpose was to show that the deeds of Jesus proved his mission as a messenger from God. It was not so much to tell the story of Jesus' life, as to testify to the impression which Jesus himself had made upon the spiritual experience of his followers.

Bibliography. Besides the usual New Testament Introductions, the introductory portions of the more recent commentaries on Mark, and the special Synoptic works referred to in the literature attached to the article on the Gospel of Matthew, consult: J. C. Du Buisson, *Origin of the Gospel of St. Mark* (Oxford, 1896); F. P. Badham, *St. Mark's Indebtedness to St. Matthew* (London, 1897); Arthur Titius, "Das Verhältniss der Herrenworte in Markus Evangelium zu den Logia des Matthäus," in *Theologische Studien* (Göttingen, 1897); W. Hadorn, *Die Entstehung des Markusevangelium* (Gütersloh, 1898); Friedrich Blass, *Philology of the Gospels*, translated from the German (London, 1898); H. B. Chajes, *Markus Studien* (Berlin, 1899); Abbott, *The Corrections of Mark* (London, 1901); E. D. Burton, *Studies in the Gospel According to Mark* (Chicago, 1904); Burkitt, *The Gospel History and its Transmission* (2d ed., Edinburgh, 1907); B. W. Bacon, *The Beginnings of Gospel Story* (New Haven, 1909).

MARK ANTONY. See ANTONIUS, MARCUS.

MARKBY, märk'bĭ, SIR WILLIAM (1829–1914). An English jurist, born at Duxford, Cambridgeshire, the son of a clergyman. He was educated at Bury St. Edmunds and at Merton College, Oxford. He became a barrister in 1856 and 10 years later went to Calcutta as judge of the High Court. Upon his return to England in 1878 he was reader in Indian law at Oxford until 1900. He was a commissioner on the administration of justice in Trinidad and Tobago in 1892. Markby was knighted in 1889; 10 years earlier Oxford had made him a D.C.L. An eminent authority on Indian law, he published *Lectures* on that subject and the well-known *Elements of Law Considered with Reference to General Principles of Jurisprudence* (6th ed., 1905).

MARKET. See MARKETING ASSOCIATIONS, AGRICULTURAL.

MARKET BOSWORTH. See BOSWORTH.

MARKET BUILDINGS. From the earliest antiquity it has been the custom to reserve in cities and towns a space where farmers and merchants could exhibit and sell their commodities, and such spaces were sometimes surrounded with porticoes or with public buildings and entered by monumental gates. The gate of the Agora at Athens (c.40 B.C.) is still extant, and the foundations of a circular structure in Pompeii are identified as those of the Macellum (meat market). The Forum Boarium (cattle market) and Forum Olitorium (oil market) in Rome illustrate the practice of providing special places for particular commodities. This prac-

tice still prevails in all large cities, and the names Grassmarket, Haymarket, Piazza dell' Erbe, and the like preserve in many old cities the memory of the original use of the places or squares which bear them. In process of time various types of accessory buildings were developed in association with market places, such as belfries, clock towers, and crosses, usually standing in the centre or at one side of the open space and serving as stands from which proclamations and addresses could be made. Such were the loggias of the Mercato Vecchio and Mercato Nuovo in Florence, the Poultry Cross at Salisbury (England), the Tour de la Vieille Horloge at Rouen (France). A decorative fountain was a frequent feature, especially in Italy and Germany.

The erection of covered buildings provided with permanent stalls to serve the purposes originally met by mere open spaces was not common until late in the eighteenth century. Yet as early as the thirteenth century the grain market of Florence was housed in a massive arcaded building later converted into a church, the Or San Michele, and in the sixteenth century the Shah Abbas surrounded the Meïdan-Shah at Ispahan with arcades providing shelter for merchants, while both there and in Constantinople certain streets were covered with vaulted roofs and given over to particular trades—the famous bazars of the Orient. The modern practice is to erect specially designed structures with stalls to be rented to the dealers, and so arranged as to furnish convenient access on the one hand to the supply wagons and on the other to the customers. Ventilation, drainage, water supply and refrigeration are scientifically provided for. The materials of construction are selected with especial reference to durability and cleanliness, and in many cities the markets are under the close supervision either of the health authorities or of a special officer or bureau.

The earliest market buildings were little more than sheds, of more or less architectural design, around a square in which a fountain supplied running water (Marché St. Germain, Paris). In 1811 the Halle au Blé, a circular grain market and exchange, covered by a dome of timber construction over 100 feet in diameter, was burned, and a new dome was built of iron, the earliest metallic roof of large space. In 1846–52 were built the vast Halles Centrales, by Baltard, covering over eight acres, in two blocks, with a lofty central avenue and four intersecting streets. This building, of iron and glass (except the lower part of the walls which is of brick), still admirably fulfills its purpose, and has been a model for other cities to follow. Smithfield Market, London, is another vast market of somewhat later date, of brick and stone, iron and glass, devoted to the wholesale meat trade. Important market buildings exist in nearly all large European cities; those of most American cities are far inferior to these in design and maintenance, and none deserves special mention. The early markets and their buildings were the precursors and prototypes of the modern exhibitions. See METAL WORK IN ARCHITECTURE; EXHIBITIONS, ARCHITECTURE OF.

MARKET CROSS. See CROSS.

MARKETENDERIN, DIE (Ger., The Canteen-Woman). An opera by Humperdinck (q.v.), first produced in Cologne, May 10, 1914.

MARKETING ASSOCIATIONS, AGRICULTURAL (AS. *market*, from Lat. *mercatus*, traffic, market, from *mercari*, to trade, from *merx*, merchandise, from *merere*, to earn, deserve; connected with Gk. *μέρος*, *meros*, share). A market may be defined as a place where goods are bought and sold. A market may consist of a public place or building used for the exchange of goods, or in a broader sense it may consist of the world, a country, a city, or a locality, as world market, foreign market, domestic market, Chicago market, etc. The markets may vary by the type of produce sold, as a fish market, wheat market, live-stock market, etc.

Markets have existed from the time when men began to diversify their products. At first they were entirely local in character. To-day, in Europe nearly every town, and in America nearly all the large cities, have one or more market places. These may be simply open public squares in some centrally located district, or they may be substantial buildings fitted up with stores, booths, and containing cold-storage rooms for the preservation of perishable goods. The primary object in establishing such markets was to enable the producer and consumer to deal directly with each other.

As transportation facilities improved the area over which exchange took place increased accordingly. The development of cold storage and refrigeration widened the area from which perishable products are obtained and lengthened the season during which they are available. The ease and cheapness with which agricultural products may be carried long distances has brought about a very complicated system of marketing and given employment to a large number of middlemen. Many purchasers of agricultural products send their agents to the farms and purchase produce direct, but in the majority of instances one or more persons intervene in the process. There have been developed among farmers associations or organizations to eliminate one or more of these intermediators. The farmers have formed coöperative elevators to handle their grain, coöperative creameries and cheese factories to manufacture and sell their dairy products, egg circles to collect and sell their eggs, and produce exchanges to sort, distribute, and sell their fruits and vegetables.

The purpose in forming the coöperative organizations is to improve the business methods and add to the efficiency in the distribution and sale of farm products. Generally the organization is so arranged that each member benefits in proportion to his contribution of the produce sold. Generally he can own but one share and have but one vote. There are many modifications of this form, but the closer the organization adheres to these principles the greater is its chance of success.

Some of the advantages of coöperative marketing are that a group of farmers dealing in the same produce are normally educating one another and thus improving their methods of production. This improvement will generally take the form of a more uniform production, either through the growing of a better variety or through the better methods of packing and grading. Other advantages of coöperative marketing are the lower costs in distributing a large shipment than many small ones, the prompt news service with regard to prices and market conditions in large trade centres, and the ability to sell on the market offering the best inducements. Coöperative selling associations can con-

trol sufficient capital and employ able managers, and sell only to trustworthy persons who can be depended upon to pay cash on delivery and thus eliminate the necessity of the producer having much capital himself.

In associated marketing the producers insure one another against loss in particular sales, in that the association does not distribute the proceeds of each sale but accumulates the proceeds of all the sales and distributes the net amounts. This type of marketing association has been extensively developed in distributing the more or less perishable produce of the farmer. Cooperative marketing has been developed in the United States principally for the sale of fruits, vegetables, dairy products, and grains. In many European countries the coöperative idea has extended to the slaughtering and packing of various animals and to the gathering and distributing of poultry and eggs. The coöperative idea has had its greatest development in Denmark, where it revolutionized the agriculture of the country and added greatly to the prosperity of its rural population.

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MARKET OVERT (Fr. *ouvert*, open). In the English law, an open or public market. The law of *market overt* is that the purchaser in good faith gets a good title to any goods which he may buy in such a market, even though the vender did not own or have a right to sell them. The law originated in an old Saxon custom which prohibited the sale of anything above the value of 20 pence, except in open market and in the presence of witnesses. The theory was that lost or stolen goods would probably be identified in a public market by the owner before the tradesman or original thief could dispose of them. This custom became the law of England after the Conquest, and was modified so as to include goods of any value and to dispense with the necessity of witnesses. It is applied to every kind of personal chattel except horses. By subsequent statutes the law was further modified, so that at present if stolen goods are sold in open market the title revests in the owner upon the conviction of the thief. Only certain ancient markets have this character, outside of London, where every public shop is a market overt and every day is market day. This law has never existed in the United States. See SALE.

MARKET VALUE. The value of an article as established by public sales of such property in a particular locality. Market value may be established by regular market quotations where these exist or by the testimony of persons familiar with the price at which such property sells regularly in the market. If the market price is abnormally enhanced or depressed at the time and place for delivery of any goods, by wrongful combinations or by an illegal monopoly, other evidence than the market sales may be resorted to for the purpose of showing the fair market value of the property in question. Consult the authorities referred to under TORT; DAMAGES; CRIMINAL LAW.

MARK'HAM, SIR ALBERT HASTINGS (1841–). A British admiral, distinguished for his participation in Arctic exploration. He was born at Bagnères. After his education in the Royal Navy Academy at Southsea, he entered the navy and served in China (1856–64), where he was commended for efficiency in the suppression of the Taiping rebellion and for his part in the operations leading to the fall of Peking. He rose to lieutenant (1862), commander (1872), captain (1876), rear admiral (1892), and admiral (1903). To advance the interest of Arctic exploration, he made a cruise in Baffin Bay in the whaler *Arctic*, which brought back in 1873 survivors of the *Polaris* American Arctic expedition. He commanded the *Alert* in the British Arctic expedition of 1875–76, when he reared the Union Jack, May 23, 1876, on the Arctic Ocean to the north of Grinnell Land, in the most northern point reached up to that time (83° 20′ 26″). In 1879 he made a cruise to Nova Zembla. From 1901 to 1904 he was commander in chief at the Nore, and in 1906 he retired. Among his publications are: *The Cruise of the "Rosario"* (1873); *A Whaling Cruise to Baffin Bay* (1874); *The Great Frozen Sea* (1877); *A Polar Reconnaissance* (1880); *Life of Sir John Franklin* (1890).

MARKHAM, SIR CLEMENTS ROBERT (1830–1916). An English traveler, geographer, and author, born at Stillingfleet, York. He was educated at Westminster School and in 1844 entered the navy. In 1850 he was made lieutenant and in 1851 accompanied the expedition sent to search for Sir John Franklin; traveled in Peru (1852–54); accompanied the British expedition against Abyssinia (1867–68); entered the geographical department of the India Office (1867–77); was editor of the *Geographical Magazine*, secretary of the Hakluyt Society in 1858–87, and later secretary and then president of the Royal Geographical Society, from which he retired in 1905. He was knighted in 1896. He published: *Franklin's Footsteps* (1852); *Travels in Peru and India* (1862); *A History of the Abyssinian Expedition* (1869); *Major James Rennell and the Rise of Modern English Geography* (1895); *Richard Hakluyt: His Life and Work, with a Short Account of the Aims and Achievements of the Hakluyt Society* (1896); *Memoir of Archbishop Markham* (1906); *Richard III* (1906); *Quichua Dictionary* (1908); *Life of Sir Leopold McClintock* (1909); *The Story of Majorca and Minorca* (1909); *The Incas of Peru* (1910).

MARKHAM, (CHARLES) EDWIN (1852–). An American poet, born in Oregon City, Oreg. When 5 years old he was taken to live in California, and there during his boyhood he worked at farming, blacksmithing, and cattle and sheep herding. The San José Normal School and two Western colleges equipped him to serve first as a school principal and later as a school superintendent in California. He began to write verse for the California papers at an early age. His best-known poem, *The Man with the Hoe*, published in book form with other verses in 1899, had an immense vogue and made his name known the country over. He followed his success East, and resided in or near New York

City, where he was engaged chiefly in journalistic work for many years. He was elected a member of the National Institute of Arts and Letters. His other books include: *Lincoln and Other Poems* (1901); *The Poetry of Jesus* (1909); *Children of Bondage* (1909), with others; *The Shoes of Happiness, and Other Poems* (1914); *California the Wonderful* (1914).

MARKHAM, GERVASE OR JERVIS (c.1568–1637). An English author, born at Gotham, Nottinghamshire. He served as a soldier in the Low Countries and attained a captaincy in the English army. Well versed in the classical and modern languages, he took up literature as a means of livelihood and prepared numerous volumes for the press. He wrote largely on topics connected with sport, and is also known for some indifferent poetry. A few works attributed to him were certainly written by others, but those regarded as genuine include: *The Most Honorable Tragedie of Sir Richard Grinvile* (1595); *The Poem of Poems* (1595); *Cavelarice, or the English Horseman* (1607); *Hunger's Prevention* (1621).

MARKHAM, WILLIAM (c.1635–1704). An American Colonial Governor, born in England. He was a first cousin of William Penn, by whom he was sent to America as Deputy Governor of Pennsylvania after the grant in 1681. On his arrival at New York, Brockholls, acting Governor in the absence of Andros, surrendered his authority over Penn's grant and gave him a letter to the local authorities. Proceeding to Pennsylvania, Markham called a council Aug. 3, 1681, and almost immediately began a controversy with Lord Baltimore about the Maryland boundary. He chose the present site of Philadelphia for the great city to be built, instead of that of the Swedish settlement of Upland (Chester), which was Penn's choice. When Penn arrived in 1682 Markham went to England to represent the colony in the boundary dispute, and when Penn returned to England Markham came again to America and was made Secretary of the Province and the Territories (the lower counties on the Delaware). He was Deputy Governor of the Territories in 1691, and was Lieutenant Governor for Governor Fletcher of New York (1693 to 1695), the crown having revoked the grant made to Penn and assumed control. He was continued in office until 1699 by Penn, who in 1694 had again secured possession, and during this time the new constitution was passed. Many charges, such as conniving at piracy and using courts to protect fraud, were made against him. Penn was not altogether satisfied with his course, but ordered him to be appointed Register-General of Wills in 1703. Markham was an Episcopalian and therefore out of sympathy with the aims of the Friends, nor was he a man of the force of character needed to cope with the Quakers.

MARKHOR, mär'kôr. See GOAT.

MARKING-NUT. The fruit of *Semecarpus anacardium,* a large tree of the family Anacardiaceæ, a native of the mountains of India. It has oblong leaves and terminal panicles of flowers. The fruit is a heart-shaped, black nut, seated on a large swollen receptacle, which when ripe is roasted and eaten, although when raw it is astringent and acrid. Between the two coats of the nutshell is a black, acrid juice, much in use for marking cotton cloths, a mixture of quicklime and water being applied to prevent it from running and to brighten the color. It is also used as an external application in rheumatism.

MARKIRCH, mär'kêrk (Fr. *Sainte-Marie-aux-Mines*). A town of Upper Alsace, Germany, situated on the Leber, 40 miles southwest of Strassburg. It is an important manufacturing centre for cotton and woolen goods, and there is also a large dyeing industry. In the Middle Ages the town was famous for its silver, copper, and lead mines, which were abandoned during the nineteenth century, but reopened early in the twentieth. Cotton weaving was begun here in 1755. Markirch was occupied by the French in the European War which broke out in 1914. (See WAR IN EUROPE.) Pop., 1910, 11,778, about one-half Protestants.

MARK'LAND, JEREMIAH (1693–1776). An English classical scholar and text critic. He was born at Childwall, England, and was educated at London and Cambridge. His works included a number of emendations of the text of Lysias and of Euripides, made partly in notes contributed to the edition of Lysias by Taylor and to Musgrave's edition of the *Hippolytus* of Euripides, partly in editions of the *Supplices,* the *Iphigenia in Aulide,* and *Iphigenia in Tauride* of Euripides; an edition of the difficult *Silvæ* of Statius (1728, 1824), which is considered a masterpiece of acute criticism; and *Remarks on the Epistles of Cicero to Brutus* (1745), in which he tried to prove them spurious. His attacks on the authenticity of the Ciceronian orations *Pro Domo Sua, Post Reditum in Senatu, Ad Quirites,* and the *De Haruspicum Responsis,* in which he was afterward followed by F. A. Wolf, started a famous and long-standing controversy. Consult Wolf, *Litterarische Analekten,* vol. ii (Berlin, 1818), and J. E. Sandys, *A History of Classical Scholarship,* vol. ii (Cambridge, 1908).

MARKLE, JOHN (1858–). An American coal operator, born at Hazelton, Pa. He graduated from Lafayette College in 1880; became general superintendent in the mines of his father's company; and later became president of the G. B. Markle Company, the successor of his father's firm and one of the largest "independent" anthracite-coal firms in Pennsylvania. John Markle represented the independent operators in the negotiations with President Roosevelt in the settlement of the anthracite coal strike of 1902, and he became president and chief engineer of the Jeddo Tunnel Company and of the Wilkes-Barre and Hazelton Railroad.

MARKOE, THOMAS MASTERS (1819–1901). An American surgeon. Born in Philadelphia, he graduated from Princeton in 1836 and from the College of Physicians and Surgeons, New York, in 1841. He was professor of anatomy in Castleton Medical College, Vermont, and of pathological anatomy at the medical department of the University of the City of New York (1852–54). In 1860 he became adjunct professor of surgery in the College of Physicians and Surgeons, being elected professor in 1870 and professor of the principles of surgery in 1879. He is author of *A Treatise on Diseases of the Bone* (1872).

MARKS, MRS. L. C. See PEABODY, JOSEPHINE PRESTON.

MARK TWAIN. The nom de plume of S. L. Clemens.

MARL (OF. *marle, merle,* Fr. *marne,* OHG. *mergil,* Ger. *Mergel,* from ML. *margila,* dim.

of Lat. *marga*, marl, from Gall. *marga*, Bret. *marg*, marl, Gk. ἄργιλος, *argilos*, white clay). A somewhat indefinite term applied in different localities to widely different materials. In a general sense it means essentially a naturally occurring mixture of calcium carbonate and clay with more or less sand, which usually falls to pieces on exposure to the air. Although probably the greater number of the marls of the United States conform to this definition, and depend for their agricultural value on their lime content, there are quite extensive deposits of the Cretaceous marls, known as greensand (especially in New Jersey), which contain variable but usually small amounts of lime and considerable amounts of potash (mainly silicate) and phosphoric acid. The name is also sometimes applied to friable clays, or mixtures of clay and sand, in which there is almost no trace of lime. Marl beds are widely distributed in the Atlantic coastal plain and have been exploited to a considerable extent in New Jersey, Maryland, Virginia, North Carolina, and South Carolina. The marls of these deposits generally belong to three classes and occur in geological formations which are found, as a rule, one above the other in immediate succession. The upper layer, blue or shale marl (Neocene), generally found at or near the surface, consists chiefly of sea mud with partially decomposed shells and bones. Its value depends mainly upon its content of carbonate of lime (40 to 50 per cent), although it contains in addition small percentages of potash (0.25 to 4.75 per cent) and phosphoric acid (trace to 1.75 per cent). This class predominates in Maryland, Virginia, and North Carolina, and has been used to a considerable extent with good results on worn-out or naturally infertile soils. The second class, Eocene or chalky marl, is commonly a coarse, friable chalk, consisting of comminuted shells and corals, of a light yellowish or grayish color to white, sometimes compacted into a solid limestone. Its content of lime is greater (50 to 95 per cent) than that of the shell marl, and the percentage of potash and phosphoric acid is smaller. In the lower layer occur the Cretaceous marls (greensand), which vary considerably in chemical composition and agricultural value. Their fertilizing value is determined largely by their content of potash (3.5 to 7 per cent) and phosphoric acid (1 to 4 per cent), although many are calcareous (1.25 to 9 per cent of lime). These marls have long been used with beneficial results by New Jersey farmers, although the benefit is more marked in case of marls rich in phosphoric acid and lime than in case of pure greensand containing a high percentage of potash, probably because the potash is in the form of an insoluble silicate (glauconite) and is very slowly available to plants.

Marl is both a direct and an indirect fertilizer, improving both the chemical and physical conditions of soils, correcting acidity, unlocking insoluble plant food, and promoting nitrification. It is very lasting in effect and has been used from ancient times for improving soils. But because lime (q.v.) is quicker in action it has been used in many cases instead of marl, although some kinds of marl are extremely useful on certain soils. On account of its bulkiness and the large amounts which must be applied in order to secure beneficial results, marl can be used profitably only in close proximity to the deposits. Booth, in a report of the State geologist of Delaware, recommends 60 to 100 bushels per acre as the proper amount to be applied on poor light soils, 100 to 200 bushels on clay soils, while 200 to 500 bushels may be used with advantage on soils of good quality abundantly supplied with humus. The addition of quicklime to marl (30 to 40 bushels of lime to 300 to 400 bushels of marl) has been found to quicken the action of the marl. It is generally advisable to let marl lie exposed to the air some time before it is incorporated with the soil, that any poisonous compounds present may be destroyed.

The foregoing applies particularly to the impure marine marls of the coastal plain and their use for fertilizer. In those parts of the glaciated region where the soil is somewhat calcareous, e.g., in Maine, northwestern Connecticut, western New York, northern Indiana, and southern Michigan, marl deposits of quite a different type are found. They are formed in lakes, largely through the action of algæ on calcareous water, and sometimes attain a thickness of 100 feet. This fresh-water marl is nearly pure calcium carbonate, and in recent years has been used very largely in the manufacture of Portland cement, especially in Michigan. Consult: Edmund Ruffin, *Calcareous Manures* (Shellbanks, Va., 1835); Ullmann, *Kalk und Mergel;* State geological reports of Alabama, Delaware, Florida, Georgia, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, South Carolina, and Virginia; Maryland Agricultural Experiment Station Report, 1889; and especially *Bulletin 243* of the United States Geological Survey (1905), on "Cement Materials and Industry of the United States," by E. C. Eckel.

MARLATT, märʹlăt, Charles Lester (1863–). An American entomologist, born at Atchison, Kans. He was educated at the Agricultural College at Manhattan, Kans. (B.S., 1884; M.S., 1886), where he was assistant professor for two years. From 1889 to 1894 he was assistant entomologist, and thereafter first assistant and assistant chief entomologist, of the Bureau of Entomology, United States Department of Agriculture. He made entomological investigations for the Department in China, Japan, and Java in 1901–02. In 1912 he was appointed chairman of the Federal Horticultural Board to attend to the enforcement of the plant quarantine law to prevent the importation of diseased plants into the United States, a law which he had helped to secure. Marlatt was president of the Entomological Society of Washington in 1897–98 and of the Association of Economic Entomologists in 1899. His publications are for the most part official reports and bulletins.

MARLBOROUGH, märlʹbe-rŭ. An old and interesting town in Wiltshire, England, pleasantly situated in the valley of the Kennet, 75 miles west of London (Map: England, E 5). It is located in the midst of chalk hills known as the Marlborough Downs. The chief edifice is the "college" (founded in 1843), a handsome building occupying the site of an old castle built by Henry I. In this a Parliament, whose enactments were called the Statutes of Marlbridge, was held during the reign of Henry III. The town corporation dates from 1200. It owns remunerative real estate and a water supply and maintains an isolation hospital and sewage farm. Its products include cordage, leather, and malt. Pop., 1901, 3046; 1911, 4401.

MARLBOROUGH, märlʹbŭr-ō. A city, in-

cluding several villages in Middlesex Co., Mass., 28 miles west of Boston, on the Boston and Maine and the New York, New Haven, and Hartford railroads (Map: Massachusetts, D 3). Among the features of Marlborough are a handsome city hall, public library, high-school building, post office, hospital, and a soldiers' monument. There are extensive boot and shoe, box, and carriage factories, miner's lamp works, and manufactories of shoemaking machinery. The government is vested in a mayor, annually elected, a bicameral council, and administrative departments. The members of the license department are appointed by the mayor; of the police, fire, and street departments, by the mayor with the consent of the council; while the members of the water, health, and poor departments are elected by the council. The water works are owned by the city. Pop., 1890, 13,805; 1900, 13,609; 1910, 14,579; 1914, 14,991; 1920, 15,028. Settled in 1656, Marlborough was incorporated as a town in 1660 and was chartered as a city in 1890. In 1676, during King Philip's War, it was almost wholly destroyed by the Indians. Out of the parts of the original township Westborough was formed in 1717, Southborough in 1727, and Hudson in 1866. Consult Hudson, *History of the Town of Marlboro, Massachusetts* (Boston, 1862), and E. A. Bigelow, *Historical Reminiscences of the Early Times in Marlborough, Massachusetts, and Prominent Events from 1860 to 1910* (Marlborough, 1910).

MARLBOROUGH. The northeastern district of South Island, New Zealand (Map: New Zealand, South Island, D 2). Area, 4325 square miles, of which about 100 square miles are devoted to farming and 2625 to sheep grazing. It has a large business in dairy products; much timber is cut. Coal, gold, and copper are found in the district. Pop., 1906, 14,368.

MARLBOROUGH, DUCHESS OF. See JENNINGS, SARAH.

MARLBOROUGH, JOHN CHURCHILL, first DUKE OF (1650–1722). A celebrated English general. He was born probably June 24, 1650, at Ashe in the Parish of Musbury, Devonshire, the second son of Sir Winston Churchill, a politician and historian and a stanch supporter of the Stuarts. John Churchill was educated at St. Paul's School, but early in life entered the army. He saw some service at Tangier against the Moors, and from 1672 to 1677 he bore arms on the Continent against the Netherlands, serving part of the time under the great Turenne. A new era in the history of war was then beginning. Artillery and musketry had displaced entirely the old pikeman, and rapidity of movement henceforth decided campaigns. In 1674 Louis XIV made Churchill a colonel of his regiment, and in 1678 he was made colonel of foot in the English service. Though there was no question of Churchill's ability, still the rapidity of his promotion was due also to the fact that some time between 1665 and 1668 his sister Arabella had become the mistress of the Duke of York. About 1676 Churchill fell in love with Sarah Jennings (q.v.), who was a lady in waiting of Princess Anne (later Queen Anne), and noted for her imperiousness and her beauty. The couple were married early in 1678, and thus Churchill gained the favor of Princess Anne, who was under the complete domination of her dictatorial attendant. In the following years he was occasionally employed in diplomatic missions to Holland, but usually he was in attendance on the Duke of York. In 1682 he was created Baron. When in 1685 the Duke of York ascended the throne as James II, Churchill became still more prominent. He commanded a body of troops to suppress the rebellion of the Duke of Monmouth (q.v.), and his coolness prevented a serious disaster to the royal troops at Sedgemoor (q.v.). Churchill was strongly attached to the English church, and his eulogists have maintained that he would not have betrayed it under any circumstances. This may be doubted, but he certainly did not desert the cause of the Church when he noticed the current of public opinion turning more and more against King James. The result was that he withdrew gradually from participation in the acts of this reign, and, though still affecting loyalty to the King, he began negotiations with William of Orange, and when the latter landed in England in 1688 Churchill was one of the first to go over to him with his troops. During the early part of the reign of William III he was in high favor; in 1689 was made Earl of Marlborough, and distinguished himself greatly during the invasion of Ireland, but lost all favor when he was suspected, and justly so, of preparing to betray William III and aid James II to recover the throne, of which he had helped to deprive him. Nevertheless, on the commencement of the War of the Spanish Succession in 1701 Marlborough was intrusted by William III with the command of the British army in the Netherlands. On March 8, 1702, however, the King died.

With the accession of Anne began the great epoch of Marlborough's life. Through his wife he controlled the Queen, while the son of the powerful minister Godolphin (q.v.) had in 1698 married his daughter. Thus he had a fairly free hand to carry out his great military exploits, though the allies, Dutch and Germans, often caused difficulties. The troops of the Emperor Leopold I were commanded by the great Prince Eugene (q.v.). Marlborough, who had been elected also captain general of the Dutch forces, took command in May, 1702, and in December was created Duke of Marlborough. He had under him about 10,000 English troops, 20,000 Dutch troops, and as many mercenaries, chiefly Germans. He was opposed by a French army of 75,000 men. The great danger to the allies was that the French would control the Rhine valley and thus completely isolate Austria. In order to prevent this Marlborough, who had been conducting a series of brilliant operations in the Low Countries, in the summer of 1704 made a rapid march to Bavaria and, having joined Prince Eugene, met the French on equal terms at Blenheim (q.v.) on Aug. 13, 1704. The battle was decided when Marlborough, by a skillful use of his cavalry, broke through the French centre and the enemy retired in great confusion. In this series of operations, instead of the old method of detailed operations and sieges, the two great leaders had concentrated all their forces in the important territory, and there by one decisive victory had won the whole campaign. Not the whole credit of the successes of the allies is due to Marlborough, a full half belonging to Eugene. For this victory great honors and pecuniary rewards were bestowed on Marlborough and he was made a Prince of the Empire (Austria). (See BLENHEIM HOUSE.) He won other important victories during the war, as when he compelled the

French under Villeroi to evacuate the whole of Flanders by his victory at Ramillies on May 23, 1706, and, together with Eugene, defeated Vendôme at Oudenarde on July 11, 1708. By this last victory and the capture of Lille the road to Paris was opened, but Marlborough had no longer a free hand. His wife had had several quarrels with Anne, and the Queen was ridding herself of the complete ascendancy of the Duchess. Moreover, England was suffering from the burdens imposed by the long struggle, and the Tories, who opposed the war, were coming into power. On Sept. 11, 1709, Marlborough and Eugene won a doubtful victory at Malplaquet, but it was the last great battle of the English general. The same year the Duchess was dismissed by Anne, a Tory ministry assumed office, and in 1711 Marlborough was relieved of his command. His enemies accused him of having embezzled the public money, and for a time he was deprived of his offices, though the charge was not pressed. In his last years he was without influence or friends, being, in spite of his victories, unpopular on account of his avarice. Godolphin had died and most of the great lords were his enemies. Upon the accession of George I in 1714 he was made captain general and master of the ordnance, but took little part in public affairs. He died June 16, 1722, leaving a large fortune.

Marlborough has often been severely treated by historians. He was unquestionably unscrupulous and avaricious. On the other hand, it was a time when this was true of nearly all public men, regardless of party, and Marlborough has received more blame simply because he was more prominent. His military abilities, however, have never been questioned. Unlike his two great successors, Frederick the Great and Napoleon, he was never entirely unhampered. He was always compelled to have regard for the wishes of his allies and the political situation in England. But he was the first since classic times to impress upon generals the need of rapidity of movement and the execution of campaigns as a whole. Moreover, he had the ability, which only the greatest commanders have, to amalgamate the different elements of his army, to become the hero of his soldiers. His campaigns always showed a grasp of the proportion of things. He never frittered his strength away on details, but waited for the decisive battle. Among generals, he is one of the very few who never lost a battle, and never failed in a campaign.

Bibliography. Sir George Murray, *Private Correspondence of the Duke and Duchess of Marlborough* (2 vols., London, 1838); id., *Letters and Dispatches of John, Duke of Marlborough, from 1702 to 1712* (5 vols., ib., 1845); id., *Letters of the Duchess of Marlborough* (ib., 1875). The most complete life is that of William Coxe, *Memoirs of the Duke of Marlborough* (3 vols., London, 1847–48), but it is too partial to Marlborough. A bitter attack on Marlborough is in Macaulay's *History;* while an impartial character-study is to be found in G. E. B. Saintsbury, *Marlborough* (London, 1879). For the military history of Marlborough, and an estimate of him as a general, consult: T. A. Dodge, *Gustavus Adolphus and the Development of the Art of War* (Boston, 1895); Sir Archibald Alison, *Military Life of the Duke of Marlborough* (ib., 1879); F. W. O. Maycock, *An Outline of Marlborough's Campaigns* (New York, 1913); S. J. Reid, *John and Sarah, Duke and Duchess of Marlborough, 1660–1744* (ib., 1914); also general histories like J. R. Green, *History of the English People* (8 vols., New York, 1905–08).

MARLBOROUGH HOUSE. A mansion on the south side of Pall Mall, London, erected in 1710 by Sir Christopher Wren for the first Duke of Marlborough. It was bought by the government in 1817. In it Princess Charlotte and her husband, Prince Leopold, and subsequently the Queen Dowager Adelaide, lived. In 1863 it became the property and city residence of the Prince of Wales.

MAR'LIN. A city and the county seat of Falls Co., Tex., 28 miles southeast of Waco; on the Houston and Texas Central and the International and Great Northern railroads (Map: Texas, D 4). It is in a noted cotton-growing district and carries on an important trade in cotton, grain, and live stock. Among the industrial plants are several cotton gins, a cotton compress, a large cottonseed-oil mill, and brick and marble works. As a health resort, Marlin has considerable reputation, derived from its hot artesian wells, 3350 feet deep, the waters of which have a temperature of 147° F. and possess valuable medicinal properties. There are fine hotels and sanatoriums, a courthouse, and an opera house. The water works are owned by the city. Pop., 1900, 3092; 1910, 3878.

MARLIN. A godwit (q.v.).

MARLINESPIKE (from *marline,* from Dutch *marlijn,* from *marren,* to bind, Goth. *marzjan,* OHG. *marrjan,* dialectic Ger. *merren,* to retard, hinder, Eng. *mar* + *lijn,* Eng. *line*), MARLINSPIKE, or MARLINGSPIKE. A pointed iron instrument, used by sailors in knotting, splicing, etc. It is generally 8 to 12 inches long, about an inch in diameter at the head and tapering to a point at the other end. Its chief use is in separating the strands of rope or in opening out a knot which is jammed so tightly that it cannot be untied otherwise. In marling and in serving it is used as a heaver to haul the turns taut. A large wooden instrument of the same general shape is termed a *fid.* See KNOTTING AND SPLICING.

MARLINSPIKE. The New England name for the boatswain or boatswain bird (q.v.).

MAR'LITT, E., the pseudonym of EUGENIE JOHN (1825–87). A popular German novelist, born at Arnstadt. Her father was a portrait painter; her patroness was the Princess of Schwarzburg-Sondershausen, who sent her to Vienna to study music. She became deaf, lived for 11 years at court, and then, withdrawing to Arnstadt, began there her novelistic career. *Die zwölf Apostel* (1865), *Goldelse* (1868), *Das Geheimnis der alten Mamsell* (1868), *Thüringer Erzählungen* (1869), *Reichsgräfin Gisela* (1870), *Heideprinzesschen* (1872), *Die zweite Frau* (1874), and other novels are familiar in English translations. They have little literary value. Her collected works appeared in 10 vols. (Leipzig, 1888–90; 2d ed., 1891–94).

MAR'LOW, or GREAT MARLOW. A municipal borough and market town in Buckinghamshire, England, on the north bank of the Thames, 32 miles west of London (Map: England, F 5). It is a much frequented fishing resort. Here Shelley wrote the *Revolt of Islam* in 1817. It has manufactures of silk, lace, paper, and furniture. Pop. (urban district), 1901, 4526; 1911, 4683.

MARLOWE, märʹlō, CHRISTOPHER (1564–93). A great English dramatist, the most important of Shakespeare's predecessors, and in some sense his master. The son of a shoemaker, he was born at Canterbury probably in February, 1564, and was educated at the King's School, Canterbury, and at Corpus Christi College, Cambridge, where he graduated in 1583, and took his M.A. in 1587. Here he made a thorough acquaintance with the Latin classics, and translated Ovid's *Amores* into English verse. His life after leaving Cambridge is hard to trace in detail. It seems to have been spent chiefly in London and to have been characterized by a revolt against conventional morality and established religion. His career ended untimely and unhappily: it was his misfortune to be killed in a drunken brawl at Deptford. Of the blasphemy and gross immorality that have often been ascribed to him he was probably not guilty. However, upon his reputation for heresy and irreligion (possibly grounded originally on his association with his old Cambridge tutor, Francis Kett, who was burned as a heretic at Norwich in 1589), was based a warrant for his arrest issued a few days before death removed him from the jurisdiction of the Privy Council. It is pleasanter to dwell on his intercourse with the chief men of letters in his time, including Kyd, Nash, Greene, Chapman, Raleigh, and probably Shakespeare. Whatever his life may have been, there can be no question of the magnificence of his genius and the far-reaching influence which he had upon the development of the English drama.

Not only did he establish the iambic pentameter as the recognized vehicle for serious drama, but he made it something more than it had been in various experiments since *Gorboduc* (1562). The metre became a living thing in his hand; by skillful variation of pause and accent, by the swift and smooth carrying along of the thought from line to line, it grew to be that blank verse which Milton perfected into one of the glories of English poetry. But his work was wider than this. Dropping the imitation of Seneca which had been trying to naturalize itself in England, he struck out boldly to create English tragedy by the laws of his own genius. The prologue to *Tamburlaine* contains what is really a manifesto, not only promising to lead his audience away

> From jigging veins of rhyming mother-wits

by his blank verse, but proclaiming a doctrine of unity far more healthful than the classical tradition which was endeavoring to impose itself upon England—the unity which comes from centring the action about one great passion, one mighty character. Great as was the age, stupendous as were its flights beyond what had been thought the uttermost limits of the possible, Marlowe is able to keep up with them, to find for them the "high astounding terms" which lend his tragedies such sublimity. In humor he was deficient; his touch is not always sure, and in his search for effect he sometimes overleaps himself and falls into bathos; but as a daring pioneer he won, and now more than ever, since Lamb and Hazlitt restored him to his place, keeps a rank among the very highest. It is hard to set limits to what he might have been had his life been prolonged; but after all his achievement is ample in that he made Shakespeare possible. After *Tamburlaine* (?1587; printed 1590), comes probably the first dramatic rendering of the Faust legend in *Doctor Faustus* (?1589; printed 1604); *The Jew of Malta*, specially noteworthy for its relation to the *Merchant of Venice* (?1589; printed 1633); his most successful attempt at English historical drama, *Edward II* (?1592; first published 1594). The probable sources of Marlowe's important plays may be indicated here. In his *Tamburlaine* he seems to have relied mainly on Fortescue's translation (1571) of Pedro Mexias's Spanish life of Timur (1543), supplemented by hints from the *Vita Magni Tamerlanis* of Perondino (1551). *Doctor Faustus* was based on a story familiar enough in the Middle Ages, and used in a variant form by Calderon in *El Magico Prodigioso;* its earliest literary form appeared at Frankfort in 1587. For *Edward II*, like Shakespeare, he makes free use of the chronicles of Stowe and Holinshed. In other words he collaborated with Nash, and possibly with Shakespeare, a share in at least the second and third parts of *Henry VI* being plausibly attributed to him. Of his nondramatic work the most important things are his unfinished paraphrase of the *Hero and Leander* of Musæus, and the famous lyric, "Come live with me and be my love." Consult his *Works*, ed. by Alexander Dyce (3 vols., London, 1850); by A. H. Bullen (3 vols., Boston, 1885); four plays, ed. by Ellis, with an introduction by J. A. Symonds, in the "Mermaid Series" (London, 1887); also A. W. Verity, *Influence of Christopher Marlowe on Shakspere's Earlier Style* (London, 1886); Fischer, *Zur Characteristik der Dramen Marlowes* (Munich, 1889); J. G. Lewis, *Christopher Marlowe* (London, 1891); A. W. Ward, *History of English Dramatic Literature to the Death of Queen Anne* (New York, 1889); J. A. Symonds, *Shakspere's Predecessors in the English Drama* (London, 1900); Seccombe and Allen, *Age of Shakespeare*, vol. ii (3d ed., ib., 1909); Swinburne's *Marlowe* (conveniently accessible in New York, 1908 ed.); G. E. Woodberry, "Marlowe," in *The Inspiration of Poetry* (New York, 1911); W. L. Phelps, in *Essays on Books* (ib., 1914); and the exhaustive article by Sidney Lee in the *Dictionary of National Biography*, vol. xxxvi (London, 1893).

MARLOWE, JULIA (1870–). An American actress, born near Keswick, England, Aug. 17, 1870, her real name being Sarah Frances Frost. She came with her parents to America when five years old. Her later childhood was passed in Cincinnati, where at the age of 12 she had her first dramatic experience in a juvenile opera company. Four years afterward she began seriously to study for the stage, and in 1887 she appeared in New York, but it was in Boston, in December, 1888, that she won, as Parthenia in *Ingomar*, an assured place as a star. An actress of unusual personal charm, she soon became a popular favorite in a variety of rôles, especially as Viola in *Twelfth Night* and as Rosalind in *As You Like It*. In 1894 she was married to Robert Taber, with whom for a time she played, but they separated, and in 1899 were divorced. In 1913 she married E. H. Sothern, whose associate she had been almost continuously since 1904. Among Miss Marlowe's successes may be mentioned her Highland Mary in *For Bonnie Prince Charlie* (1897); Barbara Frietchie in Clyde Fitch's play of that name (1899); and Charlotte Durand in the dramatization of Cable's *Cavalier* (1902); *Colin-*

ette (1903); *Queen Fiametta*, and *When Knighthood was in Flower* (1904). In the autumn of 1904 she began a co-star engagement with E. H. Sothern, under the management of Charles Frohman, appearing chiefly in Shakespearean plays. She met with unusual success in the rôles of Juliet, Rosalind, Beatrice, Portia, and Katherine in *The Taming of the Shrew*. Subsequently she appeared at various times in modern plays, but with no great success, and she came to confine herself almost entirely to Shakespearean parts. At the opening of the Century Theatre in New York, 1909, she appeared with E. H. Sothern in a production of *Antony and Cleopatra*. From 1910 to 1914, with her husband, she toured most successfully in Shakespearean repertoire, annually appearing for a season in New York. Indeed, both in artistic worth and in popularity, the Sothern and Marlowe productions of Shakespeare were the most notable of their time. Consult: McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); L. C. Strang, *Famous Actresses of the Day in America* (Boston, 1899); William Winter, in *Wallet of Time*, vol. ii (New York, 1913).

MAR'MADUKE, John Sappington (1833–87). An American soldier, born near Arrow Rock, Mo. After studying at Yale and Harvard, he entered West Point and graduated there in 1857. In 1858–59 he saw service in the West, participating in the Utah expedition to subdue the Mormons, who were rebelling against the United States government. In 1861 he entered the Confederate army as first lieutenant, though almost immediately promoted to be lieutenant colonel. In 1862 as colonel of an Arkansas regiment he bore the guiding colors at Shiloh and captured the first prisoners. He was seriously wounded on the second day, and while recovering was recommended for promotion to brigadier general. During 1863 he was in Missouri and defeated the Federal forces at Taylor's Creek. He commanded the cavalry at Price's defense of Little Rock and here fought a duel, killing Gen. L. M. Walker. The next year he was promoted to be major general and led one of the three columns in General Price's Missouri raid, was taken a prisoner of war, and was held until August, 1865. He afterward engaged in the commission and insurance business (1866–71) and from 1871 to 1874 was editor successively of *The Journal of Commerce*, St. Louis *Evening Journal*, and *The Illustrated Journal of Agriculture*. He was secretary of the State Board of Agriculture in 1874. From 1875 to 1880 he was a railroad commissioner. In 1884 he was elected Governor of Missouri and died in office.

MARMANDE, mär'mänd'. The capital of an arrondissement in the Department of Lot-et-Garonne, France, on the Garonne River, 40 miles southeast of Bordeaux (Map: France, S., E 4). Its parish church is an interesting thirteenth-century Gothic edifice. Marmande has a communal college, schools of commerce and agriculture, and manufactures rope, cloth, canvas, and hats. It is situated in a region extensively engaged in agriculture and the cultivation of the vine. Pop. (commune), 1901, 9873; 1911, 9832.

MÁRMAROS-SZIGET, mär'mō-rôsh sĭ'gĕt, or Máramaros-Sziget. The capital of the County of Mármaros, Hungary, beautifully situated on the Theiss and at the base of the wooded Carpathians, 232 miles east-northeast of Budapest (Map: Austria-Hungary, H 3). Its institutions include a school of law, a Roman Catholic and a Reformed Gymnasium, and a teachers' seminary. It has important salt mines worked from ancient times which still have a large output. It also produces lumber, spirits, and vinegar. Pop., 1900, 17,445; 1910, 21,370.

MARMETTE, mär'mĕt', Joseph (1844–95). A Canadian novelist. He was born in Montmagny, Quebec, and early devoted himself to a literary career, choosing the historical novel as a medium for bringing before the French-Canadians the stirring incidents of their history. He published: *Charles et Eva* (1867); *François de Bienville* (1870), portraying the unsuccessful siege of Quebec by Sir William Phips in 1690; *L'Intendant Bigot* (1872), a description of the closing years of French rule in Canada; *Le Chevalier de Mornac* (1873); and *Le tomahawk et l'épée* (1877).

MARMIER, mär'myā', Xavier (1809–92). A French author, born in Pontarlier. He traveled extensively in Switzerland, Holland, and Germany. In 1835 he was attached to the scientific voyage of the *Recherche* to the Arctic Sea, at which time he acquired a knowledge of the Danish, Swedish, and Finnish languages. On his return in 1839 he was made professor of foreign literature at Rennes, and two years later received a sinecure under the Minister of Public Instruction. In 1842–49 he was again traveling, everywhere studying languages, idioms, and literature. His numerous works include narratives of his journeys and translations from the German and Scandinavian, such as *Histoire de la littérature en Danemark et en Suède* (1839); *Du Rhin au Nil* (1846); *Voyage pittoresque en Allemagne* (1858–59); *Cimarosa* (1867); and *Contes russes* (1889). Consult the *Life* by Estignard (1893).

MAR'MION. A metrical romance by Sir Walter Scott (1808).

MARMION, Shackerley (1603–39). An English dramatist, educated at Wadham College, Oxford, where he graduated B.A. in 1622 and M.A. in 1624. After trying his fortune in the Low Countries, he settled in London, where he lived somewhat riotously, and was at one time arrested for stabbing a man in a brawl. There he became associated with Ben Jonson, Heywood, and other literary men. He accompanied Sir John Suckling on the showy expedition to Scotland (1638). Falling ill at York, he was brought back to London to die. Marmion made a verse paraphrase of the *Cupid and Psyche* of Apuleius (1637), which was greatly admired by his contemporaries. It was reprinted by S. W. Singer in 1820. For the court, Marmion wrote several comedies, which are still interesting. They comprise *Hollands Leaguer* (performed 1632); *A Fine Companion* (printed 1633); *The Antiquary* (performed 1636). Consult his *Dramatic Works*, ed. by Maidment and Logan (Edinburgh, 1875).

MÁRMOL, mär'môl, José (c.1818–71). An Argentine poet and patriot, born at Buenos Aires. As Deputy and Senator for his native province, he took so firm a stand for the rights of the people that he was banished by Rosas. After the overthrow of the dictator Mármol was again Senator for Buenos Aires and had charge of the National Library until he lost his eyesight. He published a drama *El poeta* (1842); *El Peregrino* (1846); *El Cruzado*, a drama (1851); *Armonías* (1851); *Poesías* (2d ed., 1854); and an historical novel, *Amalia* (1855).

This last is the work by which Mârmol is most widely known both at home and abroad, having been translated into French and German. After his death some of his poems and dramas were collected and published by his biographer, José Domingo Cortés, under the title *Obras poéticas y dramáticas de José Mármol* (Paris, 1875).

MARMONT, mär'môn', Auguste Frédéric Louis Viesse de, Duke of Ragusa (1774–1852). A marshal of France, born July 20, 1774, at Châtillon-sur-Seine. He entered the French army in 1791 and was rapidly promoted. He met Bonaparte at Toulon, served with distinction in the Italian campaign, particularly at Lodi and Castiglione, and later accompanied Bonaparte to Egypt, where he became brigadier general. On returning to France Marmont supported Napoleon in the coup d'état of the eighteenth Brumaire, and afterward continued in active military service. After the battle of Marengo (1800) he was made a general of division. In 1801 he was inspector general in chief of artillery, and in 1805 he was made commandant of the army in Holland. His services in defending the Ragusan territory against the Russians and Montenegrins in 1806–07 won him his title of Duke of Ragusa. After the battle of Wagram (1809) he was intrusted with the pursuit of the enemy, and after the battle of Znaim he was made a marshal. He was thereafter for 18 months Governor of the Illyrian provinces, and in 1811 succeeded Masséna in the chief command in the Peninsula, where he assumed the offensive, and kept Wellington in check for 15 months, but was eventually defeated in the battle of Salamanca (July 22, 1812). A wound compelled him to retire to France. In 1813 he fought at the battles of Lützen, Bautzen, and Dresden. He maintained the contest with great spirit in France in the beginning of 1814; and it was not until further resistance was hopeless that he concluded a truce with Prince Schwarzenberg, which was followed by the abdication of Napoleon. The Bourbons at first loaded Marmont with honors and distinction. On the return of Napoleon from Elba Marmont was excluded from the general amnesty, and he fled to Aix-la-Chapelle. After the second Restoration he spent much of his time in agricultural pursuits, till the revolution of 1830, when, at the head of a body of troops, he attempted in vain to put down the insurrection, and finally retreating with 6000 Swiss, and a few battalions that had continued faithful to Charles X, conducted him across the frontier. From that time he resided chiefly in Vienna. He died in Venice, March 2, 1852. He was the last survivor of the marshals of the first French Empire. His *Mémoires* (9 vols., 1856–57) are valuable for the history of his time. He was also the author of *Voyage en Hongrie* (1837) and *Esprit des institutions militaires* (1845).

MARMONTEL, mär'môn'tĕl', Antoine François (1816–98). A French pianist, born at Clermont-Ferrand, Puy-de-Dôme. He studied in 1828–32 at the Paris Conservatory, where he returned to teach in 1836, and in 1848 succeeded his former master, Zimmermann, as pianoforte professor. He published three books of piano studies, besides sonatas, nocturnes, serenades, minuets, reveries, and mazurkas, and his literary productions are: *Art classique et moderne du piano* (1876); *Eléments d'esthétique musicale et considérations sur le beau dans les arts* (1884); and *Histoire du piano et de ses origines* (1885).

MARMONTEL, Jean François (1723–99). A French dramatist, novelist, and critic, born at Bort, July 11, 1723, best known for two series of *Contes moraux* (1761–86), and the moralizing novels *Bélisaire* (1767) and *Les Incas* (1777). He studied for the church, but was attracted to letters by the patronage of Voltaire, went to Paris (1745), became a journalist, and won some success by his tragedies: *Denys le tyran* (1748) and *Aristomène* (1749). In 1753 a sinecure office attached him to the court at Versailles. During 1758 and 1759 he edited the *Mercure*. He was imprisoned 10 days in the Bastille for political satire in 1760, was elected to the Academy in 1763, and made its permanent secretary in 1783. His numerous contributions to the *Encyclopédie* (see Diderot) were collected as *Eléments de littérature* in 1787. He wrote also *Mémoires* and a treatise on French versification (1763). Marmontel's *Works* were edited by himself in 17 volumes, to which 14 were subsequently added. They were reëdited by Villeneuve (Paris, 1819–20). The *Mémoires* are best edited by Tourneux (Paris, 1891). There was an English translation in 1904. Consult C. A. Sainte-Beuve, *Causeries du lundi*, vol. iv (Paris, 1857–62), and S. Lenel, *Marmontel, un homme de lettres au XVIIIe siècle* (ib., 1902).

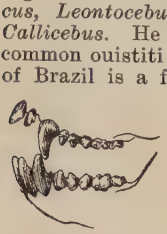
MARMORA, La. See La Marmora.

MARMORA, mär'mô-rȧ, Sea of (anciently Propontis). A small sea between European and Asiatic Turkey, communicating with the Ægean Sea by the Strait of the Dardanelles (anciently Hellespont), and with the Black Sea by the Bosporus (Map: Balkan Peninsula, G 4). It is of an oval form, 140 miles in length by 45 miles in breadth, and the east shore is indented by the two large gulfs of Ismid and Injir Liman (Mudania). The depth is generally over 600 feet, and in some places reaches over 4000. There is a current running through it from the Black Sea to the Ægean. Its navigation is not difficult and it is a great avenue of commerce. It contains many islands, of which the largest is Marmora or Marmara, famous for its white marble quarries, which supplied the materials for several famous buildings of antiquity. During the European War which broke out in 1914, the Sea of Marmora was of great military importance. The only practical means of getting munitions of war into Russia and of getting supplies of grain, etc., from Russia was closed on account of the belligerency of Turkey. To open up this highway of commerce a great allied fleet attacked the Dardanelles simultaneously with a Russian naval attack on the Bosporus. See War in Europe.

MARMOR LUNENSE. See Carrara; Luna.

MARMOSET, mär'mô-zĕt (OF. *marmoset, marmouset*, Fr. *marmouset*, puppet, from ML. *marmoretum*, marble figure, from Lat. *marmor*, Gk. μάρμαρος, *marmaros*, marble, from μαρμαίρειν, *marmairein*, to sparkle). One of the small and pretty American monkeys formerly considered to be comprised in two genera (*Hapale* and *Midas*) of the family Hapalidæ. These little creatures are distinguished from all other American monkeys by several features besides their diminutive size, long hind legs, long fur, and penciled ears. Their dentition is like that of the Old World monkeys in that it comprises only 32 teeth, without the four "wisdom" molars possessed by the Cebidæ. (See Monkey.) Their thumbs are not opposable, their nails are in the

form of claws, and their tails (which are long and bushy) are not prehensile. These and other characters place them at the foot of the scale of the monkeys, and next to the lemurs. They are arboreal in habits and climb about in small parties in search of fruit and insects, much as squirrels do; and they habitually produce two or three young at a birth instead of one, as is usual with higher monkeys. Elliot in his *Review of the Primates* groups the tamarins and marmosets in the family Callitrichidæ, dividing this into six genera, *Seniocebus, Cercopithecus, Leontocebus, Œdiponidas, Callithrix,* and *Callicebus.* He recognizes about 65 forms. The common ouistiti (*Hapale,* or *Callithrix, jacchus*) of Brazil is a familiar pet throughout tropical America, and is often brought to the United States or taken to Europe, but rarely survives even the first northern winter. It is not larger than a half-grown kitten, and is usually blackish, with the back and thighs banded with gray, and two great tufts of hair on the ears pure white; the tail is ringed with black and gray. Several other species and varieties are known, some of which are vari-colored and others pure white. The smallest, and one of the most widely distributed, is only 7 inches long.



DENTITION OF THE MARMOSETS.

The tamarins, or silky marmosets, differ in dentition and also in the absence of tufts on the ears and the rings of color on the tail. Like the others, they are common pets in South and Central America, and some kinds stray as far north as central Mexico. Several species are well known, especially the negro tamarin (*Midas,* or *Cercopithecus, ursulus*) of the lower Amazon valley; the queer little pinché (*Midas,* or *Œdipomidas, œdipus*) of the Isthmus, which has a great growth of white hair on the head; and the silky marmoset, or marikina (*Midas,* or *Leontocefus, rosalia*), which is clothed in long silky hair of a golden hue; this hair forms a long mane on the head and neck, giving the name lion monkey to some varieties. This species is often seen in menageries, and is a common pet in its own country. Consult authorities mentioned under MONKEY; especially H. W. Bates, *A Naturalist on the River Amazons* (London, 1910). See Plate of AMERICAN MONKEYS.

MAR'MOT (Fr. *marmotte,* from It. *marmotta, marmontana,* from Rumanian *murmont,* from OHG. *murmunto,* Ger. *Murmel,* from ML. *mus montanus,* mountain mouse, marmot). A name given to rodents of the ground-squirrel family. They resemble squirrels in their dentition, although in their form and habits they more resemble rats and mice. The animal to which the term (now little used) was first applied was the common marmot (*Arctomys alpinus,* or, as it is now known, *Marmota marmota*) of the mountains of Europe. It is about the size of a rabbit, grayish yellow, brown towards the head. It feeds on roots, leaves, insects, and the like, is gregarious, and often lives in large societies. It digs large burrows with several chambers and two entrances, generally on the slopes of the mountains, where the marmots may be seen sporting and basking in the sunshine during the fine weather of summer. They spend the winter in their burrows, in one chamber of which is a store of dried grass; but the greater part of the winter is passed in torpidity. The alpine marmot is easily tamed. These features and habits are characteristic of the group. A half-dozen other species occur in Europe, Asia, and North America. The best-known American species are the woodchuck and its larger relative of the Rocky Mountains. See WHISTLER; WOODCHUCK; and Plate of GOPHERS, LEMMINGS, and MARMOTS.

MARMOUSETS, mär'mo͞o'zĕ' (Fr., little men). A name given in contempt to the councilors of Charles VI of France (q.v.). They were for the most part members of the lesser nobility or of the citizen class and were despised by his uncles, who had governed the kingdom during the minority of Charles. Consult Ernest Lavisse, *Histoire de France,* vol. iv, part i (Paris, 1902).

MARNE, märn (Lat. *Matrona*). A river of France, the principal tributary of the Seine (Map: France, N., J 3). It rises in the Plateau of Langres, flows first northwest, then westward, with many windings through the departments of Haute-Marne, Marne, Aisne, and Seine-et-Marne, passes Chaumont, Saint-Dizier, Châlons, Epernay, and Meaux, and joins the Seine at Charenton, about 4 miles above Paris. Its length is 325 miles, and it is navigable for 226 miles to Saint-Dizier. It is a rather rapid stream, supplying power to a number of mills. It is paralleled in the upper reaches by lateral canals and its large traffic has been extended by means of canals, of which the most important is the Marne-Rhine Canal, which extends 195 miles from Vitry to Strassburg, passing through several tunnels. The great offensive movement of the Germans through France during the European War which began in 1914 received a final check at this stream, resulting in the series of very severe engagements lasting several days and known collectively as the battle of the Marne. See WAR IN EUROPE.

MARNE. An inland department in the northeast of France, part of the old Province of Champagne, extending southward from the frontier department of Ardennes (Map: France, N., J 4). Area, 3168 square miles. The department is traversed by the Marne River and a small portion of the Seine and Aisne. The soil is very fertile in the south, producing oats, wheat, rye, and barley, but chalky and arid in the north; on this dry and chalky soil, however, the best grapes for champagne wine are grown, especially in the neighborhood of Epernay and Avize and between the Marne and the Vesle. Cotton, metal, and woolen manufactures are largely carried on, also sheep raising and bee culture. There are large iron and copper foundries, blast furnaces, and machine works. Capital, Châlons-sur-Marne; important towns are Rheims and Epernay. Pop., 1891, 434,734; 1901, 432,882; 1911, 436,310.

MARNE, HAUTE. A department of France. See HAUTE-MARNE.

MAR'NIAN EPOCH. The name applied to the second Iron Age, or culture stage of Europe. It is so called from the Department of Marne, in northeastern France; also termed La Tène Period, from a station of that name in Switzerland. It lasted until the first century B.C. in France, Bohemia, and England, and until the tenth century A.D. in Scandinavia. It corresponds with the late Celtic of English archæologists. See NEOLITHIC PERIOD.

MARNIX, mär'nĭks, PHILIP VAN, BARON SAINTE-ALDEGONDE (1538–98). A Flemish

statesman and writer, born at Brussels. He studied theology under Calvin and Beza at Geneva and returned to his native country (1560) a devoted adherent of the Reformed religion and a sworn foe of the Spanish government and the Inquisition. Upon the appointment of the Duke of Alva to the governorship of the Netherlands (1567) Marnix sought refuge in Germany. He shared in the labors of William of Orange, who, in 1572, sent him as his representative to the first meeting of the Estates of Holland at Dordrecht. After a year's captivity in the hands of the Spaniards he entered upon an active diplomatic career as representative of the Protestant provinces at Paris and London, and in 1578 at the Diet of Worms. He took a prominent part in the formation of the Union of Utrecht. (See NETHERLANDS.) In 1583 he became burgomaster of Antwerp, and, after a 13 months' siege, was forced to surrender the city to Alexander of Parma (1585). Thereafter he took little share in political life. His writings in prose and verse form a part of the classic literature of the Netherlands. Of these the most important are: *De roomsche byenkorf* (1569), a satire; an excellent translation of the Psalms; and *Wilhelmus van Nassouwe*, which has become one of the national hymns of the Netherlands. His works were published at Brussels in seven volumes by Lacroix and Quinet (1855–59). Consult: E. Quinet, "Marnix de Sainte-Aldegonde," in *Œuvres complètes*, vol. v (Paris, 1857); *Cambridge Modern History*, vol. iii (Cambridge, 1904); A. Elkan, *Philipp Marnix von St. Aldegonde* (Leipzig, 1909).

MARNO, mär'nō, ERNST (1844–83). A German explorer of western Africa. He was born at Vienna and in 1866–67 went to Abyssinia. In 1869 he traveled to Khartum, then south to Fadasi, and in 1871 and 1872 explored the upper course of the White Nile. In 1874 he joined Gordon, who in 1878 put him in command of the District of Galabat, where he did much to suppress the slave trade. He died in Khartum. He wrote *Reisen im Gebiete des weissen und blauen Nil* (1874) and *Reise in der ägyptischen Aequatorialprovinz und in Kordofan in den Jahren 1874–76* (1878).

MAROBO'DUUS. See MARBO; MARCOMANNI.

MAROCCO, mȧ-rŏk'ō. See MOROCCO.

MAROCHETTI, mȧ'rō-kĕt'tē, CARLO, BARON (1805–67). An Italian sculptor. He was born at Turin, studied under Bosio and Gros, in Paris, and resided at Rome from 1822 to 1830. In 1827 he received a medal for his "Girl Playing with a Dog." His first important work was a statue of Emmanuel Philibert of Savoy at Turin, commissioned by Carlo Alberti of Sardinia, in recognition of which service he was made Baron. He subsequently returned to Paris. The most important of his works at Paris include: "Battle of Jemappes," a relief upon the Arc de Triomphe de l'Etoile; a monument to Bellini in Père-Lachaise Cemetery; and the marble group of the "Apotheosis of the Magdalen" on the high altar of the church of the Madeleine. In consequence of the revolution of 1848 he emigrated to England. His most important works there are an equestrian statue of Richard Cœur de Lion, which was cast in bronze by national subscription and is now near the entrance to the House of Lords, Westminster; equestrian statues of the Queen and of Wellington, for Glasgow; a portrait bust of Prince Albert; a statue of Lord Clyde in Waterloo Place and that of Thackeray in Westminster Abbey. He also modeled an equestrian statue of Washington for the New York Crystal Palace (since destroyed), a study of which is in the Metropolitan Museum of Art. His style is academic, but distinguished by some independence of treatment and skill in technique. He received the cross of the Legion of Honor in 1839 and was elected to the Royal Academy in 1866.

MARONI, mä'rō-nē' (Dutch *Marowijne*). A river forming the boundary between Dutch and French Guiana (Map: Guiana, G 3). It rises in the Tumuc Humac Mountains on the frontier of Brazil and flows northward through a densely forested region, falling in a number of cascades over the successive escarpments of the terraced plateau. It enters the Atlantic after a course of 425 miles. Below the last cascade, 46 miles from its mouth, it is a wide, deep, and beautiful stream, connected with the estuary of the Surinam by the navigable Cottica Creek running parallel with the coast.

MAR'ONITES. A Christian sect of Syria, of very ancient origin. The most probable account represents them as descendants of a remnant of the Monothelite sect (see MONOTHELITISM), who, in the early part of the eighth century, settled on the slopes of the Lebanon, their chief seats being around the monastery of Maron, a saint of the fourth century, whose life is found in Theodoret's *Religious Histories* (iii, p. 1222). The emigrants are said to have elected as their chief and patriarch a monk of the same name, with the title of Patriarch of Antioch, and, throughout the political vicissitudes of the succeeding centuries, to have maintained themselves in a certain independence among the Moslem conquerors. In the twelfth century, on the establishment of the Latin Kingdom of Jerusalem, the Maronites abandoned their distinctive Monothelite opinions and recognized the authority of the Roman church. In 1445 they entered into a formal act of union with Rome. In 1584 a college was founded in Rome by Gregory XIII for the education of the Maronite clergy; and in 1736 they formally subscribed to the decrees of the Council of Trent. Nevertheless, although united with Rome, they are permitted to retain their distinctive national rites and usages. They administer communion in both kinds; they use the ancient Syriac language in their liturgy; their clergy, if married before ordination, are permitted to retain their wives; and they have many festivals and saints not recognized in the Roman calendar. The Maronites at present are about 300,000 in number. Their patriarch is still styled Patriarch of Antioch, and resides in the convent of Kanobin, in the heart of the Lebanon. He is chosen by the bishops subject to the approval of Rome, and always bears the name Butrus (Peter). Every tenth year he reports the state of his patriarchate to the Pope. Under him are 14 bishops, to whom are subject the officiating clergy of the smaller districts. The revenues of all orders of ecclesiastics, however, are very narrow, and the inferior clergy live in great measure by the labor of their hands. About 40 convents, including 15 nunneries, are to be found in the Lebanon, with about 2000 members, who wear a distinctive costume and follow the rule of St. Anthony. The chief seat of the Maronites is the district called Kesrowan, on the western declivity of Mount Lebanon; but they are to be found scattered over the whole territory of the Lebanon, and in all the towns

and larger villages towards the north in the direction of Aleppo, and southward as far as Nazareth. They have also spread to Cyprus and Egypt, to Europe, the French colonies, and America. Their political constitution is a kind of military republic, regulated for the most part by ancient usages and by unwritten but well-recognized laws. Like the Arabs of Syria, they have a political hierarchy, partly hereditary, partly elective. The chief administration is vested in four superior sheiks, who possess a sort of patriarchal authority, and under these are subordinate chiefs, with whom, as in the feudal system, the people hold a military tenure. They are bitter enemies of their neighbors, the Druses (q.v.). Their chief occupations are cattle raising and silk culture.

Bibliography. C. H. Churchill, *The Druzes and the Maronites under the Turkish Rule from 1840 to 1860* (London, 1862); Albert Socin, *Palästina und Syrien* (Leipzig, 1880); Koehler, *Die katholische Kirche der Morgenländer* (Darmstadt, 1886); Bliss, "Essays on the Sects of Syria and Palestine—the Maronites," in the *Palestine Exploration Fund Quarterly Statement* (London, 1892); F. N. Nau, *Opuscules Maronites* (2 vols., Paris, 1899–1900); F. J. Bliss, *The Religions of Modern Syria and Palestine* (New York, 1912).

MAROON (Fr. *marron*, chestnut, chestnut colored, from It. *marrone*, chestnut). A subdued crimson color, not so yellow as chestnut (marron), from which the name is probably derived, nor so brilliant as magenta.

MAROONS (Fr. marron, apocopated, from *simarron*, Spanish *cimarron*, fugitive, from *cima*, mountain top, twig, from Lat. *cyma*, Gk. κῦμα, *kyma*, sprout, from κύειν, *kyein*, to conceive). A name given in Jamaica and Dutch Guiana to runaway negro slaves. The term was first applied to those slaves who ran away and took refuge in the uplands when their Spanish masters were driven out by the British after the latter conquered Jamaica, in 1655. For 140 years they maintained a constant warfare with the British colonists; but in 1795 they were subdued and a portion of them removed to Nova Scotia, where they gave so much trouble that most of them were transported to Sierra Leone. The Maroons of Dutch Guiana still form a number of small independent communities practicing various pagan rites, some of which can be traced to analogous African ceremonies. They are now known more commonly as Bush negroes.

MAROS, mŏ′rŏsh. The principal river of eastern Hungary. It rises in the mountains of eastern Transylvania and flows westward, past Arad, emptying into the Theiss at Szegedin, after a course of 543 miles (Map: Hungary, G 3). It is navigable about two-thirds of its length to Karlsburg, but its navigation is impeded by the great irregularity of its volume. The conjunction of the floods of the Theiss and Maros destroyed Szegedin in 1879.

MAROS-NÉMETH (mä′rŏsh-nā′mĕt) **AND NADASKA,** Count von. See Gyulai, Franz.

MAROS-VÁSÁRHELY, vä′shär-hĕl-y′. A royal free town and capital of the County of Maros-Torda in Transylvania, Hungary, situated on the river Maros, 49 miles east-southeast of Klausenburg (Map: Hungary, J 3). It has a castle which is now used for barracks, and connected with which is a fifteenth-century Gothic church; the Teleki palace, with a fine library of over 70,000 volumes (including a manuscript of Tacitus) and a natural-history collection; a technical school for metal workers, a college with a library and printing press, two Gymnasia, and an industrial museum. There are several other notable Catholic churches, many fine buildings, a county hospital, and a museum. The industries of the town include the manufacture of sugar, tile, pottery, shoes, spirits, tobacco, beer, trimmed lumber, and the refining of petroleum. Pop., 1900, 19,522; 1910, 25,517, mostly Magyars.

MAROT, mâ′rō′, Clément (1495–1544). A French poet, born at Cahors in Quercy between 1495 and 1497. He went to Paris with his father, the poet Jean Marot, about 1507, and began the study of law, which he early abandoned in favor of literature. In 1513 he became a page in the service of Nicholas de Neufville, the powerful lord of Villeroy, and two years later wrote his first original poem, the *Temple de Cupidon*, which was dedicated to the new King Francis I. This graceful allegory was inspired by the *Roman de la rose*, while its metrical form, though superior to contemporary works in its smoothness, was strongly influenced by the work of his predecessors, the school of the *rhétoriqueurs*. Thanks to this work, he became in 1518 *valet de chambre* of Marguerite d'Alençon, the future Queen of Navarre. Having entered the service of Francis I, he set out with the King on the ill-fated expedition to Pavia which resulted in the capture of the latter and the imprisonment of the poet in 1525. Marot was soon released, however, and returned to France. After this he is more original and less an imitator of Crétin, *souverain poète français*. Immediately after his return he was suspected of heresy and, in spite of a strong denial, was imprisoned in 1526, first in Paris and then less rigorously at Chartres. During his imprisonment he began his edition of the *Roman de la rose* and composed three of his best-known poems—the epistle to Bouchart protesting his innocence of the charge, his *Enfer*, and his famous letter to Lyon Jamet on the Lion and the Rat, from which La Fontaine drew his well-known fable. The King freed him on his return to France in 1526 and appointed him *valet de chambre* to succeed his father, Jean Marot, who died in 1527. In October of the same year he was again arrested for having attempted, while engaged in a prank, to save a comrade from the hands of the police. An amusing epistle to the King, in which the poet describes his efforts to bribe the state's attorney, won his release. In 1529 he composed an incomplete edition of his poetry which probably appeared during the course of the same year under the title *Adolescence Clémentine*, but of which the first edition extant is that of 1532. To this period belongs also the beautiful *Complainte, en forme d'églogue* on the death of the Queen mother Louise de Savoie (1531), which was imitated by Spenser in his *Shepherd's Calendar*. Suffering from the plague which devastated France in 1531, Marot wrote to the King his famous *Epistre pour avoir esté dérobé*, a masterpiece of its kind, in which the poet gives a very amusing account of how he was robbed by his *valet de Gascogne*. He now fell once more under suspicion of heresy, and withdrew to the court of Margaret at Nérac, where he probably occupied his time in preparing an edition of the poems of François Villon (q.v.), which he published at the end of the year 1533. The preface of this work is worthy

of note as containing the first warm appreciation of the works of the vagabond poet. After the affair of the placards he fled to Italy, taking refuge at the court of the Duchess of Ferrara, Renée de France. During his stay in Italy he began to compose his *blasons*, which were immediately imitated in France, becoming the source of an abundant literature. His epistles *Du Coq-à-l'âne*, of which he wrote several while at Ferrara, form the point of departure of a popular literary genre. Taking advantage of the truce of 1536, he returned to Lyons and was publicly obliged to abjure his heretical ideas. He was now to enjoy several years of court favor during which he composed his beautiful *Eglogue au roy sous les noms de Pan et Robin*, one of the few works of this period that reveal a feeling for nature. Immediately after his arrival he began his long quarrel with a former friend, François Sagon, in which nearly all the leading poets took part. Their contributions were collected in a volume, published in 1537, entitled *Plusieurs traictez par aucuns nouveaulx poètes du différend de Marot, Sagon et la Hueterie*. In 1539, with the help of the scholar Vatable, he commenced his poetical translation of the Psalms. At first they were well received and sung to popular tunes. But the Sorbonne took umbrage at such a procedure, and Marot was obliged to seek safety in flight. He went first to Geneva, where his Psalms were being sung in all the Protestant churches (1542). But he soon got into trouble with Calvin, and then went to Turin, where he died in the autumn of 1544. Marot is very important as a poet of transition. In his work we see the germ of the new school. He excels in the lighter vein, such as epigrams, epistles, fables, and songs, to which he has given his stamp. He was also one of the first to bring the sonnet and Italian elegy into France. His translation of the Psalms was completed by the Protestant leader Beza and is still used in French Protestant churches. In character he was a good-natured epicurean, having no desire for martyrdom.

Bibliography. His works were frequently collected (1534, 1538, 1542, 1544, etc.), best by Lenglet-Dufresnoy (4 vols., 1731), and Jannet (4 vols., 1868–72). The elaborate edition of Guiffrey, begun in 1876, has not yet been completed, only three of the six volumes having thus far appeared. The best biography is that of G. Guiffrey (1911). Consult also: Henry Morley, *Clement Marot, and other Studies* (London, 1871); E. O. Douen, *Clément Marot et le Psautier huguenot* (2 vols., Paris, 1878–79); A. A. Tilley, *Literature of the French Renaissance*, vol. i (New York, 1904). Other works of interest relating to him are Voizard, *De Disputatione inter Marotum et Sagontum* (Paris, 1885); Paul Bonnefon, "Le différend de Marot et de Sagon," in the *Revue d'histoire littéraire de la France*, vol. i (ib., 1894); Henry Guy, *De Fontibus Clementis Maroti Poetæ* (ib., 1898); Albert Wagner, *Clément Marots Verhältniss zur Antike* (Leipzig, 1906); Lefranc, *Grands écrivains de la Renaissance* (Paris, 1914).

MAROT, Daniel (c.1660–1718). A French decorative designer and engraver, born in Paris, son of the architect and engraver Jean Marot. Daniel Marot, being a Huguenot, fled to Holland in 1685 when the Edict of Nantes was revoked, and accompanied William of Orange to England, where he was appointed one of the King's architects and was especially active at Hampton Court. Much of the furniture there was designed by him and resembles the plates in his published books, especially the monumental beds with their plumes of ostrich feathers and elaborate crimson-velvet valances. At Windsor Castle there is a silver table attributed to him. After the death of King William in 1702 Marot returned to Holland, where in 1712, at Amsterdam, he published *Œuvres du Sieur D. Marot, architecte du Guillaume III, roi de la Grande Bretagne*. As a youth in France he made many designs for Boulle, especially of tall clocks and bracket clocks, and his style is always definitely Louis XIV. The most accessible collection of his designs is in T. A. Strange's *French Interiors, Furniture, etc.* (London, 1907).

MAROT, Helen (1865–). An American labor leader. She was born in Philadelphia and was active in the labor movement there and in New York, where she became executive secretary of the Woman's Trade Union League. She was also an investigator of child-labor conditions. Her writings include *A Handbook of Labor Literature* (1899) and *American Labor Union* (1914), the latter being an authoritative presentation of the trade-unionist point of view of the labor movement.

MAROT, Jean (1620–79). One of the greatest of French architectural engravers. He was born in Paris, designed numerous houses, and was for a short time associated with Jacques Lemercier (q.v.). He published *Architecture française, ou recueil des plans élévations, coupes, et profils des églises, palais, hôtels, et maisons particulières à Paris* and a work on the château of Richelieu. He was the father of Daniel Marot.

MARO'ZIA. A Roman lady of the tenth century who played an important part in the political history of the times. She was the daughter of the infamous Theodora (q.v.) and Theophylact, "consul and senator of the Romans." Her first husband was Alberic (q.v.); after his death she married Guido of Tuscany; and after the death of the latter, Hugo, King of Italy. By the power of her family and by her marital alliances she had entire control of Rome for some years. She deposed Pope John X in 928, and in the following year he was either strangled or starved to death. A little later she bestowed the papacy upon her son, John XI, who by popular rumor was supposed to be the offspring of her guilty love with Pope Sergius III. She styled herself "Senatrix" of all the Romans and "Patricia." Soon after her third marriage Marozia and her husband were thrown into prison in 932 by her son, Alberic II (q.v.). Her husband escaped, but nothing is known of her fate. Consult Ferdinand Gregorovius, *History of the City of Rome in the Middle Ages*, translated from the fourth German edition by Annie Hamilton, vol. iii (London, 1895).

MAR'PLOT. A meddling, good-natured busybody in the *Busybody* (q.v.).

MARPLOT, or the Second Part of the Busybody. A comedy by Susanna Centlivre (q.v.). It was performed at the Drury Lane Theatre, Dec. 10, 1710, and afterward altered by Henry Woodward and called *The Marplot of Lisbon*. This character reappears in 1825 as Paul Pry in the comedy by John Poole, and resembles Sir Martin Marall in Dryden's successful comedy, founded on Lord Newcastle's *Marplot*, a translation of Molière's *L'Etourdi*.

MAR'PREL'ATE, Martin. See Martin Marprelate Controversy.

MARPURG, mär'pụrk, Friedrich Wilhelm (1718–95). A German writer on music, born at Seehausen in Prussian Saxony. Little is known of his early life, but in 1746 he was secretary to General von Rothenburg at Paris, where he met Rameau, Voltaire, and D'Alembert. From there he went to Hamburg, and in 1763 was made director of the government lottery in Berlin. He composed six clavier sonatas, organ pieces, and sacred and secular songs. He is, however, better known as a writer on music, his most noteworthy works being: *Abhandlung von der Fuge* (1753–54), a standard work; *Handbuch beim Generalbass und der Composition* (1755–58); *Anleitung zum Clavierspielen* (1755); *Anleitung zur Musik überhaupt und zur Singkunst insbesondere* (1763), which are of interest at the present time.

MARQUAND, mär-kwänd', Allan G. (1853–). An American archæologist and art historian. He was born in New York and after graduating from Princeton studied at Berlin and Johns Hopkins universities (Ph.D., 1888). In 1896–97 he was professor of archæology at the American School of Classical Studies at Rome and from 1883 was professor of art and archæology at Princeton, serving also as director of the museum of historic art from 1890. In 1885 he became associate editor of the *American Journal of Archæology.* Among his writings are: a valuable *Textbook of the History of Sculpture* (1896–99), written in collaboration with A. L. Frothingham; *Greek Architecture* (1909); *Della Robbias in America* (1912); *Luca della Robbia* (1914); beside contributions to journals of art and archæology. He is considered the principal authority on the Della Robbias and their art.

MARQUAND, Henry Gurdon (1819–1902). An American capitalist and philanthropist, born in New York City. He prepared for college, but went into business as agent of his brother, Frederick Marquand (1799–1882), a New York jeweler and a benefactor of Union Theological Seminary and Yale Divinity School. This post the younger brother held for 20 years, after Frederick's retirement in 1839. Afterward he became prominent in Wall Street, especially in connection with railroad enterprises. Among his benefactions, mention should be made of a chapel and, with Robert Bonner (q.v.), a gymnasium presented to Princeton University, of a pavilion to Bellevue Hospital, and of contributions of paintings and other beautiful objects to the Metropolitan Museum of Art.

MARQUARDT, mär'kvärt, Joachim (1812–82). A German historian and antiquarian, born at Danzig. He studied at Berlin and at Leipzig and in 1859 was appointed director of the Gymnasium at Gotha, where he remained until his death. His chief work was his continuation of W. A. Becker's *Handbuch der römischen Altertümer* (1849–67). To the second edition (1871–82), almost completely rewritten, in which he was assisted by Theodor Mommsen, he contributed *Römische Staatsverwaltung,* vols. iv–vi (1873–78, 1881–85); and *Das Privatleben der Römer,* vol. vii (1879–82; 2d ed., 1886).

MARQUE (Fr., seizure), Letters of. Commissions issued by a belligerent state to vessels owned and manned by private persons, either its own citizens or neutrals, authorizing them to carry on hostilities at sea against the enemy. The usage originated in the practice of issuing letters of license to go across the boundary (mark, or march) and make reprisals. Such vessels were known as privateers and were freely employed by maritime nations at war in the sixteenth and seventeenth centuries. In the latter part of the eighteenth century most of the states of Europe enacted laws forbidding their subjects to take letters of marque from any foreign power for use against any power with which they themselves were at peace, and similar laws were passed by the United States Congress in 1797 and 1816. This put an end to privateering by neutrals, but the practice of authorizing subjects of a nation at war to prey on the enemy's commerce continued to the middle of the last century. It was declared abolished by the Declaration of Paris, which concluded the Crimean War (1856), and the declaration was accepted by most of the powers. Of the great powers only the United States refused to become a party to the declaration unless it included a provision exempting innocent commerce of a belligerent from capture by the enemy. As this has not yet (1915) been conceded the government of the United States is still technically free to employ this method of carrying on maritime warfare, but as no civilized state has issued letters of marque since the Conference of Paris, the practice may be considered obsolete. The use by a belligerent government of fast merchant vessels as auxiliary cruisers must not be confounded with the practice of privateering. In that case the private vessel is taken over by the government and embodied in its regular naval force. See Privateering.

MARQUESAS (mär-kā'sȧs) **ISLANDS,** or **MENDAÑA** (mȧn-dä'nyȧ) **ISLANDS** (Fr. *les Marquises*). A group of islands in Polynesia, in about lat. 10° S. and long. 140° W. Area, 494 square miles (Map: World, Western Hemisphere, K 7). The most important members of the group are Nukahiva (183 square miles) and Hiva-oa (153 square miles). The 11 islands, of which six are inhabited, fall into two groups which show considerable differences of dialect. With the exception of a few atolls, they are mountainous, falling abruptly into the sea on all sides, and reaching in Hiva-oa an altitude of 4158 feet. The summits are bare, and only the narrow valleys, terminating in small bays, and filled with luxuriant vegetation, are inhabited. Climate is hot and generally humid, though for six months in the year there is very little rainfall. The chief product, like that of Polynesia in general, is copra; oranges are also produced. The Marquesans form an interesting group of the Polynesian race, of which they are physically among the best representatives. They are very tall, with subdolichocephalic head form. In language they are closely related to the Hawaiians, and one stream of Hawaiian migration passed through the Marquesas. The Marquesans are an admixture of Proto-Samoan and Tongafiti elements, with a strong preponderance of the latter. Among Marquesan things worthy of note are the carved and ornamented axes and oars, feather diadems, coconut slings, carved paddle-shaped clubs, etc. Their food consists very largely of breadfruit. The Marquesans appear to have been warlike, and traces of cannibalism lingered long among them. The stone terraces of Waiko are of interest in connection with similar remains elsewhere in Polynesia. (See Megalithic Monuments.) The inhabitants are

steadily decreasing in numbers. In the early part of the nineteenth century the population was estimated at 20,000; in 1876 it was 5240; in 1900, 4300; and, in 1912, 3117. The Marquesans are all civilized and Christians; there are very few Europeans in the islands. The group is administered by native chiefs subject to the French Resident at Hiva-oa. The southern group of the Marquesas was discovered in 1595 by Mendaña de Neyra, a Spanish navigator; the northern group was discovered in 1791 by an American, Ingraham, who gave it the name of Washington Islands. Peculiar interest attaches to the Marquesas because of the fact that this archipelago was the first noncontiguous territory to be annexed to the United States. This assumption of sovereignty was proclaimed in 1813 by Commodore David Porter, of the *Essex*, but no action was taken by the government at Washington. The islands were left very much to themselves until 1842, when they were annexed by France. Consult Vincendon, *Iles Marquises* (Paris, 1843), and Churchill, *Easter Island* (Washington, 1912).

MARQUESS. See MARQUIS.

MAR'QUETRY (Fr. *marqueterie*, from *marqueter*, to inlay, from *marque*, mark). A decorative or pictorial inlay (q.v.) on furniture, of thin pieces of wood or veneer, ivory, bone, brass, tortoise shell, mother-of-pearl, etc. Marquetry is the French name for what the Italians call tarsia (q.v.), from which it was derived. The most famous French maker of marquetry was André Charles Boulle (q.v.). He was the nephew of Pierre Boulle, who married the daughter of the King's *marqueteur*, Jean Macé, of Blois. On the death in 1672 of Jean Macé after 30 years in the royal service with lodgings at the Louvre, Colbert wrote to the King, who was absent from Paris on a military campaign: "The *ébéniste* who used to make the panels of frogs is dead; he has a son who is not skillful in his profession. A man named Boulle is the most skillful man in France. Your Majesty will ordain, if it pleases him, to which of these he wishes to grant his lodgings in the galleries." Louis XIV replied: "The lodgings in the galleries to the most skillful," which of course meant André Charles. Realizing that the sombre tones of ebony were not satisfactorily softened either by *pietra dura* (q.v.) ornament or by the ivory inlays of Italy and Flanders, he increased the amount of colored ornament and lessened the amount of ebony groundwork, developing especially the art of brass and tortoise-shell inlay. His process was similar to that of wood marquetry, which he also employed extensively. He glued together two sheets of brass, or white metal, upon two sheets of tortoise shell and cut the outline of the design through all the four layers. The result was four replicas of the pattern and four replicas of the ground or matrix. By inserting the metal patterns in the tortoise-shell grounds, and the tortoise-shell patterns in the metal grounds, two complete sets were obtained. The first two, known as *Boulle première-partie*, are preferable, being less shiny and taking the engraving better than when the pattern is in the dark tortoise shell of *contre-Boulle*. Boulle also accentuated salient points of the framework of his furniture with brass and bronze mounts and gilded carving. Splendid examples of his work are the two *armoires* that brought £12,000 at the Hamilton sale, and the marriage coffer at the Louvre, illustrated in color on Plate XL of Foley's *Decorative Furniture* (London, 1910). An incendiary fire that destroyed his workshops in 1720, with their wonderful collection of furniture, models, and materials, ruined him, so that he bequeathed to his four sons an incubus of debts. Among great French marquetry makers of the eighteenth century are Foulet, Oeben, and Riesener. In the Wallace collection, London, there is a desk once part of the French crown furniture, sold in Holland to Sir William Hamilton, purchased from him in Naples by Sir Richard Wallace, and signed "Riesener fecit," with the date, Feb. 20, 1769. It is similar in design to the famous Bureau du Roi Louis XV in the Louvre, of which there is a copy in the Wallace collection. From the Netherlands, where tarsia flourished during both the sixteenth and seventeenth centuries, it came to England during the reign of William and Mary, and to some extent before. During the Georgian period (see INTERIOR DECORATION; FURNITURE) it was largely supplanted by carving, until the classic revival of the Adam period, beginning about 1760, when it in turn supplanted carving. Consult F. H. Jackson, *Intarsia and Marquetry* (New York, 1903). See FURNITURE.

MARQUETTE, mär-kĕt'. A city and the county seat of Marquette Co., Mich., 400 miles by rail north of Chicago, on Iron Bay, an inlet of Lake Superior, and on the Duluth, South Shore, and Atlantic and the Munising, Marquette, and Southeastern railroads (Map: Michigan, B 2). The city, noted for its charming scenery, clear and cool atmosphere, and fine buildings and streets, is popular as a summer resort, and is the principal shipping point for the mineral wealth, mainly iron, of the region. It has a fine harbor and regular steamship communication with important lake ports, and its ore docks, well equipped with the latest devices for handling traffic, are among the largest in the world. There are blast furnaces, redstone and trap-rock quarries, chemical works, ironworks, foundries, and machine shops; carriage, sash, door, and blind factories; lumber mills, a wood-alcohol plant, etc. Among the notable structures are the United States Government building, city hall, courthouse, Northern State Normal School, new manual training and high school, opera house, Peter White Public Library, Protestant Episcopal, Roman and French Catholic cathedrals, Catholic Orphanage, St. Mary and St. Luke hospitals, Father Marquette Monument, and the State House of Correction and Branch of State Prison in Upper Peninsula. Presque Isle, a headland of 400 acres north of Marquette, was presented to the city by the Federal government and has been converted into an attractive park. The water works, electric-light plant, power plant, costing $500,000, a cemetery, electric-supply shop, and a stone crusher are owned by the municipality. Marquette, named in honor of Père Marquette, the French missionary explorer, was settled in 1845, when the rich deposits of iron ore began to be exploited. The first dock was completed in 1854 and a railroad to the mines three years later. The city's subsequent prosperity has been marked. In 1913 it adopted the commission form of government. Pop., 1900. 10,058; 1910, 11,503; 1914 (U. S. est.), 12,117; 1920, 12,718.

MARQUETTE, JACQUES (1637–75). A French missionary and explorer in America. He was born at Laon in France. When 17 he entered the Jesuit Order, and in 1666 was sent

as a missionary to Canada. There his superiors sent him to the country of the Upper Lakes, and in 1668 he founded the Mission of Sault Ste. Marie. In 1673 Marquette, who was then in charge of the newly founded mission at Mackinaw, was instructed to accompany Louis Joliet on his expedition, sent by the Governor, Count Frontenac, to find the Mississippi. Seven men, in two birch canoes, set out on May 17. They went to Green Bay, up the Fox River, the rapids of which they passed by portage, and then on to its source, where guides were obtained from an Indian village. They crossed to the Wisconsin and floated down that stream for a week. On June 17 they entered the Mississippi, on the waters of which another week was passed before they reached a village of Illinois Indians. They passed the junction of the Mississippi and Missouri rivers, and at the mouth of the Arkansas found Indian villages, whose occupants received them with great kindness and no little curiosity. The voyagers continued southward to lat. 33° 40′, then, fearing lest they should be made prisoners by the Spaniards, they started on the return trip. On reaching the Illinois River they ascended it, and are supposed to have made the portage from the head of this stream to Lake Michigan, at or near the site of Chicago. After an absence of four months and a voyage in canoes of 2550 miles, they again made Green Bay, in the latter part of September. In October (1674) Marquette obtained permission from his superior to found a mission among the Illinois Indians. With 10 canoes he went to Green Bay, made a difficult portage through the forest to Lake Michigan, and followed the west shore of the lake to the Chicago River, where the party built a hut and passed the winter, as Marquette had become so enfeebled by illness that it was impossible for him to proceed farther. In March he was able to resume the journey. The party crossed the portage to the Illinois River and were most hospitably received at the Indian town of Kaskaskia. Marquette's condition was so serious that his party was forced to turn homeward. They reached Lake Michigan and followed the eastern shore towards Michilimackinac. Marquette did not live to reach his post, dying on May 18, 1675, near a small stream, a little south of that which now bears his name. He was buried in the wilderness, but in 1676 the bones were exhumed by a party of Ottawa converts and carried to the mission of St. Ignace, north of Mackinaw, where they were interred beneath the floor of the chapel. Marquette was a man of singular sweetness and serenity of disposition, and his influence over the Indians was great and beneficent.

Bibliography. Jared Sparks, "Life of Father Marquette," in *Library of American Biography*, vol. x (New York, 1854); "Joliet and Marquette on the Mississippi," in *Old South Leaflets, Annual Series*, vol. vii (Boston, 1889); R. G. Thwaites (ed.), *Jesuit Relations* (Cleveland, 1896); id., *Father Marquette* (New York, 1902); J. D. G. Shea, *Early Voyages Up and Down the Mississippi* (Albany, 1902); id., *Discovery and Exploration of the Mississippi* (2d ed., ib., 1903); Francis Parkman, "La Salle and the Discovery of the Great West," in *France and England in North America*, part iii (Boston, 1907); John Finley, *French in the Heart of America* (New York, 1915).

MARQUETTE UNIVERSITY. A Roman Catholic institution for higher education, founded at Milwaukee, Wis., in 1864. The university includes a college of arts and sciences and schools of law, engineering, economics, medicine, dentistry, pharmacy, and music. There is also an academic and a premedical department. The total attendance in all departments in 1914–15 was 1187. Of these 270 were in the academic department; in the college of arts and sciences there were 40; in the school of law 140; in the school of engineering 60; in the school of economics 87; in the school of medicine 140; in the school of dentistry 180; in the school of pharmacy 70; in the school of music 160; and in the premedical department 40. The instructors in various departments numbered 254. The university has no foundation funds, but is entirely dependent on tuition fees and gifts. The medical college has a "Class A" rating from the American Medical Association. The value of the grounds, buildings, and equipment is estimated at about $800,000. The main library contains about 15,000 volumes and the department libraries about 16,000 volumes. The president in 1915 was James Grimmelsman, S.J.

MARQUEZ, mär'kâs, LEONARDO (c.1820–?). A Mexican general. He served against the United States in the Mexican War, and was a prominent supporter of Santa Anna in the revolutionary movement of 1849. After the fall of that dictator Marquez espoused the cause of Miramon and Zuloaga against Juarez. In 1862 he took up the cause of the French, and rendered important service to the establishment of the power of Maximilian, by whom he was placed at the head of the regular army, and was, in 1864, given the mission to Constantinople. He returned in 1866, and a year later, when the French withdrew, he undertook to organize a native army to support the Empire. In October, 1866, Maximilian made him a division commander and in March, 1867, sent him to Mexico City to form a cabinet and raise troops for the relief of Querétaro. He joined Maximilian at Querétaro, but broke through the besiegers and made his way to Mexico City for the purpose of organizing a force to relieve the Emperor. Finding this impossible, he conceived the plan of setting up an independent government of his own in the Southern States, with Puebla as its capital. He was defeated before he could reach that city and returned to Mexico, where he was besieged by General Díaz. The city was captured, June 21, 1867, and Marquez, after remaining in concealment for several months, made his way to Vera Cruz, and then to Havana. He was expressly excluded from the amnesty of 1870. As a soldier and politician his motives were less marred by personal ambition than those of most of the leaders of Mexican affairs. He was fanatical and cold-blooded in his disregard of human life, receiving the nickname of "The Tiger of Tacubaya" for the wholesale executions which followed one of his guerrilla victories in 1859, though he alleged the express order of Miramon as an explanation. For an account of Marquez's military career consult H. H. Bancroft, *History of Mexico*, vols. v and vi (San Francisco, 1888).

MARQUIS, märkwĭs, or **MARQUESS** (OF. *markis, marquis*, Fr. *marquis*, from ML. *marchensis*, prefect of a frontier town, from *marcha, marca*, from OHG. *marka*, boundary, march). The degree of nobility which in the peerage of England ranks next below duke. Marquises were

originally commanders on the borders or frontiers of countries, or on the seacoast, which they were bound to protect; the German equivalent is *Markgraf*. The first English marquis in the modern sense was Robert de Vere, Earl of Oxford, who was created Marquis of Dublin by Richard II in 1385. The oldest existing marquisate is that of Winchester, created by Edward VI in 1551. See MARK.

MARQUIS, mär'kwĭs, THOMAS GUTHRIE (1864–). A Canadian author, born at Chatham, New Brunswick, and educated at Queen's University, Kingston, where he graduated in 1889. He was successively English master at the High School, Stratford, and at the Collegiate Institute, Kingston, and principal of the Collegiate Institute, Brockville. Retiring from teaching in 1901, he devoted himself to literature. He was chief editorial writer of the Ottawa *Free Press* (1905); was office editor of *Canada and its Provinces* (1914–15), a series of studies, in 22 volumes, of Canadian history and development. For this work he edited the Pacific Provinces section, and wrote several monographs. His publications include: *Stories of New France* (1890), in collaboration with Agnes Maule Machar (q.v.); *Stories from Canadian History* (1893); *Marguerite de Roberval: A Romance of the Days of Jacques Cartier* (1899); *Canada's Sons on Kopje and Veldt* (1900); *Life of Lord Roberts* (1901); *Presidents of the United States* (1903); *Brock: The Hero of Upper Canada* (1912); *The War-Chief of the Ottawas* (1914); *The Jesuit Missions* (1915). The last two are in the "Chronicles of Canada Series." He also edited *The Builders of Canada* (1903), a collection of biographies of eminent Canadians by well-known writers.

MARRADI, mä-rä'dē, GIOVANNI (1852–). An Italian poet, born at Leghorn. He was educated at the University of Pisa and afterward studied at Florence. In 1877 he founded, with Severino Ferrari and others, the poetic journal *I nuovi Goliardi*. He is essentially a poet of nature, and especially of the sea. Works: *Canzoni moderne* (1878); *Fantasie marine* (1881); *Canzoni e fantasie* (1883); *Ricordi lirici* (1884); *Poesie* (1887); *Nuovi canti* (1891); *Ballate moderne* (1895); *Rapsodia Garibaldina* (1905). Consult Croce, "G. Marrodi," in *La critica*, vol. iv (Paris, 1906).

MAR'RAM GRASS. See AMMOPHILA.

MARRELLA, măr-rĕl'ä. A crustacean genus that has been recently uncovered in fossil form in the Middle Cambrian shales (Stephen formation) of British Columbia. Its exact taxonomic position is unknown; it is characterized, however, by a subquadratic carapace, two immense posterolateral spines, sessile eyes, and five pairs of appendages on the head. The abdomen has 24 pairs of long, slender, pinniferous legs and the telson is a small plate. The fossils are remarkably preserved, with thin delicate gills and alimentary canals still distinct notwithstanding their great age. See STEPHEN FORMATION.

MARRIAGE (OF., Fr. *mariage*, from ML. *maritaticum*, marriage, from *maritus*, husband, from *mas*, male, husband). A union of man and woman, usually for the purpose of *consortium*, or cohabitation, which is sanctioned by the law or custom of the community. The sanction may be moral, religious, or legal. This definition is broader than that of legal usage, which makes marriage only a legal form or the status corresponding thereto; and it is not so broad as Westermarck's definition, "a more or less durable connection between male and female, lasting beyond the mere act of propagation till after the birth of the offspring." Properly speaking, the mating of animals is not marriage, and in no community of human beings is sexual union regarded as marriage until it is socially sanctioned in some way. On the other hand, communities which can hardly be said to have a positive law not infrequently attach the deepest significance to customary and religious sanctions applied to sexual relations. There has been, however, an unbroken continuity of historical forms, some of which have fallen short of marriage in any true sense, some of which have fallen short of marriage in a legal sense, while others, emerging as civil marriage, have dropped the earlier religious sanctions.

A survey of marriage in its historical evolution discloses the fact that the unions of men and women have not been restricted to the simple mating of one individual with one of the opposite sex which becomes the basis of monogamy. There have been unions of one woman with two or more men (polyandry) and of one man with two or more women (polygyny), and such arrangements have been socially approved.

Distinguished ethnologists have maintained that relatively permanent sexual unions have slowly developed out of an original promiscuity. There is, however, no satisfactory evidence that a state of true promiscuity ever existed among human beings, and the hypothesis is rendered inherently improbable by our knowledge that among the lower animals a distinct progress towards true pairing is observed as we ascend the scale from the lower to the higher vertebrata.

Chief among the facts which suggested the hypothesis of a primitive promiscuity is the widespread custom among uncivilized men of tracing names and descent through the mother instead of the father. It has been shown that the civilized races also, including the peoples of Aryan culture, in all probability passed through this matronymic stage. Furthermore, a sufficient explanation of descent in the female line is found in the general instability of pairing arrangements among primitive men. If a mother with her infant remains with her own kindred, or returns to them, she naturally keeps, and her child takes, her clan name; and her brethren or other near clansmen become the child's natural protectors.

It seems probable that from the first sexual mating among human beings has tended towards monogamic unions, but that permanency of union has been of slow growth. Among the lowest savages, such as the Australians, the Bushmen, the Fuegians, the forest hordes of Brazil, and the Innuit, a mating of one man with one woman for an indefinite, but usually not long period, is the common arrangement.

Nevertheless, in tribes somewhat more advanced but usually dwelling in extreme poverty, various forms of polyandry, or the union of one woman with two or more men, or of a group of women to a group of men, is found in many parts of the world, and undoubtedly prevailed widely in the past. In Tibetan polyandry, so called, the husbands are brothers. In Nair polyandry, or the form which prevails among the Nairs of India, the husbands of a woman may originally have been strangers to one another. Cæsar speaks of a polyandry like the Tibetan as practiced among the Britons. In the Hawaiian

Islands, before they were invaded by whites, a common form was the so-called Punaluan family, in which a number of brothers cohabited with a group of sisters, each man consorting with each woman, and each woman with each man. A conservative explanation of the known facts seems to be that primitive hordes, except perhaps in the most favorable environments, were small, as are the hordes of the lowest savages to-day, and were therefore composed of near kindred commonly marrying in and in. Under such circumstances the cohabiting group may often have been a consanguine family, a Punaluan family, or a family like that created by the Tibetan polyandry. Yet probably from the first a temporary consorting of one man with one woman was the more frequent arrangement. A horde thus marrying in and in is called *endogamous*. Two ways in which a group becomes *exogamous* (taking consorts from other groups) are recognized. Where neighboring hordes, or groups of kindred, live on friendly terms with one another, often participating in common festivities or religious observances, men frequently leave their own kindred and go to dwell with women in another group. They become in such cases in many particulars subject to the male kindred of their wives. Where neighboring groups live on bad terms with one another, frequently engaging in war, captured women may be appropriated by their captors. That wife capture has been a custom in every part of the world is admitted by all ethnologists, and there is a general agreement that the not less widespread custom of wife purchase may have grown out of wife capture. The practice of offering women to actual or potential foes as an act of propitiation probably played a large part in the origin of exogamic custom. The strict rule of exogamy is found only where the clan or gens (see GENS) is well developed, and it there is a rule of the clan as such, rather than of the horde or tribe. Where tribes are constituted of clans the clan is exogamous, and the tribe as a rule is endogamous. That is to say, men may not marry their clanswomen, but usually marry women of another clan within the same tribe.

The forms of sexual relationship thus far mentioned, let us now recall, are not necessarily marriages. Any one of them may exist in a community where the only legal union of man and woman, and the only one sanctioned by religion and public opinion, is monogamy. Any one of them becomes marriage through social sanction. There can be little doubt that religious sanctions constituting marriage are older than the legal. To the savage with his belief in imitative and sympathetic magic many things appear dangerous, and he avoids them, making them taboo. In savage communities the sexes are usually taboo to one another until by some ceremony of magic the taboo is broken. The initiation ceremonies, whereby boys and girls at puberty are admitted to certain sexual mysteries, are of this nature. They partially break the sexual taboo. The marriage ceremony is the complete and final breaking. Usually whatever is taboo may safely be touched if first it has been approached in some exceedingly careful way, or partaken of in a homœopathic portion, whereby an immunity is established. Conformably to this idea the sexual taboo is broken by such harmless approaches as the joining of hands or the partaking of a meal together. Some of the most frequent incidents of marriage ceremony are thus seen to have had their origin in that savage magic which was the first great system of social sanctions, long antedating those which were developed into positive law.

LAW OF MARRIAGE

Historical Development. The law of marriage in all Christian countries is derived from the canon law, i.e. the law established by the Christian Church in the Middle Ages. The canon law drew many of its rules regarding marriage from the Roman civil law, and it was influenced, to some extent, by Teutonic ideas; but in many respects its marriage law was novel. In nearly all Christian countries the canonical rules have been seriously modified during the last four hundred years. The changes which began with the Protestant Reformation were at first worked out by the Protestant churches and embodied in Protestant ecclesiastical law; but a tendency to regulate marriage by civil legislation appeared in the sixteenth century, and at the present day, even in those countries which have adhered most closely to the rules of the canon law, marriage is governed by the ordinary civil law.

Roman Civil Law. Marriage could be established only between Roman citizens, or between Romans and such foreigners as had by treaty the right of intermarrying with Romans (*ius connubii*). Originally, no intermarriage was possible between the gentiles or patricians and the plebeians; and after intermarriage between the orders had been legalized (445 B.C.), gentiles continued to marry, in most cases, within their own order, and often within their own *gens*. The marriage of near blood relations, however, was forbidden; originally, those related in the sixth degree (e.g. children of first cousins) were not allowed to intermarry. In the third century B.C. marriage was permitted between persons related in the fourth degree (e.g. first cousins). The legislation of the Empire varied: at one time (49 A.D.) a man was allowed to marry his brother's daughter, but in the fourth century this was made a capital offense, and in the fifth century the marriage of first cousins was again for a time prohibited. The relations established by adoption (q.v.) were treated as equivalent to relations of blood kinship. Affinity was a bar in the direct line only, until the end of the third century, when marriage with a sister-in-law (the brother's widow or his divorced wife, and the deceased or divorced wife's sister) was prohibited. Justinian, under the influence of the Christian Church, forbade marriage between godparents and godchildren on the ground that baptism established a spiritual kinship. Under the same influence the Theodosian Code had already prohibited marriage between Christians and Jews.

In the older civil law there were three modes of establishing marital power (*manus*). For the patricians there was a religious ceremony, *confarreatio;* for the plebeians there was fictitious purchase, *coëmptio*, and also prescription, *usus*. The acquisition of marital power by prescription implied that the man and the woman were living together without any preceding ceremony. At an early period this informal union was treated as marriage, even though the prescription was annually interrupted and never became complete. This marriage *consensu*, i.e. by agreement, was usually accompanied by religious observances,

such as the taking of auspices, by a banquet, and by the ceremonial taking of the wife to the husband's house, but none of these things was necessary: *consensus, non concubitus, facit nuptias.* In the course of time the consensual marriage supplanted all other forms except the *confarreatio*, which was occasionally used in some of the old families until the empire became Christian. The consensual marriage was a "free marriage" in two senses: it gave the husband no power over the person or property of his wife, and it was dissoluble at the will of either party.

Marriage could be established when both parties had reached the age of puberty, which was fixed at the completed fourteenth year for males, at the completed twelfth for females. Betrothal (q.v.), *sponsalia*, could take place at any time after the seventh year. When the parties, or either of them, were under paternal authority, no betrothal or marriage was valid without the paternal authorization.

The remarriage of widows was regarded in the older Roman ethics as improper, but it was never legally prohibited. In the later Imperial law it was prohibited for ten months, unless within that period a child had been born. In the later Imperial law, certain property disadvantages were attached to second marriages, both as regarded husbands and wives; but the object was not to penalize second marriages, but to secure the interests of the children of the previous marriages.

Early German Law. The usual form of marriage among the Scandinavians, the Germans proper, and the Anglo-Saxons was wife-purchase. The girl was bought from her father or guardian, and delivered by the father or guardian to the buyer. Abduction of a girl without payment seems to have been regarded as a mode of marriage, but the husband did not obtain complete marital authority until he had paid the customary compensation to the father or guardian. In the earliest written laws the price paid is beginning to be regarded as something that belongs to the woman, not to the father or guardian; it is *dos* or dower in the later English sense—i.e., a provision for widowhood—and instead of paying it over to the father or guardian, the bridegroom gives security for its payment on his death to his widow. In the earliest written laws also the purchase marriage consists of two separate transactions: (1) the agreement between the bridegroom and the bride's father or guardian, in which each formally binds himself to perform his part of the contract, and (2) the delivery of the bride, together with the payment of the price or the giving of security for its payment to the widow. As the formal contract of the old German law consisted in the giving of symbolic pledges, *wadia*, the first of these transactions was a *wadiatio* (Anglo-Saxon, *beweddung*), while the second was a "giving" (Anglo-Saxon, *gifta*). The *wadiatio* was more than a betrothal, it was an inchoate marriage. It produced some of the legal results of marriage, while other results attached to the giving, and others again to cohabitation. In the later development of the German law the *wadiatio* was described as *Verlobung* or promising, and consisted in the exchange of promises between bridegroom and bride, and the giving became the *Trauung* or intrusting. *Verlobung*, however, in the German view, was always something more than a Roman betrothal, and the German view was not without influence upon the development of the canon law.

Roman Canon Law. The Roman Catholic church considers marriage as a sacrament which conveys divine grace to the recipients for the purpose of enabling them to perform well the duties of the conjugal state. This aspect has nothing to do with the validity of the marriage as a civil contract; nor does the Church by this teaching deny that valid marriages are contracted outside its communion. But, considered as a sacrament of the Catholic church, it cannot be received by an unbaptized person, or properly by any one who is in a state of mortal sin. By the general view of theologians, since the consent of the parties is considered the essential part of the sacrament, they are themselves held to be the "ministers" of it: the priest simply adds the Church's benediction. Since marriage was considered a sacrament, it was early asserted that as such its regulation fell within the exclusive jurisdiction of the Church. The claim was recognized; and in the exercise of its jurisdiction the Church developed a uniform law of marriage for all Western Christendom. It did not claim to regulate the property relations of husband and wife, but it regulated the establishment and determined the validity of marriages. The principal inference which the Church drew from the sacramental theory was that marriage was indissoluble. The Church courts could declare that an existing union was not a valid marriage, i.e., they could declare a marriage null, on account of circumstances antecedent to or simultaneous with its establishment; and they could grant a separation from bed and board on account of circumstances that had arisen since the marriage; but they could not dissolve a marriage validly established by reason of any occurrences subsequent to its establishment.

There were numerous grounds on which a marriage could be set aside or annulled, called dividing or destructive impediments (*impedimenta dirimentia*), such as a previous marriage, a previous vow of celibacy, a difference of religion, impotence, etc. To the dividing impediments belonged also relationship within the forbidden degrees. The wide range of this impediment was perhaps the most peculiar feature of the canon law. The Church not only forbade marriage by reason of consanguinity and the legal affinity established by marriage; it attached the same result to the spiritual relationship established by participation in the sacraments of baptism and of confirmation, and to the illegitimate affinity established by unlawful *concubitus;* and it carried prohibitions based on affinity to the same degree as those based on blood kinship. Before 1215 the impediments of consanguinity and affinity extended to the seventh degree, but at the fourth Lateran Council Innocent III limited the prohibition based on consanguinity and affinity to the fourth degree (the seventh by the reckoning of the civil law, e.g., third cousins). From all these impediments of relationship, except those between ascendants and descendants and brother and sister, dispensation might be granted, as also from a vow of celibacy, a difference of religion, and lack of age. Lack of age, moreover, and lack of consent, were curable defects. In most cases, therefore, these dividing impediments did not render the marriages void, but only voidable. The hardships logically resulting from the annulment of marriage were

lessened by the doctrine of the "putative marriage." Where one of the parties to the invalid marriage was unaware of the impediment, that party, and also any children born of the union, were entitled to all the rights which would have been theirs if the marriage had been valid. In particular, the children were legitimate. This doctrine, however, reached over into a field which, even in the Middle Ages, was regarded as secular. The Church could say what was and what was not a marriage, but it could not regulate all the civil results of marriage, nor all the civil results of its annulment.

Other impediments were known as "impeding" or "prohibitive." To this class belonged, for example, a precontract *de futuro* (i.e., a previous betrothal to another person); also the nonobservance of ecclesiastical rules regarding banns. Disregard of such impediments subjected the offender to penalties, but did not invalidate the marriage.

It should be noted, however, that the Church's view of betrothal changed in the twelfth century. In the early Middle Ages the Church was strongly influenced by the German idea that betrothal was an inchoate marriage. In the twelfth century it went back to the Roman view that an agreement *de futuro* was a thing wholly distinct from marriage. Nevertheless some concessions were still made to German ideas. It was admitted that an agreement to marry in future and subsequent *concubitus* constituted marriage. Moreover, marriages not consummated were treated somewhat differently from those which had been consummated: they were annulled with more freedom.

On the whole, the canonical marriage was the consensual marriage of the Roman law, made indissoluble. The ages of consent were the same, 14 and 12. It was customary to publish banns, to exchange trothplight at the church door, and to have the marriage consecrated by the priest inside of the church, but none of these things was necessary. The sacrament of marriage was one which the parties could administer to each other, and the clandestine unconsecrated marriage was completely valid. The consent of parents to the marriages of their children, which was required by the Roman law, was not required by the Church, not even in the case of minors. The law was changed, after the Reformation, by the Council of Trent, which decreed that a marriage, to be valid, must be celebrated by the priest of the parish or by some other priest delegated by him for the purpose in the presence of two or three witnesses. This decree, however, was not put in force in all Catholic countries (it is affirmed that it was not introduced into the American possessions of Spain), and where the Tridentine laws are not in force, the Catholic church continues to recognize the secret and unconsecrated marriage.

Protestant Ecclesiastical Law. The Protestant churches of the Continent rejected the sacramental theory of marriage. They regarded divorce as admissible. Luther revived the theory that betrothal was an inchoate marriage, and this view was dominant until the eighteenth century. In order to suppress secret marriages the Protestant churches demanded the consent of parents, or the presence of witnesses, or an ecclesiastical ceremony, or all these things, and before the end of the century it was held that the ecclesiastical marriage was the only perfect marriage; but in the cases where *concubitus* had occurred after a promise of marriage, it was usual not only to compel the man to go through the religious ceremony, but to "supply" his assent when he refused to give it. The impediments to marriage based on consanguinity and affinity were greatly reduced. Consanguinity was treated as a bar only within the third or fourth degree, affinity only in the direct line. Spiritual kinship was not recognized. There was manifested also a tendency to treat fraud as a ground for annulling marriage, providing it was made clear that but for the fraud the marriage would not have been contracted. Some of these changes were made by civil legislation, but until the nineteenth century legislation was for the most part guided by ecclesiastical opinion.

Modern Continental Legislation. Even in Catholic countries marriage is governed at the present time by civil legislation. The most important innovation of the nineteenth century is the civil marriage. In the eighteenth century publicity of marriage, established in Catholic countries by the Tridentine decrees, was secured in Protestant states in the same way, i.e., by compulsory religious marriage. In some states it was demanded that the rites of the established Church be observed; but exceptions were generally made in favor of the adherents of other confessions or of no confession, first, by permitting marriage to be celebrated according to the forms of any recognized confession, and finally by establishing civil marriage, i.e., marriage before a civil officer. The civil marriage is regularly preceded by notices, posted or otherwise published in the domicile of each of the parties, and the civil officer does not proceed to the marriage until he is satisfied that all the requirements of the law have been observed. At the outset the parties could choose between civil and religious marriage, or the religious marriage was made compulsory only upon members of the state church. Such a choice exists to-day in Austria, Spain, and Portugal. In a larger number of Continental states, however, civil marriage is obligatory. The parties may add a religious ceremony, but the religious marriage has no legal effect. This system obtains in France, Holland, Germany, Switzerland, and Italy.

The age of consent has generally been raised (to 18 and 15 in France, to 21 and 16 in Germany), but not in Spain. The consent of parents or guardians is required for the marriage of minors, and in many legislations the consent of parents is required even after majority. In some of these legislations, the only result attached to parental opposition after majority is to delay the marriage. In Germany, if the opposition of the parents appears unreasonable, the necessary consent can be given by the court. The Roman rule forbidding remarriage of a woman within the ten months following the dissolution of the previous marriage is generally retained in modern legislations. The hindrances based on consanguinity and affinity vary considerably in different states. In Germany consanguinity is a bar only in the direct line and between brothers and sisters; affinity is a bar only in the direct line. In France uncle and niece, aunt and nephew, and brother-in-law and sister-in-law are forbidden to intermarry, but dispensation may be granted by the head of the state. Even in the more conservative Catholic countries there is a tendency to limit the impediments of consanguinity and affinity. In Spain marriages within the fourth degree are pro-

hibited, but for non-Catholics the restriction reaches no further than to first cousins. As regards lack of consent, the doctrines of the canon law are generally followed in the modern civil legislations. Fraud per se does not generally invalidate a marriage, but in the German Code fraud by which consent has been induced has this effect.

English Common Law, and Acts of Parliament. That the general ecclesiastical law of Western Christendom prevailed in the British Islands until the Reformation, and that it continued to prevail after the Reformation until changed by Parliamentary enactments, was not seriously questioned by the courts until 1843. In that year the House of Lords decided, in Queen *v.* Millis (10 Clark and Finelly, 534), that, even before the Reformation, there was a special ecclesiastical law of England and Ireland, which was not in all points identical with the Roman canon law; that, in particular, the Roman doctrine that parties could contract a valid marriage by consent alone had never been a rule of English ecclesiastical law; that, on the contrary, the assistance and benediction of a priest had always been essential to a perfect marriage in England and Ireland. This decision denied, accordingly, that the form of marriage which is still known in the United States as the "common-law marriage" had ever been a perfect marriage at English common law. The correctness of this decision has been widely questioned, and further historical investigation has strengthened the opposite opinion (see Pollock and Maitland, *History of English Law*, II, 372, and Maitland, *Canon Law in England*). The opposite theory has always been held by the courts of the United States, and the decision in Queen *v.* Millis has not been accepted by the courts of Canada.

The marriage of which the validity was denied in Queen *v.* Millis was an Irish marriage. As far as England was concerned, the question had been settled by the Acts 26 Geo. II, c. 33 (Lord Hardwicke's Act) and 4 Geo. IV, 76, which required a Church marriage preceded by the publication of banns, except when a special license was secured, and which declared any other form of marriage invalid. Church marriage meant marriage according to the forms of the Established church, and from 1753 to 1836 no exceptions were made except in the cases of Quakers and Jews. Lord Russell's Act, 6 and 7 William IV, c. 85, supplemented by Acts 1 Vict., c. 22, and 19 and 20 Vict., c. 119, furnished a choice between marriage according to the forms of the Established church, marriage according to the forms of other registered confessions, and civil marriage before a registrar. Lord Hardwicke's Act further demanded the assent of parents or guardians to the marriage of minors, and the fact that it did not operate outside England led to the numerous "Gretna Green" marriages over the Scottish border. At present, under later acts of Parliament, the same election between various forms of marriage is given in Scotland and in Ireland as in England—an election between religious marriage according to the rites of any recognized confession and civil marriage. In Scotland the formless marriage still exists, as it still exists in the great majority of the commonwealths of the United States. All that is necessary to establish the marriage is the consent or agreement *in presenti*, i.e., an agreement of marriage as distinct from an agreement to marry at some future time.

With the requirement of public marriage in England and Ireland, the canonical rule that an agreement to marry followed by *concubitus* is marriage has been abrogated. In Scotland the rule is maintained. In the United States there is a conflict of authorities. Even at the canon law the rule was based on a presumption that consent *in presenti* had intervened, but this presumption was not rebuttable. Some of the American courts treat the presumption as rebuttable; a few decline to recognize the rule. Of course neither in Scotland nor in the United States will a relation which was originally meretricious be transformed into marriage by a promise to marry; nor was any such result recognized by the Catholic church. In accordance with the common rules, the common-law ages of consent are 14 and 12. If either party, by reason of idiocy, imbecility, or insanity, does not comprehend the nature and effect of the marriage contract, there is no marriage; but if the lack of comprehension is due to intoxication, the marriage is not void, but only voidable. Mistake, as at canon law, must be of such a character that there was really no consent. As regards fraud, the English courts follow the Roman ecclesiastical rule, that fraud *per se* is not a ground for annulling a marriage. As Sir F. H. Jeune said (in Moss *v.* Moss, 1897, P. D. 268), where marriage is said to be annulled for fraud, it is really annulled because of the absence of consent. The American courts, however, are inclined to admit that a marriage may be annulled by fraud, and they are especially inclined to admit such an annullment if the marriage has not been consummated.

In England, as elsewhere, the Reformation brought about a considerable reduction in the prohibitions of marriage based on relationship. Statutes of Henry VIII, repealed in part by a statute of Edward VI and wholly repealed by a statute of Philip and Mary, were partially revived in the first year of Elizabeth's reign; and the provision that survived simply stated that "no prohibition, God's law except, shall trouble or impeach any marriage outside the Levitical degrees." This was interpreted by the ecclesiastical courts to mean that consanguinity and affinity were impediments to marriage as far as the third degree of civil computation. Under this rule a man might not marry his aunt or his niece or the daughter of his deceased wife's sister, but might marry his first cousin. Relationship by the half blood was put on the same footing as that by the full blood, and illegitimate consanguinity was treated as equivalent to legitimate blood relationship. On the other hand, the illegitimate or natural affinity of the canon law, which was affirmed in 28 Henry VIII, c. 7, is held to have disappeared from English law with the repeal of that statute. The courts regarded marriages within the forbidden degree as voidable rather than void, but such marriages were declared void by Act of 5 and 6 William IV (1835). Repeated efforts to legalize marriage with the deceased wife's sister were finally crowned with success in 1907. In all the British colonies the prohibitions based on collateral affinity have been removed.

As to proof of marriage, the common law admits any evidence of matrimonial consent. Where a formal marriage, religious or civil, has taken place, it is presumed, until the contrary is shown, that the parties were able to marry, that their consent was complete and free, and

that all necessary forms were observed. If no formal marriage has taken place, or none is proved, the fact that the parties have lived together as husband and wife, have acknowledged themselves, or have been generally reputed, to be husband and wife, raises a presumption of marriage. This presumption, however, is invalidated if it can be shown that the relation was illicit in its origin.

It is a peculiar feature of the English and American common law that it gives an action for damages for breach of contract to marry. See BREACH.

Foreign Marriages. The question whether and under what conditions a court of law will recognize as marriage a union established in another jurisdiction is a question of conflict of laws (q.v.). The general rule, all over the civilized world, is that if the forms required where the marriage was established have been observed, the marriage will be recognized as formally perfect everywhere. The capacity of parties to marry is determined, according to the prevailing European theory, by the law of their domicile, and the English courts now follow this rule. In some of the European states, however, capacity to marry is determined by the law of the country of which the person is a citizen or subject, whether he or she be domiciled there or elsewhere. In the United States the courts follow the older English decisions, according to which the capacity of the parties to marry, as well as the sufficiency of the forms observed, is determined by the law of the State in which the marriage takes place: so that citizens of any State can escape the restrictions imposed by their own State by simply crossing the line into a jurisdiction where those restrictions are not imposed.

Statutory Rules in the United States. Lord Hardwicke's Act did not apply to the Colonies, and never became a part of the common law of the United States. In nearly all of the United States, however, statutes have been enacted providing for a ceremonial marriage, and in most cases requiring also a license to marry granted by the properly constituted officer, usually the clerk of the municipality where the marriage is solemnized or the officer having supervision over vital statistics.

The marriage ceremony is usually required to be performed in the presence of two or more witnesses, by a priest or clergyman of some church, or by certain enumerated civil officers, such as judges of courts of record, justices of the peace, police justices, mayors, aldermen of cities, and county clerks. Various penalties are imposed for failure to comply with the provisions of the statute, and in some States intentional violation of the law is made a criminal offense. In most States, in the absence of a positive provision of the statute that marriages not complying with the requirements of the statute shall be void, the statute is deemed to be directory only, and not in any manner to affect the validity of the so-called common-law marriage. This is substantially the law in all of the States except California, Illinois, Kentucky, Missouri, Maryland, Massachusetts, North Carolina, Vermont, Washington, and West Virginia, in all of which it is held that the common-law marriage has been abolished by statute. But in some of these States, notably Massachusetts, Washington, and West Virginia, there are validating statutes providing that mere irregularities when an attempt is made in good faith to comply with the statute shall not affect the validity of the marriage.

A statute of New York, passed in 1901, requires a nonceremonial marriage to be evidenced by a written agreement to be entered into in the presence of two witnesses and acknowledged in the same manner as conveyances of real estate. It would seem that this statute does away with common-law marriage in New York.

In many of the United States the age at which an infant may consent to marry has been raised by statute to 16 and in some of the States to 18 years. These statutes do not, however, change the common-law rule that such marriages are not void, but *voidable* only at the option of the infant or of his parent or guardian. See INFANT.

In Connecticut and Minnesota epileptics and feeble-minded persons are not allowed to marry, and several States have somewhat similar statutes. Michigan prohibits the marriage of persons afflicted with venereal disease. Twenty-five States prohibit marriage between whites and persons of negro descent, four States between whites and Indians, and five States between whites and Chinese. In 17 States the marriage of first cousins is forbidden.

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MARRIAGE, Consanguineous. See Cross Breeding in Man.

MARRIAGE, Impediments to. See Impediments to Marriage.

MARRIAGE, Interracial. See Cross Breeding in Man.

MARRIAGE, Levirate. See Levirate Marriage.

MARRIAGE À LA MODE, ä lä mōd. A series of six paintings by Hogarth (1744) in the National Gallery, London, intended as designs for a series of engravings, as which they are most widely known. They show the results of a fashionable marriage between the son of an earl and the daughter of a rich London alderman, in subjects as follows: I. The Marriage Contract; II. After the Marriage (see illustration under Hogarth); III. Visit to the Quack Doctor; IV. The Countess's Dressing Room; V. The Duel and Death of the Earl; VI. Death of the Countess.

MARRIAGE AT CANA. A favorite subject of Italian painters, especially of the Venetian school. The most celebrated examples are those by Paolo Veronese in the Louvre (1563) and by Tintoretto in Santa Maria della Salute, Venice. The former, one of the largest easel pictures in the world, contains over 130 figures, many of which are portraits of contemporary rulers and celebrities. It represents an elaborate Venetian feast, with rich architectural background. Other examples of this subject, which was a favorite one with Veronese, are in the Dresden Gallery and the Brera, Milan. In Tintoretto's "Marriage at Cana" the table is set lengthwise in a large hall, with Christ at the farther end and guests along both sides, a remarkable piece of foreshortening. Other large canvases of the same subject are by Moretto da Brescia at San Fermo and by Scarsellino in the Ferrara Gallery.

MARRIAGE SETTLEMENT. In the English law of real property a trust of real estate created for the purpose of securing to a wife a separate interest therein for her life free from the control of her husband. Such settlements were devised to protect the wife's property rights from the absolute control which was by the common law vested in the husband. This end was attained by conveying the land to trustees for the sole and separate use of the wife usually for life, though sometimes in fee. As the term 'settlement,' as a term of conveyancing, signified a conveyance of property to be held and enjoyed by two or more persons, as mother and child or children, in succession, a marriage settlement came to denote such a conveyance made to, or for the benefit of, a woman on her marriage, with remainder to her child or children, and this irrespective of whether the wife's estate was legal, and so subject to the husband's control, or equitable and as such free from his control. A marriage settlement is usually made in anticipation of a contemplated marriage, in which case it is known as an antenuptial settlement, but postnuptial settlements are also common. See Husband and Wife; Separate Property; Settlement.

MARRIED WOMAN. See Husband and Wife; Marriage; Dower; Separate Estate.

MAR'RIOTT, John (1780–1825). An English poet. He was the son of Robert Marriott, rector of Cotesbach Church in Leicestershire, and was educated at Rugby and at Christ Church, Oxford (B.A., 1802; M.A., 1806). He left Oxford in 1804 to become tutor to George Henry, Lord Scott (died 1808), elder brother of the fifth Duke of Buccleuch. While living at Dalkeith (1804–08) he made the intimate acquaintance of Sir Walter Scott. Ordained priest in 1805, he received from the Buccleuch family the rectory of Church Lawford in Warwickshire. Though he retained this benefice till his death, he resided mostly in Devonshire, serving in various curacies. To the third edition of Scott's *Minstrelsy* he contributed three poems. Marriott's best-known poem is "Marriage is Like a Devonshire Lane" (in Joanna Baillie's *Collection of Poems*, 1823). He also wrote several popular hymns, as "Thou whose Almighty Word."

MARRONS GLACÉS, mȧ'rôn' glȧ'sā'. See Chestnut.

MAR'ROW (AS. *mearg, mearh*, OHG. *marag, marg*, Ger. *Mark*; connected with Welsh *mer*, Corn. *maru*, OChurch Slav. *mozgŭ*, Av. *mazga*, Skt. *majjan*, marrow, from *majj*, Lat. *mergere*, to dip). A substance filling the cells and cavities of the bones of mammals. There are two varieties, which are known as *red marrow* and *yellow marrow*. In some of the short bones, as the bodies of the vertebræ and the sternum, the marrow has a reddish color, and is found on analysis to contain 75 per cent of water, the remainder consisting of albuminous and fibrinous matter, with salts and a trace of oil. In the long bones of a healthy adult mammal the marrow occurs as a yellow, oily fluid, contained in vesicles like those of common fat, which are embedded in the interspaces of the medullary membrane, a highly vascular membrane lining the interior of the bones. This marrow consists of 96 per cent of oil and 4 of water, connective tissue, and vessels. The capillary blood vessels are very abundant, and in those of red marrow

the red corpuscles of the blood are constantly recruited. The oily matter of the marrow is composed of the same materials as common fat, with the oleine (or fluid portion) in greater abundance. Being of low specific gravity, it is well suited to fill the cavities of the bones and forms an advantageous substitute for the bony matter which preceded it in the young animal. Preparations of red bone marrow are in the market, for internal administration. They are useful in anæmia, when given with other reconstructives.

MARROW CONTROVERSY. One of the memorable struggles in the religious history of Scotland. It took its name from a book entitled the *Marrow of Modern Divinity*, published at Oxford in 1645. The authorship of the book has been attributed, though probably incorrectly, to Edward Fisher. The high evangelical character of this work, and especially its doctrine of the free grace of God in the redemption of sinners, had made it a great favorite with certain of the ministers of the Church of Scotland, and in 1718 an edition was published in Edinburgh by the Rev. James Hog of Carnock, followed in 1719 by an explanatory pamphlet. A committee appointed by the General Assembly of the same year, after an examination, drew up a report which was presented to the Assembly of 1720, and the result was the formal condemnation of the doctrines of the *Marrow*, a prohibition to teach or preach them for the future, and an exhortation to the people of Scotland not to read them. This act of the Assembly was immediately brought by Thomas Boston before the presbytery of Selkirk, who laid it before the synod of Merse and Teviotdale. The evangelical ministers in the Church, few in number, but supported by a very considerable amount of popular sympathy, resolved to present a representation to the next General Assembly (1721) complaining of the late act and vindicating the "truths" which it condemned. A commission of the Assembly of 1721 was appointed to deal with the ministers, and a series of questions was put to them, to which answers were drawn up by Ebenezer Erskine and Gabriel Wilson. These replies did not prove satisfactory, and the "Marrow-men" were called before the bar of the Assembly (1722) and solemnly rebuked. The matter was then quietly dropped, but it really occasioned the secession of 1734. See Boston, Thomas; Erskine, Ebenezer.

MAR'RUCI'NI. An ancient people in central Italy, on a narrow tract of land along the right bank of the river Aternus, now the Pescara. Their territory extended from the Apennines to the Adriatic; it lay between the Vestini on the northwest and the Frentani on the southeast, and between the Pæligni on the southwest and the Adriatic on the northeast. They were an independent nation, said to be descended from the Sabines, and generally were in alliance with their neighbors, the Marsi and the Pæligni. They entered into alliance with the Romans in 304 B.C., but rebelled at the beginning of the Social War. Their only place of importance was Teate, now Chieti, on the right bank of the Aternus. From an inscription, of about 250 B.C., known as the Bronze of Rapino, written in the Latin alphabet, but in an Oscan dialect, something is known of the dialect of the Marrucini. See Italic Languages, *Marrucinian;* and consult R. S. Conway, *The Italic Dialects* (Cambridge, 1897).

MARRYAT, măr'rĭ-ăt, Florence (1837–99). An English authoress, daughter of Captain Marryat. She was born at Brighton, July 9, 1837, educated at home, and began writing at 12. She was twice married, first to Col. Ross Church, of the Madras Staff Corps, and second to Col. Francis Lean, of the Royal Light Infantry. She died in London, Oct. 27, 1899. As a writer she first gained public attention by *Love's Conflict* (1865). Miss Marryat was also known as a lecturer, an operatic singer and a comedienne. In collaboration with Sir C. L. Young she wrote *Miss Chester*, a three-act drama, and in 1881 she acted the principal comedy rôle in her own play, *Her World*. Her books, fiction and miscellaneous, number some 70, none of them, probably, destined to be long remembered. Her *Life and Letters of Captain Marryat* (1872) should, however, be mentioned.

MARRYAT, Frederick (1792–1848). An English sailor and novelist, born in London, July 10, 1792. On leaving school he entered the navy as midshipman. In 1812 he attained his lieutenancy. In 1814 he was fighting on the American coast. His health gave way and he went home. He was made commander in 1815. In 1820 he was in the sloop *Beaver* on the St. Helena station. After an able service he resigned in 1830. During his naval career Marryat saved at great personal risk more than a dozen lives. He was rewarded on this score by a medal from the Royal Humane Society; and he was elected a fellow of the Royal Society in 1819, mainly because he had adapted Popham's signal system to the mercantile marine. He was also decorated by the King of France for "services rendered to science and navigation." Marryat wrote easily and made money quickly, but he was somewhat lavish, and towards 1844 was in straitened circumstances. Upon the Admiralty's refusal to let him reënter the service he burst a blood vessel, and six months later, when almost well, he was mortally shocked by hearing that his son Frederick had been lost in the *Avenger*. He died Aug. 9, 1848, at Langham. Among his numerous tales are the avowedly autobiographical *Frank Mildmay* (1829); then *Peter Simple* (1834); *Mr. Midshipman Easy* (1836); *The Phantom Ship* (1839); *Poor Jack* (1840); *The Privateer's Man* (1846). Consult Florence Marryat, *Life and Letters of Captain Marryat* (London, 1872), and David Hannay, *Life* (ib., 1889).

MARS (Lat., also *Marmar*, *Mavors*, or *Marspiter*, like Jupiter, Gk. *Ἄρης, Arēs*, of unknown derivation). Among the ancient Greeks and Romans the god of war and tumult of battle. The Greek and Roman conceptions differ radically.

Greek. Ares, though prominent in the poets, plays no large part in Greek cult or myth. It is true that a somewhat long list can be compiled of temples of the god, but he did not fill a large place in religious thought, and at but few localities was his worship important. At Thebes and Athens he seems to have been more prominent than in other communities. At Thebes he was said to have been father of the dragon who guarded his sacred spring and was slain by Cadmus (q.v.), who in the final reconciliation wedded Harmonia, daughter of Ares and Aphrodite. Here, as often in Greek legend, Aphrodite appears as the recognized consort of Ares. The connection of Aphrodite with Hephæstus, and her adultery with Ares, though told in the *Odyssey*, book viii, was not everywhere canonical,

and seems to have received its chief prominence at a late period. At Athens there was a celebrated temple of Ares, with a statue of the god, by Alcamenes, and a legend which connected him with the founding of the court of the Areopagus. (See the articles AREOPAGUS; VENUS.) He was said to have killed a son of Poseidon for an outrage on his daughter, and to have been tried by the 12 gods and acquitted on this hill, which henceforth, the Greeks said, bore his name. Cults of Ares in Thessaly and at Argos, Tegea, and Sparta are also mentioned. In legend Ares is commonly the son of Zeus and Hera, whose quarrelsome disposition he inherits. His sister in Homer is *Eris*, his sons *Deimos* (Terror) and *Phobos* (Fright), who go with him into battle. He is always greedy for war, battle, and bloodshed. The tumult of battle is his delight, and in later poets, as Sophocles, he appears as the sender of pestilence and destruction. In the Trojan War he fought with the Trojans, but he yielded to Athena, the champion of the Greeks, and was even wounded by Diomede. He was certainly closely associated in the minds of the Greeks, from Homer onward, with Thrace, and there is, to many scholars, probability in the view that his worship was derived from Thracian tribes or their kindred. Another view, supported by O. Gruppe, emphasizes the importance of Ares in Bœotian story and cult, and holds that his worship was carried thence to Thrace. In the earlier art, especially on vases, Ares is often bearded and regularly wears the full armor of a Greek soldier. In the fifth century and later this equipment disappears and the god is often represented clad in the chlamys, or nude, though usually with his attributes of shield and spear. Among the most celebrated statues are the standing "Ares Borghese" (sometimes called Achilles) in the Louvre, which goes back to a fifth-century work, and the seated "Ares Ludovisi" in Rome, which seems to be copied from a statue by Scopas (q.v.), or, according to some, from a statue by Lysippus (q.v.), though the Erotes are probably the addition of the Hellenistic copyist. Consult: O. Gruppe, *Griechische Mythologie und Religionsgeschichte*, vol. ii (Munich, 1906); A. Fairbanks, *The Mythology of Greece and Rome* (New York, 1907); the article "Ares," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

Roman. Mars was an ancient Italian deity, worshiped in all parts of central and southern Italy. To some scholars he seems everywhere to have been the god of war; others think he was originally a god of vegetation. To early peoples agriculture and war are of prime importance; both long remained of prime importance to the Romans. At Rome his worship is among the most ancient and the most important. His temple and oldest altar stood in the Campus Martius; and another famous temple was just outside the Porta Capena, to the south of the city. At each *lustrum* at the close of the census, when the *comitia centuriata*, or Roman citizens as an army, gathered in the Campus Martius (see CENSOR; COMITIA), the gathering was purified by leading around it the *suovetaurilia* (boar, ram, and bull), an offering sacred to Mars, which was afterward sacrificed, and similar ceremonies are found in connection with other purifications, as of the city, villages, and even single farms. (See AMBARVALIA.) The sacred emblems of Mars were the spear and shield, said to have fallen from heaven, which were preserved in the Regia and were carried by the Salii (q.v.), priests of the god, in their festivals. The chief festivals of Mars were in the months of March (called Martius, from the god) and October, which are clearly connected with the opening and close of the campaigning season. In legend Mars was the father by Rhea, or Rhea Silvia (q.v.), of Romulus and Remus. The wolf, a warlike beast, was sacred to Mars. So too, to some extent, were horses, which the Romans bred mainly for military purposes; the March festival in honor of Mars was known as the Equiria, and included horse racing. Augustus built in his forum a splendid temple to Mars Ultor (Mars the Avenger), because the god had helped him to avenge the death of his uncle and father by adoption, Julius Cæsar. See AUGUSTUS, FORUM OF. Consult: W. W. Fowler, *Roman Festivals* (London, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1911); and the article "Mars" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MARS. The first of the superior planets. Its mean distance from the sun is 141.5 million miles, or nearly $\frac{3}{2}$ times that of the earth; its periodic time, 686.98 days; its diameter, 4230 miles; volume, $\frac{1}{6.57}$ that of the earth; density, 0.71, earth's being unity. Its orbit is inclined at an angle of 1° 15′ 1″ to the ecliptic, and, with the exception of the orbit of Mercury, has a greater eccentricity, viz., 0.09332, than that of any other major planet. When it is nearest to the earth (i.e., in favorable opposition) its apparent angular diameter is 25″, but when farthest away (i.e., in conjunction) its diameter is not more than 4″. The axis of rotation is inclined 24° 50′ to the plane of the orbit and therefore the planet presents phenomena of seasons similar to the earth's. The diurnal rotation period of Mars is known very accurately from observations of surface markings to be 24 hours, 37 minutes, 22.67 seconds. The planet shines with a red light and is a brilliant object in the heavens at midnight when near opposition. Mars has two satellites, discovered by Hall in 1877. They are very small, and visible with powerful telescopes only. The inner satellite, Phobos, revolves around the planet at a distance of only 3760 miles from its surface in 7 hours, 39 minutes, which is less than one-third of the Martian day. Consequently, Phobos will rise in the west and set in the east, its real motion more than counterbalancing the apparent diurnal motion of Mars on its axis. The outer satellite is called Deimos; its period is 30 hours, 18 minutes, and its distance from the surface of its primary is 12,500 miles.

Beginning with the telescopic researches by Sir William Herschel, Mars has possessed special interest owing to the indication of the existence upon its surface of physical conditions not unlike those of the earth. The Martian seasons have already been mentioned. The "canal system" of Mars, suggested by Schiaparelli in 1877, has given rise to a careful study of the planet, rendered possible by the construction of our great modern telescopes. Many things seem to indicate that Mars is enveloped in an atmosphere with physical properties similar to those of the earth's atmosphere. According to observations by Lowell, at Flagstaff, Ariz., carried on for six months, this atmosphere would appear to be of remarkable clearness. Two white patches, in the

neighborhood of the poles, are very conspicuous and so brilliant that they, in the proper light of the sun, have been seen sparkling like stars. They are generally explained as accumulations of snow and ice, and this view is supported by the fact that they change with the Martian seasons.

A mixture of orange patches and gray-green markings is seen extending over more than half the surface of the planet in a central zone, almost parallel to the equator. The orange patches are assumed to be land. This assumption is based upon the similar appearance that the great deserts of the earth would present under the same conditions. Also permanent markings on these patches have been observed. The gray-green markings were at first explained to be seas and Sir William Huggins discovered water in the atmosphere of Mars, but the observations of Douglas in Arizona (1894) and Barnard at the Lick Observatory (1896) seem to disprove the aqueous character of the "seas." In 1894 Lowell and Pickering discovered, a month after the Martian vernal equinox, a dark belt connected with the south polar cap, which was explained by them as a gathering of water resulting from the melting of the cap by the summer heat. A similar appearance has been observed around the north polar cap.

Of all the markings that have been observed on the surface of Mars the "canals" have created the most interest. Since their first observation at the very favorable opposition of the planet in 1877 they have been studied carefully at later favorable oppositions. They have been described by observers as faint lines, becoming finer and straighter at closer observation, following the course of great circles, and distributed like a network over the surface of the planet. Several appear to pass through the same point, at which round spots, called lakes, are seen. Various theories have been advanced for the explanation of this "canal system." They were first taken to be waterways, and the change in their appearance was explained as due to the Martian seasons. Pickering considered them to be tracts of land rather than waterways. Lowell advanced the view that these "canals" and "lakes" constituted a system of irrigation carried out by the inhabitants of Mars for the purpose of leading the water obtained from the melting snow of the polar regions over the surface of the planet. It has been urged that the appearance of the canal system may be nothing but an optical illusion, but Lowell in 1905 obtained photographs which seem to settle decisively the question of the reality of the canals.

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MARS, märs, ANNE FRANÇOISE HYPPOLYTE BOUTET, MADEMOISELLE (1779–1847). A famous French actress. She was born in Paris. Her father was the actor Jacques Monvel; her mother was an actress, Mademoiselle Mars-Boutet. At an early age she appeared at the Comédie Française in personations of ingenuous childhood, but it was not till she had reached her twenty-fourth year that her first great success was obtained in *L'Abbé de l'épée,* in the part of the deaf and dumb girl. From that time forward, through a period of nearly 40 years, she acted through the whole range of dramatic art with a fullness of talent that never failed to present with delicacy, power, and good taste each new character in which she appeared. She was especially celebrated for her work in the ancient and classical repertory. Her last appearance was in 1841 as Célimène in *Le misanthrope* and as Araminthe in *Les femmes savantes.* She died in Paris on March 20, 1847. Her sister, Mars *aînée,* was also a well-known actress. Consult, though they are of doubtful value, the *Mémoires de Mademoiselle Mars* (Paris, 1849) and the *Confidences de Mademoiselle Mars* (ib., 1855), published by Roger de Beauvoir.

MARS, FORUM OF. A name for the Forum of Augustus. See AUGUSTUS, FORUM OF.

MARSALA, mär-sä'lä. A city in the Province of Trapani, Sicily, 102 miles by rail southwest of Palermo (Map: Italy, D 6). Though it has ruins of its ancient walls, a castle, and several fine churches, it is modern in appearance. Marsala has a Gymnasium, a technical school, an agricultural school, a city library, and a theatre. It is famous for Marsala wine, which is made by building up other wines of Sicily. The exports are wine, salt, soda, grain, and oil. Pop. (commune), 1901, 57,567; 1911, 65,451. It is on the site of the ancient Lilybæum.

MARS'BANKER, MARSH'BANKER, etc. (Dutch *marsbanker,* scad, apparently from *mars,* peddler's pack, or *mas,* crowd + *bank,* bank; so called because the fish appears in shoals). Old or local names of the menhaden (q.v.). Compare MOSSBUNKER.

MARSCHALL VON BIEBERSTEIN, märʹshäl fŏn bēʹbēr-shtīn, ADOLF, BARON (1842–1912). A German statesman and diplomat, born in Karlsruhe and educated at Heidelberg and Freiburg. He entered the judicial service of Baden, and from 1875 to 1883 was a member of the Upper House of its Parliament. In the Imperial Diet, from 1878 to 1881, he allied himself with the German Conservatives. In Baden he made a strong effort to unify Protestant opposition to the Ultramontanists; and his activity in the Empire was largely in paving the way for social reforms. After four years as Secretary of State for Foreign Affairs, an office in which he devoted himself especially to commercial treaties, he was named Prussian Minister of State in 1894. Upon his retirement in 1897 he was sent as Ambassador to Constantinople. In May, 1912, he accepted a similar position in London, but died five months later. He was recognized as Germany's ablest diplomat and was largely instrumental in influencing the Turkish government in favor of German policies.

MARSCHNER, märshʹnĕr, HEINRICH (1795–1861). A German composer, born at Zittau in Saxony. In 1813 he entered the University of Leipzig to study law, but soon abandoned it in favor of music. He met Beethoven in 1817, through the medium of his patron, the Count von Amadée, and in 1823 shared with Weber the directorship of the German and Italian operas at Dresden. He succeeded Weber as kapellmeister of the Leipzig Theater, and produced on its stage

his popular opera *Der Templer und die Jüdin* (1829), which made him famous throughout Germany. *Heinrich IV und D'Aubigne* had appeared in 1819 (produced by Weber in 1820), and *Der Vampyr* (regarded as his best work) in 1828. His compositions also include a great number of songs, pianoforte pieces, part songs, and choruses, and considerable chamber music. Other operas, not mentioned above, are: *Hans Heiling* (1833), a remarkable work: *Der Bäbu* (1837); *Adolph von Nassau* (1843); *Hjarne der Sängerkönig* (1863), reproduced in 1883 as *König Hjarne und das Tyrfingschwert*. He was kapellmeister to the King of Hanover (1831–59). His music belongs to the romantic school of Weber, whom he greatly resembled in style, although in a way his ideals leaned towards the style of Wagner. His operas had a great vogue in Germany, and still remain in the repertoire of most of the provincial theatres. He died in Hanover. Consult: G. Münzer, *Heinrich Marschner* (Berlin, 1901); M. E. Wittmann, *Marschner* (Leipzig, 1905); H. Gaartz, *Die Opern Heinrich Marschners* (ib., 1912).

MARSDEN, märz'den, SAMUEL (1764–1838). An English missionary. He was born at Horsforth, near Leeds, July 28, 1764; was educated at the free grammar school at Hull, and began life as a tradesman at Leeds. He joined the Methodists, but, desiring to obtain a collegiate education, entered the English church; studied at St. John's College, Cambridge, and was ordained in 1793, and in 1794 sailed as chaplain to the penal colony at Parramatta, near Sydney, Australia. Receiving a grant of land and 13 convicts to till it as part payment for his services, he made it the model farm in New South Wales, and devoted the profits from it to the support of schools and missions. A mutinous spirit showing itself among the convicts, Marsden sailed for England (1807), mainly for the purpose of obtaining permission for the friends of the convicts to accompany them to the penal colony. This was refused, but his proposal that the convicts should be taught trades was well received. Having had some intercourse with the Maoris of New Zealand, and found them to be superior to the Australian natives, he endeavored, while in England, to obtain funds for the formation of a mission among them and missionaries to accompany him. Two laymen, William Hall and John King, consented to go as pioneers, and accompanied Marsden to Australia, August, 1809. They were soon followed by Thomas Kendall, and the party finally went to New Zealand in 1814. He employed these teachers in laying the foundations of a Christian civilization, frequently visited them, and in his fourth visit took with him the Rev. Henry Williams, who afterward became Bishop of a Maori district. He procured reënforcements for the mission from the English and Wesleyan churches, induced the natives to adopt a fixed form of government, provided for the preparation of a grammar and dictionary of the Maori language, and lived to see the people Christianized. He died at Windsor, May 12, 1838, and was buried in his parish at Parramatta. Consult J. B. Marsden, *Life of Samuel Marsden* (London, 1859).

MARSDEN, WILLIAM (1754–1836). A British Orientalist, son of a Dublin merchant, born at Verval, Ireland. In 1771 he was appointed to the civil service of the East India Company at Bencoolen, Sumatra, became secretary to the government, and acquired a thorough knowledge of the Malay language. Having received a pension, he returned in 1779 to England, where he devoted himself to literature and published a *History of Sumatra* (1783). In 1807 he retired to private life and study, in 1812 published his *Grammar and Dictionary of the Malay Language*, and in 1818 a translation of *Marco Polo* (new ed., 1880). In 1834 he presented to the British Museum his collection of 3447 Oriental coins, and in 1835 his library of Oriental books and manuscripts to King's College. He published also *A Grammar of the Malayan Language* (1812) and *Numismata Orientalia* (1823).

MARSEILLAISE, mär'se-lāz'; Fr. pron. mär'sĕ'yăz'. The hymn of the French Revolution and since then the anthem of freedom in all European movements of liberation. In April, 1792, when a column of volunteers was about to leave Strassburg, the mayor of the city, Diedrich, gave a banquet on the occasion and asked an officer of artillery named Rouget de Lisle (q.v.) to compose a song in their honor. Rouget wrote the words during the night, adapting the music probably from the Oratorio *Esther*, by Jean Baptiste Lucien Grison, and calling it the *Chant de guerre de l'armée du Rhin*. On the following day it was sung with rapturous enthusiasm, and instead of 600 volunteers, 1000 marched out of Strassburg. The whole Army of the North soon took up the song. In Paris the song was unknown till the Marseilles battalion brought it to the city and sang it at the storming of the Tuileries. It was received with enthusiasm by the Parisians, who—ignorant of its real authorship—named it *Hymne des Marseillais*, which name it has ever since borne. The last and most pathetic strophe, the *stance des enfants*, was not written by Rouget de Lisle, but was added later.

The following is the first stanza, with refrain, approved in 1887 by a commission appointed by the French Minister of War to determine the exact form of the song:

Allons enfants de la patrie,
Le jour de gloire est arrivé!
Contre nous de la tyrannie
L'éntendard sanglant est levé (*bis*).
Entendez-vous dans ces campagnes
Mugir ces féroces soldats?

Ils viennent jusque dans nos bras
Egorger nos fils, nos compagnes.
Aux armes, citoyens!
Formez vos bataillons!
Marchons, marchons! qu'un sang impur
Abreuve nos sillons!

MARSEILLE, mär'sâ'y', FOLQUET DE. See FOLQUET DE MARSEILLE.

MARSEILLES, mär-sālz' (Fr. **MARSEILLE,** mär'sâ'y'). The principal seaport of France, the second city of the Republic in point of population; capital of the Department of Bouches-du-Rhône, and an important military and naval station. It is on the eastern shore of an inlet of the Gulf of Lyons, 25 miles east of the principal mouth of the Rhone and 534 miles by rail southeast of Paris; lat. 43° 17′ N., long. 5° 23′ E. (Map: France, S., K 5). Its location is picturesque, the ground rising on all sides in an amphitheatre of wood-crowned hills 1200 to 1800 feet high, which terminate in a steep promontory a few miles south of the city. The immediate surroundings were formerly arid, but since the completion of the canal bringing the waters of the Durance to the city the adjoining district has been irrigated and is now covered with gardens.

Few European cities have shown such rapid modern development. A century ago the town was a cluster of narrow, crooked streets grouped around the cove which formed the old harbor. Several large avenues now traverse this old portion, while practically the whole city is laid out with broad and straight streets and generally presents a modern aspect. The city is dominated by the hill of Notre Dame de la Garde, which rises to a height of 480 feet on the southwest, between the town and the shore. This hill is encircled on the water side by a picturesque road, the Chemin de la Corniche, which leads southward along the shore of the gulf to the Anse des Catalans, a distance of 4½ miles. There is a citadel on a promontory guarding the narrow entrance to the old harbor, which as a landlocked cove reaches into the heart of the city. The harbor is also defended by the fortified islands of Ratonneau and Pomégue, and the Château d'If, the latter a former state prison immortalized by Dumas in his *Monte Cristo*. Two principal avenues crossing at right angles divide the city into four quarters. One is the Rue Cannebière, the principal business street, which begins at the head of the old harbor and is continued eastward as the Boulevard Madeleine. The other, running north and south, is the Rue de Rome, which terminates at the obelisk in the Place Castellane, whence it is prolonged as the Prado, the principal boulevard of Marseilles. This is a magnificent avenue with two double rows of trees, which runs 2 miles south and southwestward, terminating on the seashore at Parc Borély. The old town is still a labyrinth of narrow streets inhabited by a seafaring population.

Marseilles has few architectural monuments and no interesting remains of ancient times. It is an episcopal see and its most prominent building is the new cathedral, the finest modern cathedral of France, which faces the southern basin of the new harbor. It is built of Florence greenstone in the Byzantine style mixed with Romanesque and classic elements, and is surmounted by five domes. Another church worthy of notice is that of Notre Dame de la Garde, built (1853–64) on the hill of that name south of the old harbor. Its belfry, surmounted by a colossal statue of the Virgin, towers nearly 600 feet above the level of the sea and affords a splendid view of the city and the surrounding country. Among secular buildings should be mentioned the Palais de Longchamp, a magnificent Renaissance building containing various museums, the Palais de Justice, and the Exchange. The educational institutions of the city include a school of medicine and pharmacy and a faculty of sciences, which form part of the University of Aix-Marseilles, a school of engineering, a school of navigation, an independent law school, two lycées, two seminaries, a commercial high school, a school of fine arts, a conservatory of music, an astronomical observatory, botanical and zoölogical gardens, a biological laboratory, museums of art, archæology, and natural history, and a municipal library of 120,000 volumes. Besides these there are a number of scientific and literary societies. The water supply is derived from the River Durance through the Canal de Marseille, constructed 1837 to 1848, which delivers water at the rate of 9000 liters per second, sufficient both for the use of the city and for the irrigation of the surrounding country. Its total length is 97 miles, of which 13 are underground. An extensive system of drainage works was completed in 1898, by which the sewage is carried miles to sea, leaving the waters of the harbor uncontaminated. The principal industries of Marseilles are the manufacture of soap, smelting of iron and copper, the construction of steam engines and automobiles, the refining of sugar, flour milling, oil factories, tanneries, lead, tin, and copper plants, petroleum refineries, and the manufacture of candles, macaroni, and tiles and brick. It also has iron-shipbuilding and naval-equipment yards. The great development of Marseilles is due chiefly to its commerce, which was greatly enhanced by the opening of the Suez Canal. The new harbor, begun in 1844, consists of a series of basins stretching northward from the entrance of the old harbor. An auxiliary harbor has been constructed in the channel between the two islets of Pomégue and Ratonneau lying off the promontory south of the city. Here are established the quarantine and the marine hospital. There are altogether 12 miles of quays, accommodating 2500 vessels at one time, and the new harbor has a water area of 414 acres, with a depth for vessels of all classes. The old harbor of 70 acres is now used for sailing vessels. In 1902 the Chamber of Commerce voted 91,400,000 francs for a canal to the mouth of the Rhone (see CANALS, *Boat Canals*), and a canal is also projected between the Rhone and the Loire, thus bringing Marseilles into connection with northern France. In 1912 the number of ships which entered and cleared was 4464, with a tonnage of 7,850,221, of which only about one-half was French. The value in 1904 of imports and exports combined was 2,061,000,000 francs; in 1912, 3,643,100,000. The principal exports are cotton and woolen goods, ribbons, silks, sugar, grain, oil, soap, fruits, wine, candles, and bricks; the chief imports are cattle, oil seeds, coffee, raw cotton and silk, hides, and grain. The trade is chiefly with the Mediterranean countries. The United States is represented by a consul.

The population of Marseilles in 1911 was 550,619. An idea of the growth of the city may be gained from the following figures: 1789, 100,000; 1851, 195,185; 1891, 403,749; 1901, 491,161; 1906, 517,498; 1911, 550,619. The increase has been due, at least in late years, wholly to immigration, as the death rate is higher than the birth rate. The districts around the wharves are frequented by people of all nationalities, and the busy, cosmopolitan air of the city is in marked contrast with the rest of Provence.

Marseilles is popularly supposed to have been founded by Greeks from Phocæa in Asia Minor, but archæological discoveries have established the fact that a Phœnician colony preceded the Greek settlement of about 600 B.C. The Greek colony, called Massilia, soon supplanted the Phœnician, and became a flourishing commercial centre, a free city, and the mother city of a number of other Greek colonies, which spread as far west as Cape St. Martin in Spain. In the fourth century B.C. Pytheas (q.v.), a citizen of Marseilles, sailed even to Britain. Finds of coins have shown that Marseilles carried on trade, especially in wine, all through Gaul, and over the Alps to the Tirol. Since the chief trade rival of the city was Carthage, Marseilles allied itself with Rome during the Punic wars, at which time it was at the zenith of its power. Its schools were long preferred to those of Athens

for the education of Roman youths. During the civil wars it took the side of Marius and later that of Pompey. Cæsar attacked and captured it in 49 B.C. and deprived it of its powers and privileges, and from that time its decadence began, though it still remained for a long time an intellectual centre. In the Middle Ages it retained to a large degree its independence. It was finally subject to the counts of Provence, and with Provence it was united with the French crown in 1481. In 1660 Louis XIV deprived the city of its privileges. Consult: Boudin, *Histoire de Marseille* (Paris, 1852); *Société de statistique de Marseille* (Marseilles, 1837 et seq.); Teissier, *Histoire du commerce de Marseille, 1855–74* (ib., 1887); P. Castanier, *Histoire de la Provence dans l'antiquité*, vol. ii (Paris, 1896); E. Caman, *Marseille au XXème siècle* (ib., 1905).

MARSEILLES. A city in La Salle Co., Ill., 77 miles southwest of Chicago, on the Chicago, Rock Island, and Pacific and the Chicago, Ottawa, and Peoria railroads, on the Illinois River, and on the Illinois and Michigan Canal (Map: Illinois, G 3). It has excellent water power; its many manufactured products include paper boxes and cartons, roofing materials, paper box board, agricultural implements, concrete blocks, cigars, etc. There are also coal mines. A large railroad bridge spans the Illinois near here. Marseilles adopted the commission form of government in 1913. Pop., 1900, 2559; 1910, 3291.

MARSH, ANNE CALDWELL (c.1798–1874). An English author, born at Lindley Wood, Staffordshire. She wrote many novels, of which *Two Old Men's Tales* (1846), *Emilia Wyndham* (1846), and *Norman's Bridge* (1847) are considered the best. Most of her works were written anonymously, and it is not certain how many are rightly attributed to her. Her best work is of delicate conception, but lacks power. Several of the stories have been republished in the United States.

MARSH, GEORGE PERKINS (1801–82). An American diplomatist and philologist. He was born at Woodstock, Vt.; graduated at Dartmouth College in 1820; studied law in Burlington, and in 1835 was elected to the State Legislature and became a member of the Supreme Executive Council of the State. From 1843 to 1849 he was a Whig member of Congress, and in the latter year resigned to become Minister Resident at Constantinople. In 1852 he was charged with a special mission to Greece, and having traveled extensively in Europe returned to the United States in 1854. Between 1857 and 1859 he served as railroad commissioner for Vermont, and from 1861 until his death was first United States Minister to the Kingdom of Italy. He died at Vallombrosa, Italy, and was buried in the Protestant cemetery in Rome. His publications include: *The Camel: His Organization, Habits, and Uses, Considered with Reference to his Introduction into the United States* (1856); *Lectures on the English Language* (1861); *The Origin and History of the English Language* (1862; rev. ed., 1885); *Man and Nature* (1864; enlarged in 1874 as *The Earth as Modified by Human Action;* rev. ed., 1885). His second wife, Caroline (Crane) Marsh, published one volume of the *Life and Letters of George Perkins Marsh* (New York, 1888).

MARSH, HERBERT (1757–1839). Bishop of Peterborough. He was born in Faversham, Kent; graduated at St. John's College, Cambridge, in 1779, and studied theology at Leipzig. He was appointed Lady Margaret professor of divinity at Cambridge in 1807, Bishop of Llandaff in 1816, and Bishop of Peterborough in 1819. Opposing the allegorical systems of interpretation of the Fathers and the Middle Ages, he insisted that Scripture had but one sense, the grammatical, and was one of the first to introduce German methods of research into English biblical scholarship. His publications include: a translation of Michaelis' *Introduction to the New Testament* (5 vols., 1793–1801); *National Religion the Foundation of National Education* (1813); *Lectures on the Authenticity and Credibility of the New Testament* (1820–22); *On the Authority of the Old Testament* (1823); *Lectures on the Criticism and Interpretation of the Bible* (1828).

MARSH, OTHNIEL CHARLES (1831–99). An American zoölogist and paleontologist. He was born in Lockport, N. Y., graduated at Yale College, and studied in Germany. Upon his return to the United States he was appointed professor of paleontology and curator of the geological museum at Yale, and held these positions until his death. Professor Marsh accomplished a great amount of valuable scientific work in the discovery and description of new fossil vertebrates from the geological formations of the Western States and Territories. In carrying out his investigations he organized many exploring expeditions at his own expense, and directed others which were equipped by the United States Geological Survey. More than 400 new fossil species of vertebrates were described by Professor Marsh, among them such interesting types as the Dinocerata (huge tapir-like animals), Pterodactyls (flying lizards), and Odontornithes (toothed birds). His discoveries of the fossil ancestors of the horse marked an epoch in evolutionary science and have been frequently employed as an illustration of the principle of evolution. The more extended and general articles by Professor Marsh were incorporated in the *Reports* and *Monographs* of the United States Geological Survey; they included: "Birds with Teeth," *Third Annual Report*, 1883; "The Gigantic Mammals of the Order Dinocerata," *Fifth Annual Report*, 1885; "The Dinosaurs of North America," *Sixteenth Annual Report*, 1896; "Dinocerata," *Monograph X;* "The Ceratopsia," *Monograph XLIX* (elaborated by J. B. Hatcher and edited by R. S. Lull). Consult G. B. Grinnell, "Othniel Charles Marsh," in *Leading American Men of Science*, edited by D. S. Jordan (New York, 1910). He served as president of the American Association for the Advancement of Science in 1878 and of the National Academy of Sciences from 1883 to 1895. The Geological Society of London, of which he was a fellow, bestowed upon him the first Bigsby medal, in 1877. He also received the Cuvier prize of the French Academy of Sciences. His valuable collection of fossil vertebrates was left to Yale University.

MARSH, SYLVESTER (1803–84). An American merchant, inventor, and promoter, born at Campton, N. H. In 1833 he removed to Chicago, where he became the originator of the meat-packing industry and invented many of the appliances now used in that business. In 1837, after most of his property was lost in the financial crisis, he entered the grain business and invented the dried-meal process. During a visit to his old home in 1852 he conceived the idea of a rail-

road to the top of Mount Washington, insisted upon the feasibility of the plan, and persisted until in 1858 he obtained a charter for the construction of the road, but because of the Civil War was unable to begin work until 1866. The work was completed in 1868. The cogs and brakes used on the road were invented by Marsh. Railways of a similar kind and construction were soon afterward built up Mount Rigi, Switzerland, and up Green Mountain, Mount Desert, Maine, and many others have followed.

MAR'SHAL (OF. *mareschal, marcscal*, Fr. *maréchal*, from ML. *mareschalcus, mariscalcus*, from OHG. *marahscalh*, groom, master of the horse, marshal, from *marah*, AS. *mearh*, Ir., Gael. *marc*, Gk. *μάρκας, markas*, horse + *scalh*, Ger. *Schalk*, Goth. *skalks*, AS. *scealc*, obsolete Eng. *shalk*, servant). A term in English history, originally meaning a groom or manager of the horse, though eventually the King's marshal became one of the great officers of the household of the Norman and Plantagenet kings, being conjointly with the constable (q.v.) a judge in the *curiæ martiales*, or courts of chivalry, and enjoying equal rank with the Chancellor. The constable's functions were virtually abolished in the time of Henry VIII, and the marshal became thenceforth the sole judge in questions of honor and arms. The earl marshal is president of the English College of Heralds, and appoints the kings-at-arms, heralds, and pursuivants. The dignity of marshal existed formerly in Scotland, where a different orthography was adopted, and the office of marischal became hereditary in the fourteenth century in the family of Keith. In France the highest military officer is called a marshal, a dignity which originated early in the thirteenth century. There was at first only one maréchal de France, and there were but two till the time of Francis I. Their number afterward became unlimited. Originally the marshal was the esquire of the King and commanded the vanguard in war; in later times the command became supreme and the rank of the highest military importance. From the title of this class of general officers the Germans have borrowed their Feldmarschall, and the English the title of field marshal, a dignity bestowed on commanders distinguished either by elevated rank or superior talents. The title "marshal" in the United States is used: (1) to denote the ministerial officer of the United States courts, there being, with several exceptions, one appointed for each judicial district. The exceptions are the few instances where one marshal is required to perform the duties of two districts. The duties of this officer resemble those of a sheriff in the State courts; he opens and closes the sessions of the district and circuit courts, serves warrants, and executes throughout the district all lawful precepts directed to him. Marshals are also appointed for Porto Rico, Alaska, and Hawaii. (2) In many States of the South and West the marshal is the town or village police officer, and is to be distinguished from the officers of the county called sheriffs, and from the officers of the justices' courts called constables. Besides their functions in connection with the courts, the United States marshals discharge duties in connection with the administration of the internal-revenue service, public lands, the mail service, etc. They are appointed by the President with the advice and consent of the Senate for a term of four years.

MAR'SHALING. In law, the arrangement or ordering and distribution of different funds under administration so that all parties having rights as creditors or legatees therein may receive their due proportions. The principle upon which this is done is the equitable rule that a party who is entitled to satisfaction or security out of one or more of several funds or properties which must be looked to by others for their satisfaction or security shall not be allowed to elect to satisfy or secure himself so as to exclude another who is entitled to resort to only one of the funds, when the first party can otherwise sufficiently protect himself. The principle of marshaling is applied to the distribution of assets of a decedent or insolvent among legatees and creditors, as well as to the distribution of securities of various sorts among creditors who may be variously entitled to them. An instance of marshaling of assets is found in the old rule that a simple contract creditor, who was at the common law entitled to payment only out of the personal estate of a deceased person, was subrogated to the right of a specialty creditor to be paid out of real or personal assets where the latter had recovered out of the personal assets. So to-day legatees, who are, of course, entitled only to personal estate, may have their claims satisfied out of the real estate where simple contract creditors, who might now resort to the real estate, have satisfied their claims out of the personal estate and in so doing have exhausted it.

The doctrine of marshaling securities is most frequently exemplified in the case of mortgagees and others having rights, such as vendor's liens, judgment liens, etc., against the real estate of the debtor. Thus, where the owner of two estates or funds mortgages both to one person and only one of them to another person, the first encumbrancer will be required to resort in the first instance to the estate or fund on which the other has no claim. The same principle has been applied to mortgages of personal chattels, to sureties who have become liable to pay the principal debt, and in many other cases. The doctrine is an admirable example of the way in which the courts of equity work out the principle, "Equality is equity." See EQUITY; SUBROGATION.

MARSHALING OF ARMS. In heraldry, the science of arranging several coats of arms on the same escutcheon so as to indicate the relation borne by one person to others connected with him either by birth or marriage. See HERALDRY.

MAR'SHALL. A city and the county seat of Clark Co., Ill., 18 miles west by south of Terre Haute, Ind., on the Vandalia and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Illinois, J 7). It has some trade and manufactures of flour, lumber, furniture, condensed milk, etc., and is in an oil and an agricultural and stock-raising district. The water works and electric-light plant are owned by the city. Pop., 1900, 2077; 1910, 2569.

MARSHALL. A city and the county seat of Calhoun Co., Mich., 108 miles by rail west of Detroit, on the Kalamazoo River and on the Michigan Central Railroad (Map: Michigan, E 6). It has the grounds of the County Agricultural Society, the Dulcenia Home for Old Ladies, and a fine high-school building, city library, and county courthouse. The city is the centre of a rich farming district, and manufactures coffee-roasting and peanut-butter machinery, hot-air

furnaces, couplers and axles, carriages and wagons, bathtubs, electrical appliances, farming implements, medicines, flour, etc. There are also marble and granite works, and roundhouses of the Michigan Central Railroad. Marshall owns and operates the water works and electric-light plants, both of which are run by water power, on a profitable basis. Pop., 1900, 4370; 1910, 4236.

MARSHALL. A city and the county seat of Lyon Co., Minn., 165 miles west by south of St. Paul, on the Redwood River and on the Great Northern and the Chicago and Northwestern railroads (Map: Minnesota, B 6). It has a public library, and among the prominent buildings are the public schools, county courthouse, and county jail. An important trade is carried on, and there are several grain elevators, a sash and door factory, a flour mill, and a creamery. The water works and electric-light plant are owned by the city. Pop., 1900, 2088; 1910, 2512.

MARSHALL. A city and the county seat of Saline Co., Mo., 84 miles by rail east of Kansas City, on the Chicago and Alton and the Missouri Pacific railroads (Map: Missouri, C 2). It is the seat of Missouri Valley College (Presbyterian), founded in 1889, and Academy Notre Dame de Sion (Catholic), and has a handsome courthouse, United States government building, and a State institution for the feeble-minded and epileptics. Marshall is near deposits of coal, salt, and building stone, and carries on an important trade, and manufactures flour, shoes, creamery products, lumber, brick and tile, carriages and wagons, and canned goods. The water works are owned by the city. Pop., 1900, 5086; 1910, 4869.

MARSHALL. A city and the county seat of Harrison Co., Texas, 42 miles west of Shreveport, La.; on the Texas and Pacific and the Marshall and East Texas railroads (Map: Texas, E 3). It is the seat of Wiley University (Methodist Episcopal) and Bishop College (Baptist) for negroes, and has a fine courthouse, city hall, high school, Carnegie library, and opera house. The city is in a fertile agricultural region adapted particularly for fruit and vegetable cultivation, and the vicinity possesses valuable oak and pine forests. Among the industrial enterprises are a foundry and machine shops, cotton compress, saw and planing mills, brickyards, fertilizer factory, pottery plant, carriage works, railroad shops of the Texas and Pacific and Marshall and East Texas railroads, carwheel works, etc. The water works are owned and operated by the municipality. Marshall has adopted the commission form of government. Pop., 1900, 7855; 1910, 11,452; 1914 (U. S. est.), 12,984; 1920, 14,271.

MARSHALL, Alfred (1842–). An English economist, born in London. From the Merchant Taylors' School he passed to St. John's College, Cambridge, where he graduated with distinction in 1865. In 1877 he became principal of University College, Bristol, and in 1883–84 was lecturer and fellow of Balliol College, Oxford. From 1885 to 1908 he served as professor of political economy at Cambridge. In 1891 he was appointed a member of the Royal Commission of Labor. With his wife he published (1879) *Economics of Industry*. His *Principles of Economics* (1890) won for him the position of one of the foremost of English economists. In this work he seeks to present and reconcile the essential doctrines of classical and modern economics. He published also: *Present Position of Economics* (1886); *Elements of Economics* (1891); and numerous articles in scientific and popular periodicals.

MARSHALL, Arthur Milnes (1852–93). An English naturalist, born at Birmingham. He received his B.A. degree from London University at the age of 18 and then went to Cambridge, where he graduated in 1874. In the following year he was sent by that university to the zoölogical station at Naples. Upon his return he began the study of medicine, but in 1879 became professor of zoölogy at Owens College, Manchester. He was made a fellow of the Royal Society in 1885, a councilor of the same in 1891–92, and presided over a section of the British Association in 1892, but was particularly distinguished as a teacher and organizer. He started the biological classes at Victoria University, and contributed much to the scientific knowledge of embryology in his technical publications, especially the *Quarterly Journal of Microscopical Science*, and in separate memoirs. Among his writings are: *The Segmental Value of the Cranial Nerves* (1882); *The Frog* (1882; 10th ed., 1909); *A Junior Course of Practical Zoölogy* (1887; 5th ed., 1899), with C. H. Hurst; *Vertebrate Embryology* (1893). He lost his life in the Alps. His *Biological Essays and Addresses* were collected and published posthumously in 1894, as well as his memoir upon *The Darwinian Theory*.

MARSHALL, Emma (1832–99). An English novelist, born near Cromer in Norfolk, England, the youngest daughter of Simon Martin, a Norwich banker. She was educated in a private school at Norwich. In 1854 she married Hugh Graham Marshall, and thereafter lived an uneventful life at Wells, Exeter, Gloucester, and Bristol. She died at Clifton, May 4, 1899. Beginning with *Edith Prescott* (1863), she produced during her long career more than 100 volumes of tales, mostly for the young. Especially popular—several of them were translated into German—were those in which appeared well-known historical characters, as Sir Philip Sidney and Sir Thomas Browne. Among her latest novels were: *In Colston's Days, a Story of Old Bristol* (1883); *The Tower on the Cliff* (1886); *Penshurst Castle, in the Time of Sir Philip Sidney* (1893); *In the Choir of Westminster Abbey in the Time of Henry Purcell* (1897); *Under the Dome of St. Paul's in the Time of Christopher Wren* (1898). She also wrote verse.

MARSHALL, Francis Albert (1840–89). An English playwright, born in London, November, 1840. He was educated at Harrow and studied at Exeter College, Oxford, but left without a degree. He became a clerk in the audit office of Somerset House and began writing for newspapers and periodicals. In 1868 he resigned his post and subsequently joined the staff of the London *Figaro* as dramatic critic. He was already known for his comedies and farces: *Mad as a Hatter* (1863); *Corrupt Practices* (1870), which were followed by *Q. E. D., or All a Mistake* (1871); *False Shame* (1872); *Brighton* (1874); *Lola* (1881), a comic opera; and several others. For Henry Irving he made a version of *Werner* (1887). He was general editor of the Henry Irving Edition of Shakespeare (1888–90), and had earlier published *A Study of Hamlet* (1875) and *Henry Irving, Actor and Manager* (1883).

MARSHALL, Henry Rutgers (1852–).

An American architect and psychologist. He was born in New York City; graduated from Columbia University in 1873 (A.M., 1876); and became a practicing architect in New York in 1878. He lectured on æsthetics at Columbia in 1894–95 and at Princeton in 1915–16. Though Marshall achieved success as an architect and was president of the New York chapter of the American Institute of Architects (1902–04), he became better known perhaps as a psychologist. Rutgers and Hobart colleges gave him honorary degrees. He served as president of the American Psychological Association in 1907. His writings include: *Pain, Pleasure, and Æsthetics* (1894); *Æsthetic Principles* (1895); *Instinct and Reason* (1898); *Consciousness* (1909); *War and the Ideal of Peace* (1915).

MARSHALL, Humphrey (1722–1801). An American botanist, born in West Bradford (Marshallton), Pa. He learned the trade of a stonemason, but about 1748 turned to farming, and began to cultivate his scientific tastes, which he had ample means of gratifying through the acquisition of property in 1767, and six years afterward he was instrumental in the formation of the botanic gardens at Marshallton. He held several local offices, was made a member of the American Philosophical Society (1786), and published *Arboretum Americanum* (1785), a catalogue of the trees and shrubs of America, which was translated into French.

MARSHALL, Humphrey (1756–1841). An American statesman, cousin of Chief Justice John Marshall, born in Westmoreland Co., Va. He received very little schooling, entered the Continental army during the Revolution, and attained the rank of captain. Before the close of the war he removed to Kentucky and settled in 1780 near Lexington, where he studied law and was admitted to the bar. In 1787 he was a delegate to the convention held at Danville to consider the question of separating Kentucky from Virginia, and strongly opposed that project. He soon became known as one of the strongest Federalist leaders in the Kentucky region. In 1788 he was a delegate to the Virginia convention that ratified the Constitution. He had an inborn dislike for James Wilkinson (q.v.), whom he seems to have suspected of intriguing with the Spaniards in Louisiana from the first, and for a decade or more occupied the position of a sort of "watchdog" of Federal interests in Kentucky and was active in opposing and exposing the numerous Spanish intrigues and plans for attacking the Spanish or French at New Orleans. He opposed the plan of George Rogers Clark for an expedition against the Spaniards in 1793, declaring it was a part of the scheme of Genet (q.v.), and would only have the effect of embroiling the country with a friendly power. From 1795 to 1801 he was a United States Senator from Kentucky. His letters to the *Western World* signed Observer, in which he clearly pointed out the existence of the Burr conspiracy, led to Federal action and the thwarting of Burr's plans of empire. While a member of the State Legislature in 1809 he fought a duel with Henry Clay in which both were wounded. He published a *History of Kentucky* (1812; 2 vols., 1824), which is in reality a curious and partisan piece of autobiography, but contains much of value in regard to early politics in the West.

MARSHALL, Humphrey (1812–72). An American soldier and politician, grandson of Humphrey Marshall (1756–1841), born at Frankfort, Ky. He graduated at West Point in 1832, but resigned from the army the next year. He studied law and practiced in Frankfort and in Louisville, where he took much interest in the State militia, raising a company of volunteers for service against the Indians on the Texas frontier. At the outbreak of the Mexican War he entered as colonel of a Kentucky volunteer cavalry regiment and led the charge at Buena Vista. He was a Whig member of the United States House of Representatives in 1849 and was reëlected in 1851, but resigned in 1852 and accepted the post of Commissioner to China. He retired in 1854, and the next year again entered the House of Representatives, on the American ticket (see American Party; Know-Nothings), and served until 1859. At the beginning of the Civil War he entered the Confederate army as brigadier general and commanded in eastern Kentucky. He was in command of the Confederates at the battle of Middle Creek (1862) and in the same year defeated Gen. Jacob Cox at Princeton, Va. He resigned from the army to practice law in Richmond, but was elected one of Kentucky's representatives in the Confederate Congress, serving on the military committee, and was afterward reëlected. After the war he resumed the practice of law in Louisville.

MARSHALL, John (1755–1835). The most famous of American jurists, for 34 years Chief Justice of the United States Supreme Court. He was born Sept. 24, 1755, in Fauquier Co., Va.; studied under a private tutor; then attended an academy in Westmoreland County; and studied law until the outbreak of the Revolution, when he entered the army as a volunteer. He soon rose to the rank of first lieutenant, and by 1777 was a captain. His first fight was near Norfolk; he afterward served in the New Jersey campaign, was at Valley Forge during the memorable winter of 1777–78, and participated in the battles of Brandywine, Germantown, and Monmouth, and in the capture of Stony Point. During most of 1780, while without a command, he attended the law lectures delivered by the famous Chancellor George Wythe at William and Mary College. The following year he was admitted to the bar of Fauquier County, where he practiced for two years. In 1782 he was elected to a seat in the Virginia Legislature and soon became a member of the Executive Council. In the meantime he had removed to Richmond. In 1784 he was again elected to represent Fauquier County in the Legislature. In 1787 he was chosen to represent Henrico, the county in which he had lately taken up his residence, and in the following year was a delegate to the State convention which was called to ratify the Federal Constitution. The distinction of securing the adoption of the Constitution by Virginia belongs to Marshall and Madison perhaps more than to any others. Marshall's refutations of Patrick Henry's arguments against adoption were particularly effective. In the meantime his law practice was rapidly increasing, and he declined a reëlection to the Legislature in 1792 in order to devote his whole time to his practice, but in 1795 he was again persuaded to stand for reëlection and was successful. It was about this time that Marshall appeared before the Supreme Court in the famous case of Ware *v.* Hilton, in which the validity of the Virginia Sequestration Act was involved, and his able argument added greatly to

his growing reputation. He declined to accept the post of Attorney-General or the French mission tendered him by President Washington, but finally consented to go to Paris in 1797 with C. C. Pinckney and Elbridge Gerry to induce the Directory to remove the restrictions which it had laid on American commerce. Although the negotiations proved fruitless, Marshall's conduct seems to have been more satisfactory to the government than that of either of his colleagues. In 1798 he declined to accept a seat on the bench of the United States Supreme Court as the successor of James Wilson, but in the same year at the solicitation of Washington became a candidate for Congress and was elected, although his constituency was decidedly Anti-Federalist in politics. In Congress he supported the administration in particular and Federalist measures generally, although he voted for the repeal of the obnoxious Alien and Sedition Acts. His most notable effort in Congress was a speech in support of the conduct of the President in surrendering Jonathan Robbins, the murderer of a man on a British frigate, who had escaped to the United States and had been delivered up to the British government by the President. Marshall showed conclusively that the surrender of Robbins was clearly within the President's constitutional power. In May, 1800, he was invited by President Adams to take the office of Secretary of War, but declined. However, he accepted the position of Secretary of State, which he held for a short time. On Jan. 31, 1801, he was commissioned Chief Justice of the United States Supreme Court. The accession of Marshall to the bench of the Supreme Court as Chief Justice marks a turning point in his life and an epoch in the legal and constitutional history of the United States. He died July 6, 1835, at Philadelphia, whither he had gone for medical treatment. For 34 years Marshall dominated the court by his great learning, his masterful power of analysis and clearness of statement. Perhaps no judge ever excelled him in the capacity to hold a legal proposition before the eyes of others in such various forms and colors. He resolved every argument by the most subtle analysis into its ultimate principles, and then applied them to the decision of the case in question. His service on the bench, which continued until his death, was effective and conspicuous not only in securing for the court the recognition and profound respect for which hitherto there had been no especial occasion, but also in so expounding the Constitution as to make clear for the first time the nature of the national government and to forecast the lines along which, in actual development as well as in judicial interpretation, the nation was to proceed. In the period of Marshall's predominance the court upheld the Federalist theories, as in the national bank case of McCulloch *v.* Maryland, and gave a clear definition of the relations of the State and national governments. On the subject of the constitutional prohibition against the impairment of contracts, several noteworthy opinions were rendered by him, culminating in the famous Dartmouth College case, the soundness of which has more recently been questioned. Particularly in the field of constitutional law the work of Marshall forms the greatest contribution to American jurisprudence made by any judge. In a single decision, the famous case of Marbury *v.* Madison (1 Cranch, 137), he established the authority of the Federal courts to set aside an act of Congress on the ground of its unconstitutionality, and thus he placed on a firm footing the principle of judicial supremacy. His interpretations of the Constitution have long been recognized as an important and permanent feature of American public law. In the field of international law, also, his contribution was very great, as witness especially his opinion in Schooner Exchange *v.* McFaddon (7 Cranch, 116). This aspect of Marshall's importance had not been widely appreciated until it was discussed by John Bassett Moore in *John Marshall* (Boston, 1901). Mr. Moore says that from 1790 to 1801 only six decisions involving Constitutional questions had been rendered by the Supreme Court; from 1801 to 1835 there were 62, of which 36 were written by Marshall. During his period of service there were 195 cases involving points of international law, and Marshall delivered the opinion in 80 of these. Aside from his judicial labors, Marshall wrote a *Life of George Washington* (5 vols., 1804–07; 2d ed., 2 vols., 1832). His introduction to this work, *A History of the Colonies Planted by the English on the Coast of North America,* was published separately in 1824. *John Marshall, Complete Constitutional Decisions,* edited by J. M. Dillon, appeared in 1903 (Chicago), and *The Constitutional Decisions of John Marshall,* edited with introductory essay by J. O. Cotton, Jr., in 1905 (2 vols., New York). Consult also: A. B. Magruder, *John Marshall* (Boston, 1885; new ed., 1908); Henry Hitchcock, in T. M. Cooley et al., *Constitutional History of the United States as Seen in the Development of American Law* (New York, 1887); J. F. Dillon, *John Marshall* (3 vols., Chicago, 1903); H. Flanders, *Life of John Marshall* (Philadelphia, 1905); J. E. Oster, *The Political and Economic Doctrines of John Marshall; also his Speeches, Letters, and hitherto Unpublished and Uncollected Writings* (New York, 1914).

MARSHALL, John (1818–91). An English anatomist and surgeon. He was born at Ely, Cambridgeshire, and was educated at University College, London, where he became a demonstrator in surgery in 1845, assistant surgeon at the hospital in 1847, surgeon and professor of surgery in 1866, and consulting surgeon in 1884. He became also professor of anatomy at the Royal Academy in 1873, and was president of the Royal College of Surgeons in 1883. In surgery he introduced the galvanocautery and the operation for the excision of varicose veins. He showed great ability as a teacher of anatomy to art students. His publications include: *A Description of the Human Body, its Structure and Functions* (1860; 4th ed., 1883); *Anatomy for Artists* (1878; 3d ed., 1890); *The Outlines of Physiology, Human and Comparative* (3 vols., 1867).

MARSHALL, Louis (1856–). An American lawyer, born at Syracuse, N. Y. He studied at Columbia Law School; began practice at Syracuse in 1878; and later became a member of the firm of Guggenheimer, Untermyer, and Marshall, of New York City. He lectured at New York Law School in 1900 and at the Law School of Syracuse University in 1901; was appointed chairman of the New York Immigration Commission by Governor Hughes in 1908; served as mediator in settling the cloak makers' strike in 1910; and was counsel for Governor Sulzer in his impeachment trial in 1913 and for Leo M.

Frank in Georgia in 1914–15. Marshall was a leader in the movement which brought about the abrogation in 1911 of the Treaty of 1832 with Russia; under the treaty the Russian government had found it possible to discriminate against Russian Jews who had become naturalized citizens of the United States. Marshall identified himself actively with Jewish educational and institutional work. In 1913 he received the honorary degree of LL.D. from Syracuse University, of which he became trustee in 1910 and to which he presented a law library.

MARSHALL, Orsamus Holmes (1813–84). An American lawyer and historical writer. He was born at Franklin, Conn., graduated at Union College in 1831, studied law, spending some time at Yale, and entered upon active practice, having been admitted to the bar at Buffalo in 1834. His interest in literary and historical subjects was early manifested. He was one of the founders of the Buffalo Female Academy and of the Buffalo Historical Society, and for many years was chancellor of the University of Buffalo. His historical writings concern chiefly the relations of the Iroquois with French and English and are of considerable value. A volume was collected after his death entitled *Historical Writings of Orsamus H. Marshall Relating to the Early History of the West* (1887).

MARSHALL, Robert (1863–1910). A Scottish playwright. He was born in Edinburgh and was educated at St. Andrews and Edinburgh universities. In 1886 he was commissioned a lieutenant in the West Riding Regiment; served as district adjutant in Cape Town in 1893–94; was promoted to captain in 1895; and was aide-de-camp to the Governor of Natal from 1895 to 1898, when he retired from the army. His plays include: *The Shades of Night* (1896); *His Excellency the Governor* (1898); *The Broad Road* (1898); *A Royal Family* (1899); *The Noble Lord* (1900); *The Second in Command* (1900); *There's Many a Slip* (1902); *The Haunted Major* (1902); *The Unforeseen* (1902); *The Duke of Killiecrankie* (1904); *Everybody's Secret* (1904); *The Lady of Leeds* (1905); *The Alabaster Staircase* (1906).

MARSHALL, Stephen (c.1594–1655). A Presbyterian leader. He was born at Godmanchester, Huntingdonshire, England, graduated B.A. at Cambridge (1618), entered the ministry and joined the ranks of the Nonconformists. He was an eloquent man, considered in some quarters the greatest preacher of the day; not learned or original, but influential because of his personality and eloquence. Beginning with the advocacy of a reform of the Church of England, while retaining episcopacy and liturgy, he ended with the *de jure divino* Presbyterian theory. He was one of the leaders of the Westminster Assembly (1643 et seq.). Marshall published many sermons. One treatise, *A Defense of Infant Baptism* (1646), may be mentioned. He was also one of the joint authors of a pamphlet published at London (1641), called *An Answer to a Booke* [by J. Hall, Bishop of Norwich] *entituled An Humble Remonstrance. In which the originall of Liturgy* [and] *Episcopacy is Discussed. And Quœres Propounded Concerning Both. Written by Smectymnuus.*

MARSHALL, Thomas Riley (1854–). An American lawyer and public official, descended from the famous John Marshall family of Virginia. He was born at North Manchester, Ind., was educated at Wabash College (A.B., 1873; A.M., 1876), and studied law in the office of Judge Olds of Fort Wayne, being admitted to the bar in 1875. He practiced law at Columbia City, where as a member of the firm of Marshall and McNagny and later, in 1892, of Marshall, McNagny, and Clugston, he attained success. His practice extended beyond his county, and he became known as an orator. In 1880 he was a candidate for district attorney, but was defeated; from 1896 to 1898 he was chairman of the Democratic committee of his congressional district; and in 1908 he was nominated for Governor and was elected. Although a conservative in his belief in the maintenance of traditional political institutions, he had a progressive administration, advocating the direct election of Senators, an employers' liability law, and anti-race-track and bookmaking legislation. His efficiency in office and his alleged opposition to the Taggart faction—an opposition which, however, did not reach an open rupture—brought him favorable national attention. In 1912 he was the "favorite son" candidate of Indiana for the presidential nomination, and, while unsuccessful in this ambition, he was given that for Vice President. He proclaimed himself a "progressive with the brakes set." After his election he consistently supported the Wilson administration. In 1913 certain of his speeches regarding the social unrest growing out of discontent with the present distribution of wealth, in which he was reported as advocating revolutionary ideas respecting inheritance of property, occasioned surprise and criticism, partly through misunderstanding. He received honorary degrees from Wabash College, Notre Dame University, and the University of Pennsylvania. See Indiana, *History*.

MARSHALL, William Calder (1813–94). A Scottish sculptor. He was born in Edinburgh, March 18, 1813. He studied sculpture at the Trustees' Academy, Edinburgh, and in London, under Chantry and Bailey. In the schools of the Royal Academy he won a gold medal and traveling scholarship, and from 1836 to 1838 continued his studies in Rome. His work was chiefly idealistic statuary, and among his productions of this class are: "The Creation of Adam" (1842); "Christ Blessing Little Children" (1844); "Paul and Virginia" (1845); "Sabrina" (1846), perhaps the most popular of all his figures; and the group "Agriculture" on the Albert Memorial. In historical figures he modeled the bronze statue of Sir Robert Peel in Manchester, and in Westminster Palace the busts of Chaucer, Lord Clarendon, and Lord Somers. In decoration he was extensively engaged in the ornamentation of the new Houses of Parliament and the Wellington Chapel in St. Paul's Cathedral. His work is in the pseudoclassic style of his day, but is marked by simplicity and refinement and elegance of design. He died in London, June 16, 1894.

MARSHALL, William Louis (1846–1920). An American soldier and engineer, born at Washington, Ky. He attended Kenyon College, Ohio, in 1859–61; served as a private in the Tenth Kentucky Cavalry in 1862–63; and graduated from the United States Military Academy in 1868. Entering the engineering branch of the service, he was promoted through the various grades to brigadier general and chief of engineers in 1908. He was acting professor of natural and experimental philosophy at West Point in 1870–71. While in charge of the Colo-

rado section of the "Explorations West of the 100th Meridian" in 1872–76 he discovered (1873) Marshall Pass across the Rocky Mountains and the gold placers of Marshall Basin on the San Miguel River, Colo., in 1875. He had charge of levee construction and improvements on the Mississippi River in 1881–84, and thereafter until 1900 of harbor improvements on Lake Michigan and river improvements in Illinois and Wisconsin. He superintended also the construction of the Hennepin Canal (1890–1900), of the Ambrose channel entrance to New York harbor, and of fortifications for that harbor. As chief engineer he had charge of all the river and harbor and fortification works of the United States from 1908 to 1910, when he was retired.

MARSHALL ISLANDS. An archipelago in Micronesia, situated east of the Caroline Islands and belonging to Germany since 1885 (Map: Australasia, J 2). It consists of two parallel chains of atolls, the Ratak chain of 13 islands in the east and the Ralik of 11 islands in the west, with an aggregate area of 158 square miles. The islands are low, the water supply scanty, and the soil very poor, supporting a scanty flora, in which the coconut and the breadfruit tree predominate. The chief export is phosphate, which in 1910 appeared in the statistical returns with a valuation of 8,561,000 marks. The population of the whole archipelago in 1910 was about 15,000, of whom 179 were Europeans, 91 being Germans. The islands are administered by an Imperial Commissioner residing on the island of Jaluit. These islands were occupied by the Japanese during the war which broke out in Europe in 1914. See WAR IN EUROPE.

MAR'SHALLTOWN. A city and the county seat of Marshall Co., Iowa, 60 miles by rail northeast of Des Moines, on the Iowa River and on the Chicago Great Western, the Minneapolis and St. Louis, and the Chicago and Northwestern railroads (Map: Iowa, E 2). It is the seat of the Iowa State Soldiers Home and has a public library. It is a shipping point for large quantities of grain, and among its industrial establishments are extensive meat-packing plants, manufactories of steel furnaces and steam specialties, flour mills, grain elevators, canning and bottling works, and carriage factories. The surrounding region is adapted to agriculture and stock raising. Settled in 1860, Marshalltown was incorporated as a town in 1865 and received a charter as a city of the second class in 1868. The commission form of government was adopted in 1912. The city owns and operates the water works and electric-light plant. Pop., 1890, 8914; 1900, 11,544; 1910, 13,374; 1914, (U. S. est.), 14,042; 1920, 15,731.

MARSHAL'S COURT. See CHIVALRY, COURT OF.

MAR'SHALSEA. A former prison in Southwark, London, connected with a court of the same name. It was abolished in 1849.

MARSHBANKER. See MARSBANKER.

MARSH-CALD'WELL, MRS. ANNE (1791–1874). An English novelist, daughter of James Caldwell, of Linley Wood, Staffordshire. In 1817 she married Arthur Cuthbert Marsh, of Eastbury Lodge, Hertfordshire. Encouraged by Harriet Martineau, she published *Two Old Men's Tales* (1834). In the course of a few years she took rank among the popular novelists of her time. She published anonymously, and a complete list of her novels has never been made. Fifteen volumes appeared in the *Parlour Library* (1857). They depict mostly the manners of the upper middle class and the lower aristocracy. *Emilia Wyndham* (1846) seems to be one of the best.

MARSH CROCODILE. See MUGGER.

MARSHES. See WASTE LAND.

MARSH'FIELD. A town in Coos Co., Ore., 10 miles north of Coquille; situated on Coos Bay, on the Coos Bay, Roseburg, and Eastern Railroad, and on the lines of the Inter-Ocean Transportation Company, the Northern Pacific Steamship Company, and the Southern Pacific Steamship Company (Map: Oregon, A 4). Marshfield has a navigable channel 300 feet wide and 25 feet deep. Features of interest in the town and the vicinity are the Carnegie library, Golden and Silver Falls, and the Ten Mile Lakes. The chief industries are lumbering, coal mining, fishing, dairying, and market gardening; and there are also manufactories of myrtle-wood novelties, pulp, paper, veneered woods, boxes, boats, and doors and sashes. Pop., 1900, 1391; 1910, 2980.

MARSHFIELD. A city in Wood Co., Wis., 175 miles northwest of Milwaukee, on the Chicago and Northwestern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, C 4). Among the noteworthy features are the public library, hospital, city hall, county asylum buildings, experiment farm, and three parks. Marshfield has extensive manufactures of lumber, including staves, headings, barrels, and furniture, also beds, springs, mattresses, veneer, foundry products, metal goods, gasoline engines, creamery products, etc. Dairying has assumed a position of great importance in recent years. There is also some trade in grain and live stock. The city owns its electric-light and power plant. Pop., 1900, 5240; 1910, 5783. Marshfield was almost entirely destroyed by fire in 1888, but has been rebuilt completely.

MARSH GAS. See METHANE.

MARSH HARE, or RABBIT. A hare (*Lepus,* or *Sylvilagus, palustris*) of the lowlands along the southern Atlantic seaboard, which is slightly larger than the cottontail, measuring 18 inches, and differs in its nearly bare feet and more scanty pelage. It frequents boggy lands, and readily takes to the water.

MARSH HAWK, or HEN HARRIER. A bird of prey (*Circus cyaneus* of Europe, or *Circus hudsonius* of North America) which haunts marshy places. The adult male is light bluish gray, the tail is barred with six to eight bands, and the tips of the wings are blackish. The female is dusky or rusty brown, streaked about the head. Both sexes may be easily recognized by the broad white patch on the rump. Though long-winged and capable of strong flight, it is habitually slow in its movements, sweeping back and forth over low meadows, river margins, and wet ground generally, in search of the small game to be found in such places, keeping near the ground and dropping suddenly upon its prey —more often a frog or a mouse than anything else. Only rarely does it seize a bird or disturb poultry; and its services are of great value to the agriculturists and should be encouraged. It was classed as "ignoble" in falconry. These hawks nest upon the ground in some marsh, and lay four or five nearly globular, dirty-white eggs. Consult: Elliott Coues, *Birds of the Northwest* (Washington, 1874); Fisher, *Hawks and Owls of the United States* (ib., 1893); Chandler, "Modifications and Adaptations to

Function in the Feathers of *Circus hudsonius*" in *University of California Publications in Zoölogy* (Berkeley, 1914); and standard authorities. See Plate of EAGLES AND HAWKS.

MARSH HEN, or MUD HEN. A gunner's name for various rails, coots, and gallinules (qq.v.).

MARSH MALLOW. A name applied to *Althæa officinalis,* native of Great Britain and naturalized in the United States, in both of

MARSH MALLOW (*Althæa officinalis*).

which countries it grows in meadows and marshes, particularly near the seacoast. The whole plant, which is a woody herb, abounds in mucilage, especially in the perennial root, confections made from it being known as *pâtes de guimauve.* The leaves and tender twigs have been used for food in some regions during seasons of scarcity. The hollyhock (*Althæa rosea*) is an allied species. See HOLLYHOCK; ALTHÆA.

MARSH'MAN, JOSHUA (1768–1837). An English missionary. He was born at Westbury Leigh, Wiltshire, and was sent in 1799 by the Baptist Missionary Society to India to join William Carey (q.v.) and his colleagues. They established their mission at Serampur, a Danish colony, 16 miles above Calcutta, and to supplement the scanty funds sent out by the society schools were opened for both European and native children. This course did not meet the approval of the society, and in 1826 Marshman returned to England to try to effect a settlement of the differences. He failed in his object, and the matter ended in a separation of the Serampur mission for the society. He returned to Serampur in 1829 and died there, Dec. 5, 1837. In addition to his special missionary duties Dr. Marshman gave himself with great zeal to the study of the Bengali, Sanskrit, and Chinese languages, and became an extraordinary linguist. He published: *A Dissertation on the Characters and Sounds of the Chinese Language* (1809); *The Works of Confucius, Containing the Original Text with a Translation* (1809); *Clavis Sinica* (1814); *Elements of Chinese Grammar, with a Preliminary Dissertation on the Characters and Colloquial Medium of the Chinese* (1814). He also prepared the first complete Chinese version of the Bible. He assisted Dr. Carey in preparing a Sanskrit grammar and a Bengali and English dictionary and the Bible in Telugu. Consult J. C. Marshman, *Life and Times of the Serampur Missionaries* (London, 1859), and Carey, *Marshman and Ward,* an abridgment of the above (ib., 1864).

MARSH MAR'IGOLD, *Caltha.* A genus of plants of the family Ranunculaceæ. *Caltha palustris,* usually called cowslip in the United States, is a very common American plant, with kidney-shaped, shining leaves and large yellow flowers, a principal ornament of wet meadows and the sides of streams in spring. It partakes of the acridity common to the order; but the flower buds, preserved in vinegar and salt, are said to be a good substitute for capers. The plant is used before flowering as a potherb

MARSH MARIGOLD (*Caltha palustris*).

in many places. A species, *Caltha natans,* occurring in ponds from Minnesota northwestward, has white or pink flowers.

MARSH PLANTS. See SWAMP.

MARSH ROSE'MARY. A name given to several species of *Statice* or *Limonium,* members of the family Plumbaginaceæ. *Statice limonium,* a perennial plant, grows in salt marshes along the seashore of southern and western Europe, and *Limonium carolinianum,* an American plant, grows in similar localities on the American coast. Marsh rosemary has a tuft of spatulate oblong, bristly pointed, one-ribbed leaves, developing in August a much-branched, panicled scape, from 1 to 2 feet high, bearing numerous small lavender-colored flowers.

MARSH'S TEST. See ARSENIC.

MARSH TREFOIL. A plant widely distributed in northen latitudes. See BUCK BEAN.

MARSH WREN. A wren that inhabits reedy marshes. In the United States and Canada two species are more or less numerous wherever such marshes occur. The most familiar one along the Atlantic coast is the long-billed marsh wren (*Telmatodytes palustris*), while the short-billed (*Cistothorus stellaris*) is more numerous in the interior of the country. Both are brownish above and light colored below, with little to distinguish them besides the marked difference in the length of the bill; but the long-billed is the larger. Both species are migratory, and are notorious for their excited activity, micelike manners, and rippling prattling song. They construct large globular nests, suspended among

the reeds, woven of grass blades and entered by a little hole in the side. As often happens among other wrens (see WREN), many more nests will be built each season than there are pairs in the locality, some of which may be utilized as sleeping places by the cock birds. The nests of the two species are much alike, but the eggs are very distinct, those of the long-billed being dark chocolate in color, while those of the short-billed are pure white.

MAR'SI. 1. An ancient tribe of central Italy, inhabiting the district around Lake Fucinus (Lago di Celano, now drained). Their origin, like that of other Italian tribes, is involved in obscurity and fiction. They were probably of Sabine origin, but spoke a dialect akin to the Latin. They are worthy of notice chiefly on account of their warlike spirit. The Marsians were at one time allies of the Romans, but in 308 B.C. they revolted and joined the Samnites. After being subdued they again (301 B.C.) shook off the alliance of Rome, but were beaten in the field and lost several of their fortresses. From this time they continued the firm allies of Rome, contributing by their valor to her triumphs until the Italians were aroused in 91 B.C. to demand redress of their wrongs and a share in the privileges of Roman citizens. A war ensued, generally known as the Social War (q.v.), but frequently called the Marsic War, because the Marsi were prominent among the malcontents. Their leader was Pompædius Silo. Though they were often defeated, the perseverance of the allies gained, in 87 B.C., the object for which they had taken up arms—enfranchisement as Roman citizens. The Marsians, inhabiting a mountain district, were temperate in their habits, brave, and unyielding. So marked was their valor that there was a proverbial saying recorded by Appian, "that Rome had achieved no triumph *over* the Marsi, or *without* the Marsi." The ancient Marsi were represented as enchanters, able to tame serpents and to heal their bites; and it is worthy of note that the jugglers who now amuse the people by handling serpents are natives of the region in the vicinity of Lago di Celano. Inscriptions found at the southwest corner of Lake Fucinus testify to the existence there of a temple and grove of Angitia, a goddess of healing, especially skilled in curing, by charms and herbs, the bites of serpents. Their only important town was Marruvium (San Benedetto), the ruins of which are still visible. Consult: Sophus Bugge, *Italische Landet Kunde* (Christiania, 1878); R. S. Conway, *The Italic Dialects* (Cambridge, 1897); and the article "Marsi" in Friedrich Lübker, *Realleæikon des klassischen Altertums* (8th ed., Leipzig, 1914). See ITALIC LANGUAGES.—2. An ancient people of Germany, according to Tacitus, *Germania*, chap. ii. In books i–ii of his *Annales* Tacitus makes the Marsi an important tribe or group of tribes between the rivers Lippe and Ruhr, perhaps near Dortmund. They fought with Germanicus. See GERMANIA; GERMANICUS CÆSAR.

MARSIAN (mär'sĭ-*a*n) **WAR.** See SOCIAL WAR.

MARSICK, mȧr'sĭk', MARTIN PIERRE JOSEPH (1848–). A Belgian violinist and teacher, born at Jupille, near Liége. His earliest professional instruction was at the Désire-Heynberg Conservatory at Liége. His musical precocity was such that at 12 years of age he was organist of the Liége Cathedral. At 17 years of age he became a pupil of Léonard at the Brussels Conservatory, and a year later entered the Paris Conservatory, where he studied under Massart and won the first prize for violin playing. He completed his student course under Joachim at Berlin, and in 1873 made a very successful début at the "concerts populaires." He became a member of the faculty of the Paris Conservatory in 1892, succeeding Massart as professor of violin. His compositions are almost entirely for the violin and are very popular on the French concert platform. In 1895–96 he toured the United States and confirmed the reputation that had preceded him.

MARSIGLI, mär-sē'lyĕ, LUIGI FERDINANDO, COUNT (1658–1730). An Italian soldier and scholar, born at Bologna. He rose from the ranks to be general in the Austrian army. After the fall of Altbreisach (1703), where he was second in command, he was degraded by court-martial and was never entirely reinstated, though generally considered innocent. Thereafter Marsigli devoted himself to scientific explorations and founded the Institute of Science and Arts at Bologna (1714). In connection with it he established a press for printing its reports. His works include: *Osservazione intorno al Bosforo tracio* (1681); *Storia del mare* (1711); *Danubius Pannonico-Mysicus* (1726); *Stato militare dell' imperio ottomano* (1732).

MARSIGLIO, mär-sē'lyŏ. See MARSILIUS.

MARSIL'EA'CEÆ. One of the two families of water ferns, the other being the Salviniaceæ (q.v.). The family comprises the two genera *Marsilea* and *Pilularia*, whose species root in the mud, either under water or in muddy flats. The stem is prostrate and gives rise to a series of leaves, whose blades reach the surface of the water. The leaf of *Marsilea* has a long petiole bearing four wedge-shaped leaflets, peltately arranged, and resembling a four-leaved clover, except that the veins are forking. The fruit body (sporocarp) of *Marsilea* is somewhat bean-shaped, and is borne on a stalk that arises from the petiole, which represents a branch of the leaf bearing and inclosing the sporangia.

MARSILI, mär-sē'lē, LUIGI (c.1330–94). An Italian humanist. He was born at Florence and there entered the Augustinian convent of Santo Spirito. He studied theology at Paris, on the advice of Petrarch, who wished him to become a Christian champion against the Averroists. Santo Spirito under Marsili became the seat of a society for classical study and discussion; among its members was Coluccio Salutati. Marsili was employed in several diplomatic errands by the city of Florence. His manuscript comments on Petrarch's poems were preserved at the Laurentian Library. Consult Rossi, *Il quattrocento* (Milan).

MARSIL'IUS, or **MARSIGLIO,** mär-sē'lyŏ, OF PADUA (c.1270–c.1343). A Christian polemic. He was born in Padua and studied medicine there. Later he taught philosophy at Paris and became rector of the university in 1313. There between 1324 and 1326 he produced, in conjunction with John of Jandun, the treatise on jurisprudence which gives him his lasting fame, the *Defensor Pacis*, an arraignment of the "usurpations," as he terms them, of the Roman pontiff. The way to peace, he maintains, is for the spiritual power to give up its claim to rule the temporal power. He argues for a virtual separation of Church and state, and pleads in singularly modern language for religious liberty and the

equality of the clergy. He denies the right of the Church to punish heresy. He accompanied his patron, Louis of Bavaria, in his conquest of Rome (1328), where for a short time his ideas were put into practice. His book was printed and published at Basel (1522). The anonymous editor was probably the printer Valentinus Curius, though some think he was Huldreich Zwingli. It was translated by William Marshall (London, 1553).

MARSIPOBRANCHII, mär'sĭp-ō-brăn'kĭ-ī. A class of fishlike animals, the lampreys, with a cartilaginous skeleton and the skull imperfectly developed. See CYCLOSTOMI.

MARSIVAN, mär'sē-vän'. A town of Asia Minor in the Vilayet of Sivas, situated among gardens and vineyards, 56 miles south of the Black Sea (Map: Turkey in Asia, C 2). It is the seat of Anatolia College, an institution with which a Protestant theological seminary and an American hospital are connected, the three institutions having a student body of over 700. The city also contains Jesuit and Armenian schools. In the neighborhood are a silver mine and hot mineral springs. It is a prosperous town with a population of about 25,000, most of them Moslems.

MARS-LA-TOUR, märs'-lȧ-tōōr'. A village of France, in the Department of Meurthe-et-Moselle, 12 miles west-southwest of Metz. It is noted for the bloody cavalry battle which took place there between the French and Germans, Aug. 16, 1870, better known as the battle of Vionville (q.v.).

MAR'STON, JOHN (?1575–1634). An English dramatist, belonging to the Marstons of Shropshire. He was born probably at Coventry about 1575. In 1594 he graduated B.A. from Brasenose College, Oxford, and very soon, it would seem, studied law. Turning to literature, he published in 1598 *The Metamorphosis of Pigmalions Image; and Certaine Satyres,* and *The Scourge of Villanie: three Books of Satyres.* The first, *Pigmalions Image,* is an amatory poem, written, the author asserted, to bring into disrepute the whole species. The satires, some of which are devoted to a quarrel between Marston and Joseph Hall, are coarse and brutal. On the other hand, they are not wanting in vigor and point. Most famous are the lines in which Marston dedicates himself to everlasting oblivion. The earliest trace of Marston as a playwright is in Henslowe's Diary (Sept. 28, 1599). His extant tragedies comprise: *Antonio and Mellida* and *Antonio's Revenge* (1602); *The Malcontent* (1604); *Sophonisba* (1606); *The Insatiate Countess* (1613), which, however, is sometimes assigned to William Barksteed. His comedies comprise: *The Dutch Courtezan* (1605); *Parasitaster, or The Fawne* (1606); *What You Will* (1607). As he often collaborated, his hand is also discernible in several other plays. In conjunction with Chapman and Jonson he wrote *Eastward Hoe* (1605); and on account of certain offensive passages he and Chapman were sent to prison, where Jonson voluntarily joined them. Before this Marston and Jonson had quarreled, but they were now reconciled. The comedies are lively and entertaining. The tragedies contain passages of power and beauty, but they tend too much to bombast, coarseness, and the gross horrors of the tragedies of blood. The best is *The Insatiate Countess.* In middle life Marston left the stage and entered the Church. From 1616 to 1631 he held the living of Christchurch in Hampshire. He died in London, June 25, 1634. Marston's *Workes* were first published in London, in 1633. The *Works,* edited by J. O. H. Phillipps, appeared in 1856 (3 vols., London); and, edited by A. H. Bullen, in 1887 (3 vols., ib.). The *Poems,* edited by A. B. Grosart, appeared in 1879 (2 vols., ib.). Consult also: F. G. Fleay, *Biographical Chronicle of the English Drama, 1559–1642* (London, 1891); "John Marston als Dramatiker," in *Englische Studien,* vols. xx, xxi (Heilbronn, 1895); W. M. Dixon, in *Cambridge History of English Literature,* vol. vi (Cambridge, 1910).

MARSTON, JOHN WESTLAND (1819–90). An English dramatic poet, born in Lincolnshire. He studied law, but left that profession for literature. He published *Gerald and Other Poems* (1842), besides some novels and short stories, and was long a contributor to the *Athenæum.* His principal literary activity, however, was in the field of dramatic literature. Among his numerous plays are: *The Patrician's Daughter* (1841), a tragedy; *Strathmore* (1849); *Ann Blake* (1852); *A Hard Struggle* (1858); *Donna Diana* (1863), his best play; *The Favorite of Fortune* (1866); *A Hero of Romance* (1867); *Life for Life* (1869).

MARSTON, PHILIP BOURKE (1850–87). An English poet, born in London. From early childhood he suffered a partial loss of sight which ultimately became complete blindness. Besides vision he lost friends, relatives, and fortune, the whole serving to develop in his verse a vein of unvaried sadness. His sonnets and lyrics are highly esteemed for technical excellence. It is generally believed that he was the subject of Mrs. Craik's *Philip, My King.* He is the subject of an elegy by Swinburne. He published three volumes of poetry: *Song Tide and Other Poems* (1871); *All in All* (1875); *Wind Voices* (1883). There were posthumously published a collection of stories, edited by W. Sharp and called *For a Song's Sake and Other Stories* (1887); and, in verse, *Garden Secrets* (1887) and *A Last Harvest* (1891), both edited by Mrs. Louise C. Moulton. Consult Coulson Kernahan, in *Sorrow and Song* (Philadelphia, 1894), and William Sharp, in *Papers Critical and Reminiscent* (New York, 1912).

MARSTON MOOR. A plain in Yorkshire, England, where, July 2, 1644, the Royalist army, under Prince Rupert, was beaten by the Parliamentary forces, English and Scottish, under Fairfax, the Earl of Manchester, and the Earl of Leven. The approach of Rupert forced Fairfax to abandon the siege of York, and he took up his position on Marston Moor, with about 25,000 men. Rupert, with about the same number, came up with him on the afternoon of July 2; and in the evening, at the head of the Royalist right, he made a fierce charge upon the Parliamentary left, which broke and fled in disorder. The Parliamentary centre had likewise been broken by the infantry of the Royalist centre and had suffered heavily; but while the Royalists were dispersed in search of plunder or in pursuit of the enemy, Cromwell's famous Ironsides brigade, with the Scottish regiments, commanded by David Leslie, and some others, rallied, charged the Royalists vigorously, and remained masters of the field, capturing 1500 prisoners and all the Royalist artillery. The killed on the Royalist side numbered 4000 and the wounded about as many more; on the Parlia-

mentary side the losses numbered only a few hundred. This victory resulted in the occupation of York and the control of the whole North of England by the Parliamentary forces. Consult S. R. Gardiner, *History of the Great Civil War* (London, 1901), and J. W. Kennedy, *The Scottish Borderers at Marston Moor, 1644* (Hawick, Scotland, 1902).

MARSTRAND, mär'strän, Vilhelm Nikolai (1810–73). A Danish genre painter, born in Copenhagen. Here he studied at the Academy and under Eckersberg, but at an early stage worked independently and won success with such subjects as a "Sleigh Drive by Torchlight" (1829) and a "Musical Party" (1834), of special interest as containing numerous portraits from the musical world. In 1836 he went to Rome, where he joined the circle that centred about Thorvaldsen and where, with others, he painted an "Episode in the October Festival at Rome" (1840, Thorvaldsen Museum, Copenhagen). After visiting Florence he passed a year in Munich and returned home in 1841. Prominent among his productions during the next decade were a "Scene from Danish Peasant Life" (after Holberg) and "Childbed Room" (1846), both in the Copenhagen Gallery, and "Pothouse Politicians" (1852, Hamburg Gallery), besides other episodes and characters from the plays of Holberg. On a trip through Sweden he sketched hundreds of studies, embodied afterward in "A Sunday in Dalecarlia" (1853, Copenhagen Gallery). His keen powers of observation and characterization, his healthy, wholesome satire, and freshness of ideas have assured Marstrand a unique position in Danish art. His versatility was also remarkable and after repeated visits to Italy he painted portraits, religious and historical subjects. His success in the latter field is evidenced by his mural paintings in the mortuary chapel of Christian IV at Roeskilde and "Foundation of Copenhagen University," in the Aula of that building. His illustrations to *Don Quixote* constitute part of his most meritorious work. He was appointed professor at the Copenhagen Academy in 1848 and director in 1853.

MARSTRANDER, mär-strän'dĕr, Carl Johan Sverdrup (1883–). A Norwegian philologist, born at Christiansand. He was educated at the University of Christiania, became a lieutenant in the army, but took up the study of languages—comparative philology and (from 1906) Celtic being his specialties. In 1907 he went with government scholarship to Ireland, in 1908 became stipendiary in comparative philology at the University of Christiania, and in 1910 was appointed professor of Celtic and comparative philology in the School of Irish Learning at Dublin. He published Irish texts and scientific essays in *Zeitschrift für celtische Philologie, Indogermanische Forschungen, Christiania Videnskabs-Selskabs Skrifter,* and especially in *Erin,* of which he became one of the editors. He was also appointed editor of the large *Irish Dictionary* of the Royal Irish Academy, Dublin, and edited, with Osborn Bergin, *Miscellany to Kuno Meyer* (Halle, 1912).

MARS ULTOR, Temple of. See Augustus, Forum of; Mars, *Roman.*

MARSU'PIAL FROG (from Lat. *marsupium,* from Gk. μαρσίπιον, *marsipion,* dim. of μάρσιπος, *marsipos,* μάρσιππος, *marsippos,* μάρσυπος, *marsypos,* pouch). A tree frog of the South American genus *Nototrema,* which is peculiar among the Hylidæ in that the female has a pouch on her back for the reception of the eggs. This pouch forms two blind sacs made by infolding of the skin, which extend forward over the back; but in one species the opening is longitudinal. The eggs are few in number and of large size, with much food yolk, for in most species the embryos remain in the pouch until they are fully matured. How the eggs get into the pouch is not known, but Gadow thinks it most likely that they are placed there by the help of the male immediately after fertilization. Five or six species of these small, brightly colored frogs have been described from the tropical forests of Venezuela and the upper Amazon. Consult Hans Gadow, *Amphibia and Reptiles* (London, 1901).

MAR'SUPIA'LIA. The marsupials form one of the great subdivisions of the class Mammalia, and are of special interest because of their ancestral history and relationships and their remarkable geographical distribution. Although ranked as an order, Marsupialia is coëxtensive with the subclass Metatheria (q.v.). Its principal characters are as follows: the brain is small, with the surface folding absent or very simple, the corpus callosum rudimentary, and the cerebellum completely exposed. Epipubic bones are present in both sexes, and there are other important skeletal characters, prominently a tendency to the separation of bones ankylosed in the higher Eutheria. The mammary glands are provided with long teats, and are usually inclosed in a marsupium or pouch, which serves to protect the helpless young. The imperfection or absence of the pouch is found only among the Koalas, who grow and suckle on the mother's teat after postnatal removal, the young being protected only by the hair of the mother's abdomen. The young when born are very minute and undeveloped. They are not merely imperfect fœtuses, but actual larvæ, inasmuch as they are provided with a special sucking mouth, in adaptation to their needs, which is later replaced by a true mouth. The young when born are transferred by the lips of the mother to the pouch, where they are placed upon a teat to which the temporary sucking mouth clings; and, as they are unable to suck, the milk is injected into them by the action of special muscles of the mammary gland. (See Gland.) The organs of reproduction are peculiar to the group, which is often called Didelphia in reference to their character. The oviducts never unite to form a uterus and the vagina is always double, at least in part; the testes hang suspended in front of the penis and the glans of the latter is often bifurcate. The anus and urinogenital opening are surrounded by a common sphincter muscle. It was formerly supposed that no allantoic placenta was present in the group, but it is now known to exist in some bandicoots (*Perameles*). The egg is minute, as in Eutheria, but incompletely divides at first.

In dentition and habits as great a variety exists among the marsupials as in all the rest of the mammals together, for carnivorous, herbivorous, insectivorous, and omnivorous forms are all well known, including arboreal, terrestrial, cursorial, leaping, and burrowing forms. In distribution, one family, the Didelphyidæ (opossums), is peculiar to the American continent, where it is spread from New York State to Patagonia; only two of the 23 species, however, occur north of Mexico. Opossums are the most

MARSUPIALS

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1 KANGAROO — MACROPUS GIGANTEUS
2 OPOSSUM — DIDELPHYS VIRGINIANA
3 — KOALA — PHASCOLARCTUS CINEREUS
4 TASMANIAN WOLF — THYLACINUS CYNOCEPHALUS
½ NATURAL SIZE

primitive of all the marsupials and are thought to resemble closely the ancestral stock from which came the living members of this infraclass. All the other marsupials (except one) are confined to the Australasian region, where they completely dominate all other mammals and form the most characteristic feature of the fauna. Their survival and prosperity in Australia are doubtless due to the entire absence there of destructive carnivores, except the dingo, of doubtful antiquity; and they have become diversified within their limited circumstances in the same way as have the larger company of mammals all over the world, to enable them to utilize all possible advantages. The fact of marsupials existing in America, and especially in the Neotropical region, has excited much speculation as to how they came there, so remote from Australia. Geographical researches show that during the Mesozoic age marsupials inhabited Europe and North America, but none of that period have been found in Australian rocks. These oldest ancestors of the race appear to have been mainly of the polyprotodont type, little differentiated from the diprotodonts, however; and either this differentiation occurred very long ago (in Jurassic or Cretaceous times) or the latter is a condition which has arisen, as Beddard suggests, independently in both South America and Australia. At any rate, before the Tertiary age was finished pouched marsupials disappeared from the Northern Hemisphere and survived only in Australasia and South America. The hypothesis of a former land connection between Australia and Patagonia is still a moot question. It seems probable that in early Tertiary times there must have been a land connection by way of the Antarctic continent. The most eminent authorities differ on this point. It is interesting to know that a diprotodont (see OPOSSUM RAT) exists in Patagonia.

The relationships of marsupials have become much better understood than formerly. The name Metatheria was originally given with the idea that this group was intermediate between the Prototheria (monotremes) and higher Eutheria, and in a sense this is true, but the former belief that it represents a stage of development from the Prototheria to the monodelphic mammals is not now accepted. The distinctions between the marsupials and the Monotremata are fundamental, and there is no evidence of the derivation of the two branches from any common source. On the contrary, as Beddard concludes in a learned review of the subject, the great specialization of the structure of the marsupials (including evidence of degeneration), and their age, point to the fact that they are the descendants of an early form of eutherian mammal, since the time when the stock had acquired diphydonty and the allantoic placenta. See the article MAMMALIA.

Classification. Rather less than 150 species are known, but they exhibit a most extraordinary variety of size, form, and color. The classification of the marsupials is based primarily upon the dentition, although the characters of the feet have been given much weight recently. There are two principal groups, the *Polyprotodontia*, which have numerous small, subequal incisor teeth, and the *Diprotodontia*, which have not more than six incisors in each jaw and usually have only two in the lower jaw. The former includes the opossums, Tasmanian wolf and "devil," the dasyures, bandicoots, and the like; while in the latter are the wombats, phalangers, koala, and kangaroos. Descriptive articles will be found under each of these terms and the related words.

Bibliography. In addition to standard works and books descriptive of Australia consult the folio volumes with colored plates by John Gould, *Monograph of the Macropodidæ* (London, 1841); C. R. Waterhouse, "Marsupialia or Pouched Animals," in William Jardine, *Naturalists' Library*, vol. xxiv (Edinburgh, 1855); John Gould, *Mammals of Australia* (3 vols., London, 1863); Gerard Krefft, *Mammals of Australia* (Sydney, 1871); Oldfield Thomas, *Catalogue of Marsupialia and Monotremata in the British Museum* (London, 1888); F. E. Beddard, *Mammalia* (ib., 1902); W. K. Gregory, "Orders of Mammals," in *American Museum of Natural History, Bulletin*, vol. xxvii (New York, 1910); Parker and Haswell, *Text-Book of Zoölogy* (ib., 1910); W. B. Scott, *History of Land Mammals in the Western Hemisphere* (ib., 1913).

MARSU'PIAL MOLE (*Notoryctes typhlops*). A small burrowing marsupial of central southern Australia. The marsupial mole is in no way connected with the European mole, but nevertheless has acquired many similar habits, affording a valuable lesson in parallelism in development. Consult Beddard, *Mammalia* (London and New York, 1902).

MARSUPPINI, mär'sōōp-pē'nē, CARLO. See ARETINO, CARLO.

MAR'SUS, DOMITIUS (c.54 B.C.–c.4 B.C.). A Roman poet of the Augustan age. He seems to have been a friend of Mæcenas (Martial, viii, 56, 21), and of Vergil and Tibullus, but he is not mentioned by Horace. His works include: *Cicuta*, Hemlock, a collection of epigrams: *De Urbanitate*, a treatise, bitterly satirical, on the use of wit, in oratory, which is quoted by Quintilian; *Amazonis*, an epic; and erotic elegies and fables. He is frequently mentioned by Martial (iv, 29, 7; vii, 29, 7), who praises the wit and severity of his satire. The few fragments of his works may be found in Bährens, *Fragmenta Poetarum Romanorum* (1886). Consult: J. A. Weichert, *Poetarum Latinorum Vitæ et Reliquiæ* (1830); R. Unger, *De Domitii Marsi Cicuta* (Friedland, 1861); W. S. Teuffel, *Geschichte der römischen Litteratur*, vol. ii (6th ed., Leipzig, 1910); M. Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

MAR'SYAS (Lat., from Gk. Μαρσύας). One of the Sileni of Asia Minor, and therefore at once a spirit of the water (perhaps originally god of the river Marsyas: see below) and of music, especially of the flute, which was associated with the worship of the great goddess Cybele (q.v.), as whose devoted servant Marsyas appears in the Phrygian legend. Thus he is called the son of Hyagnis (to whom was attributed sometimes the invention of the flute), and a teacher of Olympus, to whom the development of the art was assigned. Under Greek and especially Attic influence other features were added to the legend. Athena, so ran the story, had invented the flute, but, observing the reflection of her distorted face as she played on the flute, threw it from her. It was found by the Silenus, or satyr, Marsyas, who became so skillful in its use that he ventured to challenge the god of the cithara, Apollo, to a musical contest. Here two versions follow. According to one, King Midas as judge gave the decision to Marsyas, whereupon Apollo bestowed on the

umpire asses' ears for his poor judgment. In the other version the muses were the arbiters, and gave the decision to Apollo, as his instrument allowed him to add song. In both versions the god hung his presumptuous rival to a tree and flayed him alive, or caused him to be flayed by a Scythian slave. At Celænæ in Phrygia Marsyas was worshiped at the cavern whence flows the tributary of the Mæander that bears his name, and here also was shown his skin, which had been hung up in warning by the victorious god. In the Forum at Rome and in Roman colonies statues of Marsyas were set up as a symbol of liberty. Marsyas was a favorite figure in art. The Athenian sculptor Myron made a famous group of Athena and Marsyas, of which the latter figure seems reproduced in a marble statue in the Lateran, which represents Marsyas as picking up the flute. Another celebrated group is represented by the statue of Marsyas hung from the tree, and the celebrated Florentine figure of the Scythian whetting his knife to flay Marsyas (found at Rome in the 16th century); of the other figures of this group no certain copies have been identified. The competition was also represented on the base of the statues of Leto, Apollo, and Artemis at Mantinea, by Praxiteles, and of this composition three of the four slabs are now in the Museum at Athens.

MART. A city in McLennan Co., Tex., 19 miles by rail east of Waco, on the International and Great Northern Railroad (Map: Texas, D 4). It is in a productive cotton region, and has large cotton gins, oil mills, and compresses. The city contains also a fine high-school building and railroad repair shops. The water works are owned by the municipality. Mart has adopted the commission form of government. Pop., 1910, 2939.

MARTEAU, mär'tō', Henri (1874–). A French violinist, born at Rheims. He studied with Léonard and, after the latter's death in 1891, entered the Paris Conservatory, where in the following year he won the first prize. From 1892 to 1894 he toured the United States with emphatic success. His tours of Scandinavia from 1894 to 1899 were equally successful. In 1900 he was appointed professor in the conservatory at Geneva, and in 1908 he succeeded Joachim at the Königliche Hochschule in Berlin. He published some meritorious chamber music and a scena for soprano, chorus, and orchestra.

MARTEL, Charles. See Charles Martel.

MARTEL, mär'tĕl', Louis Joseph (1813–92). A French politician, born at Saint-Omer. He studied law, entered politics, and was elected to the Legislative Assembly of 1849 from Pas-de-Calais. He protested strongly against the coup d'état of 1851. He was a member of the Corps Législatif from 1863 to 1870; in 1871 was elected to the National Assembly, and was vice president of the Chamber. In 1875 he was elected life member of the Senate; in 1876 he became vice president of the Senate, and in 1876–77 he was Minister of Justice and Public Instruction. In 1879–80 he was again president of the Senate.

MARTEL DE JANVILLE, de zhăn'vĕl', Gabrielle, Countess de (1850–). A French author, born at the château of Coëtsal (Morbihan), and better known by her pen name, Gyp. She was the great-grandniece of Mirabeau, and married Count Martel de Janville in 1869. She created the essentially Parisian characters Petit Bob, Loulou, and Paulette, types of a more or less risqué society, which she describes in witty dialogue, and with piquant satire. Her very numerous novels (133 in 31 years) include: *Petit Bob* (1882); *Autour du mariage* (1883); *Un homme délicat* (1884); *Elle et lui* (1885); *Autour du divorce* (1886); *Pour ne pas l'être?* (1887); *Pauvres petit' femmes* (1888); *Bob au salon* (1888); *Mademoiselle Eve* (1889); *Bob à l'exposition* (1889); *L'Education d'un prince* (1890); *Monsieur Fred* (1891); *Mariage civil* (1892); *Du haut en bas* (1893); *Mariage de chiffon* (1894); *Le cœur d'Ariane* (1895); *Le bonheur de Ginette* (1896); *Totote* (1897); *Israël* (1898); *L'Entrevue* (1899); *Le pays des champs* (1900); *Le friquet* (1901); *Sœurette* (1902; 2d ed., 1910); *Un ménage dernier cri* (1903); *Maman* (1904; 2d ed., 1910); *Le cœur de Pierrette* (1905); *Ces bons Normands* (1907); *La paix des champs* (1908); *Joies d'amour* (1909); *L'Amoureux de Line* (1910); *La guinguette* (1911); *Le grand coup* (1912); *Napoléonnette* (21st ed., 1913).

MARTELÉ, mär'te-lā' (Fr., hammered). In music, a direction for bow instruments, indicating that notes so marked are to be played with a clean, decided stroke. When the term is used in piano music it means that the keys are to be struck heavily and firmly.

MARTEL'LO TOWER. A round masonry tower designed to form part of a system of coast defense. The original Martello tower was situated in the Gulf of San Fiorenzo, Corsica, and was named after its inventor. In 1794 two British war ships unsuccessfully attacked it, with loss to themselves; this single experience, it is said, leading afterward to the adoption of Martello towers by the English. They were erected along the more exposed parts of the south coast and the south and southeastern coasts of Ireland. They were determined on and built hurriedly during the Napoleonic wars, owing to fear of a French invasion. They are about 40 feet high, solidly built, and situated on or near the beach. The walls are five and one-half feet thick and were supposed to be bomb-proof; the base formed the magazine, the garrison occupied the two upper rooms, and the swivel heavy gun and its accompanying howitzers were placed on the roof. They were a great expense to the nation, and have always been regarded as worthless. They are now dismantled and, except in the few instances where they are utilized by the coast guard, abandoned.

MAR'TEN (Fr. *martre, marte,* from ML. *martus, marturis, mardarus, mardalus, mardarius,* from OHG. *mardar,* Ger. *Marder,* from OHG. *mart,* AS. *mearþ,* marten; probably connected with Lith. *martis,* bride). Either of two species of fur-bearing animals of the genus *Mustela,* which also contains the sables. The body is elongated and supple, as in weasels, the legs short, and the toes separate, with sharp, long claws. The nose is grooved and the ears are shorter and broader than in weasels, and the tail is bushy. The martens exhibit great agility and gracefulness in their movements and are very expert in climbing trees, among which they generally live, furnishing a lofty hollow in a decaying trunk with a bed of leaves. Here the young are brought forth in litters of six to eight early each spring; but in a mountainous country all will make dens, sometimes in crevices of rocks.

The term marten is somewhat indefinite, but is most applied in America to the animal which is the nearest analogue to the Old World sable

(q.v.), and hence is frequently called the American sable or pine marten: technically it is *Mustela americana*. This species, which for 250 years has supplied the most valuable of the American furs gathered from its tribe, originally had a range wherever forests grew from New Jersey and Pennsylvania to Labrador and Hudson Bay, and from Colorado and central California to the barren grounds of the Arctic coast; and it was so plentiful that periodically it overflowed certain districts and spread in hordes, scattering far and wide in search of food. On the other hand, periods of astonishing scarcity of martens occur every eight or ten years, no cause for which is known. The incessant trapping which goes on in the wilderness has of course considerable effect in diminishing their numbers, and this species everywhere disappears before the approach of civilization. They keep mostly to the trees, and hence like the denser parts of the forest, but they constantly descend to the ground for food, especially in winter, when they regularly hunt for hares and grouse of all kinds, trailing them with nose to the track like hounds. Their broad feet enable them to move rapidly, even over soft snow. They also hunt persistently for squirrels, chase them in the trees and on the ground, and enter their nests. To this diet are added whatever mice and birds and small fare come their way.

Martens have little to fear from native foes; the much larger fisher is said to kill them occasionally, and it is not improbable that the great horned owl now and then manages to pounce on one, but very few of the carnivores care to taste their flesh unless driven to it by extreme hunger. They are trapped from November until towards March, when their coat begins to become ragged and dull in hue, and with the approach of the rutting season they are no longer attracted by the baits offered by trappers. This species averages about 18 inches in length of head and body, plus seven to eight inches of tail. Its highly variable tints may be described as rich brown, somewhat lighter below. The winter fur is full and soft, an inch and a half deep, and has sparsely scattered through it coarse black hairs which the furrier pulls out. The tail has longer hairs, but is less bushy than that of the fisher. The distinction between this animal and either the European pine marten or the Asiatic sable is visible only to an experienced eye, and it is only recently that naturalists have agreed to regard them as specifically distinct. Four closely related species are recognized in North America, while the best known (*americana*) is divided into six subspecies.

A much larger, very distinct American form, unlike anything in the Old World, is Pennant's marten (*Mustela rennanti*), the "pekan" of French-Canadian trappers and commonly known to Americans as the "black cat" or "fisher," the latter an erroneous name, since the animal never catches fish. It is the largest of its race, and is described under FISHER. For illustration of the pine marten see Plate of FUR-BEARING ANIMALS. Three other species are natives of western Europe, including the now rare and restricted pine or sweet marten (*Mustela* or *Martes martes*) and the more common beech or stone marten (*Mustela* or *Martes foina*), which is not an inhabitant of Great Britain. The habits of both are substantially the same as have been described above, and they differ mainly in the pine marten having (like the American form) a yellowish throat and chest, while that of the beech marten is white. Consult: Elliott Coues, *Fur-Bearing Animals* (Washington, 1877); Sir H. H. Johnston, *British Mammals* (London, 1903); E. T. Seton, *Life-Histories of Northern Animals* (New York, 1909).

MARTEN, HENRY (1602–80). An English regicide. He studied at University College, Oxford, and in 1640 became a member of Parliament. There he joined the extremists of the popular party, and as early as 1643 urged the extirpation of the entire royal family. For this he was expelled from the House. In 1646 permitted to return to Parliament, he again urged extreme action against the King. He was at odds with Cromwell for a time, but later cooperated with him in bringing about the King's trial, at which he was one of the leading judges. He was especially active in establishing the Republic, and he continued to have great influence in Parliament during the Protectorate. Upon the Restoration he gave himself up as a regicide in 1660, was tried and found guilty, but was not executed. He died in prison.

MARTÈNE, mär'tân', EDMOND (1654–1739). A Roman Catholic scholar. He was born at Saint-Jean-de-Lôsne, near Dijon; became a Benedictine monk at 18, and joined the famous Congregation of St. Màur. He spent his life in the service of learning, searching the libraries of Germany, France, and the Netherlands, the fruits of the search appearing in many works, notably in the new edition of the *Gallia Christiana* (14 vols., 1715–56); *Commentarius in Regulam Sancti Patris Benedicti* (1690); *Thesaurus Novus Anecdotorum* (1717); *Veterum Scriptorum et Monumentorum Historicorum Dogmaticorum et Moralium Amplissima Collectio* (1724–33); *Annales Ordinis S. Benedicti*, vol. vi (Paris, 1739).

MARTENS, mär'tĕns, FEDOR FEDOROVITCH, or FRIEDRICH FROMMHOLD VON (1845–1909). A Russian writer on international law, born at Pernau in Livonia. He studied law at the universities of St. Petersburg, Vienna, Heidelberg, and Leipzig. In 1868 he became an official of the Ministry for Foreign Affairs and thereafter continued to be an active and influential figure in matters of foreign diplomacy. In 1873 he was appointed professor of public law at the university of St. Petersburg. He took part in the Brussels conference for the codification of martial law (1874). In 1884 and 1887 he was a member of the Red Cross conferences. In 1889 he represented Russia at the Brussels conference for commerce and maritime law. He was intrusted with the office of arbitrator between England and France in the New Zealand question in 1891, and two years afterward he was a delegate to The Hague conference on arbitration. He was chosen vice president of the Institute of International Law at The Hague in 1894. In 1905 he was legal adviser to the Russian peace plenipotentiaries at Portsmouth. His publications include: *Recueil de traités et conventions conclus par la Russie avec les puissances étrangères* (1874–1909); *Das Consularwesen im Orient* (Ger. trans., 1874); *La Russie et l'Angleterre dans l'Asie Centrale* (1879); *La question égyptienne* (1881); *La conférence africaine de Berlin* (1885); *La paix et la guerre* (Fr. trans., 1901); and his famous treatise on international law (1882), which is available in French and German translations.

MARTENS, GEORG FRIEDRICH VON (1756–

1821). A German publicist and diplomat, born at Hamburg. He studied at the universities of Göttingen, Strassburg, and Vienna. From 1783 to 1789 he was professor of law at Göttingen. In the latter year he was ennobled. In 1808 he entered into the Westphalian civil service as Councilor of State and after 1810 as head of the finance department. After the restoration, he was made Privy Councilor by the King of Hanover. Martens's chief literary work is *Recueil de traités* (7 vols., 1791–1801; 4 suppl. vols., 1802–08); *Nouveau recueil* (1817–42; continued by Karl von Martens and others); but he acquired special fame by his *Précis du droit des gens modernes de l'Europe* (1789; 3d ed., 1821; rev. by Pucheiro-Ferreira, 1864).

MAR'TENSEN, HANS LASSEN (1808–84). A Danish theologian and bishop. He was born at Flensburg, Schleswig, Aug. 19, 1808; studied theology at the University of Copenhagen; and in 1840 became professor at the university, first in philosophy and afterward in theology. In 1845 he was appointed preacher to the Danish court, and in 1854 elevated to the bishopric of Seeland, the highest dignity of the Danish church. In this position, by his eminent scholarship, his catholic spirit, and his tireless activity, he exerted a powerful and beneficent influence. His writings show a modified mysticism, the result of his study of the mediæval mystics. He died in Copenhagen, Feb. 3, 1884. His works include: *Mester Eckart* (1840), an essay on the mysticism of the Middle Ages; an *Outline of a System of Ethics* (1841); *Christian Dogmatics* (1849; 5th ed., 1904; Ger., French, Swed. trans.; Eng. trans., 1866); a *System of Christian Ethics* (1871–78; Ger., Swed. trans.; Eng. trans., 1873–82), his main work; *Katolicisme og Protestantisme* (1874); *Jakob Böhme* (1882; Eng. trans., 1885); an autobiography (Ger. trans., *Aus meinem Leben*, 1883–84). Consult also his correspondence with Dorner, *Briefwechsel mit L. A. Dorner* (2 vols., Berlin, 1888).

MARTENSITE. See IRON; METALLOGRAPHY.

MAR'THA, *Ger. pron.* mär'tȧ. An opera by Flotow (q.v.), first produced in Vienna, Nov. 25, 1847; in the United States, Nov. 1, 1852 (New York).

MAR'THA AND MA'RY, OF BETHANY. Two sisters named in the Gosepls of Luke and John as special friends of Jesus. At their home in Bethany, on the Mount of Olives, near Jerusalem, Jesus found a welcome on his visits to Jerusalem. Martha, being represented as taking the lead, was perhaps the elder, though Mary was the more appreciative of Jesus' teaching (cf. Luke x. 38–42). The regard in which Jesus held the sisters was extended to their brother Lazarus (q.v.), at whose death Jesus came to Bethany to comfort the sisters, not only by the raising of the dead one, but by teaching concerning immortal life, which Martha, however, found hard to grasp (John xi.). A few days before the crucifixion Jesus was a guest at a meal in the home of Simon of Bethany, a leper, at which Martha assisted, and which Mary made the occasion of anointing Jesus with the contents of a box of most precious ointment—a symbol of her regard graciously accepted by Jesus (Matt. xxvi. 6–13; Mark xiv. 3–9; John xii. 1–8). The attempts to identify this anointing with that referred to in Luke vii. 36–50 cannot be pronounced successful. Nothing more is known of the sisters. Mediæval legend confounded Mary with Mary Magdalene (q.v.), and asserted that she, Martha, and Lazarus labored and died in southern France.

MARTHAS VINEYARD. An island lying off the southern coast of Massachusetts, of which State it forms, with one or two minor islets, the County of Dukes (Map: Massachusetts, F 7). It is about 20 miles long and about 9½ miles in greatest width, and is separated from the mainland by Vineyard Sound, 4 to 6 miles wide. The island is mainly level excepting a ridge of hills along the northwestern coast, and some hilly country in the western part. The highest point is Prospect Peak, 308 feet, in Chilmark township. The south coast has shallow lagoons and sand bars, while on the north side the coast consists of bluffs about 30 feet high. Gay Head Light, at the western extremity, is 145 feet above the sea. The island is a much-frequented summer resort, and is noted for its large annual camp meetings which were begun in 1835 at Oak Bluffs, renamed Cottage City in 1907. The principal town and the county seat is Edgartown. The population in 1900 was 4561; in 1910, 4504. The island was discovered and named by Bartholomew Gosnold in 1602. Its Indian inhabitants were all converted to Christianity, and were loyal to the whites during King Philip's War. During the Revolution the island was plundered by the British.

MARTÍ, mär-tē', JOSÉ JULIÁN (1853–95). A Cuban patriot and author, born in Havana. At 16 he was condemned to imprisonment for his liberal ideas and in 1871 was banished to Spain, where he published his first pamphlet, entitled *El Presidio político en Cuba* (1871). He studied in the University of Saragossa and received degrees in law, and philosophy and letters (1873). Escaping from Spain, he went to Mexico (1873), where he edited the *Revista Universal*. In 1877 he went to Guatemala and there wrote plays, taught in the Normal School, and served as judge. After the Peace of Zanjon (1878), he returned to Cuba, but being implicated in the revolutionary movements of 1879, he was deported again to Spain. In 1880 he went to New York, visited Carácas, and returned to New York, where he accepted the position of Consul of Argentina. At this time he began the propaganda in favor of the separation of Cuba from Spain, which won him the title of the "Apostle of the Independence." A prolific writer and an able orator, he devoted his energies to arousing the Cuban émigrés to action. He visited Tampa and Key West in 1891 and the following year founded the *Partido Revolucionario Cubano*, which soon had branches in the Cuban colonies in the cities of the United States, Mexico, Santo Domingo, and Haiti. Martí was named *Delegado* of the Partido with extensive powers. He secured the adhesion of Máximo Gómez to the movement, and carried on the agitation, visiting many cities and making speeches in English and Spanish. Pursuant to his plans, the Cubans arose in revolt on Feb. 24, 1895, and on April 10 Martí and Máximo Gómez landed at Sabana la Mar, near Baracoa, to join the movement. Martí was named, at once, major general of the patriot forces. On May 19 the Cuban army was surprised at Dos Ríos by a Spanish column, and in the skirmish Martí was killed. He published in New York *La Patria*, a journal devoted to Cuban interests, and *La Edad de Oro*, a children's paper. He wrote a novel *Ismaelillo* and numerous poems, translated

Ramona, by Helen Hunt Jackson, and *Mystery*, by Hugh Conway, and corresponded for various newspapers. His writings have been collected and edited by his friend Gonzalo de Quesada, under the title *Obras literarias* (Washington, Havana, and Berlin, 1900–11). Consult: "José Martí: apuntes biográficos," in *Biblioteca del periódico Cuba* (Tampa, Fla., 1896); M. Deulofeu, *Martí, Cayo Hueso, y Tampa* (Cienfuegos, 1905); M. H. Ureña, "José Martí," in *Cuba Contemporánea*, vol. ii (Havana, 1913).

MARTI, mär'tē, KARL (1855–). A Swiss Old Testament scholar, born in Bubendorf, Basel. He studied at Basel under Kautzsch and Socin, at Göttingen under Ritschl, and at Leipzig under Fleischer and Delitzsch. From 1878 to 1895 he was pastor of Reformed churches in the Canton of Basel, and for most of this time taught in the University of Basel. He went to the University of Bern in 1895 as professor of Old Testament, and after 1901 also held the chair of Semitic philology. In 1912 he was rector of the university. His most important work was on the prophets, and his published works include: *Der Prophet Jeremia von Anatot* (1889); *Der Prophet Sacharja, etc.* (1892); *Der Einfluss der Ergebnisse der neuesten alt-testamentlichen Forschungen auf Religionsgeschichte und Glaubenslehre* (1894; also in a Swedish version); *Kurzgefasste Grammatik der biblisch-aramäischen Sprache* (1896; 2d ed., 1911); *Geschichte der israelitischen Religion* (1897; 5th ed., 1904); "Isaiah" (1900), "Daniel" (1901), and the "Dodekapropheton" (1903–04) in the *Kurzer Hand-Kommentar zum alten Testament*, of which he was editor from 1897 to 1904; *The Religion of the Old Testament* (1907; in German, 1906); *Stand und Aufgabe der alttestamentlichen Wissenschaft in den Gegenwart* (1912).

MARTIAL, mär'shal (MARCUS VALERIUS MARTIALIS). The greatest Roman epigrammatist. He was born at Bilbilis, in Spain, March 1, 38–41 A.D.; the exact year is in doubt. In 64 he came to Rome, where he resided till 98, when he returned to his native town. Here he found many good friends and patrons, and a highly cultivated lady named Marcella made him a present of a small estate, where he passed in repose the years until his death, which occurred not later than 104 A.D.. While at Rome Martial became famous as a wit and poet, and received the patronage of the emperors Titus and Domitian. He was on intimate terms with Juvenal (q.v.). He lived in a sort of precarious affluence in a mansion in the city, and in Nomentum, a suburban villa, to both of which he makes frequent reference. From Rome his reputation rapidly extended to the provinces; and even in Britain his *Epigrammata*, which, divided into 14 books, now form his extant works, were familiarly read. These books, which were arranged by himself for publication, were written in the following order: The first 11, including the *Liber de Spectaculis*, were composed at Rome, with the exception of the third, which was written during a tour in Gallia Togata (Cisalpine Gaul); the twelfth was written at Bilbilis, and the thirteenth and fourteenth at Rome, under Domitian. The last two, entitled *Xenia* and *Apophoreta*, describe in distichs the various kinds of souvenirs presented by the Romans to one another on holidays. To the other books we are also indebted for much of our knowledge of the manners and customs which prevailed under the Empire from Nero to Trajan. Martial's works have also a great literary value, as embodying the best specimens of what we now understand by epigram (q.v.)—not a mere inscription, but a poem of two or more lines, containing the terms of an antithesis, which ends with a witty or ingenious turn of thought. The wonderful inventiveness and facility displayed by Martial in this species of composition have always received the highest admiration, qualified, however, by disgust caused by his grossness, and his servile flattery of Domitian. The best edition of Martial is that of Friedländer (2 vols., Leipzig, 1886); a handy text edition is that of Gilbert (Leipzig, 1886). The "Introduction" to E. Post's excellent edition of *Selected Epigrams of Martial* gives a good account of Martial's life and writings, of his character as a man, of his relations with his contemporaries, of his indebtedness to other writers, especially Catullus (q.v.), and of his fame. He has never found an adequate translator, but a collection of translations in prose and verse will be found in Bohn's "Classical Library." Consult also W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910); P. Nixon, *A Roman Wit: Epigrams of Martial Rendered into English* (Boston, 1911); and Martin Scanz, *Geschichte der römischen Litteratur*, vol. iii, pt. 2, §§ 413-415a (3d ed., Munich, 1913).

MARTIAL LAW (Lat. *martialis*, pertaining to war or Mars, from *Mars*, the god of war). The exercise of exceptional governing power by military authorities in cases where the ordinary law is superseded by the control of military forces. It is not a written law, but arises out of a necessity, either (*a*) in case of the invasion of a foreign country by belligerents, or (*b*) where by the force of internal dissension or conflict the regular civil authority of a country is partly or wholly overcome, and the proclamation of martial law is necessitated by the exigency of the occasion.

Martial law includes under its sway all persons—whether civil or military. In its administration the forms of military law are adhered to as far as practicable. In the Civil War the government of the United States declared martial law to be the immediate and direct effect and consequence of occupation or conquest, and that it was simply military authority exercised in accordance with the laws and usages of war. When a place, district, or country is occupied by an enemy, civil and criminal law continues to take its usual course unless stopped by order of the occupying military power; but the functions of the hostile government, legislative, executive, or administrative, cease, or continue only with the sanction or participation of the occupier. Under martial law cases which come within the "rules and articles of war," or the jurisdiction conferred by statute on courts-martial, are tried by the latter, otherwise by military commission. It was the judgment of the Supreme Court of the United States *ex parte Milligan* (4 Wall. 2, 127) that, when the civil courts are open and in "the unobstructed exercise of their jurisdiction," a military tribunal is without the necessary jurisdiction to try civilians. Martial law is not retrospective. An offender cannot be tried for an offense committed before martial law is proclaimed. Martial law may continue in a conquered country until a civil government can be established or restored. Acts done under martial law have no immediate con-

stitutional or legislative authorization, but emanate directly from the military power. But where the civil authority exists the Constitution is imperative (Art. VI, Sec. 2) that it shall be paramount. Under the constitutional system of the United States, it is held by the Supreme Court that a State Legislature may proclaim the existence of martial law when demanded by the public safety. The power of the Federal government to make such proclamation is a restricted one, implied from the clause in the Constitution (Art. I, Sec. 9, Sub. 2), providing that only in cases of rebellion or invasion, where necessary for the general welfare, shall the writ of *habeas corpus* be superseded. For further information as to the suspension of the privilege of *habeas corpus* in time of martial law, see HABEAS CORPUS. Compare MILITARY LAW, from which martial law must be distinguished.

MAR'TIA'NUS CAPEL'LA. See CAPELLA, MARTIANUS MINNEUS FELIX.

MARTIGNAC, mär'tē'nyȧk', JEAN BAPTISTE SYLVÈRE GAY, VISCOUNT DE (1778–1832). A French politician and administrator, born at Bordeaux. His devotion to the Bourbons and his services to the Duchess d'Angoulême during the Hundred Days won him the post of Procurator-General of Limoges in 1815. Six years later he was elected a deputy, and made himself prominent by his eloquence and his gradual abandonment of his extreme Bourbon sentiments. He accompanied the expedition to Spain in 1823 and two years later was made Viscount. In 1828 he became Secretary of the Interior and actual head of the ministry. Here his policy was checked by a combination of the Right and the Left. He retired in August, 1829, and signed the address of the Two Hundred and Twenty-One; but after the revolution of July, 1830, boldly defended Charles X. He wrote an *Essai historique sur la révolution d'Espagne et sur l'intervention de 1823* (1832). Consult E. Daudet, *Le ministère de M. de Martignac* (Paris, 1875).

MARTIGNY, mär'tē'nyē', or **MARTINACH** (Lat. *Octodurum*). Three united villages in the Canton of Valais, Switzerland, situated 1550 feet above the sea on the left slope of the Rhone valley, about 24 miles south from the east end of Lake Geneva (Map: Switzerland, B 2). The two noted routes, one to the Vale of Chamonix by the Tête Noire or the Col de Balme, and another to the Great St. Bernard, branch off here. Martigny is on the Simplon road into Italy, and is a resort frequented by tourists. Pop., 1900, 4292; 1910, 5613.

MAR'TIN (from *Martin*, Fr. *Martin*, from ML. *Martinus*, Martin, from Lat. *Mars*, the god of war). A swallow; in the United States, one of the large purple swallows of the genus *Progne*. Several of the South American species are familiar birds in Argentina, one species (*Progne tapera*) breeding only in the clay structures of an ovenbird. The common purple martin (*Progne subis*) is widely distributed in North America, ranging in summer as far north as Newfoundland and the Saskatchewan, and wintering in Central and South America. The martin is eight inches long and sixteen across the wings. The male is shining blue-black, while the female is bluish-black above and brownish-gray beneath. The nest was primitively made in hollows of old trees, but in all settled parts of the country the birds now occupy bird houses set upon poles for their accommodation, and they have distributed themselves accordingly, not frequenting farms or villages where bird houses are not erected for them. In occupying these houses they must withstand the competition of bluebirds, wrens, white-bellied swallows, and, most of all, English sparrows. The growing scarcity of the bird in New England is attributed mainly to the usurpations of the last-named species, which, having got possession of the quarters, cannot easily be dislodged. These various influences make the distribution of the species more and more local, and are lessening its numbers in the northeastern States. In the South they are more numerous and familiar, and they are everywhere regarded with affection. The eggs are pure white. The food and habits of the martin are like those of other swallows. See SWALLOW.

In Europe the black swift is sometimes called "black martin," and in France the name "martin" is applied to the kingfisher; but the French colonists in the Orient call the mynas of the genus *Acridotheres* "martins." In the United States the bank swallow (q.v.) is sometimes called "sand martin," and the kingbird is occasionally called "bee martin." Such uses of the word, however, are confusing, and it is desirable that the name martin should be confined at least to the swallows, and in America to those of the genus *Progne*. See Plate of SWALLOWS.

MARTIN. The name of five popes, the second and third of whom are more properly known as Marinus I and II, though since the thirteenth century the two names have commonly been confounded in the lists. MARTIN I, Saint, Pope 649–655. He was a martyr to his firm stand against monothelitism, which he caused to be condemned in the first Lateran Council. (See LATERAN COUNCILS.) In consequence he was seized by the Greek Emperor Constans II, who attempted to depose him and carried him off to the Crimea, where he died a prisoner. Consult *Cambridge Mediæval History*, vol. ii (Cambridge, 1913).—MARTIN II, Pope 882–884. Before his election to fill the vacancy caused by the violent death of John VIII, he had been Bishop of Cære, and chosen by three popes to represent them as legate in the delicate negotiations with the East, in which capacity he was present at the fourth Council of Constantinople in 869. As Pope he had close relations with the English King Alfred, to whom he sent a relic of the cross. Consult H. K. Mann, *Lives of the Popes*, vol. iii (London, 1906).—MARTIN III, Pope 942–946. A Roman by birth and a man of high repute for learning and piety, though his pontificate fell in the unhappy period of the domination of the Italian noble factions. Consult H. K. Mann, *Lives of the Popes*, vol. iv (London, 1910).—MARTIN IV, Pope 1281–85, Simon de Brion. A Frenchman by birth, he became canon of Tours, was made Cardinal by Urban IV in 1261, and was several times legate in France. He was elected Pope by the influence of the French party in the Sacred College, aided by the presence at Viterbo (where the conclave was held) of Charles of Anjou, whom he afterward constantly supported, especially in his efforts to retain possession of Sicily. Consult "Les Régistres de Martin IV," in *Bibliothèque des écoles français d'Athènes et la Rome* (Paris, 1901).—MARTIN V, Pope 1417–31, Otto Colonna. He was born in Rome in 1368. He was named Cardinal in 1405 by Innocent VII, and in 1410 appointed to adjudicate the appeal of Huss, against whom he decided. By his election to

the papacy at Constance the great schism (see CONSTANCE, COUNCIL OF; SCHISM, WESTERN) was finally extinguished. He presided in all the subsequent sessions of the council; and when the Fathers separated without discussing urgent questions of reform, he was finally persuaded to call another council, originally at Pavia, then, from fear of the plague, at Siena, and when it was about to meet at Basel, he designated the zealous reformer Cardinal Cesarini as its president. Martin himself, however, died just before the assembling of the council. Consult Mandell Creighton, *History of the Papacy*, vols. i, ii (London, 1902–04), and Ludwig Pastor, *History of the Popes*, vol. i (ib., 1906).

MARTIN, mär'tăn', BIENVENU (1847–). A French Socialist leader and cabinet officer. He was born at Saint-Bris (Yonne), and was educated in the law. He held an underprefecture, entered the Council of State, and in 1894 became director under the Minister of Colonies. He was an unsuccessful senatorial candidate for Yonne in 1897; was elected deputy for Auxerre in that year; was reëlected in 1898 and 1902; and in 1905 became Senator for Yonne. In the Chamber he supported the Waldeck-Rousseau and the Combes ministries, and advocated the separation of church and state. In 1904 he organized the new Radical Socialist group of the Left. In 1905–06 he held the portfolio of Public Instruction in the Rouvier cabinet; he was Minister of Justice in the Doumergue cabinet in 1913–14, and in the first Viviani cabinet organized in June, 1914; and when the War in Europe (q.v.) broke out in 1914, he became Minister of Labor in the second Viviani cabinet, formed August 26 of that year.

MAR'TIN, BRADLEY (1841–1913). An American banker, brother of Frederick Townsend Martin, born at Albany, N. Y. He was educated at Union University (A.M., 1863); served as lieutenant in the National Guard during the Civil War; and was admitted to the bar. He devoted his time to the management of his interests in banks, trust companies, and industrial corporations; but he took also a leading part in the social life of New York City. From 1893 until his death he lived in England and Scotland.

MARTIN, mär'tĕn, EDUARD (1809–75). A German gynæcologist and obstetrician. He was born at Heidelberg; studied medicine there, at Jena, Göttingen, and Berlin; and became professor of gynæcology at Jena (1837) and at Berlin (1858). Martin was one of the first to operate on diseased ovaries. He wrote: *Lehrbuch der Geburtshilfe für Hebammen* (4th ed., 1880); *Handatlas der Gynäkologie und Geburtshilfe* (1862; 2d ed., 1878); and *Die Neigungen und Beugungen der Gebärmutter* (1866; 2d ed., 1870).

MARTIN, EDWARD SANDFORD (1856–). An American author and editorial writer, born at Owasco, N. Y., educated at Harvard (A.B., 1877), and admitted to the bar at Rochester, N. Y., in 1884. He was honored with membership in the National Institute of Arts and Letters. A contributor, editorially, to *Life*, and a writer for various periodicals, his work includes, also: *Sly Ballades in Harvard China* (1882); *A Little Brother of the Rich* (1890), verses; *Pirated Poems* (1890); *Cousin Anthony and I* (1895); *Lucid Intervals* (1900); *The Luxury of Children, and other Luxuries* (1904); *The Courtship of a Careful Man* (1905); *Reflections of a Beginning Husband* (1913); *The Unrest of Women* (1913); *The War Week by Week*, being observations from *Life* (1914); *Poems* (1915).

MARTIN, ERNST (1841–1910). A German scholar in Romance and Germanic philology. He was born at Jena, a son of Eduard Martin; studied at Jena, Berlin, and Bonn, and was made professor at Strassburg in 1877, after having taught in the universities of Freiburg and Prague. He wrote a useful *Mittelhochdeutsche Grammatik* (1865; 13th ed., 1906); *Examen critique des manuscrits du roman de Renard* (1872), followed by two editions of *Reynaert* (1874), and *Roman de Renart* (1882–87), as well as the *Neue Fragmente der Gedichte von den Vos Reinaerde* (1889); *Geschichte der niederländischen Litteratur* (1870–72); *Untersuchungen zur Gralsage* (1880); *Elsässische Litteraturdenkmäler des 14ten bis 17ten Jahrhunderts* (5 vols., 1878–87); *Wörterbuch der elsässischen Mundarten* (1899); an edition of *Parcival und Titurel* (2 vols., 1900–03); an edition of *Kudrun* (2 vols., 1902); *Wolfram von Eschenbach* (1903); and *Der Versbau des Heliand und der altsächsischen Genesis* (1907).

MARTIN, mär'tăn', FÉLIX (1804–86). A French-Canadian Jesuit and author, born at Auray in Brittany. In 1842 he was sent to Canada to assist in reëstablishing Jesuit missions there. He founded St. Mary's College in Montreal; collected material for the history of Canada, and published and edited many works throwing light on the old Canadian Jesuit missions, among which are the following: *Manuel du pèlerin de Notre Dame de Bon Secours* (Montreal, 1848); *Relation des Jesuites* (1850), an enlarged edition of O'Callaghan's work; *Mission du Canada, relations inédites* (1861); *De Montcalm en Canada* (1867); and *Le R. P. Isaac Jogues* (1873). He assisted Carayon in a series of volumes on the Jesuit missions.

MARTIN, FRANÇOIS XAVIER (c.1762–1846). An American jurist and historian. He was born in Marseilles, France, and when about eighteen years of age engaged in business at St. Pierre, Martinique, then, as now, a dependency of France. In 1783 he came to the United States and settled in Newbern, N. C. Under the patronage of ex-Governor Abner Nash he began the study of law. In 1792, by request of the General Assembly, he compiled the British statutes which were in force in North Carolina at the time of the Revolution. In 1794 he made a compilation of the private acts of the Assembly, and in 1803 extended Judge Iredell's revision from 1789. Meanwhile he had translated and published Pothier on *Obligations*. In 1806–07 he represented the borough of Newbern in the State Assembly. In 1809 President Madison appointed him judge of the Territory of Mississippi, and the next year he was transferred to the Territory of Orleans. When the State of Louisiana was admitted to the Union in 1813, he became the first Attorney-General. In 1815 he was appointed to the Supreme Court and served thirty-one years. During the latter part of this time he was presiding judge. At the time of his appointment the law in force in the State was a mixture of Spanish and French statutes and decisions, into which the writ of *habeas corpus* and the system of procedure in criminal cases according to the common law had been introduced. Judge Martin's services in welding into a homogeneous whole this mass of contradictory statutes and principles gave him

the title "Father of the jurisprudence of Louisiana." During the last ten years of his life he was practically blind, but continued to do full work on the bench until superseded by the judges appointed under the new Constitution in 1845. In addition to his judicial labors, he published two volumes of *Reports of the Superior Courts of Orleans*, from 1809 to 1812 (1811 and 1813); eighteen volumes of *Reports of the Supreme Court of Louisiana* (1813–30); a *History of Louisiana* (1827); and a *History of North Carolina* (1829).

MARTIN, Fredrik Robert (1868–). A Swedish art collector and author, born in Stockholm. He was amanuensis in the State Historical Museum (1899–1902) and interpreter at the Swedish Legation in Constantinople 1903–08); gained the doctorate in Vienna (1899); and is best known for his rich collections of Oriental art, made on journeys to Siberia (1891–92), Russia, Caucasus, and Central Asia (1894–95), and to Egypt, Asia Minor, and Turkey (1895–96). In 1898–1903 the government sent him to Russia, Turkey, and other lands to locate objects of art which had been produced in Sweden. He exhibited collections at the Stockholm Exposition (1897) and at the Mohammedan Exposition at Munich (1910), where he was a commissioner. Among other works he published: *The Persian Lustre Vase in the Imperial Hermitage at St. Petersburg* (1899); *Figurale Persische Stoffe, 1550–1650* (1899); *Svenska kungliga gåvor till ryske zaren, 1647–1699* (1900); *Silfverskatter i kejserliga skatkammaren i Moskva* (1900); *Dänische Silberschätze aus der Zeit Christian IV. im kaiserlichen Schatzkammer, Moskva* (1900); *Die Persischen Prachtstoffe im Schlosse Rosenborg, Kopenhagen* (1901); *Aeltere Kupferarbeiten aus dem Orient* (1902); *A History of Oriental Carpets Before 1800* (1908), a great work; and *The Miniature Painting and Painters of Persia, India, and Turkey, 8th to 18th Century* (1912).

MAR'TIN, Frederick Townsend (1849–1914). An American author, brother of Bradley Martin, born at Albany, N. Y. He graduated from the Albany Law School in 1872, and became judge advocate with the rank of colonel in the National Guard. The latter years of his life were spent chiefly in Europe, and he died in London, where he had become known for his philanthropies. His writings on the subject of the life of the wealthy and the socially prominent owe their value to Martin's personal experiences. Besides contributing to magazines, he wrote: *The Passing of the Idle Rich* (1911); *My Personal Experiences of Meeting Snobs* (1911); *The Reminiscences of My Life* (1911); *Things I Remember* (1913).

MARTIN, George Madden (Mrs. Attwood R. Martin) (1866–). An American writer of stories, born in Louisville, Ky., and educated in the public schools in that city, and at home. A successful contributor of short stories to magazines, she succeeded also in winning a large audience with her books: *Emmy Lou—Her Book and Heart* (1902); *House of Fulfilment* (1902); *Abbie Ann* (1907); *Letitia, Nursery Corps, U. S. A.* (1907); *Selina, her Hopeful Efforts and her Livelier Failures* (1914).

MARTIN, Gregory (?–1582). A translator of the Bible, born at Maxfield in Sussex, England. He was educated at St. John's College, Oxford (B.A., 1561; M.A., 1565), where he was distinguished as a Hebraist and Grecian. After leaving the university, he became tutor to Philip Howard, afterward Earl of Arundel. A stanch Catholic, he encouraged the Howards to remain true to their faith. Unable to conform to the Established church, he fled to Douai in Flanders (1570), where he taught Hebrew in the English College, then just established. In 1577 he was sent to help organize the English College at Rome. In 1578 the college at Douai was moved to Rheims. There Martin spent the rest of his life in the translation of the Bible. He died October 28, 1582. The famous Douai Bible, though since revised, is still the standard among English Catholics. It was made from the Latin, collated with the Greek and the Hebrew versions. The New Testament appeared at Rheims in 1582. The Old Testament was not published till 1609–10. The whole was revised by Bishop Challoner in 1749–50. Though Martin's version was severely criticized by English Protestants, it was freely used for the authorized Protestant version made under King James.

MARTIN, Helen Reimensnyder (1868–). An American author. She was born at Lancaster, Pa.; studied at Swarthmore and Radcliffe colleges; and married Frederic C. Martin in 1889. She became known for her stories of "the Pennsylvania Dutch," the shorter ones contributed to *Leslie's*, the *Century*, the *Cosmopolitan*, the *Ladies' Home Journal*, and other magazines. Her early work was so photographic in character that it was much resented by the people among whom she had lived. She is author of *Warren Hyde* (1897); *The Elusive Hildegarde* (1900); *Tillie, A Mennonite Maid* (1904); *Sabina, A Story of the Amish* (1905); *His Courtship* (1907); *The Betrothal of Elyphalate* (1907); *The Revolt of Anne Royle* (1908); *The Crossways* (1910; new ed., 1914); *When Half-Gods Go* (1911); *The Fighting Doctor* (1912); *The Parasite* (1913); *Barnabetta* (1914); *Martha of the Mennonite Country* (1915).

MARTIN, mär'tăn', Henri (1810–83). A French historian, born at Saint Quentin. Educated for the practice of law, he soon abandoned law for literature. At first he wrote historical romances and poetry, but later, with Paul Lacroix, he began the task of compiling a history of France, to be made up of extracts from different authors. One volume only was published, when Lacroix abandoned it, but Martin resolved to go on. The first volume appeared in 1833, and the undertaking was completed in 1836. Meanwhile he set to work on a history of his own, the first edition of which appeared in the years 1833–36, in fifteen volumes. The third and enlarged edition appeared between 1837 and 1854, in nineteen volumes. In 1844 the Academy of Inscriptions gave Martin a prize of 9000 francs; in 1851 he received the Gobert prize, and in 1869 was awarded the great prize of 20,000 francs by the Institute. After the fall of the Second Empire he was elected to the National Assembly, and in 1876 he was elected Senator. In 1878 he became a member of the French Academy. As an historian Martin belongs to the school of Thierry. His *Histoire de France*, which comes down to the year 1789, was later continued into the nineteenth century by the *Histoire de France moderne* (2d ed., Paris, 1878–85). He was the author of numerous other literary and historical works, but his great fame rests on the *Histoire de France*. Consult: Hanotaux, *Henri Martin* (Paris, 1885); Mulot, *Souve-*

nirs intimes (ib., 1885); Jules Simon, *Mignet, Michelet, Henri Martin* (ib., 1889).

MARTIN, HENRI JEAN GUILLAUME (1860–). A French decorative painter. He was born at Toulouse and studied under Jean Paul Laurens. He became Officer of the Legion of Honor, was awarded a "first medal" in 1883, a gold medal at the Exposition of 1889, and a grand prize at the 1900 Exposition. His works comprise: "Beauty" (1900); "Pastoral" and "The Painter" (1901); "The Painter's Muse," "The Green Country Seat" (both 1902); "The Landscape" (1903); "Labor," "The Float," "Noon," "Evening," decorative panels (1904); "Landscape," decorative panel for Rostand's house (1904). In 1903 and 1906 he painted decorations for the Capitol of Toulouse, and in 1907 "Twilight" and "Rural Scenery."

MAR'TIN, HENRY AUSTIN (1824–84). An American surgeon, born in London, England, and educated at the Harvard Medical School, where he graduated in 1845. During the Civil War he served as surgeon in the Union army, became surgeon in chief of the Second Corps, Army of the Potomac, and was later brevetted lieutenant colonel and medical director. In his practice in Boston, after the war, he made himself well known by introducing the Beaugency virus (1870), the use of the rubber bandage (1877), and tracheotomy without tubes (1878). Dr. Martin contributed largely to medical journals (especially the London *Lancet* and the *British Medical Journal*), and also to the *North American Review.*

MARTIN, mär'tăN', HENRY MARIE RADEGONDE (1852–). A French paleographer and librarian, born at Airvault (Deux-Sèvres). He became administrator of the Arsenal Library, was for a time secretary general of the international congress of librarians, and took an active part in numerous other societies. He wrote: *Le livre du roi Dancus* (1883), written under the nom de plume of Henry Martin-Dairvault; *Catalogue général des manuscrits de la bibliothèque de l'arsenal* (8 vols., 1885–1900); *L'Odyssée d'un bibliognoste* (1892); *L'Evangéliare de Sainte-Aure* (1897); *Histoire de la bibliothèque de l'arsenal* (1900), crowned by the Institute; *Procès-verbaux et mémoires du congrès international des bibliothécaires* (1901); *Observations sur la technique de l'illustration de livres du moyen âge* (1904); *Les miniaturistes français* (1906); *Le Térence des ducs* (1907); *La légende de Saint-Denis* (1909); *Les joyaux de l'arsenal* (1909); *Les peintres de manuscrits et la miniature en France* (1909); *Le Boccace de Jean sans Peur* (1911). He reëdited in 1888 Louys Gruau's *Nouvelle invention de chasse pour prendre et oster les loups de France* (published 1613).

MAR'TIN, HENRY NEWELL (1848–96). An American biologist, born in Newry, Ireland. He was educated at University College, London, and at Christ's College, Cambridge, where he graduated B.A. in 1874 and became fellow. In 1876 he was chosen professor of biology at Johns Hopkins and director of the biological laboratory. Martin there carried out some valuable experiments on respiration in general and especially on the beating of the heart of a mammal after death. In 1890 he was elected president of the American Society of Naturalists. He edited *Studies from the Biological Laboratory of Johns Hopkins* and the *Journal of Physiology;* assisted Huxley in his *Practical Biology* (1876) and Moale in a *Handbook of Vertebrate Dissection* (1881–84); and wrote, apart from the papers above mentioned on respiration, *The Human Body* (1881) and *Observations in Regard to the Supposed Suction-Pump Action of the Mammalian Heart* (1887).

MARTIN, HOMER D(ODGE) (1836–97). An American landscape painter. He was born at Albany, N. Y., October 28, 1836, and, except that he studied there for a few weeks under William Hart (q.v.), a landscape painter of the Hudson River School, he was practically self-taught. In 1857 he first exhibited at the National Academy, and five years later he removed to New York. In 1875 he was elected a member of the National Academy, and in 1877 he was one of the founders of the Society of American Artists. After visiting Europe in 1876, he returned in 1881, and spent five years in France, at Villerville and Honfleur. Abroad he came under the influence of Boudin and Corot. On his return to America he resided in New York, until in 1893 he went to St. Paul, Minn., where he died February 12, 1897. His interpretation of nature is always poetical; his work was at first careful in detail, but later it became far bolder in style. Sure and powerful in line, it shows a keen comprehension of form, based upon careful studies from nature. His color is subdued, often expressed in tones of mellow browns, with subtle qualities of reflected light and shade. His brush work is firm and broad, and his paintings express large spaces, both in sky and land, and are always imbued with grave melancholy. Among his best-known works are: "The Old Mill" (1860); "Old Manor House," "Adirondack Scenery" (Untermyer collection, New York); "The Iron Mine," "Evening on the Seine," and "Lower Ausable Pond," all three in the Evans collection, National Gallery, Washington; "Newport Neck" (Lotos Club, New York); "Sea at Villerville" (Kansas City Art Institute); "View on the Seine" (called by the painter "Harp of the Winds"), "Sand Dunes, Lake Ontario," and "Mounts Madison and Jefferson," all three in the Metropolitan Museum, New York; and "Lighthouse at Honfleur" and "Lake Sandford," both in the Century Club, New York. Consult: E. G. Martin, *Homer Martin, a Reminiscence* (New York, 1904); Samuel Isham, *History of American Painting* (ib., 1905); F. J. Mather, *Homer Martin, Poet in Landscape* (ib., 1912); F. F. Sherman, "Landscape of Homer Dodge Martin," in *Art in America,* vol. iii (ib., 1915); and for reproductions, D. H. Carroll, *Fifty-Eight Paintings by Homer D. Martin* (ib., 1913).

MARTIN, JOHN (1789–1854). An English historical and landscape painter, born at Haydon, near Hexham. The only art instruction that he received was from a china painter at Newcastle. In 1806 he moved to London, at first practicing china painting. He exhibited his first picture, "Sadak in Search of the Waters of Oblivion," at the Royal Academy, in 1812; "Adam's First Sight of Eve" (1813), and "Clytie" (1814). In 1817 "Joshua Commanding the Sun to Stand Still" gained for him a premium of £100 at the British Institute. His best-known work, "Belshazzar's Feast," appeared in 1821, and won a premium of £200. Then followed the "Destruction of Herculaneum" (1822); "Seventh Plague" (1823); the "Creation" (1824); "Fall of Nineveh" (1828); "Eve of the Deluge" (1840); and many other biblical

subjects, besides a number of landscapes in water color, six of which are in the South Kensington Museum. He died in the Isle of Man, Feb. 17, 1854. Martin was much criticized for his deficiencies in drawing and color, but he had a fertile invention and pronounced originality. His best work is his illustrations to Milton.

MARTIN, Joseph (1852–). A Canadian statesman. He was born at Milton, Ontario, was educated at the Michigan State and Ontario normal schools and Toronto University, and was a public-school teacher for some years. He removed to Manitoba, and was admitted to the bar of that province in 1882, practicing his profession successively in Portage la Prairie and Winnipeg. He was elected a Liberal member of the Manitoba Legislature in 1883, was Attorney-General in the administration of Thomas Greenway (q.v.) in 1888–91, and in 1890 introduced the famous measure abolishing separate schools (see Manitoba). He was an unsuccessful candidate for the House of Commons in 1891, but in 1893–96 represented Winnipeg in that body. In 1897 he removed to Vancouver, British Columbia, was admitted to the bar of that province, sat in the Provincial Legislature (1898–1903), was Attorney-General and Minister of Education (1898–99), Premier and Attorney-General (1900), and leader of the Liberal Opposition (1902–03). He owned and edited the Vancouver *Guardian* in 1907. While in British Columbia he was prominently identified with the Asiatic Exclusion League, in 1908 was an unsuccessful candidate for the House of Commons in its interest, and the same year removed to England to practice his profession in London and enter British politics. He was elected to the British House of Commons in 1910.

MARTIN, Josiah (1737–86). An English Colonial Governor, born probably in the West Indies. He entered the British army in 1756, was promoted to be major in 1761, and lieutenant colonel in 1771. In the latter year he was appointed Governor of North Carolina to succeed William Tryon, who was transferred to New York. At first his frankness and honesty favorably impressed the people, but his stubbornness and his high opinion of the royal prerogative and of his own importance soon caused opposition. He attempted to prevent the Colony from sending delegates to the Continental Congress of 1774, but a Provincial Congress met and elected delegates in defiance of his protest. This seems to have been the first legislative body in America to meet without royal authority. After the battle of Lexington he was practically a prisoner in the palace at Newbern. Martin fled to Wilmington and then to Fort Johnston, on the Cape Fear River. On July 18, 1775, he took refuge in the British sloop-of-war *Cruiser* and attempted to administer the government from there until the next year. He was attacked by a small force of colonists, fled on board the *Cruiser*, and eventually was compelled to accompany the British fleet to Charleston in 1776. When Lord Cornwallis entered North Carolina at the head of a British force Martin was with him, and finally accompanied him to New York and from there to London, England.

MARTIN, mär'tēn, Karl (1851–). A German geologist, born in Oldenburg. He studied at Munich, Leipzig, and Göttingen, where, in 1874, he became assistant in the geological museum; and after a year's teaching at Wismar in Mecklenburg was chosen professor of geology at Leyden. In 1878 he was appointed director of the geological museum of Leyden; and in 1882 became a member of the Philadelphia Academy of Natural Sciences. In 1895–96 he was rector of the University of Leyden. He wrote, besides contributions to periodicals on the geology of the Netherlands and of the East Indies: *Niederländische und nordwestdeutsche Sedimentärgeschiebe* (1878); *Tertiärschichten auf Java* (1879–80); *Bericht über eine Reise nach Niederländisch Westindien* (1888); *Reisen in den Molukken, in Ambon, den Uliassern, Seran und Buru* (1894; 2d ed., 1913); with Becker, *Geology of the Philippine Islands* (1901); *Geologischer Teil* (1903); *Vorläufiger Bericht über geologische Forschungen an Java* (1911–12).

MARTIN, Konrad (1812–79). A German Catholic theologian, Bishop of Paderborn. He was born at Geismar; studied oriental languages at Halle and theology at Munich and Würzburg; took orders in 1836; and taught in Cologne and Bonn (1844). He was appointed to the see of Paderborn in 1856, and showed great diligence in advancing Catholic educational and charitable institutions. Called to Rome in 1869, he was a member of the Vatican Council of 1870, urged the dogma of infallibility, and publicly defended it. His opposition to the government at the beginning of the *Kulturkampf* (q.v.) was so violent that he was imprisoned for a year, and in 1875 fled to Belgium, where he died. He wrote various Catholic manuals: *Drei Gewissensfragen über die Maigesetze* (1874), anonymously; *Drei Jahre aus meinem Leben* (1877; 3d ed., 1878); and *Blicke ins Jenseits* (1878). Consult Christian Stamm, *Conrad Martin, Bischof von Paderborn* (Paderborn, 1892).

MAR'TIN, Lady. See Faucit, Helen.

MARTIN, mär'tăn', Louis Aimé (1786–1847). A French writer, born near Lyons. Educated for a mercantile career, he went, against the wishes of his parents, to Paris, where he took up literature. In 1815 he was appointed secretary of the Chamber of Deputies, and not long afterward became professor of literature and ethics in the Ecole Polytechnique. In 1831 he became keeper of the Library of St. Geneviève. He published *Etrennes à la jeunesse* (1809), and *Lettres à Sophie sur la physique, la chimie, et l'histoire naturelle* (1810), in prose and verse. His most valuable work was *Education des familles* (1834), contending that to improve mankind women must be educated so that they may be able to rear men of virtue. He was the disciple and friend of Bernardin de Saint-Pierre.

MARTÍN, mär-tēn', Luis (1846–1906). A Spanish Jesuit, twenty-fourth general of the order. He was born in Melgar, near Burgos, entered the Society of Jesus when 18, continued his studies, held the chair in rhetoric in Poyanne, France, and in 1877 became rector of the University of Salamanca, where he made a national reputation as a theologian. In 1891, he became assistant of the order in Spain, and in 1892, after the death of Anderledy, and on his recommendation, Martín was chosen general, removing to the official headquarters at Fiesole. His successor was Father Franz Xaver Wernz (q.v.).

MAR'TIN, Luther (1744–1826). An American lawyer and political leader, born in New Brunswick, N. J. He graduated at Princeton in 1766; taught school in Queenstown, Md.; studied law; was admitted to the bar in 1771; and prac-

ticed in both Maryland and Virginia. In 1774 he was a member of the Annapolis convention that protested against the arbitrary acts of the British crown, and throughout the Revolution he continued active on the Patriot side. In 1778 he was appointed Attorney-General of Maryland. He was one of Maryland's representatives in the Continental Congress in 1784–85. He was a delegate to the Constitutional Convention of 1787 at Philadelphia; steadfastly contended there against the establishment of a strong national government; finally left the convention altogether; and subsequently strongly opposed the ratification of the Constitution by Maryland. By his opposition to the Constitution he earned the sobriquet of "The Federal Bulldog." In 1804 he defended Judge Samuel Chase (q.v.) in the impeachment proceedings before the United States Senate, and in 1807 was counsel for Aaron Burr (q.v.). From 1814 to 1816 he was Chief Justice of the Court of Oyer and Terminer in Baltimore, and in 1818 was again made Attorney-General. He was stricken with paralysis in 1820, and, largely owing to poverty, lived thereafter at the home of his friend Aaron Burr in New York. He published *A Defence of Captain Cresap; Genuine Information Delivered to the Legislature of the State of Maryland Relative to the Proceedings of the General Convention Lately Held at Philadelphia* (1788); and *Modern Gratitude* (1801–02). Consult H. P. Goddard, *Luther Martin, the Federal Bull-Dog* (Baltimore, 1887).

MARTIN, Percy F. (1861–). An English journalist and traveler. He was educated at University College, London, and early became a newspaper correspondent in Latin America and for a short time in India. Besides contributions to newspapers, reviews, and annuals on South and Central America, he wrote: *Through Five Republics of South America* (1905), *Mexico's Treasure House* (1906), *Mexico of the Twentieth Century* (1907), *Salvador of the Twentieth Century* (1911), *Peru of the Twentieth Century* (1911), *Maximilian in Mexico* (1913), *The Sudan in Evolution* (1914).

MARTIN, Riccardo (1878–). An American operatic tenor, born at Hopkinsville, Ky. As a child he began to play the violin. In 1893 he went abroad, studying piano in Germany and singing in Italy. After a few years he returned and entered Columbia University, where he devoted himself to composition and orchestration under MacDowell. At that time he wrote a number of songs and choruses. In 1900 he settled in New York as a teacher of singing. Here Dr. Holbrook Curtis discovered his voice, whereupon he went to Florence to study with Lombardi. Having finished his vocal studies with Sbriglia and Escalais in Paris, he made his operatic début in Nantes as Faust, in 1904. The next two years he sang in Verona and Milan, where he was engaged for the San Carlo Opera Company, with which he made his American début at New Orleans in 1906. After 1907 he was a member of the Metropolitan Opera House, singing the principal lyric rôles; in 1915, after Caruso left for Monte Carlo, Martin was his temporary successor. He also sang at Covent Garden and in Mexico.

MARTIN, Robert Montgomery (c.1803–68). An English historical writer and statistician, born in Ireland. In 1820–30 he traveled in Ceylon, Africa, and India, and in 1834 published his valuable *History of the British Colonies.* He prepared for the press the papers of the Duke of Wellington, and in 1840 founded the *Colonial Magazine,* which for two years he edited. His further works include: *Political, Commercial, and Financial Condition of the Anglo-Eastern Empire* (1832); *History of the Antiquities of Eastern India* (1838); and *The Statistics of the British Colonies* (1839).

MARTIN, Sir Theodore (1816–1909). An English author. He was born in Edinburgh, and was educated at the high school and university of that city. In 1846 he became parliamentary agent in London. Among his earliest literary ventures was the volume of parodies, *Bon Gaultier's Ballads* (1845; 16th ed., 1903), written in collaboration with Prof. W. E. Aytoun. In 1858 he began his series of admirable translations with *Poems and Ballads of Goethe* (again assisted by Professor Aytoun). *Faust* appeared in 1865–66. Martin's other versions are dramas from Oehlenschläger (1854–57), the *Odes of Horace* (1860), *Catullus* (1861), the *Vita Nuova* (1862), *Faust* (1865–86), Heine's *Poems and Ballads* (1878), and *Six Books of Vergil's Æneid* (1896). The Horace renderings, in 1882 extended to include the entire works, are generally conceded to be the best yet made of that poet. They are supplemented by a booklet in the *Ancient Classics for English Readers.* His further works include: *The Life of W. E. Aytoun* (1867); *The Life of the Prince Consort* (1874–80); *The Life of Lord Lyndhurst* (2d ed., 1883); a *Life* (5 vols., 1875–80) of the Prince Consort, for Queen Victoria; *Helena Faucit, Lady Martin* (1901); *Queen Victoria as I Knew Her* (1908); and *Madonna Pia* and other plays. In 1881 Martin was elected rector of St. Andrews University. He was knighted in 1880. For Lady Martin, see the article Faucit, Helen.

MARTIN, Thomas Commerford (1856–). An American electrical engineer and editor, born in London, England. He was associated with Thomas A. Edison in his work in 1877–79 and thereafter was engaged in editorial work. From 1883 to 1909 he served as editor of the *Electrical World,* after 1909 was executive secretary of the National Electric Light Association, and in 1900–11 was a special agent of the United States Census Office. At various times he lectured at the Royal Institution of Engineers, London, the Paris Société Internationale des Electriciens, the University of Nebraska, and Columbia. In 1887–88 he served as president of the American Institute of Electrical Engineers. He is author of *The Electric Motor and its Applications* (1887; 3d ed., 1888), with Joseph Wetzler; *Inventions, Researches, and Writings of Nikola Tesla* (1893; 3d ed., 1894); *Edison: His Life and Inventions* (1910), with F. L. Dyer.

MARTIN, Thomas Mower (1838–). A Canadian landscape painter, born in London and a student there at the South Kensington Art School. He went to Canada in 1862 and settled at Toronto. He was influential in founding the Royal Canadian Academy, the Ontario Art Union, the Ontario Society of Artists, and the Ontario School of Art, of which he became director in 1877. His pictures include: "The Untamed Wilderness," "A Summer Idyl," and "Sunrise, Muskoka." He painted many pictures of Rocky Mountain and British Columbia scenery. He published *An Artist's Letters from the Rockies* (1889) and *Canada from an Artist's Point of View* (1893–95).

MARTIN, Thomas Staples (1847–1919).

An American legislator. He was born at Scottsville, Va., and thenceforth lived on a farm two miles from that town. He was a cadet in the Virginia Military Institute in 1864–65 and during much of that time was in actual service in the Confederate army. He studied at the University of Virginia in 1865–67 and was admitted to the bar in 1869. In 1895 he became a United States Senator and was reëlected for the third time for the term ending in 1919.

MARTIN, Victoria Claflin Woodhull (1838–). An American reformer, born in Homer, Ohio, a sister of Tennessee Claflin, who became Lady Cook. Victoria Claflin married, when she was 14, Dr. Canning Woodhull; the marriage was unhappy and there was a separation. In 1866 she married Col. James H. Blood; they were divorced in 1875. In 1870 Mrs. Woodhull, as she was called, with her sister formed in New York a stockbrokers' house called Woodhull, Claflin & Co., which published for several years *Woodhull & Claflin's Weekly.* In the same year she memorialized Congress in behalf of woman suffrage. In 1871 Miss Claflin was nominated for Congress and both sisters tried to vote in New York. Both had been mediums and clairvoyants and Mrs. Woodhull in this year was elected president of the National Association of Spiritualists. In May, 1872, she was nominated for the presidency of the United States by the Equal Rights party. In December of that year both sisters were arrested by the Federal authorities, charged with mailing improper matter, viz., the Beecher-Tilton scandal, published in their weekly (possibly without their knowledge). They were acquitted in June, 1873. Mrs. Woodhull lectured widely in the United States, especially on "The Human Body the Temple of God," and urged race improvement, the same standard of morality for both sexes, electoral reform, etc. In 1877 she went to England to live and there married John Biddulph Martin (died 1895), a London banker. She became editor of the *Humanitarian Magazine* and wrote on social subjects.

MARTIN, Violet ("Martin Ross") (?–1915). An Irish novelist, educated at home, at Ross, County Galway, and at Alexandra College, Dublin. She identified herself prominently with the woman suffrage movement. Her literary work began with a miscellany of articles contributed to various British periodicals. Eventually she collaborated with her cousin, Miss Edith Œ. Somerville, in a series of Irish novels. *The Experiences of an Irish R. M.* (1899), a tale racy of the soil and with a sparkle, dash, and wit that recall Charles Lever's rollicking stories, made a decided hit on both sides of the sea. Other novels in which she and Miss Somerville collaborated are: *The Real Charlotte* (1901); *The Silver Fox* (1902); *All on the Irish Shore* (1903); *Some Irish Yesterdays* (1906); *Further Experiences of an Irish R. M.* (1908); *An Irish Cousin* (1910); *Dan Russell the Fox* (1912); *In Mr. Knox's Country* (1913).

MARTIN, William Alexander Parsons (1827–1916). An American missionary and educator, born at Livonia, Ind. He graduated at Indiana University in 1846 and entered the Presbyterian Seminary at New Albany, Ind. (now McCormick, Chicago); taught classics for a year; and then went to Ningpo, China, as missionary (1850). He founded the Presbyterian mission at Peking (1863) and remained in charge for five years, until he was appointed professor of international law at the Tung-wên College of Peking, of which he was also president from 1869 to 1894. For the Chinese government he translated a number of works on international law, such as the *Guide diplomatique* (1874) and two textbooks on physics, which were especially reprinted for the Emperor. In 1880 he was sent abroad by the Chinese government to investigate the educational systems in other countries. He received the honorable title of mandarin of the third rank in 1885 and of the second rank in 1898; and in 1885 was also made the first president of the Oriental Society of Peking. From 1898 to 1900 he was first president of the Imperial University of Peking. His writings include: *The Chinese: Their Education, Philosophy, and Letters* (1881); *Evidences of Christianity* (1855, in Chinese); *The Three Principles* (1856); *Religious Allegories* (1857); *A Cycle of Cathay, or China South and North* (1896; 2d ed., 1897); *The Lore of Cathay, or the Intellect of China* (1901; 2d ed., 1912); *The Siege in Peking* (1900); *Awakening of China* (1907).

MARTIN, Sir William Fanshawe, fourth Baronet (1801–95). A British naval officer. Entering the navy in 1813, 10 years later he was appointed commander of the sloop *Fly*, in which he gave such valuable service that he was thereafter known as "Fly" Martin. He was promoted to captain in 1824, commodore in 1849, rear admiral in 1853, vice admiral in 1858, and admiral in 1863. As commander in chief of the Mediterranean in 1860–63 he greatly improved the discipline of the fleet. From 1866 to 1869 he was commander in chief at Plymouth and in 1870 was retired. He succeeded to his baronetcy in 1863.

MARTIN, Winfred Robert (1852–1915). An American Orientalist, Hispanist, and librarian, a son of William Alexander Parsons Martin. Born at Ningpo, China, he studied the humanities at Princeton University, where he received the degree of A.B. in 1872, and that of A.M. in 1875. Three years later he graduated from the law school of New York University. After a long period of study in Germany he took his Ph.D. at Tübingen in 1887. From 1888 to 1907 he was professor of Oriental languages and literatures at Trinity College (Hartford, Conn.) and from 1902 to 1907 gave instruction in Sanskrit in the mission courses of Hartford Theological Seminary. Dr. Martin's linguistic ability was very unusual, and this, coupled with his wide reading and extraordinary memory, marked him for the difficult post to which he was called in 1907, and which he held until his death—that of librarian of the Hispanic Society of America, of which he was also a member. In 1907 Trinity College gave him an honorary LL.D., and in 1911 the King of Spain made him a Knight of the Order of Isabella the Catholic.

MARTINACH, mär'tē-näĸ. The name of three united villages in Switzerland. See Martigny.

MARTINA FRANCA, mär-tē'nȧ frȧn'kȧ. A city in the Province of Lecce, Italy, situated on a hill 17 miles north-northeast of Taranto (Map: Italy, F 4). It is a comparatively modern town, with manufactures of oil. Pop. (commune), 1901, 25,007; 1911, 24,786.

MARTIN CHUZ'ZLEWIT. A novel by Charles Dickens, which appeared in 20 monthly parts in 1843 and 1844.

MARTIN DE MOUSSY, mär'tăN' de mōō'sē',

JEAN ANTOINE VICTOR (1810–69). A French physician and traveler, born at Moussy-le-Vieux. He studied medicine in Paris, and practiced in the military hospitals. In 1841 he went to Montevideo, South America, and in the nine years' siege of that place (1843–52) was director of the medical service to the French and Italian forces. After the downfall of Rosas, the dictator of Argentina, in 1852, he was employed by the government of President Urquiza to prepare a geographical description of that republic. In the execution of this task he spent four years (1855–59) in constant travel. The results of his labors are embodied in his work in three volumes, entitled *Description géographique et statistique de la confédération argentine* (1860–64), which, with the atlas accompanying it, is of the highest authority, and *Mémoire historique sur la décadence et la ruine des missions des jésuits dans le basin de la Plata* (1865). He presented to the city of Montevideo a well-equipped meteorological observatory.

MARTINE, mär'tĭn, JAMES EDGAR (1850–). An American legislator. He was born in New York City and was educated in the public schools. He engaged in farming near Plainfield, N. J., and dealt extensively in real estate and building operations. He was a candidate for various offices in New Jersey; was a warm supporter of Woodrow Wilson during the latter's governorship; and became United States Senator from New Jersey for the term of 1911–17. He attracted attention in the United States by championing the cause of the working class, particularly the miners of West Virginia and Colorado.

MARTINEAU, mär'tĭ-nō, HARRIET (1802–76). An English writer, sister of James Martineau, born at Norwich, England, June 12, 1802; educated mostly at home. She early became a convert to Unitarianism. Miss Martineau began writing when a girl, contributing her first article in 1821 to the *Monthly Repository*, the Unitarian organ. In 1829 the house in which had been placed the small fortunes of the family failed and Miss Martineau turned to literature for support. Her health had been precarious from girlhood and it now frequently broke down. For rest she visited America (1834–35) and Venice (1839). By 1845 she had passed from Unitarianism to agnosticism. In 1845–46 she settled near Ambleside by the English Lakes, where she lived till her death, June 27, 1876. Miss Martineau published 36 distinct works, comprising tales, novels, and essays on history, politics, economics, and philosophy, and contributed extensively to periodicals. In the *Daily News* alone appeared more than 1600 articles. She gained her first success with *Illustrations of Political Economy* (1832–34), a series of tales with a purpose, and *Illustrations of Taxation* (1834), in which she sought to popularize current theories through fiction. Among her other works are: *Society in America* (1837); *Western Travel* (1838); *Deerbrook*, a readable novel (1839); *The Playfellow*, good children's stories (1841); *Life in the Sick Room* (1843), autobiographical; *Letters on Mesmerism* (1845); *Eastern Life, Past and Present* (1848), in which she avowed her religious opinions; *History of England during the Thirty Years' Peace* (1849), a weighty piece of writing; *Letters on the Laws of Man's Social Nature and Development* (1851), written in conjunction with H. G. Atkinson; *The Philosophy of Comte* (1853), a condensation of the *Philosophie positive; Biographical Sketches* (1869). Though little of Miss Martineau's work has survived as a permanent literary possession, it was of great value to her generation. She was a popularizer of the advanced thinking of her day. Consult: *Autobiography, with Memorials* by M. W. Chapman (London, 1877); F. F. Miller, *Harriet Martineau* (Boston, 1890); J. F. Clarke, "Harriet Martineau," in his *Nineteenth Century Questions* (Boston, 1898).

MARTINEAU, JAMES (1805–1900). An English Unitarian divine, brother of the preceding. He was born at Norwich, April 21, 1805. He was educated for the ministry at Manchester College (Unitarian, then located at York) and was graduated in 1827. He spent one year teaching in Bristol and then, Oct. 26, 1828, he was ordained to the Presbyterian ministry in Dublin. He resigned his pastorate in Dublin because he objected to receiving state aid in the *regium donum*, though it would have increased his salary by £100. From Dublin he went to Liverpool, where he was settled over Paradise Street Chapel and eked out his income by taking pupils. Here he attracted considerable attention by engaging, along with J. H. Thom and Henry Giles, in a controversy against some clergymen of the Church of England on the subject of Unitarianism. Soon afterward Martineau was elected professor of mental and moral philosophy at Manchester New College and continued to lecture in the college when it was removed to London in 1853, though he also retained his pulpit in Liverpool for four years. In 1857 he took up his residence in London. The next year he added to his work the task of sharing the pulpit of Little Portland Street Chapel with J. J. Taylor, then principal of the college. Upon the death of Mr. Taylor in 1868 he became principal of the college and filled the chapel pulpit alone for four years, when the strain compelled him to give it up. He is the author of *The Rationale of Religious Inquiry* (1836); also *Unitarianism Defended* (in collaboration with Thom and Giles, 1839), the lectures delivered in the controversy referred to above; *Endeavors after the Christian Life* (2 vols., 1843–47); *Miscellanies* (1852); *Studies of Christianity* (1858); *Essays, Philosophical and Theological* (1866–67); *Religion as Affected by Modern Materialism* (1874); *Hours of Thought on Sacred Things* (1876–79); *Study of Spinoza* (1882); *Types of Ethical Theory* (1885); *Study of Religion* (1888); and *The Seat of Authority in Religion* (1890). He received honorary degrees from Harvard, Leyden, Edinburgh, Oxford, and Dublin. He died Jan. 11, 1900. In philosophy he was an intuitionist, maintaining that men have a power of conscience which, without aid from experience, can ascertain the higher of two conflicting motives. In theology he was, as already seen, a prominent Unitarian; but his greatest importance will probably remain in his ethical work.

Bibliography. J. H. Hertz, *The Ethical System of James Martineau* (New York, 1894); A. W. Jackson, *James Martineau: A Biography and Study* (Boston, 1900); Henry Sidgwick, *Lectures on the Ethics of Green, Spencer, and Martineau* (ib., 1902); *James Drummond, Life and Letters of James Martineau* (2 vols., New York, 1902); S. P. Cadman, "James Martineau," in *Charles Darwin and Other English Thinkers* (Boston, 1911).

MARTINELLA, mär'tē-nĕl'lȧ (It., crane).

A famous bell which in the old days of Florence used to announce the approach or declaration of war. It is usually spoken of in connection with the *carroccio*, a famous car of large size, drawn by oxen, which accompanied the citizens to the field of battle. After war was declared the martinella rang, and when at last the army moved out the bell was placed on a car which followed the carroccio, and guided the troops by its sound.

MARTINELLI, mär'tē-nĕl'lē, SEBASTIANO (1848–). An Italian Roman Catholic prelate. He was born near Lucca, in the seminary of which town he received his theological education. He entered the Augustinian Order in 1863, was ordained priest in 1871, and was elected prior general of the order in 1889 and again in 1895. On the recall to Rome of Cardinal Satolli, the first Apostolic Delegate to the United States, he was appointed to succeed him, and at the same time was raised to the episcopate as titular Archbishop of Ephesus (1896). His wise and statesmanlike conduct of many difficult questions brought him during his term as delegate was generally recognized. In 1902, having been made Cardinal in 1901, he was recalled.

MARTINET, mär'tē-nā', ACHILLE LOUIS (1806–77). A French engraver. He was born in Paris and was a pupil of the painter Heim and of Forster, the engraver. Many of his important plates were after the old masters, as Rembrandt's portrait by himself, Raphael's various Madonnas, and Murillo's "Nativity"; but he also engraved the works of more recent painters. Among them were "The Last Moments of Count Egmont," after Gallait; "Charles I Mocked by Cromwell's Soldiers"; and "Mary in the Desert," after Delaroche. His work is distinguished by great delicacy of line and perfect but somewhat rigid technique.

MARTINEZ, mär-tē'nĕz. A city and the county seat of Contra Costa Co., Cal., 35 miles by rail northeast of San Francisco, on the Straits of Carquinez and Suisun Bay and on the Southern Pacific Railroad (Map: California, C 5). It is an important shipping point for grain, grapes, and pears, has copper-smelting works and oil-refineries, and manufactures fertilizers, lumber, and acids, etc. The city contains the De La Salle Institute of Christian Brothers, a public library, park, and fine high school, courthouse, and city hall buildings. Pop., 1900, 1380; 1910, 2115.

MARTÍNEZ, mär-tē'nāth, ENRICO (c.1570–1632). A Mexican engineer, born, according to different biographers, either in Holland, Germany, or Spain. He probably received his engineering education in Spain, was appointed royal cosmographer, and went to Mexico in 1603 as an interpreter of the Inquisition. In 1607 he took charge of the construction of the canal which was to drain the valley of Mexico, a work which he completed in less than a year. This canal soon proved inadequate, however, and Martínez was eventually commissioned to deepen the cut, but died while the work was still under way. A monument to him was unveiled in Mexico City in 1883. He wrote: *Discurso sobre la magna conjunción de los planetas Júpiter y Saturno, acaecida en 24 Diciembre 1603 en Sagitario* (Mexico, 1604); *Repertorio de los tiempos, é historia natural de Nueva España* (Mexico, 1606), and a *Tratado de trigonometria*. He also designed 32 maps of the Pacific coast of Mexico.

MARTÍNEZ DE CAMPOS, mär-tē'nāth dā kăm'pōs, ARSENIO (1831–1900). A Spanish general and statesman, born at Segovia, Dec. 14, 1831. He served on General O'Donnell's staff in the campaign of Morocco, 1859, was with Prim during Spain's brief participation in Mexican affairs in 1861, and joined the army in Cuba in 1869, remaining until 1872. On the abdication of King Amadeus (q.v.), in 1873, he was given several important commands under the Republic, in all of which he distinguished himself by his ability. On Dec. 29, 1874, at Murviedro (Sagunto), in conjunction with General Jovellar, he proclaimed the son of the deposed Queen Isabella, Alfonso XII, King of Spain. The army followed his lead, a ministerial regency under Cánovas del Castillo was formed, and in January, 1875, the youthful Alfonso was established in Madrid and the monarchy was restored. Martínez de Campos brought the civil war to a successful issue by the defeat of the Carlists at Peña de Plata (1876), and was rewarded by the gift of the highest rank in the army. In the same year he was sent to Cuba to conduct the military operations against the insurgents. The central insurgent committee submitted in 1878, and, the insurrection being at an end, Martínez de Campos returned to Spain and became the advocate of a just and liberal policy towards the colony. Cánovas del Castillo resigned March 7, 1879, and Martínez de Campos headed a new ministry, but was unable to hold power for many months. Upon his return to office, however, Cánovas carried out the main features of the General's Cuban programme. In 1881 Martínez de Campos made a coalition with the Liberal leader Sagasta (q.v.), which lasted until 1884, and was Minister of War under him. In 1886, in 1891, and in 1899 he was president of the Senate. In 1893, as Governor of Catalonia, he was wounded by a bomb while suppressing anarchist riots in Barcelona, occasioned by the new taxes of the government, and unsuccessful attempts were made to assassinate him and his family. He was sent to Cuba as captain general upon the outbreak of a new insurrection in 1895, in the hope that he would repeat his former success as a pacificator; but he was recalled in January, 1896, and thereafter took part as a Moderate Liberal in the endeavor to bring about a reorganization of Spanish affairs and a restoration of prosperity. His conspicuous services were highly appreciated both at home and abroad. He was a Knight Grand Cross of the following orders: San Fernando, San Hermenegildo, and Military Merit, in Spain; Tower and Sword, in Portugal; and Leopold, in Austria. He was also a Knight of the Golden Fleece, in Spain; and Grand Cordon of the Legion of Honor, in France.

MARTÍNEZ DE LA ROSA, dā lā rō'sā, FRANCISCO DE PAULA (1789–1862). A Spanish statesman and man of letters. He was born in Granada, March 10, 1789; studied law at the University of Granada, and was appointed lecturer on ethics there when less than 20 years old, and attained some celebrity by a series of epigrams concerning local personages, which he published under the title of *El cementerio de momo*. The French had just invaded Spain, and he entered enthusiastically into the national movement. He was employed by the Junta of Granada to procure arms and supplies at Gibraltar, and he afterward went to England on the same errand. There, in 1811, his first poem, *Zaragoza*, was published. On his return to Spain he produced, at Cadiz, a tragedy called *La*

viuda de Padilla, which was successful and was followed by a comedy, *Lo que puede un empleo,* satirizing political life. In 1813 he was returned to the Cortes from Granada and at once took a high position as an orator. He was a supporter of the constitution of 1812, on the abolition of which, in 1814, Martínez was sentenced to imprisonment for 10 years in the fortress of the Peñón de la Gomera. Released by the insurrection of 1820, he was for a short time head of the ministry, but, having become by 1823 the most unpopular man in the country through his attempt to harmonize all parties, he resigned and took up his residence in Paris. Between 1827 and 1837 he published a collection of his *Obras literarias* in five volumes. In 1830 he was permitted to return to Spain, and began to write an historical novel, *Doña Isabel de Solís,* in imitation of Sir Walter Scott. In March, 1834, he became the head of a Liberal ministry, and was the author of the royal statute of 1834 which created a constitutional government and took away the ancient privileges of the provinces. He was also influential in making the Quadruple Alliance (England, France, Spain, and Portugal), because of which Spain sent an army into Portugal to expel the pretenders Miguel and Carlos. And yet his unpopularity increased so rapidly that he resigned in 1834. On the fall of Queen María Christina in 1840 he went to Paris and resumed the composition of *Espiritu del siglo,* a work dealing with the French Revolution, which had been begun in 1835. Upon the fall of Espartero he entered in May, 1844, the Narváez cabinet, and was from 1847 to 1851 Ambassador to Paris. He died at Madrid, Feb. 7, 1862. His periods of exile at Paris threw him into contact with the leaders of the Romantic movement and he was so much impressed that after a successful attempt at a play in French, *Aben-Humeya,* he produced, on his return in 1834, *La conjuración de Venecia,* which opened the way for the Romantic drama in Spain. Consult Godard, *Martinez de la Rosa* (Paris, 1862).

MARTÍNEZ DE ROZAS, dā rōsȧs, JUAN (1759–1813). A Chilean patriot, born in Mendoza, Argentina (then Chile). He studied in a college in Mendoza and at the University of Santiago de Chile, receiving a degree in law in 1784. He was intendant of the city of Concepción for a number of years, and in 1808 the captain general, Francisco García Carrasco, made him his private secretary, in which position Rozas had opportunity to introduce many reforms. He joined the revolutionary movement in 1810 and was made a member, and later president, of the Junta of Santiago, where his popularity was very great. On account of discords among the patriots he was banished, in 1812, by José Miguel Carrera, to Mendoza, where he died. A man of advanced ideas and republican sentiments, he exercised a remarkable influence in Chile and is called the "founder and teacher of the Chilean nation."

MARTÍNEZ MONTAÑÉS, JUAN. See MONTAÑÉS, JUAN MARTÍNEZ.

MARTINI, mär-tē′nē (OF SIENA) (1439–1502). An Italian architect, born in Siena. He was attached to the courts of Urbino (1476) and Naples (1491). He is chiefly known for his translation of Vitruvius into Italian, and for the beautiful church of Madonna del Calcinaio at Cortona, begun in 1485. The present dome was added after his death by Pietro Nozzi.

MARTINI, GIAMBATTISTA (PADRE MARTINI) (1706–84). An Italian composer and writer on music. He was born at Bologna and studied the elements of music under his father and Padre Predieri, and counterpoint under Antonio Riccieri. In 1729 he entered a Franciscan monastery, after having served as choirmaster at the church of San Francesco, Bologna, since 1725. He wrote two of the most learned treatises on music of the eighteenth century—*Storia della musica* and *Saggio di contrappunto.* Many of his compositions are in manuscript at Vienna and Bologna. His fame as a teacher of composition was very great. He was a firm adherent of the Roman school of composition and wrote a considerable number of works in that style. He died in Bologna. Consult L. Busi, *Il padre, G. B. Martini* (Bologna, 1891).

MARTINI, SIMONE, wrongly called SIMONE MEMMI (?1284–1344). One of the chief painters of the early Sienese school. He was born at Siena, where he studied under Duccio, whose influence was the chief one in the formation of his art. His artistic activity falls into three distinct periods, marked by his residence at Siena, Assisi, and Avignon. From about 1320 to 1333 there are notices of payments to him for works executed for the Palazzo Pubblico and other buildings in Siena. From 1333 to 1339 he was occupied with an important series of frescoes at Assisi. In 1339 he was called by Benedict XII to the papal court at Avignon, where he was employed with his brother Donato in the decoration of the papal palace. He died at Avignon in 1344. With the exception of a few portraits his subjects were religious.

In Siena his important work is a large wall painting in the Palazzo Pubblico, a splendid "Majestas," i.e., the Madonna, surrounded by saints and angels (1315). On the wall opposite this painting is an equestrian portrait of a Sienese captain at arms, Guidoriccio Fogliano (1328), riding through the land—"mediæval pride of life incarnate," as Berenson aptly says. "The Legend of Beato Agostino Novello" in the church of St. Agostino in Siena is also ascribed to him by Berenson. A beautiful altarpiece which was formerly in the Siena Cathedral, "The Annunciation" (1333), was painted by Simone in collaboration with Lippo Memmi, and is now in the Uffizi Gallery at Florence. In the Chapel of St. Martin in the Lower Church at Assisi are a series of magnificent frescoes illustrating the legend of St. Martin and other saints. In Naples at the church of San Lorenzo is a fresco, "St. Louis of Toulouse Crowning his Brother Robert" (1324), painted when the church was completed by King Robert I. At Avignon there are fragments of frescoes attributed to him by Berenson and others. In the papal palace and cathedral and in the chapel of St. John there are frescoes illustrative of the life of that saint. The chief characteristics of his painting are its splendid decorative quality, its gorgeous yet harmonious color, its flowing line. His other works include: Polyptychs in the Opera del Duomo, Orvieto, and at Pisa (both c.1320), and in Fenway Court, Boston, and the former Avignon altarpiece, with scenes from the Passion, parts of which are in Paris, Berlin, and Antwerp. Consult Bernhard Berenson, *Central Italian Painters of the Renaissance* (New York, 1897).

MARTINIQUE, mär′tē′nēk′. An island and French colony of the Lesser Antilles, situated between lat. 14° 23′ and 14° 52′ N. and on the

meridian of 61° W., between Dominica on the north and St. Lucia on the south (Map: West Indies, G 4). Area, 381 square miles. The island is in greater part of volcanic origin, the loftier elevations (Mont Pelée, in the northwest, now about 4900 feet in elevation; the Pitons du Carbet, 3960 feet; the Vauclin, in the south) being all of lava or agglomerate masses, whose age dates back to some portion of the Tertiary period. Isolated patches of limestone, of Miocene and Pliocene age, occur in the east and in the south (near Trinité, the Marin, etc.), and there is also a detached bordering of recent coral structures. Much of the interior surface is a comparatively recent alluvium, formed from the disintegration of the prehistoric lavas. The relief of the land is essentially mountainous, the *mornes* and *pitons* rising with marked abruptness and forming the landscape that is so distinctive of most of the inner (volcanic) islands of the Lesser Antilles. Between these are valleys of beautifully flowing contour and deeply incised cañon-like troughs. The culminating point of the island is Mont Pelée, whose height has increased by nearly or fully 700 feet since May, 1902.

A large part of the island, somewhat over a third, is under cultivation. The principal crop is sugar cane, but a superior grade of cacao has been raised with success and profit; coffee, tobacco, and cotton are grown in some parts. Where not under cultivation the island is still largely covered with woodland, and a forest of strictly tropical luxuriance is found in scattered spots. The higher animal life is not very abundant, and its characteristics are largely South American, marked with the deficiencies that belong to insularity. Of the seemingly native animals the opossum, which has been known in the island for upward of 200 years, is the most notable. Of the birds the most abundant or common species is probably the Martinique blackbird. Of the dreaded fer-de-lance serpent, which was at one time very abundant, but few individuals remain to-day, the animal having been all but exterminated by the introduced mongoose.

The interior of the island is crossed by well-constructed highroads, but there are as yet no railways, excepting a few that are used in private transport on the cane plantations. The climate is on the whole salubrious, and the heat is measurably tempered, especially on the eastern side, by the steadily blowing trade winds, the temperature only exceptionally rising above 92° F. to 94° F. The humidity is, however, high. July and August are ordinarily the most rainy months, and February, March, and April the months of least rainfall. The annual precipitation is from 85 to 95 inches. Earthquakes are of frequent occurrence. That of 1839, which destroyed a large part of Fort de France, was particularly destructive. The only historically recorded volcanic eruptions that took place before the year 1902 were those of 1762 and August, 1851, both of Mont Pelée. See PELÉE, MONT.

Of the population much the greater part consists of the colored races, especially negroes and mulattoes; hardly a vestige, except in mixture, remains of the ancient Carib Indians. In 1878 the inhabitants numbered 162,861; in 1888, 175,863; in 1901, 203,781; in 1905, 182,024; in 1911, 184,084. The capital of the colony is Fort de France, which had 22,164 inhabitants in 1901 and 26,935 in 1911. Other important towns are Lamentin, Ste. Marie, Trinité, François, Robert, Gros Morne, St. Joseph, and Carbet, with populations ranging from 6000 to nearly 11,000. St. Pierre, of which nothing but ruins now remain, was, up to the time of its destruction, the largest and most important town on the island.

The colony is administered by a governor (appointed by the home government of France) and a general council, and there are elective municipal councils. It is represented in the French Parliament by one senator and two deputies. In 1890, in the general trade, imports and exports were valued at 30,261,000 and 23,350,000 francs respectively; in 1900, 24,763,000 and 26,979,000; in 1910, 19,563,000 and 27,587,000; in 1912, 21,520,000 and 30,523,000. In 1912 the trade with France amounted to 11,510,000 francs imports and 28,574,000 francs exports. In 1911 there were entered 88 vessels, of 156,000 tons. The island of Martinique was discovered by Columbus, who subsequently landed near Carbet, on June 15, 1502. In 1635 a fort was erected by the Frenchman D'Esnembuc on the site of the later St. Pierre. The English took the island repeatedly from the French, holding it for the last time during the Napoleonic wars. Slavery was abolished by decree of April 27, 1848. The Empress Josephine was born at Trois-Ilets.

Bibliography. Daney, *Histoire de la Martinique depuis la colonisation jusqu'en 1815* (Fort Royal, 1846); Rey, *Etude sur la colonie de la Martinique* (Paris, 1881); Aube, *La Martinique, son présent et son avenir* (ib., 1882); Monet, *La Martinique* (ib., 1882); Heilprin, *Mont Pelée and the Tragedy of Martinique* (Philadelphia, 1903); Dumoret, *Au pays du sucre* (Paris, 1901); Landes, *Notice sur la Martinique* (ib., 1900); Garaud, *Trois ans à la Martinique* (5th ed., Nancy, 1902); Russell, "Volcanic Eruptions on Martinique and St. Vincent," in *National Geographic Magazine*, vol. xiii, containing a bibliography (Washington, 1902).

MARTINIQUE, PETIT. See GRENADINES.

MAR'TIN MAR'PREL'ATE CONTROVERSY. A bitter religious dispute of the Elizabethan period. It was occasioned by the publication, 1588–89, under the name of Martin Marprelate, Gentleman, of a number of bitterly personal tracts directed against what the writer conceived to be abuses in Church and state, and against certain bishops in particular. The publisher and chief instigator was John Penry (q.v.), or Ap-Henry, a Puritan preacher, abetted by Sir Richard Knightley of Northamptonshire, Job Throckmorton of Warwickshire, and others. The tracts were printed on a rude and peripatetic press, at Kingston-on-Thames, Coventry, Manchester, etc., and provoked in reply a great number of abusive books and pamphlets. Martin's broad satires were disapproved by devout Puritans, but undoubtedly they were powerful factors in furthering the Puritan cause. Great efforts were made to discover and apprehend the authors. Penry was executed in 1593. Henry Barrow, one of his assistants, to whom the chief responsibility for the tracts has sometimes been attributed, also suffered death in the same year. The tracts have been reprinted by Arber in the *English Scholar's Library* (London, 1878 et seq.). Consult: William Maskell, *A History of the Martin Marprelate Controversy* (London, 1845); E. Arber, *Introductory Sketch to the Martin Marprelate Controversy* (ib.,

1879); H. M. Dexter, *Congregationalism of the Last 300 Years as Seen in its Literature* (New York, 1880); J. D. Wilson, in *Cambridge History of English Literature*, vol. iii (Cambridge, 1909); William Pierce, *Historical Introduction to the Marprelate Tracts: A Chapter in the Evolution of Religious and Civil Liberty in England* (New York, 1909).

MAR'TINMAS. A festival celebrated on St. Martin's Day, November 11. Luther was born on the eve of the festival and therefore received the saint's name.

MAR'TIN OF TOURS, tōōr (c.316–c.400). Bishop of Tours and patron saint of France. He was born at Sabaria, Pannonia, of heathen parents, about 316. He was educated at Pavia, and at the desire of his father, who was a military tribune, entered the army at an early age under Constantine the Great. The virtues of his life as a soldier are the theme of more than one interesting legend. On obtaining his discharge from military service (336), Martin became a disciple of Hilary (q.v.), Bishop of Poitiers. He returned home and converted his mother to Christianity, but he himself endured much persecution from the Arian party, who were at that time dominant; and in consequence of the firmness of his profession of orthodoxy he is the first who, without suffering death for the truth, has been honored in the Latin church as a confessor of the faith. On his return to Gaul, about 360, he sought a hermit life in Ligugé, near Poitiers, where soon monks gathered about him and a convent was established. In 371 he was drawn by force from his retreat and ordained Bishop of Tours. The fame of his sanctity and his repute as a worker of miracles attracted crowds of visitants from all parts of Gaul; and in order to avoid the distraction of their importunity he established a monastery near Tours, in which he resided. He died at Candé (Candeum) about 400. His life is the subject of a great number of legends. In the Roman Catholic church the festival of his birth is celebrated on November 11. Consult: Chamard, *St. Martin et son monastère* (Poitiers, 1873); J. G. Cazenove, *St. Hilary of Poitiers and St. Martin of Tours* (London, 1883); Scullard, *Martin of Tours, Apostle of Gaul* (ib., 1891); *Cambridge Mediæval History*, vol. i (Cambridge, 1911).

MARTIN PROCESS. See IRON AND STEEL, *Open-Hearth Process.*

MAR'TINSBURG. A city and the county seat of Berkeley Co., W. Va., 75 miles west of Washington, D. C., on the Baltimore and Ohio and the Cumberland Valley railroads (Map: West Virginia, F 2). Its most prominent structures are the United States courthouse and post office, King's Daughters and city hospitals, and the county courthouse. The industrial interests are represented by railroad repair shops, woolen, cassimere, and hosiery mills, grain elevators, flour mills, clothing factories, distilleries, lime works, extensive slate and limestone quarries, wagon and carriage shops, lumber and planing mills, automobile works, and cement plants. The surrounding region is rich in fruit, particularly apples and peaches, and there are important live-stock and agricultural interests. The municipality is governed by a mayor, elected every two years, and a unicameral council. The executive power is vested in an appointed board of affairs. The city owns and operates the water works. Martinsburg was founded and incorporated as a town in 1778. Pop., 1900, 7564; 1910, 10,698; 1914, 12,032; 1920, 12,515.

MAR'TINS FERRY. A city in Belmont Co., Ohio, on the Ohio River, nearly opposite Wheeling, W. Va., and on the Baltimore and Ohio, the Wheeling and Lake Erie, and the Pennsylvania railroads (Map: Ohio, J. 5). It is in an agricultural, bituminous-coal, and limestone region, and, besides productive coal mines, has extensive manufactures of iron, steel, tin, glass, machinery, heaters, galvanized-iron products, stoves, boxes, and barrels. Walnut Grove Cemetery is interesting as the burial place of persons prominent in the history of the settlement of the Ohio valley. Settled about 1769, Martins Ferry was incorporated as a village in 1865. It is governed under the Ohio municipal code, which provides for a mayor, elected biennially, and a unicameral council. The water works and electric-light plant are owned and operated by the municipality. Pop., 1900, 7760; 1910, 9133; 1914 (U. S. est.), 9718; 1920, 11,634.

MAR'TINSVILLE. A city and the county seat of Morgan Co., Ind., on the White River, 30 miles southwest of Indianapolis, on the Vandalia and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Indiana, E 6). It is widely noted for its artesian mineral wells and has several large sanatoriums. The city contains a Carnegie library and has flour, saw and planing mills, woodenware factory, chair factory, and brick plants. The water works and electric-light plant are owned by the municipality. Pop., 1900, 4038; 1910, 4529.

MARTINSVILLE. A town and the county seat of Henry Co., Va., 40 miles (direct) west by north of Danville, on the Norfolk and Western and the Danville and Western railroads (Map: Virginia, E 5). Attractive features of the town include the courthouse, municipal building, post-office and high-school buildings, and the Roundabout stock farm. There are cotton mills, furniture factories, tobacco warehouses, and spoke factories. Farming is also engaged in extensively. Martinsville owns its water works, electric-light and telephone plants. Pop., 1900, 2384; 1910, 3368.

MARTINUS SCRIBLERUS, mär-tī'nŭs skrĭb-lē'rŭs, MEMOIRS OF (Neo-Lat., Martin Scribbler). An extensive satire (1741), written principally by John Arbuthnot (q.v.), with Swift and Pope also among the contributors. Its aim was at one with that of the Martinus Scriblerus Club, formed by the men above named at Pope's suggestion with a view to satirizing literary dullness and incompetence. The chief monument of the association is Pope's contribution to the labors of the club—*The Dunciad* (completed 1741).

MARTINUZZI, mär'tē-nōōt'sē, GEORG (GYÖRGY UTIEŠENOVIĆ), also known in Hungarian history as FRATER GEORGIUS (or GYÖRGY) (1482–1551). A Hungarian statesman, born at Kamičic in Croatia. He entered the Pauline order in 1510; became Bishop of Grosswardein in 1534; and was consecrated Archbishop of Esztergom and made Cardinal in 1551. His political career began with his successful negotiations with Ferdinand for the return of Buda to John Zapolya, King of Hungary, in 1529. Thereafter he was treasurer and chief councilor of Zapolya, and upon the latter's death in 1540 was Regent of Hungary and guardian of the infant King, John Sigismund. He was opposed in his policies by the Queen mother, Isabella,

who sought to bring in the Austrians, but he defeated her purpose. For 10 years subsequently he brilliantly maintained a trying and perilous position between the mutually hostile Austrians and Turks; but finally he was assassinated by the permission of Emperor Ferdinand, who accused the frater of treason.

MARTINY, märˈtē′nĭ, PHILIP (1858–). An American sculptor. He was born in Alsace, where he studied under Eugène Dock. In the early eighties he came to the United States and entered the studio of Augustus Saint-Gaudens. He did much to raise the standard of decorative sculpture in the United States. His conceptions are original and spontaneous, his execution skillful, his modeling simple yet rich. Among his best-known decorative works are the sculpture for the grand staircase of the Congressional Library, Washington, for the Carnegie Library, Washington, and for the Hall of Records, New York; the bronze doors of St. Bartholomew's Church, New York; two groups in the Chamber of Commerce, New York; and figures and a fountain for Senator Clark's residence in New York. Among his monumental works are the Soldiers and Sailors Monument, Jersey City; the McKinley Monument, Springfield, Mass.; the monument to Admiral de Gernay, Newport, R. I., and the portrait statue of Vice President Hobart, Paterson, N. J.

MAR'TITE. A form of hematite (q.v.) pseudomorphus after magnetite.

MARTITZ, märˈtĭts, FERDINAND VON (1839–). A German international law scholar, born in Insterburg and educated at Königsberg and Leipzig. He taught at Königsberg from 1864 to 1872, was professor at Freiburg in 1872–75 and at Tübingen from 1875 to 1898, and then was appointed to a chair in Berlin. In 1898–1903 he was a member of the Prussian Oberverwaltungsgericht, and he was a member of the permanent Court of Arbitration at The Hague. His published works include: *Internationale Rechtshilfe in Strafsachen* (1888–97); *Die Monarchie als Staatsform* (1903); *Völkerrecht* (2d ed., 1913); and he contributed the section on international law to the volume *Systematische Rechtswissenschaft* (1913) in the Teubner series "Kultur der Gegenwart."

MARTIUS, märˈtsĭ-ŭs, KARL FRIEDRICH PHILIPP VON (1794–1868). A distinguished German traveler and naturalist, born and educated in medicine at Erlangen. He went to Brazil (1817–20) as a member of a scientific expedition sent out by the Austrian and Bavarian governments, and by his researches in that country acquired a reputation second only to that of Humboldt. He was specially intrusted with the botanical department, but his researches extended to ethnography, statistics, geography, and natural science in general; and his works, published after his return, exhibited a poet's love of nature and great powers of description. He was professor of botany and director of the Botanic Garden at Munich from 1826 until he retired in 1864. Among his works are: *Reise nach Brasilien* (1824–31); *Nova Genera et Species Plantarum* (1824–32); *Icones Plantarum Cryptogamicarum* (1828–34). He also published a most valuable monograph on palms, *Historia Naturalis Palmarum* (1823–53); *Die Pflanzen und Thiere des tropischen Amerika* (1831); *Das Naturell, die Krankheiten, das Arzttum und die Heilmittel der Urbewohner Brasiliens* (1843); *Beiträge zur Ethnographie und Sprachenkunde Amerikas* (1867). Consult Meissner, *Denkschrift auf Karl F. P. von Martius* (Munich, 1869).

MARTIUS' YELLOW. See COAL-TAR COLORS.

MART'LET (probably for **marlet*, **merlet*, from OF. *merlette*, *merlotte*, probably the dim. of *merle*, blackbird, from Lat. *merula*, blackbird). In heraldry (q.v.), a martin without legs or beak. Also used as the difference for the fourth son.

MARTOS, märˈtŏs. A town of south Spain, in the Province of Jaén, situated among the mountains 15 miles southwest of Jaén (Map: Spain, D 4). It is built on the slope of a steep hill, surmounted by a ruined castle, has mineral baths and exports excellent olive oil, produced in the surrounding district. Pop., 1900, 16,682; 1910, 17,025.

MARTOS Y BALBÍ, märˈtŏs ē bäl-bē′, CRISTINO (1830–93). A Spanish politician, jurisconsult, and orator. Born at Granada, he studied letters and philosophy there and at Toledo and jurisprudence at Madrid. In 1851, while still a student at Madrid, he started a student rebellion against a recently decreed law concerning public instruction. The example of Madrid was followed in other university centres throughout the country, and the government dismissed from their respective universities for one year Martos and a few others of the leaders. This was the beginning of a stormy political career that obliged him to stay abroad from 1866 to 1869, when he returned and was elected to Congress. In 1874 he resumed his law practice, but in 1879 he was again elected deputy and by successive reëlections continued to serve in that capacity the rest of his life. He held various portfolios under various ministries and was for a while president of the Congress.

MARTUCCI, märˈtōōt′chē, GIUSEPPE (1856–1909). An Italian composer and pianist, born at Capua. Having received his first musical instruction from his father, a trumpet player, he entered the Conservatory of Naples in 1867. Here he studied piano and composition under Costa, Cesi, Serrao, and Rossi, graduating in 1872. Two years later he was appointed professor in that institution. As conductor of the concerts established by Prince d'Ardore he won fame. Beginning his career as a concert pianist in 1875, he visited Germany, France, and England, meeting everywhere with signal success. In 1886 he accepted the position of director at the Liceo Musicale of Bologna, where he also conducted at the Opera. Here he scored a phenomenal success in 1888, when he conducted the first performance in Italy of *Tristan und Isolde*. From 1902 until his death he was director of the Conservatory at Naples. He is one of the few modern Italian composers who have won a high rank in the field of pure instrumental music. His works include two symphonies, two concertos for piano and orchestra, a piano quintet, two piano trios, a sonata for piano and cello, several string quartets, an organ sonata, numerous compositions for piano.

MARTVYEEV, märt-vyā′ĕf, ARTAMON SERGYEEVICH (?–1682). A Russian statesman. He gained distinction as a scholar and author; became chief counselor of Czar Alexius in 1671; and attained the rank of boyar (q.v.) in 1674. When Alexius died Martvyeev proposed to have the Czarevitch Peter elevated to the throne instead of the sickly Theodore, but the hostile

boyars and relatives of Theodore proclaimed him Czar and banished Martvyeev from court. When Peter (the Great) was proclaimed in 1682, Martvyeev was summoned to court as Peter's chief adviser, but was immediately killed by rebellious musketeers. His political and educational reforms under Alexius had an important influence on the later introduction of western ideas in the reign of Peter the Great.

MARTY, mär'tē', George Eugène (1860–1908). A French composer and orchestral conductor, born at Paris. He was a pupil of Massenet at the Conservatory and in 1882 won the Prix de Rome with his cantata *Edith*. In 1892 he took charge of the ensemble classes at the Conservatory, and also acted as chorus master at the Théâtre Eden. During the season of 1895–96 he was conductor at the Grand Opéra. During his incumbency as conductor of the Concerts du Conservatoire from 1901 to his death he proved himself one of the greatest concert conductors France ever produced. His compositions include the operas *Le Duc de Ferrare* (1899) and *Daria* (1905); a pantomime, *Lysic;* an overture, *Belsazar;* a *Suite romantique;* a symphonic poem, *Merlin enchanté;* piano pieces and songs.

MARTYN, mär'tĭn, (William) Carlos (1841–). An author and Congregational minister, born in New York City. After graduating from Union Theological Seminary in 1869 his first charge was in St. Louis, and afterward he held pastorates at Portsmouth, N. H., New York City (1876–90), Newark, and Chicago (1892–94). From 1897 to 1903 he was literary director of the Abbey Press, New York. Thereafter until 1905 he lectured and served occasionally as a supply, and in 1906 he became pastor at Noroton, Conn. His work includes: *Life of John Milton* (1865); *Life of Martin Luther* (1865); *History of English Puritans* (1866); *History of the Huguenots* (1867); *The Dutch Reformation* (1869); *History of the Pilgrim Fathers* (1870); *Wendell Phillips, the Agitator* (1891), for the "American Reformers Series," of which he was editor; for the same series, *William E. Dodge, the Merchant* (1891) and *John B. Gough* (1894); *Christian Citizenship* (1896); *Sour Saints and Sweet Sinners* (1898), a novel.

MARTYN, mär'tĭn, Edward (1859–). An Irish dramatist, educated at Belvedere College, Dublin, at Beaumont College, Windsor, and at Oxford, who played an important part in the Irish literary revival. It was he who, with Lady Gregory and George Moore, founded the Irish National Theatre, and he met the expenses of its initial performances; and it was his *The Heather Field* and W. B. Yeats's *Countess Kathleen* that in 1899 inaugurated the dramatic activities which that theatre, under changing names, was creditably to continue. An ardent patriot and an ardent Catholic, his convictions color his dramatic and other writings. His plays show the Ibsen influence. His interest in music led him to establish a fund of $50,000 to found a Palestrina choir in Dublin. In addition to *The Heather Field* and a satire, *Morgante the Lesser* (published under the pen name of Sirius in 1890), Martyn wrote: *Maève* (1899); *The Tale of a Town* (1902); *An Enchanted Sea* (1902). Consult George Moore's trilogy *Hail and Farewell* (New York, 1911–13), passim, for information regarding Martyn's part in certain phases of the Irish literary revival, and see Irish Literature, *Irish Literature in English.*

MARTYN, Henry (1781–1812). An English missionary. He was born at Truro, Cornwall, England, Feb. 18, 1781, of humble origin. In 1797 he entered St. John's College, Cambridge, and in 1802 was chosen fellow of his college. After receiving ordination in 1803 he served as curate to the Rev. Charles Simeon (q.v.). In 1805 he sailed for India as chaplain in the East India Company's service, and reached Calcutta in May, 1806; in September he received his appointment to Dinapur, and soon conducted worship among the natives in their own language and established schools for their instruction. In 1809 he was stationed at Cawnpore. While here he translated the New Testament into Hindustani and Persian, the Psalms into Persian, and the Prayer Book into Hindustani. His unremitting labor in the Indian climate affected his health, and he sought restoration in a voyage to Persia. He penetrated to Shiraz, where he revised, with the aid of learned natives, his Persian and Arabic translations of the New Testament and held discussions with the native scholars, many of whom were greatly impressed. In view of the effect of his frequent discussions, and of his being engaged in a translation of the New Testament into Persian, the preceptor of all the mollahs wrote an Arabic defense of Mohammedanism. To this Martyn replied in Persian. Ill health again compelling him to change his plans, he decided to return to England, and in September, 1812, set out overland for Constantinople. At Tokat in Asia Minor his utter prostration compelled him to stop, and he died there, Oct. 16, 1812. A monument was erected at Tokat in 1856. Besides the translations mentioned he was the author of *Controversial Tracts on Christianity and Mohammedanism* (1824). The story of his brief career had a great missionary influence in both Great Britain and America. Consult: *Journals and Letters of the Reverend Henry Martyn,* edited by Samuel Wilberforce (2 vols., London, 1837); C. D. Bell, *Henry Martyn* (New York, 1881); George Smith, *Henry Martyn, Saint and Scholar, First Modern Missionary to the Mohammedans, 1781–1812* (London, 1892).

MARTYN, Thomas (1735–1825). An English clergyman and botanist, born at Church Lane, Chelsea. He graduated at Emmanuel College, Cambridge, in 1756, became a fellow of Sidney Sussex College, and was ordained priest in 1759. From 1762 to 1825 he served as professor of botany at Cambridge, succeeding his father, John Martyn, who had held the same position for 28 years. Thomas Martyn was not only a distinguished teacher of his subject in Cambridge, but was the author of several books, the best known of which was the translation and continuation of Rousseau's *Letters on the Elements of Botany,* the eighth edition of which appeared in 1815. This was the standard English text for a long period. He also wrote *The Language of Botany* (1793), a dictionary of botanical terms and notes, and was one of the editors of *A Botanical Dictionary,* which was published in the United States in 1817. Much interested in insects, he published a *Natural History of Spiders, The Coleoptera,* etc., and also extended his interest to other fields of zoölogy, publishing, among other works, *The Universal Conchologist.*

MARTYN'IA (Neo-Lat., named in honor of John Martyn, an English botanist of the eighteenth century). A genus of eight or 10 species

of unpleasant smelling, low, branching annual or thick-stemmed perennial plants with tuberous roots, belonging to the family Martyniaceæ, mostly natives of warm countries. The leaves are simple, rounded; flowers large, bell-shaped, and somewhat two-lipped, very similar to catalpa flowers, borne in racemes; the fruit is a pod

MARTYNIA (UNICORN PLANT).

with a long incurved beak; when ripe it splits into two-hooked horns, opening at the apex. The seeds are numerous, black, with a thick, wrinkled coat. *Martynia louisiana*, unicorn plant, which grows on river banks and waste places in southern Indiana and Illinois and southwestward, is cultivated in gardens for its fruit, which, when the pods are young, is used for making pickles. The leaves of this species are heart-shaped, oblique, entire, the upper alternate; corolla dull white or purple or spotted with yellow and purple; endocarp of the fruit crested on one side, long-beaked. *Martynia fragrans*, from New Mexico, has violet-purple flowers, with a rather pleasant odor, somewhat like that of vanilla.

MAR'TYR (AS., Lat. *martyr*, from Gk. *μάρτυς, martys, μάρτυρ, martyr*, witness; connected with Lat. *memor*, mindful, Skt. *smar*, tŏ remember). The name given in ecclesiastical history to those who bore witness to their faith by death, though the title was not strictly confined to these, but usually extended to those who were condemned to torture, to hard labor in the mines, or to banishment. On the other hand, it was not attributed to those who sought death by self-denunciation or by public breaking of the statues of the gods. The common teaching of the Fathers was that martyrdom, hence called the baptism of blood, supplied the place of the ordinary baptism where there was no opportunity to receive the sacrament. The martyrs were specially venerated by their fellow Christians. As it was held that their superabundant merit might, in the eyes of the Church, compensate for the weakness of less perfect brethren, a practice arose by which martyrs awaiting death gave to those sinners who were undergoing public penance letters of commendation to their bishop in order that their course of penance might be shortened. (See INDULGENCE.) The death of a martyr was reported to the bishop of the place, who decided whether he was entitled to the name; this early form of canonization made him a *martyr vindicatus*. By the beginning of the twelfth century the decision was becoming more generally, and since Urban VIII (1636) has been absolutely, reserved to the Pope. The martyrs, who were the earliest saints to be honored by a special anniversary commemoration, have in later times received a special precedence in liturgical rank—their names in the litany of the saints, e.g., coming immediately after those of the Apostles. In the old Roman calendar there was a common feast of all the martyrs, of which Gregory III, when in 731 he transferred it to November 1, widened the reference to include all saints. The number of the martyrs of the early ages was undoubtedly great, although Gibbon and others have attempted to minimize it. Ruinart among older scholars and Cardinal Wiseman in modern times have given strong evidence in confirmation of the large numbers. The Roman martyrology alone contains 14,000 names.

MARTYR, PETER. A writer on early American history. See PETER MARTYR.

MARTYR, PETER. An Italian Reformer. See VERMIGLI, PIETRO MARTIRE.

MARTYRE DE SAINT SÉBASTIEN, mȧr'tēr' de săN sā'bȧs'tyăN', LE (Fr., The Martyrdom of St. Sebastian). An oratorio by Debussy (q.v.), first produced in Paris, May 22, 1911.

MAR'TYROL'OGY (ML. *martyrologium*, MGk. *μαρτυρολόγιον*, from Gk. *μάρτυρ, martyr*, martyr + *-λογία, -logia*, account, from *λέγειν, legein*, to say). A calendar of martyrs (see MARTYR), and sometimes of other saints, arranged in the order of months and days. It early became usual to write on diptychs or folding tablets the names of Christians, living or dead, who were to be especially commemorated in the celebration of the Eucharist. Thus were inscribed particularly the names of martyrs whose anniversaries were honored. These, which were at first only lists of names, were gradually expanded, and by combining the records of various churches complete martyrologies were made. The oldest extant martyrology is probably a Syrian one of the year 412 (see below), though the so-called *Martyrologium Hieronymianum* may be almost contemporary with it, at least in part. This has been ascribed to St. Jerome, possibly because he translated and commented upon the work of Eusebius, *De Martyribus Palæstinæ*. It was compiled in Italy, probably in the fifth century, and revised in Gaul about 600. An old Roman martyrology was known to Bede and to a contemporary French monk, Usnard, whose work forms the basis of the later Western martyrologies, as officially published in Rome by Baronius in 1586, and also in the revised editions by direction of various popes (by Pius IX in 1873).

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MARTYRS, mär'tēr', LES. A prose work by Chateaubriand (1809). It is the story of two Christian lovers at the end of the third century, during Diocletian's persecutions.

MARUCCHI, mȧ-rōōk'kē, ORAZIO (1852–). An Italian archæologist. He was born in

Rome and became an eminent authority on Egyptology and on Christian archæology, especially of the city of Rome. He was director of the Egyptian museum in the Vatican and of the Christian museum of the Lateran, and filled the chairs of Christian archæology in the College of San Apollinare and the University of Rome. Marucchi was editor of the *Nuovo Bulletino di Archeologia Cristiana* (1895), which carried on the work of De Rossi; and he published *Gli obelischi egiziani di Roma* (1898); *Il museo egizio vaticano* (1899); *La santita del matrimonio confermata degli antichi monumente cristiani* (1902); *Le catacombe romane* (1905, also in French); *Manuale di archeologia cristiana* (1908); *Epigrafia cristiana* (1910); *I Monumenti del museo cristiano pio-lateranese* (1910); *Guide du Forum romain et du Palatin* (1911); *Il cimitero di Priscillo*, etc. (1913).

MARUÉJOULS (Pierre Adolphe) Emile (1837–1908). A French statesman, born at Villefranche-de-Rouergué (Aveyron). He studied law at Paris, and in 1889 was elected deputy from Villefranche and thereafter was successively reëlected. He was a member of the consulting committees on railways and of the superior councils on fine arts and commerce. In 1898, in the Brisson ministry, he was Minister of Commerce and Industry, and from 1902 to 1905, in the Combes ministry, he was Minister of Public Works. He served as chairman of the French delegation at the International Railway Congress which met in Washington in 1905. An Officer of the Legion of Honor and the recipient of decorations from numerous foreign governments, he contributed to several reviews and periodicals, such as *La Gazette des Beaux-Arts* and *Le Temps*. In 1869 he was awarded a prize for eloquence by the French Academy.

MARULIĆ, mä-rōō′lĭsh, Marko (1450–1524). A Croatian poet and scholar, born at Spalato. He studied at Padua and entered a monastery in his native town. His works in Latin deal with politics, theology, and history; the best known was *De Institutione Bene Vivendi* (probably first printed in 1506), which passed through many editions and was translated into several languages. More important than his Latin and Italian works are his poems in the vernacular, which mark him as the "father of Croatian poetry" and one of the great names of the literature of Ragusa. The best known is an epic on the *History of Judith* (Historija sv. Judite), written in 1501 but published 20 years later. He also wrote some mystery plays (*prikazanija*), which are the first dramatic composition in Croatian. His works in the vernacular were republished at Agram (1869) by Kukuljević-Sakćinski, with a biographical sketch of Marulić.

MARUTS, mä-rōōts′ (Skt., probably the shining ones). In Hindu mythology, the gods of the storm and the wind. They play a prominent part in the *Rig-Veda*, especially as allies or associates of Indra (q.v.), and vary in number, usually thrice seven or thrice sixty. The hymns addressed to them, as they crash through the forests, make the mountains quake, or sweep the plain, accompanied by lightning, dust, and rain, are among the most spirited in the *Veda*. They have been translated by Max Müller, *Sacred Books of the East*, vol. xxxii (Oxford, 1891). In post-Vedic times Marut is used in the singular, meaning wind or the god of the wind. Consult A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897), and W. J. Wilkins, *Hindu Mythology* (London, 1900).

MAR′VEL, Ik. The pseudonym of Donald G. Mitchell.

MAR′VELL, Andrew (1621–78). An English poet and politician. He was born March 31, 1621, at Winestead, Yorkshire; attended the grammar school at Hull, of which his father became master; graduated B.A. at Trinity College, Cambridge (1638); traveled on the Continent (1642–46); returned to England about 1650; was tutor to Lord Fairfax's daughter Mary; became assistant to Milton in his Latin secretaryship of state (1657); and was elected to Parliament from Hull (1659). From 1663 to 1665 he was secretary to Charles Howard, first Earl of Carlisle, on his embassy to Muscovy, Sweden, and Denmark. Without fortune or influence, possessing no commanding talent as a speaker, he maintained a character for integrity so genuine and high that his constituency felt itself honored by his conduct, and allowed him to the end of his life "a handsome pension." Charles II made fruitless efforts to win him over to the court party. Marvell died Aug. 18, 1678. Marvell was a man of varied talents and of poetic genius. He was a competent man of affairs. As a potent pamphleteer, his reputation was high among his contemporaries, but his controversial writings make little appeal to posterity. His satires have shared much the same fate as his pamphlets, because they are bound up, as lampoons, with incidents and people of his day now forgotten, and partly because their humorous exaggeration, mordant irony, and comic verve cannot atone for artistic failings. In his best poetry Marvell rises, as Lamb well says, "to the highest strains of passion and imagination," abjuring the conceits, the mere fanciful ingenuity, and the witty delicacy which give a certain quaint attraction to his verse, but frequently obscure the meaning. The high-water mark of his poetry is the "Horatian Ode" to Cromwell, but his many and varied lyrics, such as "The Garden," "A Drop of Dew," "To his Coy Mistress," "The Bermudas," and "Young Love," are, of their kind, faultless. His works were published as follows: *Miscellaneous Poems* (1681); *Works* (2 vols., 1726), edited by Thomas Cooke; *Works*, including letters and prose pamphlets (3 vols., 1776), edited by Edward Thompson; *Works*, including prose works and letters, as well as poems, with annotations, in Fuller Worthies Library, 3 vols. (1872, 1875), edited by Dr. Grosart; *Poems and Satires* (2 vols., 1892), edited by G. A. Aitken; *Poems and Satires* (1904), edited by Edward Wright. Consult the *Life* by Dove (London, 1832); the critical biography by Augustine Birrell, in "English Men of Letters Series" (ib., 1905); John Brown, in *Cambridge History of English Literature*, vol. vii (Cambridge, 1911).

MAR′VEL OF PERU, pĕ-rōō′. A garden plant. See Jalap.

MARVELOUS BOY, The. A title given to Thomas Chatterton.

MARVIN, Charles Frederick (1858–). An American meteorologist, born at Putnam, Ohio. In 1883 he graduated from Ohio State University and in the following year he was appointed on the civilian corps of the signal service of the United States. In 1903 he became professor of meteorology in the Weather Bureau, and in 1913 chief. He conducted important experiments for determining the amount

of moisture in the air and for measuring wind velocities and pressures; invented instruments for automatically measuring and recording rainfall, snowfall, sunshine, and atmospheric pressure; made investigations furthering the use of kites in meteorology; and aided the advancement of seismological and solar radiation experimentation. He contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA, and is the author of numerous pamphlets and papers published by the Weather Bureau and scientific magazines, under such titles as *Anemometry, Barometers and the Measurement of Atmospheric Pressure, Kite Experiments at the Weather Bureau and the Mechanics and Equilibrium of Kites, The Collection and Measurement of Precipitation, Psychrometric Tables and the Measurement of Vapor Pressures at Low Temperatures, The Collection and Measurement of Precipitation with Special Reference to Snowfall.*

MARVIN, ENOCH MATHER (1823–77). An American bishop, born in Warren Co., Mo. He was a self-educated man. He entered the ministry of the Methodist Episcopal church in 1841, joining the Missouri Conference, but at the time of the division of the church in 1844 identified himself with the Church South. For a time he was agent for St. Charles College. During the Civil War he served for two years as chaplain with the Confederate army, under General Price. In 1866 he was elected a bishop of the Methodist Episcopal Church South; in 1877 he completed a missionary tour around the world. He was a noted preacher and was the author of *Errors of the Papacy and Transubstantiation* (1860); *The Life of William Goff Caples* (1871); *Sermons* (1876); *The Doctrinal Integrity of Methodism* (1878); *To the East by Way of the West* (1879); *The Methodist Episcopal Churches, North and South* (n. d.). Consult T. M. Finney, *The Life and Labors of Enoch Mather Marvin* (St. Louis, 1880).

MARWAR, mär'wẽr. A native state of India. See JODHPUR.

MARX, märks, ADOLF BERNHARD (1795–1866). A German writer on musical subjects, born at Halle. He studied law and practiced it for a short time, but soon devoted himself exclusively to music and became editor of the Berlin *Allgemeine Musikalische Zeitung.* In 1830 he was made professor of music at the Berlin University and in 1832 obtained the post of musical director at the university. Together with Kullak (q.v.) and Stern he founded in 1850 the Sternsche Konservatorium, which is still one of the foremost music schools of Germany. His works include: *Die Lehre von der musikalischen Komposition* (1837–45); *Allgemeine Musiklehre* (1839; 10th ed., 1884); *Ludwig van Beethoven: Leben und Schaffen* (1859; 4th ed., 1884); *Gluck und die Oper* (1862); *Das Ideal und die Gegenwart* (1867).

MARX, KARL (1818–83). A great economist and socialist, properly to be regarded as the founder of the modern Socialistic movement. He was born of Jewish parents at Treves, Germany, May 5, 1818, and educated at the universities of Bonn and Berlin. In 1842 he joined the staff of the *Rheinische Zeitung für Politik, Handel und Gewerbe,* a Liberal organ, and for a short time he was editor of the paper. Shortly before the suppression of the paper, in 1843, Marx withdrew from the editorial force and removed to Paris, where he assisted in editing the *Deutsch-Französische Jahrbücher,* and lived in close association with the French Socialistic group, of which Proudhon was the leader. Here he became acquainted with Friedrich Engels, with whom he was associated throughout the remainder of his life. In 1845 he was expelled from Paris at the instance of the Prussian government and removed to Brussels, where he remained for three years, deeply engaged in economic study. One of the fruits of his labors here was his controversial work on Proudhon, the *Misère de la philosophie,* in which he criticizes his former associate unsparingly.

In 1847 Marx and Engels entered into relations with a revolutionary association in England known as the Communist League, which held a Congress in 1847 and issued a program composed by Marx and Engels, known as the Communist Manifesto. This document was published in most of the languages of Europe and became practically the creed of the Socialistic revolutionaries. It advocated the following measures: (1) Abolition of property in land and the application of all rents to public purposes; (2) a progressive income tax; (3) abolition of all rights of inheritance; (4) confiscation of all property of emigrants and rebels; (5) centralization of credit in the hands of the state by means of a national bank with state capital and an exclusive monopoly; (6) nationalization of means of communication and transportation; (7) extension of productive enterprises by the state, the reclamation of waste land and general improvement of the soil; (8) compulsory labor, with establishment of industrial armies especially for agriculture; (9) combination of agriculture with manufacturing, the elimination of distinction between town and country by more even distribution of the population; (10) free education in public schools and abolition of child labor in factories.

In 1848 Marx returned to Cologne and started the *Neue Rheinische Zeitung,* but because of his revolutionary activity he was ordered to leave Germany in May, 1849. He went to Paris, but later in the year was forced to leave that city and moved to London, which was henceforth his home. He became a newspaper correspondent, writing for the New York *Tribune, Putnam's Monthly,* and other papers, a number of his articles subsequently being published in pamphlet form. Among these are: "Der 18te Brumaire des Louis Bonaparte" (1852); "The Life of Palmerston" (1850); "Palmerston and Poland" (1853). In 1859 he published his *Kritik der politischen Oekonomie* (translated into English, 1904), which contained the essence of the principles elaborated in his subsequent work, *Das Kapital.*

In 1864 Marx at last found the opportunity of realizing a plan he had long contemplated—that of organizing the laborers of the civilized world into a great association. On September 28 there was a great meeting in St. Martin's Hall, to which Marx outlined his scheme of an "International Workingmen's Association" (q.v.). During these years Marx was also greatly interested in the developments in Germany and assisted Liebknecht and his associates in establishing the Social Democratic Labor party in 1869. In 1867 appeared the first volume of *Das Kapital* (English translation, 4th edition, from the 3d German edition, London, 1891). The second volume was completed by Engels and published in 1885; the third in 1895. The style is heavy, and the analysis detailed and difficult. Marx seeks to

discover the economic law that governs society. Modern social development is made possible only by capital; it has reached its highest point and must necessarily be followed by another system. Modern capitalism exploits the laborer by getting possession of the "surplus value" of his services, i.e., the amount produced by him over and above the amount of his wages, which are regulated by the "iron law" and tend therefore to a minimum. The basis of the exchange value of a commodity is the amount of labor expended on it. In the long run this means the average amount of labor expended under average conditions. Marx traces the historic development of capital and shows the tendency for the instruments of labor to concentrate in fewer and fewer hands. Thus arises the capitalistic class. Meantime develops also a class who have only their labor to sell, the proletariat. The growth of capitalism reduces the number of capitalists and increases the poverty and misery of the working classes, but also serves to bring them to self-consciousness. The proletariat will finally organize and the means of production will be seized and managed for the good of all. Marx outlined no ideal future condition. He tried to show what he believed to be the course of historical development and sought to bring about the next step, the organization of all laborers for their common good. Marx died in London, March 14, 1883.

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MA'RY (Gk. Μαριάμ, *Mariam*, Μαρία, *Maria*, from Heb. *Miryām*, of uncertain etymology), The Mother of Jesus. Apart from what is contained in the narratives of Jesus' birth and childhood (Matt. i–ii; Luke i–ii), very little is told of Mary in the New Testament. If the genealogy in Luke iii. 23–38 is intended to be that of Mary (which is doubtful), she was descended from David. She was also related to the priestly family to which Elizabeth, mother of John the Baptist, belonged. (See Luke i. 5, 36.) After her betrothal to Joseph, a carpenter of Nazareth in Galilee, but before her marriage, she was informed in an angelic vision that she would through miraculous conception give birth to a son who should reign on the Davidic throne and be called the Son of the Highest. (Luke i. 26–38.) The marriage to Joseph took place. Jesus, her first-born son, was born at Bethlehem, whither she had gone with Joseph in consequence of a census decreed by Augustus. (Luke ii. 1–6.) Compelled to flee into Egypt with the infant Jesus, Joseph and Mary returned to Nazareth after the death of Herod the Great. (Matt. ii. 13–23.) Here some have believed that other children, Jesus' brothers and sisters (cf. Mark vi. 3; Matt. xiii. 55), were born; though the belief in her perpetual virginity has been a part of traditional theology from early times. Soon after Jesus began his public ministry the family—Joseph was apparently dead—moved to Capernaum. (John ii. 12; cf. Matt. iv. 13, ix 1.) To what extent Mary accompanied Jesus on his journeys we do not know. That she did not fully comprehend the mission of her son is evident from John ii. 4, if not from Mark iii. 31–35. (Cf. Luke ii. 48–49.) She witnessed the crucifixion and was then intrusted by Jesus to the care of John, the beloved disciple, who gave her a place in his home. (John xix. 25–27.) The last notice of Mary in the New Testament is in Acts i. 14, where she is mentioned as one of the company of disciples who were accustomed to meet in the upper room in Jerusalem soon after the Resurrection.

No more than this is told of her in the New Testament; but the tradition of the Christian Church added much to it. There grew up a literature, partly apocryphal (see Apocrypha), dealing with her infancy and childhood, with her espousal to Joseph, and with the birth and infancy of Jesus, and with her death and assumption into heaven. The more her position in the scheme of redemption was meditated upon, the more important did she appear. The frequent controversies as to the nature of her son bore upon her own personality and history; thus the Council of Ephesus (431) really summed up its doctrine against Nestorius in calling Mary the "mother of God" (θεοτόκος). Festivals celebrated in her honor increased in number; among the older ones, some of which date back to the fifth century, are the Purification, February 2; Annunciation, March 25; Assumption, August 15; Nativity, September 8; and Conception, December 8. The devotion to her not simply as an historical memory, but as a living power, owing to the prevailing force of her intercession with her son, became so marked in course of time that it was one of the things against which the reformers of the sixteenth century strongly protested. It continued to develop, however, in the Roman Catholic church, and found expression, among many other ways, in the definition in 1854 of her conception as immaculate, or free from the taint of original sin, a doctrine suggested as early as Augustine, and long held by the Catholic church; and the prayer in which her intercession is invoked (see Ave Maria) became second only to the Lord's Prayer in frequency of use. Many of the shrines erected in her honor, at places supposed to have been consecrated by apparitions of her presence, have become among the most celebrated pilgrimage places. On this aspect of the devotion, see the articles Lourdes; Einsiedeln.

Bibliography. Northcote, *Celebrated Sanctuaries of the Madonna* (London, 1868); Rudniki, *Die berühmtesten Wallfahrtsorte der Erde* (Paderborn, 1891). For the subject in general, consult the immense collection of documents in Bourassé, *Summa Aurea de Laudibus Beatæ Mariæ Virginis* (13 vols., Paris, 1866 et seq.); J. H. Newman, *Development of Christian Doctrine* (London, 1845); Kurz, *Marieologie* (Regensburg, 1881); A. B. M. Jameson, *Legends of the Madonna* (Boston, 1881); J. S. Northcote, *Mary in the Gospels* (London, 1885); Lehner, *Die Marienverehrung in den ersten Jahrhunderten* (2d ed., Stuttgart, 1886); Philip Schaff, *Creeds of Christendom* (New York, 1890); E. M. Hurll, *The Madonna in Art* (Boston, 1897); J. B. Terrien, *La mère de Dieu et la mère des hommes d'après les Pères et la théologie* (4 vols., Paris, 1900–02).

On the narratives of the infancy of Jesus in

the Gospels, consult Resch, "Das Kindheitsevangelium," in Gebhardt and Harnack, *Texte und Untersuchungen* (Leipzig, 1897); Sir W. M. Ramsay, *Was Jesus Born in Bethlehem?* (London, 1898). See also ASSUMPTION OF THE VIRGIN MARY; IMMACULATE CONCEPTION; MADONNA; ROSARY.

MARY I (1516–58). Queen of England from 1553 to 1558. Mary was born at Greenwich, Feb. 18, 1516, and ultimately was the only surviving child of Henry VIII by Catharine of Aragon. Her education was carefully and severely planned, and she learned to converse readily in Latin, French, and Spanish, and knew Italian. When two years of age she was betrothed to the Dauphin of France, afterward to her cousin, Charles V, and finally a treaty was signed providing for her marriage to either Francis I or his second son, Henry. Numerous other proposals were made, but they were rendered futile by the rapid changes in England's foreign relations or by Mary's refusal of a Protestant, until in the end her accession as Queen left her at liberty to choose her own consort. She was twice in danger, owing to her religious convictions—during the period of the divorce of her mother and during the reign of her brother, Edward VI (q.v.). She was a loving child and refused to abandon her mother's cause when Henry VIII divorced Catharine. In the end she was persuaded by her friends with the greatest difficulty to submit to Henry's demands and sign a renunciation of the Pope's authority and her own legitimacy. As a result of her compliance she was received into half favor and given a place in the succession to the crown. During Edward's reign she held uncompromisingly to the old faith, at the cost of much annoyance and the danger of actual persecution. In 1553 she succeeded to the crown, her popularity greatly increased by the attempt of Northumberland to displace her with Lady Jane Grey (q.v.).

Mary began her reign firmly resolved to sweep away the religious innovations of her father and half brother. She proceeded throughout in a legal manner and never failed to secure the consent of Parliament to her acts, though during the Tudor period Parliament very imperfectly represented the sentiments of the English people. The mass was restored without opposition in 1553, and the authority of the Pope reëstablished somewhat tardily and reluctantly in 1554. Mary could not persuade the Parliament to restore the Church lands, but she gave back such property as was still in the possession of the crown. This was a greater proof of her sincerity than of her statesmanship, for it impoverished her resources and led to subsequent disasters which touched English pride. Even more disastrous was her marriage in 1554 with Philip, son of Charles V, which was so unpopular that on its proposal a formidable rebellion broke out under the leadership of Wyatt to depose Mary and put Elizabeth on the throne. Philip, who was 11 years younger than Mary, was an uncompromising Catholic. He was extremely unpopular, and repaid Mary's boundless devotion with coldness and neglect. To please him the Queen joined in a war against France, with the result that Calais, the last remnant of the English conquests during the Hundred Years' War, was lost in 1558. It was no disaster of any consequence to England, but to Mary and her subjects it seemed irreparable. In addition to her husband's neglect, the loss of Calais, and her own ill health, Mary's last days were darkened by the religious persecutions which filled the latter part of her reign, in which nearly 300 persons were burnt for their faith and for which she received the name of Bloody Mary. It should not be forgotten that she adopted these measures with reluctance, as a last resort, and that her predecessors and successors were guilty of like practices. She died without issue, Nov. 17, 1558. Consult: John Lingard, *History of England* (6th ed., London, 1854–55); J. M. Stone, *The History of Mary I, Queen of England* (ib., 1901); J. B. Mullinger, "Philip and Mary," in *Cambridge Modern History*, vol. ii (Cambridge, 1904), containing a bibliography; Martin Hume, *Two English Queens and Philip* (New York, 1908); J. A. Froude, *The Reign of Mary Tudor* (ib., 1910).

MARY II (1662–94). Queen of Great Britain. She was born at St. James's Palace, April 30, 1662, the eldest daughter of James II and Anne Hyde, who was a daughter of the Earl of Clarendon. At the age of 15 she was married to William, Prince of Orange. She joined her husband in England early in 1689 after the flight of her father. In the same year Parliament declared the crown of England vacant by the abdication of James, and conferred it upon William (III) and Mary. She died of smallpox Dec. 28, 1694. Consult: Gilbert Burnet, *Essay upon the Life of Queen Mary* (London, 1695); Doebner (ed.), *Memoirs and Letters of Mary II, Queen of England* (Leipzig, 1886); R. S. Rait, *Five Stuart Princesses* (New York, 1908); M. Morris, *Reign of William and Mary* (ib., 1910); E. and M. S. Grew, *The Court of William III* (Boston, 1910). See WILLIAM III.

MARY (1867–). Queen Consort of George V (q.v.) of England.

MARY, APOCALYPSE OF THE VIRGIN. See APOCRYPHA, *New Testament.*

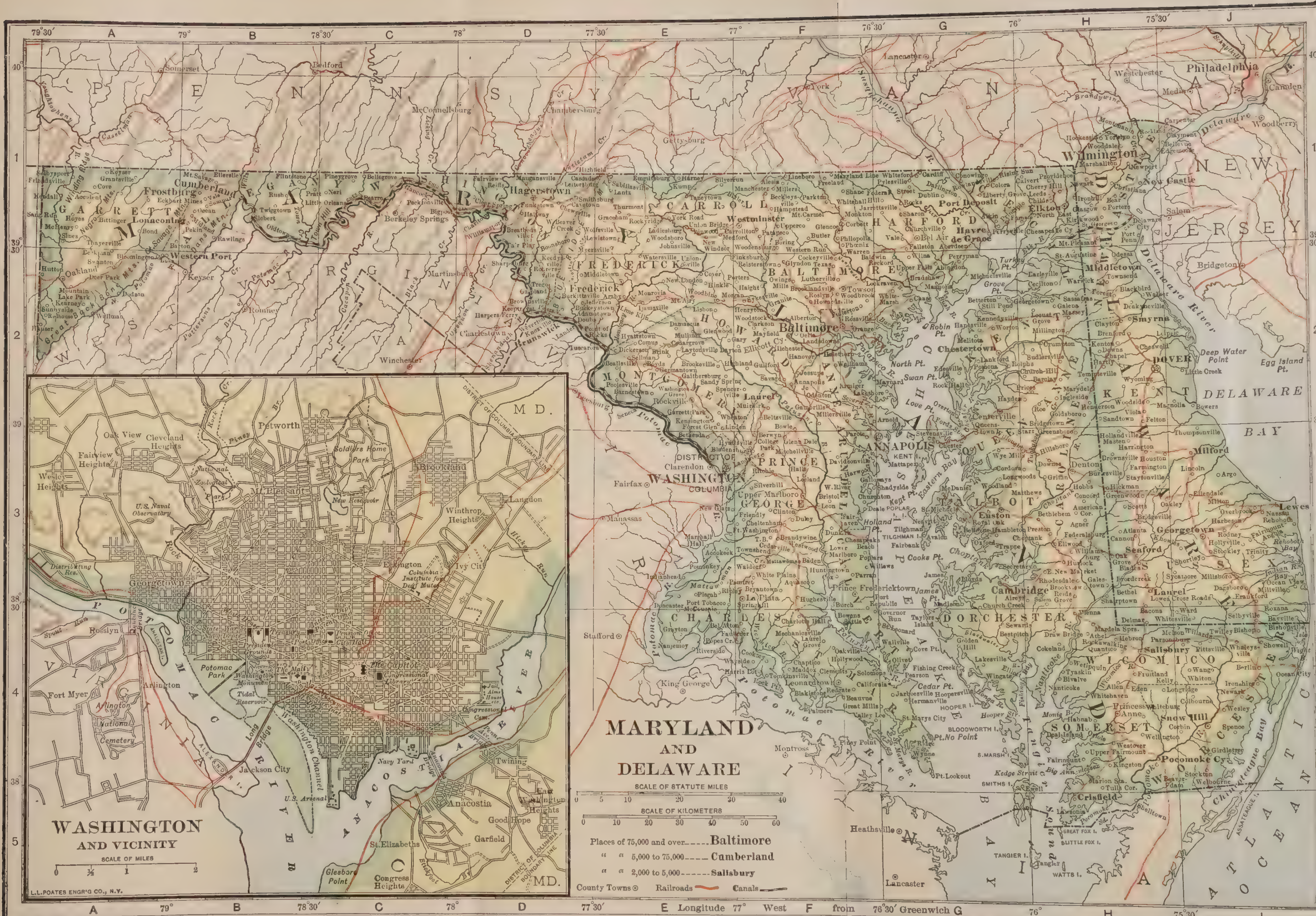
MARY, NATIVITY OF THE VIRGIN. See APOCRYPHA, *New Testament.*

MARY, OF BETHANY. See MARTHA AND MARY, OF BETHANY.

MARYBOROUGH, mā'rĭ-bŭr'ō. A seaport municipality of March Co., Queensland, Australia, on the Mary River, 180 miles north of Brisbane, with which it has railroad communication (Map: Queensland, H 8). Among its institutions are a college, a library, and St. Paul's Anglican Church. It is the port of a rich coal, gold, and copper mining and agricultural region; has sugar mills and refineries, iron foundries, breweries, tanyards, boot, shoe, and soap factories, saw mills, shipbuilding industries, active fisheries, and a considerable export trade in timber, sugar, and minerals. The wharves are available to vessels of 17½ feet draft. Pop., 1901, 10,159; 1912, 11,626.

MARYBOROUGH. A municipality of Talbot Co., Victoria, Australia, 112 miles north of Melbourne by rail (Map: Victoria, C 5). It has fine government buildings, botanical gardens, and parks. Its industries include agriculture and important quartz and alluvial gold mines. Pop., 1901, 5633; 1911, 5675.

MARY'LAND, mĕr'ĭ-land. One of the thirteen original States of the American Union. It occupies a middle position on the Atlantic coast between Pennsylvania and Virginia, being included between lat. 37° 53′ and 39° 43′ 26″ N. and long. 75° 4′ and 79° 33′ W. It is bounded on the north by Pennsylvania, the boundary being Mason and Dixon's line, and by Delaware;


MARYLAND
AND
DELAWARE
SCALE OF STATUTE MILES
0 5 10 20 30 40
SCALE OF KILOMETERS
0 10 20 30 40 50 60
Places of 75,000 and over Baltimore
" " 5,000 to 75,000 Cumberland
" " 2,000 to 5,000 Salisbury
County Towns
Railroads
Canals
WASHINGTON
AND VICINITY
SCALE OF MILES
0 ½ 1 2
L.L.POATES ENGR'G CO., N.Y.
Longitude 77° West from Greenwich
PENNSYLVANIA
NEW JERSEY
WEST VIRGINIA
VIRGINIA
DELAWARE BAY
ATLANTIC OCEAN
CHESAPEAKE BAY
GARRETT
ALLEGANY
WASHINGTON
FREDERICK
CARROLL
BALTIMORE
HARFORD
CECIL
HOWARD
MONTGOMERY
PRINCE GEORGE
ANNE ARUNDEL
CHARLES
ST. MARYS
CALVERT
KENT
QUEEN ANNES
TALBOT
CAROLINE
DORCHESTER
WICOMICO
SOMERSET
WORCESTER
NEW CASTLE
SUSSEX
Baltimore
Annapolis
Washington
District of Columbia
Wilmington
Philadelphia
Dover
Cumberland
Frederick
Hagerstown
Salisbury
Cambridge
Easton
Crisfield
Georgetown
Potomac R.
MD.
VIRGINIA
Potomac
Anacostia
Georgetown
Arlington
Fort Myer
Rosslyn
Jackson City
Potomac Park
Washington Monument
Navy Yard
U.S. Arsenal
St. Elizabeths
Congress Heights
Brookland
Petworth
Mt. Pleasant
Cleveland Heights
Fairview Heights
Wesley Heights
Oak View
Langdon
Winthrop Heights
Ivy City
Eckington
Twining
East Washington Heights
Good Hope
Garfield
Giesboro Point
U.S. Naval Observatory
Soldiers Home Park
Arlington National Cemetery

on the east by Delaware and the Atlantic Ocean; on the south and west by West Virginia and Virginia. It is separated from the two last-named States by the Potomac River, which is the boundary from its source in a small mountain stream to its mouth in a broad estuary entering the Chesapeake Bay. The outline of the State is extremely irregular, as the southern boundary is mainly a winding river, while, in addition to this, Chesapeake Bay divides the eastern half into two parts. The extreme length of the northern boundary is 205 miles, with a further extension of 35 miles where the State stretches eastward south of Delaware to the ocean. The extreme breadth from north to south, near the eastern shore of the Chesapeake, is 128 miles, while it is only about 2 miles across near Hancock. The total area is 12,210 square miles, of which 2319 square miles are water.

Topography. The surface of Maryland shows great diversity. It is usually divided, for purposes of classification, into three regions: the coastal plain, the piedmont plateau, and the Appalachian province. All are drained by the rivers flowing into the Chesapeake, excepting the northwest corner, which drains towards the Ohio, a narrow strip draining directly into the Atlantic, and a fragment at the extreme northeast draining into Christian Creek and the Delaware.

The coastal plain embraces that part of Maryland lying to the east of a line passing from Washington to Baltimore, Havre de Grace, and Wilmington. It includes more than half the land area of the State and is divided by Chesapeake Bay into what is commonly called the "eastern shore" and the "western shore" or southern Maryland. The eastern shore is low and level; only in the north does it reach 100 feet, and most of it is less than 25 feet above the sea. The western shore is higher and rises to 300 feet near the District of Columbia and again near Baltimore. Chesapeake Bay has many islands, and the entire Atlantic coast is made up of a long, reeflike, sandy island, inclosing the Chincoteague and Assateague bays. The eastern shore is drained by the Pocomoke, Nanticoke, Choptank, and Chester rivers and by some smaller streams. The western shore is drained in the most part by the Potomac, the Patuxent, the Patapsco, and the Gunpowder.

The most conspicuous feature of the coastal plain of Maryland is Chesapeake Bay, which has about two-thirds of its 200 miles of length within the State. It is from 10 to 40 miles wide, and its numerous estuaries cut the plain in every direction and reach to the eastern edge of the piedmont plateau. The bay is navigable for the largest ships, and its numerous arms furnish a large number of fine harbors. The large area of sheltered, shallow, inland water affords an excellent fishing ground and an opportunity for oyster gathering and oyster culture scarcely equaled elsewhere in the world.

The piedmont plateau extends from the edge of the Atlantic plain to the Catoctin Mountain, the first range of the Appalachian system. This region is about 40 miles wide. Most of the surface is broken and hilly, especially in its western part, ascending with complicated drainage systems to Parr's Ridge in Carroll County. Between Parr's Ridge and the Catoctin Mountain is the comparatively level Frederick valley, drained by the Monocacy River, flowing southward into the Potomac. Near the mouth of the Monocacy, Sugar Loaf Mountain (1281 feet) rises abruptly from the plain. From the Catoctin Mountain to the west boundary of the State, the Appalachian region spreads a succession of valleys, separated by nearly parallel northeast and southwest mountain ranges and all draining into the Potomac. The Blue Ridge, 2400 feet high at Quirauk, near the Pennsylvania line, crosses the State to Weverton on the Potomac and is the eastern limit of the Great or Hagerstown valley. This valley is bounded on the west by the North Mountain, between which and Cumberland is the Alleghany Ridge, a complex chain of long, narrow, very level mountain ridges, separated by narrow valleys, beginning at an elevation of about 500 feet at the Potomac. Just west of Cumberland rises Dan's Mountain (2882 feet).

To the west of it is the Alleghany plateau, giving the elevation of 2000 feet or more to all of Maryland to the west, except the immediate valleys of the Potomac, Savage, and Youghiogheny rivers.

Much of the plateau is above 2500 feet, and the highest mountains, the Savage and its extension, the Backbone Mountain, exceed 3000 feet in elevation.

Climate. The climate of Maryland is one of transition in which the Northern severe winter gives way to the open Southern winter. The extreme temperatures of more Northern locations are occasionally met with, but the periods of cold are of less duration and the number of freezing days and the amount of snowfall are less. An extreme winter temperature of 26° below zero F. has been recorded at Sunnyside in the Alleghany plateau, and a summer temperature of 109° F. near Cumberland. Changes of temperature are frequent, and there is a great daily range. In north-central Maryland the average temperature for January is 30° F., that for July 75° F. The average annual temperature for the State is between 53° F. and 54° F. The average dates for first and last killing frosts in the plateau are October 1 and April 15; on the Marine Islands the growing season is a month longer, extending from April 1 to October 15.

The average rainfall for the State is 43 inches, of which 11.5 to 12 fall in spring and in summer and 9.5 to 10 in the fall and in winter. The effects of elevation and slope are clearly shown in the distribution of the rainfall. The western slope of the Alleghany plateau receives 53 inches; the eastern slope of Parr's Ridge over 45; the inclosed valleys between Cumberland and Hagerstown and small sections at the extreme east and southwest of the State, receive between 30 and 35. The Atlantic plain in the main receives from 42 to 48 inches. The snowfall averages 25.4 inches for the State, 16.6 for the southern and 43.4 for the western districts. The number of days of precipitation on the coast is 130, in the mountains 140. The relative humidity varies from 80 in the sea islands to 65 at the extreme west. The warm moist climate and light soil of the eastern shore cause that district to be the home of many Southern plants not found elsewhere in the same latitude.

Soil. Maryland has varied soils corresponding with the geological formations. The more recent formations of the Atlantic plain have light, sandy, and loamy soils, unsuited to grass, but especially adapted to vegetables, truck farming, small fruits, and peaches. Southern Mary-

land is an extensive producer of tobacco for the export trade. The region of metamorphic rocks and the limestone and shale valleys of the west are of heavier, often clay, soils, usually very fertile and adapted to wheat, maize, grass, and clover. On the western slope of the Blue Ridge Mountains, the Cambrian (Harper's) shale, crossing the State from Harper's Ferry northeastward, produces a strip of sandy, shaly soil with exceptional adaptation to peaches, which are here a highly specialized crop. Similar shaly soils are on the flanks of all the ranges, and the valley floors are usually limestone.

Geology. Maryland presents a great variety of geologic formations, owing to the fact that it presents what is virtually a cross section from the Ohio valley to the Atlantic Ocean. That is, the various outcrops which run in broad bands parallel with the Atlantic coast are here so narrow that the whole series is encompassed by the State, from the coastal-plain formations to the western coal fields, while farther south they widen out so that even the State of North Carolina does not include them all. The entire portion of the State east of Chesapeake Bay and a strip from 5 to 20 miles wide along its west shore are covered with relatively recent and for the most part unindurated formations, consisting of Tertiary and Quaternary sands and clays east of the bay, and Cretaceous, Eocene, and Miocene on the west shore. West of this follows the Archean belt of the piedmont plateau. It is here about 50 miles broad, occupying the whole central part of the State, but in early Mesozoic time this Archean land was divided into two parts by a narrow arm of the sea which ran southwestward from the present mouth of the Hudson, and whose bed is now filled with a deep layer of Triassic sandstones and shales and accompanying dikes of diabase occupying the Frederick valley. The narrow western part of the State is traversed by the various outcrops brought to the surface by the Appalachian folding and subsequent denudation. They are largely Devonian, which is of great thickness, but include also all of the older Paleozoic periods—Cambrian, Ordovician, and Silurian. From the vicinity of Cumberland to the west boundary of the State the various formations of the Carboniferous and Permian are exposed, forming a part of the great Appalachian coal field. The Maryland coals occur in five basins, of which the Georges Creek and upper Potomac basins are most largely worked. In addition to the foregoing there are intrusions of eruptive rocks running in a chain of dikes east of the Blue Ridge. During the Pliocene and Pleistocene periods the eastern part of the State was subjected to repeated changes of level, resulting in a series of four sea-formed terraces, the oldest lying at the highest level and the successively younger imbricating around the preceding. The latest has been but slightly dissected by erosion, whose effects are more pronounced on the older and higher terraces. The latest movement of the land was downward, resulting in a partial submergence of the lower courses of the coastal-plain rivers—Chesapeake Bay and its broad and winding estuaries being, in fact, a drowned river valley with its tributary streams converted into estuaries.

Mining. The principal mineral product is coal, which represents over one-half of the total mineral value produced. Deposits are confined to Allegany and Garrett counties, with the greater part coming from the Georges Creek basin in the former. Coal mining was started in the early part of the nineteenth century, the product being shipped by barges on the Potomac River. The coal of the Georges Creek basin is of high repute as a steam and blacksmith's fuel, but has poor coking qualities. The output in 1913 was 4,779,839 short tons, valued at $5,927,046. Mechanical methods of mining coal have made little progress in Maryland mines, as practically 95 per cent of the total production is mined by hand. In 1912 there were 6162 men employed in the coal mines.

Next to coal, the most important industries are clay working and stone quarrying. The clays are widely distributed and are suitable for a variety of uses. The fire bricks manufactured from that of the western part are considered among the best in the United States. The value of the clay products in 1913 was $1,917,500. The principal quarry product is granite. A white marble extensively used for structural purposes is also produced in Baltimore County. Limestone is quarried in considerable quantities in the western part of the State. Maryland is one of the most important slate-producing States. Slate is all quarried in the so-called Peach Bottom district near Cardiff, Harford County. The product is a black slate well known in the markets all over the world and is used almost entirely for roofing. Lime is produced in considerable quantities. The product in 1913 was 108,883 short tons, valued at $357,392. The value of the sand and gravel produced in 1913 was $622,567. The other commercial mineral products are cement, copper, feldspar, infusorial earth, iron ore, mineral paints, mineral waters, quartz, sand-lime brick, talc, soapstone, and a small quantity of silver. The total value of the mineral products in 1913 was $11,292,723.

Agriculture. Of an approximate land area in 1910 of 6,362,240 acres, 5,057,140 were in farms, of which there were 48,923. The improved land in farms in 1910 was 3,354,767 acres. The average acres per farm was 103.4 in 1910. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $286,167,028 in 1910. The average value of land per acre was $32.32 in 1910. Of the total number of all farms in 1910, 14,416 were operated by tenants. The acreage of farms owned by white farmers in 1910 was 2,783,279; that owned by colored farmers was 122,039. The acreage leased by white farmers was 1,721,414; that leased by colored farmers was 223,117. The native white farm operators in 1910 numbered 40,669, the foreign-born white farmers 1882, and the negro and other nonwhite farmers 6372.

The following is a table of crops, showing acreage, value, and production as estimated by the United States Department of Agriculture.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	663,000	24,531,000	$16,681,000
Wheat	612,000	13,158,000	13,947,000
Oats	43,000	1,161,000	604,000
Potatoes	44,000	3,432,000	2,059,000
Hay	390,000	*448,000	6,854,000
Tobacco	*22,000	†17,600	1,408,000
Rye	25,000	425,000	366,000

* Tons. † Pounds.

The total value of crops in 1909 was $43,920,000. The general character of agriculture is indicated by the fact that about half of the total value of the crops in 1909 was contributed by cereals, about one-sixth by potatoes and other vegetables, and more than one-eighth by hay and forage. The remainder consisted chiefly of forest products, fruits and nuts, tobacco, small fruits, and flowers, plants, and nursery products. The leading crops in the order of their importance are corn, wheat, hay and forage, potatoes, and tobacco.

The total acreage of potatoes and other vegetables in 1909 was 155,339 and their value $7,996,105. Excluding potatoes and sweet potatoes and yams, the acreage of vegetables was 108,084 and their value $5,729,000. The growing and canning of orchard fruits is of importance. The total production of the orchard fruits in 1909 was 2,577,359 bushels, valued at $1,517,400. Of these, apples were by far the most important. Other important orchard fruits were peaches and nectarines, pears, cherries, plums, and prunes. Figs are the only tropical fruit grown in any quantity. Of small fruits the most important is the strawberry, of which 23,611,095 quarts, valued at $1,070,072, were grown in 1909. The total production of small fruits in that year was 26,277,054 quarts, valued at $1,227,548.

A small amount of sugar beets are grown, and these are used entirely as root forage. There were grown, in 1909, 275 tons of sorghum cane, from which 1782 gallons of sirup were made.

Live Stock and Dairy Products. The total value of the domestic animals of the State in 1909 was $30,649,961. On Jan. 1, 1915, the estimated numbers and value of live stock were as follows: cattle, other than milch cows, 121,000, valued at $3,570,000; milch cows, 177,000, valued at $9,558,000; horses, 167,000, valued at $18,871,000; mules, 25,000, valued at $3,450,000; sheep, 223,000, valued at $1,160,000; swine, 349,000, valued at $3,385,000. The poultry of all kinds on the farms in 1910 were valued at $1,858,570. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $5,480,900. This included 8,739,720 pounds of butter. There were 19,424,325 gallons of milk sold.

Fisheries. In 1890 the value of the fishery products was $6,460,759, while in 1908, the latest year for which complete statistics are available, it had fallen to $3,306,910. More persons are engaged in the industry than in any other State. The oyster is the most important product of the fisheries, amounting to almost 75 per cent of the entire output. In 1908, 5,830,200 bushels of oysters, valued at $2,127,140, were taken for market purposes and 401,800 bushels, valued at $101,190, for seeding purposes. The rivers flowing into Chesapeake Bay contribute largely to the fisheries products, particularly shad. There were taken, in 1908, 3,936,800 pounds of this fish, with a value of $246,590. Soft crabs were taken to the amount of 7,587,300 pounds, valued at $195,000, and hard crabs to the amount of 12,785,900 pounds, valued at $124,350. Among other important products are alewives, striped bass, menhaden, white perch, yellow perch, sturgeon, catfish, and terrapin. There were engaged in the fisheries, in 1908, 8444 fishermen. There were 1107 vessels engaged in fishing, and these were valued at $821,141.

Manufactures. Maryland has been an important manufacturing State from its first settlement. The value of its products per capita increased from $57 in 1849 to $244 in 1909, when it ranked fifteenth among the States, when measured by the value of its products. The table on the following page gives the more important figures relative to the 10 leading industries, as gauged by value of products, for 1909 and 1904.

As will be noted from the table, the manufacture of clothing is by far the most important industry. In 1909 Maryland ranked fourth among the States in the production of men's clothing and eighth in the production of women's clothing. The canning and preserving of fruits, vegetables, fish, and oysters and the manufacture of pickles, preserves, and sauces is an important industry. This industry, whose chief characteristic is its extremely seasonal character, attained commercial recognition in 1850, and Maryland became its chief centre. Considering the short season during which it is active, the value of its products, compared with other industries, is very large. The total value of vegetables canned in 1909 was $10,779,540. The lumber and timber industry has more establishments than any other. The making of fertilizers is also of great importance. This industry began about 1832, when the demand for a commercial fertilizer arose on account of the increase in tobacco culture and various other forms of agriculture. Bone was the first crushed fertilizer, but subsequently crushed bone was mixed with phosphate rock from South Carolina, guano from the West Indies, and potash salts from Germany. The quantity of all kinds of fertilizers produced in 1909 was 608,699 tons. The manufacture of cotton goods, including cotton small wares, is one of the oldest industries. In 1909 there were 16 establishments, the value of whose products was $5,522,000. The manufacture of iron and steel products, chiefly pig iron, is of considerable importance, although on the decline. There are iron deposits, but the ore is of a grade that does not compare favorably with other ore, and most of it is imported. There were produced, in 1912, 219,546 long tons of pig iron. In the early history of the State shipbuilding was one of its most important industries. The "Baltimore clippers" were famous all over the world and were instrumental in greatly extending the commerce of the State. The substitution of iron and steel for wood in shipbuilding resulted in the decline of the industry. It is still of considerable importance, however, and many vessels for the United States government are constructed in the shipyards of the State. There were launched, in 1909, 129 vessels of all kinds, with a gross tonnage of 34,160. Of these, nine were iron and steel vessels.

The average number of wage earners engaged in the manufacturing industries in 1909 was 107,921; 75,573 were males and 32,348 were females. The wage earners under 16 years of age numbered 6548, of whom 3157 were males. Almost three-fourths of the total number of wage earners in 1909 were in establishments where the prevailing hours of labor per week ranged from 54 to 60, or from 9 to 10 a day, and of these over one-half were employed 60 hours a week. By far the most important city is Baltimore. There were in this city, in 1909, 71,444 wage earners, and the value of the product of its

manufactures was $186,977,710. In the value of manufactured products Baltimore was thirteenth among the cities of the United States in 1909. The men's clothing industry is practically confined to Baltimore.

Forest Products. Although much of the merchantable timber has been cut away, there are still large quantities of timber standing. The use of the lumber for the manufacture of paper and pulp has shown a large increase in recent years. In 1909 there were cut 267,939 M feet of rough lumber and there were manufactured 17,583 thousands of lath and 12,352 thousands of shingles. The principal varieties of lumber sawed in 1910 were yellow pine, oak, and chestnut. There were also forest products to the value of $2,349,045 cut or produced on the farms. This includes firewood, charcoal, fencing material, logs, railroad ties, telegraph and telephone poles, materials for barrels, tanbark, etc.

Transportation. Maryland is traversed by the main lines of two important railroad systems. The Baltimore and Ohio Railroad was one of the first important lines operating in the United States. The total railway mileage on June 30, 1914, was 1401 miles of single-track road. The Baltimore and Ohio, with 336 miles, had the longest mileage; the Philadelphia, Baltimore, and Washington had 329; the Western Maryland 272; the Baltimore, Chesapeake, and Atlantic 88; and the Northern Central 77. The Baltimore and Chesapeake Canal connects the head of Chesapeake Bay with the Delaware River. Chesapeake Bay gives excellent facilities for water transportation, and the Potomac River is navigable to Washington. The Chesapeake and Ohio Canal, in the early part of the nineteenth century a great highway of commerce, now carries chiefly coal. Baltimore is the commercial centre of the State. There were, in 1914, 18 companies operating electric railways, and these had 940 miles of single track in the State.

Banking. The first bank in the State was the Bank of Maryland, chartered in 1790. In the early thirties there were half a dozen banks in Baltimore which suffered with all the other banks of the country from the money panic of 1837. Six or seven banks failed, among them the Bank of Maryland, seriously affecting the commercial interests of the State. In 1850 there were 27 banks, with a capital of $9,310,407. On Sept. 12, 1914, there were 101 national banks, with capital $16,009,710, surplus $11,761,710, cash $5,091,791, loans $95,354,675, and deposits $91,912,716. There were on June 30, 1914, 62 State banks with capital $2,997,945, surplus $1,673,455, cash $1,017,106, loans and discounts $20,006,159, and deposits $24,945,808; and 52 savings banks (mutual and stock) with 289,585 depositors and deposits to the amount of $109,663,347.

Government. The State has been governed under constitutions of 1776, 1851, 1864, and 1867. Amendments may be proposed by the General Assembly and must be passed by three-fifths of all the members of the two Houses. The amendment is then submitted to the qualified voters. When two or more amendments are submitted, they shall be so submitted that each

COMPARATIVE SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY: Total	PERSONS ENGAGED IN INDUSTRY: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	4,837	125,489	107,921	$251,227	$45,436	$315,669	$116,620
	1904	3,852	107,303	94,174	201,878	36,144	243,376	93,352
Canning and preserving	1909	468	9,755	8,613	8,377	1,926	13,709	3,619
	1904	408	10,167	9,146	7,151	1,790	12,935	3,762
Cars and general shop construction and repairs by steam-railroad companies.	1909	21	5,926	5,549	4,264	3,535	9,059	3,866
	1904	21	5,203	4,977	2,303	2,837	5,752	3,142
Clothing, men's, including shirts	1909	359	21,946	19,784	19,578	7,563	36,921	15,955
	1904	157	15,274	13,849	12,766	4,110	25,653	10,881
Copper, tin, and sheet-iron products	1909	81	5,980	5,275	24,719	2,076	16,909	6,101
	1904	75	3,054	2,727	16,455	987	9,263	3,167
Fertilizers	1909	41	1,750	1,439	9,098	617	9,673	2,710
	1904	39	1,500	1,256	6,058	524	6,632	1,640
Flour-mill and gristmill products	1909	295	935	506	3,729	227	9,268	1,265
	1904	202	890	550	2,717	212	7,318	1,108
Foundry and machine-shop products	1909	157	5,520	4,798	10,324	2,751	11,978	6,022
	1904	118	5,451	4,899	8,274	2,810	10,586	6,640
Lumber and timber products	1909	561	8,165	7,003	9,182	2,457	12,134	5,627
	1904	301	5,851	5,149	5,432	1,959	8,937	4,031
Slaughtering and meat packing	1909	54	1,324	1,034	3,808	604	13,683	2,180
	1904	44	683	562	1,322	320	6,848	960
Tobacco manufactures	1909	263	4,098	3,476	6,644	1,229	10,559	4,893
	1904	...	.....	.....	.....	.....	.....	.....

amendment shall be voted on separately. Every 20 years dating from 1887 the question of calling a constitutional convention for altering the constitution is laid before the people.

Legislative.—The Legislature consists of two branches, a Senate and a House of Delegates. Each county and each of the four legislative districts of Baltimore City is entitled to one Senator, who serves for four years. Each county is entitled to delegates in proportion to its population, ranging proportionately from two delegates for every county having 18,000 inhabitants or less to six delegates for each county having 55,000 or more. Each of the four legislative districts of Baltimore is entitled to the number of delegates to which the largest county is entitled. An unusual provision of the constitution prevents clergymen of any creed or denomination from serving as Senator or delegate. The General Assembly meets every second year on the first Wednesday of January, dating from 1868. Sessions are limited to 90 days. When the General Assembly is convened by proclamation of the Governor, the session shall not continue longer than 30 days. The House of Delegates has the sole power of impeachment, and all impeachments are tried by the Senate.

Executive.—The executive power is vested in the Governor, who holds office for four years. He must have attained the age of 30 years, have been a citizen of the State for 10 years, and for five years next preceding his election a resident of the State. The Governor has the veto power, but bills carrying his veto may be passed by a three-fifths majority of the members of both Houses. The Governor has power to disapprove of any item or items of any bills making appropriations of money embracing distinct items.

Judiciary.—The judicial power is vested in a court of appeals, circuit courts, orphans' courts, and justices of the peace. The judges of all courts are elected in the counties by the qualified voters in their respective judicial circuits. Each of the judges holds office for a term of 15 years or until he shall have attained the age of 70 years. The court of appeals is composed of the chief judges of the first seven of the several judicial circuits and a judge from the city of Baltimore specially elected thereto. One of these is appointed chief judge by the Governor. The State is divided into eight judicial circuits, the city of Baltimore constituting the eighth. For each of these circuits there is a chief judge and two associate judges, styled Judges of the Circuit Court. In the city of Baltimore are six courts: the Supreme Bench of Baltimore City, the Superior Court of Baltimore City, the Court of Common Pleas, the Baltimore City Court, the Circuit Court of Baltimore City, and the Criminal Court of Baltimore. The orphans' courts are composed of three men for each county, elected for a term of four years.

Suffrage and Elections.—Every male citizen of the United States of the age of 21 years and upwards, who has been a resident of the State for one year and of the legislative district or county in which he may offer to vote for six months next preceding the election, is entitled to vote. Persons convicted of bribery or other crimes against the electorate are forever disqualified from voting thereafter. Elections for Governor are held on the Tuesday next after the first Monday of November every four years, dating from 1867. There is a primary-election law, which was enacted in 1912. All parties must nominate candidates, including judges and members of the national House of Representatives, by primary elections. The nomination of candidates by direct vote does not apply to the nomination of such candidates for county offices, State Senate, and members of the House of Delegates in the counties of Howard, Washington, and Worcester. Provision is also made by the act for presidential primaries.

All candidates for offices must be nominated, selected, or chosen by the direct vote of the duly registered voters belonging to the political parties. In case there are more than two candidates for any State office, there is provided on the ballot opportunity for voters to indicate first or second choice respectively. There is a corrupt-practices act, which compels a strict accounting for political funds and limits the expenditures. By provisions of this act candidates' expenditures are limited to $10 per thousand registered voters up to 50,000 and $5 per thousand above 50,000. An unusual provision is that any promise made by the wife of a candidate is to be considered as coming from the candidate himself. United States Senators are nominated under a special senatorial primary-election law enacted in 1908. The Legislature of 1914 amended this law so as to conform with the provisions of the Seventeenth Amendment to the Constitution.

Local and Municipal Government.—The General Assembly has power to organize new counties, but no such county must be formed without the consent of the majority of the legal voters residing within the limits proposed to be formed into the new county; and no new county must contain less than 400 square miles or less than 10,000 white inhabitants, nor must any change be made within the limits of any county whereby the population of said county would be reduced to less than 10,000 white inhabitants or its territory be reduced to less than 400 square miles. Each county has a county commissioner elected for a term not exceeding six years. A sheriff and a surveyor are also elected for each county. Other county officials are coroners, elisors, and notaries public. Towns and cities may adopt a commission form of government. The only city which had adopted this form at the end of 1913 was Cumberland.

Other Constitutional and Statutory Provisions.—A married woman may acquire, hold, and manage property independently of her husband and dispose of the same as if single. The husband must join, however, in the execution of any deed. Debtors are protected in the possession of property to the value of $500. Professional Christian Science healers come within the statutory regulations concerning practitioners of medicine. The white-slave traffic is regulated by severe provisions. There is a workmen's compensation law and provisions regulating the employment of children. The State has no general local-option law, but a number of countries have been permitted to vote on the liquor question by virtue of special acts passed by the Legislature. A bill extending local option in regard to the sale of intoxicating liquor to counties not prohibiting such sale was passed by the House of Delegates in 1912, but was defeated by the Senate.

Finance. Maryland led in the movement for internal improvements which began in the early twenties of the nineteenth century, and its first public debt was created in order to acquire 5000

shares of the Chesapeake and Ohio Canal. In 1836 bonds to the amount of $8,000,000 were authorized to be invested in various improvements, chiefly canals and the Baltimore and Ohio Railroad, and by 1839 the public debt amounted to more than $16,000,000. A financial collapse resulted in the following year when the State stopped payments of interest. In 1841 very heavy taxes were imposed, which were almost impossible to collect, and a repudiation of the State's debts was threatened. The arrears of interest were finally funded in 1844, and on Jan. 1, 1848, payment of interest on the State debt was resumed. During the Civil War there was a considerable debt incurred for defense, bounties, etc., but it has been defrayed, and the debt now consists almost entirely of bonds sold to defray the cost of new public buildings. On Sept. 30, 1914, the bonded debt amounted to $19,685,880. Of these bonds the largest issue, amounting to $3,191,095, is a refunding series known as the consolidated loan of 1899. All the remaining bonds were issued at different times between 1900 and 1914 either for public buildings or for public roads and highways. In 1914 there was raised a loan of $817,880 for the purpose of refunding the consolidated loan of 1899, due Jan. 1, 1914. The sinking fund of this loan held securities and cash aggregating $3,209,230, or more than sufficient to retire it; but rather than sell the securities at a loss the Treasury officials decided to hold the securities and refund for the amount less the holdings of its own stocks. On Sept. 30, 1914, there was a balance in the Treasury of $1,840,256. The gross receipts for the fiscal year 1914 amounted to $12,600,566. The disbursements aggregated $12,999,561. The State has no floating debt.

Militia. According to the Thirteenth Census there were 271,373 men of militia age. The organized militia on June 31, 1914, consisted of 157 officers and 1986 enlisted men.

Population. The growth of the population is shown by the following figures: 1790, 319,728; 1850, 583,034; 1870, 780,894; 1900, 1,188,044; 1910, 1,295,346. Population on July 1, 1914, was 1,341,075; 1920, 1,449,661. By color the population in 1910 numbered 1,062,639 whites and 232,250 negroes. There is a small foreign population. The native whites of foreign or mixed parentage in 1910 numbered 191,838 and the foreign-born whites 104,174. Of the latter the largest numbers came from Germany and Russia. The urban population, i.e., in places of 2500 or more, in 1910 was 658,192. The rural population in 1910 numbered 637,154. The density per square mile in 1910 was 130.3. By sex the population was divided in 1909 into 644,225 males and 651,121 females. The males of voting age numbered 367,908. The largest city in the State is Baltimore (q.v.), with a population in 1910 of 558,485. The other large cities of the State, with their populations in 1910, are as follows: Cumberland, 21,839; Hagerstown, 16,507; Frederick, 10,411; Annapolis, 8609.

Education. Maryland has the same problems which hamper the development of education in the more Southern States. These include a negro and a preponderant rural population. Conditions have greatly improved as a result of wise measures passed by the Legislature and the intelligent supervision by the State Department of Education. In 1910, of a total population of 10 years of age and over of 1,023,950, there were 73,397 illiterates, or 7.2 per cent of the population. That conditions are improving is shown by the fact that the percentage in 1900 was 11.1 per cent. According to the Thirteenth Census the total number of children from 5 to 20 years of age in the State in 1910 was 415,905. Of these, 230,123 attended school. The report of the State Superintendent of Education shows a total population between 5 and 20 years, on July 31, 1913, of 415,908. The number of different pupils enrolled in 1913 was 237,835, and the average daily attendance was 115,007. In the colored schools there were, in 1913, 43,757, and the average daily attendance was 26,167. The total number of schools in 1913 was 2469, and there were 5805 teachers, of whom 4899 were females and 906 were males. The average yearly salary of teachers was $537.59. The total value of school property in 1913 was $10,672,069. Schools for colored children numbered 540, with 905 teachers, of whom 667 were females and 238 were males.

The educational system is administered by a State Board of Education with a State Superintendent as its executive officer. The Legislature of 1902 passed a compulsory education bill, but this applied only to Baltimore City and Allegany County. The Legislature of 1912 passed a compulsory school law, the adoption and enforcement of which is left to the school boards of the several counties, excepting five counties, whose representatives in the General Assembly had exempted their counties. Up to 1914 five county school boards had approved the law and were enforcing its provisions, with the result that there had been an increase of from 10 to 15 per cent in school attendance. The General Assembly of 1910 passed a high-school law, which made possible excellent results along the lines of secondary education. Approved high schools of the first group, which must have an enrollment of not less than 80 students, four grade and two special teachers, receive an appropriation from the State of $2300. A second-group high school, which may have a three years' course, two grade and one special teacher, and whose enrollment must be not less than 35 students, receives a State appropriation of $1400.

The total expenditure for public schools in 1913 was $5,326,876. The Legislature of 1914 passed a number of unusually important laws relating to education. Among these were measures providing for the consolidation of schools and the establishment of a State university. There has been a teachers' pension law since 1902. The normal schools are the Maryland State Normal School at Baltimore, Frostburg State Normal School at Frostburg, and the Maryland Normal and Industrial School for Colored Students at Bowie. The institutions of higher education in the State include Johns Hopkins University (q.v.) at Baltimore, which offers a summer course for teachers, Western Maryland College at Westminster, Washington College at Chestertown, St. John's College at Annapolis, Maryland Agricultural College at College Park, and Blue Ridge College at New Windsor. These institutions all receive State aid. In addition there are Goucher College and Hood College in Baltimore, Woman's College at Frederick, and the Maryland College for Women at Lutherville. Under the auspices of the Roman Catholic church are Loyola College at Baltimore, Mount St. Joseph's College at Baltimore, Rock Hill College at Ellicott City, and Mount St. Mary's College at Emmitsburg. Morgan

College at Baltimore is a coeducational institution for colored students. The Jacob Tome Institute, an endowed secondary school, is at Port Deposit. The United States Naval Academy, a government institution to train young men to serve as officers in the United States navy, is located at Annapolis.

Charities and Corrections. Charities and corrections are in charge of the Board of State Aids and Charities. The correctional institutions include St. Mary's Industrial School at Baltimore, Industrial Home for Colored Girls at Melvale, the House of the Good Shepherd (colored) at Baltimore, Maryland School for Girls at Loch Raven, the House of Reformation for Colored Boys at Cheltenham, and the Maryland Industrial School for Girls at Baltimore. There are in addition many homes and asylums for children and adults, especially in Baltimore. There are 23 general hospitals, 7 hospitals for the insane, and 9 special hospitals. In addition there are a number of educational institutions which come under the jurisdiction of the board. These include 10 boarding schools for general educational purposes, St. Francis Xavier's School for the Deaf at Irvington, Maryland School for the Blind at Overlea, and Maryland School for the Deaf at Frederick. The total appropriations for the support of the State institutions in 1913 amounted to $1,136,118. The State Penitentiary is in Baltimore. The convicts are generally employed under contract, the majority being engaged in the manufacture of boots and shoes. The prisoners confined in jails do not as a rule have employment. About half the prisoners are negroes.

Religion. The Roman Catholic and Methodist churches far surpass all others in Church communicants. Of the other denominations the strongest are the Protestant Episcopal, Lutheran, Baptist, and Presbyterian.

History. In 1632 Cecilius Calvert, second Lord Baltimore, received from Charles I a charter conferring on him the possession of the territory now forming the States of Maryland and Delaware. The grant had been obtained by George Calvert, first Lord Baltimore, the father of Cecil, but he died before the charter was issued. It was the intention of the Lord Proprietor to found a feudal State in Maryland (named in honor of Charles's Queen, Henrietta Maria), and to that end he was invested with sovereign powers, subject only to the recognition of the King as lord paramount by the payment of a yearly tribute of two Indian arrows. One of the chief causes that led to the settlement of Maryland was the desire of Lord Baltimore, a Catholic, to found a colony where his fellow believers might profess their religion openly without incurring the penalties to which they were subjected in England. Other denominations, however, in the Proprietor's scheme, were to be on an equal footing with the Catholics, and of the 20 gentlemen and 200 or 300 commoners who arrived at Point Comfort, Va., in February, 1634, under the leadership of Leonard Calvert, it is probable that more than half were Protestants. On the twenty-fifth of March mass was celebrated on St. Clement's Island in the Potomac, and shortly after the site of the city of St. Mary's was traced on land bought from the Yaocomico Indians, near the banks of the river.

In his use of the vast powers granted him by the King, Baltimore was as moderate as in the expression of his religious views, and he made no attempt to establish anything like an absolute government. By the terms of the charter, laws for the province could be made by the Proprietor only, with the consent of the freemen or their deputies, and on Jan. 26, 1635, the first assembly of freemen met at St. Mary's. The right of initiating laws, claimed both by the Assembly and by the Proprietor, was conceded in 1638 to the people, Baltimore reserving to himself the mere veto power. The first "statutes of the province" were passed in 1638 and 1639. With the Indians friendly relations were established. The worst enemy of Lord Baltimore's colony was William Claiborne (q.v.), a Virginian, who had established a trading post on Kent Island in Chesapeake Bay in 1631. He refused to recognize the authority of Lord Baltimore, and in 1638 his settlement was captured by Leonard Calvert during Claiborne's absence in England. In 1643 a company of Puritans, excluded from Virginia for nonconformity, settled at Providence, now Annapolis, and put themselves in opposition to the government. The outbreak of the Civil War in England enabled Baltimore's enemies to carry their opposition to a great length. In 1645 Capt. Richard Ingle, acting ostensibly in the name of Parliament, seized St. Mary's. Claiborne also returned from England, regained possession of Kent Island, and the Governor attempted in vain to dispossess him. For nearly two years Ingle held the province under his sway until Gov. Leonard Calvert returned from Virginia with a military force and recovered possession. As early as 1638 the molestation of Protestants had been punished. In 1649 an Act was passed at the desire of the Proprietor guaranteeing freedom of worship to all followers of Jesus Christ. The Puritans continuing to be turbulent, their settlement, by way of conciliation, was in 1650 erected into a separate county, named Anne Arundel, and as other Puritans arrived from England, Charles County was shortly afterward organized for their benefit. Their numbers increased to such an extent that they soon had a majority in the Assembly. In 1652 commissioners from England visited Maryland, among whom were Claiborne and Bennett, the Puritan leader of Anne Arundel County. The authority of the English Commonwealth was completely established in the colony, and Kent Island was given up to Claiborne. A commission for the government of the colony was organized with Capt. William Fuller at its head. The Puritans made use of their ascendancy to repeal the Toleration Act of 1649 and to enact penal laws against the Catholics. A severe conflict ensued. Providence was attacked March 25, 1655, by the proprietary party; but the assault was repulsed, the whole invading force being either killed or taken prisoners. In 1654 Lord Baltimore made a vain attempt to regain possession of the province, but succeeded only in defeating a scheme for uniting Maryland to Virginia. Three years later his title was recognized by the Protector, and in 1658 the proprietary government was restored. The period before the revolution of 1688 was marked by an important treaty with the Susquehanna Indians (1661) and some difficulties with William Penn concerning the boundary line between the two provinces in the Delaware country. Upon the deposition of James II, the incompetency of the Governor, the failure to proclaim the new monarchs, and preposterous rumors of a Popish plot stirred up the people, and an As-

sociation of the Protestant Freemen headed by Capt. John Coode seized the province in the name of William and Mary. The Legislature laid before the King a list of complaints against the government of Lord Baltimore, and in August, 1691, the Proprietor was deprived of his political privileges, though his property rights were left intact. In 1715, however, the province was restored to the fifth Lord Baltimore, a Protestant. At the beginning of the eighteenth century tobacco was the staple product. Commerce and manufactures were greatly restricted by the Navigation Acts. There were very few towns, Baltimore being founded as late as 1729, Frederick in 1745, and Georgetown in 1751. Prosperity was widely diffused, and the standard of living, owing to the abundance of game and fish, high. All sects were tolerated, except the Catholics, who were denied the suffrage and forbidden to worship in public. The Anglican church was established in 1692. Four years later a free high school was opened at Annapolis. The question of the north boundary, which after 1730 threatened to bring on war with Pennsylvania, was settled by the drawing of the famous Mason and Dixon's line (1763–67).

Maryland took an active part in the wars resulting in the extinction of the French domination upon the continent, and in the last and most important of these its western border suffered severely from Indian attacks, owing to the obstinacy of the Legislature in refusing to vote means for defense. The colony was also among the first to oppose the aggressions of the British government, which led to the War of the Revolution. The Stamp Act was received with great indignation, and the imposition of duties on tea was responded to by the burning of a tea ship (1774). In the same year a popular convention began to direct the revolutionary movement. It gradually assumed charge of the government. A bill of rights and a constitution were adopted in November, 1776, and the Legislature assembled at Annapolis, Feb. 5, 1777. Maryland took a most efficient and honorable part in the Revolutionary War, though it did not join the Confederation till 1781, owing to her claim that the western lands should belong to the Union. In 1783 Congress met at Annapolis, and here, on December 23, after the conclusion of peace, Washington resigned his commission as general in chief. The Federal Constitution was adopted in the Maryland convention April 28, 1788, by a vote of 63 to 11. Maryland suffered considerably in the War of 1812. (See UNITED STATES.) The beginning of the war was marked by a fierce riot against a Federalist newspaper of Baltimore, in which a number of people were killed. Havre de Grace and other villages were burned by the English fleet in 1813, Baltimore was unsuccessfully attacked by a British army, and Fort McHenry was bombarded in September, 1814. This battle was the occasion for the writing of "The Star Spangled Banner" by Francis Scott Key (q.v.). An elaborate system of internal improvements was initiated in 1828, when the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad were begun. (See *Finance.*) In 1844 the first line of electric telegraph in the United States was run from Baltimore to Washington. The position of Maryland in the Civil War was peculiar. As a slaveholding State her sympathies were naturally to a great extent with the South, but her proximity to Pennsylvania made her truly a Border State. Many of her people favored secession, a large number entered the Confederate army, and in the first days of the war the passage of Union troops through Baltimore was opposed, several Massachusetts soldiers being killed on April 19, 1861; but the strength of the Union party, added to the efforts of the Governor, served to keep the State from seceding. Later, bitter feelings were aroused by the policy of the general government in establishing military rule and suspending the habeas corpus in a large part of the State. The adherence of Maryland to the Union was extremely important in that it saved Washington from falling into the power of the Confederates.

Railroad development was facilitated by a system of State and county aid. For many years the claims of the State against the Baltimore and Ohio Railroad for the recovery of the subsidy granted the company in 1836 were fought in the courts without definite result. The Chesapeake and Ohio Canal was constructed as far as Cumberland and was profitable for some years, but diversion of traffic and danger from storms made it bankrupt. In 1865 the educational system, antiquated and inefficient, was reformed. The prevalence of corruption in city elections led to a revision of the election laws in 1889 and the adoption of the Australian ballot in 1890. In 1896 the bipartisan system of election boards was fully recognized.

The constitution of 1776 was often amended, especially in 1802, when the property qualification for the suffrage was abolished, and in 1837 the election of the Governor was given to the people. New constitutions were adopted in 1851, 1864, and 1867, the second of which abolished slavery. Its electoral vote has been as follows: 1796, Adams, 7, Jefferson 4; 1800, Adams 5, Jefferson 5; 1804, Pinckney 2, Jefferson 9; 1808, Pinckney 2, Madison 9; 1812, Clinton 5, Madison 6; 1816, Monroe 8; 1820, Monroe 11; 1824, Jackson 7, Adams 3, Crawford 1; 1828, Adams 6, Jackson 5; 1832, Clay 5, Jackson 3. It went Whig from 1836 to 1848, Democratic in 1852, American party (Know-Nothing) in 1856, and Democratic in 1860. In 1864 it voted for Lincoln, but from 1868 to 1892 was Democratic. In 1896, 1900, 1904, and 1912 it went Republican.

In 1907 John Walter Smith, Democrat, was nominated for Senator by votes cast for the first time directly by the people. The primary was, however, limited to the Democratic party. In the election for State officers held in November of that year Austin L. Crothers, Democrat, was elected Governor.

The presidential election of 1908 resulted in a division of the electoral vote. Bryan received six and Taft two, although the highest Taft elector received 116,593 votes compared with 115,910 votes for the highest Bryan elector. This situation was brought about by the large number of ignorant voters who were unable to read the names on the ballots.

In 1909 and again in 1910 persistent efforts were made to disfranchise the negro vote; these failed largely through the efforts of Governor Crothers. Statutes passed by the State Legislature made the "grandfather clause" (see SUFFRAGE) applicable to individual cities. These greatly restricted the negro vote. In June, 1915, the United States Supreme Court declared these statutes unconstitutional. State officers were for the first time nominated at direct primaries in 1911.

The Legislature of 1912 passed a measure providing for primaries for the election of presidential electors. Although the Republican sentiment was strongly for Roosevelt, as appeared from these elections, the control of the party remained in the hands of the Republicans. Following the nomination of Mr. Taft in Chicago, the Progressives formed a separate party. At the election of Nov. 5, 1912, Wilson carried the State with 116,654 votes, Roosevelt received 57,786 and Taft 54,956.

Senator Isidor Rayner died in 1912, and the Governor appointed William P. Jackson to fill his place until an election could be held, which would have been in 1914. In the meantime, however, the constitutional amendment providing for the election of Senators by the people had been ratified by the States. Governor Crothers issued a warrant for the election of a Senator by the people in November, 1913, although the Legislature had passed no law providing for the machinery and method for nominating and electing Senators. The Democrats nominated Blair Lee, the Republicans Thomas Parran, and the Progressives George L. Wellington. Lee was elected by a large plurality. His right to a seat in the Senate was questioned, and a hearing was held by the Senate Committee on Privileges and Elections; he was declared entitled to his seat in January, 1914.

In 1913 six amendments to the State constitution were ratified. The most interesting of these was one empowering the Legislature to place the penalty for bribery at elections upon the buyer of votes as well as the seller.

The term of Senator Smith expired March 4, 1914, when he was a candidate for reëlection; he was opposed by E. S. Carrington, Jr., Republican, and V. C. Reichard, Progressive. At the election held in November, 1914, Mr. Smith was reëlected. The most remarkable feature of this election was the decline of the Progressive vote, which from 57,786 in 1912 fell to 3697 in 1914.

The following is a list of the Governors:

PROPRIETARY GOVERNORS

Leonard Calvert	1634–47
Thomas Greene	1647–49
William Stone	1649–54
Commissioners	1654–58
Josias Fendall	1658–60
Philip Calvert	1660–61
Charles Calvert (became Lord Baltimore 1675)	1661–76
Cecilius Calvert	1676
Thomas Notley	1676–79
Charles, third Lord Baltimore	1679–84
Benedict Leonard Calvert and Council	1684–88
William Joseph (President of Council)	1688–89
Protestant Associators	1689–90
Nehemiah Blakistone and Committee	1690–92

ROYAL GOVERNORS

Sir Lionel Copley	1692–93
Sir Edmund Andros	1693–94
Francis Nicholson	1694–99
Nathaniel Blakistone	1699–1702
Thomas Tench (President of Council)	1702–04
John Seymour	1704–09
Edward Lloyd (President of Council)	1709–14
John Hart	1714–15

PROPRIETARY GOVERNORS (RESTORED)

John Hart	1715–20
Charles Calvert	1720–27
Benedict Leonard Calvert	1727–31
Samuel Ogle	1731–32
Charles, fifth Lord Baltimore	1732–33
Samuel Ogle	1733–42
Thomas Bladen	1742–47
Samuel Ogle	1747–52
Benjamin Tasker	1752–53
Horatio Sharpe	1753–69
Robert Eden	1769–76
The Convention and Council of Safety	1776–77
Thomas Johnson	1777–79

STATE

Thomas Sim Lee		1779–82
William Paca		1782–85
William Smallwood		1785–88
John E. Howard		1788–91
George Plater		1791–92
Thomas Sim Lee		1792–94
John H. Stone		1794–97
John Henry	Democratic-Republican	1797–98
Benjamin Ogle	Federalist	1798–1801
John F. Mercer	Democratic-Republican	1801–03
Robert Bowie	" "	1803–06
Robert Wright	" "	1806–09
Edward Lloyd	" "	1809–11
Robert Bowie	" "	1811–12
Levin Winder	Federalist	1812–15
Charles Ridgely	"	1815–18
Charles Goldsborough	"	1818–19
Samuel Sprigg	Democratic-Republican	1819–22
Samuel Stevens, Jr.	" "	1822–25
Joseph Kent	" "	1825–28
Daniel Martin	Anti-Jackson	1828–29
Thomas K. Carroll	Jackson-Democrat	1829–30
Daniel Martin	Anti-Jackson	1830–31
George Howard	Whig	1831–33
James Thomas	"	1833–35
Thomas W. Veazey	"	1835–38
William Grayson	Democrat	1838–41
Francis Thomas	"	1841–44
Thomas G. Pratt	Whig	1844–47
Philip F. Thomas	Democrat	1847–50
Enoch L. Lowe	"	1850–53
Thomas W. Ligon	"	1852–58
Thomas H. Hicks	American	1858–62
August W. Bradford	Unionist	1862–65
Thomas Swan	Unionist, later Democrat	1865–68
Oden Bowie	Democrat	1868–72
William P. Whyte	"	1872–74
James B. Groome	"	1874–76
John L. Carroll	"	1876–80
William T. Hamilton	"	1880–84
Robert M. McLane	"	1884–85
Henry Lloyd	"	1885–88
Elihu E. Jackson	"	1888–92
Frank Brown	"	1892–96
Lloyd Lowndes	Republican	1896–1900
John W. Smith	Democrat	1900–04
Edwin Warfield	"	1904–08
Austin L. Crothers	"	1908–12
Phillips L. Goldsborough	Republican	1912–16
E. C. Harrington	Democrat	1916–20
A. C. Ritchie	"	1920–

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MARYLAND AGRICULTURAL COLLEGE. A State institution for agricultural and scientific education, founded at College Park, Md., in 1856. The college includes departments of agriculture, horticulture, biology, chemistry,

canning, mechanical engineering, civil engineering, electrical engineering and general science, as well as courses for training teachers in agriculture and a summer school for teachers of rural schools. During the winter short courses in agriculture are given. The original college buildings, which were completed in 1859, and the administration building, completed in 1904, were destroyed by fire on Nov. 29, 1912. A temporary assembly hall, kitchen, and dining hall were erected. Calvert Hall, the dormitory, was completed in 1915. Other buildings are the library and gymnasium, buildings for the departments of civil and electrical engineering and physics, and Morrill Hall, containing the other important departments. The college sanitarium, completed in 1901, is used as an administration building. In 1914–15 there were about 500 students in all departments; of these 300 were in the regular courses and about 200 in the short courses. The faculty, including professors and instructors, numbered 40. The college has no endowment, the income depending upon annual appropriations made by the United States and the State of Maryland. The total annual income is about $165,000 and the buildings and grounds were valued at about $515,000. The library contains about 8000 volumes. The president in 1915 was Harry J. Patterson, D.Sc.

MARYLAND HISTORICAL SOCIETY. An association founded in 1844 for the purpose of collecting and arranging material relating to the history of Maryland. It now owns the Athenæum Building, on Saratoga Street, Baltimore, in which it has gathered a priceless collection of manuscripts, documentary records, books, and pamphlets. There is also a gallery of historic curios, portraits, and valuable paintings. The society has done great service in rescuing, editing, and printing historical data. It is the official custodian of the early archives of the State, and it is engaged in printing the most valuable of these records. Thirty large quarto volumes have already been issued. Its series of Fund Publications contains many valuable reprints and monographs.

MARYLAND YELLOWTHROAT. A North American warbler (*Geothlypis trichas*), common in summer throughout the continent. It is about 5½ inches long, olive green above and bright yellow below, with a conspicuous broad black band or "mask" across the forehead (of the male), which includes the bill, extends back to

MARYLAND YELLOWTHROAT.

a point on each side of the neck, and is bordered above by a white line; the female has only a dull white line above the eye. These warblers spend their time near the ground and make their nests there, usually beside a stream; and they utter a short, questioning song as characteristic as it is pretty. The name is rather misleading, as the species has been divided into five forms, the Maryland, Western, Florida, Pacific, and Salt Marsh yellowthroats. Four closely allied species, the Kentucky warbler (q.v.), mourning, Connecticut, and McGillivray's warblers, were formerly placed in this genus but now are grouped as *Oporornis*. All of these visit the United States, while several others are found only in Mexico and Central America.

MARYLEBONE, mā′rĭ-lē-bōn′, *commonly* mā′rĭl-bŏn *or* măr′ĭ-bŭn. A metropolitan and parliamentary borough in the northwestern part of the city of London. It is regularly laid out, with many handsome streets, and here are situated Regent's Park, the gardens of the Zoölogical and Botanic societies, the Coliseum, Middlesex and other hospitals, Bedford College for women, University College, several other denominational institutions, and the terminal stations of the Midland, Great Western, and Great Northern railroads. Here are located the residences of Charles Dickens, the artist Turner, Gibbon, the historian, and Faraday, the chemist. Pop., 1901, 133,329; 1911, 117,184.

MARY MAGDALENE, măg′dă-lēn, *or* măg′dă-lē′nē, or Mary of Magdala. A woman mentioned in the Gospels as a follower of Jesus and, with others, a contributor to his support (Luke viii. 2–3). Her home was doubtless at Magdala (q.v.). She had been cured of demoniacal possession by Jesus and was among his most devoted friends. With the like-minded women she was a witness of the crucifixion (Matt. xxvii. 55, 56; Mark xv. 40–41; Luke xxiii. 48–49) and of the entombment of Jesus (Matt. xxvii. 61 and parallels). The same company came to the tomb on the Sunday morning following the crucifixion, and, finding it open and empty, ran back to the city to inform the disciples (Matt. xxviii. 1–10 and parallels). But Mary appears to have soon returned alone to the tomb, and to her the risen Jesus first appeared (John xx. 1–18; Mark xvi. 9). Her joy on hearing and seeing him again was excessive, but Jesus would not permit her to touch him, to show her that the relation between them was now entirely different from what it had been. Nothing more is told of her in the New Testament. The traditional identification of her with the "woman who was a sinner" (Luke vii. 36–50) is without foundation. This idea, the ruling one in art and literature, with its accompanying conception of the word Magdalene, has therefore no basis in fact. The Eastern church held that she died at Ephesus, whence her relics were taken to Constantinople. A mediæval legend in the Western church identified her with the sister of Martha and represented her as ending her days in southern France. Consult A. B. M. Jameson, *Sacred and Legendary Art*, vol. ii (London, 1866), and *Life of St. Mary Magdalene, translated from the Italian* (2d ed., Boston, 1906). For the tradition of her life in France, consult Faillon, *Monuments inédits sur l'apostolat de Ste.-Marie-Madeline en Provence* (2 vols., Paris, 1859).

MARY MAGDALEN IN ART. A favorite subject of painters during the Renaissance and the seventeenth century. Mary is chiefly represented as standing at the foot of the cross, assisting at the entombment, as the first witness of the Christ after the resurrection ("Noli me tangere"), or as a penitent. The small pot of ointment with which she once anointed the feet of Christ is the symbol by which she is identified. Among the most important representations of the subject was the celebrated painting of Cor-

reggio, now lost, but of which a good copy by Adriaen van der Werff survives in the Dresden Gallery. Titian has probably given the most impressive representations in his "Christ appearing to Magdalen," in the National Gallery, London, and in the well-known "Penitent Magdalen," in the Pitti Palace, Florence. Other representations are by Domenichino (Pitti Palace); Carlo Dolci (Uffizi, Florence); Van Dyck (Vienna Museum); Rubens (Vienna Museum); Tintoretto (Scuola di San Rocco, Venice); Murillo (Madrid); Memling (Louvre); Veronese (Madrid Museum); and three by Guido Reni in the Louvre, National Gallery, London, and Vienna Museum.

MARY OF BUR'GUNDY (1457–82). Daughter and heiress of Charles the Bold, Duke of Burgundy and sovereign of the Netherlands, born at Brussels. On the death of Charles (1477), Louis XI of France advanced various claims to the territories over which that prince had ruled. To defend herself Mary granted great concessions to the towns of the Netherlands and married Maximilian of Austria, with whom she lived happily for five years, dying from a fall from her horse. She was a woman of great beauty, intelligence, and amiability. Through her the Netherlands came into the possession of the house of Hapsburg, passing subsequently through her son Philip the Fair to her grandson Charles V (q.v.).

MARY OF GUISE, gwēz (1515–60). Queen of Scotland. She was the daughter of Claude, Duke of Guise, and Antoinette de Bourbon, and is also known as Mary of Lorraine. At the age of 19 she was married to Louis d'Orléans, Duke of Longueville, who died in 1537. In 1538 she married James V of Scotland, who died in 1542, soon after the announcement to him of the birth of a daughter, Mary, afterward Queen of Scots. Mary of Guise was Regent of Scotland for a short period, and showed herself an enemy of the party led by Arran and an opponent of the Reformed religion. She caused her daughter to be sent to France and plighted to the future Francis II, the marriage taking place in 1558. Consult Agnes Strickland, *Lives of the Queens of Scotland* (Edinburgh, 1861), and T. G. Law, in *Cambridge Modern History,* vol. iii (Cambridge, 1904), containing a bibliography.

MARY OF SAINT ANGELA, Mother. See Gillespie, Eliza Maria.

MARY OF THE INCARNATION (1599–1672). A French educator in Canada, born at Tours. Her name was Marie Guyard, but she was married in her eighteenth year to M. Martin. She was left a widow with an infant son before she was 20. She then gave herself almost entirely to religious work, devoting herself also for 12 years to the education of her son. Finally she claimed to have entered into a mystical marriage with the Christ, and entered the Ursuline convent at Tours. In 1639 she was chosen superior of the convent of Ursulines established at Quebec by Madame de la Peltrie (q.v.), whom she accompanied to Canada. Though a mystic and a dreamer, she showed great executive ability and managed the convent with success until her death. She was tall and stately, and impressed all with the strength of her personality. Many of the letters she wrote back to France were collected and published posthumously under the title *Lettres de la vénérable mère Marie de l'Incarnation* (Paris, 1681). There is also an autobiography prepared by direction of her superiors. Consult: Martin (her son), *La vie de la vénérable mère Marie de l'Incarnation* (Paris, 1677); Charlevoix, *Vie* (ib., 1724); and the *Life* by Casgrain, published in his collected works, vol. iii (Montreal, 1886).

MA'RYPORT. A seaport and bathing resort in Cumberland, England, at the mouth of the Ellen, 28 miles southwest of Carlisle (Map: England, C 2). Shipbuilding and its kindred branches are carried on extensively, and there are manufactories of rope, duck, iron, steel, lumber, and leather. A large quantity of coal and coke is shipped, especially to Ireland. The town owns gas and water works, a slaughterhouse, and markets, and maintains an isolation hospital. Maryport was the seat of a Roman camp and is rich in antiquities. It was called Ellenfoot until 1750, when it received its present name, owing to the fact that Mary, Queen of Scots, landed here in her flight from Scotland. Its prosperity dates from 1750, when its harbor was built. Pop., 1901, 11,897; 1911, 11,418.

MARY'S RIVER INDIANS, or **CHEPENAFA.** See Kalapuya.

MARY STUART (Mary, Queen of Scots) (1542–87). Queen of Scotland from 1542 to 1567. She was born Dec. 7 or 8, 1542, at Linlithgow Palace, the daughter of James V of Scotland by Mary of Guise. Her father died within a week of her birth, and she was proclaimed Queen. The English began negotiations for her betrothal to Prince Edward (later Edward VI), but, though they declared war to enforce their demands, they were unable to do so. After the Scots were defeated at Pinkie Cleugh, the young Queen was sent for greater security to an island in the Lake of Monteith. Meanwhile negotiations were opened with France for her marriage to the Dauphin (later Francis II), and these were satisfactorily concluded on July 7, 1548, whereupon Mary was sent to France. At the French court Mary received a good education and showed considerable intelligence. On April 24, 1558, her marriage to the Dauphin took place, and, contrary to the public agreements, she bound herself secretly that, if she died childless, her Scottish realm and her right of succession to the English throne, as great-granddaughter of Henry VII, should pass to France. In 1559 her husband ascended the French throne, and during his reign of over a year Mary exerted supreme influence. But the death of Francis II, on Dec. 5, 1560, destroyed all her plans. Catharine de' Medici was hostile to her; and so, on Aug. 15, 1561, after considerable negotiation with the great Protestant lords of Scotland, she left France forever and returned to Scotland.

Her government began auspiciously, and even the religious situation caused at first little difficulty. Protestantism had received the sanction of the Scottish Parliament, and Mary did not oppose this settlement, stipulating merely for liberty to use her own religion. Moreover, she surrounded herself with Protestant advisers, her chief minister being her natural brother, James Stuart, an able and ambitious statesman, whom she soon created Earl of Mar, and a little later Earl of Murray (q.v.). Her chief difficulties were to come to an amicable agreement with Elizabeth concerning the succession to the English throne. The English Queen, however, was suspicious of Mary, and the question of whom the latter would marry complicated matters further, Elizabeth fearing that an alliance of the

Scottish Queen with a powerful foreign prince, like Don Carlos of Spain, would endanger her throne. Contrary to the advice of all, Mary, on July 29, 1565, married her cousin, Henry Stuart, Lord Darnley, who had some claims to both the Scottish and English thrones. The marriage was not a love match, but chiefly due to the fact that Darnley had considerable influence with the English Catholics, who would thus aid Mary in any plans she might have to obtain the English throne. On the other hand, the marriage alienated the powerful Protestant lords of Scotland, notably Murray, who rose in rebellion, and it made Elizabeth more suspicious than ever. The insurrection of the Protestant lords was suppressed, but Mary's eyes were soon opened to the mistake of her marriage with the worthless Darnley. She was disgusted by his debauchery and alarmed by his arrogance and ambition, which went so far as to prompt him to demand that the crown should be secured to him for life, and that if the Queen died without issue it should descend to his heir. Ascribing Mary's reluctance to accede to these demands to the influence of her confidential adviser, David Rizzio, an Italian of great ability, but generally hated as a foreigner and a Roman Catholic, Darnley conspired with the Protestant nobles to murder him and seize the government. It was stipulated that Protestantism should remain the recognized religion. On March 9, 1566, Rizzio was dragged from Mary's supper room and assassinated. Mary dissembled her indignation at her husband's treachery, succeeded in detaching him from the conspirators, and persuaded him not only to escape with her from their power by a midnight flight to Dunbar, but also to issue a proclamation in which he denied all complicity in their designs. Two of the chief conspirators, Ruthven and Morton, fled to England, while Murray and the Queen became reconciled. On June 19, 1566, Mary gave birth to a son (later James VI of Scotland and James I of England); but soon afterward she quarreled more than ever with Darnley, and the latter thought of leaving the country. Meanwhile the Queen showed more and more favor to James Hepburn, Earl of Bothwell, a needy and profligate noble. About Jan. 9, 1567, Darnley fell ill. Mary brought him to Edinburgh, and he was lodged in a small mansion. Here on February 9 the Queen visited him, but left him about 10 o'clock in the evening. Early the next morning the house in which Darnley slept was blown up, and his lifeless body was found in a neighboring garden. Bothwell was undoubtedly the murderer, and it is a matter of controversy whether or not Mary was privy to the deed. A mock trial was held, and Bothwell was acquitted. On April 19 he carried the Queen to Dunbar, probably with her full consent. He divorced his young wife, Catherine Gordon, whom he had married little more than a year before, and on May 15, 1567—only three months after her husband's murder—Mary became Bothwell's wife.

This last indiscretion of Mary arrayed all her nobles in arms against her. She was able to lead an army against them, but it melted away without striking a blow at Carberry Hill, June 15, 1567. She had to abandon Bothwell and surrender herself to the confederated lords, who led her to Edinburgh, and from there to Lochleven. At the latter place she was compelled on July 24, 1567, to sign an act of abdication in favor of her son. Escaping from her island prison May 2, 1568, Mary found herself in a few days at the head of a small army, but this was defeated on May 13 by the Regent Murray at Langside, near Glasgow. Four days afterward, in spite of the entreaties of her best friends, Mary crossed the Solway and threw herself on the protection of Queen Elizabeth, only to find herself a prisoner for life.

Mary was first taken to Carlisle, but on July 13, 1568, she was removed to Bolton. Elizabeth demanded that there should be an inquiry into Darnley's murder. Mary seems to have held out at this time hopes of marriage to the Duke of Norfolk, and there were several attempts to bring about a rising among the Catholics in England and Scotland in her favor. As a result Norfolk was executed, as being implicated, on Tower Hill, June 2, 1572. Undoubtedly Elizabeth would have been glad to be rid of her dangerous prisoner, but could not on account of her relations with Spain and France at the time. Mary was moved from place to place, until in April, 1585, she was placed under the care of Sir Amyas Paulet, and here all opportunity was given her to become entangled in the conspiracy of Antony Babington (q.v.) against Elizabeth. For this she was brought to trial, and though she denied all complicity, she was found guilty, and beheaded on Feb. 8, 1587, at Fotheringay Castle. She met her fate with great composure and dignity.

Mary was reputed to be the most beautiful woman of her time. Her whole life was dramatic, and hence it has never ceased to interest poets and historians. She was a woman of great ability and varied accomplishments. Her prose writings have been collected by Prince Alexander Labanoff in his *Recueil des lettres de Marie Stuart.* Setting aside the 12 sonnets which she is said to have written to Bothwell, and which survive only in a French version of an English translation, no more than six pieces of her poetry are now known. The best is the poem of 11 stanzas on the death of her first husband, Francis II. The longest is a *Meditation.* All are in French, except one sonnet, which is in Italian.

Bibliography. The different collections of English, French, and Spanish state papers contain much material. Consult also: William Robertson, *History of Scotland during the Reigns of Queen Mary and King James VI* (2 vols., London, 1759); F. A. A. Mignet, *Histoire de Marie Stuart* (2 vols., Paris, 1851); Agnes Strickland, *Life of Mary, Queen of Scots* (2 vols., London, 1873); J. A. Froude, *History of England* (ib., 1881); Bresslau, "Die Kassettenbriefe der Königin Marie Stuart," in *Historisches Taschenbuch,* 6th series, vol. i (Leipzig, 1882); T. F. Henderson, *The Casket Letters and Mary, Queen of Scots* (Edinburgh, 1889); H. G. Bell, *Life of Mary, Queen of Scots* (2 vols., London, 1890); C. E. Lloyd (ed.), *State Trials of Mary, Queen of Scots* (Chicago, 1899); Samuel Cowan, *Mary, Queen of Scots, and Who Wrote the Casket Letters?* (London, 1901); M. M. Shoemaker, *Palaces and Prisons of Mary, Queen of Scots* (New York, 1903); T. G. Law, in *Cambridge Modern History,* vol iii (Cambridge, 1904), containing an exhaustive bibliography; Andrew Lang, *The Mystery of Mary Stuart* (London, 1904); T. F. Henderson, *Mary, Queen of Scots: Her Environment and Tragedy* (2 vols., New York, 1905); F. A. Maccunn, *Mary Stuart* (2d ed., ib., 1907); Samuel Cowan, *Last Days of Mary Stuart, and Journal of Burgoyne, her*

Physician (Philadelphia, 1907); F. A. Mumby, *Elizabeth and Mary Stuart* (Boston, 1914).

MARY SUMMER. The pseudonym of the French author Charlotte Marie (Filon) Foucaux (q.v.).

MA'RYSVILLE. A city and the county seat of Yuba Co., Cal., 52 miles by rail north of Sacramento, at the junction of the Yuba and the Feather rivers and on the Southern Pacific, the Western Pacific, and the Northern Electric railroads (Map: California, D 3). Steamers ply between here and San Francisco. A splendid levee system has been erected at a cost of $2,000,000 to protect the city from river floods. Marysville is the seat of the College of Notre Dame (Roman Catholic) and has a fine public library, handsome courthouse and city hall buildings of quaint Spanish architecture, three parks, and splendid bridges spanning both rivers. The city is in an agricultural and mining region, dredger mining on the Yuba River near Marysville having placed the county among the leading gold-producing districts in the United States. The surrounding region is rich in the production of cereals, olives, rice, prunes, raisins, and seedless grapes. Among the industrial establishments are gold-dredger and traction-engine works, flour and woolen mills, and fruit drying and canning plants. The government, under a charter of 1876, is administered by a mayor, elected biennially, and a unicameral council, elected at large, though representing the city wards. Pop., 1900, 3497; 1910, 5340.

Marysville, built on the site of a trading post called New Mecklenburg, was founded in 1849 by Charles Covilland, a Frenchman, and was called Yubaville until 1850, when it was renamed after the founder's wife. In 1851 Marysville was chartered as a city; in 1852 it had 4500 inhabitants and, in 1855, 8000; and in 1860, when the gold work began to decline, it had become, on account of a large floating population, the third city in size in the State.

MARYSVILLE. A city and the county seat of Marshall Co., Kans., 113 miles by rail west of St. Joseph, Mo., on the Big Blue River and on the St. Joseph and Grand Island and the Union Pacific railroads (Map: Kansas, F 3). It has good water power and there are grain elevators, planing mill, greenhouses, marble yard, and manufactures of flour, machinery, cigars, cement blocks, lumber, wagons, brooms, etc. Pop., 1900, 2006; 1910, 2260.

MARYSVILLE. A village and the county seat of Union Co., Ohio, 28 miles northwest of Columbus, on Mill Creek and on the Toledo and Ohio Central and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Ohio, D 5). It is surrounded by a farming and dairying country and productive sheep district and has a large milk condensery, brass works, and other industrial establishments. Among the noteworthy features of the city are the State Reformatory for Women, State armory, high school ($100,000), Carnegie library, and the various county institutions. Pop., 1900, 3048; 1910, 3576.

MA'RYVILLE. A city and the county seat of Nodaway Co., Mo., 46 miles north of St. Joseph, on the Chicago, Burlington, and Quincy and the Wabash railroads (Map: Missouri, B 1). It has a State Normal School, State Farm and Experiment Station, conservatory of music, St. Francis Hospital, Carnegie library, and fine post-office and high-school buildings. Among the industrial establishments are cigar, lightning-rod, and rope-halter factories, feed mills, a garment factory, foundry, acetylene-light factory, a serum laboratory, cement-block, meat-packing, and cider and vinegar plants, etc. A large trade in grain, cattle, and hogs is carried on. The water works are owned by the city. Pop., 1900, 4577; 1910, 4762.

MARYVILLE. A town and the county seat of Blount Co., Tenn., 16 miles south of Knoxville, on the Southern, the Louisville and Nashville, and the Tennessee and Carolina Southern railroads (Map: Tennessee, G 3). It is surrounded by a farming country and has flour, woolen, and planing mills, stove foundry, aluminium works, and coffin factory. The town possesses a fine courthouse and is the seat of Maryville College (Presbyterian), which was founded here in 1819, Maryville having been settled as early as 1795. Pop., 1910, 2381.

MARZIALS, mär'zī-*alz*, *Fr. pron.* mär'zê'àl', THÉODOR (1850–). An English poet and composer, born in Brussels. His father was a Frenchman, his mother a Yorkshire woman. He passed his boyhood in Brussels and in Switzerland, and studied with M. L. Lawson in London. In 1870 he became superintendent of the Musical Department in the British Museum. In 1872 he published for private circulation a pastoral called the *Passionate Dowsabella,* republished the next year in *A Gallery of Pigeons, and Other Poems.* The volume, showing some pre-Raphaelite influence, contains poems of striking beauty. Afterward he composed, with their music, many delightful songs. His ballads in Old English style have been especially popular in England and elsewhere. In 1882 appeared *Old Songs Arranged with Accompaniments;* in 1904, *Pan Pipes.*

MASA. See MOSGU.

MASACCIO, mä-sät'chō, properly TOMMASO GUIDI (1401–c.1428). One of the greatest Florentine painters, the pioneer of the early Renaissance in Florence. Our meagre information on his life is derived from the Florentine tax rolls. According to a statement given by his brother, he was born Dec. 24, 1401, the son of a notary, whose family, the Scheggia, were of Castello San Giovanni in the Val d'Arno. Here, it would seem, Masaccio was born. In 1422 he was enrolled in the guild of speziali (druggists), to which painters belonged, and in 1424 in the guild of painters proper. His nickname Masaccio (Hulking Tom) shows him to have been of careless and slovenly habits. In one of the tax-roll records it is stated that he lived with his mother and brother and that he neither collected what was due him nor paid his debts, from which it would seem that he was impractical in money matters. According to a notice by Vasari, based upon a contemporary statement by Landini, he lived to be only 26. That he did not attain a much greater age is proved by a tax roll of 1428, in which it is reported that he died at Rome.

In his art he was a pupil of Masolino, and was probably influenced by Brunelleschi and Donatello. He rendered very material assistance to Masolino (q.v.), perhaps even painted whole frescoes in San Clemente, Rome, as he certainly did in the celebrated Brancacci Chapel, Santa Maria del Carmine, Florence. When Masolino left these frescoes unfinished, Masaccio took charge of the work, and it was his achievements which gave them their supreme importance in

Florentine painting. Even in the works assigned to Masolino, as in the "Raising of Tabitha," the assistance of his superior pupil may be traced. The smallest of Masaccio's independent subjects is the "Expulsion from Paradise," a marvel in the rendition of movement, of the nude, and in emotional qualities. Eve cries aloud in her anguish, while Adam in deeper grief covers his face with his hands. Other frescoes of the series by him are "SS. Peter and John Healing"; "St. Peter Baptizing"; "SS. Peter and John Distributing Alms"; and "The Tribute Money." In the last-named fresco, a very large composition, Masaccio's genius is most completely expressed. Just below it, "St. Peter Enthroned" is by his own hand, as is also the design of the "Raising of the King's Son," in which the saint and the group on the left are in part by him, the remainder being by Filippino Lippi.

His frescoes in the Brancacci Chapel were epoch-making in Florentine painting. They determined the path it was to pursue to the end, and were the training school of painters as long as Florentine art remained worth while. Even Michelangelo was inspired by them, and Raphael introduced whole figures in his Vatican frescoes. What Donatello had done for sculpture and Brunelleschi for architecture, Masaccio did for painting. As early as 1436 Alberti, the greatest art theorist of the early Renaissance, ranks him with these artists and with Ghiberti and Luca della Robbia. Like Giotto, he was a supreme master of the significant. Avoiding unnecessary detail, he depicted only the essential. His naturalism was of the noble kind which does not sacrifice style. His knowledge of the nude far transcended that of the painters of his generation, and his frescoes, notwithstanding their ruined condition, evince decorative color of a high order. He was the first Italian painter with a perception of atmospheric perspective, and his landscape combines realistic with imaginative qualities of a high order.

His most important fresco, after those of the Brancacci Chapel, is the "Trinity," with the Virgin and St. John and donor and his wife, in Santa Maria Novella, Florence. The fresco in the oratory at Montemarciano seems an early work, but the Pietà in the baptistery of Empoli is more probably by Masolino (q.v.). The most important and numerous of Masaccio's surviving panels are a number belonging to an altarpiece painted in 1426 for the church of the Carmine in Pisa. Although the panels have been dispersed, the principal have been identified and an ingenious reconstruction of the altar has been attempted by Berenson. One panel, "St. Paul," is still at Pisa; four others, including the "Adoration of the Magians" and the "Martyrdom of SS. Peter and Paul," are at Berlin; while the centrepiece, a "Madonna Enthroned with Angels," belongs to the Sutton collection, Brant Broughton, Lincolnshire. Other panels of the same altar are the "Crucifixion," Naples, and "St. Andrew," belonging to Count Lanckoronski, Vienna. Mention should also be made of the "Madonna with St. Anne," in the Florentine Academy, an early but impressive panel. The portrait of a young man in the Gardner collection, Boston, ascribed by Berenson to Masaccio, is usually considered a school piece.

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MASAI, mä-sī'. A mixed people in British East Africa, east of Lake Victoria, probably of Hamitic stock. They are divided into the nomad Masai, or Il Oikob, and the settled Masai, or Wa Kwafi, the latter having been forced to become agriculturists, both on account of the plague which destroyed their immense herds of cattle and the intertribal warfare that drove them into the territory of non-Masai tribes. The Il Oikob, or "Freemen," are typical Masai and are of magnificent physique, not one of the warrior class being under 6 feet in height. Their complexion is chocolate, their hair frizzly, and their eyes slightly oblique. The pure-blooded tribes have good features and, barring their color, would pass for Europeans, while among other tribes the coarse negro features are observed. Each tribe is nomadic within certain well-marked boundaries and the subdivisions are named from their geographical location. Their villages, set in a circle in which the cattle are herded, consist of huts of bent boughs plastered with cow dung, with flat roofs. Encircling the village is a strong *boma*, or thorn fence. They practice few arts, their weapons and utensils being procured largely by barter or from a subject tribe called Andorobbo living among them. The country is elevated and the climate temperate, so that the Masai wear more clothing than the tribes in the warmer parts of Africa. The women adorn themselves with a profusion of strings of beads and circlets of iron and brass. They wear the rudiments of a dress, consisting of a small apron in front and a larger at the back. The men have an upper garment of tanned skin, a length of cloth fastened at the neck and hanging down the back, armlets of ivory or horn, ornaments of slender iron chain, and a waist cloth. The hair is gathered into a sort of chignon which hangs below the shoulder blades. The ear lobes are enormously distended by ornament.

The Masai are divided into a number of clans, the symbol of which the warriors paint on their shields. The people are divided into married men, living in the villages, and warriors, living in the camps. The latter youths are set apart by the rite of circumcision on reaching puberty, occupy separate quarters, and are attended by the unmarried women. A diet of meat and milk is allowed them, but only one of these must be eaten at a time, and between the periods a purgative treatment is required. Before going on their raids they gorge themselves with blood and meat. The warrior's costume consists of an oval headdress of ostrich feathers encircling the

face, a shoulder cape of vulture feathers, a belt and anklets of colobus monkey skin. Their weapons are a long-bladed assagai, a short sword and club, and an oval shield of buffalo hide. After serving his time the warrior settles down to married life, and then varies his flesh diet with vegetable food purchased from agricultural tribes. The Masai are dignified, self-contained, and intellectually capable. They practice no form of burial, the bodies of the dead being cast out to be devoured by hyenas. Prayers and offerings of grass dipped in cream are made to a superior deity; grass is also an offering to ward off evil. They believe in witchcraft and maintain shamans. Consult: Thomson, *Through Masai Land* (London, 1885); A. C. Hollis, *The Masai: Their Language and Folklore* (Oxford, 1905); M. Merker, *Die Masai* (2d ed., Berlin, 1910).

MASAMPO, mȧ-säm′pō; also called Masan by the Japanese. A treaty port of Chosen (Korea), on the south coast, west of Fusan. It was opened to foreign commerce on May 1, 1899. Pop., 1912, 34,000 natives, 300 foreigners, and a Japanese settlement of 3000. The climate is mild and the harbor good. Some lines of small steamers connect the town with Fusan. Its nearness to the latter city has interfered with its trade and development in the past, but the Japanese government is engaged in the construction of a naval station and a new Japanese city and hopes to make Masampo one of the most important commercial and industrial towns of south Chosen. Masampo became known to the world in 1900, through the unsuccessful efforts of the Russian government to obtain a lease of the place.

MASANIELLO, mä′zȧ-nyĕl′lō, properly Tommaso Anielio (c.1623–47). A fisherman of Amalfi, leader of the revolt which took place in Naples in 1647 against the Spanish Viceroy, the Count of Arcos. The people had been exasperated by oppression, and great excitement had been produced by a new tax laid upon fruit, the chief sustenance of the poor. On July 7, 1647, the customhouse officers were assaulted in the market place by the infuriated people, Masaniello was chosen captain, and the houses of the tax farmers were sacked. The Governor fled to the castle, and Masaniello became master of the city, dispensing justice and punishing severely all attempts at brigandage. On July 13, in the church of the Carmelites, the Viceroy agreed to restore the ancient rights of the Neapolitans and to remove the oppressive taxes. The events of the week unbalanced Masaniello's mind; he became savage, cruel, and irresponsible. The people lost faith in him because of his compromise with the Viceroy; his lieutenants were seduced by the government, and he himself was murdered by a mob, who were furious, because of his supposed desertion to the Spanish party. Auber used the story of his life in *La muette de Portici.* Consult Saavedra, *Insurección de Napoli en 1647* (Madrid, 1849). See Muette de Portici.

MÁS Á TIERRA, mäs ȧ tyĕr′rȧ. See Juan Fernandez.

MASAYA, mȧ-sä′yȧ. A town of Nicaragua, 15 miles southeast of Managua and 10 miles from the north shore of Lake Nicaragua, near the volcano of Masaya, a broad, low mountain, about 3000 feet high (Map: Central America, D 5). The town stands in the centre of a fertile region, growing tobacco, coffee, sugar, and rice, and is connected by railway with Granada and Managua. The natives manufacture cordage and palm hats. Pop., 1913 (est.), 13,000, largely native Indians.

MASBATE, mȧs-bä′tȧ. One of the Philippine Islands, situated nearly in the centre of the archipelago, about 30 miles south of the southeast end of Luzon (Map: Philippine Islands, D 4). Together with Burias, Ticao, and a few other smaller islands it forms the Province of Masbate. It is in the form of two legs of a triangle, with the large Bay of Asid opening towards the south. The eastern leg extends 82 miles from northwest to southeast, with an average width of 15 miles, and from this the western leg projects about 24 miles. The area of the island is 1236 square miles, of Burias 197, of Ticao 121, and of the whole province 1569 square miles. The island is very mountainous, rising at points to about 2500 feet; the principal chain sending out a number of spurs, extends in a semicircle from the northwest to the southeast end. Its rivers are all very short. The tropical climate is subject to frequent and sudden changes.

There are extensive forests in the interior and the principal occupation of the inhabitants is lumbering and the extraction of forest products. Stock raising, important before the Spanish-American war, has suffered greatly since from the rinderpest. Fishery is carried on to a great extent, but agriculture is in a backward state. The principal manufactures are sugar sacks and palm mats, the latter being noted for their excellent workmanship and durability of colors. The commerce is considerable, as Masbate lies not only opposite the Strait of San Bernardino, one of the two main eastern entrances to the archipelago, but also in the direct route from Manila to Samar and Leyte. There are several excellent landlocked harbors. The population of the island is about 30,000 and of the whole Province of Masbate was, in 1903, 43,675, of whom 10,183 lived in Ticao and 1627 in Burias. The tribe of the Visayans constitutes nearly 93 per cent of the population; there are also 2205 Bícols and 583 Tagalogs. The capital is Masbate, situated on the north coast; it is a port of entry, with a good harbor and a population of 4018.

Perfect peace prevailed throughout the island before the end of the year 1900, and the inhabitants showed great eagerness to have civil government established, which was done on March 18, 1901.

MASCAGNI, mȧ-skä′nyē, Pietro (1863–). An Italian composer. He was born at Leghorn, of humble parentage. Unknown to his father, the boy began to study music with Soffredini, and subsequently his uncle furnished him with the means to continue his studies. At the Milan Conservatory he worked for a little while, under Ponchielli and Saladino, but suddenly broke off his studies to make a tour with an operatic troupe. For a few years he made a precarious livelihood by conducting various traveling opera companies, until he achieved his phenomenal success in 1890 with *Cavalleria Rusticana.* The great promise held out by this work was never fulfilled. The public was carried away by the excellent libretto and the dramatic intensity of the music; but the musicians could not be blind to the glaring defects of musical workmanship and the crudity and brutality of the orchestration. Instead of remedying these

faults by means of serious study, Mascagni, intoxicated by this easily won success, continued to write. *Amico Fritz* (1891), *I Rantzau* (1892), *Ratcliff* (1894), *Silvano* (1895), *Zanetto* (1896), were complete failures. *Iris* (1898) was moderately successful. The last-named opera was revived at the Metropolitan Opera House, New York, in 1915. *Le Maschere* (1901), *Amica* (1905), again were signal failures; while *Isobel* (1911) scored a great popular success, but left the critics cold. *Parisina* (1913) met a very indifferent reception. With *L'Alodoletta* (1915) the composer ventured for the first time into the field of comedy. How a musician so deficient in the technic of his art could have occupied the post of director of the Liceo Rossini at Pesaro from 1895 to 1903 will forever remain a mystery. He made several tours of European countries, meeting with varying success. But his American tour of 1902 was a complete fiasco. Consult: G. Bastianelli, *Pietro Mascagni* (Naples, 1910), and E. Pompei, *Mascagni nella vita e nel arte* (Rome, 1912).

MASCARA, mȧs-kȧ′rȧ, *Fr. pron.* mȧs′kȧ′rȧ′. The capital of an arrondissement and a fortified town in the Province of Oran, Algeria, 45 miles southeast of Oran, on the slope of the Atlas Mountains. Mascara stands on the site of a Roman colony and is inclosed by walls 2 miles in length. Two of its ancient buildings remain and the city is now of the French colonial type. In 1832 it became the residence of Abd el Kader, who was born in the neighborhood. It was burned by the French in 1835, afterward regained by Abd el Kader, and finally taken by the French in 1841, since when it has developed into an important trading centre, doing an extensive trade in cereals and oil and in the famous wine that bears its name. Pop., 1901, 20,992; 1911, 24,254.

MASCARENE (mäs′kȧ-rēn′) **ISLANDS.** The collective name given to the islands of Réunion, Mauritius (qq.v.), and Rodriguez, situated east of Madagascar.

MASCARILLE, mȧ′skȧ′rēl′. A type of valet distinguished for effrontery, intrigue, and impudence, immortalized by Molière in *L'Etourdi*, *Les précieuses ridicules*, and *Le dépit amoureux*.

MASCARON, mȧ′skȧ′rôN′, JULES (1634–1703). A French prelate and court preacher. He was born at Marseilles. He was intended for the law, but preferred the Church, and entered the Congregation of the Oratory. He began preaching in 1663, and soon attracted attention, and wherever he went in the provincial towns—as Angers, Saumur, Marseilles, and Nantes—large audiences, representing various classes, and even the learned, thronged to hear him. In 1666 he was called to the court, where his reputation continued to increase. He gained and held the favor of King Louis XIV notwithstanding his unsparing denunciation of fashionable and even royal sins. He was made Bishop of Tulle in 1671, and was transferred thence in 1679 to a more responsible position at Agen; but still continued to preach before the court. The most famous of his orations was that on Marshal Turenne (1675). Other orations which have been much admired are those on Chancellor Séguier, Queen Henrietta of England, and the Duke of Beaufort. A collection of his sermons and orations, edited by Father Borde, a member of the Congregation, was published in 1704. His sermons may also be found in a collection of funeral orations by Bossuet, Fléchier, and Mascaron (Paris, 1734). *Œuvres de Mascaron* appeared in Paris in 1828.

MASCART, mȧ′skär′, ELEUTHÈRE ELIE NICOLAS (1837–1908). A French physicist, born at Quarouble, Nord. He was educated at the Ecole Normale Supérieure. He succeeded Regnault at the Collège de France in 1872 and in 1878 he was made director of the Government Central Meteorological Bureau, a post he held until 1907, during which time he greatly improved its organization, equipment and work. He was a member of the International Bureau of Weights and Measures. He was elected a member of the Academy of Sciences in 1884, taking the place of Jamin, and in 1904 became its president. Mascart was honored with the various decorations of the Legion of Honor, being made a commander in 1889. He conducted a number of important investigations in spectroscopy, especially of the ultra-violet rays and various interference phenomena. He also made valuable studies in various fields of electricity, working in 1881–84 on the unit of resistance, and later on atmospheric electricity and terrestrial magnetism. He is the author of *Eléments de mécanique* (1866); *Traité d'électricité statique* (1876); *Leçons sur l'électricité et le magnétisme*, in collaboration with Joubert (1882); volume ii of *Méthodes de mesures et applications* (1888); *Traité d' optique* (1889), and *Traité de magnétisme terrestre* (1900).

MASCHERONI, mäs′kȧ-rō′nē, LORENZO (1750–1801). An Italian mathematician, born at Castegnetto. He was educated at the University of Pavia and at the Collegio Marsiano di Bergamo. He served as professor of literature, and after 1786 of mathematics, at the University of Pavia. Although he had been ordained to the Roman Catholic priesthood, he supported the revolutionary changes of the time, and became a deputy of the Cisalpine Republic. In 1798 he was a member of the international commission to establish a new metrical system. He wrote considerable verse, including *Versi sciolti di Daphni orobiano a Lesbia cidonia* (1793), and *Versi sciolti indirizzati alla contessa Paolina Secco-Suardi Grismondi* (1808). His mathematical writings include: *Sulle curve chè servono a delineare ore ineguali degli antichi nelle superficie piane* (1784); *Nuove ricerche sull' equilibrio delle volte* (1785); and his chief work, *Geometria del compasso* (1795).

MASCLE, măs′k'l (OF. *mascle, macle*, Fr. *macle*, from Lat. *macula*, spot). A heraldic bearing in the form of a lozenge pierced in the centre. See HERALDRY.

MASCOUTEN, mȧs-kōō′tĕn (from *Mashkodainsug*, little prairie people). An Algonquian people of the Illinois River concerning whom there has been much controversy. From a misinterpretation of their Algonquian name they were known to the Hurons, and hence to the French, as the "Fire Nation" (*Nation du Feu*). Much of the confusion in relation to the name arises from the fact that it was apparently used in a general as well as a specific sense and applied without warrant to more than one Algonquian band of the Illinois and Wabash prairies. According to the traditions of the Ojibwa and Ottawa they drove the Mascouten from the neighborhood of what is now Mackinaw, and forced them to retire to the southern end of Lake Michigan. In 1712 they joined the Foxes and Kickapoo against the French, but suffered terrible reverses, losing 150 in a single en-

counter. In the same year the Potawatomi and other Northern tribes made a concerted descent upon the Mascouten and Foxes and killed or took captive one thousand of them, pursuing the survivors as far as Detroit. The power of the Foxes was completely broken by this war with the French and their allies, and the Mascouten were so far reduced that in 1736 they were said to number but 60 warriors, living then with the Kickapoo in southern Wisconsin. They are now extinct.

MASCOV, mäs'kôf, JOHANN JAKOB (1689–1761). A German publicist and historian, born at Danzig. He studied theology and law at the University of Leipzig, where he was afterward appointed professor of law and history. Of his publications, the following are considered of great merit: *Principia Juris Publici Imperii Romano-Germanici* (1729; 6th ed., 1769), which for a long time remained a model textbook in many universities; and *Geschichte der Deutschen bis zum Abgang der merowingischen Könige* (1726–37), a very valuable volume for the early history of Prussia, one of the first to consider the nation rather than its rulers. Consult W. Goerlitz, *Die historische Forschungsmethode J. J. Mascovs* (Leipzig, 1901).

MAS-D'AZIL, mȧ'dȧ'zĕl'. An archæological grotto in the Department of Ariège, France, yielding relics especially of the latest Paleolithic period. See PALEOLITHIC PERIOD.

MASDEU, mäs-dā'o͞o, JUAN FRANCISCO (1744–1817). A Spanish historian, born at Palermo. He entered the society of Jesus in 1759, was professor in Jesuit seminaries at Ferrara and Ascoli, visited Spain in 1799, was exiled, and returned in 1815 to Valencia, where he died two years later. His great work, which subsequent investigations have not yet entirely superseded, and which despite its 20 volumes was not complete (continuation on the same scale would have carried it to 50 volumes), is the *Historia crítica de España y de la cultura española* (1783–1805).

MASE'FIELD, JOHN (1875–). An English poet and dramatist, born in the west of England. As a boy he was a sailor on the ship *Conway*, and made many voyages. Not only at sea but on land was his early life adventurous; among other occupations he had been a farm laborer, and a bar-tender in a New York saloon. These experiences of the lower strata of society were later to prove grist for his literary mill. When he abandoned the sea, ceased roaming, and established himself in or near London, Masefield became a constant writer in prose and in verse. In 1912 the Royal Society of Literature awarded him the Edmond de Polignac prize for poetry. His best poetic work is, perhaps, found in his ballads of the sea, and in such narrative poems as *The Everlasting Mercy* and *The Widow in the Bye Street*, memorable for the vitality of their stark realism, for their terrible pathos, and for the curiously monotonous but effective chant that the verse form supplies. His sketches and stories of the sea, with the savor of storm-tossed brine about them, are appealing in their blend of romance and picturesque realism. His stories for boys are in a vein to please young readers. His plays, impressive, if sometimes crude, show remarkable evidence of a rapidly increasing power; they are essentially plays for reading, however, rather than for the theatre. The following list of Masefield's varied productions is representative of the range of his work: *Salt-Water Ballads* (1902); *Sea Life in Nelson's Time* (1905); *A Mainsail Haul* (1905; reissue, 1913), tales and sketches of the sea; *On the Spanish Main, or Some English Forays* (1906); *Captain Margaret, A Romance* (1908); *The Tragedy of Nan and Other Plays* (1910); *The Tragedy of Pompey the Great* (1910), an historical drama; *Ballads* (1910); *The Street of To-day* (1911); *William Shakespeare* (1911), in the "Home University Library"; *Jim Davis* (1912), a story for boys; *The Story of a Roundhouse and Other Poems* (1912); *The Everlasting Mercy*, and *The Widow in the Bye Street* (two narrative poems, written earlier than 1913, but then published in one volume); *Philip the King* (a drama), *and Other Poems* (1914). In addition Masefield wrote introductions to *Hakluyt's Voyages*, the *Voyages of Marco Polo*, and selections from Daniel Defoe, and edited *The Voyages of Captain William Dampier* (1906).

MASÈRES, mȧ'zâr', FRANCIS (1731–1824). An English mathematician, historian, jurist, and reformer, born in London, of Huguenot descent. He was educated at Clare College, Cambridge, obtained a fellowship, and was admitted to the bar. Soon afterward he went to Canada and in 1766 was appointed Attorney-General, which position he held for three years. He lived in Quebec until 1773. Upon his return to England the same year he became cursitor baron of the Exchequer (1773–1824). He was also senior judge of the Sheriff's Court, London (1780–1822). When the Quebec Act (q.v.) was being debated in the House of Commons, Masères was one of the important witnesses, but testified in partial opposition to Sir Guy Carleton (Lord Dorchester) (see CARLETON), whose recommendations were finally embodied in the Act. Masères, although of French descent, had strong Protestant prejudices, which led him to oppose the granting of full civil and religious freedom to the French Canadians. He published: *Principle of Life Annuities Explained in a Familiar Manner* (1783); *Scriptores Logarithmici* (1791–1807); *Scriptores Optici* (1823); *Select Tracts on Civil Wars in the Reign of Charles I* (1815); besides a large number of scientific papers, political, historical, and religious books and pamphlets.

MASH'AM, ABIGAIL, LADY (1670–1734). A friend and confidante of Queen Anne of England. She was born in London, the daughter of Francis Hill, a merchant, and his wife Mary Jennings, an aunt of the Duchess of Marlborough, by whose influence she was appointed a lady of the bedchamber to Princess Anne. She became the confidante of the Princess, and, after the latter became Queen, her genial personality increased in the royal favor as the imperious bearing of the Duchess became more and more intolerable. In 1707 Abigail was married to Samuel Masham, a gentleman of the bedchamber to Prince George of Denmark. This marriage brought about an open rupture with the Marlboroughs. The intrigues of Mrs. Masham finally resulted in the overthrow of the Whigs, the elevation of Harley to power, and the dismissal of the Duke of Marlborough. Mrs. Masham was engaged in plots to bring back the Stuarts, and she seems always to have used her position for her pecuniary advantage. Her husband was raised to the peerage in 1712. Lady Masham adhered to Bolingbroke in the quarrel between him and Oxford. After the death of Queen Anne in 1714 she lived in retirement. See ANNE.

MASHAM, SAMUEL CUNLIFFE LISTER, first

BARON (1815–1906). An English inventor. He was born near Bradford, and in 1838 his father set him up in the worsted-milling business at Manningham. During his lifetime he took out more than 150 patents, mostly in connection with cloth making. His wool-combing machine was especially profitable, and so greatly was it in demand that he made a profit of nearly $5000 on each machine sold. His silk combing for utilizing silk waste became a success in 1864, and by 1878 he had developed a velvet loom that yielded him a million dollars' profit annually. He was made first Baron of Masham in 1891. He published *Lord Masham's Inventions* (1905).

MASHERBRUM, mŭsh'ĕr-brụm. See HIMALAYA.

MASHONALAND, mȧ-shō'nȧ-lănd. One of the two divisions, or provinces, of Southern Rhodesia, between Matabeleland and the Zambezi River (Map: Congo, F 6). It consists mainly of a fertile, savanna-covered plateau, 3000 to 5000 feet above the sea, intersected by several affluents of the Zambezi and the Sabi. The climate is healthful to Europeans. Gold has been found in considerable quantities. The white population in 1911 numbered 12,631; native population, 495,451; in addition there were a number of Asiatics and other colored persons. The chief towns are Hartley, Umtali, Gatooma, Victoria, and Salisbury, the capital of southern Rhodesia, with 3479 white inhabitants in 1911. A railway from Beira, on the coast of Portuguese East Africa, was opened, via Umtali, to Salisbury in May, 1899. In October, 1902, a railway 301 miles in length was completed between Salisbury and Bulawayo (in Matabeleland). The main line ("Cape-to-Cairo" railway) was completed in June, 1904, from Bulawayo 282 miles to Victoria Falls, where it crosses the Zambezi on a bridge 650 feet long, 30 feet wide, and about 420 feet above the water. The bridge was formally opened in September, 1905. In 1889 Mashonaland was acquired by the British South Africa Company, and in 1893 the company's possession was secured through a successful war with the Matabeles, who in July of that year began hostilities by a raid into Mashonaland. See RHODESIA.

The ruins of south Mashonaland, of which the best known are those of the Zimbabwe group, are numerous. Along the gold-bearing reefs are thousands of excavations into the quartz veins as well as many hundred ancient ruins, temples, fortresses, and the like. The early history of this region was not known by the Mashonas who were living here at the time of the advent of the Europeans. The announcement of the finding of the ruins by the traveler Carl Mauch in 1871 attracted much attention, and in 1891 Theodore Bent surveyed and described the ruins of Zimbabwe. He found one portion to be elliptical with a round tower and to cover a considerable area of a gentle rise; below this in the valley lay a mass of ruins; while another structure, apparently a fort, crowned a bold, rocky hill. The walls are constructed of small, squared blocks of rough-face granite, laid dry, and occasionally having ornamental courses in herringbone or chevron pattern. The walls are very thick, in some places standing over thirty feet, and the coursing and broken joints show fair skill in masonry. The elliptical ruin has several gateways, the interior is broken by walls into a labyrinth, and in a central space are an altar and two remarkable round towers, the latter built solid. Monoliths of rough, unhewn blocks of granite, set in the ground, occur in these ruins, and in some cases the monoliths are set upright on the top of the wall. The hill fort consists of curving walls built among gigantic granite boulders, forming a maze above a cliff 90 feet high, and is flanked on the accessible side by a wall 36 feet high and 13 feet thick at the top. Around the rude altar in the temple ruins were found phallic emblems, birds, and decorated bowls carved from soapstone. Remains of gold smelting furnaces with crucibles and pottery blowpipes, and stone ingot molds, were discovered, and glass beads, celadon pottery, Persian pottery, and Arabic glass occurred in the ruins. Spearheads and arrowheads, battle-axes, bells, chisels, spades, and other tools were taken out. The ruins have been ascribed to the pre-Mohammedan Arabs, probably of the Sabæo-Himyaritic period, so that there seemed good reason for locating the Land of Ophir in this region. These conclusions were challenged by Randall-MacIver, who holds that glass and porcelain sherds not older than of the 14th century occur in the lowest strata examined, and that accordingly the ruins are of merely mediæval antiquity. This view is also accepted by Von Luschan, who regards practically all the finds as of Kaffir origin. On the other hand, Passarge pleads for an old Sabæan culture, which may have become deteriorated and invested with a Kaffir veneer.

The Mashonas are a Bantu negro people, whom the Matabeles have driven to live in hill forts overlooking their fields. They are peaceful agriculturists, raising corn, sweet potatoes, rice, tobacco, and Indian hemp. They have herds of cattle and goats, and a common occupation is hunting for gold. The Mashonas are of chocolate-brown color, above the average height, slender in build, and the young women have good figures and are graceful. The men wear bracelets of buffalo hide, necklaces of bone and claws of gazelle hoofs, and aprons of leather interwoven with beads of iron and brass. Their headdress is of feathers and their coiffure is elaborate. The two front teeth are filed to a V-shape. The women shave their heads, but young girls string beads on their hair. They wear aprons, and their bodies are decorated with raised tattooing. The warriors carry three assagais, a club, shield, and battle-axe. The bow and arrow are also used. They are skillful iron smelters and workers, using the double bellows and working out implements and weapons with stone tools. They also make pottery, wooden dishes, and bark cloth. They smoke and snuff tobacco and use the narcotic hemp to excess. Travelers remark on their fondness for heat; many are disfigured from scorching caused by sleeping too near the great fires. Their musical instruments are the African harp, jew's-harp, and drum.

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MASH'PEE. A settlement of New England Indians in Barnstable County, Mass., established as a reservation in 1660. From that time to the present they have intermarried with negroes and whites, but 206 of them still claim their Indian identity.

MAS'INIS'SA, or **MAS'SINIS'SA** (c.239–148 B.C.). King of the Massylians, in eastern Numidia. He was educated at Carthage, receiving a thorough training in Latin and Greek, and in 213 B.C. induced his father to form a league with the Carthaginians, with whom he fought successfully, in 212, against Syphax, King of the Massæsylians, in western Numidia, the ally of the Romans. He then passed over into Spain at the head of a troop of Numidian cavalry, and displayed great zeal and valor in the war against Rome. But the victory of the Romans at Silpia in 206 B.C., and (so the story goes) the action of the Carthaginians in giving Sophonisba, the beautiful daughter of Hasdrubal (son of Gisco), who had been promised him in marriage, as wife to his old rival Syphax, led Masinissa to enter into an alliance with the Romans. The Carthaginians incited Syphax to make war upon him. Defeated and stripped of his sovereignty, which he had just inherited from his father, Masinissa was compelled to seek refuge on the coast of Syrtis, where he bravely defended himself until the arrival of Scipio in 204 B.C., when he identified his cause with that of the Romans. He defeated Syphax, overran his country, captured Cirta, his capital, and took prisoner his Queen, Sophonisba, whom Masinissa still loved. Scipio, who feared the influence of the Carthaginian princess, demanded her surrender as a captive of war, and Masinissa, to spare her the shame, gave her poison to drink. In the decisive battle of Zama, which followed the arrival of Hannibal in Africa (202 B.C.), he made a brilliant charge at the head of his Numidian horse, drove the cavalry of Hannibal from the field, and was the first to turn the tide of battle against the Carthaginians. For this service he received the Kingdom of Syphax in the following year. He now profited by the leisure which peace afforded him, devoting his attention to the organization of his government, and to the civilizing of his semibarbarous subjects. He put the finances on a sound basis, and developed a formidable army and fleet. But his lust of conquest was never satiated. He made continuous inroads into the territory of Carthage, and his depredations finally drove the Carthaginians to war (150 B.C.), an event which the Romans seized as a welcome pretext for intervening and utterly crushing their ancient rival. Consult Meltzer-Kahrstedt, *Geschichte der Karthager*, vol. iii (Berlin, 1913).

MASK (Fr. *masque*, origin uncertain; probably from Sp. *máscara*, from Ar. *maskharat*, buffoon, mask, from *sakhara*, to ridicule). A disguise or covering of the face, worn either to aid in the simulation of some character or for other purposes, as in the rites of savage people for the frightening away of demons or even protecting the faces of the dead. The use of masks in the drama originated perhaps in the harvest festivities of the most ancient Greek peasantry, appearing subsequently to have been associated with the representation of Satyrs, Silenus, and Bacchus in the orgies of Bacchus. In Greek tragedy, which was an outgrowth from these, masks were used from the first, and in comedy at least at a later day. Regular types of masks were developed for the different characters in tragedy and comedy, expressive of fixed emotions. They were often provided with metallic mouthpieces for the purpose of increasing the power of the voice, as was made necessary by the great size and openness of the ancient theatres. Their use indeed was adapted both to the vastness of the buildings and to a formal style of dramatic representation in which the ideal prevailed over any reality of individual impersonation. In the modern theatre the use of masks, coming down through the mimes and pantomimes of the Romans and the early Italian *commedia dell' arte* (comedy of masks), has been chiefly confined to that class of entertainments in which the very names of the characters, like Pantaloon and Harlequin (q.v.), have been derived from Italy. The use of masks at costume balls also originated in Italy, where the domino, or half mask, worn by ladies, became especially popular.

The name death masks is given to masks, usually of plaster, made after death. In the preparation of these masks the face of the dead body is usually covered with oil, and plaster of Paris is then applied. After the plaster has hardened it is removed, being prevented by the oil from adhering too closely to the skin. Into the mold thus formed fresh plaster is poured, and the resulting cast is the death mask. Such masks are of the utmost value as exact resemblances of the faces from which they are taken, although the change of contour caused by death necessarily impairs to some extent their value. Similar masks are occasionally made from living men. Here, however, the mobile expression is frequently of necessity sacrificed, so that it is in general true that the more expressive the living face, the fainter is the likeness, while a set and determined face gives, as a rule, a clear and accurate mask. The use of death masks is both ancient and widespread. The Romans made them of wax, while among the Egyptians and in the ruins of Hissarlik masks of thin gold plate have been found, and among the American Indians occasional specimens have been discovered.

Among certain groups of savages, masks play an important rôle in their ceremonials. They are sometimes constructed to imitate living forms, as of animals, but more often to portray mythological characters. As a consequence the imagination of the maker is allowed a certain freedom, and the result is seen in the grotesque productions which are familiar from the ethnological collections of our museums. They are most commonly employed in shamanistic rites and in dances of a religious and more or less secret character. Their use is perhaps most prominent in North America, particularly among the tribes on the North Pacific coast, and in the islands of the South Seas, notably in the Melanesian group. The French form of the word, "masque" (q.v.), is now used in English to designate a form of drama in which the mask is, or was originally, worn.

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Geheimbünde Afrikas (Halle, 1898); C. H. Hart, ed., *Brouwere's Life Masks of Great Americans* (New York, 1899); Fritz Karpf, "Ueber Tiermasken," in *Woerter und Sachen*, vol. v (Heidelberg, 1913).

MASK. In architecture and decoration, the face of a human being or animal, conventionalized in character; sometimes called a *mascaron* (French). The Greeks and Romans copied the tragic and comic masks of their actors in sculpture and painting for decorative purposes, and similar designs, but with exaggerated grotesqueness, were popular with the late Renaissance artists, especially of the Baroque period, for the keystones of doorways and other prominent positions.

MASKAT, mȧ-skät'. A town of Arabia. See MUSCAT.

MASKED PIG. An extraordinary breed of domestic swine, cultivated in Japan. It is black, has a short head, broad forehead and muzzle, great ears, and deeply furrowed skin; and thick folds of skin, which are harder than the other parts, resembling the plates on the Indian rhinoceros, hang about the shoulders and rump.

MASKEGON, mȧs-kē'gon (Swamp People). A wandering Algonquian people, a division of the Cree, scattered over the immense swamp region of British America, stretching from Lake Winnipeg to Hudson Bay, including the basins of the Nelson and Severn rivers. In former times they lived entirely by hunting and fishing, to which those upon reservations now add lumbering and a little farming. As they are officially classed with the Cree, no reliable estimate of their population can be given, but they may number from 1500 to 2000.

MAS'KELL, WILLIAM (c.1814–90). An English theologian, born at Bath. From University College, Oxford, he graduated B.A. in 1836, and the next year took holy orders. In 1842 he became rector of Corscombe in Dorsetshire, where he began his researches in Church history, particularly in the Anglican ritual. He produced at this period the *Ancient Liturgy of the Church of England* (1844); *History of the Martin Marprelate Controversy* (1845); and *Monumenta Ritualia Ecclesiæ Anglicanæ* (1846). These works placed him among the most able exponents of High Church doctrines. Resigning Corscombe, he became vicar of St. Mary's Church near Torquay, and domestic chaplain to the Bishop of Exeter (1847). His earlier investigations were now followed by *Holy Baptism* (1848); *An Enquiry into the Doctrine of the Church of England upon Absolution* (1849); and a volume of doctrinal sermons. He took an active part in the Gorham controversy (q.v.); and when Gorham won his case in the Privy Council, Maskell went over to the Church of Rome (1850). To the Privy Council he had addressed two memorable letters on the *Present Position of the High Church Party* (1850). Maskell never took orders in the Church of Rome. His later life was passed in the west of England, where he resumed his learned researches, publishing, among several works, *Protestant Ritualists* (1872) and *Ivories Ancient and Mediæval* (1875). He died at Penzance, April 12, 1890.

MASKELYNE, mȧs'ke-līn, NEVIL (1732–1811). An English astronomer, born in London. He was educated at Westminster and at Cambridge; carried out numerous investigations characterized by extreme accuracy of work, and became in 1765 Astronomer Royal and director of the observatory at Greenwich. He introduced into navigation the method of determining longitude by lunar distances. He founded *The Nautical Almanac* in 1767, and published *The British Mariner's Guide* (1763); *Astronomical Observations* (1765); and other works.

MASKINONGE, MUSKELLUNGE, mŭs'ke-lŭnj (Algonquin, great pickerel, from *mas*, great + *kinonge*, Chippewa dialect *kenozha*, *kinoje*, pickerel, from *kenose*, long). The great pike (*Lucius masquinongy*, or *Esox nobilior*) of the lakes of the northern United States and Western Canada, from the Ohio River northward. This magnificent fish, the largest of its family, and the most to be feared as a predatory force in American fresh waters, has the general form of a pike (q.v.), a length of from four to eight feet, and often a weight exceeding 100 pounds. It is swift, strong, and fierce, and a high prize for the angler. Its characteristics are its dark-gray color, the sides in the typical form (confined to the Great Lakes) with blackish spots of varying size on a grayish-silvery ground; the fins are spotted with black; and the opercle and lower parts of the cheeks are scaleless. See Colored Plate of AMERICAN GAME FISHES, accompanying article TROUT.

MASK'WELL. In Congreve's *Double-Dealer*, the scoundrel from whose character the play is named.

MASOCH, LEOPOLD VON SACHER. See SACHER-MASOCH, LEOPOLD VON.

MASOLINO DA PANICALE, mä-sō-lē'nō dȧ pä'nē-kä'lȧ (1384–c.1440). A Florentine painter of the Renaissance. The facts of his life are little known and much disputed. According to the traditional account, based upon Vasari, he was born at Panicale di Valdelsa, whence his usual name; but Crowe and Cavalcaselle identify him with Tommaso di Cristoforo Fini, in which case he would have been born at Florence. Masolino is a diminutive of Tommaso, which was certainly his given name. There is nothing to confirm Vasari's statement that he was an assistant of Lorenzo Ghiberti; but the statement that he was a pupil of Gherardo da Starnina, a later Giottesque master, is not unlikely. In 1423 he was admitted to the guild of physicians and apothecaries, in which the painters were enrolled. In 1426 he departed for Hungary, where he painted under the patronage of Fillippo Scolari, a Florentine who had attained a position of great importance there. In 1428 he was employed at Castiglione di Olona.

His only undisputed works are two, one a series of frescoes at Castiglione di Olona, in the Province of Como, northern Italy. Of these one representing the "Life of the Virgin," which is signed by the master, is in the Collegiate Church. Another more interesting series, representing the "Life of St. John the Baptist," is in the Baptistery near by; while the Palazzo contains an independent landscape with decorative friezes. Of the frescoes in the Baptistery the "Feast of Herod," "Herodias and Salome," and the "Baptism of Christ" are especially noteworthy. They reveal a transitional art, still containing mediæval elements, but Renaissance in viewpoint and in many salient features—such as the perspective, classic decoration, a naturalistic conception of the human body studied from the nude, and strictly realistic portraiture in contemporary costume.

A second series of frescoes, originally attrib-

uted to Masolino by Jakob Burckhardt, and now generally considered his work, is in a chapel of San Clemente, Rome. The subjects, representing episodes from the lives of SS. Ambrose and Catharine, and a Crucifixion, have been much repainted. "St. Catharine before the Philosophers" and the "Martyrdom of St. Catharine," with a remarkable landscape, are masterly presentations. The frescoes as a group seem earlier in date than those at Castiglione di Olona and there is much in them that reminds of Masaccio, to whom they have also been attributed. It seems indeed quite likely that Masolino was assisted here by his more talented pupil. This was unquestionably the case in the world-famous frescoes of the Brancacci Chapel, Santa Maria del Carmine, Florence. According to a tradition, dating from the time they were painted, Masolino received the commission but left it unfinished, and it was continued by Masaccio. The problem of the authorship is further complicated by the circumstance that they were finally completed by Filippino Lippi (q.v.). The principal subject of the frescoes is the "Lives of SS. Peter and Paul," and according to the best criticism, the following are by Masolino: "St. Peter Preaching"; "The Raising of Tabitha," "St. Peter Healing the Cripple," and the "Fall of Man." Compared with the adjacent productions of Masaccio they seem lacking in reality, power, and significance. Their author strives after ideal beauty rather than actuality. They show an abstract rather than a realistic beauty of line, imposing composition, and tender modeling. Among other subjects attributed to him are: a Gothic panel of the Madonna (1423) in the Kunsthalle, Bremen; a still earlier Madonna with God the Father and angels at Munich, two panels in the Naples Museum; "Christ in Glory" at Strassburg; an "Annunciation" at Gosford House, Scotland; frescoes of the "Pietà" in the Baptistery of Empoli, and of the "Madonna with Angels," in San Fortunato, Todi.

Bibliography. The principal monograph is by Toesco, *Masolino da Panicale* (Bergamo, 1908); also, A. H. Layard, *The Brancacci Chapel and Masolino, Masaccio, and Filippino Lippi*, published by the Arundel Society (London, 1868); Schmarsow, *Masaccio Studien* (Cassel, 1895–1900); Bernhard Berenson, "Quelques peintures méconnues de Masolino da Panicale," in *Gazette des Beaux-Arts*, ser. 3, vol. xxvii (Paris, 1902); id., in *Study and Criticism of Italian Art*, vol. ii (London, 1902); Crowe and Cavalcaselle, *History of Painting in Italy*, ed. by Douglas and Strong (New York, 1903); for data on the life of Masolino: Milanesi, *Storia dell' arte toscana* (Florence, 1873).

MA'SON, Alfred Edward Woodley (1865–). English novelist and politician, born at Dulwich and educated at Dulwich College and at Trinity, Oxford. From 1906 to 1910 he was a Liberal member of Parliament representing Coventry. He gained popularity as a novelist, his work including: *A Romance of Wastdale* (1895); *The Courtship of Morrice Buckler* (1896); *The Philanderers* (1897); *Parson Kelly* (1899), with Andrew Lang; *Miranda of the Balcony* (1899); *The Four Feathers* (1902); *The Truants* (1904); *Running Water* (1907); *At the Villa Rose* (1910); *The Witness for the Defense* (1911), a play; *The Turnstile* (1912); *Open Windows* (1913), a play; *Green Stockings* (1915), a comedy.

MASON, Charles (1730–87). An English astronomer. He was employed as an assistant at the Greenwich Observatory from 1756 to 1760 and was sent with Jeremiah Dixon to the Cape of Good Hope in 1761 to observe the transit of Venus. In 1763 they were employed by the proprietors of Maryland and Pennsylvania to survey the boundary line between their respective possessions. The boundary fixed by them has since been known as "Mason and Dixon's line" (q.v.). They also fixed "the precise measure of a degree of latitude in America." The particulars of this work are recorded in vol. lviii of the *Philosophical Transactions*. Mason and Dixon returned to England in the autumn of 1768. In the following year Mason went to Cavan, Ireland, to observe the transit of Venus, his report of which appeared in the *Philosophical Transactions* for 1770. He was also employed by the Board of Longitude to verify the lunar tables of Tobias Mayer; these were published after his death under the title of *Mayer's Lunar Tables Improved by Charles Mason* (London, 1787). His private journal, field notes, etc., were found among a pile of waste paper in the cellar of the Government house at Halifax, Nova Scotia, in 1860, and an account of their contents was published by Porter C. Bliss in the *Historical Magazine* for July, 1861.

MASON, Daniel Gregory (1873–). An American composer and writer on music, born at Brookline, Mass. He graduated from Harvard University in 1895, studied music in Boston, New York, and Paris, and became assistant professor of music and extension lecturer at Columbia University. He composed an Elegy for piano (1901); Sonata for violin and piano (1912); Pastorale for violin, clarinet, and piano (1913); *Country Pictures* for piano (1913); and is author of *From Grieg to Brahms* (1902); *Beethoven and his Forerunners* (1904); *The Romantic Composers* (1906); *A Student's Guide to Music* (1909); *A Neglected Sense in Piano Playing* (1912); *Music as an International Language* (1913); *Guide to Music* (1914).

MASON, Francis (1799–1874). An American missionary and Orientalist. He was born at York, England, came to the United States in 1818, entered Newton Theological Seminary in 1827, and in 1830 was sent as a missionary to Burma. His labors were chiefly among the Karens. Into two dialects of their language—Sgaw and Pwo—he translated the Bible and other religious books, and a seminary for the training of preachers and teachers was conducted by him. He published, in 1852, *Tenasserim, or the Fauna, Flora, Minerals, and Nations of British Burma and Pegu*, a second edition of which appeared under the title *Burma: Its People and Natural Productions* (1860; 3d ed. by Theobald, 2 vols., 1882–83). He also published, besides translations from the Burman, Pali, and Sanskrit: *Life of Ko-Thah-Byu, the Karen Apostle; A Memoir of Mrs. Helen M. Mason* (1847); a *Memoir of Sau Quala* (1850); *Pali Grammar on the Basis of Kachchayano, with Chrestomathy and Vocabulary* (1868); *The Story of a Workingman's Life, with Sketches of Travel* (1870), an autobiography.

MASON, George (1725–92). An American political leader of the Revolutionary period, born in Stafford (now Fairfax) County, Va. He was an intimate friend and neighbor of Washington, was a member of the Ohio Company, and as early as 1759 was a member of the Virginia Assembly. He was a leader of the opposi-

tion in Virginia to the Stamp Act, and in 1769 drafted the nonimportation resolutions, which were presented by Washington and adopted by the Assembly. At a popular meeting of the citizens of Fairfax County held July 18, 1774, he offered twenty-four resolutions on the issues between Great Britain and the Colonies in which were outlined both the nonintercourse policy with Great Britain and the scheme of a general intercolonial Congress. These resolutions were sanctioned by the Virginia Convention in August, and were reaffirmed by the Continental Congress in October of the same year. Mason served on the Virginia Committee of Safety, and occupied a seat in the Virginia Constitutional Convention of 1776. In the latter capacity he earned distinction as the author of the well-known Bill of Rights which constitutes so notable a part of the Virginia Constitution of 1776, and which was probably the most complete as well as the most advanced statement of the rights of man that had then appeared. In 1777 the Legislature, of which he was still a member, elected him to the Continental Congress; but he declined to serve and remained an active and influential member of the Legislature for many years. In 1780 he outlined a plan which was subsequently adopted by Virginia for ceding to the Federal government her claims to the territory north and northwest of the Ohio River. In 1787 he became a member of the Constitutional Convention at Philadelphia, and took an active part in the debates on the Constitution. He spoke against the provision for the continuance of the slave trade and disapproved of the instrument as a whole. He refused to sign it, and, with Patrick Henry in the Virginia Ratification Convention of 1788, threw his influence against ratification and proposed twenty alterations, some of which were afterwards adopted. He was chosen as one of the first United States Senators from Virginia, but declined to serve. With Madison and Jefferson, Mason carried through the Virginia Legislature measures disestablishing the Episcopal church and protecting all forms of worship. His death occurred October 7, 1792, at "Gunston Hall," and his statue, with those of other distinguished Virginians, stands in front of the State Capitol at Richmond. Consult Rowland, *Life and Writings of George Mason* (2 vols., New York, 1892).

MASON, George Heming (1818–72). An English landscape and figure painter, born in Staffordshire. He first studied medicine, but afterward went to Rome, where he earned a living painting portraits, though he had had no regular artistic training. He returned to England in 1858. Mason's pictures represent English or Roman subjects, treated in an idyllic manner. They are softly harmonious in color, but lacking in vigor and truth to nature. Among the best are: "Ploughing in the Campagna" (1857), "Dancing Girls" (1868), "Harvest Moon" (1872), "The Cast Shoe," and "Wind on the Wold," the last two in the Tate Gallery, London.

MASON, James Murray (1798–1871). An American lawyer and legislator, best known as one of the representatives of the Confederate government in Europe during the Civil War. He was born on Mason's Island, Fairfax County, Va.; graduated at the University of Pennsylvania in 1818, and practiced law for some time at Winchester, Va. He soon became prominent in politics, and was a member of the Virginia House of Delegates from 1826 to 1832, of the Virginia Constitutional Convention of 1829, of the national House of Representatives from 1837 to 1839, and of the United States Senate from 1847 to 1861. Mason, having absented himself about March 20, during the session of the Senate for executive business, did not again take his seat. He was expelled by formal vote (July 11) at the special session of the Thirty-seventh Congress, which met under the call of President Lincoln, July 4, 1861. In Congress he was conspicuous as an upholder of slavery and as an ardent advocate of the principle of States' rights, and in 1850 he drafted and introduced the famous Fugitive Slave Law, which formed part of the compromise measures of that year. For ten years he was chairman of the Senate Committee on Foreign Affairs. Late in 1861 he was appointed commissioner of the Confederate government to England, and on the night of October 12 started from Charleston, S. C., with John Slidell, the Confederate commissioner to France; but having reached Havana about the twenty-second of October, he and Slidell were seized on board the British steamer *Trent* by Captain Wilkes of the United States ship *San Jacinto* and were confined at Fort Warren, Boston, until Jan. 2, 1862, when the United States government, yielding to the demand of England, ordered their release. Their seizure caused great excitement on both sides of the Atlantic and threatened to bring on a war between the United States and Great Britain. (See Trent Affair, The.) After his release Mason proceeded to London, where he endeavored to win over the British government, and the British people as well, to the side of the Confederacy, but he was never received officially by the ministers, and in September, 1863, his commission was withdrawn. He, however, remained in Europe, spending his time principally in Paris and London and vainly attempting to induce France and England to intervene actively on the side of the Confederacy. Immediately after the war he returned to America. Fearing arrest at the hands of the Federal government, he lived in Canada until 1868, when he removed to Virginia and thereafter until his death lived near Winchester. Of Mason Mr. Charles Francis Adams has this to say: "He was in many, and by no means the best ways, a typical Virginian. Very provincial and intensely arrogant, his dislike of New England, and especially of Massachusetts, was pronounced and only exceeded by his contempt."

MASON, Jeremiah (1768–1848). An American lawyer and legislator. He was born in Lebanon, Conn., graduated at Yale in 1788, was admitted to the bar in 1791, and began the practice of his profession at Westmoreland, N. H. He removed to Walpole, N. H., in 1794, and in 1797 to Portsmouth, which was his home for the next thirty-five years. He was soon recognized as the head of his profession in a State whose bar was unequaled in America and which could number among its members Ezekiel and Daniel Webster and Jeremiah Smith. He was appointed Attorney-General of the State in 1802 and was elected to the United States Senate in 1813. He became one of the foremost debaters in that body, his speech delivered in 1814, on the Embargo, being especially powerful; but in 1817 he resigned his seat to continue the practice of his profession. He afterward served for a number of terms in the New Hampshire Legis-

lature, where his service had little connection with politics, but was given largely to revising and codifying the State laws. In 1832 he removed to Boston, where, until his age compelled him to retire, he maintained the high reputation which he had previously won.

MASON, JOHN (1586–1635). The founder of New Hampshire. He was born at Lynn Regis, Norfolk, England; served in 1610 in the navy; in 1616 went to Newfoundland as Governor of the colony, and in 1620 published a description of the country, to which he added a map in 1626. He explored the New England coasts in 1617; in 1622 obtained a grant of a region called Mariana, now the northeastern part of Massachusetts; in the same year, in connection with Sir Ferdinando Gorges, procured a patent for the Province of Maine; and in 1623 sent a colony to the Piscataqua River. In 1629 he obtained a patent for the New Hampshire colony, and with Gorges took one also for Laconia, a region including Lake Champlain. He held various honorable positions in England: in 1625–29 he was treasurer and paymaster of the English army engaged in war against France and Spain; in 1632 he was made vice president of the Council for New England; and in 1635 he was a judge in Hampshire and vice admiral of New England. His rights in New Hampshire were sold in 1691 to Governor Samuel Allen. He died in London in December, 1635, and was buried in Westminster Abbey. Consult Tuttle, *Memoir of Captain John Mason, the Founder of New Hampshire,* in an illustrated edition of Mason's tract on Newfoundland, published for the Prince Society (Boston, 1887).

MASON, JOHN (1600–72). An American Colonial commander. He was born in England; served under Sir Thomas Fairfax in the Netherlands; emigrated in 1630 to Dorchester, Mass.; in 1633 obtained a military command at Boston; and in 1635 aided in founding Windsor, Conn. In 1637 he was placed in command of a small force of English and Indians sent against the Pequots (q.v.). After the destruction of that tribe Mason removed to Saybrook, at the request of the inhabitants, for the defense of the Colony. In 1651, when New Haven attempted to found a settlement on the Delaware, it was proposed to put Mason in command, but the General Court at Hartford would not consent to his removal from Connecticut. In 1659 he removed to Norwich. He was a major of the Colonial forces for thirty years, Deputy Governor of Connecticut in 1660–70, and chief judge of the Colonial court from 1642 to 1668. He prepared, at the request of the General Court of Connecticut, a *Brief History of the Pequot War,* which was incorporated by Increase Mather in his *Relation of Trouble by the Indians* (Boston, 1677, republished with introduction by the Rev. Thomas Price, Boston, 1736). Consult G. E. Ellis, "Life of John Mason of Connecticut," in Jared Sparks, *Library of American Biography,* vol. xiii (Boston, 1864).

MASON, JOHN (1858–1919). An American actor, born at Orange, N. J., and educated at Columbia University. He made his first regular appearance on the stage at the Walnut Street Theatre, Philadelphia, in 1878. The next year he joined the company of the Boston Museum, and remained there four years, playing leading parts. For the next ten years he was connected with various companies, playing a great variety of rôles and greatly increasing his ability as an actor. He made his first appearance abroad at the St. James's Theatre, London, in 1891, scoring a decisive hit as Simeon Strong in *The Idler.* In 1900 he joined Daniel Frohman's company at Daly's Theatre, New York, appearing in *The Ambassador, The Interrupted Honeymoon, The Man of Forty,* and *Lady Huntsworth's Experiment.* He was leading man with Mrs. Fiske in 1905, playing, among other parts, Lövborg in *Hedda Gabler,* and Paul Sylvaine in *Leah Kleschna.* During 1906 he appeared in *The Liars, The Tyranny of Tears,* and various other successful plays. In the next year he scored a great success as Jack Brookfield, the gambler, in Augustus Thomas's *The Witching Hour.* Subsequently he appeared in Thomas's *As a Man Thinks* (1911), Bernstein's *The Attack* (1912), a revival of *Liberty Hall* (1913), and *Big Jim Garrity* (1914).

MASON, JOHN YOUNG (1799–1859). An American politician, born at Greensville, Sussex Co., Va. He graduated at the University of North Carolina in 1816, and in 1819 was admitted to the bar. After serving as a member of the Virginia Assembly and as a delegate to the Virginia State Constitutional Convention of 1829, he was a member of Congress from 1831 until 1837. When in Congress he was chairman of the Committee on Foreign Affairs. He next served as judge of the United States District Court for Virginia from 1837 until 1844, when President Tyler made him Secretary of the Navy, an office which he retained until Tyler's death. He entered the cabinet of President Polk as Attorney-General, but in 1846 again took up the portfolio of the Navy, which he held for three years. In 1853 President Pierce made him Minister to France, where he remained until his death. On Oct. 10, 1854, he met Buchanan and Soulé, the ministers of the United States to England and Spain, respectively, in a conference at Ostend, and in conjunction with them issued the famous Ostend Manifesto (q.v.).

MASON, SIR JOSIAH (1795–1881). An English manufacturer of pens. Born at Kidderminster, he began selling cakes in the streets when only eight years old, and later taught himself to read and write while serving as shoemaker's apprentice. He tried his hand at various trades, and finally in 1824 he set up as a manufacturer of split-steel key rings, for which he had invented special machinery. He began manufacturing steel pens in 1829, and rapidly developed an immense business, which he sold to a limited liability company in 1875. He added to his fortune by gold and silver plating in connection with the Elkington Brothers, and by copper and nickel smelting works. Between 1858 and 1868 he built up a great orphanage at Erdington at a cost of nearly $1,500,000, and for this he was knighted in 1872. He also gave more than $1,000,000 to endow Mason's College (now part of the University of Birmingham), which was opened in 1880. Consult J. T. Bunce, *Sir Josiah Mason: A Biography* (London, 1882).

MASON, LOWELL (1792–1872). An American music teacher, born in Medfield, Mass. When only 16 he directed a church choir at Medfield and upon his removal to Savannah continued his interest in musical affairs. In 1827 he returned to Boston, where he became president of the Handel and Haydn Society and strongly advocated the Pestalozzi system of teaching. He founded the Boston Academy of

Music (1832), and in 1837 went to Germany to study musical pedagogic methods. He is remembered chiefly for his numerous hymn tunes, which are still in general use throughout the country, and his collections of songs: *Boston Handel and Haydn Collection of Church Music* (1822); *Juvenile Psalmist* (1829); *Lyra Sacra* (1837); *The Sabbath Hymn and Tune Book* (1859), with E. A. Park and Austin Phelps; *The Psaltery* (1845); *Carmina Sacra* (1841); *New Carmina Sacra* (1852).

MASON, OTIS TUFTON (1838–1908). An American ethnologist, born at Eastport, Me. He graduated in 1861 at Columbian (now George Washington) University and was principal of the preparatory school of the university (1861–84). He became curator of ethnology in 1884, and head curator of the department of anthropology in 1902, in the United States National Museum. Mason founded the Anthropological Society of Washington; was anthropological editor of the *American Naturalist* and of the *Standard Dictionary;* and wrote, besides many reports published by the government: *Summaries of Progress in Anthropology; Woman's Share in Primitive Culture* (1894); *The Origin of Inventions* (1895); *Indian Basketry* (2 vols., 1904). He was a contributor to the NEW INTERNATIONAL ENCYCLOPÆDIA.

MASON, WILLIAM (1724–97). An English divine and poet, born probably at Kingston-upon-Hull. He was educated at Cambridge, and in 1749 became a fellow of Pembroke College. He was appointed rector of Aston in Yorkshire, and chaplain to the Earl of Holderness in 1754. The next year he visited Germany, and in 1757 was appointed chaplain in ordinary to the King. Subsequently he was for more than thirty years preceptor and canon residentiary of the cathedral at York. Among his writings are *Musæus* (1747), a monody to the memory of Pope; *Isis* (1748), a monologue denouncing the Jacobitism of Oxford; and the dramatic poems *Elfrida* (1752) and *Caractacus* (1759). He also wrote a number of odes in imitation of his friend Gray, of whom he published a *Life* in 1774. The first book of *The English Garden* appeared in 1772, and in 1782 he published a *Critical and Historical Essay on Cathedral Music.* His collected works were issued in 1811. A tablet to him was erected in the Poets' Corner of Westminster Abbey.

MASON, WILLIAM (1829–1908). An American musician, born in Boston. After having studied music in Europe with Hauptmann, Moscheles, Richter, Dreyschock, and Liszt, he appeared as a pianist in Prague, Frankfort, Weimar, and London, and upon his return to the United States made several successful tours. In 1855 he settled in New York, and founded there the Mason and Thomas recitals of chamber music, which were continued until 1868. After 1855 he devoted himself almost entirely to teaching and composing. His works include numerous compositions, mostly for the pianoforte, but he is best known for his textbooks: *A Method for the Pianoforte* (1867), *System for Beginners* (1871), both in collaboration with E. S. Hoadley; *Touch and Technic* (1878); *A Primer of Music* (1894); and his interesting *Memories of a Musical Life* (1901).

MASON, WILLIAM PITT (1853–). An American chemist, born in New York City. He graduated at Rensselaer Polytechnic Institute (C.E., 1874; B.S., 1877), and studied medicine at Union University (M.D., 1881), and bacteriology at the Pasteur Institute in Paris. At Rensselaer he was an assistant from 1875 to 1893, and thereafter professor of chemistry. His works include: *Examination of Potable Water* (1890); *Water Supply* (1896; 3d ed., 1902); *Notes on Qualitative Analysis* (1883; 5th ed., 1908); *Examination of Water* (1899; 4th ed., 1913).

MASON AND DIXON'S LINE. The boundary line between the States of Maryland and Pennsylvania, as run by two English surveyors, Charles Mason and Jeremiah Dixon, during the years 1763–67, and popularly accepted prior to the Civil War as the dividing line between the free States and the slave States. The line is that which was agreed upon in the settlement of a dispute between the States of Maryland and Pennsylvania over their respective boundaries as described in their charters. The chief controversy turned upon the meaning of the phrases "the beginning of the 40°" and "the beginning of the 43° of N. Lat." employed in the description of the Pennsylvania boundary. The quarrel, in which Lord Baltimore and Penn soon engaged, continued for more than eighty years; was the cause of much trouble between individuals; and occupied the attention of the proprietors of both provinces, the Lords of Trade and Plantations, the High Court of Chancery, and the Privy Councils of three kings. No compromise was reached during the life of Penn, but after his death his sons succeeded in obtaining from Charles, Lord Baltimore, in 1732, an agreement by which the boundary line was to be drawn by commissioners representing both parties to the controversy. Baltimore at once came over with his commissioners, but on becoming dissatisfied with the agreement he prevented its immediate execution. The unsettled condition of the boundary, therefore, continued and with it increasing disturbances in the disputed territory. The Governor of Maryland then laid the matter before the Proprietary and the King, and invoked their intervention for the settlement of the dispute. By an Order in Council the King commanded both sides to keep the peace and instructed the Proprietaries to grant no lands in the disputed territory until the boundary could be adjusted. Pending a decision of the question by the English Court of Chancery, to which the matter was submitted in 1735, both parties agreed upon a provisional boundary. A decision was finally reached in 1750 by the Chancellor, Lord Hardwicke, which, with the agreement of 1732, served as the basis of a compromise between the proprietors in 1760. Commissioners representing both sides were appointed, and the eastern boundary was determined. To run the east and west line, as well as other parts unsettled, Mason and Dixon were appointed in 1763, and at once entered upon their task. By the year 1767 they had carried the line over the mountains to a point 244 miles from the Delaware River. Farther advance was stopped by the Indians, but the line was subsequently completed by others. The boundary was marked by milestones, every fifth one having the arms of Baltimore engraved on one side and those of Penn on the other. Its exact latitude is 39° 43′ 26.3″ North. A resurvey of the line was made in 1849. Between 1901 and 1903 another resurvey was made by the States of Pennsylvania and Maryland. The work was placed under the direction of the commission consisting of the Superintendent of the

United States Coast and Geodetic Survey, the Secretary of Internal Affairs of Pennsylvania, and the Director of the Geological Survey of Maryland.

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MASON BEE. A bee of the subfamily Osmiinæ of the family Megachilidæ; especially in the United States one of the genus *Osmia*, and in Europe one of the genus *Chalicodoma*. The name is derived from the manner in which these bees construct small earthen cells, sometimes mixed with sand, pebbles, and wood scrapings, glued together so firmly that they are smooth inside. Ten to twenty of the cells are usually found together, and each one contains a store of honey and pollen for the larvæ, only one of which is found in each of the cells. These bees show a high order of intelligence in the manner in which they adapt themselves to circumstances, and this accounts for the very great diversity seen in the situations in which the cells are placed. *Ceratosmia lignivora* is a true wood borer. Certain species excavate the pith of brambles, alternately widening and contracting the burrow to correspond with the proposed cells and the intervals between them. Others use the hollows of reeds and straws; two European species utilize the empty shells of several species of Helix, compactly filling each shell with their cells, which are placed in different relative positions according to the exigencies of the case, and then carefully closing the entrance with pellets of clay, sticks, and pebbles; others again plaster their cells thickly upon the underside of a flat stone which is slightly raised from the ground; and still another species places its cells in comparatively unprotected situations at the roots of grass. The Chalicodomas make very perfect masonwork in the walls of their cells.

The food stored up in the cells is composed of a mixture of honey and pollen. Réaumur and Fabre experimented with the young bees to find whether they were able to overcome additional difficulties in making their way out of the cell. When the mouth of the cell is covered with earth and pith or brown paper put in contact with the covering of the cells, the bees make their way out without any great apparent difficulty, but when some space intervenes between the mouth of the cell and the new barrier, the bees are unable to gain their freedom. The Osmiinæ are of comparatively small size, and are usually of dark metallic colors. The eggs are white, oblong, and about the size and shape of a caraway seed. They hatch in about eight days. Development of the larvæ is rapid; they spin delicate cocoons and winter as pupæ.

Consult: L. O. Howard, *Standard Natural History*, vol. ii (Boston, 1884); Henri Fabre, *Insect Life*, translated from the French (London, 1901); id., *Mason Bees* (New York, 1914); L. O. Howard, *The Insect Book* (New York, 1914). See Plate of WILD BEES with the article BEE.

MASON CITY. A city and the county seat of Cerro Gordo Co., Iowa, 72 miles northeast of Fort Dodge, on the Chicago Great Western, the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, the Chicago, Rock Island, and Pacific, and other railroads (Map: Iowa, D 1). The city has a public library, a fine courthouse, hospitals, and two city parks, and is the seat of the National Memorial University and of an Odd Fellows' Orphans' Home. Its population is increasing rapidly, and it enjoys considerable industrial and commercial prosperity. There are important agricultural, grain, and live-stock interests, and a wholesale trade in groceries, fruits, etc.; also sandstone quarries, extensive cement, brick, and tile works, flour mills, lime works, sash and door factories, gasoline-engine factory, a large packing house, and foundries. Mason City, settled about 1855, adopted the commission form of government in 1913, the power being vested in a mayor and two commissioners. The city owns and operates the water works. Pop., 1900, 6746; 1910, 11,230; 1914 (U. S. est.), 13,495; 1920, 20,065.

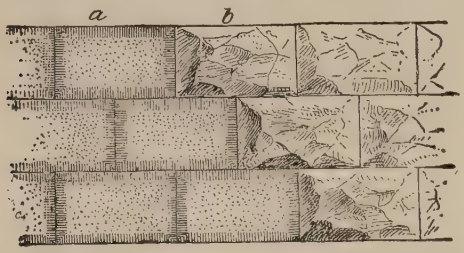
MA'SONRY. The art and trade of construction in stone. The term is also somewhat loosely used of work in brick or concrete. It is the fundamental art in building and engineering work, even where a framework of wood or iron is used for a large part of the superstructure, and has been practiced from the earliest antiquity. The masonry of the ancient Egyptians is extraordinary, whether we consider the size of the materials, or the unequaled exactness with which they are fitted together without the use of mortar. Cyclopean or polygonal masonry, of which remains exist in many parts of Greece and Italy, as well as Asia Minor, also exhibits stones of great size with carefully adjusted joints. The walls of Mycenæ and Tiryns are among the earliest examples. They are built with huge irregular blocks, the spaces between being filled up with smaller stones. The ancient Italian masonry is usually more carefully executed. In some cases the beds or horizontal joints are made level and the upright joints left unsquared. No mortar is used in cyclopean masonry.

The masonry of the Greeks of historic times was usually of carefully coursed and squared blocks, equal, at its best, to the finest Egyptian work. Many of the Roman buildings in the East were constructed with blocks of enormous size, as at Baalbek (q.v.) in the second century, where some of the stones are 60 feet in length. But the typical Roman system was that of masses of cemented rubble or coarse concrete between facings of brick or of marble ashlar, or, in more ordinary work, of small blocks of tufa set cornerwise (opus reticulatum). Such walls were stuccoed on their interior faces. Roman vaulting was executed in masonry of cut stone, brick, or concrete, according to circumstances.

The mediæval builders of western Europe carried masonry in stone to a high pitch of both scientific and artistic perfection, using rubble and random ashlar in preference to coursed ashlar, and producing with stone of moderate size edifices of extraordinary impressiveness. The perfection of their cutting of moldings and of ornament rivals that of the finest Greek work.

Modern stone masonry involves the labors, after the quarrying, of the *stonecutter* who hews the stones into shape (often at a stoneyard or shed far from the building), the *mason* who lays them in place, and the laborer or *helper* who brings the mortar when mixed. A *carver* or sculptor carves the ornamental work. Masonry is classified according to the treatment of the exposed surface into quarry-faced, pitch-

faced, and dressed. *Quarry-faced masonry* is that in which the faces of the stones are left as they come from the quarry; it is used chiefly for massive engineering works and basements of large buildings. *Pitch-faced masonry* is that in which the face of the stones is rough but the edges are dressed to straight lines. *Dressed masonry*, as the name indicates, is that in which the face of the stones is dressed to a more or less smooth plane surface; it may be hammered, tooled, smooth-rubbed or polished. *Range masonry* is that in which the horizontal joints or courses are continuous throughout. *Broken-range masonry* is that in which the horizontal joints are not continuous throughout, so that a portion occupying a given height in two courses may abut against another having one or three courses in the same height. *Ashlar masonry* is masonry of carefully squared blocks, as distinguished from that of blocks not squared at



ASHLAR MASONRY.

the ends. In the finest work all the blocks are of the same size, the length usually twice or thrice the height, and the vertical joints of each course centred under the blocks of the next. In the figure, *a* shows hammered ashlar with tooled or chisel draft; *b*, pitch-faced ashlar. *Random*, or *random-coursed*, ashlar is masonry of squared stones of various sizes, laid without continuous horizontal beds. (The American usage which would confine the term ashlar to mere facings of cut stone is inaccurate.) *Rubble masonry* is that composed of unsquared stone, laid with or without an attempt to approximate regular courses.

Some of the other current definitions of stone-masonry work are as follows: *Face*, the front surface of a wall; *back*, the inside surface; *facing*, the stones which form the face of a wall; *backing*, the stones which form the back of a wall; *filling* or *core*, the material between the inner and outer facings, or between the backing and facing, in very massive work; *batter*, the slope of the surface of a wall; *course*, a horizontal layer of stone in a wall; *joints*, the meeting surfaces of the stones (the horizontal joints are called *beds*); *coping*, a course of stone on the top of the wall to protect it; *quoins* are squared stones, alternately long and short, forming the corners of buildings or projecting wings; *pointing*, a finishing of the visible joints with fine mortar; *bond*, the arrangement of stone in adjacent courses; *stretcher*, a stone whose greatest dimension lies parallel to the wall; *header*, a stone whose greatest dimension lies perpendicular to the wall; *dowels*, pegs set in holes in adjacent faces of two stones to prevent slipping; *cramps*, bars of iron having the ends bent to enter holes in the upper surfaces of adjacent stones.

Ashlar masonry is used for works in which great strength or a finished and elegant effect is required. The thickness of the mortar joints in the very best class of ashlar masonry for building purposes is about ⅛ inch; for railway and bridge masonry about ¼ inch to ½ inch. The arrangement of headers and stretchers varies; the strongest arrangement is where a header and a stretcher are used alternately. Dowels and cramps are used where exceptional strength is required. Ashlar masonry is usually backed with rubble masonry, brickwork, or concrete, the backing being built simultaneously with the facing. In certain classes of stone masonry, such as bridges and architectural work of importance, the stones are cut to exact dimensions and to special forms. In lighthouse construction these special forms are sometimes quite intricate. See LIGHTHOUSE.

Rubble masonry is employed for backing ashlar, for rustic work, and other uses not requiring great strength or elegant finish. The stones are prepared for laying by simply knocking off the weak corners and loose pieces. All interstices are filled with small pieces of stone and mortar, and the mortar joints are made thick enough to prevent adjacent stones from touching. Very often rubble masonry is laid without mortar, and is then called dry rubble masonry.

A highly important and refined branch of masonry is that of arches and vaults, not only in bridges and tunnels, but in monumental architectural works, as in the superb vaults of the mediæval cathedrals and churches and some modern works. This kind of masonry involves the application of the geometric science or art of *stereotomy*, or *stonecutting*, for the preparation of *templets* or patterns of each face of each stone used. See STEREOTOMY; VAULTING.

The excellence of masonry depends on the quality of the stone and of the mortar and the care with which the stones are cut, laid, bedded in mortar, and bonded. Not only must the exposed face of each stone be correctly shaped, but the *beds*, or horizontal surfaces of the top and bottom, must be dressed to a true plane for a sufficient depth from the face. The mortar may be of sand and lime; of sand, lime, and cement; of sand and cement; or, in hydraulic work, of pure cement; properly proportioned and mixed, and so applied as to fill all interstices between the stones. In the finest work the visible joints do not exceed ⅛ inch in thickness; in heavy, rustic, and engineering work they may be much thicker. The strength of masonry (or the safe load it will carry) varies from 10 tons per square foot for ordinary rubble to 25 or 30 tons for the best granite ashlar.

There are, besides the common kinds of masonry described above, various special forms, especially in English work. In *herringbone* masonry long thin slabs of stone, or bricks, are laid obliquely in courses having the slope or inclination alternately reversed. *Bowlder* masonry is that which is composed of large, rounded field stones or bowlders laid up without cutting, as in rustic walls and basements. *Flint rubble* is a finishing of the face of a rubble wall with a heavy coat of mortar in which white flint stones are set as closely as possible. *Rustic* or *rusticated* masonry is a form of ashlar having the joints deeply cut or beveled, or the body of the block in strong relief with a depressed border or draft around it.

Brick Masonry. With due allowance made for the difference of the material and dimensions,

brick masonry corresponds very closely to dressed ashlar masonry. The bond used is varied considerably, but is usually either the English bond or the Flemish bond. (See BRICKWORK.) The mortar used in brickwork may be either lime mortar or cement mortar, the former being most used in ordinary building. Brickwork should carry safely a load of 20 tons per square foot when laid in lime mortar.

Concrete Masonry. Concrete masonry, strictly speaking, signifies blocks of concrete laid like stone masonry. The term is, however, sometimes loosely applied to monolithic or massive concrete formed while plastic in temporary molds, especially when used in connection with true masonry of stone or brick. For the various processes of building in concrete, see CONCRETE. In English usage, and to some extent in the United States, the terms "masonry," "masonwork," and "mason" are exclusively applied to work in stone. Masonry of brick is "brickwork" and "bricklaying," and a brick mason is a "bricklayer." As these trades are distinct in the United States, as in Great Britain, good usage warrants the general observance of a like distinction in the use of these terms here. For a comprehensive treatise on masonry work, consult: I. O. Baker, *Treatise on Masonry Construction* (10th ed., New York, 1909); F. E. Kidder, *Mason's Work* (9th ed., ib., 1909); W. F. Patton, *A Practical Treatise on Foundations* (2d ed., ib., 1909). See BUILDING; BRICK; CEMENT; CONCRETE; MORTAR; QUARRY; STONE CUTTING AND DRESSING; STONE, ARTIFICIAL.

MASONS. The Masonic fraternity, variously referred to as ANCIENT FREE AND ACCEPTED MASONS, or FREE AND ACCEPTED MASONS. It is the largest, oldest, and most widely distributed secret society in the world. Lodges of Masons are found in every civilized country except Russia, where, for obvious political reasons, the society, although it took root there at times, has never flourished. Accurate totals of membership from all foreign countries are unavailable. Those for the United States are official. Of the approximately 2,348,000 active members in the world, 67 per cent are in the United States, about 23 per cent are in Europe, and 16 per cent in the United Kingdom.

Freemasonry as known to-day is an English creation and dates back only to London in 1717. Comparatively few of the lodges of Masons in the United Kingdom have been traced back for 100 years prior to 1717; beyond that definite record of their existence is lost. They come down, of course, in a general way in English history as operative (stone) mason lodges, survivals of the guilds which built churches, cathedrals, and bridges during the Middle Ages. Volumes have been written in efforts to trace the origin of Masonry, an organization evolved from a few surviving mason lodges in England and Scotland a little more than 200 years ago. The story of its origin being at the building of King Solomon's temple and that it has had an uninterrupted existence since, is a myth.

Owing to the completion of the era of church and cathedral building throughout Europe 300 years or more ago, and to the results of the Reformation and the Thirty Years' War, there were comparatively few surviving guilds of stonemasons and builders, which during the Middle Ages had traveled through Europe, originally under the patronage of the Church. The latter had conferred privileges on them, hence free masons. The guilds in England have a manuscript record that a general assembly of masons was held at York, under the patronage of Edwin Athelstan, where a code of laws was adopted which, as alleged, became the foundation of later Masonic constitutions. Traveling guilds of builders held a general assembly at Strassburg in 1275, and again in 1375, at which a fraternity was formed with apprentices, craftsmen, and masters among the members, and with an initiatory ceremony and a sign—perhaps the first traveling operative Freemasons, under protection of Church and State.

With the decline of church building the guilds gradually disappeared. In France guilds which were the outcome of the colleges of artificers accompanying the invasion of the Roman legions were abolished in 1539. A later French builders' fraternity, called the Companionage, possessed a remarkable legend of the death of the master builder, which modern Masons will be interested to learn antedated the establishment of modern Freemasonry at London in 1717. The Roman occupation of northern Europe naturally left an influence on the mason guilds of Germany, France, and Britain, but the German and French guilds disappeared between 1500 and 1600. From some time prior to 1600, until early in the eighteenth century, surviving British mason guilds began to accept as members persons not operative masons or workers, whence Free and Accepted Masons. This, whether the result of a fad or not, brought many distinguished and well-to-do men into the fraternity (1660–1700), after which the so-called work of the lodges was only in the symbolism of the labor performed by earlier masons. From this came speculative in contrast with the operative masons.

When four surviving old lodges met in London in 1717 and formed a Grand Lodge there was but one degree of Masonry. By 1724 the three degrees of entered apprentice, fellowcraft, and master mason were all in the ritual and have constituted ever since what has been called universal Masonry, the possession of which everywhere has been a prerequisite to membership in all later Masonic rites.

Keen search has been made by Masonic historians for an explanation of the world range, down through the ages, of the symbols found in the rituals of Freemasonry. A large part of the collection is attributed to the research and ingenuity of antiquarians and other learned men who, late in the seventeenth century, made the mystical ornamentation for the surviving mason guilds in England, and this was supplemented by an effervescence of activity in this direction immediately after the original Grand Lodge of England was formed at London in 1717.

The Essenes of the first three centuries perfected the kabbala, of which there is a suggestion in Masonry. The Culdees, apostolic monks of Eastern origin, found later in Britain, were drawn on for early architecture. Elias Ashmole, eminent antiquarian, one of the early "accepted masons," was a Rosicrucian, and as that cult did, so Masonry displays the double and single triangles, a point within a circle, and the hexagon. From the mason guilds were derived the square and compasses, King Solomon's temple and its two pillars, St. John the Baptist, the five, seven and nine, and various words, grips, and signs. Whether it was the triangles or the lion of the Gnostics, it may be noted that these all appeared after the accession of antiquarians

APPROXIMATE NUMBER OF MASONS THROUGHOUT THE WORLD,

BY COUNTRIES, IN THE YEAR PRIOR TO THE OUTBREAK OF THE GREAT WAR IN EUROPE, 1914–15

	Master Masons 1914	Royal Arch Masons 1913	Royal and Select Masters 1913–14	Knights Templars 1914
Alabama	26,397	3,943	701	1,663
Arkansas	20,534	4,261	625	1,385
Arizona	2,118	695	....	495
California	50,257	12,692	2,847	7,446
Colorado	16,139	5,197	931	‡3,190
Connecticut	24,281	9,011	5,894	4,118
Delaware	3,358	*1,144	....	....
District of Columbia	9,599	3,567	....	1,683
Florida	11,437	2,134	260	1,209
Georgia	38,425	7,255	913	3,299
Idaho	4,012	1,134	....	‡699
Illinois	122,233	37,350	8,444	‡17,897
Indiana	63,035	16,384	7,923	7,549
Iowa	47,585	12,580	1,950	7,016
Kansas	40,668	9,794	1,936	6,234
Kentucky	40,459	9,329	1,941	4,987
Louisiana	15,152	3,386	612	1,023
Maine	29,872	10,151	4,799	5,609
Maryland	15,766	3,857	1,652	2,158
Massachusetts	63,290	24,165	8,957	§17,894
Michigan	71,752	22,462	8,482	9,107
Minnesota	27,447	8,823	1,554	4,599
Mississippi	19,103	4,432	2,444	2,056
Missouri	58,237	13,658	2,728	7,008
Montana	6,977	†1,940	....	1,307
Nebraska	20,144	4,770	1,678	2,728
Nevada	1,886	489	....	....
New Hampshire	10,620	4,409	2,593	‡2,735
New Jersey	36,649	6,986	1,206	3,451
New Mexico	3,208	1,081	....	‡667
New York	186,179	39,398	6,792	22,783
North Carolina	22,314	3,092	604	1,598
North Dakota	8,666	2,534	....	1,548
Ohio	90,666	35,160	17,018	‡16,639
Oklahoma	23,353	4,922	883	2,378
Oregon	12,315	3,724	783	‡1,707
Pennsylvania	110,630	33,188	6,088	22,974
Rhode Island	8,461	4,111	2,490	....
South Carolina	14,281	2,842	748	‡1,431
South Dakota	10,221	2,233	....	1,829
Tennessee	26,242	5,434	1,119	1,802
Texas	58,724	18,860	15,767	6,235
Utah	2,081	598	....	465
Vermont	13,610	4,276	1,637	2,783
Virginia	23,392	7,058	....	‡3,336
Washington	18,407	4,130	1,366	‡2,184
West Virginia	15,768	5,943	....	3,922
Wisconsin	28,082	11,110	3,567	‡4,999
Wyoming	3,036	945	....	672
Other in Grand Body	....	....	1,113	‡1,097
Totals, United States	1,557,068	437,637	120,947	229,594
Alberta	5,382	....	....	....
British Columbia	6,344	....	....	....
Ontario	53,699	‖18,333	....	....
Manitoba	6,455	....	....	....
New Brunswick	3,320	†821	....	....
Nova Scotia	6,528	1,439	....	....
Prince Edward Island	769	....	....	....
Quebec	7,362	1,418	....	....
Saskatchewan	4,500	....	....	....
Totals, Canada and Provinces	94,359	22,011	....	7,324

	Master Masons 1914
Total, Mexico	3,000
Total, Central America	1,000
Total, Cuba, Porto Rico, West Indies, etc.	10,000
Brazil	29,000
Argentina	4,500
Peru	2,600
Chile	1,000
Bolivia	500
Paraguay	1,000
Other South American countries	1,000
Total, South America	39,600
England, Scotland, and Ireland	370,000
Germany	63,000
France	40,000
Italy	15,000
Sweden	15,000
Hungary	6,000

	Master Masons 1914
South Australia¶	4,904
New South Wales	17,524
West Australia	3,949
Victoria	12,310
New Zealand	12,695
Tasmania	1,443
Total, Australasia	52,825
South Africa	8,000
Egypt	2,000
Rest of Africa	3,000
Total, Africa	13,000
Holland	4,600
Switzerland	4,300
Denmark	4,100
Norway	4,000
Portugal	4,000
Austria, Rumania, Greece, Luxemburg, Servia, Belgium	11,000
Total, Europe	541,000
India, China, Japan, Straits Settlements	15,000
Hawaii, Philippines, and other Pacific islands	2,000
Approximate grand total for all countries	2,348,852

* 1914. † 1912. ‡ 1913. § Including Rhode Island, 1913 ‖ Ontario and the Northwest.
¶ Probably very much understated. Unsettled conditions prevent full reports.

and historians, Englishmen in professional, literary, and scientific life who became the accepted masons and who devised the symbolic building, the second temple, "a house not made with hands," etc.

Thus symbolic Freemasonry now presents that which suggests a dipping into almost all the mystical schools of philosophy and religion, pagan and Christian, by the operative masons of the Middle Ages; also into the Vehmgerichte, or German Society of Free Judges of the thirteenth century, and into the symbolism and teachings of the Pythagoreans, on top of all which must be included the legend of the master's degree as by far the most impressive feature, the pinnacle of dramatic symbolism placed on the English or symbolic rite about 1725. Whether it was dug up and borrowed from the archives of the French Companionage, successor to French mason builders of the Middle Ages, may never be known. If it is not, the coincidence is one of the most remarkable recorded.

Thus upon the bare skeleton of a secret brotherhood, which only tradition said had come down through the ages, was lavished a wealth of mystical symbolism gathered from the records of creations of man's religious and ethical aspirations. The supply of raw material was so abundant that, after the impulse given the work of upbuilding Freemasonry which culminated in 1717–25, when the three symbolic degrees, or "blue-lodge" Masonry, were perfected, a second period of elaboration of the possibilities of Masonic degrees and rites marked the remainder of the eighteenth century. This era in which Masonic degree factories were operated overtime extended in reality from late in the seventeenth century to early in the nineteenth. As each new degree or rite appeared, in England or on the Continent, the framers with rare judgment made eligible to membership only those who had received the original or first three degrees of Masonry. Thus, though rites have come and rites have gone, whatever the value or status of the added grades or degrees, the only genuinely universal Masonry continues to be the three degrees of entered apprentice, fellowcraft, and master Mason.

Within 10 years after the four remaining Masonic lodges in London had formed the Grand Lodge of England in 1717, organized Freemasonry had spread throughout the United Kingdom, to the Continent of Europe, and to many British colonies, including, in 1730, those in America. Thus began what has been called the revival of Freemasonry, its historic period, in which the international spread of the formation of lodges was greatly aided by vogue which the fraternity had acquired in England. Through British army and navy lodges, and by coöperation from Masons, members of the British diplomatic service abroad, Masonic lodges sprang up within a few years in almost all quarters of the world.

The first grand master of the newly formed Grand Lodge of England was Anthony Sayre, followed by George Payne in 1719 and by Dr. John Theophilus Desaguliers in 1719. Payne succeeded to the office in 1720, in which year the general regulations for the craft were compiled. These were revised by Dr. Desaguliers and Rev. James Anderson, a Scottish Presbyterian clergyman, and published in 1723 under the title of *Charges of a Freemason*. Prior to 1717 lodges met when and where desired, elected a master for the communication, and did Masonic work. After the Grand Lodge was organized lodges were created by warrant, elected permanent officers, and met at stated locations. The fraternity then took on the distinct characteristics for which it has since been known. Requisites for admission were and are a belief in a Supreme Being and in the immortality of the soul, under which Christians, Jews, Mohammedans, Indians, and others who are believers in a God are eligible to membership. No atheist can become a Mason.

The Mason is instructed that his fraternal obligations involving aid or assistance to members are to be subordinated to the duty he owes to God, his country, and his family, with full recognition of the duty he owes to his fellow men. The fraternity differs radically from the secret, beneficiary (insurance or other) societies, and from the Independent Order of Odd Fellows, the next largest secret, international fraternal association, in that its measure of relief or charity extended among members is purely voluntary, dependent on the need in each individual case. It is in no way part of a contract or other understanding that such-and-such distress on the part of brethren shall call for specific financial or other recognition or care.

The craft in England as well as on the Continent was early patronized by royalty, which gave it a distinction gained then or since by no other like society.

In 1724 a Grand Lodge of all England was formed by an old lodge at York, which claimed to date from the assembly of Masons said to have been held there in the year 926. It, however, maintained friendly relations with the Grand Lodge of England in 1717, and died a natural death in 1792. In 1751 nine lodges, chartered by the Grand Lodge of England, seceded, charging that the Grand Lodge of 1717 had departed from some of the old landmarks. It has ever been a Masonic law that the landmarks may not be changed. These formed a Grand Lodge of England according to Old Institutions, and styled themselves Ancients and called the original Grand Lodge adherents Moderns. Then followed the historic Masonic schism, which continued until the reunion of 1813 in the United Grand Lodge of Ancient Freemasons of England. The leader of the Ancients was Laurence Dermott, who published the *Ahiman Rezon, or Book of Constitutions*, virtually a copy of the constitutions of the original Grand Lodge of England. This he addressed to the Ancient York Masons of England. The Dermott grand lodge was relatively the more active in propagating lodges abroad, and difference in its work explains some of the striking variations in lodges in various States in America.

Permanent Masonic union in England in 1813, under the Duke of Kent as Grand Master of the Ancients and the Duke of Sussex as Grand Master of the Moderns, forever laid the controversy. Masonic students and historians present evidence that the degree known as the holy royal arch was originally the second (or third) section of the master's degree; that it was cut off and expanded by the Ancients, and that at the reunion of 1813 it was adopted and authorized to be conferred on master Masons. In the United States, the Dominion of Canada, and the Maritime Provinces the royal arch degree is made the summit of the capitular rite of four degrees conferred on master Masons who may be elected to receive it.

In England the royal arch is conferred in chapters of royal arch Masons governed by a Supreme Grand Chapter. The mark master's degree, distinctively English, a detached ceremonial, is conferred on master Masons in mark lodges, governed by a Grand Lodge of Mark Masters; and the Order of the Temple, associated with Knight Templar traditions, is conferred in priories of Knights Templars, governed by a Great Priory.

There was never any connection between Freemasonry and Templary or Malta knighthood, other than in Masonic legends which told of the Crusaders, after their return from Palestine, taking refuge among Masons and bequeathing their rites to the latter. This idea was fostered in an address in 1737 by Chevalier Ramsey, a Scotchman who became a Mason at London in 1728. This was the period in which degree making was rampant and Templar and Malta chivalric grades were common in the French, Scottish, and other systems. The old Baldwyn Encampment degrees at Bristol, long called the basis of the English Templar degrees, have not been traced back of 1779. By 1745 Masonic Templary, originating in the fertile minds of Masonic degree makers and dressed in the historical atmosphere of Knights of the Temple and Malta, ran across Europe and, through English and Irish Grand Lodge influence, into the American colonies. These degrees have ever been among the most popular in all rites into which adopted. This is partly explained by their trinitarian Christian character. As none but professing Christians among royal arch Masons are eligible, these degrees naturally fill a want left after English symbolic Masonry, which was originally trinitarian Christian, became unitarian and cosmopolitan. There are only about 6500 Knight Templars in the United Kingdom and Ireland.

The English Masonic menu also includes the Ancient Accepted Scottish rite degrees, which are under the administration of a Supreme Council and may be conferred on master Masons. In Scotland the statutes and ordinances of the Mason craft at the close of the sixteenth century, as outlined by William Shaw, general warden and his Majesty's master of work, were concerned mostly with trade relations. There was a password, but no degree or ceremonial. In 1736, through the efforts begun by Desaguliers 15 years before, various Scottish Mason lodges were interested and a Grand Lodge of symbolical Masons for Scotland, as well as provincial grand lodges, were formed. A gradual affiliation of remaining Scottish Mason lodges followed. Symbolic Freemasonry was introduced from England into Ireland in 1730. It met with some opposition from the Roman Catholic church, but the fraternity there expanded proportionately compared with elsewhere.

The first Masonic lodge in France was established at Dunkirk in 1721. It had an English charter, as, for that matter, did the first lodges in Spain, Germany, Netherlands, Austria, Greece, Turkey, Russia, Italy, Portugal, India, China, South Africa, Japan, and the American Colonies. The second French lodge was established at Paris in 1725. It also was of English origin, but fell under the ban of the Church and became social rather than Masonic in its aims. A Grand Lodge for France was formed in 1736, after which the strength of the fraternity there was marked with a riot of activity in the creation of new degrees and rites, most of which soon fell into disuse. In 1766 a National Grand Lodge of France was formed, since 1772 called the Grand Orient. Antagonism between the original Grand Lodge and the Grand Orient brought confusion, the latter using some superimposed Scottish rite degrees with the three symbolic degrees from England, while the earlier grand body was carried off for a time by the mystical creations of the notorious Cagliostro. With the revolution of 1793 both these grand bodies suspended, but in 1799 they were revived and united as the sole governing Masonic body in France. Then came another war of rituals between the Scottish philosophical and the new Ancient Accepted Scottish rite, imported as a novelty from the United States, and the fraternity in France was rent again. Union of the Grand Orient and the newly formed Supreme Council followed in 1804, when the American-created Scottish rite of 33 degrees was officially introduced, the two grand bodies sharing in its administration. The Grand Orient, it was claimed, broke the concordat in 1814, and assumed control of all the Scottish rite degrees, which brought on war with the Supreme Council. Political conditions owing to Bonapartist membership rendered the Supreme Council dormant until 1821, when it placed the first three degrees under dominance of a Grand Lodge of France, a Scottish rite protégé. The Grand Orient, having removed the name of the Deity from its lectures and the Bible from its altars, is not recognized by Masonic grand bodies which hold to the ancient landmarks.

Between 1725 and 1775 scores of so-called higher Masonic degrees were invented, some grouped into systems or rites. Many of these were hawked about the Continent by charlatans and others, in some instances as a means of livelihood. It was in France, too, that the earlier "Scottish" degrees were invented, so called to secure a distant birthplace where there were immemorial Masonic lodges. These degrees, 25 of them, "made in France," were first systematized in 1754, at Paris, by the Chevalier Bonneville, and called the Rite of Perfection. The only thing Scottish about them was the legends attributing their origin to Scotland. Some of the partisans of the Stuarts are reputed to have been members of this rite, which also lent color to the Scottish legend. In 1758 a Council of Emperors of the East and West at Paris succeeded to the title to this Rite of Perfection of 25 degrees, and in 1761 granted a patent to Stephen Morin to introduce the rite into the West Indies. In 1772 the Council of Emperors merged with a faction of the Grand Orient of France (which controlled the three symbolic English degrees), and as the factional Grand Lodge died within a few months the Rite of Perfection dropped out of sight in France. In 1779 the Grand Orient announced its control of Masonic degrees as extending only to the first three degrees. In 1786 the Grand Orient promulgated the French rite of seven degrees, four superimposed on the three which the English Grand Lodge gave to the world. The importance of this lies in pointing out Morin's authority to disseminate the Ancient and Accepted Scottish rite, or Rite of Perfection, which he carried to America, where it was developed into a rite of 33 degrees at Charleston, S. C., in 1801. From here it went to all parts of the globe, being for many years unrecognized as an American off-

spring of the French so-called Rite of Perfection, the rite *Ecossais*, or Scottish rite, amplified and adorned. It is to-day found virtually in every country where Masonry flourishes. Where the English rite of three degrees exists, the Scottish rite, governed by supreme councils, confers degrees only from the fourth to the thirty-third.

Freemasonry was introduced into America in 1730 by the Grand Lodge of England, when Daniel Coxe of New Jersey was made Provincial Grand Master for Pennsylvania, New Jersey, and New York. St. John's Lodge in Philadelphia was chartered by Coxe in the latter part of 1730 or in 1731. Benjamin Franklin's account books show that he sold stationery to that lodge in 1731. Franklin himself became a Mason in that year. St. John's Lodge of Boston was granted a warrant in 1733 by Major Henry Price, who had been made Provincial Grand Master in England in that year. Traveling military lodges attached to the British army in the Colonies helped to spread Freemasonry throughout the New World. After the Revolution colonial lodges formed grand lodges of their own, to which they transferred their allegiance. Subordinate lodges were established by the Grand Lodge of England at Savannah, Ga., Charleston, S. C., and Wilmington, N. C., about 1730–37, and it was not until 20 years later that successors to Daniel Coxe established a lodge at New York City.

There have been scores of Masonic rites, all drawing their initiates from possessors of the first three symbolic (English) degrees of entered apprentice, fellowcraft, and master Mason, but only five of any great consequence survive. The English rite consists of the first three degrees "including the holy royal arch." The second, or American rite, beginning with the first three degrees conferred in lodges, continues (if desired) with four degrees, mark master, past master, most excellent master, and royal arch Mason, conferred in chapters; the (optional) three degrees, royal master, select master, and superexcellent master, conferred in councils; and, finally, three orders, or grades, Companion of the Red Cross, Knight Templar, and Knight of St. John and Malta, conferred in commanderies of Knights Templar. Each of the latter groups, chapters, councils, and commanderies, has a separate government under a grand or State body, and these are subsidiary each to a single general grand, or national, body. In this respect they differ from the lodges which form the basis of the whole Masonic system in that the Grand Lodge in each State forms a sovereign jurisdiction. The French rite consists of the three English degrees (as do all rites), to which have been added four degrees selected from among those most popular in France among the many unsystematized inventions which appeared in the latter half of the eighteenth century. The rite in use by most German lodges, having its sanction in the Grand Lodge of the Three Globes, adds to the three symbolic degrees, seven degrees drawn from Scottish rite sources and the Templar theory of the origin of masonry.

The Swedish rite (practiced in Norway and Sweden) mixes the English and French systems. The Rite of Memphis (Egyptian) was constructed from the Rite of Misraim, founded at Milan in 1805, with 90 degrees, Scottish and other available floating material, to rival the Ancient Accepted Scottish rite, into which its founders had been denied admission. After a stormy career in France it became almost dormant in 1822. In 1839 the Rite of Memphis with 96 degrees and a ninety-seventh for its official head was framed at Paris out of the disintegrating finery of the Rite of Misraim, and soon sprang into life at Marseilles and Brussels. It disappeared by 1862, in which year an American carried the rite to New York, some accounts placing its transplanting eight or ten years earlier. The rite found place in England and nominally in a number of the United States, but was never active and had comparatively few members. Abroad it was chiefly useful to enable degree-peddling Masons, regular or irregular, to establish alleged "Scottish" rite grand bodies from which to peddle alleged Masonic lodge warrants to the uninformed in the United States and other countries.

The mission of Stephen Morin to the West Indies in 1761 resulted in his making a number of Scottish rite Masons of 25 degrees, who brought the rite into the Colonies—to Albany in 1767, to Philadelphia in 1781, and to Charleston in 1783. At the latter city in 1801 was created a new Ancient Accepted Scottish rite of 33 degrees. It confers, where the English three degrees exist, from the fourth to the fourteenth degrees in lodges of perfection, fifteenth and sixteenth in councils of Princes of Jerusalem, seventeenth and eighteenth in chapters of Rose Croix; nineteenth to thirty-second inclusive in consistories of Princes of the Royal Secret, and the thirty-third and last degree, that of sovereign grand inspector general, in supreme councils, of which there was to be one in each country where the rite existed, except in the United States, where there were to be two.

The "new" rite speedily went to France, where, strangely, it was welcomed as a discovery. By 1806 it had reached New York. The Mother Supreme Council of the World, formed at Charleston, now impressively housed in a temple at Washington, is known as the Supreme Council, A. A. S. R., U. S. A., Southern Jurisdiction. The Supreme Council for the Northern Jurisdiction was created at New York in 1813, with Daniel D. Tompkins, afterward Vice President of the United States, "in the Grand East." It is now established at Boston. The march of this rite throughout the world has been continuous. In the United States its growth has outrun that anywhere else, but not without years of controversy over regularity and right of control by rival Scottish rite governing bodies which ended in the reunion of 1867.

Two other Scottish rite bodies maintain a nominal existence in the United States. Each has a complete organization on paper, but with a relatively moderate following. The leaders in these two bodies doubtless believe they are the

ANCIENT, ACCEPTED SCOTTISH RITE MEMBERSHIP

	Southern Masonic Jurisdiction United States	Northern Masonic Jurisdiction United States
Number of active 33° members	25	44
Number of emeritus 33° members	5	3
Number of honorary 33° members	847	1,085
Number of 32° members	56,162	79,007
Number of consistories established	92	46

real, hereditary proprietors of the rite here, but the referendum to the more than a million and a half master Masons in America does not agree with that view. Statistics of membership of the rite in the Southern and the Northern jurisdictions, 1913 and 1914 respectively, which include most of the prominent official and other representatives of the symbolic lodges and grand bodies and enjoy great material prosperity, are given in the table on the preceding page. No figures are given out by either of the other Scottish rite bodies referred to.

In the United States and most other English-speaking countries charity and protective features of the fraternity have shown themselves in the establishment of Masonic homes, orphanages, and schools for the care of dependent aged Masons and for widows and children of members. Chicago and Utica, N. Y., have very large institutions of this character. Others, including the earliest in the United States, that established at Louisville, Ky., in 1867, are the home at Philadelphia, and those at St. Louis, Mo., Richmond, Va., Burlington, N. J., Nashville, Tenn., and Wichita, Kans. These are supported by per capita taxes levied through the grand lodges and by voluntary contributions.

The Ancient Arabic Order of Nobles of the Mystic Shrine is the principal playground of American Freemasonry. It was founded at New York in 1871, the joint product of Dr. Walter M. Fleming, William J. Florence, the actor, and Prof. A. L. Rawson. It contains a legend as to an Arabic origin, and on its altars rest copies of the Bible and the Koran. Those closest to its beginnings have said that Florence conceived of it and set the stage, that Rawson, the Orientalist, wrote the ritual, and that Dr. Fleming introduced it. Only Masonic Knights Templars or thirty-second-degree members of the Scottish rite are eligible as members of "the Shrine" to wear its fez, claws, scimitar and star, which is apparently the ambition of so many members of the craft. There are 137 Shrine temples in the United States, with a total of more than 200,000 members, "nobles" as they are called.

Other Masonic places for recreation, but open to master Masons, include the Veiled Prophets of the Enchanted Realm, formed at Utica, N. Y., in the latter part of the nineteenth century, with about 5000 members; the Independent International Order of Owls, St. Louis, 1890, with perhaps 4500 members, and the Tall Cedars of Lebanon, which, like the others, is found in several States and has perhaps 10,000 members.

The Royal Order of Scotland, one of the oldest continuous appendant orders of Freemasonry, was introduced into the United States in 1878. Its two degrees are conferred in a provincial Grand Lodge held in a room of the temple of the Scottish rite, Southern Jurisdiction, where the chair is ever kept vacant for the hereditary Grand Master. These lodges are opened annually in most English-speaking countries. Membership is restricted. Its own tradition says the order took its rise in the time of David I, King of Scotland; that it presents the sacrifice of the Messiah, whereupon the candidate goes into the world to search for the lost word. This alone should date the invention not earlier than the first half of the eighteenth century.

The Order of the Red Cross of Constantine, Masonic, is conferred in grand councils in the United Kingdom and in the United States. It is based on the story of the conversion to Christianity of Constantine the Great and his vision of the passion cross. This ceremonial is claimed to have been rescued from some of the more ambitious of those degrees which interested continental Europe between 1725 and 1760. Master Masons in the United States were made eligible to receive the order in 1897. Not more than 5000 members are believed to have been attained in America and fewer than half that in England. In the United States, Chicago and Philadelphia have been most interested in its ceremonials.

From the middle of the eighteenth century the craft has been patronized by English royalty and the nobility. The like was true in France under the Bourbons, the Bonapartes, and the Republic. In the United States, besides Washington, five signers of the Declaration of Independence—Benjamin Franklin, John Hancock, William Hooper, Philip Livingston, and Thomas Nelson, Jr.—were Masons, as were Generals Nathanael Greene, Richard Henry Lee, Israel Putnam, Francis Marion, Barons De Kalb and Steuben and Marquis de Lafayette, Gen. Joseph Warren, Paul Revere, and Brandt, the Mohawk, and Tecumseh, the Shawnee chief. Ten Presidents of the United States were Masons, if Fillmore, who recanted, be counted. In addition to Washington they were Jackson, Polk, Buchanan, Johnson, Garfield, McKinley, Roosevelt, and Taft.

The Sovereign College of Allied Masonic and Christian Degrees of America, Richmond, Va., is described by itself as a body of Masons which confers academic and ritualistic degrees for distinguished service to the craft. Little is known of it other than finding it on various lists of Masonic organizations. It quotes several well-known side or detached degrees, some from the era in which degree making and selling were popular, and which are now interesting chiefly as curios.

The Order of the Eastern Star, often referred to as a Masonic society to which women relatives of Masons are eligible, has no Masonic connection whatever, other than that its membership is confined to women, as described, and to master Masons who may care to join it. This mixed men-and-women order, made up of Masons, their wives, daughters, mothers, etc., was formed in 1868, has governing chapters in almost every State in the Union and nearly 350,000 members.

Negro Freemasonry in the United States is as legitimate in its origin as that which came to white men in America from the Grand Lodge of England, as they were both derived from the same source. At Boston in 1775, Prince Hall, a negro, and 14 other colored men were made Masons in an English army lodge at what is now Fort Independence. It has been conjectured that the English, knowing the whites would resent such a proceeding, initiated the negroes to enlist the aid of the latter. If so, the plan failed, for Prince Hall sided with and fought for the colonists. In 1784 the Grand Lodge of England granted a warrant to Prince Hall and associates constituting African Lodge 454. There never has been a difficulty over the social gulf between the black and white races at this action by the English Grand Lodge. The latter dropped African Lodge from its roster after the union of 1813. There is no affiliation or recognition between white and colored Freemasonry in the United States. The latter has, or recently

had, a National Grand Lodge, something the white Masons never had. Colored Freemasons number perhaps 200,000, with lodges and grand lodges in nearly half of the States of the Union. They have paralleled, too, the Royal Arch Chapter degrees with perhaps 10,000 members; Knight Templary ceremonials with, as claimed, about 5000 members; and have a number of Scottish rite bodies, derived by charter through a representative of the Supreme Council of France, and, as reported, 2000 or more thirty-second-degree members.

Anti-Masonic sentiment has shown itself in three ways since the revival of Masonry in 1717. The first, continuous since 1724, comes from the Roman Catholic church; the second, attracting very little attention, from several offshoots of the Scotch Presbyterian church; while the third was shown for only about a decade following the disappearance from Batavia, N. Y., in 1827, of William Morgan, who had threatened to make public Masonic secrets.

In 1738 Pope Clement issued a bull against Freemasonry, enjoining temporal and spiritual communities against entering the society or spreading or defending its principles or admitting it to their houses under pain of excommunication. In the Latin American republics the church has continued, with the aid of successive papal bulls, to denounce Freemasonry and prohibit Catholics from joining not only the Masons but a few other secret societies to which many Masons belong. There is no rule or regulation in Masonry which could be construed as preventing a Roman Catholic from becoming a member, and the church's antagonism to the craft of late, particularly in France, Italy, and Spain, has been due perhaps to reported atheistic and antichurch tendencies among lodge members there, for part of which the latter have been cut off from affiliation with English-speaking bodies, and because of the general attitude of many Latin American grand lodges in antagonizing the church politically.

In 1757 the synod of Stirling debarred all adhering Freemasons from the ordinances of religion, and that attitude has been continued since by several factions of the Scotch church.

The disappearance of William Morgan, whom people imagined to have been thrown into Niagara River by the Masons, created a tremendous excitement which Thurlow Weed and William H. Seward and others turned to political advantage by pretending that a body found in the river had been recognized as Morgan's. Asked later as to the claim, Weed made the famous comment that it was a "good enough Morgan until after election." So great was the outcry at the time that lodges were abandoned right and left in the Eastern and Middle States, while many families, church members, and friends separated on the issue. An anti-Masonic party was formed, became for a few years practically the only opponent of the Democratic party, and in 1832 ran William Wirt for the presidency, who, with Clay, Republican candidate, was defeated by Andrew Jackson, a Freemason. (See ANTI-MASONS.) Freemasonry recovered slowly from the inquisition given it by the anti-Masonic party. During 10 years prior to the Civil War the craft in the United States fully recovered what it lost between 1828 and 1840 and has grown rapidly ever since the war ended.

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MASO'RA, MASSORAH, MASSORETH (Heb. tradition, from *māsar*, to hand over). A particular collection of critical notes on the text of the Old Testament, its divisions, accents, vowels, grammatical forms, letters, etc. According to the early mode of Semitic writing, only the consonants were indicated; hence in the course of time there inevitably arose a vast number of variants in the Old Testament text, or rather different ways of reading and interpreting the same letters by dividing them into different words with different vowels and accents. Some measures for the more accurate preservation of the documents became indispensable, and the desideratum was supplied by the Masora, which, by fixing an immutable reading upon each verse, word, and letter, put an end to the confusion and left the individual fancy free to take its own views for homiletical purposes only. The origin of the Masora is shrouded in mystery. The first certain traces of it are found in certain Halachistic works treating of the synagogue rolls of the Pentateuch and the mode of writing them, and it is reasonable to suppose that practical necessities called forth by the institution of readings from the Pentateuch and Prophets as a regular feature of religious services led to accurate determination of the text of each verse, the number of letters, and the pronunciation of each word, including the proper intonation. A late Talmudic treatise, *Massecheth Sopherim*, treats of these matters. Some of the earliest works on the subject have survived in their titles only, such as *The Book of the Crowns* and *The Book of the Sounds*. There can hardly be a doubt that the Masora, like the Halacha and Haggada, was the work, not of one age or century, but of many ages and centuries, as, indeed, we find in ancient authorities mention of different systems of accentuation used in Tiberias, Babylon (Assyria), and Palestine. In the period of Hadrian we learn of two scholars, Nakkai and Hammum, who are said to have counted the number of verses in the books of the Old Testament, but the systematic work of the Masoretes belongs to a much later period. The vowel system at present employed, which is their work, cannot be traced further back than c.700 A.D., and appears to be based on the example furnished by Syrian grammarians; but before this was perfected at Tiberias in Palestine another system, chiefly superlinear in character and much more complicated, was evolved and adopted in Babylonia. These two systems are distinguished as the Tiberian and the Babylonian respectively. It was in Tiberias that the Masora was first committed to writing. Monographs, memorial verses, finally glosses on the margins of the text, seem to have been the ear-

liest forms of the written Masora, which gradually expanded into one of the most elaborate and minute systems, laid down in the "Great Masora," made up of longer notes placed upon the upper and lower margins (about the eleventh century). Besides this there was compiled the "Small Masora," notes placed between the columns of the texts. A further distinction is made between Masora *textualis* and *finalis*, the former containing all the marginal notes; the latter, larger annotations, which, for want of space, had to be placed at the end of the paragraph. Of independent Masoretic works the most important is the one known as *Ochlah weochlah*. The final arrangement of the Masora, which was first printed in Bomberg's Rabbinical Bible (Venice, 1524–25), is due to Jacob ben Chayim ben Adonijah and to Felix Pratensis. The language of the Masora is Aramaic, and besides the difficulty of this idiom, the obscure abbreviations, contractions, symbolical signs, etc., with which the work abounds, render its study exceedingly difficult. An explanation of the Masora is found in Elias Levita, *Masoreth Ha-Masoreth* (translated into German by Semler, Halle, 1772; edited, with an English translation by Ginsburg, London, 1867), and Buxtorf, *Tiberias* (Basel, 1620). Consult also: C. T. Ginsburg, *The Massorah* (4 vols., London, 1880–1905); Harris, "Rise and Development of the Massorah," in the *Jewish Quarterly Review*, vol. i (ib., 1889); König, *Einleitung in das Alte Testament* (Leipzig, 1893); Cornely, *Introductio in V. T. Libros Sacros*, vol. i (Paris, 1894); Weir, *A Short History of the Hebrew Text of the Old Testament* (London, 1899); C. T. Ginsburg, *Introduction to the Hebrew Bible* (ib., 1899); S. R. Driver, *Notes on Hebrew Text of the Books of Samuel, with Introduction on Hebrew Palæography* (2d ed., Oxford, 1913).

MASÓ Y MARQUEZ, mä-sō' ē mär'kāth, Bartolomé (1834–1907). A Cuban patriot, born near Manzanillo and educated in France. He became a rich planter. At the outbreak of the Ten Years' War (1868–78), he joined the patriot army and rose to the rank of colonel. Cespedes made him Superintendent General of the Treasury and he was active in the service of the Republic under Estrada Palma. After the war he was arrested and imprisoned. From 1883 to 1895 he was again a prosperous planter near Manzanillo, and, in the latter year, was the first prominent Cuban to join the revolutionary movement started by José Martí (q.v.). He was chosen Vice President of the newly organized insurgent government (September, 1895) and in 1897 was elected President. In 1901 he was considered as the logical candidate for the vice presidency with Estrada Palma, but, being opposed to the Platt amendment, he finally came out as his opponent. Although he had a large following, he withdrew his candidacy before the date of the election, alleging that unfair methods were being used in the canvass.

MASPERO, mä'spe-rō', Sir Gaston Camille Charles (1846–1916). A distinguished French Egyptologist. He was born in Paris, June 23, 1846, and received his early education at the Lycée Louis le Grand. At the age of 14 he studied the Egyptian language privately, and in 1865, when he entered the Ecole Normale, he had attained a high degree of proficiency in the interpretation of hieroglyphic texts. Two years later he published, with the approval of Mariette, his *Essai sur l'inscription dédicatoire du temple d'Abydos et la jeunesse de Sésostris.* In 1867 he went to Montevideo to coöperate with Vicente Fidel Lopez in his studies on the Indian dialects of Peru, translating into French and editing Lopez's work, *Les races aryennes de Pérou.* On his return to Paris, a year later, he resumed his Egyptological studies, and in 1869 he read before the Académie des Inscriptions a memoir on the Abbott Papyrus, containing an official report in regard to the tomb robberies in the Theban necropolis under Ramses IX. This memoir, under the title *Une enquête judiciaire à Thèbes au temps de la XXème dynastie*, was published at Paris in 1871. In 1869 Maspero became *répétiteur* in the department of Egyptology at the Ecole des Hautes Etudes, and three years later he passed the examination for the degree of doctor, presenting two theses: *De Carchemidis Oppidi Situ et Historia Antiquissima* and *Du genre épistolaire chez les Egyptiens de l'époque pharaonique.* In 1874 he was appointed professor of Egyptology in the Collège de France as the successor of E. de Rougé. In 1875 was published his *L'Histoire ancienne des peuples de l'Orient*, which was the first attempt to present, from monumental sources, the history of the ancient East as a whole, and to exhibit the relations existing in antiquity between the peoples of western Asia and the Nile valley. The eleventh edition of this work, which has been frequently revised, was published in 1912. In the course of the next five years Maspero wrote a number of valuable memoirs on Egyptian philology, history, and archæology, the most important being: "De quelques navigations des Egyptiens sur la mer Erythrée" (*Revue Historique*, 1878); "La grande inscription de Beni-Hassan" (*Recueil de Travaux*, 1878); "Récit de la campagne de Mageddo sous Thoutmès III" (*Recueil de Travaux*, 1879–80). He received the decoration of the Legion of Honor in 1879 and in 1882 was made an Officer of the Legion. In 1880 he was sent by the French government to Egypt at the head of the Mission Archéologique, which, under his skillful management, developed into a school for the prosecution of advanced studies in Egyptology and kindred subjects. In 1881 Maspero was appointed director of the excavations and antiquities of Egypt, succeeding Mariette, several of whose posthumous works he edited and whose biography he wrote in 1905. His excavations, though less extensive than those of his predecessor, were more methodical, and he is entitled to special credit for his successful efforts for the preservation and protection of the monuments of Egypt. In 1883 he became a member of the Académie des Inscriptions et Belles-Lettres. In June, 1886, leaving Grébaut as his successor in Egypt, he returned to Paris and resumed his chair at the Collège de France, assuming at the same time the direction of Egyptological studies in the Ecole des Hautes Etudes. In 1899 he returned to Egypt to resume the position which he had resigned in 1886, and he remained there until 1914, when his election as permanent secretary of the Académie des Inscriptions et Belles-Lettres brought him back to Paris. He received the English K. C. M. G. in 1909. Maspero's works are very numerous. In addition to those already mentioned, some of the most important are: *Hymne au Nil* (1868); *Etudes égyptiennes* (1879–91); *Les contes populaires de l'Egypte ancienne* (1882; 4th ed., 1911); *Mémoire sur*

quelques papyrus du Louvre (1883); *L'Archéologie égyptienne* (1887; Eng. trans. by Amelia B. Edwards as *Manual of Egyptian Archæology and Guide to the Study of Antiquities in Egypt;* also translated and enlarged by Agnes S. Johns, 6th Eng. ed., 1914); *Les momies royales de Deïr-el-Bahari* (1889); *Lectures historiques: Egypte et Assyrie anciennes* (1890; 6th ed., 1912); *Etudes de mythologie et d'archéologie égyptiennes* (1892 et seq.; vol. vii, 1912). Translations, edited by Sayce, were published as: *The Dawn of Civilization: Egypt and Chaldæa* (3d ed., 1897); *The Struggle of the Nations: Egypt, Syria, and Assyria* (1897); *The Passing of the Empires, 850–330* B.C. (1900). *A Complete History of Egypt* in twelve volumes appeared in 1904 et seq. Other works include: *Les contes populaires de l'Egypte ancienne* (3d ed., 1906); *Causeries d'Egypte* (1907; Eng. trans. by Elizabeth Lee, *New Light on Ancient Egypt*, 1909); *Egypt, Ancient Sites and Modern Scenes* (trans. by Lee, 1911); *Art in Egypt* (1912; appeared in United States, England, France, Germany, Italy, Spain); *Egyptian Art* (trans. by Lee, 1913). Maspero edited the valuable *Mémoires de la mission française au Caire* (1884 et seq.) and in 1879 assumed editorial direction of the *Recueil de travaux relatifs à la philologie et l'archéologie égyptiennes et assyriennes.* It was in this journal (vols. i–xiv) that he published the text and translation of the inscriptions engraved upon the walls of the pyramids of the fifth and sixth dynasties at Saqqara (q.v.). He also contributed frequently to the *Journal asiatique.* See EGYPTOLOGY.

MASQUE (Fr., mask), or **MASK.** A species of dramatic entertainment much in vogue in England in the sixteenth and seventeenth centuries, so named from the masks (see MASK) which were originally worn in it. It was introduced during the reign of Henry VIII in imitation of some of the Italian allegorical pageants of the period, and was at the same time a development of the festive processions of the city of London and of the royal progresses. Around the acted pageantry of the mythological and allegorical personages in these there grew up regular dramatic performances in which music and dancing were prominent and which were comparable to the *ballets* of the French court. (See BALLET.) Masques were in their time the favorite form of private theatricals, though the elaborate and expensive style in which they were usually given limited them for the most part to the homes of the nobility and the court. They were at their best in James I's day. Ben Jonson, above all, made the masque a thing of literary beauty, in which his classic learning and graceful fancy united to furnish royal amusement. As spectacles, masques were largely an affair of costume and of scenic design, to which the architect Inigo Jones lent his aid. The taste for this style of entertainment died away under Charles I; yet to his time belongs Milton's *Comus.* In this, however, though it was made to be acted, the masque has become a literary form practically independent of actual presentation, and as such it has survived to our day.

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MASQUERADE mȧs'ke-rād' (Fr., from Sp., Portug. *mascarda*, masquerade, from *mascara*, mask). The disguise effected by wearing a mask or strange apparel, or the assembly itself of persons masked and disguised with fantastic dress. In early times the masquerade often accompanied religious observances; it was a feature of the Greek Bacchanalia and the Roman Saturnalia, and fantastic costume, at least, is known to have been worn at the Jewish feast of Purim. The Druids when proclaiming the New Year (q.v.) masked and disguised in women's robes, the skins of beasts, etc. During the Middle Ages masquerades characterized by great frivolity and extravagance were held in the churches in spite of the attempts of the Fathers to do away with them. Even the priests took part in them. Of this nature were the feast of fools (q.v.) and other burlesquing festivals, recalling the heathen Saturnalia. They bore different names in different countries and were continued until the sixteenth century. Such was probably the origin of the masked ball, an exclusive form of masquerade which was introduced into the French court by Catharine de' Medici. It found its way to England in the reign of Henry VIII, but did not reach any of the courts of Germany till the end of the seventeenth century. The *bal costumé* is a very modified and much less objectionable form of the masquerade. During the carnival public masquerades are held in all the theatres and dancing saloons of Paris, and processions of maskers pass through the streets playing mad pranks. See CARNIVAL; GREEK FESTIVALS.

MASS. The name given among Catholics to the Eucharist or Lord's Supper (q.v.), considered as the highest form of Christian worship, as a sacrifice, and the offering of the body and blood of Jesus Christ under the forms of bread and wine. The proofs adduced to show its institution under this aspect at the Last Supper are the words employed on that occasion; the teaching of St. Paul and of the Fathers of the Church; the practice of the Apostles; the unbroken tradition of all Christendom for 16 centuries; and its retention as a sacrifice in the Eastern churches which separated from Catholic unity. The prophecy of Malachi (i, 11) is likewise regarded as foretelling it. The teaching of Roman Catholic theologians is that in the Eucharist Christ is "as it were slain." He is not merely present, but is in a state which is a kind of death. He is there with all the perfections of his godhead, and all the complete nature, functions, and glory of his manhood; all, in fact, that he is in heaven; but he does not manifest it; nor does he exercise his powers in the Sacrament as he does in heaven. How much or how little his human senses are exerted is still a matter of discussion among theologians. This sacramented condition of Christ is evidently the greatest conceivable way of expressing subjection to God's dominion, of impetrating, atoning, and rendering thanks, the four objects which are considered to be the purposes of the Sacrifice of

the Mass. Necessarily it supposes transubstantiation (q.v.) and the priestly power. Accordingly it can only be offered by one who is in priest's orders. By the law of the church he must be fasting, absolutely, from the midnight previous to the celebration of the mass. It is offered in the morning, though this time may be extended, for reasons legislated upon, to a limited time after midday. Each priest is permitted to offer it once a day; though on Christmas Day he may offer three masses, and in some countries two on All Souls' Day. In some countries where there is a lack of priests it is permitted to celebrate mass twice on Sundays; otherwise the people would not be able to fulfill the obligation which is incumbent upon them of assisting at mass on Sundays and certain great festivals. (See COMMANDMENTS OF THE CHURCH.) Absence from this public worship on Sundays and certain feasts without sufficient reason is held to be a grievous sin.

The priest who celebrates always communicates. This is for the integrity of the sacrifice; but the essence of the sacrifice is by many taught to be in the consecration. Whether some or none of the congregation communicate does not affect the sacrifice; the rule is, however, that some one must be present to make the responses. (For the teaching and details as to communion, see SACRAMENT; COMMUNION IN BOTH KINDS.) The bread must be wheaten bread; the wine, wine of the grape. In the Eastern church leavened, in the Western unleavened, bread is used. The time of the introduction of unleavened bread in the West is not certain.

Private masses are said in a low tone, and hence called low masses. Those which are sung are called high masses, and if the celebrant is assisted by other ministers the mass is said to be solemn; if the celebrant is a bishop it is pontifical. Those celebrated for the dead are called, from the first word of the introit, requiems; and the mass at the celebration of marriage is called a nuptial mass. As saints are honored on almost every day of the liturgical year, prayers in which their intercession is invoked are introduced at the beginning and at the end of the service, and also in the part which the priest recites in a tone audible only to himself, and hence called the Secret.

There are certain days not devoted to the commemoration of any mystery or saint, and the priest is permitted to choose one in whose honor he may celebrate according to his devotion; these are termed votive masses. There is no such thing as *dry mass;* the expression is used to denote the going through, by one who is preparing for the priesthood, of the various prayers and ceremonies in order to familiarize himself with them. The "mass of the presanctified," used on Good Friday (see HOLY WEEK), is not a complete mass, lacking the consecration.

The use of an unchanging language like Latin and some Oriental languages is intended to be a safeguard against new meanings that grow into words in the use of living tongues. It is not necessary, on the theory here explained, that the words should be understood or even heard in detail by the congregation any more than it was necessary for the Jews to enter the sanctuary where the sacrifice was being offered. They understand that they are taking part in the supreme act of worship, though even the assistant at the priest's side may not be able to hear the words of consecration.

For the vestments used in the mass, see COSTUME, ECCLESIASTICAL; and for the early development of liturgical structure, see LITURGY. The mass is divided into two main parts, known from ancient analogy as *missa catechumenorum* and *missa fidelium*, the latter or more sacred part having been originally that from which the unbaptized were excluded. (See DISCIPLINA ARCANI.) A similar distinction, though not identical, is made between the Pro-Anaphora and Anaphora of the Greek liturgies. The first consists of the celebrant's preparation at the foot of the altar, introit, *Kyrie eleison*, *Gloria*, collect, epistle and gospel, and creed. The second begins with the offertory or oblation of the elements; the preface leads up to the *Sanctus*, and then follow the canon or practically unvarying central portion of the mass (including the consecration) and its accompanying prayers, the communion, and the postcommunion; the congregation is dismissed with the ancient formula *Ite missa est*, from which the mass derives its name (Lat. *missa*). See the articles on all the more important parts of the service named above.

The musical history connected with the mass is of considerable importance, as the early development of polyphonic music was almost exclusively along the lines of sacred use. Originally the whole service, when sung, was set to plain chant (q.v.); but later the *Kyrie*, *Gloria*, *Credo*, *Sanctus*, and *Agnus Dei* were detached and set to new music, these numbers constituting what is called a mass in the musical sense. The masses of the composers of the Gallo-Belgic school of the fifteenth century had become so complicated and overloaded with contrapuntal tricks that a desire for a simple and more dignified style was created. Palestrina inaugurated the new epoch in writing distinguished by grandeur and majesty; his compositions were usually for four to eight voices. The great masters of the seventeenth and eighteenth centuries wrote masses for eight, twelve, sixteen, twenty-four, and sometimes even more voices. All these works were written *a cappella*, without instrumental accompaniment. The development of instrumental music suggested new combinations, and the *missa solemnis* of Bach and Beethoven thus grew up. Gounod, Silas, and Widor have given notable examples of this style in more recent times. See SACRED MUSIC.

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MASS. See MATTER.

MASSA, mäs'sä. The capital of the Province of Massa e Carrara, Italy, on a hill rising from the banks of the Frigido, 3 miles from its outlet in the Gulf of Genoa and 26 miles north of Pisa (Map: Italy, C 2). Its chief buildings are the ducal palace, now the prefecture building, a former summer residence of Elisa Bacciocchi, Napoleon's sister. Its institutions include a Gymnasium, lyceum, technical school, and art

school. Massa has fine marble quarries, which are extensively worked, and important manufactures of silk, paper, and olive oil. It was formerly the capital of a principality and later of the Duchy of Massa-Carrara, which was united with Modena in 1829. It is jointly with Carrara the seat of a bishop. Pop. (commune), 1901, 26,413; 1911, 30,830.

MAS'SACHU'SET (at the great hills, i.e., the Blue Hills of Milton). An important Algonquian confederacy formerly occupying the territory about Massachusetts Bay, and extending along the coast from Plymouth northward to about Salem, including the basins of the Neponset and Charles rivers. Their principal village, from which they took their name, was on the site of Quincy, in Norfolk County. Before the coming of the whites they seem to have held the leading place among the tribes of southern New England, and are said on good authority to have had over 20 villages in 1614. They suffered more than any other tribe from the great pestilence of 1617, and when the English arrived a few years later they found the Massachusets reduced to a mere handful and most of the villages depopulated. In 1631 they numbered only about 500, and two years later were still further reduced by smallpox, which carried off their chief, Chickatabot. In 1646 they were gathered, with other converts, into the mission villages of Natick, Nonantum, and Ponkapog, and ceased to have a separate tribal existence.

MAS'SACHU'SETTS. A North Atlantic State of the American Union, belonging to the New England group. Except the eastern part, which expands along the ocean front, Massachusetts resembles generally a parallelogram and lies approximately between lat. 42° and 42° 43′ N. It is bounded on the north by the States of Vermont and New Hampshire, on the west by New York, on the south by Connecticut and Rhode Island and the Atlantic Ocean, and on the east by the Atlantic Ocean. Its greatest length is 184 miles; the distance from Cape Ann due west to the New York State line, 138 miles; the extreme width is 113¾ miles, and the average width in the west 47¾ miles. The total area is 8266 square miles, of which the water surface amounts to 227 square miles. The irregular coast line gives an ocean frontage of nearly 300 miles, excluding the shore lines of the islands and lesser inlets. There are three great bays—Cape Cod Bay, Massachusetts Bay, and Buzzards Bay.

Topography. Massachusetts, a part of the upland or uplifted peneplain of southern New England which slopes from the local representatives of the Appalachian Mountains southeastward to the sea, may be divided into four physiographic provinces. 1. In the extreme west, extending north and south across the State, the Berkshire Hills (from Berkshire County) are a continuation of the Green Mountains of Vermont, and are composed of a number of ranges and minor valleys. The Taconic Range attains an extreme elevation of 3535 feet in Greylock or Saddle Mountain, near the northern boundary—the highest elevation in Massachusetts. The altitude falls away slightly to the south, where Mount Washington or Everett, in the southwest corner of the State, rises to a height of 2624 feet. The Hoosac Range has a somewhat regular altitude of 1200 to 1600 feet, reaching its maximum in Spruce Hill—2588 feet. The Housatonic valley has an elevation of 1100 feet at its north end and falls to 800 in the south. East of these ranges to the Connecticut the slope is southeast and is deeply cut by rivers. 2. The Connecticut valley, the second province, a broad flood plain, running from the Vermont-New Hampshire line and extending into Connecticut, has been cut out of the upland because of the presence of a less resistant rock than is found to the east or the west. The trap ridges, so conspicuous in the State of Connecticut from Long Island Sound up, are represented in the valley by Mount Tom, with an altitude of 1214 feet, Mount Holyoke, 955 feet, and others which rise as isolated peaks above the surrounding low country but do not extend above the upland level. 3. The country on the east side of the Connecticut River is a dissected plateau, with an elevation of about 1100 feet at the middle of the State, the surface sloping gradually eastward. Upon the old Cretaceous base level, which forms the top of most of the hills, some older hills stand out as monadnocks, the most conspicuous of which is Wachusett Mountain, 2108 feet in height. 4. In the eastern section the country is generally level or undulating. This lowland continues southeastward into the Cape Cod peninsula, extending in the form of an arm bent at the elbow for a distance of 65 miles, 35 miles eastward and a nearly equal distance northward, curving slightly westward at the extremity. Near this southern projection of the State lie many islands similar in character to the Cape Cod peninsula—Marthas Vineyard, the 16 Elizabeth Islands, and Nantucket Island.

Hydrography. The rivers of Massachusetts are numerous, but unimportant for purposes of navigation. The Connecticut traverses the State from north to south. It varies in width from 450 feet to 100 feet, but its flow is broken by falls at various points. On its western side it receives the Deerfield and Westfield, and from the east Millers River and the Chicopee. Though navigable for small craft it is chiefly important for its water power and for floating logs from the forests near its headwaters. Between the Taconic and the Hoosac Mountains flow north and south, respectively, the Hoosac and Housatonic rivers, the former discharging into the Hudson, the latter into Long Island Sound. The valleys of the Connecticut and its branches and the Housatonic are noted for their picturesque scenery. Descending from New Hampshire, the Merrimac flows for 35 miles through the northeastern corner of the State, discharging into the Atlantic Ocean. It is navigable for small craft as far as Haverhill, 15 miles from its mouth, but is valuable especially for its water power. Other rivers important also chiefly for their water power are the Concord, emptying into the Merrimac at Lowell; the Charles, discharging into Massachusetts Bay at Boston; and the Blackstone and the Taunton, flowing south into Narragansett Bay. The courses of the rivers are marked by broad reaches and sudden declines, instead of uniform gradients. Very many small glacial lakes are scattered over the State, especially near Cape Cod. There are excellent harbors at Fall River, New Bedford, Provincetown, Plymouth, Boston, Lynn, Marblehead, Salem, Gloucester, and Newburyport. Boston harbor is the most important harbor in the State. It is protected from the severe northeast storms by drumlins which have been partly submerged and tied to the mainland by spits, but the small basin formed thereby acts as a catch-

ment for the sediment brought down by the rivers. South of Boston the inlets are all of the "hook spit" type, a prominent feature along this part of the coast; but only the harbor of Provincetown is deep enough to accommodate the largest ocean ships. Buzzards Bay, the third largest indentation of the State, extends 30 miles inland to the west of Cape Cod, and contains New Bedford and Wareham harbors. The former is one of the most important havens in the State.

Climate. Massachusetts lies in the middle of the north temperate zone, yet, because of its proximity to the paths of the cyclonic and anticyclonic disturbances, it is strongly influenced by the north winds of winter and by the west and southwest winds of summer, bringing respectively the cold waves and the hot continental air to the coast. The average temperature for January is between 25° F. and 30° F., and for July about 70° F. In Boston the highest temperature ever recorded is 104° F. and the lowest, 13° below zero F. Inland the winter extreme especially is frequently exceeded. There is an average annual precipitation of 40 inches and over, very evenly distributed through the year. The snowfall is rather heavy, ranging from 30 inches at the south coast to 60 inches in the northwestern counties. The average annual relative humidity ranges from 80 per cent on the islands at the southeast to less than 70 per cent in the northwestern counties. The islands of Marthas Vineyard and Nantucket have an average wind velocity for the year of 14 miles per hour, the highest average recorded in the United States. The normal wind direction for January is northwest, and for July is southwest.

Soil. The soil of the State is largely the result of glacial erosion and deposition. The harder ridges, overridden by the ice, were denuded of all soil; the débris of the granitic hills is too coarse and too new to invite cultivation.

The Triassic valley of the Connecticut River gives flat lands of exceeding fertility, while river and lake deposits of worked-over glacial till furnish many alluvial plains of very rich land, but of limited area.

Many glacial lakes are partly filled and are utilized as cranberry marshes.

Geology. Massachusetts has a very complex geological history. At the beginning of Cambrian time three mountain masses of granitic rock extended across the State to the northeast, alternating with arms of the sea. Cambrian and Ordovician strata were deposited on the shore of the Champlain channel, west of Hoosac Mountain; in a narrow gulf, which extended from Gaspé Point to Worcester; and in a trough extending from western Rhode Island via Portsmouth to the Bay of Fundy. The Hoosac Mountain and its continuation in the Green Mountains represent the axis of the Appalachian mountain making in New England, and the older Paleozoic clastics to the west were very strongly metamorphosed—the limestones into marbles, the muds and gravels into slates and schists, and some of the sandstones into quartzites. In Carboniferous time the whole State had been worn down to base level, and coal measures were deposited in the Rhode Island-Nova Scotia basin and in the Gaspé-Worcester trough. In Triassic time there was an estuary in the Connecticut River valley extending to the north boundary of the State, with an average of 20 miles in width. This estuary was gradually filled with sandstones, and during their formation there were great outflows of trap rock. In the later Cretaceous all New England was reduced to base level, the southeastern margin of Massachusetts being under a shallow sea, receiving deposits of clays, as at Gay Head in Marthas Vineyard. The State was involved in the uplift of the Appalachian region at the close of the Cretaceous, and was raised into a plateau of moderate elevation. Massachusetts shared with the whole of New England in the denudation and erosion of the Pleistocene glaciation. The ice moved southward and southeastward across the State, discharging into the sea beyond Nantucket and Long Island and by deposition of its débris giving reality as well as form to Nantucket, Marthas Vineyard, and Cape Cod. It strongly accentuated the southward-trending valleys, while the higher ridges were denuded of soil, and the ice, on receding to the north, left the State strewn with a mantle of drift.

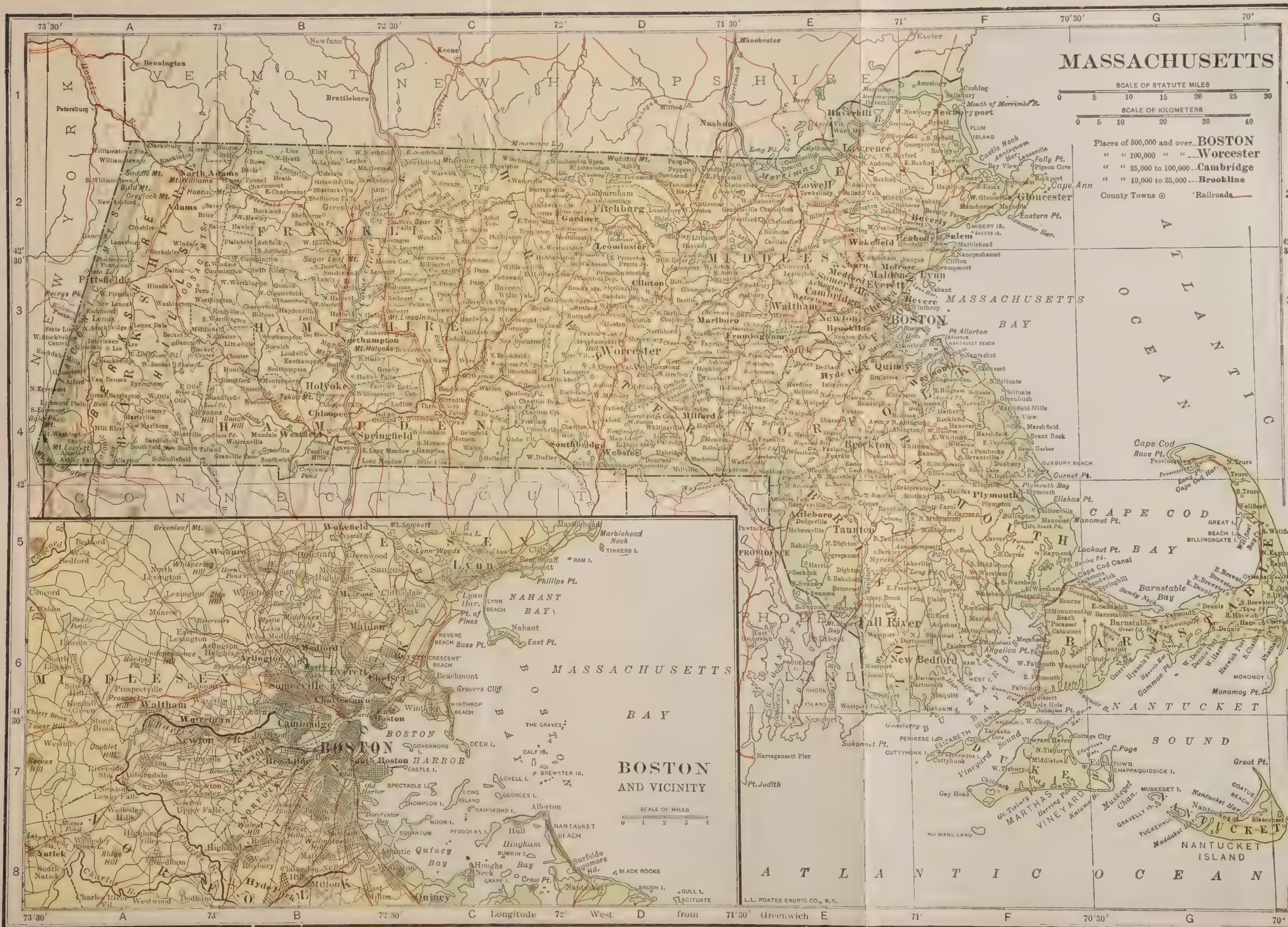
Mineral Production. Quarry products and clay are the chief mineral products. Measured by value, about 60 per cent of the stone quarried is granite, which is used chiefly for building and monumental purposes. The quarrying of trap rock is next to that of granite in the value of the output, Massachusetts being one of the half-dozen States in which the production of trap rock is an important industry. The total value of stone produced in 1913 was $4,096,372. Massachusetts was for many years the largest producer of granite in the United States, but is now surpassed by Maine and Vermont.

The chief clay products are common brick and brick for stove lining. The lime-burning industry is located in Berkshire County and is carried on independently of the marble-quarrying operations. The production of lime in 1913 was 130,365 tons, valued at $683,541. The production of sand and gravel in 1913 amounted to 290,757 short tone, valued at $149,036. In addition to the above, emery, fuller's earth, gems, infusorial earth, quartz, sand-lime brick, and talc are produced. The total value of all minerals produced in 1913 was $7,044,529.

Agriculture. Of an approximate land area of 5,144,960 acres in 1910, 2,875,941 acres were in farms, which numbered 36,917. Improved land in farms in 1910 was 1,164,501 acres. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, in 1910, was $226,474,025. The average value of all property per farm was $6135 in 1910, while the average value of land per acre was $36.69. The number of farms operated by owners and managers, in 1910, was 33,938. The native white farmers in 1910 numbered 28,431, the foreign-born white farmers 8362, and the negro and other nonwhites 124. Of the foreign-born white farmers the greater number came from Canada.

The table on page 205 gives the acreage, production, and value of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture.

The total value of crops in 1909 was $31,948,000 and the combined acreage of crops for which acreage was reported was 654,844, representing 56.2 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that only 5.1 per cent of the total value of crops in 1909 was contributed by the cereals, while over one-third was con-



MASSACHUSETTS
SCALE OF STATUTE MILES
0 5 10 15 20 25 30
SCALE OF KILOMETERS
0 5 10 20 30 40
Places of 500,000 and over..BOSTON
" " 100,000 " "..Worcester
" " 25,000 to 100,000..Cambridge
" " 10,000 to 25,000..Brookline
County Towns ⊙
Railroads
VERMONT
NEW HAMPSHIRE
NEW YORK
CONNECTICUT
RHODE ISLAND
MASSACHUSETTS BAY
CAPE COD BAY
ATLANTIC OCEAN
NANTUCKET SOUND
BOSTON
AND VICINITY
SCALE OF MILES
0 1 2 3 4
L.L. POATES ENGR'G CO., N.Y.
Longitude 72° West from 71°30' Greenwich

tributed by hay and forage and one-fourth by potatoes and other vegetables. In 1909, the production of hay and forage was 831,955 tons, valued at $11,280,989, with an acreage of 519,503. The total acreage of potatoes and other vegetables in 1909 was 61,686 and their value

PRODUCTS	Acreage	Prod. bu.	Value
Corn	48,000	2,256,000	$1,918,000
Oats	9,000	333,000	186,000
Rye	3,000	57,000	58,000
Potatoes	27,000	4,185,000	2,971,000
Hay	480,000	*634,000	13,631,000
Tobacco	6,600	†11,550	2,044,000

* Tons. † Pounds.

$8,184,000. Excluding potatoes and sweet potatoes, the acreage of vegetables was 37,220, valued at $6,190,000. Tobacco had an acreage of 5521 in that year, and the production amounted to 9,549,306 pounds, valued at $1,218,060. The total value of orchard fruits in 1909 was $2,074,270, there being produced 2,763,679 bushels. The most important of these fruits are apples, of which 2,550,259 bushels, valued at $1,780,290, were grown in 1909. Other important orchard fruits are peaches and nectarines, pears, plums, and prunes. The most important of the small fruits are cranberries, which are grown chiefly in the marshy lands of Barnstable and Plymouth counties. The acreage devoted to this fruit in 1909 was 6577. There were produced 22,714,496 quarts, valued at $1,062,205. Next in point of value were strawberries. Other small fruits grown in important quantities are blackberries, dewberries, raspberries, loganberries, and currants. The total quantity of small fruits produced in 1909 was 29,260,143 quarts, valued at $1,676,790. The grapes produced in 1909 amounted to 1,132,838 pounds, valued at $30,858.

Tobacco has been raised in the valley of the Connecticut River since earliest Colonial days. In the growing of flowers and plants Massachusetts is one of the most important States. The value of the flowers and plants grown in 1909 was $2,455,467. The value of the maple sugar and maple sirup produced in the State in 1909 was $77,559.

Live Stock and Dairy Products. As in other New England States, stock raising has suffered from the effects of Western competition. The development of intensive farming has necessitated an increase in the number of horses, and the rapid growth of the dairying industry has resulted in a gain in the number of dairy cows. The total value of live stock on the farms of the State in 1910 was $19,208,712. There were 252,416 cattle, valued at $9,348,076. On Jan. 1, 1915, the number of cattle other than milch cows was estimated at 83,000, with a value of $2,083,000; milch cows, 157,000, valued at $10,362,000; horses, 64,000, valued at $9,920,000; sheep, 30,000, valued at $168,000; swine, 108,000, valued at $1,674,000. The total value of fowls of all kinds in 1910 was $1,492,961. The value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $15,187,774. There were sold 64,496,692 gallons of milk, valued at $13,297,634, and 2,220,311 pounds of butter, valued at $696,336.

Fisheries. The Massachusetts Bay Colony early recognized fishing as one of the leading industries, in fact, second only to farming. Special legislation was adopted whereby the fisheries were exempt from taxation, and ship carpenters and fishermen from military duty. Boston began to export fish in 1633, and fishing villages soon sprang up all along the coast. Gloucester became, as it still continues to be, the most prominent port in the world in the cod and mackerel fisheries off Newfoundland and Labrador. Whales were first caught off Nantucket in 1690, and New Bedford became famous in the whale fisheries, its whaling vessels frequenting the remotest seas. This industry has steadily declined. The United States Fish Commission has extensive hatcheries, laboratory, and school at Woods Hole, and the State has hatcheries at Wilkinsonville and Winchester. In the items of investment and value of products the fishing industry of Massachusetts in 1908 exceeded that of all other States of the Union. It has over one-half of the investment in, more than half of the quantity of, and fully half of the value of, the products of the coast fisheries of New England. The products, derived chiefly from the numerous offshore fishing banks extending along the coast from Nantucket Shoals, Mass., to the Grand Banks of Newfoundland, are, in order of value, codfish, haddock, mackerel, herring, pollack, halibut, lobsters, hake, and numerous species of fish, etc., of less importance. In 1908 there were 11,577 men engaged in fisheries. The capital in 1908 was estimated at $5,749,000. The value of the product for the same year was $7,095,000. The industry is concentrated almost entirely in the cities of Boston and Gloucester, particularly in the former. The returns for 1908 show that fully 50 per cent of the industry was located in Essex County.

Forest Products. The area of standing forest in 1908 was 8040 square miles, representing about 39 per cent of the area of the State. Very little of this, however, was of any commercial value. In 1909 there were forest products to the value of $2,668,410 cut or produced on farms. The lumber sawed in 1913 amounted to 224,580 M feet, board measure.

Manufactures. Massachusetts is preëminently a manufacturing State, its early industrial development being due in part to the fact that it contained one of the first permanent settlements of North America. The superior water-power advantages which the State affords were largely instrumental in bringing about the establishment of a number of important mills and factories. There were, in 1910, 12 cities with a population of over 50,000. There were also 43 cities and towns having a population of over 10,000 but less than 50,000. These 55 cities and towns contained 77.4 per cent of the total population and were credited in 1909 with 82.9 per cent of the total value of its manufactures.

The raw materials used in the manufacturing industries of Massachusetts are for the most part produced elsewhere, and most of its manufactured products are sold for consumption beyond its borders. It has excellent steam-railway facilities (see *Transportation*), and the network of electric railways is not only an important factor in connection with its manufactures, but adds greatly to its facilities for local trade. Massachusetts in 1909 was surpassed only by New York, Pennsylvania, and Illinois in the value of manufactured products. The table on page 206 gives the most important figures relative to manufactures in 1909 and in 1904.

There were, in 1909, 76 industries or industry

groups for which products valued at more than $50,000 were reported. These industries include four with products exceeding $50,000,000 in value, six with products between $25,000,000 and $50,000,000 in value, and 16 with products between $10,000,000 and $25,000,000 in value, making an aggregate of 26 industries with a value of products in excess of $10,000,000 each. There were in addition 15 industries with products between $5,000,000 and $10,000,000 in value, 23 with products between $1,000,000 and $5,000,000 felt hats; and shoddy. Combined, the eight allied industries gave employment in 1909 to an average of 192,147 wage earners, and the value of their products amounted to $387,063,000. Massachusetts is not only the foremost State in the Union in the production of all textiles combined, but is first as regards three of the most important branches—cotton goods, including cotton small wares; woolen, worsted, and felt goods and woolen hats; and cordage and twine and jute and linen goods. It ranks third in the

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — FIFTEEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	11,684	644,399	584,559	$1,279,687	$301,173	$1,490,529	$659,764
	1904	10,723	532,481	488,399	965,949	232,389	1,124,092	497,682
Boots and shoes, including cut stock and findings.	1909	860	90,048	83,063	90,243	45,990	236,343	83,353
	1904	893	75,156	70,148	59,925	36,175	173,680	63,070
Boots and shoes, rubber	1909	8	7,451	6,928	15,692	3,376	18,722	8,082
	1904	7	7,971	7,674	14,845	3,754	39,035	25,857
Bread and other bakery products	1909	1,201	9,755	6,697	12,752	3,814	26,146	10,419
	1904	1,108	7,735	5,552	7,017	3,072	18,660	7,939
Clothing, men's, including shirts	1909	254	8,208	7,335	8,242	3,398	18,314	8,558
	1904	187	6,175	5,263	6,325	2,311	14,913	6,837
Confectionery	1909	117	6,398	5,548	7,371	1,860	15,266	6,077
	1904	93	4,664	4,167	3,747	1,302	9,318	3,810
Cordage and twine and jute and linen goods.	1909	31	7,003	6,690	17,510	2,560	16,632	5,434
	1904	27	5,061	4,892	12,698	1,667	15,523	3,900
Cotton goods, including cotton small wares.	1909	182	110,686	108,914	214,017	45,117	186,462	81,305
	1904	161	90,239	88,640	174,552	32,555	130,069	49,801
Electrical machinery, apparatus, and supplies.	1909	83	16,725	14,507	32,961	8,209	28,143	15,408
	1904	72	9,706	8,798	12,735	5,003	15,882	8,558
Foundry and machine-shop products	1909	857	49,393	44,179	103,052	27,032	86,926	55,744
	1904	777	39,570	35,844	78,022	20,834	63,750	39,324
Leather, tanned, curried, and finished	1909	132	11,006	10,252	41,197	5,444	40,002	11,236
	1904	132	9,752	9,074	27,070	4,556	33,353	10,312
Lumber and timber products	1909	708	10,478	8,976	17,552	5,031	23,026	10,542
	1904	618	9,836	8,501	13,714	4,501	20,308	9,113
Paper and wood pulp	1909	88	13,742	12,848	42,524	6,542	40,097	17,747
	1904	87	12,365	11,705	41,074	5,588	32,012	14,065
Printing and publishing	1909	1,279	24,410	17,532	33,473	11,684	47,445	34,564
	1904	1,144	20,933	15,112	28,265	9,064	39,274	28,356
Slaughtering and meat packing	1909	94	3,832	3,325	15,547	1,837	44,403	5,517
	1904	80	3,520	3,027	12,983	1,595	38,012	4,131
Woolen, worsted, and felt goods, and wool hats.	1909	183	55,533	53,873	133,955	24,593	141,967	53,991
	1904	190	45,264	44,050	104,257	18,137	99,314	36,536

in value, and 12 with products between $500,000 and $1,000,000 in value.

While a few industries predominate, there are a very large number which are of considerable importance. The leading products, measured by value, are boots and shoes, cotton goods, woolen goods, and foundry and machine-shop products. The textile industries considered as a whole much exceed boots and shoes in importance. They comprise chiefly the manufacture of cotton goods, including small cotton wares; woolen, worsted, and felt goods, and woolen hats; cordage and twine and jute and linen goods; hosiery and knit goods; carpets and rugs, other than rag; silk and silk goods, including throwsters; fur-production of carpets and rugs and fifth in silk and silk goods and in fur-felt hats. In addition to the manufacture of textiles there are large industries which are engaged in the dyeing and finishing of textiles, which includes the bleaching, dyeing, and mercerizing of raw fibres, yarns, and woven cloth, as well as the printing of cotton piece goods. These rank twelfth among the industries of the State, as measured by value of products, which was $21,893,000. The manufacture of cotton goods is the most important among textile industries. There were engaged in these manufactures 9,377,984 spindles and 234,249 looms. The cotton consumed during 1909 amounted to 622,368,027 pounds. Although

the manufacture of cotton goods under the factory system in the United States began in Rhode Island in 1790, the introduction in 1814 of the power loom and at about the same time of the dressing machine in Waltham, Mass., marked the beginning of the real growth of the industry. The manufacture of woolen, worsted, and felt goods and wool hats is second in importance among the textile industries. The manufacturing processes involved in the production of woolen and worsted goods in the United States were largely perfected in Massachusetts. As early as 1839 there were 144 mills in operation in the State. In 1909, 156,338,534 pounds of wool were consumed in this industry. Although the major part of the wool consumed is domestic wool, the relative increase in foreign wool has been more rapid, particularly for the period 1904–09. The manufacture of cordage and twine and jute and linen goods ranks third among textile manufactures, and hosiery and knit goods fourth. The first stocking factory in the United States was established at Newburyport in 1831. The principal products of the carpet factories in the State are Wilton, Axminster, and Brussels carpets, and of the silk mills, plain and fancy silk-mixed broad silks.

Measured by value of products, the manufacture of boots and shoes is the most important industry. In 1909, 102,826,648 pairs of boots and shoes were produced in the factories of Massachusetts. This is 41.5 per cent of the total number reported for the United States. Of the 860 establishments connected with this industry 469 were engaged primarily in the manufacture of boots and shoes in 1909, 215 in the production of boot and shoe findings, and 176 in the manufacture of boot and shoe cut stock. Although this industry is one of the oldest in the State, dating from about 1629, it was not until after the period from 1851 to 1865, when various kinds of shoemaking machinery were introduced, that the real expansion of the industry began. Massachusetts leads all other States in the combined industry and in each of the three separate branches.

The development of industries connected with foundry and machine-shop products has been in a measure dependent upon, and largely stimulated by, the growth of the textile, boot and shoe, printing and publishing, paper and wood pulp, and other important industries which employ machinery extensively in their manufacturing processes. A large part of the machinery used in the United States for these industries, particularly in the first two, is manufactured in the State.

Massachusetts is one of the most important of the States in the manufacture of paper and wood pulp. The mills engaged in the production of paper alone largely predominate. This branch of industry was developed and brought to its high standard of efficiency mainly in Massachusetts, and for many years it has ranked among the principal manufacturing activities.

The leather industry includes establishments primarily in the manufacture of leather and those which treat hides or skins for others. Calf and kid skins constitute the most important class of material used in these manufactures. Massachusetts ranks third in the Union in this industry with respect to value of products.

While neither the manufacture of men's clothing nor that of women's clothing is among the 10 leading industries, the two industries combined had in 1909 an output valued at $30,042,000.

In the manufacture of electrical machinery, apparatus, and supplies, Massachusetts is of leading importance. In 1909 the allied industries engaged in the manufacture of jewelry, silverware, and plated ware, and in the reducing and refining of gold and silver from clippings, sweepings, and scrap, combined, employed an average of 9966 wage earners and turned out products valued at $23,109,000. This group had its beginning about 1805, the chief finished products at that time being such articles as silver spoons, gold beads, and finger rings, and later included a cheaper grade of jewelry, in the manufacture of which Massachusetts is now one of the leading States. It leads all other States in the production of rubber footwear. In addition to the industries named there are five others in which, though they are not among the leading ones of the State as measured by value of products, Massachusetts leads all other States of the Union. These industries are the manufacture of paper goods outside of paper mills; the manufacture of cutlery and tools; the manufacture of whips; the manufacture of bicycles, motor cycles, and parts; and the making of shoe lasts.

The total number of wage earners in 1909 was 584,559, of whom 401,172 were males and 183,387 were females. The wage earners under 16 years of age numbered 20,735, of whom about half were males. In the carpet and rug and cotton-goods industries and in the manufacture of cordage and twine over two-fifths of the wage earners are women 16 years of age and over; in the knitting mills, over one-half; in the silk mills, nearly three-fifths; and in the woolen and worsted mills, nearly two-fifths. Of the wage earners employed in the manufacture of boots and shoes, including cut stock and findings, nearly one-third are women 16 years of age and over. For a great majority of the wage earners employed in the manufacturing industries the usual hours of labor are between 54 and 60 a week.

Boston is of course the most important city as measured both by the number of wage earners and the value of products. There were in that city, in 1909, 69,637 wage earners, and the value of products was $237,457,472. Lawrence held second place in importance in 1909. Worcester is the third city in rank according to value of products, and Lynn ranks fourth. Lynn, Brockton, and Haverhill, with the exception of St. Louis, Mo., which held third place in 1909, are the three most important centres of the boot and shoe industries of the United States, ranking in the order named. Fall River, Lowell, and New Bedford, which in the value of manufactured products in 1909 ranked fifth, sixth, and seventh, respectively, in the State, owe their prominence primarily to the manufacture of cotton goods. These three cities lead all others in the United States in the manufacture of this class of textiles. Cambridge is an important manufacturing city, but it is dependent upon no one industry for its industrial position. Holyoke is the centre of the paper industry in the State and also the leading city in the United States in the manufacture of fine paper. The manufacture of all textiles combined, however, is even more important in Holyoke than the paper industry. Other important manufacturing places are Somerville (q.v.), which outranks all others in the slaughtering and meat-packing

industries, Springfield, Fitchburg, Chelsea, Peabody, Woburn, Taunton, Plymouth, Webster, North Adams, Clinton, Northampton, Adams, Newton, Methuen, Pittsfield, and Attleboro. These by no means include all the important manufacturing cities of the State. Nearly all cities, and many towns, are engaged in important manufactures of some sort. Further information in regard to these cities and towns will be found in their alphabetical place in other portions of this work.

Transportation. Massachusetts is well provided with transportation facilities both by land and by water. Most of the railway lines centre in Boston and the mileage for the eastern end of the State is greatly in excess of that of the other parts. The first railroad in the United States was the Quincy Railroad, 3 miles long, constructed in 1826–27 to convey granite from the Quincy quarries for the Bunker Hill Monument. It was not, however, operated by steam. The Boston and Lowell steam railroad was opened in 1835. At about the same time roads were built to Providence and to Worcester, and by 1842 the latter line had been extended to Albany. One of the most important public works ever undertaken by the State was the construction of the Hoosac Tunnel (see TUNNEL) completed in 1873. The total mileage of track of all kinds in 1914 was 4927, of which 2125 was main-line track. There were in 1914 three important railway companies—the Boston and Albany, 961; Boston and Maine, 1967; and New York, New Haven, and Hartford, 1833. By a process of amalgamation which forms an interesting chapter in railroad history the Boston and Maine and most of the important trolley and steamship lines were acquired by the New York, New Haven, and Hartford Railroad. This corporation continued to hold them until 1914, when it was compelled by the United States government to relinquish its control over the Boston and Maine and its other holdings in the trolley and steamship companies in New England. (See RAILWAYS.) The development of electric railways has been an important factor in connection with manufactures, and they have added greatly to the facilities for local trade. The electric railway mileage in 1912 was 2328. The railways are under the supervision of a State Public Service commission, which has the power to regulate rates and charges.

The State has been generous in the construction and repair of highways. In 1912 the highway commission was authorized to issue $5,000,000 in scrip for the construction of State highways from 1913 to 1917. Maritime commerce has from the earliest days of the history of the State been of the greatest importance. Boston, the second seaport in importance on the Atlantic coast, furnishes excellent opportunities for domestic and foreign commerce. The Cape Cod Canal, which shortens the distance between Vineyard Sound and Boston by 70 miles, was formally opened in July, 1914. (See CANAL.) Several other cities and towns have good water facilities, which augment to some extent the water traffic to and from Boston and ports outside the State. Maritime commerce dates from the first days of the colony. As early as 1631 Governor Winthrop launched, for coast trade, a bark called the *Blessing of the Bay*, and a few years later vessels were plying regularly between the various ports. Early in the eighteenth century there was a large West Indian trade. Many ships were also built for the French and Spaniards, who paid for them largely in rum and molasses. After the Revolution an immense trade with the East Indies and with the African coast was developed. Still later, notably between the years 1840 and 1860, the clippers built at East Boston and Newburyport were the fastest ships then known, and carried on no small share of the world's freighting. The outbreak of the Civil War, however, nearly paralyzed the commerce of American shipowners, and it has never fully revived. There are several lines of steamers running from New York to Boston. There are also several steamship lines connecting with Europe and the West Indies. The customs districts are Barnstable, Boston, and Charlestown, Fall River, Gloucester, Marblehead, New Bedford, Newburyport, Plymouth, Salem, and Beverly. The total imports received in Boston and Charlestown in 1913 amounted to $146,599,451, and the exports from these ports were valued at $69,552,657.

Banks. The first commercial bank in the Colonies is said to have been established in Boston in 1686. The Massachusetts Land Bank was started in 1739, but all Colonial banks were prohibited in 1740. The Massachusetts Bank, organized in Boston in February, 1784, was the first local bank in the State and the second in the Union. The Union Bank of Boston was chartered in 1792. By the beginning of the nineteenth century five banks had been incorporated in the State. Massachusetts was the first State to require (1803) semiannual bank reports to be sworn to by the directors. Thus its banks were put on a firmer basis and passed through the panic of 1808–09 in better shape than the other New England banks as a rule. In 1814 again the Massachusetts banks showed their superior strength. A comprehensive banking law was enacted in 1829, with stringent provisions as to capitalization and limits of circulation. Yet these were evaded during the speculative régime of 1830–36; as a consequence in the financial depression 1837–44, 32 banks failed. In 1838, however, a system of official examination of banks by a board of bank commissioners was adopted. The banking law of 1857 provided for one commissioner. Under this improved system there was only one bank failure in the panic of 1857. When the system of national banks was introduced State banks of discount were prohibited and do not exist at present. The necessity for loans on real estate (which the national banks are prohibited from making) led to the development of trust companies. Savings banks are numerous and popular, and their investment and general management are strictly regulated by law. On Sept. 12, 1914, there were 172 national banks, with capital $55,842,500, surplus $36,403,925, cash, etc., $11,163,699, loans $347,016,143, and deposits $327,909,915; 69 loan and trust companies, with an aggregate capital of $25,438,800, surplus of $22,666,025, cash $23,428,307, loans of $242,351,487, and deposits $296,104,997; 196 savings banks, with 2,305,340 depositors and deposits of $895,178,637.

Government. The constitution of Massachusetts was agreed upon by delegates of the people in convention which was held at Cambridge between Sept. 1, 1779, and March 2, 1780, when the convention adjourned to meet on the first Wednesday of the ensuing June. In the meantime the constitution was submitted to the people, who approved of it by a two-thirds vote.

The constitution has been amended many times. Amendments may be proposed in the General Court, and if agreed to by a majority of the Senators and two-thirds of the members of the House of Representatives present and voting thereon, are referred to the next General Court. If this court agrees to the proposition in the same manner it shall be submitted to the people, and if approved by them by a majority vote, becomes a part of the constitution.

Legislative.—The legislative department consists of a Senate and a House of Representatives and is known as the General Court of Massachusetts. The General Court meets every year on the first Wednesday in January. The House of Representatives consists of 240 members apportioned to the several counties of the Commonwealth. The Senate is the first branch of the Legislature. It has power to try all impeachments brought by the House. The two-thirds veto of each House overrides the Governor's veto.

Executive.—The supreme executive magistrate is the Governor. He is chosen annually, and at the time of his election must have been an inhabitant of the Commonwealth for seven years next preceding. There is a Council composed of eight members, elected annually for the purpose of advising the Governor, which exercises the power of chief executive when both the offices of Governor and Lieutenant Governor are vacant. Other executive officials are the Secretary, Treasurer, Receiver General, Auditor, and Attorney-General. They are elected annually and hold office for the same length of time as the Governor.

Judiciary.—Judicial officers are appointed by the Governor with the consent of the Council and they hold office during good behavior. They may be removed from office by the Governor upon the address of both Houses of the Legislature. The supreme judicial court consists of a Chief Justice and six associate justices. The superior court consists of a Chief Justice and 15 associate justices. Each county has a probate court and a court of insolvency, which are distinct in their jurisdiction, powers, etc., but have the same judge and register. These courts are held by the judge of probate and insolvency appointed for the county, but the judges of the several counties may, in case of necessity or convenience, interchange services.

Suffrage and Elections.—Every male citizen of 21 years of age and upward, excepting paupers and persons under guardianship, who shall have resided within the Commonwealth one year and within the town or district in which he may claim a right to vote six calendar months next preceding any election of Governor, Lieutenant Governor, Senators, or Representatives, has a right to vote. No person shall have the right to vote or be eligible to office under the constitution who shall not be able to read the constitution in the English language and write his name. These provisions do not apply to any person prevented by physical disability from complying with its requisitions. The election for the choice of Governor, Lieutenant Governor, Senators, and Representatives is held on the Tuesday next after the first Monday in November, annually. The Legislature of 1907 passed an Act codifying the laws relative to caucuses and elections. In every city except Boston there is a board of registrars of voters, consisting of four persons appointed by the mayor with the approval of the board of aldermen, and in every town having less than 300 voters registered, the selectmen and the town clerk constitute a board of registrars of voters. Each political party annually elects a State committee, the members of which hold office for one year from the first day of January next following their election. Cities and towns may adopt the provisions of the law for nominating by primaries. Nominations of candidates for any offices may be made by nomination papers and signed in the aggregate by not less than 1000 voters for each candidate. There is a State ballot-law commission, consisting of three persons appointed by the Governor for a term of three years. The names of all candidates except for presidential electors must be arranged under the designation of the office in alphabetical order. There are severe penalties for corrupt practices in elections. Nominations for Senator or Representative are made by a direct plurality vote in accordance with an Act approved by the people in 1910, and by the terms of a provision passed in 1911 the nomination of candidates of political parties for all offices to be filled by State election except the office of presidential elector and the election of district members of State committees, members of ward and town committees, and of delegates to State conventions of political parties, shall be by direct plurality vote in primaries. Business corporations are prohibited from making political contributions. The Legislature of 1912 passed a measure providing for the direct election of delegates to national conventions and making provision for the expression of preference for candidates for President and Vice President of the United States. The Legislature of 1913 amended the election laws so as to permit questions of instruction on public policies to be submitted to the voters on the official ballot. Women have the right to vote for school committees.

Local and Municipal Government.—Municipal governments may be established by the General Court in towns exceeding 12,000 population, with the consent and upon the application of a majority of the inhabitants. Unincorporated towns are governed by selectmen elected annually at town meetings. Cities and towns may adopt the commission form of government.

Miscellaneous Constitutional, and Statutory Provisions.—Wilful desertion for three years, failure to provide for that period, and habitual drunkenness are among the causes for which divorces are granted. It is unlawful for any person, partnership, or association to require an employee engaged in any commercial occupation to do on Sunday the usual work of his occupation unless such employee is allowed during the six days next ensuing 24 consecutive hours without labor. Gambling and betting in public places are forbidden. There are strict child-labor laws and measures providing for workmen's compensation and labor arbitration. The manufacture and sale of cocaine are prohibited. There are stringent laws against white-slave traffic. Women, and children under 18 years of age, are prohibited from being employed more than 54 hours a week in manufacturing or mechanical establishments. Every town and city of more than 10,000 inhabitants is required to maintain a dispensary for the discovery, treatment, and supervision of needy residents afflicted with tuberculosis. Counties are permitted to establish pension systems for their employees.

There is a retirement system for State employees, which is practically an assisted old age pension. There are stringent pure-food laws, and the Legislature of 1913 passed a measure providing for mothers' pensions. By the same Legislature a uniform marriage law was passed. The sale of liquor in the State is regulated by municipal and town local option laws which went into effect in 1881.

Finance. In matters of finance and taxation Massachusetts has always been one of the most progressive of the States. The Colony in 1646 introduced a system of direct taxation and a poll tax, and soon after a "faculties" tax, which had income as a basis. The first Treasurer's report was published in 1655. When Massachusetts was reorganized in 1690 under a provincial charter direct taxation upon property and a poll tax were again made the main foundation of the revenue system. In the middle of the eighteenth century lotteries were established for many extraordinary and even normal needs of the Treasury. The system was abandoned in 1765, only to be reëstablished at the advent of the Revolution. The direct debt in 1786 was $5,000,000 and the State's share of the national debt was as much more. The immediate current liabilities in that year were $1,500,000. A large part of this debt was, however, assumed by the Federal government in 1790. Up to 1794 the State debt was almost canceled. In the early part of the nineteenth century a well-regulated system of taxation of corporations grew up. In 1812 banks were taxed, and insurance companies after 1832. During the Civil War the public debt greatly increased. At one time it amounted to more than $32,000,000. By 1871, however, it had been reduced to $16,573,000, for the payment of which there was created a sinking fund of $8,261,000. On account of many railroad loans and other public improvements the debt again grew rapidly in the seventies, but it was always well provided by the sinking fund. On Dec. 1, 1914, the debt amounted to $112,964,662. The sinking-fund assets amounted to $38,263,060, leaving the net debt $84,701,602. This may be divided into two parts—the direct debt, which is an obligation incurred for the benefit of the entire State, and the contingent debt, which, while a direct debt, has been incurred for the benefit of 41 cities and towns in the vicinity of and including Boston, called the metropolitan district. This was incurred to aid in the administration of certain improvements, such as the construction of water, sewer, and park systems, etc. The various cities and towns benefited refund this amount by means of sinking-fund assessments levied by State boards of commissioners and paid at the same time and in the same manner as State taxes. The per capita debt, which in 1880 was $11.66, had increased to $23.49 in 1914. Massachusetts has a larger debt than any other State except New York. The report of the Receiver General showed a cash balance on hand on Dec. 1, 1913, of $8,220,590. The total receipts for the fiscal year 1914 amounted to $43,241,099 and the total expenditures were $43,386,669, leaving a balance on hand on Dec. 1, 1914, of $8,075,020.

Militia. In 1910 there were 760,324 men of militia age. The organized militia numbered 452 officers and 5341 enlisted men.

Population. The population by decades has been as follows: 1790, 378,000; 1800, 422,000; 1810, 472,000; 1820, 523,000; 1830, 610,000; 1840, 737,000; 1850, 994,000; 1860, 1,231,000; 1870, 1,457,000; 1880, 1,783,000; 1890, 2,238,000; 1900, 2,805,000; 1910, 3,366,416. Population on July 1, 1914, was 3,605,522; 1920, 3,852,356. In 1910 Massachusetts ranked sixth in population among the States. In density of population it ranked second, with 418.8 persons to the square mile. The native-born white population with native parents was 1,103,429, being 32.8 per cent of the total. The native whites of foreign or mixed parentage numbered 1,170,447. There were 1,051,050 foreign-born whites, representing 31.2 per cent of the total population, and 38,055 negroes. The rural population was 241,049. Until the middle of the nineteenth century the people of Massachusetts were almost wholly of English descent. Two movements, however, wrought a vast change with respect to race. The first of these was a migration westward of the native population. The other was the great influx of foreigners, chiefly from Ireland and Canada, those from the latter country being mainly of French descent.

The growth of the manufacturing industries has resulted in a large urban population. Unlike most States, females formed the majority of the population. This is due chiefly to the westward emigration and an increased opportunity for females to find employment in the mills and at domestic service. The total number of males in 1910 was 1,655,248, and of females 1,711,168. There were, in 1910, 71 cities or towns having a population of 8000 or over. This is larger than the number contained in any other State. In 1910 the population of Boston (q.v.), the largest city, was 670,585. The estimated population of the city in 1914 was 733,802. Other large cities with their estimated populations in 1914 are as follows: Worcester, 157,732; Fall River, 125,443; Lowell, 111,004; Cambridge, 110,357; New Bedford, 111,230; Lynn, 97,207; Springfield, 100,375; Lawrence, 95,834; Somerville, 83,881; Holyoke, 62,852; Brockton, 64,043; Malden, 48,979; Haverhill, 47,071; Salem, 46,994; Newton, 42,455; Fitchburg, 40,507; Taunton, 35,631; Chelsea, 32,452. All of the above are estimates of the United States Census Bureau.

Education. The establishment of public schools was one of the first concerns of the settlers of Massachusetts. The first free school was organized in 1635, and Harvard College was founded in the following year. A statute enacted in 1647 provided that each town having 50 families should maintain a school to teach the children to read and write, and that each town having 100 families should provide a grammar school to fit youths for college. This statute was the foundation for all succeeding educational legislation, and it has resulted in a system which is one of the best in the world. The State Board of Education was created in 1837. Its first secretary was Horace Mann, and his reports and labors gave impulse and vigor to the schools of the entire Union. The local unit of organization is the town (township), each having a school committee appointed by the people and a skilled superintendent appointed by the committee. The central coördinating and supervisory body is the State Board of Education, and between it and the local organizations stand the agents of the State Board, each of whom has his particular district or his special phase of educational work to oversee. This system brings about efficiency and uni-

formity. Ample financial support is provided by taxation and by the income from the State school fund, which was established in 1834 from proceeds derived from the sale of lands in the State of Maine, and from the claims of Massachusetts upon the United States for military services. This fund on Jan. 1, 1913, amounted to $5,000,000. The excellent results obtained from the administration of the school system are shown by the fact that of a total population of 2,742,684 of 10 years of age and over in 1910, the illiterates numbered only 141,541, or 5.2 per cent, and if the foreign-born white population were eliminated the percentage of illiteracy would be only 0.4 per cent, or 3428. Among the negroes of the State the percentage of illiteracy in 1910 was 8.1. According to the thirteenth census the total number of persons of school age (5 to 20 years) in 1910 was 941,376, and of these 614,105 attended school. According to figures furnished by the State Board of Education the number of different pupils of all ages in public schools during the school year ending July 1, 1913, was 557,211. The total number of teachers on that date was 16,979, of whom 15,292 were females and 1687 were males.

In 1909 the Board of Education was reorganized and a commissioner and two deputies were appointed. Towns which have a valuation not exceeding $2,500,000 share in the income of the State school fund. Such towns are also required to belong to superintendency unions, the superintendents of which are paid in part from contributions by the State. A number of these towns also receive aid from the State, either in the shape of the $500 grant for maintaining a high school or reimbursement for the payment of tuition pupils attending a high school in another town or city. Particular attention has been given to the subject of vocational education. A number of cities in the State maintain day and evening industrial schools.

The number of public day schools on June 30, 1912, was 12,396, and in these were 16,433 teachers. The high schools numbered 270, with 2728 teachers and 69,319 pupils. The total expenditure for high-school support was $3,990,923. There were 342 evening schools, with 2134 teachers and 63,272 pupils. The total expenditure for public schools in 1912 was $18,769,204. The cost of the public schools per child in that year was $30.87. There were 47 incorporated academies, with 7000 pupils. Attendance in academies has decreased owing largely to the increasing excellence of the high schools. The Legislature of 1913 passed a measure of great importance providing for the establishment and maintenance of continuation schools and courses of instruction for working children.

There are State normal schools at Bridgewater, Westfield, Hyannis, Fitchburg, Lowell, and Salem. There is also a State Normal Art School at Boston. While the State system of education does not include higher institutions of learning, excepting normal colleges, these have been amply provided by private enterprise. The oldest collegiate institution is Harvard University at Cambridge. The others are Amherst College at Amherst, Boston University at Boston, Tufts College at Tufts College Station, Medford, Williams College at Williamstown, Clark College and University at Worcester, the College of the Holy Cross at Worcester, and Boston College, Boston. Colleges for women are Radcliffe College, affiliated with Harvard University, Cambridge; Smith College at Northampton; Mount Holyoke College at South Hadley; Wellesley College at Wellesley; and Simmons College in Boston. Scientific and technical colleges are the Massachusetts Agricultural College at Amherst (co-educational); the Massachusetts Institute of Technology at Boston; and the Worcester Polytechnic Institute at Worcester. Details in regard to these institutions will be found under their titles. The theological institutions include Andover Theological Seminary, now affiliated with Harvard University, at Cambridge; Newton Theological Seminary (Baptist) at Newton; Harvard Divinity School (nonsectarian) at Cambridge; New Church Theological School at Cambridge; Boston University School of Theology (nonsectarian), under Methodist auspices; Protestant Episcopal Theological School at Cambridge; and Tufts College Divinity School (Universalist) at Tufts College Station, Medford. Medical schools include the Harvard Medical School, the College of Physicians and Surgeons in Boston, Tufts College Medical School, and the Boston University School (homœopathic). There is an Industrial School for Deaf Mutes at Beverly, and schools for the deaf in Randolph and Northampton.

Charities and Corrections. The charitable institutions are under the direction of the State Board of Charities, and the penal and reformatory institutions are administered by a Board of Prison Commissioners. The institutions under the supervision of the Board of Charities are the State Infirmary at Tewksbury, the State Farm at Bridgewater, the Norfolk State Hospital, the Lyman School for Boys at Westborough, the Industrial School for Boys at Shirley, the State Industrial School for Girls at Lancaster, the Massachusetts Hospital School at Canton, the North Reading State Sanatorium, the Rutland State Sanatorium, the Lakeville State Sanatorium, the Wakefield Sanatorium, and the Penikese Hospital (for lepers) on Penikese Island. The supervisory powers of the board over these institutions extend to the right of investigation and recommendation as to any matters relating to the institutions, but the administration of each is vested in a separate board of trustees. The total number of persons under care in these institutions in 1913 was about 20,000, and the cost of administration is about $1,500,000 yearly. In addition to these institutions there are many private hospitals and institutions for the education of special classes. These include Perkins Institution and Massachusetts School for the Blind at Watertown, the Massachusetts School for the Feeble-Minded at Waltham, the State Hospital at Tewksbury, the Hospital for Inebriates at Foxborough, and Hospital for Epileptics at Monson. In addition to these there are many city and town almshouses and over 500 voluntary charitable homes and asylums. The prisons include the State Prison in Boston, the Massachusetts Reformatory at Concord, the Reformatory for Women at Sherborn, the prison camp and hospital at Rutland, and the State Farm at Bridgewater. The prison population at the end of 1913 was about 6000. Convicts in the prisons and houses of correction work only under the public-account system. Both in the State and county institutions the labor of prisoners is under the supervision of the General Superintendent of

Prisons. Prison-made goods must be sold to public institutions instead of in the open market.

The State Board of Charities is vested with greater power than is commonly exercised by similar boards in other States, and its administration has resulted in many improvements, such as the curtailment of unnecessary aid, which creates rather than lessens pauperism, and the more judicious treatment of children who may require the attention of State authorities. The tendency in the latter kind of cases is to find homes for or board children in private families rather than in institutions, great care being taken to find proper homes and to keep in close touch with children placed therein.

Religion. In the Colonial period the population belonged mainly to the Congregational church. Before the end of the eighteenth century the Baptists and Methodists had become prominent and are now leading denominations. In the early part of the nineteenth century Massachusetts became the centre of Unitarianism in the United States. With the coming of large numbers of Irish about the middle of the nineteenth century the Roman Catholic church for the first time became prominent, and it is now much stronger than any one of the Protestant denominations. The Episcopalian, Universalist, and Christian Scientist are also leading sects.

History. In 1602 Bartholomew Gosnold (q.v.) effected a settlement on Cuttyhunk Island, between Buzzards Bay and Vineyard Sound, but the colony was abandoned after three weeks. The first successful attempt at colonization was made by a band of Pilgrims, 102 in number, who came from Leyden in Holland. They were a Puritan sect, known as Separatists or Brownists, who had fled from England to Holland in 1608, to escape persecution and, weary of living in a foreign land, had determined to found a place of refuge in America. Through a company of merchant adventurers a patent was obtained from the Council for New England for a settlement within the limits of "Virginia." They set sail from Delftshaven, July 22, 1620, and from Plymouth in England on September 6. It was their intention to settle south of the Hudson River, but storms drove the *Mayflower* to the neighborhood of Cape Cod, and on December 11 (December 21 N. S., the anniversary of Forefathers' Day being celebrated on December 22) the emigrants landed at Plymouth.

Before landing they drew up and subscribed to a compact or frame of government for the new settlement, and elected John Carver Governor for one year. Shortly after landing they entered into a treaty of peace with the Indian chief Massasoit and his tribe, which remained unbroken for a long time. Within four months 44 of the colonists died from exposure to the cold and the lack of wholesome food, and for two years they suffered many privations, but in 1623 they were relieved by a bountiful harvest. Others from the Leyden church joined them and, by 1631, 600 persons—nearly the whole of that body—had emigrated. In 1624 the property of the Colony, which had been held as common, was divided among the settlers; in 1627 the rights of the trading company were bought out, and two years later a patent confirming the colonists' right to the territory they had occupied was issued to Governor Bradford and others. The Colony grew up in practical independence and, organized as a perfect democracy, it carried on its government without any royal sanction. By 1640 there were eight towns with 2500 inhabitants in the Plymouth Colony. Outside the limits of the Colony several scattered settlements were made in Boston harbor between 1623 and 1628.

In 1628 an expedition organized by an English company and commanded by John Endicott landed at Salem. The company had obtained a grant of the territory lying between the Atlantic and Pacific and extending to a point 3 miles south of the river Charles and 3 miles north of the river Merrimac. After persistent efforts a royal patent was obtained for "the Governor and company" of the Massachusetts Bay, and the associates were constituted a body politic, with a Governor, deputy, and 18 assistants to be annually elected, and a general assembly of the freemen, with legislative powers to meet four times in a year, or oftener if necessary. Measures contrary to English laws and statutes were forbidden by the charter, but religious liberty was not named in the document, though this was the ultimate aim of the emigrants. In 1629 the colony was reënforced and the government and patent of the company were transferred from London to New England. The old officers resigned, giving place to others chosen from among those who were about to emigrate, John Winthrop being elected Governor. The Colony grew rapidly. The conflict between the Puritans and Charles I brought about a large emigration to Massachusetts, and between 1630 and 1640 about 20,000 persons arrived in the Colony. Charlestown, Boston, Watertown, Dorchester, Roxbury, Mystic, Saugus (Lynn), and other places were settled at this period. The settlers of Massachusetts Bay, as distinguished from the Plymouth pilgrims, were wealthy, and as a rule of a higher social class. They came in congregations under the lead of their ministers, who were graduates of the English universities. Fraternal relations were quickly established between the two colonies, however. Education was fostered from the beginning. Harvard College was founded in 1636, and in 1642 a system of public schools was organized. Having no charter to occasion disputes, Plymouth Colony prospered peacefully and monotonously, and its history is unmarred by records of religious narrowness; but Massachusetts Bay was in turmoil from the first, owing to its theocratic government and the stern and arbitrary conduct of the magistrates. It was the desire to escape from the yoke of the Massachusetts theocracy that led to the settlement of Rhode Island and Connecticut. Prejudiced by the dissensions between magistrates and people and by the fear that the Colony would become independent, the crown demanded back the charter in 1634; but the colonists evaded the order, made preparations to resist, and were fortunate in having attention diverted from them by the political troubles in England. To strengthen itself, the Bay government exacted an oath of allegiance in 1633–34, and that he had opposed this oath as well as the patent was the main reason for the banishment of Roger Williams (q.v.). The banishment of Anne Hutchinson (q.v.) and the hanging of Quakers were excused by the authorities on the ground that their teachings endangered the stability of the government; and the same spirit was at the basis of the act which made Church membership a qualification for the franchise, and

finally made the Congregational the established church of the Colony (1651). In 1643 Massachusetts Bay united with Plymouth, Connecticut, and New Haven to form the New England Confederacy, for protection against the Indians and the Dutch.

The restoration of the Stuarts was followed by fresh disputes with the crown, but in 1662 the King confirmed the Massachusetts charter and made a conditional promise of amnesty for past political offenses. He insisted, however, upon his right to interfere in the affairs of the Colony, required the complete toleration of the Church of England, the taking of an oath of allegiance, and the administration of justice in his name. Commissioners were sent over from England to investigate the affairs of the Colony, but they met with defiance from the magistrates and could accomplish nothing. The contest with the crown continued in spite of the pressure of the Indian War (1675–76), in which the New England Colonies were plunged. (See PHILIP, KING.) Charles II was incensed at the independent course of the Colony in assuming certain sovereign powers, as it had done in coining money or taking possession of the Maine settlements. The English merchants were irritated by the active trade that was carried on illegally with the West Indies and Europe. Edward Randolph (q.v.) urged on the English government against the Colony, and Massachusetts, under its theocracy, on its side, would make no concession. In 1684 the charter of the Colony was declared forfeited, the General Court was dissolved, and a royal commission superseded the charter government. In 1686 Sir Edmund Andros was made Governor and ruled without restraint and without sense. When news of the landing of William of Orange in England arrived, the people of Boston threw Andros into prison, reinstated the old magistrates, and revived the General Court. In 1692 a new charter was granted uniting Massachusetts Bay and Plymouth. Its terms, however, were less favorable than the old charter, in that the Governor, Deputy Governor, and Secretary were to be appointed by the King, and the members of the Assembly were to be elected by freeholders instead of Church members. In 1692–93 the witchcraft delusion broke out in Salem and vicinity, but the excitement was short-lived and was confined to a limited area. (See WITCHCRAFT.) In 1703–04 and 1722–25 there were wars with the Indians. The Colony aided England zealously in her contest with France, notably in the capture of Port Royal (1690) and of Louisburg (1745). (See PEPPERELL, WILLIAM.) In the early French and Indian wars the settlers of western Massachusetts suffered greatly at the hands of the Indians; towns like Haverhill and Deerfield were subjected to pillage, many of the inhabitants were massacred and the survivors led away into captivity. In 1765 the population of Massachusetts was about 240,000, falling into well-defined classes, but all equal in political power and held firmly together by the consciousness of a common origin and the possession of a common creed. The austerity of seventeenth-century Puritanism had passed away in great measure, but Church and state were still connected, and the Great Revival of 1740 showed how deeply faith lay rooted in the hearts of the people. The first printing press had been brought over in 1639, and a newspaper, the Boston *News Letter*, was issued in 1704. Educational institutions were being constantly founded. Property was well diffused, though for half a century after 1690 the Colony suffered from a reckless financial policy, which flooded the country with paper money. In resistance to the arbitrary acts of the British Parliament Massachusetts was the pioneer. The struggle against the writs of assistance and the famous speech of James Otis (May, 1761) marked the opening of the contest which ended in independence. The opposition to the Stamp Act, the Boston massacre, the destruction of the tea in Boston harbor, the closing of the port of Boston, and the virtual annulment of the charter followed in rapid succession. In October, 1774, the General Court resolved itself into a Provincial Congress and proceeded to erect an independent State government. The organization of a militia and the storing of supplies led to Lexington and Concord. (For military operations during the Revolution, see UNITED STATES.) In the war Massachusetts took the leading part, though her population was by no means united in the cause of the Revolution. Among the Loyalists who were banished or who voluntarily abandoned their homes were many of the most prominent and wealthy families. In 1780 a constitution was adopted, and by the Bill of Rights, prefixed to it, slavery, as was subsequently decided by the courts, was abolished. In 1786 the rising known as Shays's rebellion, occasioned by heavy taxes and the poverty of the people, occurred in the western part of the State. The Anti-Federalist element in the State was powerful till 1797, and the United States Constitution was ratified in January, 1788, by the close vote of 187 to 168. After 1797 the Federalist party became predominant, the opposition to the War of 1812 was bitter, and delegates from Massachusetts participated in the Hartford Convention (q.v.). The State remained stubbornly Federalist long after the party had disappeared everywhere else, and as a result it took little interest in national affairs. With the passing of the Federalist party greater liberty of thought came into the fields of politics and religion. In 1815 "dissenters" were released from paying taxes to support Congregational ministers, and in 1833 the Congregational church was disestablished. Educational development continued under all régimes. In 1739 Williams College and in 1821 Amherst College were founded, and in 1837 a State Board of Education was created. The antislavery movement had its birth in Massachusetts, and at Boston William Lloyd Garrison (q.v.) began the publication of the *Liberator* on Jan. 1, 1831. Abolitionism grew rapidly after 1840 and was favored in its growth by such episodes as the capture of the runaway slave Shadrach in the streets of Boston in 1851 and of Anthony Burns in 1854. In the Civil War, under the administration of the patriotic Governor, John A. Andrew, the state contributed nearly 160,000 men to the Union armies.

Legislation since the Civil War has dealt largely with the questions of the liquor trade, the regulation of corporations, municipal government, the civil service, and labor. As early as 1853 a law reducing the working day from 12 hours to 10 was passed. Since then the State has been active in caring for the industrial classes, to such an extent, indeed, that after 1895 the depressed condition of the textile trades was attributed by some to the fact that employers were unduly hampered by oppressive

State regulations passed to protect labor and could not meet the competition of the rising manufactures of the South. In 1898 and subsequent years a succession of strikes among the mill operatives caused great distress among the working classes.

The period after the Civil War witnessed the rise of many political movements. The temperance question came into prominence in 1867; the question of the admission of women to the suffrage was agitated up to 1880; the national Labor party exerted great influence in 1878. From 1858 to 1874 the State government was Republican. In 1874 the Democrats elected their candidate for Governor on an antiprohibition platform; in 1882 they were victorious with Benjamin F. Butler as their candidate. In 1890 the revelation of corruption in the Legislature brought about the choice of a Democratic Governor in the person of William E. Russell, whose great popularity caused him to be reëlected in 1891 and 1892. Until 1909 the State was Republican by heavy majorities. Curtis Guild, Jr., was elected Governor in 1906 and reëlected in 1907. At the presidential election of 1908 Taft carried the State with 265,966 votes to 155,453 for Bryan. Eben S. Draper, Republican, was elected Governor, and was reëlected in 1909, but by a greatly reduced plurality, and in the following year he was defeated by Eugene N. Foss, a former Republican, who ran as an independent candidate on a so-called Progressive-Democratic ticket. Mr. Foss made his campaign on the issue of the tariff. The Republicans elected the other State officers. H. C. Lodge, whose term in the Senate expired in 1911, was reëlected by the Legislature in January of that year. In the State election in 1911 Governor Foss was reëlected and was again the only Democratic official who was successful.

Massachusetts was one of the hardest-fought battle fields in the presidential election of 1912. The Progressive party was aggressive and both Mr. Roosevelt and Mr. Taft made notable addresses. As a result of the division in the Republican party Wilson carried the State with 173,208 votes compared with 155,948 for Taft and 142,228 for Roosevelt. Foss was again reëlected governor. The Democrats also elected the Lieutenant Governor and Secretary of State. Mr. Foss was a candidate for reëlection again in 1913, but was defeated in the primaries. In the election on November 5 of that year David I. Walsh, Democrat, was elected with 180,460 votes compared with 126,700 for Bird, Progressive, and 116,300 for Gardner, Republican. Mr. Foss, who ran independently, received about 20,000 votes. As a result of this election the Republicans lost their majority in the Lower House, in which the Progressives held the balance of power. In January, 1913, John W. Weeks was elected United States Senator by the Legislature to succeed W. Murray Crane. The Democrats remained in power in 1914, electing their candidate for Governor with 210,442 votes. That the Republicans had made up a great part of their losses of the several years previous was shown by the fact that the Republican candidate, S. W. McCall, received only about 12,000 votes less than the successful candidate. The Progressive vote fell from 142,228 in 1912 to 32,145 in 1914. In national elections Massachusetts has been Federalist, Whig, and Republican, with the exception of the years 1804 (Jefferson), 1820 (Monroe), 1824 and 1828 (John Quincy Adams), and 1912 (Wilson).

Colonial and State Governors of Massachusetts:

PLYMOUTH COLONY

John Carver	1620–21
William Bradford	1621–33
Edward Winslow	1633–34
Thomas Prence	1634–35
William Bradford	1635–36
Edward Winslow	1636–37
William Bradford	1637–38
Thomas Prence	1638–39
William Bradford	1639–44
Edward Winslow	1644–45
William Bradford	1645–57
Thomas Prence	1657–73
Josiah Winslow	1673–81
Thomas Hinckley	1681–86
Sir Edmund Andros (Governor-General)	1686–89
Thomas Hinckley	1689–92

Plymouth Colony absorbed by Massachusetts Bay.

MASSACHUSETTS BAY COLONY

John Endicott	1629–30
John Winthrop	1630–34
Thomas Dudley	1634–35
John Haynes	1635–36
Henry Vane	1636–37
John Winthrop	1637–40
Thomas Dudley	1640–41
Richard Bellingham	1641–42
John Winthrop	1642–44
John Endicott	1644–45
Thomas Dudley	1645–46
John Winthrop	1646–49
John Endicott	1649–50
Thomas Dudley	1650–51
John Endicott	1651–54
Richard Bellingham	1654–55
John Endicott	1655–65
Richard Bellingham	1665–73
John Leverett	1673–79
Simon Bradstreet	1679–84
Joseph Dudley (President of Council)	1684–86
Sir Edmund Andros (Governor-General)	1686–89
Simon Bradstreet	1689–92
William Phips	1692–94
William Stoughton	1694–99
Richard Coote, Earl of Bellemont	1699–1700
William Stoughton (acting)	1700–01
The Council	1701–02
Joseph Dudley	1702–15
The Council	1715
Joseph Dudley	1715
William Tailer (acting)	1715–16
Samuel Shute	1716–23
William Dummer (acting	1723–28
William Burnett	1728–29
William Dummer (acting)	1729–30
William Tailer (acting	1730
Jonathan Belcher	1730–41
William Shirley	1741–49
Spencer Phipps (acting)	1749–53
William Shirley	1753–56
Spencer Phipps (acting)	1756–57
The Council	1757
Thomas Pownall	1757–60
Thomas Hutchinson (acting)	1760
Sir Francis Bernard	1760–69
Thomas Hutchinson	1769–74
Thomas Gage	1774
The Council	1774–80

STATE

John Hancock		1780–85
James Bowdoin		1785–87
John Hancock		1787–93
Samuel Adams		1793–97
Increase Sumner	Federalist	1797–99
Moses Gill (acting)	"	1799–1800
Caleb Strong	"	1800–07
James Sullivan	Democratic-Republican	1807–08
Levi Lincoln (acting)	"	1808–09
Christopher Gore	Federalist	1809–10
Elbridge Gerry	Democratic-Republican	1810–12
Caleb Strong	Federalist	1812–16
John Brooks	"	1816–23
William Eustis	Democratic-Republican	1823–25
Marcus Morton (acting)	"	1825
Levi Lincoln	Democrat and Federalist	1825–34
John Davis	Whig	1834–35
Samuel T. Armstrong (acting)	"	1835–36
Edward Everett	"	1836–40
Marcus Morton	Democrat	1840–41
John Davis	Whig	1841–43
Marcus Morton	Democrat	1843–44
George N. Briggs	Whig	1844–51
George S. Boutwell	Democrat and Free Soil	1851–53
John H. Clifford	Whig	1853–54
Emory Washburn	"	1854–55
Henry J. Gardiner	American	1855–58

Nathaniel P. Banks	Republican	1858–61
John A. Andrew	"	1861–66
Alexander H. Bullock	"	1866–69
William H. Claflin	"	1869–72
William B. Washburn	"	1872–74
Thomas Talbot (acting)	"	1874
William Gaston	Democratic	1875–75
Alexander H. Rice	Republican	1876–79
Thomas Talbot	"	1879–80
John D. Long	"	1880–83
Benjamin F. Butler	Democrat and Independent	1883–84
George D. Robinson	Republican	1884–87
Oliver Ames	"	1887–90
J. Q. A. Brackett	"	1890–91
William E. Russell	Democrat	1891–94
Frederick T. Greenhalge	Republican	1894–96
Roger Wolcott		1896–1900
Winthrop Murray Crane	"	1900–03
John L. Bates	"	1903–05
William L. Douglas	Democrat	1905–06
Curtis Guild, Jr.	Republican	1906–08
Eben S. Draper	"	1908–10
Eugene N. Foss	Progressive-Democrat	1910–13
David I. Walsh	Democrat	1913–16
Samuel W. McCall	Republican	1916–19
Calvin Coolidge	"	1919–21
Channing Cox	"	1921–

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MASSACHUSETTS AGRICULTURAL COLLEGE. An institution for agricultural training, founded at Amherst, Mass., in 1867. The total amount of property owned by the college is 660 acres, of which 175 acres comprise the college campus, 75 acres belong to the experiment station, 100 acres to the horticultural department, and 250 acres to the college farm. The courses given include an extension service connected with a winter course, a summer school, farmers' week, extension schools, and correspondence courses. There is also a graduate school which offers the degree of M.Sc., Ph.D., and M.Agr. The buildings and land belonging to the college were valued in 1915 at $815,000 and the equipment at $430,000. It is supported chiefly by appropriations from the State Legislature. There were enrolled in all departments in 1914–15 about 600 students; of these 182 were enrolled in the winter school and 168 in the summer school. The instructors numbered 60. The library contains about 44,000 volumes. The president in 1915 was Kenyon L. Butterfield.

MASSACHUSETTS BAY. A wide, triangular indentation of the eastern coast of Massachusetts, extending from Cape Ann to Plymouth harbor, a distance of about 50 miles, while its depth inland from the middle of this base line to Boston is about 25 miles (Map: Massachusetts, F 3). Its northern shore is rocky, the southern marshy and sandy, and both are irregular and indented by numerous large and small bays, forming the harbors of Gloucester, Salem, Marblehead, Lynn, and Boston. The bay contains a number of islands along the shores, especially in the entrance to Boston harbor. The name Massachusetts Bay is sometimes made to include Cape Cod Bay.

MASSACHUSETTS HISTORICAL SOCIETY. A learned association with headquarters in Boston, the oldest historical society in the country, having been organized in 1791 and incorporated in 1794. Its objects are the collection, preservation, and diffusion of the materials for American history. The first volume of *Collections* was printed in 1792, and this has been followed by 70 more, together with 49 volumes of *Proceedings*. It has also published a new and illustrated edition of Bradford's *History of the Plymouth Plantation, 1620–1647*, in two volumes. The society has a museum of relics and antiquities and a fine library of nearly 60,000 volumes, 120,000 pamphlets and broadsides, a large collection of rare manuscripts made by the late Francis Parkman relating to the history of the French in Canada, and the Winthrop collection of manuscripts relating to early New England history.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY. A school of industrial science in Boston, Mass., established in 1861 through the efforts of W. B. Rogers and others, "for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science, and aiding generally by suitable means the advancement, development, and practical application of science in connection with arts, agriculture, manufacture, and commerce." The society of arts was the first section of the institute to be established, holding meetings since 1862, and doing much valuable work. The museum of arts has not yet been established, mainly owing to the extraordinary growth of the school of industrial science, which has overshadowed the other departments. On account of the disturbed state of the country during the Civil War the regular courses of instruction

were not opened until 1865. The institute was a pioneer in the introduction of laboratory methods, which are a distinguishing characteristic of its work. In addition to instruction in the sciences and their application to the arts, general studies essential for a liberal education are required. Fifteen distinct courses are offered, each of four years' duration: civil engineering, mechanical engineering, mining engineering and metallurgy, architecture, chemistry, electrical engineering, biology and public health, physics, general science, chemical engineering, sanitary engineering, geology, naval architecture and marine engineering, electrochemistry, and engineering administration. Some of these courses are specially adapted to certain classes of students, such as course XIII A, to which only naval constructors of the United States navy are eligible. Each course leads to the degree of B.S. Within most of the regular courses a considerable latitude is permitted in the selection of branches, a partial choice of professional course being made at the middle of the first year, while in the fourth year nearly the entire time is devoted to professional subjects. Much attention is paid to postgraduate work, with many students from other colleges who have already received degrees. As an example of the special courses provided for such students there may be noted the course in aëronautical engineering.

In 1913 an arrangement was made in coöperation with Harvard University for the maintenance of a School for Health Officers, leading to a Certificate in Public Health (C. P. H.). The studies include engineering courses from the institute curriculum and medical courses at the Harvard Medical School. At the beginning of 1914, by an arrangement made with Harvard University, the university's courses in civil, sanitary, mechanical, electrical, and mining engineering will henceforth be given in the buildings of the institute by technology instructors under the direction of the president of the institute and a faculty comprising the institute professors and those of the university departments affected by the agreement.

The school in 1914–15 had 268 instructors and a total attendance of 1816 students. The library contained 120,000 volumes and 60,000 pamphlets. The institute publishes programmes, catalogues, and reports; the Society of Arts issues *Science Conspectus;* the architectural department is responsible for the *Technology Architectural Record,* and the M. I. T. Alumni Association sends out the *Technology Review.* The students issue a daily, *The Tech,* the *Technology Monthly,* and annuals and occasionals, among the latter, *Concerning Technology,* a students' handbook. The school occupies nine buildings in the Back Bay district of Boston, comprising the Rogers, Walker, and Pierce buildings, three engineering and mechanical laboratories, boiler and power house, and gymnasium, valued with the grounds at $1,600,000. In September, 1916, the school will remove to its new plant in Cambridge on the bank of the Charles River basin, where on a plot of 50 acres there will be ready educational buildings of three and one-half acres to the floor. The Pratt School of Architecture and the student quarters, including Walker Memorial, dining hall, dormitories, and gymnasium, will be constructed on the completion of the educational portion. The value of the entire plant will be about $10,000,000. The endowment of the institute is $3,049,975, of which the income of only $1,613,498 is directly applicable to the current expenses. The income in 1914 was $705,823; of this amount more than half is derived from student fees, the remainder largely from interest on various funds and gifts from the State of Massachusetts and the United States. The presidents have been: William B. Rogers (1862–70, 1878–81); John D. Runkle (1870–78); Francis A. Walker (1881–97); James M. Crafts (1897–1900); Henry S. Pritchett (1900–07); Arthur A. Noyes (acting, 1907–09); and Richard Cockburn Maclaurin (1909–).

MASSACHUSETTS MEDICAL SOCIETY. An association with headquarters in Boston, incorporated Nov. 1, 1781, making it the oldest State organization of the kind that has met regularly from the date of founding. Its charter was signed by Samuel Adams as President of the Senate and John Hancock as Governor of the Commonwealth. Its fellows may include all respectable physicians and surgeons of the State who are graduates of medical colleges approved by its council and have been examined by its censors. In 1884 the motion was carried to admit women to membership. Its charter gave it authority to examine all candidates for the practice of medicine and surgery. The society has issued a number of valuable publications, including the *Medical Communications,* issued regularly since 1790, and the *Publications* of the Massachusetts Medical Society, a *Pharmacopœia,* and many reports, essays, a triennial catalogue since 1789, and recently an annual directory of the officers and fellows. The membership of the society in 1915 was 3500. Through its standing committees the society performs important functions in maintaining high standards in the medical profession and in favoring measures before legislative bodies for the improvement of the public health.

MASSACRE OF THE INNOCENTS. A popular subject with Italian and Flemish painters, representing the slaying of the children of Bethlehem by the soldiers of Herod. Among the most famous examples are those by Guido Reni in the Bologna Gallery; Tintoretto in the Scuola di San Rocco, Venice; Daniele da Volterra in the Uffizi, Florence; Pieter Breughel in the Vienna Gallery; and Rubens in the Munich Gallery. The scene is usually given with much realistic detail, stress being laid upon the endeavors of the mothers to save their infants.

MASSAFRA, mäs-sä'frä. A town in the Province of Lecce, Italy, 12 miles by rail from Taranto (Map: Italy, F 4). The principal articles of commerce are olives, wine, cotton, and fruits. Pop. (commune), 1901, 11,026; 1911, 11,104.

MASSAGE, má-säzh' (Fr. *massage,* from *masser,* Gk. μάσσειν, *massein,* to knead). A means of remedial treatment consisting in the manipulation of a part or the whole of the body by friction, stroking, pressing, kneading, percussion, and like movements. When these applications are combined with active or passive movements the process is called the *Swedish movement cure.*

The practice of rubbing and anointing is probably as old as the race. Homer alludes frequently to it. The Egyptians used it. Massage in one form or another was one of the luxuries of the baths of the ancient Greeks and Romans. Socrates spoke of the curative properties of olive

oil with friction; Hippocrates laid stress on rubbing and unguents; Asclepiades held that disease was the result of an abnormal arrangement of the atoms which form the human body, and consequently friction, bathing, and exercise would necessarily open the pores and allow the escape of all useless and worn-out atoms and restore equilibrium; Herophilus, Athenæus, Celsus, and Galen gave written rules for such treatment. The Chinese are said to use massage, in place of bleeding, on the theory of producing better circulation. Both the Turks and the Russians combine it with their baths, and their excellent practice has taken its place in our Western civilization. In one form or another massage is in vogue among most peoples, savage and civilized. In Sweden the art has been brought to a high degree of perfection, and it is practiced scientifically throughout the United States.

The manipulations in massage are divided by Metzger into four principal classes: (1) *Effleurage*, or stroking, is carried on with the palms of the hands, with the thumbs, or the tips of the fingers. It consists in lightly stroking the surface in various directions and has a soothing effect on the nervous system, increasing the superficial blood and lymphatic circulation. A procedure carried on in much the same way, but with more vigor, is (2) *Friction*. This manipulation penetrates more deeply than stroking and reaches the subcutaneous tissues and superficial muscles. (3) *Petrissage*, known also as kneading or pinching, is performed with the thumbs and fingers, or the whole hand, portions of the body, such as muscles or groups of muscles, being grasped and manipulated. (4) *Tapotement* (percussion or tapping) may be performed with the palms of the hands, or a chopping movement is made with the ulnar border of both hands. The tips of the fingers may be used with a shoving movement, and lastly the clenched fists are used to beat upon the large groups of muscles of the back of the legs and the gluteal region. General massage is carried on somewhat as follows: Beginning at an extremity, the foot, e.g., the skin is taken up between the thumb and fingers and rolled and pressed; then the muscular masses are well grasped, rolled, and pressed and kneaded, and rapidly tapped; and then each articulation is in turn put through all its motions. Even the muscles of the neck and face may be subjected to the same treatment. Massage by percussion alone consists in applying to various parts of the body a very rapid succession of short blows not forcible enough to cause pain.

The effects of massage are local and systemic. The local effects are the result of the masseur putting forth more or less muscular power, which at the points of contact or friction develops or is transformed into another mode of motion—heat. The action thus induced also serves to elevate the temperature. The blood vessels dilate and an increased quantity of blood enters them, and the motion of the blood current is accelerated. The immediate effect of these changes is to promote the nutritive energy of the tissues subjected to friction. This result is seen in the improved color, warmth, and volume of the parts. All the organic functions are performed with more energy, and power is gained in every way. The effects upon the nervous system are, in general, excellent. For instance, if an inflamed joint is rubbed with extreme gentleness, the sensibility, at first so acute that the slightest touch would give pain, rapidly subsides, until, after an hour of friction, it may be handled with some roughness, without evoking painful sensations. The acutest suffering is often alleviated by persistent friction of a gentle kind. The state of spasm of a muscle is relieved and relaxation induced by persevering rubbing of the affected muscle. These results are no doubt due to the fact that the gentle titillation of the cutaneous branches of the nerves (end organs) has so far lowered their irritability that they cease to receive and transmit painful impressions. Among the affections which may be either cured or temporarily relieved by massage are wakefulness and nocturnal restlessness, simple headache, or even severe paroxysms of neuralgia, tic douloureux, hemicrania, migraine, spinal pain, infantile paralysis, progressive muscular atrophy, chronic (nontubercular) joint affections, synovitis, contractions, deformities, and thickening from inflammatory deposits in joints and other tissues. See MOVEMENT CURE.

Consult: Ostrom, *Massage and the Original Swedish Movements* (7th ed., London, 1912); M. D. Palmer, *Lessons on Massage* (4th ed., ib., 1912); Douglas Graham, *Massage, Manual Treatment, Remedial Movements, etc.* (4th ed., Philadelphia, 1913); L. L. Despard, *Textbook of Massage* (2d ed., London, 1914).

MAS'SAGE'TÆ (Lat., from Gk. Μασσαγέται). A nomadic people, allied to the Scythians, who anciently inhabited the broad steppes to the east of the Caspian Sea. Herodotus says that they practiced group marriage; that they sacrificed and devoured their aged people; that they worshiped the sun and offered horses to him; that they lived on the milk and flesh of their herds and on fish; and that they fought on horseback and on foot with lance, bow, and double-edged axe. Cyrus the Great is said to have lost his life in fighting against their Queen, Tomyris, in 529 B.C.

MASSA'LIANS, or **MESSA'LIANS** (Gk. Μασσαλιάνοι, *Massalianoi*, from Syr. *Maṣlīn*, they who pray, from *ṣalī*, to bow). 1. A small non-Christian body in Asia Minor in the fourth century, who held a plurality of gods, but worshiped only one. The name came from the prominence of prayer in their worship. 2. A party of wandering Christian fanatics, of both sexes, who without well-recognized leaders came from Mesopotamia in the fourth and fifth centuries into Armenia, Asia Minor, and Syria, and caused great scandal by begging and their idle mode of life. They renounced marriage and believed that by means of long-continued prayer spiritual purity might be obtained. The Greeks called them Euchites.

MAS'SASAU'GA (North American Indian name). The small ground rattlesnake of the central United States. See RATTLESNAKE.

MAS'SASOIT (?1580–1661). A celebrated sachem of the Wampanoag or Pokanoket Indians, whose territory embraced nearly all the southern part of the present Massachusetts, from Cape Cod to Narragansett Bay. His tribe was said to have been very large at one time, but to have been almost exterminated by disease, so that, on the coming of the whites, it numbered only about 300. On March 22, 1621, he visited Plymouth with 60 warriors and on behalf of the Wampanoags concluded a treaty of peace and mutual protection with Governor Carver. This was sacredly kept by both sides for more than

50 years, and Massasoit himself remained the steadfast friend of the colonists until his death in 1661. He lived at Sowams, within the present town of Warren, R. I., where commissioners from the adjacent settlements often visited him. Consult Virginia Baker, *Massasoit's Town Sowams in Pokanoket* (Warren, R. I., 1904).

MASSAUA, mäs-sou'ä, or MASSOWAH, or MASSAWA. The chief town and formerly the capital of the Italian colony of Eritrea (q.v.). It is situated partly on the mainland, partly on two small islands on the west shore of the Red Sea, 350 miles northwest of the Strait of Bab-el-Mandeb (Map: Africa, J 3). It is a fortified military station and its commercial importance is very considerable owing to its being the natural port for the northern part of Abyssinia. The climate is excessively hot. The commerce is chiefly with Arabia, Bombay, and the interior of Abyssinia, the chief exports being ivory, coffee, tobacco, wax, and ostrich feathers. Imports and exports in 1911 were valued at 18,845,118 and 9,371,802 lire respectively; transit, 5,234,262 lire. Massaua has steamship connection with Egypt, Italy, and Austria-Hungary. A railway is in operation to the capital of the colony, Asmara, 75 miles distant, and a 63-mile extension to Keren was under construction in 1914. The population was (1908) 2275 (524 Europeans), the natives being Mohammedans of various African and Asiatic races. Massaua formerly belonged to Egypt and was taken by Italy in 1885.

MASSAWA. See MASSAUA.

MASSÉ, mä'sā', FÉLIX MARIE, called VICTOR (1822–84). A French dramatic composer, born at Lorient (Morbihan). He studied under Halévy and Zimmermann at the Paris Conservatory, and won the Prix de Rome in 1844, his composition in the competitive examination being *Le rénégat.* In 1860 he was appointed chorus master at the Opéra, and six years later became professor of composition at the Conservatory. By this time he had become one of the commanding personalities of French musical life, and in 1872 became a member of the Institute. He died in Paris, July 5, 1884. A statue of him was erected in his native town in 1887. Massé's music is distinguished for its grace and gayety and its attractive poetic quality. His best operas are: *Les noces de Jeanette* (1853); *Galatée* (1854); *La fiancée du diable* (1854); *Les saisons* (1856); *Paul et Virginie* (1876). Consult A. Pougin, *Musiciens du XIXème siècle* (Paris, 1911).

MASSEAU, mä'sō', PIERRE FÉLIX (1869–). A French sculptor, born at Lyons. He became secretary of the National Society of Fine Arts and was a member of the jury on fine arts at the Paris Exposition of 1900 and secretary for decorative art at the Milan Exposition. He was made Chevalier of the Legion of Honor and was awarded several medals. His works comprise: "The Mad Girl of the Sonnet" (1893); "Loulette" (1894); "The Secret" (1896); "Monna," marble head (Dijon Museum, 1897); "Expectation" and "The Post" (1898); "Gisèle," marble bust (1899); "Lunghino" (1901); "The Thinker" and "Beribboned Head" (1902); "Beethoven," bronze bust (1903); "Nymph," "Two Sisters," and "Winged Head" (1904); "Confidence," group (1905); "Education of the Faun" and "Bilitis" (1906); "Bathing Woman," "Leading to Joy," "Apachina" (1907); "Little Daughter of Eve" (1909).

MASSE'NA. A village in the town of the same name, situated in St. Lawrence Co., N. Y., 38 miles by rail northeast of Ogdensburg, on the Grasse and Racket rivers and on the New York Central and Hudson River and the Grand Trunk railroads (Map: New York, F 1). The town includes also Massena Centre and Massena Springs, the latter a popular watering place. Massena has a public library, and among other features of interest are the St. Lawrence Power Company's huge concrete power house and highway bridge (412 feet span and 65 feet above water). The power plant of this concern in 1901 was equipped to generate electrical energy equivalent to 35,000 horse power, and the scheme as projected admits of a very considerable expansion in the event of an increased demand, the water-power development possible here being, next to that of Niagara, the greatest in the United States. The water power is obtained by means of a canal 3 miles long, 200 feet wide, and 18 feet deep, starting at the head of the Long Sault Rapids on the St. Lawrence and emptying into the Grasse River. The chief industries are dairying and the manufacture of aluminium, Massena being the home of the Aluminium Company of America, which has an immense plant here. Settled about 1792, the town of Massena was organized in 1803. Pop., 1900, 2032; 1910, 2951.

MASSÉNA, mä'sā'nä', ANDRÉ, DUKE OF RIVOLI, PRINCE OF ESSLING (1758–1817). A marshal of France, born at Nice, May 6, 1758. In his youth he was a ship boy in a small vessel and afterward for 14 years served in an Italian regiment in the pay of France, but left the service in 1789 because his birth precluded him from promotion. He was married and settled at Nice when the French revolutionary wars began, but he at once volunteered and soon rose to be chief of battalion. In December, 1793, he was made a general of division. He distinguished himself in the Italian campaigns of 1794–95, particularly at Loano (Nov. 23, 1795), and in 1796 was put in command of the advance guard of the Army of Italy. He won renown at Arcole (Nov. 15–17, 1796) and Rivoli (Jan. 14, 1797). Bonaparte called him "the favorite child of victory." Masséna resigned his command on account of charges of rapacity, but at the close of 1798 he was put in command of the Army in Switzerland, which operated against the allied Austrian and Russian forces. He defeated the Russians under Korsakoff at Zurich, Sept. 25–26, 1799. In 1800 he was charged with the defense of Genoa, but after an heroic resistance of nearly two months was compelled to surrender the city to the Austrians in June. After the battle of Marengo Bonaparte gave him the command of the Army of Italy. In 1804 he was made a marshal of the Empire. In 1805 he again commanded in Italy, ably manœuvring against Archduke Charles. In 1806 he compelled the surrender of Gaeta, and was largely instrumental in placing Joseph Bonaparte on the throne of Naples. After the battle of Eylau (Feb. 7–8, 1807) Masséna commanded the right wing of the French army, and after the Peace of Tilsit (q.v.) he was made Duke of Rivoli. He subsequently distinguished himself in the sanguinary battle of Aspern (Essling), in 1809, and at Wagram (q.v.) he commanded the left wing of the French army. For these services he was created Prince of Essling. In 1810 he was intrusted with the chief command in Portugal, and compelled the

British and their allies to fall back to Lisbon; but, being unable to make any impression on Wellington's strong position at Torres Vedras, he resigned his command and retired in partial disgrace. His failure he attributed to the disobedience of his lieutenants Ney, Regnier, and Junot. During the Restoration he gave his adhesion to the Bourbons. He died April 4, 1817. His *Mémoires* (7 vols., Paris, 1848–50), edited by General Koch, contain historical matter of interest and value. Consult also: Toselli, *Notice biographique sur Masséna* (Nice, 1869); Edouard Gachat, *Histoire militaire de Masséna* (Paris, 1908); G. Fitzmaurice, "Masséna," in *Royal United Service Association, Journal*, vol. lvii (London, 1913).

MASSENBACH, mä'sen-bäg, CHRISTIAN VON (1758–1827). A Prussian soldier, born at Schmalkalden. He studied in the Military Academy at Stuttgart; became a lieutenant in the Württemberg army in 1778; and entered the service of Frederick the Great in 1782. He accompanied an expedition to Holland in 1787 and served in the war against France in 1792–95. Chief of staff to Prince Hohenlohe in 1806, he was held chiefly responsible for the defeats at Jena and Auerstädt and for the capitulation of the Prince's army. He later took part in Württemberg politics and wrote: *Rückerinnerungen an grosse Männer* (1808); *Memoiren zur Geschichte des preussischen Staats unter Friedrich Wilhelm II und III* (3 vols., 1809–10); *Denkwürdigkeiten des preussischen Staats seit 1792* (2 vols., 1809). His writings were responsible for his trial on a charge of high treason in 1817 by the Prussian authorities, to whom he had been surrendered, and for his sentence to 14 years' imprisonment. He was pardoned by Frederick William III in 1826.

MASSENET, mäs'nā', JULES EMILE FRÉDÉRIC (1842–1912). A French composer, born at Montaud (Loire). He was educated at the Paris Conservatory, where he won prizes for his pianoforte playing and for fugue writing. Subsequently he studied under Ambroise Thomas and in 1863 won the Grand Prix de Rome. In 1878 he was made professor of advanced composition at the Conservatory, which post he held until 1896, and in 1878 he was elected to the Académie des Beaux-Arts. In the latter year he made a successful tour of Great Britain. His instrumentation is especially fine, and he is a master of dainty, bizarre effects; but his music lacks real depth, though its euphony and well-defined melody make an immediate appeal, and gained for him exceptional popularity—perhaps not quite deserved when one considers the merit of some of his contemporaries. He published a volume of interesting reminiscences, *Mes souvenirs* (1912). His works include the following operas: *Don César de Bazan* (1872), *Les Erinnyes* (1873), *Le roi de Lahore* (1877), *Hérodiade* (1881), *Manon* (1884), *Le Cid* (1885), *Esclarmonde* (1889), *Le mage* (1891), *Werther* (1892), *Thaïs* (1894), *La Navarraise* (1894), *Sapho* (1897), *Cendrillon* (1899), *Le jongleur de Notre-Dame* (1902), *Ariane* (1906), *Thérèse* (1906), *Bacchus* (1908), *Don Quichotte* (1910), *Roma* (1912), and three posthumous operas *Panurge* (1913), *Cléopâtre* (1914), and *Amadis*. His other works include the cantatas *Marie Madeleine* (1873), *Eve* (1875), *La vierge*, and *Narcisse* (1878); an oratorio, *La terre promise* (1900); orchestral suites, *Scènes hongroises*, *Scènes pittoresques*, *Scènes dramatiques*, after Shakespeare, and several orchestral overtures, notably to Racine's *Phèdre;* also many collections of songs. Consult: L. Schneider, *Massenet* (Paris, 1908); H. T. Finck, *Massenet and his Operas* (New York, 1910); A. Pougin, *Massenet* (Paris, 1913).

MASSE'TER. See JAWS.

MAS'SEY, GERALD (1828–1907). An English poet, born at Gamble Wharf, near Tring, Hertfordshire, of poor parents who gave him little education. When eight years old he was placed in a silk mill, where he worked 12 hours a day. At 15 he found employment in London as an errand boy, and soon began writing verse. Stirred by the Chartist movement and the revolution of 1848, he started a weekly paper called the *Spirit of Freedom*, which was devoted to the interests of workingmen; joined the Christian Socialists, and was encouraged in his undertaking by Kingsley and Maurice. He afterward lectured on spiritualism in England, the United States, and Australia. Among his poems are: *Voices of Freedom and Lyrics of Love* (1850); *The Ballad of Babe Christabel, and Other Poems* (1854); *Havelock's March, and Other Poems* (1861); *A Tale of Eternity, and Other Poems* (1869); *My Lyrical Life* (collected poems, 1889). We may mention, also, many contributions to the periodicals, and several volumes of prose, as, *Shakespeare's Sonnets never before Interpreted* (1866); *Concerning Spiritualism* (1872); *The Secret Drama of Shakespeare's Sonnets* (1888). Massey's social verse now appears bombastic; his dramatic songs and lyrics are often sweet and beautiful.

MASSEY, HART ALMERNI (1823–?1897). A Canadian manufacturer. He was born in Haldimand Township, Northumberland Co., Ontario, and was educated at Watertown, N. Y., and at Victoria College, Cobourg, Ontario (1842–44). While assisting in the management of his father's farms he resolved to devote himself to improvements in agricultural machinery, and after several years' experience in a factory started by his father at Newcastle, became sole owner in 1855. He produced the first reaping and mowing machines made in Canada, and by a number of notable improvements brought the manufacture of agricultural implements in the Dominion to a high state of efficiency. He received prizes at the Paris Exhibition, and in 1876 one of his machines received the highest award at the Centennial Exhibition, Philadelphia. The business was incorporated in 1870 and in 1879 was removed to Toronto. A binder, a rake, and a harvester were added to the number of improved implements; and at Antwerp, Belgium, Massey received the highest award at the International Exhibition in 1885. The latter part of his life was noteworthy for its discriminating interest in and promotion of educational and religious work. He gave largely to missions, hospitals, libraries, churches, and educational institutions, especially to Victoria University.

MASSI, mäs'sē, GENTILE. An Italian painter. See GENTILE DA FABRIANO.

MAS'SICOT (Fr. *massicot*, from *masse*, Lat. *massa*, mass, lump, from Gk. *μᾶζα, maza*, barley cake, from *μάσσειν, massein*, to knead). A natural lead monoxide, yellow in color. It is found massive, usually with a crystalline and shining surface, which, when broken, shows a scaly texture. Artificial crystals of massicot have been obtained among furnace products and by direct chemical methods.

MASSIL'IA. See MARSEILLES (towards the end).

MASSILIEN'SIS, JOHANNES. See CASSIANUS.

MAS'SILLON. A city in Stark Co., Ohio, 72 miles by rail south of Cleveland and 8 miles west of Canton, the county seat; on the Tuscarawas River, the Ohio Canal, and the Pennsylvania, the Wheeling and Lake Erie, the Northern Ohio Traction and Light Company, and the Baltimore and Ohio railroads (Map: Ohio, G 4). It is the centre of the noted Tuscarawas Valley coal field, and in its vicinity are several quarries of valuable white sandstone. The industrial plants produce extensively farming implements and machinery, stationary and portable engines, iron bridges, bar iron, glass bottles, stoves and heating furnaces, silos, steel washers, steel sheets, wire baskets, power-plant specialties, steam hammers, fire and paving brick, aluminium and enameled ware, paper, and steel tubing and pipe. In Massillon are the State Hospital and Asylum for the Insane, a city hospital, and a public library, besides several parks. Massillon was founded in 1825, was incorporated as a village in 1853, and was chartered as a city in 1868. The government is administered by a mayor, elected biennially, a unicameral council, and directors of service and safety, who, with the mayor (by whom they are appointed), constitute a board of control. The board of education is independently elected by popular vote. Pop., 1890, 10,692; 1900, 11,944; 1910, 13,879; 1920, 17,428.

It was named by Mrs. James Duncan after Father Jean Baptiste Massillon (q.v.), the noted French divine.

MASSILLON, mȧ'sē'yôn', JEAN BAPTISTE (1663–1742). A distinguished French bishop and preacher, born at Hyères, June 24, 1663. He entered the Congregation of the Oratory in 1681, and while engaged in teaching theology in the diocese of Meaux he delivered an eloquent funeral oration on the Archbishop of Vienne, which led to his being called to Paris and placed at the head of the seminary of Saint-Magloire. There a course of conferences, delivered in the seminary, established his reputation. He was twice called to preach in the presence of Louis XIV at Versailles. He preached funeral orations on the Prince of Conti, the Dauphin, and Louis XIV. In 1717 Massillon was named Bishop of Clermont, and was appointed to preach before the young King Louis XV, for which occasion he composed his celebrated *petit carême* —a series of 10 sermons. In 1719 he was consecrated Bishop and was elected a member of the French Academy. After 1723 he lived almost entirely in his diocese of Clermont, where his charity, gentleness, and amiable disposition gained him the affections of all. His works, consisting mainly of sermons and other similar compositions, were collected in 15 volumes, by his nephew, and published in 1745–46; later editions have appeared in great numbers, the best being that of the Abbé Guillon (Paris, 1828) and that of Blampiguan (ib., 1886). The latter has also published a biography, *Massillon d'après des documents inédits* (ib., 1879).

MAS'SINGBERD, FRANCIS CHARLES (1800–72). Chancellor of Lincoln. He was born in Lincolnshire; was educated at Rugby and at Magdalen College, Oxford, and, after graduation with high honors, entered the Church and in 1825 became rector of South Ormsby in his native county. He was made a prebendary in Lincoln Cathedral in 1847 and chancellor in 1862. As chancellor he strove to improve the practical efficiency of the cathedral. He was early and prominent in the movement for the restoration of the deliberative functions of convocation, with reference to which he published in 1833 *Reasons for a Session of Convocation.* In addition to many papers and discussions on ecclesiastical subjects he was the author of: *Church Reform* (1837); *The Educational and Missionary Work of the Church in the Eighteenth Century* (1857); *History of the Leaders of the English Reformation* (1842; 4th ed., 1866); *The Law of the Church and the Law of the State* (1859); *Lectures on the Prayer-Book* (1864); *Sermons on Unity, with an Essay on Religious Societies* (1868).

MASSINGER, mȧs'sĭn-jẽr, PHILIP (1583–1640). An English dramatist, son of Arthur Massinger, a retainer of Henry Herbert, second Earl of Pembroke. The elder Massinger was educated at St. Alban Hall, Oxford; was afterward a fellow of Merton College and member of Parliament. Philip entered St. Alban Hall in 1602, but he left without a degree in 1606, the year in which his father probably died. Massinger went to London, probably not before 1610, and began writing for the stage. The extent of his work has not been definitely determined, for he collaborated on a large scale. He seems to have written single-handed about 15 plays, and in conjunction with others fully 25. His most common collaborator was Fletcher; and certain of the plays they wrote together must be sifted from those that have long passed under the name of Beaumont and Fletcher. Massinger studied his art well, and skillfully adjusted his plays to the stage. In the art of construction, indeed, he ranks high. As much cannot be said for his characterization, which is stiff and unnatural and distorted by the obvious determination of the dramatist to bend the creatures of his fancy to fit a moral aim and the illustration of ethical problems. His best-known comedy, *A New Way to Pay Old Debts* (first performed between 1622 and 1626), kept the stage well on into the nineteenth century. Sir Giles Overreach, the leading character in the play, is without much doubt a portrait of a notorious extortioner of the time named Sir Giles Mompesson. Political satire is one of the characteristics of Massinger's plays, particularly of *Believe as you List, The Emperor of the East, The Maid of Honour,* and *The Bondman.* In the last-named play (performed late in 1623 or early in 1624), the object of attack is Buckingham. Good examples of Massinger's power are *The Virgin Martyr* (partly Dekker's) and *Barnavelt* (partly Fletcher's). Through his life he kept up friendly relations with the Herberts. From Philip, the fourth Earl of Pembroke, he received, it is said, a pension of £30 or more. He died at Southwark, in March, 1640, and was buried in the churchyard of St. Saviour's. There is no satisfactory edition of Massinger. The best is by William Gifford (4 vols., 1805; second ed., 1816; reprinted by Cunningham, 1867). Consult also *Dramatic Works of Massinger and Ford,* edited by Hartley Coleridge (London, 1840; rev., 1883), *Selected Plays,* edited by Arthur Symons, for "Mermaid Series" (ib., 1887–89); and for Massinger's share in plays ascribed to Beaumont and Fletcher, *Transactions of New Shakespeare Society* (London, 1880–86); F. G. Fleay in the last-named publication (ib., 1874); *Biographi-*

cal Chronicle of the English Drama (ib., 1891); A. W. Ward, *History of English Dramatic Literature to the Death of Queen Anne* (New York, 1899); Leslie Stephen, *Hours in a Library* (3d series, ib., 1905); Emil Koeppel, in *Cambridge History of English Literature*, vol. vi (Cambridge, 1910).

MASSINISSA. See MASINISSA.

MASSMANN, mäs'mȧn, HANS FERDINAND (1797–1874). A German philologist, well known for his studies in Old German language and literature. Born in Berlin, he studied there, and, after serving in the War of Liberation, in Jena, where his radical ideas and "demagogic" sympathies brought him into difficulties with the authorities. In 1826 he became a teacher at the Royal Gymnastic Institute at Munich and afterward was chosen professor of Old German literature at the university. At Berlin, whither he had gone in 1842 to introduce gymnastics into the Prussian service, he accepted the chair of Germanic philology. Massmann's writings include editions of *Deutsche Gedichte des 12. Jahrhunderts* (1837–42); Gottfried's *Tristan* (1843); *Kaiserchronik* (1849–53); of the biblical translations of the Gothic Bishop Ulfilas (1855–56) and of Tacitus's *Germania* (1847); *Geschichte des mittelalterlichen Schachspiels* (1839); *Litteratur der Totentänze* (1840). Consult article in *Allgemeine deutsche Biographie*, vol. xx (Leipzig, 1884), and Euler and Hartstein, *H. F. Massmann: sein Leben, seine Turn- und Vaterlandslieder* (Berlin, 1897).

MASSON, mȧ'sôN', ANTOINE (1636–1700). A French line engraver, born at Louvry, near Orléans. He learned engraving as an armorer's apprentice and had no other teaching. He engraved 68 plates, mostly portraits, of which the most celebrated are those of Count d'Harcourt, known as the "Cadet à la Perle," Gaspard Charrier, and Olivier d'Ormesson. "The Pilgrims of Emmaus," after Titian, known as "The Tablecloth" because of the extreme care with which Masson has rendered the texture of linen, is his most famous subject. His work shows extraordinary facility and great talent for color, but it is often marred by mannerisms.

MAS'SON, DAVID (1822–1907). A Scottish author, born at Aberdeen, Dec. 2, 1822. He was educated at Marischal College, Aberdeen, and at the University of Edinburgh. At 19 he became editor of a Scottish provincial paper. In 1847 he settled in London. He was editor of *Macmillan's Magazine* from 1858 to 1865. In 1852 he succeeded Clough in the chair of English literature at University College and in 1865 retired to accept the professorship of rhetoric and English literature in the University of Edinburgh. In 1893 he became Historiographer Royal for Scotland. Masson is widely known for his studies in Milton, comprising the exhaustive work, *The Life of Milton in connection with the History of his Time* (6 vols., 1859–80; first volume enlarged 1881; index, 1894), and at least four editions of his poems: the Cambridge edition (3 vols., 1874), revised as the Cabinet edition (1890); the Golden Treasury edition (2 vols., 1874), the Globe edition (1 vol., 1877), an intermediate between the Cambridge and the Golden Treasury (3 vols., 1822). The same careful scholarship is displayed in lives of Drummond of Hawthornden (1873) and De Quincey (1878), and in an edition of De Quincey's works (14 vols., 1889–91). Among Masson's other writings are: *Essays, Biographical and Critical* (1856; reprint, with additions, 1874–76); *British Novelists* (1859), an excellent piece of criticism; *Recent British Philosophy* (1865); *Carlyle Personally and in his Writings* (1885); *Edinburgh Sketches and Memories* (1892). From 1880 to 1899 he edited, with introductions, the *Register of the Privy Council of Scotland*, vols. iii–xv (1578–1627).

MASSON, mȧ'sôN', FRÉDÉRIC (1847–). A French historian, born at Asnières. He became librarian of the Ministry of Foreign Affairs and in 1903 was elected to the French Academy. He is particularly known as the historian of the life and times of Napoleon, his writings including: *La révolte de Toulon en prairial an III* (1875); *L'Impératrice* (1877), anonymously; *Le Marquis de Grignan* (1881; 3d ed., 1908), crowned by the French Academy; *Les diplomates de la Révolution* (1884); *Napoléon et les femmes* (1893; 21st ed., 1897), translated as *Napoleon and the Fair Sex* (1894); *Napoléon chez lui* (1894); *Les cavaliers de Napoléon* and *Napoléon inconnu* (1895); *Marie Walewska* (1897); *Joséphine de Beauharnais, 1763–1796* (1899); *Joséphine, impératrice et reine* (1898); *Joséphine, répudiée 1809–1814* (1901); *L'Impératrice Marie-Louise* (1902); *Napoléon et son fils* (1904); *Napoléon et sa famille* (9 vols., 1897–1907); *Le sacre et le couronnement de Napoléon* and *Autour de Sainte-Hélène* (1908); *Sur Napoléon* (1909); *Napoléon à Sainte-Hélène, 1815–1821* (1912); *L'Académie-Française, 1629–1793* (1912); *Pour l'Empereur* (1913).

MASSON, LOUIS FRANÇOIS RODRIGUE (1833–1903). A Canadian statesman, born in Terrebonne, Quebec. He was educated at the Jesuit College, Georgetown, D. C., and at St. Hyacinthe College, Province of Quebec. In 1859 he was admitted to the bar and he sat in the Canadian Parliament as Conservative member for Terrebonne from 1867 to 1882. From 1878 to 1880 he was Minister of Militia and Defense, in 1880 was President of the Council, and from 1884 to 1887 was Lieutenant Governor of Quebec Province. As Minister of Militia and Defense, he procured the passage of a law establishing cadet companies in the universities, colleges, and high schools of the Dominion. In 1882 and again in 1892 he was summoned to the Senate. He was mayor of Terrebonne and published *Les bourgeois de la compagnie du Nord-Ouest* (1889).

MAS'SON, THOMAS LANSING (TOM MASSON) (1866–). An American editor and author, born at Essex, Conn., and educated in the public schools of New Haven. Engaging in journalistic work in New York, he became literary editor of *Life* in 1893 and a regular contributor of humorous articles to various magazines. As an editor, he was responsible for *Humorous Masterpieces of American Literature* (1904); *In Merry Measure* (1905); *The Humor of Love in Verse and Prose* (1906); *The Best Stories in the World* (1914). His own books are: *The Yankee Navy* (1899); *A Corner in Women* (1905); *The Von Blumers* (1906); *A Bachelor's Baby and Some Grown-Ups* (1907).

MASSON-FORESTIER, mȧ'sôN'-fô'rĕs'tyā', ALFRED (1852–1912). A French writer, born at Havre. He studied law and from 1884 to 1899 practiced his profession at Rouen. After 1899 Masson-Forestier settled in Paris and devoted all his time to literature, contributing to the *Revue des Deux Mondes, Temps, La Revue* etc. His stories, usually short and in content

sober, are reminiscent of Merimée and Maupassant. He wrote: *Difficile devoir* (1891); *Pour une signature, etc.* (1892); *La jambe coupée, etc.* (1894); *Remords d'avocat* (1896), crowned by the French Academy; *Angoisses de juge, etc.* (1898); *Une flambée d'amour* (1900); *A même la vie* (1901); *L'Attaque nocturne* (1903). Among his dramas may be mentioned: *Médecin de campagne* (1901); *Attaque nocturne* (1905), with A. de Lorde; *Baraterie* (1906); *Le droit du père* (1907), with J. Monnier. The last years of his life were spent in a study of Racine and he published in 1911 *Autour d'un Racine ignoré.*

MASSO'RA, or **MASSORETH.** See MASORA.

MASSOWAH. See MASSAUA.

MASSYS, QUINTEN. See MATSYS, QUINTEN.

MAST (AS. *mæst*, OHG. *mast*, Ger. *Mast;* probably connected ultimately with Lat. *malus*, pole). In sailing vessels a mast is an upright spar on which sail is set. In large ships masts are in several lengths. In fore-and-aft-rigged vessels the mast is commonly in two parts, called the lower mast and the topmast; in large square-rigged vessels the masts are in three sections, the lower mast, topmast, and topgallant mast. That part of the topgallant mast above the eyes of the topgallant rigging and below the royal rigging is called the royal mast; if skysails are carried the part of the topgallant mast above the eyes of the royal rigging is called the skysail mast or skysail pole.

Large lower masts are either of iron or steel or built up of many timbers whose edges meet in radial planes. These timbers are bolted together and further held by circular bands of iron or steel. They are joined to the timbers above and below by scarfs and the scarfs break joints (i.e., no two scarfs are abreast each other horizontally).

The parts of a mast are the head, hounds, body, partners, and heel. The head is the upper part; the hounds are the enlarged parts just below the eyes of the rigging; the body is the part between the hounds and the deck; the partners the portion which passes through a deck; and the heel is the lower end. Lower masts alone have partners (since the upper masts do not pass through decks) and they have tenons at the heel which fit in the mast step on the keelson. They are held in position by wedges at the partners and by the rigging. Of the latter, the shrouds lead from the masthead just above the hounds to each side of the ship, where they spread out fanwise and sustain the mast against thwartship pressure; the stays lead from the masthead forward along the centre line of the ship, furnishing strength in that direction; while the backstays, also descending from the masthead, extend to the sides of the ship abaft the shrouds to resist the forward pull of the sails. Upper masts have similar rigging, but the lower ends are secured differently. The heel passes through a hole in a heavy iron-bound wooden block called a cap, which is secured to the head of the lower mast, and extends downward to the trestletrees, between which it passes and to which it is secured by a heavy piece of wood or iron, called a fid, passing through the mast and trestletrees or simply resting on the latter, the heel extending beyond the fid hole far enough to be held from horizontal movement by a framed hole between the trestletrees. On the head of the uppermost mast there is usually placed a small disk of wood called the truck, which has sheaves or holes for signal halyards.

Upper masts and the lower masts of schooners and of other fore-and-aft-rigged craft are (when the masts of the latter are not of iron) almost invariably of one stick, the sliding of yards and of the hoops of fore-and-aft sails being interfered with if bands are used. When masts are large and made of a single stick they form no inconsiderable item in the equipment of a ship, for they must be straight, free from blemishes, cracks, deep-seated knots, etc. They are usually of pine, spruce, or fir, which woods combine lightness with strength in addition to other desirable qualities.

As regards position in a ship masts are variously named. In two-masted vessels the forward is called the foremast, the after one the mainmast. In three-masted ships the forward one is the foremast, the middle one the mainmast, the after one the mizzen or mizzenmast. When there are four masts, all large, they are called the foremast, forward mainmast, after mainmast, and mizzen; if the after mast is small, they are called the foremast, mainmast, mizzen, and jigger. When the masts exceed four in number there is no fixed rule for naming.

The masts of large modern steamers and men-of-war are used for signal and lookout purposes. They are of many types, especially in men-of-war. The battleships of the United States navy are fitted with tall circular structures built of steel tubing which have the appearance of openwork or cage towers. The broad bases of these "cage" masts obviate the necessity of stays and the numerous elements permit them to withstand the hits of many projectiles without collapsing or falling. In the British navy and some other services tripod masts are fitted. The masts of large war vessels usually carry one or more observation or searchlight platforms, but fighting tops are no longer fitted on masts nor are guns mounted in any way upon them. See SHIP; SHIP, ARMORED; SHIPBUILDING.

MAS'TABA. An Arabic word of uncertain derivation, meaning a bench, applied by Mariette to Egyptian tombs of a type which prevailed under the Memphite dynasties of the ancient Empire. Many hundreds of these tombs exist in the great necropolis between Abu Roash and Dashur, especially at Gizeh and Saqqara. They are oblong, benchlike structures with flat roofs of stone and walls of sun-dried brick or of stone, having a slight inclination or batter inward. They vary in size from 19 by 25 feet to 84 by 172 feet, and are carefully oriented, with the long axis set north and south. Upon this axis an opening in the roof marks the mouth of the burial shaft, which leads to the mummy chamber, cut in the rock at a depth of some 40 feet. The mastaba itself is sometimes solid, sometimes chambered. The solid mastaba has upon its eastern face a rectangular recess, containing an inscribed stele. In the chambered mastaba a doorway set in a recess, which in the more important examples forms a spacious vestibule or porch fronted by twin piers, gives access to the chamber or chapel. This is often richly adorned with mural paintings, designed for the delectation of the *ka*, or disembodied double of the deceased, and invariably possesses on its western wall an inscribed stele and a sculptured door, through which the *ka* might eventually pass to the land of the Sun of Night. From this chamber also small openings lead to the *serdabs*, or secret chambers containing the *ka* statues, by means of which the *ka* was supposed to retain

his or her identity while confined in the limbo of the tomb. Sometimes these openings are wanting, the *serdabs* being hermetically sealed. The chapel was open to any one to enter. Consult: Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. i (Paris, 1882); A. E. Mariette, *Les mastabas de l'ancien empire* (ib., 1881–87); Adolf Erman, *Life in Ancient Egypt* (New York, 1894); Georges Bénédite, "Les origines du mastaba," in *Musée Guimet, Annales*, vol. xxx (Paris, 1908). An excellent model of a mastaba, showing internal arrangements, is illustrated in the *Bulletin of the Metropolitan Museum of Art*, vol. viii (New York, 1913).

MAS'TER (OF. *maistre*, Fr. *maître*, from Lat. *magister*, leader; connected with *magnus*, Gk. *μέγας, megas*, great). The proper designation of the commander of a merchant vessel. The courtesy title of captain which is generally accorded him is a military designation properly belonging to the naval service only. The rank of master existed in the United States navy and was the title of an officer next junior to lieutenant. It was the survival of the term "sailing master," which in turn was a relic of the days when ships were commanded and fought by soldiers but navigated and manœuvred by the sailing master and his crew of seamen. The Act of Congress of August, 1882, changed the title of master to that of lieutenant (junior grade).

MASTER AND SERVANT. In its broadest sense, persons in such a relation that one is employed to work for and represent the other. Modern law, however, distinguishes the employee who is engaged to represent his employer in business transactions involving the making of contracts on the employer's behalf from others, and designates him as agent (q.v.). This article will be confined to the law of master and servant in its narrower sense—to the rules governing the relation of persons where one is employed to render service for the other but not to bind him by contract.

Formerly servants were classified as voluntary and involuntary, the latter including slaves and apprentices (see APPRENTICE). As slavery, or involuntary servitude, has, except as a punishment for crime, disappeared from every common-law jurisdiction, and as apprenticeship has largely lost its importance, only voluntary servants will be here considered. Eminent legal writers hold that some of the rules governing master and servant to-day "can only be explained by going back to the time when servants were slaves." For example, it is said the genesis of the master's extraordinary liability for acts of his servant which he has neither commanded nor approved is found in the right of the ancient master to surrender the slave who has injured another. This and similar views, however, have not been sufficiently established.

The modern servant becomes such as the result of an agreement with the master which either party may break at will, subject only to the usual consequence that the party in the wrong is liable to pay damages for the breach of contract. If the contract is not to be performed within a year after it is made, it is required by the Statute of Frauds (q.v.) to be in writing. If, however, it be for an indefinite period, which may end within a year after the agreement is entered into, no writing is necessary. Thus, a contract of service, to continue indefinitely during the life of either party thereto, may be made orally, since it may terminate within a year after it is made. And even when an oral agreement is made for a term longer than a year, if the master receive and accept services rendered by the servant and then refuse to go on and complete the contract, the latter may recover, in an action in quasi contract, technically called a *quantum meruit*, the value of the labor he has thus performed. When the services continue for a year, and after its expiration the servant remains in the same employment without any further expressed agreement, a renewal of the contract for another year and upon the same terms is presumed. In the absence of special contract as to the time of service it is sometimes difficult to determine whether the hiring is for a year or for a shorter period, such as a month, week, etc. The common instance of the hiring of farm hands, in which each of the interested parties had a right, in the absence of any contract stipulations, to assume that the services would continue through the four seasons, gave rise to the presumption, which came to be applied to most contracts of hiring in England, that if no time were specified an agreement was meant to last for one year. But this presumption is easily overcome by slight evidence of facts and circumstances which indicate a contrary intention. Thus, the period for which the wages are to be paid, as by the quarter, month, week, etc., will frequently be decisive in proving the hiring to be for a year, a month, a week, etc., as the case may be. And it may be laid down as the general rule in the United States that where the contract is silent as to the term of service and there is no well-defined usage in the particular community on the subject, the hiring is terminable at the will of either party.

After the relation has been duly constituted we have to consider (1) the mutual duties and liabilities of the parties and (2) their respective rights and liabilities with respect to third parties.

1. **Mutual Duties and Liabilities.** The servant is bound to have competent skill for the service which he undertakes, to exercise due diligence in his work, to obey all lawful orders of his master concerning the labor for which he was engaged, to conduct himself respectfully, and not to leave his employment during the time for which the contract was made. If he leave the master without just cause during the stipulated time, he cannot recover unpaid wages for the services already rendered, and if he be rightfully discharged he forfeits his wages for the period during which he has served without payment. But if he be prevented by sickness from completing his part of the contract, he may recover for the value of the services which he has rendered. If his unjustifiable breach of contract result in damage to his employer he is liable therefor. In some cases servants may be enjoined by the courts from breaking their contracts of service. (See CONSPIRACY; STRIKE.) Some of the grounds on which a servant may be lawfully discharged before the expiration of his term are gross immorality, willful disobedience of orders, habitual negligence, and glaring incompetence to perform his duties. If during his term he be discharged unjustly and without sufficient cause, he may either treat the contract as rescinded and sue for the value of the services already rendered, or he may sue for the breach of the contract and in that action recover both the value of the services already rendered and

the compensation for the damages sustained by him because of his wrongful discharge. But it is always his duty, during the residue of the term for which he was employed, to seek for other employment of a similar character in the same locality, in order to reduce as much as possible the damages recoverable against his master. If he do not thus seek and accept such similar employment as he may be able to obtain, the master may show that fact, in mitigation of damages, in the action brought by the servant for the breach of the contract. If, after the contract is made, the master neglect or refuse to furnish work pursuant thereto, the servant may recover as damages the entire amount of the stipulated wages, if he have duly held himself in readiness to perform and been unable by reasonable effort to obtain other employment of a similar character. If he sue, however, before the expiration of the stipulated time and recover damages up to the time of trial, he will be thereby barred or precluded from maintaining any further action for subsequently accruing damages. This results from the principle that a contract for work and services is entire, and its breach gives only one right of action. When a servant becomes sick the master is generally under no obligation to supply him with medical attendance; but an implied contract to pay for the services of a physician who is called in is frequently fastened upon the master from the fact that he has the physician called and otherwise acts as if he were assuming the obligation.

While, as a rule, the servant takes upon himself all the ordinary risks incident to the employment, still the master is under a legal obligation to use reasonable and ordinary care to supply the servant with safe machinery and appliances with which to work; and if, because of the master's failure to perform the duty properly, the servant be injured, without any contributory negligence on his own part, he may recover, in an action against his master, compensation for the damages thus sustained. If the servant be employed upon work involving special risks, of which he cannot be presumed to be cognizant, it is the duty of the master to inform him of such risks, or the master will be chargeable with negligence. Where the labor is in connection with specially dangerous machinery—such, e.g., as that used by railroad companies—the courts require the master to have the same very carefully inspected, to see, as far as is reasonably possible, that it is safe; but even in such cases they do not go to the extent of making the master an insurer of the servant's safety in the use of such machinery. If a servant be aware of the dangerous character of the place in which, or machinery or tools with which, he is requested by the master to work, and continue in his employment without objection on that ground, he cannot recover damages from the master for an injury which results from any such cause. If the master willfully injure the servant, or by his personal neglect or wrongful act cause him injury in other ways than through defective machinery, place of labor, or implements of toil, he is liable to such servant in damages. In entering upon his employment the servant also voluntarily takes the risk of injury which may result from the negligence or wrongful acts of his fellow servants (q.v.), except in cases coming within the provisions of modern statutes relating to employers' liability (q.v.).

Although it is customary for the master to give a testimonial of character to an honest and capable servant at the termination of his employment, he is not legally bound to do this, in the absence of a contract or a well-defined usage therefor.

2. Their Rights and Liabilities with Respect to Third Parties. The master is entitled to the services of his servant in accordance with the contract of hiring. He may, therefore, justify an assault necessarily made in defense of his servant and may have an action for damages against any one who wrongfully beats or injures the servant so that his services are lost or impaired. So if any one entice away the servant and thereby cause loss to the master, the latter may recover in an action the damages for the injury thus sustained. If a female servant be seduced, her master may sue for consequent loss of services.

For his acts of negligence or positive wrong which result in injury to others a servant is, of course, personally liable. But since he is so often pecuniarily irresponsible, the question most frequently litigated is that of the extent of his master's liability for such acts. The general statement of the rule is that the master is liable for the wrongful acts or torts of his servant which are within the scope of his employment and which cause injury to third persons. Even though the act of the servant be a willful wrong, yet when it is done in connection with the master's business or in furtherance thereof, it may make the latter liable for injury thereby occasioned to third parties. But when the servant leaves and loses sight of his master's business, and wantonly does a wrongful act, he alone is liable for consequent injury to others. When a servant creates a nuisance upon his master's premises, whereby injury is caused to adjoining property, and when a servant prevents his master from performing a contract by which the latter is bound, the master is liable, even though the act of the servant were willful and malicious. So a carrier of passengers is bound to protect them from injury resulting from the violence or insults of his own servants, and will be liable if while passengers they be thus injured.

For important statutory changes in the law of master and servant, see COMBINATION; CONSPIRACY; EMPLOYERS' LIABILITY; FELLOW SERVANTS; LABOR LEGISLATION; STRIKES. Other statutes have for their objects the prevention of the employment of young children in certain lines of work; securing the payment of wages in money and at stated times; limiting the hours of labor which masters may require of their servants; and the like.

Bibliography. Holmes, *The Common Law* (Boston, 1881); James Kent, *Commentaries on American Law* (ib., 1896); Huffcut, *Agency, Including the Law of Master and Servant* (ib., 1901); Reinhard, *Agency, Including Master and Servant* (Indianapolis, 1902); F. F. Dresser, *Employers' Liability* (St. Paul, 1902); Pollock and Maitland, *History of English Law* (2d ed., Cambridge, 1903); C. B. Labatt, *Commentaries on the Law of Master and Servant* (Rochester, 1904); C. M. Smith, *A Treatise on the Law of Master and Servant* (6th ed., Toronto, 1906); John Macdonnel, *Law of Master and Servant* (2d ed., ib., 1908); J. D. Wilkinson, *Personal Injuries and Somewhat of the Relation of Master and Servant* (New Orleans, 1909).

MASTER-AT-ARMS. A petty officer in the navy who forms one of the police of a ship. In the United States navy there are four grades of masters-at-arms—chief master-at-arms and masters-at-arms of the first, second, and third class. Large ships have one or more chief masters-at-arms and several of the lower ratings. In small ships a first or second class master-at-arms is the chief of the ship's police.

MASTER BUILDER, The. A drama by Ibsen (1893). The original title is *Master-Builder Solness.*

MASTER HUMPHREY'S CLOCK. Tales by Charles Dickens which appeared in a weekly of this name. "Old Curiosity Shop" and "Barnaby Rudge," purporting to have been narrated by Master Humphrey, were the stories. They were subsequently published separately.

MASTER IN CHANCERY. An officer of a chancery or equity court, appointed to assist the chancellor or judge. The office is one of great antiquity. Formerly the masters were assistants or associates of the chancellor and the Master of the Rolls and sat with them in court by turns, usually two at a time. In later times, however, this practice was discontinued and the duties of masters confined to business transacted in chambers, some of their duties being purely ministerial and administrative and some of a judicial character. It was common practice to refer causes to a master for hearing, particularly causes involving intricate accounts and requiring computation. A master is often appointed to examine witnesses, to take depositions, to inquire into and report the facts of a case to a chancellor or judge of the court, to make settlements under deeds, to discharge special duties under the direction and in behalf of the court, etc. Masters in chancery were formerly clerks in chancery, 11 in number, besides the Master of the Rolls, who was their chief. They were at first called *preceptores,* but in the reign of Edward III came to be known as masters in ordinary. The office has been abolished in England, the duties formerly belonging to masters being now discharged by judges or registrars and by masters of the Supreme Court. In most of the United States the office still exists, the officer being sometimes called a master and sometimes commissioner (q.v.). See Master of the Rolls; Masters of the Supreme Court; Referee.

MAS'TERMAN, Arthur Thomas (1869–). An English zoölogist, born at Tunbridge Wells, a brother of C. F. G. and J. H. B. Masterman. He was educated at Weymouth and at Christ's College, Cambridge. At St. Andrews he was assistant professor of natural history in 1893–99 and at Edinburgh lecturer on biology and zoölogy at the School of Medicine in 1900–03. In 1903 he became superintendent inspector to the Board of Agriculture and Fisheries, and from 1905 to 1912 he was British Government expert to the International Council for the Study of the Sea. With W. C. McIntosh, of St. Andrews, he wrote the valuable *Life-Histories of the British Marine Food-Fishes* (1897), and alone he made many contributions to technical periodicals and published an *Elementary Text-Book of Zoölogy* (1901–02).

MASTERMAN, Charles Frederick Gurney (1873–). An English publicist and author, born in Sussex, a brother of A. T. and J. H. B. Masterman. He distinguished himself as a student at Christ's College, Cambridge, of which he became a fellow in 1900. After leaving the university he became known as a contributor to the London weeklies and magazines and as literary editor of the *Daily News.* He was connected with London poor-work administration and acted as lecturer for the Cambridge and London University Extension societies. As a Liberal, he sat in Parliament for West Ham from 1906 to 1911 and for South-West Bethnal Green thereafter till 1914. In 1909–12 he was Undersecretary of State, Home Department, and in 1912–14 Financial Secretary to the Treasury. In 1914 he was appointed Chancellor of the Duchy of Lancaster, but resigned the next January. He wrote: *Tennyson as a Religious Leader* (1899); *The Heart of the Empire* (1901); *From the Abyss* (1902); *In Peril of Change* (1905); *The Condition of England* (1909); *Modern Industrialism* (1912).

MASTERMAN, John Howard Bertram (1867–). An English clergyman and historian, brother of A. T. and C. F. G. Masterman. He was educated at Weymouth College, at University College School, and at St. John's College, Cambridge, where he was lecturer and Naden divinity student in 1894–96. He was for three years a university-extension lecturer and vicar of St. Aubyn's, Devonport. Then for 10 years he was in Birmingham, being principal of the Midland Clergy College (1899–1901), warden of Queen's College (1902–07), canon of Birmingham (1906–07), and professor of history in the university (1902–09). He was afterward canon of Coventry and rector of St. Mary-le-Bow Church, Cheapside. Masterman served as Hulsean lecturer at Cambridge in 1907–08. He published: *The Age of Milton* (1897), *Introduction and Notes to the First Epistle of St. Peter* (1900), *Was Jesus Christ Divine?* (1904), *I Believe in the Holy Ghost* (1906), *Rights and Responsibilities of National Churches* (1908), *The House of Commons* (1908), *Parliament and the People* (1909), *The Dawn of Mediæval Europe* (1909), *History of the British Constitution* (1912), *The Challenge of Christ* (1913).

MASTER OF ARTS. A degree conferred by colleges and universities. In those of the United States and Great Britain this title follows that of Bachelor of Arts. In the United States a corresponding master's degree follows a bachelor's degree in science, philosophy, or other baccalaureate designations and indicates a year's study beyond the baccalaureate course. The master's degree is the highest in the faculty of arts, but inferior to that of bachelor of divinity and the doctorate of philosophy. In the early universities the mastership or licentiate, as it was then called, was the one degree conferred, the baccalaureate then being a mere preliminary degree, and the doctorate being either a synonymous term or one used to indicate the ceremonial and official aspect of the licentiate. It is still the first degree conferred in the Scottish universities. In the universities of Germany the terms "mastership" and "doctorate" are yet sometimes used as synonymous. In the British universities the degree of Master of Arts is the highest degree taken by the majority of students, although the doctor's degree whether by research or examination is becoming more common, especially in the newer universities. At Oxford and Cambridge the M.A. degree is open without examination to those who hold the B.A. after a period of years on paying the necessary fees. The chief value of the degree at these univer-

sities, except that it indicates a certain standing, is that it is accompanied by the privilege of voting in Congregation at Oxford and the Senate at Cambridge, a privilege which on more than one occasion has led to the defeat of progressive measures by the large body of masters of art who are nonresident and often out of touch with the actual educational needs of the universities and the country. See BACHELOR'S DEGREE; DEGREE; UNIVERSITY.

MASTER OF THE BUCKHOUNDS. In Great Britain, an officer in the Master of the Horse's department of the royal household, who, with the hereditary lord falconer, has the control of all matters relating to the royal hunts. A salary of £1500 is attached to the office, which is regarded as one of considerable political importance. The Master of the Buckhounds goes out of office on a change of ministry.

MASTER OF THE HORSE. In Great Britain, an officer of the court who has the superintendence of the royal stables and of all horses and breeds of horses belonging to the sovereign. He has the privilege of making use of the royal horses, pages, and servants, and rides next to the sovereign on all state occasions. The Master of the Horse is appointed during pleasure, by letters patent; but his tenure of office depends on the existence of the political party in power. The office was an important post under the Byzantine emperors, where the count of the royal stables, the *comes stabuli*, or constable, exercised far greater powers than are conveyed by the mere title. In ancient Rome, when, in times of crisis, recourse was had to the creation of a dictator, the latter appointed a master of the horse as his chief lieutenant, corresponding to the modern chief of staff.

MASTER OF THE HOUSEHOLD. In Great Britain, an officer in the Lord Steward's department of the royal household, whose specific duties consist in superintending the selection, qualification, and conduct of the household servants. He is under the treasurer and with the comptroller examines the accounts of the department. The appointment is during pleasure of the sovereign and is not dependent upon any political party.

MASTER OF THE REVELS. An official of the English court (*Magister jocorum revellorum et mascorum*) who had charge of the royal festivities. The office came into prominence in the reign of Edward VI, though established at an earlier date.

MASTER OF THE ROLLS. The president of the chancery division of the High Court of Justice in England and in rank next to the Lord Chief Justice of England and the Lord Chancellor. He is the keeper of the rolls of all patents and grants that pass under the Great Seal and of all records of the Court of Chancery. He was originally an officer of that court and was formerly the chief of the masters in chancery. He is the only superior judge in England who can now be elected to represent a constituency in the House of Commons. The Master of the Rolls had originally the custody of the rolls or records; in the course of time this charge became merely nominal, the custody having vested in officers not in his appointment or control, an anomaly which was remedied by 1 and 2 Vict., c. 94, which restored the custody to him with extensive powers. Consult Hardwicke, *Office of the Master of the Rolls* (London, 1728); D. M. Kerly, *Historical Sketch of the Equitable Jurisdiction of the Court of Chancery* (Cambridge, 1890); Pollack and Maitland, *History of English Law* (2d ed., ib., 1903).

MASTER OF THE SACRED PALACE. See MAGISTER SACRI PALATII.

MASTER OF THE SUPREME COURT. The title given in England to the chief officers of the courts under the judges, their duty being to attend the sittings of the courts during term and make minutes of their proceedings. They also tax all the bills of costs of the parties arising out of the suits and matters before the courts and exercise many judicial as well as most of the administrative functions of the courts to which they are attached. Their duties are determined by rules of the Supreme Court. The power of appointing the masters is vested in the Lord Chancellor, the Lord Chief Justice of England, and the Master of the Rolls. There are 18 masters attached to the King's Bench Division of the Supreme Court and 16 to the Chancery Division. In the courts of the United States the duties of masters are divided between the judges and the clerks of the courts. Consult Renton and Robertson (eds.), *Encyclopedia of the Laws of England* (2d ed., London, 1908). See MASTER IN CHANCERY; MASTER OF THE ROLLS.

MAS'TERS, MAXWELL TYLDEN (1833–1907). An English botanist, born at Canterbury, England. He was educated at King's College, London, and from 1855 to 1868 was lecturer on botany at St. George's Hospital. In 1865 he became the principal editor of the *Gardener's Chronicle*. Among his general publications are: *Vegetable Teratology* (1869; in German, 1886); *Botany for Beginners* (1872); *Plant Life* (1883); *Plant Life on the Farm* (1905). *Botany for Beginners* and *Plant Life* were translated into French, German, and Russian. The Conifers were the special subject of his investigations, and many papers dealing with them appeared in various scientific serials.

MAS'TERS, THE SEVEN WISE. See SEVEN WISE MASTERS.

MASTERSINGERS. See MEISTERSINGER.

MAS'TERWORT (trans. of Neo-Lat. *Imperatoria*, fem. sing. of Lat. *imperatorius*, imperial), *Imperatoria ostruthium*. A perennial plant of the family Umbelliferæ, from 1 foot to 2 feet high, with broad biternate leaves, large flat umbels of whitish flowers, and flat, orbicular, broadly margined fruit. It is a native of the north of Europe and has been introduced in a few localities in America. It was formerly much cultivated as a potherb and was held in great repute as a stomachic, sudorific, diuretic, etc.; its virtues being reckoned so many and great that it was called *divinum remedium*. It still retains a place in the medical practice of some countries of Europe, although probably it is nothing more than an aromatic stimulant. The root has a pungent taste, causes a flow of saliva and a sensation of warmth in the mouth, and is said to afford relief from toothache. Some recent monographers have separated this and its related species from *Peucedanum*, grouping them in the genus *Imperatoria*.

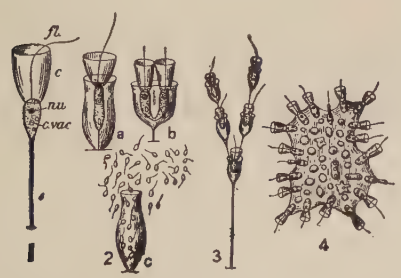
MAS'TIC (Fr. *mastic*, from Lat. *mastiche*, from Gk. μαστίχη, *mastichē*, mastic, from μαστίζειν, *mastizein*, to chew; so called because used as chewing gum in the East). A species of gum resin yielded by the mastic or lentisk tree (*Pistacia lentiscus*, *Pistacia atlantica*) and other species of the family Anacardiaceæ. It

oozes from cuts made in the bark and hardens on the stem in small, round, tearlike, straw-colored lumps, or, if not collected in time, it falls to the ground; in the latter state it acquires some impurities and is consequently less valuable. Its chief use is in making the almost colorless varnish for varnishing prints, maps, drawings, etc. It is also used by dentists for stopping hollow teeth and was formerly employed in medicine as a mild stimulant. Small quantities are exported chiefly from the Morocco coast, but some is occasionally shipped from the south of Europe. The name mastic is also given to oleaginous cements, composed of about seven parts of litharge and 93 of burned clay, reduced to fine powder, made into a paste with linseed oil. See SIDEROXYLON.

MAS'TIFF (OF. *mestif*, Fr. *métif*, of mixed breed, mongrel, from Lat. *mixtus*, p.p. of *miscere*, Gk. *μίσγειν*, *misgein*, *μιγνύναι*, *mignynai*, to mix, Skt. *miśra*, mixed, OChurch Slav. *mĕsiti*, Welsh *mysgu*, Gael. *measy*, OHG. *miskan*, Ger. *mischen*, AS. *miscian*, Eng. *mix*). A large dog of the hound group, kept since ancient times to guard property, and more recently as a pet. See HOUND.

MASTIFF BAT. One of a group of tropical American bats (genus *Molossus*), characterized by mastiff-like faces, general muscularity, and long, thick tails free from the membrane. They are better able than most other bats to scramble about on their feet. They assemble in large companies in hollow trees, caverns, and old houses, and sometimes constitute a nuisance by taking possession of roofs and garrets. One species (*Molossus periotis*) measures 2 feet across the outstretched wings. Consult P. H. Gosse, *A Naturalist's Sojourn in Jamaica* (London, 1851), and H. W. Bates, *The Naturalist on the River Amazons* (ib., 1910).

MAS'TIGOPH'ORA (Neo-Lat. nom. pl., from Gk. *μαστιγοφόρος*, *mastigophoros*, whip-bearing, from *μάστιξ*, *mastix*, whip + *φέρειν*, *pherein*, to bear). A class of Protozoa characterized by the presence of one or more flagella, or lashlike appendages. Some (*Euglena*) approach the plants and were formerly placed with them; others



CHOANOFLAGELLATA MASTIGOPHORA.

1, Monosiga; 2, Salpingoëca; 3, Polyeca; 4, Proterospongia; 2*b* illustrates longitudinal fission; 2*c*, the production of germs (flagellulæ); *c*, collar; *c.vac*, contractile vacuole; *fl*, flagellum; *l*, lorica; *nu*, nucleus. (After Kent.)

closely resemble Rhizopoda. The group is divided into four orders: (1) Flagellata (q.v.); (2) Choanoflagellata; (3) Dinoflagellata; (4) Cystoflagellata. See NOCTILUCA.

The Choanoflagellata, or collared monads, are mostly fixed and remarkable for their collar, a vaselike prolongation of the protoplasm of the body. In this respect they resemble the collared digestive cells lining the digestive sacs (ampullæ) of sponges. These forms are fixed or stalked, and tend to grow in colonies, so as to suggest the derivation of the sponges from some such forms. They have but a single flagellum, but no trace of a mouth or gullet. They multiply by longitudinal fission, or produce numerous young (flagellulæ).

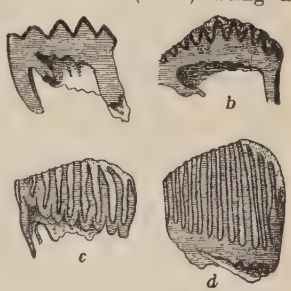
The third order, Dinoflagellata, move by means of two flagella, and are remarkable for having the body often protected by a very beautiful and elaborate shell formed of cellulose in plates, which is provided with three long processes or horns. They are mostly marine. Some are phosphorescent, while certain species occasionally abound in such enormous numbers as to color the sea water deep brown or red. See RED WATER.

Of the Cystoflagellata, which have two flagella, one is modified into a large long tentacle, the other minute and situated within the gullet. *Noctiluca* (q.v.) is the type.

MASTI'TIS. See MAMMARY GLAND, DISEASES OF; MAMMITIS.

MAS'TODON (Neo-Lat., from Gk. *μαστός*, *mastos*, breast + *ὀδούς*, *odous*, tooth). The name for a genus of extinct elephants. This genus is that most remote from the family type (*Elephas*) and nearest the *Dinotherium* type, by reason mainly of the structure of its molar teeth, which are provided with but few transverse ridges—not more than five—that have a $\wedge$ form in cross section (occasionally broken into isolated conical tubercles) and are separated by little or no cement. (See MAMMOTH.) Another dental difference of the Tertiary mastodons from nearly all other Elephantidæ is its possession of milk molars, which in some instances persist through life, the permanent dentition in such cases being a mixture of milk and permanent teeth. Tusks (incisors) sometimes occur in both jaws.

Mastodons began to exist in the Miocene age and became extinct in the Pleistocene. They were scattered all over the globe, and more than 30 species have been distinguished by paleontologists, the latest described (1901) being a small and primitive type discovered in Egypt. This seems to confirm the prevailing opinion that the group originated in the Old World and spread to America by way of Siberia. Two or more species belong to South America (Patagonia), where no other elephant has thus far been found. It is probable that several species lived in North America, but the one best known and commonly in mind when the term is used is *Mastodon americanus*. This species seems to have ranged over all the United States and southern Canada and to have been numerous, for its teeth and bones, in a more or less perfect condition, are repeatedly found. A dozen or more mounted skeletons are on exhibition in



TEETH OF ELEPHANTS.

Comparison of tooth structure of proboscideans, shown by vertical cross sections of molars; *a*, mastodon; *b*, *Elephas insignis*, a fossil species intermediate between mastodons and true elephants; *c*, African elephant; *d*, mammoth. This series exhibits progress from simplicity to complexity.

museums in New York, Chicago, Pittsburgh, Cambridge, Mass., Albany, N. Y., and elsewhere. Careful comparison and study of these and other specimens show that this mastodon at least must have had the general form and appearance of a modern elephant, with a somewhat heavier body and flatter forehead than that of the mammoth or Indian elephant; nor did its height exceed theirs on the average—if anything it was less, owing chiefly to the shortness of the legs. The tusks, too, were of similar length (9 feet, measured along the outer curve, indicating an old and large male), and they had a characteristic tendency to curl upward, in much the same way as in living elephants. It is probable that the animal, at any rate in the more northerly parts of its range, was warmly clothed, like the mammoth, although there is not much direct evidence of it beyond the discovery, many years ago, of a large mass of woolly brown hair buried in a bog in Ulster Co., N. Y., in apparent connection with mastodon remains. Several of the most complete skeletons known have been obtained from that region, where animals had become mired in swampy valleys. The disappearance of this numerous and widespread species is as incomprehensible as in the case of the mammoth and the South American horse. That it existed until recent conditions were established is plain. The food remains in its stomach have been repeatedly analyzed and found to consist of herbage, bark, and leaves especially of conifers of the same kinds as now grow in the place where its bones lay. Workmen who came upon and broke mastodon bones in an Illinois peat bog (see *American Naturalist*, January, 1882) greased their boots with the marrow fat. It is the opinion of competent judges that remnants of the herds survived the advent of mankind into North America; there being many positive statements on record as to arrowheads lying among mastodon bones. On the whole, American geologists think it highly probable that the mastodon and man were briefly contemporary in North America and that it was the ancestors of the Indians who exterminated this unwieldy animal.

Consult: J. C. Warren, *The Mastodon Giganteus of North America* (Boston, 1855); F. A. Lucus, "Animals of the Past," in *American Museum of Natural History, Handbook Series No. 4* (New York, 1913); W. B. Scott, *A History of Land Mammals of the Western Hemisphere* (ib., 1913).

MAS'TODONSAU'RUS (Neo-Lat., from *mastodon*, mastodon + Gk. σαῦρος, *sauros*, lizard). The largest known labyrinthodont batrachian, found fossil in Triassic rocks of Württemberg, England, and India. The body attained a length of nearly 10 feet and the skull alone had a length of about 4 feet. See STEGOCEPHALIA.

MASTOIDI'TIS. See EAR.

MASUDI, mȧ-sōō'dē (Ar. ABU'L HASAN 'ALĪ AL MAS'ŪDĪ) (?–c.956). One of the most eminent Arabian geographers and historians. He was born in Bagdad, descended from a distinguished family, one of whose members, Mas'ud, was a companion of Mohammed on his flight to Medina. Masudi early devoted himself to profound studies; he also undertook extensive journeys into many lands even beyond the bounds of Islam. After traveling through Persia and Kirman he came in 916 to India, where he visited Multan and Mansura; thence he went to Ceylon and subsequently proceeded east as far as China. On his way back he spent some time in Madagascar and Oman. To the north he went to the Caspian district, and in 926 we find him at Tiberias in Palestine. In 943 he was at Antioch and two years later in Damascus. The rest of his life he spent in Syria and Egypt, dying at Fostat about 956. He was a geographer, philosopher, student of religions, familiar with Judaism and Christianity, and a historian acquainted with the ancient and mordern history of the East and West. His *Kitāb Akhbār al-Zamān* contained a universal history in 30 volumes; his *Kitāb al-Ausat*, a short chronological account of the world's history. Masudi combined these two in a more popular work called *Murūj al-Dhahab* (Meadows of Gold), in which he gives a general view of the political, religious, and social history of the most important Asiatic and European countries, as well as of their geography (ed. Bulak, 1866, Cairo, 1886; with French trans. by De Meynard and De Courteille, 9 vols., Paris, 1861–77; vol. i in English by A. Sprenger, London, 1841). A still more general work on history and geography was his *Kitāb al-Tanbīh* (ed. De Goeje, Leyden, 1894; partially trans. by De Sacy in *Notices et extraits*, vol. viii, and in vol. ix of the French trans. of the *Meadows*). Another work, also called *Akhbār al-Zamān*, is falsely ascribed to him. Consult: Carra de Vaux, *L'Abrège des merveilles* (Paris, 1898); Karl Brockelmann, *Geschichte der arabischen Litteratur*, vol. i (Weimar, 1899); R. A. Nicholson, *A Literary History of the Arabs* (Cambridge, 1907).

MASULIPATAM, mȧ-sōō'lē-pȧ-tăm'. The capital of the District of Kistna, Madras, British India, 215 miles north of the city of Madras, on the Bay of Bengal on one of the mouths of the Kistna (Map: India, D 6). Its former brisk export trade in cotton manufactures is in a state of decline and at present the city is of little industrial importance. There are still small industries in weaving, bleaching, and printing. Masulipatam was visited by a very severe storm in 1864, during which it is estimated that nearly 30,000 persons were killed. Its chief institution is Noble College. Pop., 1901, 39,507; 1911, 42,123.

MASURENLAND, mȧ-zōō'ren-länt. The name of the section of East Prussia which includes in the broadest sense the circles of Johannisburg, Sensburg, Lyck, Lötzen, Ortelsburg, Neidenburg, Rössel, Oletzka, Osterode, and Allenstein. The land is one of gently rolling topography, marked by hundreds of lakes, some of them basins with many branches, and some long narrow channels with several pieces of water following one another like beads on a string. The most important of these lakes, Mauer and Spirding, cover an area of more than 40 square miles. The whole region is connected by a canal system over 100 miles in length. Lyck is commonly called the capital of the entire district. Some years ago the German government thought of draining part of this region as Frederick the Great had done in the middle of the eighteenth century. The military authorities strongly objected, contending that this section would always be a barrier to a Russian invasion. The wisdom of following the latter course was well illustrated in the European War which began in 1914. On several occasions in the winter of 1914–15 the Russians made inroads into Masurenland. With the coming of spring and the melting of the ice they were compelled to retreat so as not to have their

lines of communication effectively cut. See WAR IN EUROPE.

MAT. See MATTING.

MA'T (Egypt. *Ma'et*, truth). An Egyptian deity, the goddess of truth and justice. She is usually represented as a woman wearing upon her head an ostrich feather, and occasionally her eyes are bandaged to indicate that she judges without respect to persons. She is always present at the judgment of the dead (q.v.), and it is her symbol, the feather, against which the heart of the deceased is weighed. At all periods the kings of Egypt professed themselves zealous worshipers of the goddess; judges especially were her priests and wore her image when on the bench. Ma't was the daughter of the sun god Rê; by the Greeks she was identified with Themis. Consult Alfred Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897), and A. E. T. W. Budge, *The Gods of the Egyptians*, vol. i (London, 1904). See Plate of EGYPTIAN DEITIES.

MATABELELAND, măt'ȧ-bē'lē-lănd. One of the two divisions, or provinces, of Southern Rhodesia, lying east of the Bechuanaland Protectorate and separated from the Transvaal by the Limpopo River (Map: Africa, G 6). In 1888 the Matabele came within the British sphere of influence by a treaty signed by their chief, Lobengula. The following year they were brought under the administration of the British South Africa Company, against which they declared war in 1893. They were subdued after a spirited campaign, during which Lobengula died. In 1896–97 there was another revolt, after which the natives were allowed a share in the government, the country being divided into districts, each with a native commissioner, responsible for the good conduct of his people. The white population in 1911 numbered 10,975; native population, 249,108; in addition there were a number of Asiatics and other colored persons. The chief towns are Buluwayo, Gwelo, and Selukwe. Buluwayo had 5200 white inhabitants in 1911; it is on the main line of the "Cape to Cairo" Railway, 1362 miles from Cape Town, and is connected by rail with Salisbury, in Mashonaland, and with the Gwanda mines. See RHODESIA.

The Matabele, or Matabili, are a Zulu people of Bantu stock driven out of the Transvaal by the Boers into South Zambezia, thenceforth known as Matabeleland. The celebrated chief Umsilikatzi in 1838 led the exodus and after crossing the Limpopo established his seat of government at Buluwayo. His successor (1870) was the chief Lobengula. The Zulu military organization copied from Europeans enabled the Matabele, previous to British domination, to harass and almost destroy the surrounding Mashonas and other peoples and rendered much of the territory beyond the Limpopo a wilderness.

The Matabele are herdsmen and to their cattle they attach the highest importance, but they also raise great crops of maize, tobacco, and other agricultural products. Their houses are thatched, circular in plan, and have conical roofs. The villages have no particular arrangement. The women brew beer and grind maize as their principal duties. The men are brave hunters and are accustomed to attack the lion with their assegais. They smelt iron and work it into spears, battle-axes, hoes, etc. Rude pottery is made, and cloth from bark. They are polygamists. Ancestor worship is the most prominent feature of their religion. Consult: Frank Oates, *Matabele Land and the Victoria Falls* (London, 1881); Montague, *The Interior of Central Africa* (ib., 1886); Wills and Collingridge, *The Downfall of Lobengula* (ib., 1894); Norris *Matabeleland* (ib., 1895); R. S. S. Baden-Powell, *The Matabele Campaign* (2d ed., ib., 1901).

MATACHINES, mä'tȧ-chē'năs (from Sp. *matachin*, clown performer, masked dancer). A kind of dramatic dance given at Christmas time by the Spanish-speaking natives of New Mexico, that is usually said to relate to Montezuma, the last ruler of the Aztecs. The performers wear masks and headdresses and carry gourd rattles and three-tined wands, called "palms." The principal characters are El Monarca, "the monarch," i.e., Montezuma; La Malinche, a young and very pretty girl, who plays the leading female rôle (in reality the name Malinche is simply the Aztec pronunciation of Marina, the famous mistress of Cortés); El Toro, "the bull," a clown who wears a buffalo head and robe; and El Abuelo, "the grandfather," an old man who carries a whip and impersonates the Devil. The dance is partly processionial and partly stationary, with El Monarca either at the head of the procession or seated on a throne. La Malinche does a *pas seul* between the two lines of dancers, and according to one story succeeds by her gracefulness and beauty in relieving Montezuma from his melancholy and in making him return to his people, whom he had forsaken. Another explanation of the drama is that it represents an incident in the life of Cortés instead of Montezuma, and that La Malinche, Cortés's mistress, dances down between the lines of conspirators, learns their secret, and warns Cortés. There is undoubtedly an Indian element in the dance, and it belongs to a class of Indian-Spanish dramas, usually called *historias*, that are seen in many parts of Mexico and Central America.

MATACO, mȧ-tä'kō. A group of tribes constituting a distinct stock, ranging along the Vermejo River in the Chaco region of northern Argentina. They are pastoral hunters, subsisting entirely by hunting and fishing and the product of their horses and cattle. They fish with nets and arrows. They dress in skins and live in small brush huts, but are apt in the use of tools. They are rather under medium size, with hair frequently wavy. They are sometimes called Mataguayo, a name properly belonging to another tribe of Guaycuran stock living somewhat farther to the north. Consult: Lafone Quevedo, in *Instituto Geográfico Argentina, Boletin* (Buenos Aires, 1896–97); D. G. Brinton, *Linguistic Cartography of the Chaco Region* (Philadelphia, 1898); *Anales de la Sociedad Científica Argentina* (Buenos Aires, 1904); Schuller, *Sobre el origen de los charruás* (Santiago, 1906).

MAT'ADOR, *Sp. pron.* mä'tȧ-dōr'. See BULLFIGHT.

MATAGALPA, mä'tȧ-gäl'pȧ. A town of Nicaragua, capital of the Department of Matagalpa (Map: Central America, E 4). It is situated on a plateau in the north-central part of the country and has a very pleasant climate. It is the centre of a rich agricultural district producing sugar, tobacco, and coffee. Stock raising, also, is carried on extensively. It is the seat of a United States consular agent. Pop. (est.), 15,749, largely native Indians.

MATAGUAYO, mä′tȧ-gwä′yō. An Indian stock of South America. See GUAIACURUAN; MATACO.

MATAJA, mȧ-tä′yȧ, VICTOR (1857–). An Austrian political economist, born in Vienna. He studied at the university of his native city, where he lectured from 1884 to 1890 on political economy. From 1890 to 1892 he was professor of law at the University of Innsbruck, and in the latter year he became councilor in the ministry and head of the Department of Statistics at Vienna. In 1897 he was appointed honorary professor of political economy in the University of Vienna. He published: *Der Unternehmergewinn* (1884); *Das Recht des Schadenersatzes vom Standpunkt der Nationalökonomie* (1888); *Grundriss des Gewerberechts und der Arbeiterversicherung* (1899); *Die Reklame* (1910).

MATAMATA, mä′tȧ-mä′tȧ (South American name). A large and singular turtle (*Chelys fimbriata*) of Guiana and northern Brazil, typical of the family Chelididæ. (See TURTLE.) In old age it is 35 to 40 inches long when the neck is outstretched; its rather flat shell is covered with large roughly conical shield plates in three fore-and-aft rows, with a margin of small rough plates. The plastron is weak and narrow. The neck is very long; the head is small and pointed, with the eyes small and close together; the ear flaps large; and the nose produced into a long soft tube at the end of which open minute nostrils. The jaws are very weak, and partly covered with smooth skin, so that prey (frogs, fishes, and the like) probably are sucked into the widely distensible throat rather than seized. The most remarkable thing about the creature, however, is the fact that its head and throat are covered with fringes of outgrowths of skin, in rows from its face to its shoulders. These float about like weeds as it lies quietly near the surface of the water, and conceal its true character so well that the small animals come within reach unsuspectingly. Not much is known of its life history or habits. See TURTLE.

MATAMOROS, mä′tȧ-mō′rōs. A town in the State of Tamaulipas, Mexico, on the south bank of the Rio Grande, 23 miles from its mouth and opposite Brownsville, Tex. (Map: Mexico, K 5). Its port is Bagdad (q.v.), and it is the seat of a United States consul, with which country it carries on a large trade. The chief exports are hides, skins, and cottonseed; the chief imports, manufactured goods from Great Britain and the United States. In 1913 its exports were valued at $2,388,173 and imports at $1,680,707. At the outbreak of the war between the United States and Mexico the Mexican forces were for some time concentrated here, but after the battle of Resaca de la Palma (q.v.) the city was evacuated and on May 18, 1846, the Americans under General Taylor took possession. Pop., about 10,000.

MATAMOROS, MARIANO (c.1770–1814). A Mexican patriot. Very little is known of his early life or education. He was a priest at a small village called Jantelolco, near Cuernavaca, when in 1811, aroused by the constant insults and atrocities of the Spanish troops, he joined the army of insurgents under command of the patriot Morelos. By him he was raised to the rank of colonel. He took a most important part in the siege of Cuautla (1812) and the capture of Oajaca (1812), and most notably at the victory of San Augustin del Palmar (1813), which was due almost entirely to his military genius. He took part in the unsuccessful attack on Valladolid (Dec. 22, 1813) and was captured in the defeat suffered by the revolutionists at Puruarán (Jan. 5, 1814). He was court-martialed and shot in the Plaza of Valladolid on Feb. 3, 1814. He was an active and successful leader of the revolution and performed valuable service in organizing the troops and maintaining military discipline. His death was a severe blow to the patriot cause at a very critical moment when it was suffering many reverses. His name has been bestowed on the important town of Matamoros, on the Rio Grande, and upon many smaller towns and districts of the country. By the historians of the time he is considered one of the most skillful of the revolutionary leaders.

MATANE, mȧ′tȧn′. A town of Rimouski Co., Quebec, Canada, situated on the Intercolonial and Canada and Gulf Terminal railways (Map: Quebec, A 2). There is steamship communication with Montreal and Gaspé. It is the seat of an extensive lumber industry and has large saw mills. Pop., 1901, 1176; 1911, 2056.

MATANUS′KA RIVER. A stream tributary to Knik Arm, Cook Inlet, Alaska (Map: Alaska, J 5). The Matanuska valley sprang into importance through the legislation of the 62d and 63d Congresses for the construction of railways and for the development of the coal resources of Alaska. The Matanuska coal fields are distant 25 miles from Knik Arm, which is frozen over in winter. The coal varies from subbituminous and semibituminous up to anthracite in quality. Areas aggregating about 47 square miles are underlain by coal, in seams varying from 5 to 36 feet in thickness. Under the Act of Congress of Oct. 20, 1914, the entire area is to be surveyed and 7680 acres of the best coal seams are to be reserved for the exclusive use of the United States. The remaining areas are to be leased, under competition and by the royalty system, for development by American citizens. The Railway Commission of 1913 recommended that a branch line of railway be constructed connecting the Matanuska coal fields with tidewater for the economical transportation of the coal mined. Such line is to be built from the appropriation of $35,000,000 made by Congress for the construction of government railways in Alaska. Consult Martin, "Matanuska Coal Field," in *United States Geological Survey, Bulletin 239,* and "Railway Routes in Alaska," *62d Congress, 3d Session, House of Representatives, Document 1346.* See ALASKA, *Geology, Mining.*

MATAN′ZAS. A province of Cuba, occupying the west-central part of the island and bounded on the north by Florida Strait, on the east and south by the Province of Santa Clara, and on the west by a short coast line on the Ensenada de la Broa and the Province of La Habana (Map: Cuba, D 4). Its area is 3700 square miles. A line of highlands reaching a height of 1300 feet runs along the north coast, but the province as a whole is low, merging towards the south into the large swamps of Zapata. The chief industry is the production of sugar cane and the manufacture of sugar. Oranges, bananas, henequen, sweet potatoes, and corn are extensively grown. The development of the resources of the province has been facilitated by its network of railways. Its extensive

commerce is carried on mainly in Matanzas (q.v.), the capital, and Cárdenas, which rank second and fifth respectively in commercial importance in the island. Pop., 1899, 202,214; 1907, 239,812; 1913 (est.), 266,376.

MATANZAS. The capital of the Province of Matanzas, Cuba, and the third city in population of the Republic (Map: Cuba, D 3). It is situated in an amphitheatre-like location at the head of the Bay of Matanzas on the north coast of Cuba, 44 miles east of Havana. The small rivers Yumuri and San Juan divide the city into three parts: to the north Versalles, a residence district; in the centre Matanzas proper, the commercial and most thickly populated section; and to the south Pueblo Nuevo, the industrial and railway centre. Its streets are straight and regular, and it has a handsome square, the Plaza de la Libertad. In Versalles is the fine drive, Paseo de Martí, with a monument to the memory of the martyrs of independence, beyond which is the old Fort San Severino, a seventeenth-century structure. The principal buildings are the San Esteban theatre, the market, the government building, several churches, the lyceum, and the Spanish casino. The city has a tropical but healthful climate, and although it still has a defective sewage system, sanitary conditions have been considerably improved since the first American intervention. The harbor is large and well sheltered, but owing to lack of improvements vessels are forced to anchor some distance from shore and load and unload by lighters. Matanzas is second only to Havana as a Cuban commercial and railway centre. Its exports are chiefly sugar, molasses, and rum, and its imports, manufactured articles. Industries include a petroleum refinery, which supplies the whole island, sugar refineries, rum distilleries, tanneries, shoe factories, car and machine shops, and guava-jelly factories. Cordage is also manufactured from henequen, grown near the city. The city is the seat of a United States consular agent. Pop., 1907, urban, 39,005; municipal, 64,385. Matanzas was founded in 1693. Its harbor was long the refuge of pirates. The home of the poets Heredia, Milanes, and Plácido, it was once known as the Athens of Cuba. The city is surrounded on the land side by rocky hills, upon the summit of which, to the north, is located the Monserrat Chapel, built in 1875 by a Catalan society and having the retablo of the altar uniquely made of cork brought from Spain. From here one has a view of the Yumuri valley, said to be one of the most beautiful in the world. Three miles east of the city are the caves of Bellamar, with their wonderful variety of stalagmite and stalactite formations.

MAT'APAN', Cape. See Cape Matapan.

MATARÓ, mä-tä-rō'. A town of northeast Spain, in the Province of Barcelona, situated on the Mediterranean coast 18 miles northeast of Barcelona (Map: Spain, G 2). It is surrounded by vineyards and gardens and has several handsome promenades, a seminary, a school of arts, and the celebrated Colegio de Valldemia. It is an important industrial centre and manufactures cotton and woolen textiles, sailcloth, starch, soap, glass, chemicals, and pigments, especially white lead. There is also some shipbuilding, but the commerce is insignificant. The railroad between Mataró and Barcelona was the earliest road built in Spain. Pop., 1900, 18,765; 1910, 19,918.

MATAS, măt'ăs, Rudolph (1860–). An American surgeon, born near New Orleans. He was educated at Barcelona, Spain, at Paris, France, at Brownsville, Tex., and Soule's College, New Orleans, and graduated from the Literary Institute of St. John at Matamoros, Mexico, in 1876, and from Tulane University (M.D.) in 1880. Thereafter he practiced in New Orleans, where he became known as a specialist in surgery after 1895. In the latter year also he was appointed professor of surgery at Tulane. He became senior surgeon of Touro Infirmary, senior visiting surgeon of the Charity Hospital, and first lieutenant in the United States Medical Reserve Corps. He edited the New Orleans *Medical and Surgical Journal* in 1883–95, was elected president of the American Surgical Association in 1909, and served also as president of the Louisiana State Medical Society in 1894–95 and of the Southern Surgical and Gynecological Association in 1911.

MATCHES (OF. *mesche*, Fr. *mèche*, It. *miccia*, match, from ML. *mixa*, Lat. *myxus*, wick, from Gk. *μύξα*, *myxa*, lamp nozzle). Specially prepared pieces of inflammable material designed to enable the user to obtain fire readily. At present the name match, or friction match, is usually applied to a splinter of wood, tipped with some combustible material which will ignite on being rubbed against either a specially prepared or any rough surface. One of the first forms of this useful article was the brimstone match, made by cutting dry pine wood into thin strips about 6 inches long, pointing the ends, and dipping the latter into melted sulphur; thus prepared, the sulphur points instantly ignited when applied to a spark obtained by striking fire into tinder from a flint and steel. Early in the nineteenth century was invented the instantaneous light box, which consisted of a small tin box containing a bottle in which was placed some sulphuric acid, with sufficient fibrous asbestos to soak it up, and a supply of properly prepared matches. The latter were splints of wood which had been dipped first into melted sulphur and afterward into a paste composed of chlorate of potash, powdered loaf sugar, powdered gum arabic, and a little vermilion as coloring matter. By dipping these prepared points into the sulphuric acid the matches were instantly ignited. The chief disadvantages of this device were the danger of using a material so destructive as sulphuric acid, together with its great power of absorbing moisture, which soon rendered it inert.

In 1827 the first true friction match was invented by John Walker, of Stockton-on-Tees, Durham. The inflammable mixture was a compound of chlorate of potash and sulphuret of antimony with enough of powdered gum to render it adhesive when mixed with water and applied to the end of the match, which had previously been dipped in melted brimstone. These matches were ignited by the friction caused by drawing them through a piece of bent sandpaper. Imitations of Walker's matches, known as lucifers, were made by Samuel Jones from 1829 to 1830 and G. F. Watts, and Richard Bell & Co., competitors, also put out lucifers, borrowing the name.

The ignition of sulphur and phosphorus by friction was discovered by Godfrey Haukwitz in 1680, and it was 150 years before this discovery was applied to matches. It is stated that in 1833 phosphorus friction matches were made at

Vienna. About the same time Walker, who invented the original friction match, substituted phosphorus for the former mixture. In 1836 the first improved friction matches were made in the United States by Alonzo Phillips, of Springfield, Mass. The body of these matches is usually of wood, but some, called vestas, are of very thin wax-taper strips and were first patented in 1832 and manufactured a few years later, and latterly cardboard has been employed. The composition of the head of an ordinary match consists of phosphorus and nitre, or phosphorus, sulphur, and chlorate of potash, mixed with melted gum or glue, and colored with vermilion, umber, soot, or other coloring material.

In later processes lead peroxide, red lead, or manganese dioxide were substituted for the nitre. The precise formulas are generally preserved as trade secrets. The simplest and cheapest matches for many years were phosphorus sulphur matches, which lighted easily and were made of white phosphorus, being sold in the splint, card, or block type. These were succeeded in large part by the so-called parlor match with a more inflammable head, where the sulphur was replaced by other chemicals.

To obviate the danger of fire incurred by using matches so readily ignitable as the ordinary or parlor match, safety or strike-on-box matches were put upon the market in 1855 and since have been extensively used. Their inventor was a Swede named Lundstrom. The safety match differs from the ordinary match in having the phosphorus omitted from the composition applied to the match stick and combined instead with sand to form a friction surface on the match box, where the matches, which usually have chlorate of potash in their heads, are rubbed in order to be lighted. The dipping composition varies in different brands, most of which are made in European countries rather than in America, where the output is relatively small, though the quality good. In the United States double-top or double-dip matches have in large measure supplanted the parlor or single-dip type. They contain a large flame-producing head of highly inflammable material containing no phosphorus and a cap that may or may not contain phosphorus. Such matches strike anywhere and easily and were first proposed in 1898 and again in 1899. They were put upon the American market in 1905.

The constant handling of ordinary white or yellow phosphorus is a very unhealthful occupation, the emanation of phosphorus oxides giving rise to necrosis, or mortification of the bones of the jaw, producing the so-called "phossy jaw" disease once common in the match industry. In the early days of match manufacture the industry was largely carried on, in European countries, in cellars, and deaths from necrosis were so common that government intervention was necessary to drive the manufacturers into more sanitary quarters. In the modern match factory better surroundings, the increased use of mechanical appliances, and the smaller amount of phosphorus used have greatly decreased the danger incurred by matchmakers. It can, however, be entirely removed if the more expensive red or amorphous phosphorus, or the sesquisulphide of phosphorus, be used in its stead.

To-day the use of white phosphorus is in large measure prohibited or placed under restriction. The first step was taken in 1875 when Denmark forbade its use, and this was followed by Switzerland in 1879. In 1906 an international conference was held at Berne and a treaty proposed, which was followed by laws prohibiting the sale or importation of matches made of the white or yellow phosphorus in Switzerland, Luxemburg, Germany, France, Netherlands, Austria, and Spain. In 1908 the White Phosphorus Matches Prohibition Act was passed in Great Britain, and since 1910 it has been illegal to import or sell matches containing white phosphorus. The evil effects of white phosphorus were realized also in the United States, and it was proposed in 1910 to deal with the matter by a heavy internal revenue tax on all matches made from white phosphorus. In fact, this was recommended by President Taft in a message to Congress. On Jan. 27, 1911, the Diamond Match Company, the largest manufacturers in the United States and the sole owners of patents for the use of tetraphosphorus trisulphide in America, surrendered these patents for cancellation so that the process could be used by any one and thus avoid the dangers of white phosphorus. The Esch-Hughes Nonpoisonous Match Act, which made white phosphorus matches impossible through heavy taxation, became effective July 1, 1913, and practically rendered obsolete the old white phosphorus matches made in the United States. In their place there was employed practically universally for the prime igniting ingredient a nonpoisonous sesquisulphide of phosphorus compound which required for its ignition a temperature of about 210° F. as compared with white phosphorus which ignites at an ordinary room temperature. The white phosphorus matches would ignite at a temperature of 150°–200° F., while the sesquisulphide of phosphorus variety would ignite at 300°–350° F. The bill for safer matches received the approval also of the fire-prevention interests, as matches were a prolific source of fires. The old-fashioned matches were often ignited by rats and other rodents, who will not eat the sesqui matches.

In the better grades of matches, to prevent the smoldering of the burnt stems, the sticks or splints are usually soaked or impregnated in a solution of magnesium sulphate, alum, or sodium phosphate before the head is formed by dipping; this is done for both safety and strike-anywhere matches.

In the United States, as in most European countries, the sale of matches is regarded in much the same light as that of explosives and combustibles, and is regulated by State laws or municipal and insurance fire regulations which prescribe in detail the number of and conditions under which matches may be stored. In some States and cities the kind of match is also restricted, and only those considered reasonably safe are specified in the regulations, while the Underwriters' Laboratories will approve certain types and brands of matches which meet their conditions. Model match laws are now found in several States and in the ordinances of a number of cities.

In Great Britain, Norway, Sweden, Germany, Austria, China, and Japan the matchmaking industry has assumed enormous proportions. In France the making of matches is a government monopoly. In the United States the match industry is highly competitive; the Diamond Match Company making about 60 per cent of the matches consumed in the country, estimated at 250,000,000,000 a year. There are about a

dozen manufacturing companies in America, and the Diamond Match Company operates four factories. Much ingenious and automatic machinery is used in its factories. The first step in the manufacture of larger ordinary and safety matches is to prepare the splints from blocks of pine from which all knots and cross-grained portions have been removed. This wood comes in the form of planks 2 inches thick and is thoroughly dried. It is then sawed into lengths of from 1⅞ to 2½ inches, or the length of an ordinary match. A machine now receives these blocks, and they are cut by knives or dies into rows of splints, each row containing splints for 44 matches. Each row of splints as it is cut from the block is placed in cast-iron plates which are formed into an endless chain. The machine makes from 175 to 250 revolutions a minute, and, as has been said, at each revolution 44 matches are cut and set. Another important type of machine for the smaller matches makes the splints or sticks by cutting off veneers by a log-peeling machine. These are then cut into rectangular match sticks and are "cleaned" and straightened. After the splints have been cut and set in the plates they are carried over a drying or heating block, where they are heated in order that the melted paraffin may not become cold on the exterior of the stick, but may saturate the end thoroughly. The paraffin and the composition which forms the head of the match are placed in proper receptacles, which are automatically replenished without stopping the machine. Through these the splints pass, and at the composition rollers the head of the match is received. As the chain carries the bundles along the matches are cooled and dried by blasts of air, and finally they are automatically removed and packed in appropriate boxes. One such machine will yield 100 gross of boxes per day and requires the attention of eight girls. The boxes, which have been made by automatic machinery too, are fed into the machine automatically, and after receiving their contents are discharged on a rotating table, where they receive their covers at the hands of girls, two to four being employed at each table. After the chain has discharged its matches into boxes it is ready for a fresh set of splints, and the operation proceeds continuously.

The use of automatic machinery is also applied to the manufacture of so-called book matches, where strips of cardboard, separated so as to form individual matches, are bound in cardboard cases with a striking surface. An automatic machine prints the cardboard, cuts it into combs, dips the ends in the igniting mixture, folds it, stitches it into books, and affixes to the outside the patent striking composition. These book matches, which have found wide vogue, especially for advertising purposes and for pocket match safes, date from about 1899.

In England and parts of continental Europe match boxes once were made by hand by laborers as a household industry, but latterly in many countries, as in America, the making of boxes is effected by automatic machinery and is a part of the matchmaking establishment.

The following figures show the value of matches exported from and imported into the United States for selected years:

YEAR	Imported	Exported
1900	$156,705	$95,422
1905	187,951	52,834
1910	372,945	80,877
1911	588,309	77,106
1912	510,146	92,851
1913	730,170	102,407
1914	882,795	77,736

The following estimate of the match production of the world for 1910 affords a comparative idea of the industry:

COUNTRY	Gross of boxes per annum
United Kingdom	17,250,000
Sweden and Norway	24,290,000
Germany and Austria	14,000,000
France	4,800,000
America	21,800,000

The development of the match industry in the United States is shown by the accompanying table from the thirteenth United States census, which includes the statistics of the various establishments that manufacture friction, parlor, and safety matches. These statistics cover the various censuses of 1849 to 1909 inclusive:

YEARS	Number of establishments	Wage earners (average number)	Wages	Cost of materials	Value of products	Value added by manufacture
1909	26	3,631	$1,389,719	$4,598,878	$11,353,138	$6,754,260
1904	23	3,185	1,100,890	3,284,855	5,646,741	2,361,886
1899	22	2,047	612,715	3,420,740	6,005,937	2,585,197
1889	27	1,696	473,556	935,008	2,193,638	1,258,630
1879	37	2,219	535,911	3,298,562	4,668,496	1,369,934
1869	75	2,556	616,714	1,179,666	3,540,008	2,360,342
1859	75	1,252	179,450	229,720	698,566	468,846
1849	60	1,021	154,620	137,514	427,823	290,309

MATE (ODutch *maet*, Dutch *maat*, Ger. *Maat*, companion). In the merchant service mates are the officers of a ship subordinate to the master. Large vessels have a first, second, third, and sometimes a fourth mate; smaller ships have one or two less. In steamers they are now very commonly called first officer, second officer, etc. (instead of first mate, second mate). The first or chief mate performs the duties of executive for the master. In port he superintends and directs the stowage and discharge of cargo and has general care of the ship. At sea he assists the master in navigating and keeps the log; in most ships he has command of the port watch. His qualifications are superior to those required of the other mates, and he is usually, like the master, appointed by the owners and may be discharged by them only, except in unusual circumstances. In case of the death or disability of the master he succeeds to the command. The second mate commands the starboard watch at sea. He is not usually required to have a thorough knowledge of navigation, but should be a thorough seaman capable of directing the men in any kind of seamen's work. The

third and fourth mates (when there are such) have duties similar to those of a second mate. Very large steamers, such as the great transatlantic liners, have more than four mates or officers of this status. A mate in the United States navy is technically a petty officer, but is classed with warrant officers, though junior to them and holding only an appointment instead of a warrant. The uniform is similar to that of warrant officers. Mates were formerly called master's mates and a large number of them were in service during the Civil War. Boatswain's mates, gunner's mates, carpenter's mates, machinist's mates, etc., are petty officers and wear the appropriate petty officer's uniform. See PETTY OFFICER.

MATÉ, mä'tâ, or PARAGUAY TEA (abbreviation of Spanish *yerba de maté*, calabash herb). A substitute for tea, extensively used in South America, and almost universally through Brazil. It consists of the leaves and green shoots of certain species of holly (q.v.), more especially *Ilex paraguayensis*, dried and roughly ground. The true maté is a large shrub or small tree with smooth leaves and axillary umbels of small flowers. The leaves of a number of other species of *Ilex* are mixed with maté, and sometimes it is adulterated with leaves of plants in no way related to it. The term "maté," which has by usage become attached to this material, belongs originally to the vessels in which it was infused for drinking; these were usually made of gourds or calabashes, often trained into curious forms during their growth. Into the hollow vessels thus formed a small quantity of the material is put, and boiling water is added. The original method of drinking was as follows: each person who was to partake of the beverage was provided with a small tube about 8 inches long with a bulblike strainer at one end made either of fine basketwork or of perforated metal to prevent the fine particles from being drawn up into the mouth, and when his turn came he dipped in his tube (bombilla), sucked up a small portion of the infusion, and passed the maté bowl on to the next person. It is extremely unpleasant to Europeans at the high temperature at which it is usually drunk. The effect of maté is much the same as that of tea, stimulating and restorative, owing to the presence of a large proportion of caffein. The collection and preparation of maté is a large industrial occupation in Paraguay and Brazil, upward of 5,000,000 pounds of maté being annually exported from Paraguay to other parts of South America, but it is not yet an important article of export to other quarters of the world. See Plate of BEVERAGE PLANTS.

MATEHUALA, mä'tâ-wä'lâ. A town in the southern part of the State of Nuevo León, Mexico (Map: Mexico, J 6). It has wide and straight streets and several plazas, one containing a garden and a statue of Neptune. There are silver, gold, and copper mines in the neighborhood, and the town has several silver-smelting establishments. Pop., 12,000.

MATEJKO, mâ-tā'kō, JAN ALOYSIUS (1838–93). A Polish painter, born at Cracow. He studied at the art school in his native town, then went to Munich, and afterward studied at the Vienna Academy. In 1873 he was appointed director of the Cracow Art School. He was awarded a first-class medal at the Paris Exposition of 1867 and a medal of honor in 1878. His principal works are large paintings of incidents in Polish history and include an "Episode from the Diet at Warsaw" (1867, Vienna Museum); "The Union of Lublin, 1569" (1875); "Wernyhora Prophesying the Future of Poland"; "Albrecht von Brandenburg Doing Homage to King Sigismund I" (1882, National Museum, Cracow); "John Sobieski Raising the Siege of Vienna" (Vatican, Rome); "Declaration of the Polish Constitution" (1892). They are spirited in conception and notable for the archæological knowledge displayed in their detail, but are usually glaring in color and confused in composition. He also painted excellent portraits and published *Ubióry w Polsce* (1860), a work representing the costumes of the Polish nation from 1222 to 1795. Many of the best present-day Polish painters were pupils of Matejko.

MATERA, mâ-tā'râ. A city of the Province of Potenza, Italy, 34 miles west-northwest of Taranto (Map: Italy, F 4). It is irregularly built on steep slopes, 1300 feet above the sea. The roofs of the houses of the lower streets are on a level with the roadbeds of the upper streets. The principal buildings are an episcopal palace, a cathedral, and a college. Matera has manufactures of leather and arms and a trade in oil and agricultural produce. In the vicinity are the famous troglodyte caverns of Monte Scaglioso, still used as dwelling places by some of the lower classes. Matera is the seat of an archbishop. Pop. (commune), 1901, 17,237; 1911, 17,324.

MATE'RIALISM (from *material*, from Lat. *materialis*, relating to matter, from *materia*, matter). Usually defined as the philosophical view which resolves all existence into matter or into an attribute or merely an effect of matter. It makes matter the central ultimate reality and makes everything else, consciousness included, a derivative appearance, which is then sometimes treated as illusory. When consciousness is treated as illusory, materialism is suicidal, for the simple reason that materialism can have meaning only for a conscious being, and if consciousness is treated as a vain show, materialism can consistently be regarded only as one of the varieties in the show. But such an attitude towards consciousness is not to be consistently maintained (see KNOWLEDGE, THEORY OF); hence the only forms of materialism we need here consider are those that regard consciousness as an effect or as an attribute of matter, which, following Külpe, we shall call the causal and the attributive forms of materialism.

The attributive form assumes that substance is what the etymology of the word would suggest—viz., a permanent unchanging entity which furnishes the support for various appearances; these appearances, as referable to the substance, are called its attributes. Materialism of this type regards this substance as an extended, impenetrable, movable entity, which in some way has inhering in it or resting upon it or referable to it the attribute of consciousness, which may be treated as either a separable or an inseparable mark. This method of dealing with the relation of matter and consciousness is charmingly simple, but it is the simplicity of uncritical thought. It must be discarded along with the notion of substance (q.v.) interpreted as substratum. Substance is, properly speaking, nothing but the unitary complex of qualities called attributes. Instead of being simple, substance has a complexity measurable only by the number of attributes it possesses. Not that it is a mere com-

pound; it is unitary in the sense that all the attributes organize themselves simultaneously or successively into a single differentiable object. Now, if any substance has consciousness as an attribute, that substance is by that token a conscious substance, and to call it merely material is to be blind to the fact that materiality is as much an attribute as color or duration. If matter is always or sometimes conscious, it is not matter as ordinarily conceived. To call this conscious thing matter is not to take a philosophical attitude but to set up as a lexicographical reformer.

Causal materialism is true or false according to the interpretation put upon cause; but even when that interpretation is true, materialism is only a half truth, for in that case matter is as dependent on mind as mind is on matter. If by cause is meant anything but the invariable condition of an event, causal materialism is questionable, for there is no reason to suppose there is any such cause. (See CAUSALITY.) But if by cause is meant an invariable condition, then all experience warrants us in saying that a certain organization of matter is cause of consciousness. Such a statement, however, says nothing about the nature of consciousness except that it requires, as a condition of its appearance at a certain time, that there should be in existence at that time some sort of nervous organization. If one proceeds to say that the physical world is not in its turn dependent on the psychical, that statement must be challenged. If the statement merely means that some form of physical existence preceded in time any ascertainable form of consciousness, no valid objection can be raised; but if it means that the physical can be conceived to exist out of all relation to the psychical, then the assertion is questionable. For every judgment is passed upon reality as it appears to the judging consciousness. Reality apart from a judging consciousness is *eo ipso* unknowable. But this impossibility of the knowledge apart from consciousness is not the impossibility of an existence antedating consciousness. Relation to consciousness there must be in any conceivable reality; but the relation need not be one of simultaneity. It is indubitable that we can know things which do not exist at the time we know them. But if there can be knowledge of things which antedate the knower, there is nothing impossible in the supposition that knowable, if not known, objects were themselves the causes of the succeeding knowledge. But if they were causes of the succeeding knowledge, then the succeeding knowledge is an integral element in the system of which the cause is likewise a determining element. In other words, effect and cause are reciprocal and both are indispensable in the causal system. It is only when the time order is taken in the historical sense that cause is considered more important than the effect. This is not to say that the effect is the cause of its cause, for cause means indispensable *antecedent*, and that is what the effect, as effect, is not. But it is indispensable nevertheless. For instance, if the universe is of such a nature that the interposition of an opaque body between a luminous body and an eye means an eclipse of the luminous body, the absence of such an eclipse carries with it the absence of such an interposition. This same principle would make consciousness, which is the result of physical conditions, itself an indispensable element in the universe in which its causes existed. One cannot admit the existence of the physical cause of a psychic effect without admitting the existence of the psychic effect. In other words, we cannot conceive consciousness absolutely absent from the universe; we cannot think away consciousness from its place in the universe without thinking away this very thinking, i.e., without doing the impossible. We may ignore our own consciousness and that of others in our philosophical system, but if we do, so much the worse for our system. What a system of reality could be that had no place in it for a knowing mind, no knowing mind in that system could say. This point is forcibly presented by Prof. H. S. Jennings from the biological side. "*Every diversity in conscious states is accompanied by a diversity in physical conditions* . . . it follows also that *every diversity of conscious states* (plus the concomitant physical conditions) *is preceded by a diversity in physical conditions.* Such being the case, the question whether the same antecedent physical conditions without consciousness would produce the same or a different result contains contradictory specifications and is without experimental meaning. For without consciousness, and indeed the particular given kind of consciousness, the physical conditions are not the same. No experimental meaning can be given to the question whether it is the antecedent physical diversity or the antecedent conscious diversity that is efficacious in producing the diversity of results, for the two are inseparable.

Now the materialist who makes consciousness an effect of matter, but not itself an indispensable element in the universe, fails to see this logical interrelation of effect and cause. A materialist who recognizes this interdependence ceases thereby to be a materialist, for now in his theory his reasons must be acknowledged to be as much characterized by mental facts when and whence those facts are, as it is characterized by physical facts when and where these latter facts are. Neither is independent, although one may be prior. The materialist looks at the priority and overlooks the interdependence. One consequence of overlooking this interdependence is the assumption that the laws of matter are the only natural laws. Consciousness is regarded as running its course in accordance with mechanical principles. Hence will is of no determining value. It is this corollary from materialism that has made the doctrine so distasteful to the ordinary thinker. For this corollary means the denial of moral responsibility. But the results of the renewed study of psychology within recent years have made it quite impossible to assert that the laws of consciousness are mechanical laws as these laws manifest themselves in the purely material part of the universe. See MECHANISM.

Materialism is an old view; all the Ionic philosophers (see IONIAN SCHOOL) were by implication materialists; Democritus, Leucippus, Epicurus, and Lucretius (see articles on them) worked out a quite elaborate materialistic system. There is a materialistic vein running through the thought of many of the Italian philosophers of the Renaissance. Gassendi, likewise, makes consciousness, at least in the form of feeling, an inseparable attribute of matter. The eighteenth century was especially marked by its materialistic philosophy. Priestley in England and La Mattrie, Diderot, and Holbach

in France were outspoken in their materialism of the attributive kind. The latter part of the eighteenth century and the early part of the nineteenth century were characterized by a strong antimaterialistic reaction, to be followed again in the middle of the latter century by a strong outburst of materialistic thought. Carl Vogt, Jacob Moleschoot, Louis Büchner, and Heinrich Czolbe carried on a vigorous propagandism in favor of materialism, but the results of the scientific study of psychology were too patent, and the nineteenth century went out with a strong dislike for the view that made matter the one essential reality. Many systems of thought of the present day are styled materialistic by their opponents, but are really not materialistic at all, inasmuch as they recognize the indefeasibility of consciousness.

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MATERIALS, STRENGTH OF. See STRENGTH OF MATERIALS.

MATE'RIA MED'ICA (Lat., medical material). That department of the science of medicine which treats of the materials employed for the alleviation and cure of disease: (1) their physical properties; (2) various modes of preparation; (3) chemical composition and relations, including the tests for purity and the means of detecting probable adulterations; (4) physiological action on man and animals in large and small doses; (5) therapeutic actions and uses, and the average doses in which they should be prescribed; and (6) the official preparations containing the substances in question, and their uses. Strict classification of drugs into groups according to their physiological action is impossible, as their action is so complex that one would often be found in several classes. It is, however, customary to group them according to their most marked or important characteristic for convenience of description and ease in recalling those having a common action. See THERAPEUTICS; PHARMACOPŒIA.

MATÉRIEL, mȧ'tā'rē'ĕl' (Lat. *materialis*, relating to matter). The term in its military sense is applied to the completed units of military and naval armament, stores, transportation, and equipment, as distinguished from the *materials* of which such units are constructed. A gun is part of the *matériel* of artillery; the *material* in the gun is principally steel.

MATERNA, mȧ-tĕr'nȧ, AMALIE (1847–1918). An Austrian opera singer, born in St. Georgen, Styria. She made her first stage appearance in Graz, 1864, and in the same year married Karl Friedrich, a well-known actor, and with him was engaged at the Carl-Theater, Vienna. Her début as a prima donna occurred in 1869, when she sang at the Imperial Opera as Selika in *L'Africaine*. In 1876 she created the part of Brunhilda at Bayreuth. She became one of the greatest sopranos of the early Wagnerian opera, and a great favorite in the United States. She retired in 1897.

MAT GRASS. See AMMOPHILA; NARDUS.

MATHEMAT'ICAL SOCIETY, THE AMERICAN. A national association for the advancement of mathematical science. It was reorganized under its present name in July, 1894, and has a membership of about 700. Its library of some 5000 volumes is deposited in the library of Columbia University. Meetings are held three times a year in New York City and twice a year at Chicago. There is also a general summer meeting, and sectional meetings are held in California and in the central West. The society publishes two journals, the *Bulletin* and the *Transactions*, and has issued several volumes of *Colloquium Lectures*. The list of ex-presidents includes Emory McClintock, G. W. Hill, Simon Newcomb, R. S. Woodward, E. H. Moore, T. S. Fiske, W. F. Osgood, H. S. White, Maxime Bôcher, H. B. Fine, E. B. Van Vleck, and E. W. Brown.

MATHEMATICAL SOCIETY, THE LONDON. An association founded in 1865 by a number of English mathematicians and incorporated in 1894. It was instituted for the promotion of mathematical knowledge. The society owns an excellent library of books and periodicals on scientific subjects. The society began in 1865 the publication of the *Proceedings of the London Mathematical Society*, and has now over 35 volumes of essays upon advanced mathematical topics. During the session 1913–14 over 40 papers were read on mathematical subjects and 20 of these were published. The meetings are held on the second Thursday in each month, from November to June, and the anniversary meeting is in November. The president in 1914 was Professor A. E. H. Love, F.R.S., and the honorary secretary, J. H. Grace, F.R.S.

MATHEMAT'ICS (Lat. *mathematica*, from Gk. *μαθηματική, mathēmatikē*, mathematics, from *μάθημα, mathēma*, learning, science, from *μανθάνειν, manthanein*, to learn). The technical meaning of the word is due to the Pythagoreans, who distinguished four branches: "There are four degrees of mathematics: arithmetic, music, geometry, spherics." In modern times attempts have frequently been made to frame a satisfactory definition of the scope of the science. Descartes asserts that "all sciences which have for their object the search after order and measure belong to mathematics." D'Alembert in the *Encyclopédie* defines it as the science which considers the properties of magnitude in so far as this is calculable or measurable. Comte, in his *Philosophie positive*, speaks of it as the science which proposes to determine certain magnitudes from certain others from the exact relations that exist between them. Sagnet has proposed the following: "Mathematics have for their object the study of exact and necessary relations concerning the magnitude, the form, and the relative position of various objects, material or immaterial, which appeal to our senses." With regard to these definitions it may be observed that

they are all based on concepts such as "magnitude," "order," "measure," which are themselves extremely difficult to define.

History. Mathematics as a science makes its first definite appearance among the Egyptians. There are evidences of its antiquity among the Chinese, Hindus, and Babylonians, but the earliest written records of considerable mathematical progress are found in Egypt, and give an interesting view of the state of the science as early as the latter part of the third millennium before Christ. At that time arithmetic was sufficiently developed to include a fair numerical system, a cumbersome but elaborate treatment of common fractions, and some work in finite series. A limited and imperfect system of mensuration was known, a beginning was made in algebraic symbolism, and the simple equation was solved. Of the several mathematical papyri that have come to light in recent years the most elaborate is that transcribed by Ahmes about 1700 B.C., from one written probably some six or eight centuries earlier. Mathematics in Egypt, however, made but slight progress beyond this point until the Greek ascendancy in Alexandria. The Babylonians were the next to show signs of mathematical power, particularly in the application of arithmetic and geometry to astronomy. To them is due the suggestion of the sexagesimal system of fractions developed by the Greeks and still commonly used in angle and time measurements. The extensive trade of the Phœnicians also developed a commercial arithmetic among themselves and their neighbors, but it did not lead to any general scientific progress.

The real beginning of mathematics as a steadily progressing science is to be found in Greece, and in particular in the establishing of the Ionian school of Thales (q.v.) about 600 B.C. Geometry as a science here makes its appearance. The next great step in the progress of mathematics was taken by Pythagoras (q.v.) in founding his famous school at Crotona in southern Italy. Under his influence a considerable part of elementary geometry became developed, and a beginning was made in creating a theory of numbers. (See NUMBER.) Considerable progress had been made in geometry before the third epoch-making step was taken, the founding of the Athenian school about 420 B.C. Hippocrates of Chios began the movement that made Athens the mathematical centre for the next century and a half. It was Plato, however, who brought the school to the zenith of its fame. Although he was not, strictly speaking, a mathematician, his ideas concerning the methods of establishing truths in philosophy and science gave a powerful impulse to the progress of mathematics. The third century B.C. saw the rise of the great Alexandrian school, where Euclid taught and where Archimedes, Apollonius, and Eratosthenes studied. With that century closes the Hellenic ascendancy in mathematics and philosophy, and thenceforth we find scientific progress sporadic and short-lived. By the second century of our era progress had practically ceased. Heron and Ptolemy were the greatest of the later Greek writers on applied geometry. The only new movement in mathematics made by the post-Christian Greeks was that of Diophantus, whose work on equations is the first of any pretensions ever composed. The Romans did almost nothing in mathematics except in a purely mercantile way, their only contribution being to the practical work of surveying. Among the later Romans the name of the philosopher Boëthius stands out with some prominence for his textbook work in elementary mathematics, but he displayed no originality. The same must be said for such mediæval writers as Alcuin, Gerbert (see SYLVESTER), and Bede.

Meanwhile mathematics had obtained a foothold in the East. The Chinese early showed a taste for the science, particularly as related to astrology and astronomy. The first definite trace of really satisfactory work among the Oriental peoples, however, is that of Aryabhatta early in the sixth century A.D. Aryabhatta possessed considerable knowledge of the theory of numbers, of algebra, and of the first principles of trigonometry. The next Hindu mathematician of great prominence was Brahmagupta, who lived in the seventh century, and whose work on arithmetic and algebra and on the mensuration of solids is a distinct advance on that of his predecessors. The list of prominent Hindu mathematicians includes the name of Mahavir (Mahaviracarya), and closes with Bhaskara in the twelfth century, in whose work a fairly well developed algebraic symbolism is found. It was among the Hindus, too, that our present numeral system started, being by them transmitted, through the Arabs, to Europe. (See NOTATION; NUMERALS.) One of the most interesting periods in the development of mathematics is that of the Arab ascendancy, and in particular that of the founding of the great school at Bagdad. In this school one of the first teachers was Al Khuwarizmi, who gave the name to algebra in the ninth century. He was followed by several writers of prominence, but, if we except the science of trigonometry, it is rather by their preservation of Greek and Hindu learning than by their own originality that they are noteworthy. Among the last of the Persian and Arab writers was the poet Omar Khayyam, whose work in algebra showed considerable power. The work of the Arabs in Spain was rather that of teaching than of contributing to scientific advance.

The first of the European writers to contribute in any large way to the advance of mathematics was Leonardo of Pisa, at the opening of the thirteenth century. His *Liber Abbaci* placed before Italian scholars the Hindu number system (already slightly known) and the mathematical knowledge of the world at that time. The period of the Renaissance was one of great activity in mathematics. This activity was inaugurated in Austria by Regiomontanus and Peuerbach and in Germany by Widmann. In Italy Paccioli was the first to publish, in 1494, any modern printed work of much importance on mathematics, although an edition of Euclid had already (1482) appeared, besides several minor works, notably one on arithmetic printed at Treviso in 1478 and two printed at Bamberg in 1482–83. During the sixteenth century the Italian algebraists, notably Tartaglia, Ferro, Cardan, Ferrari, and Bombelli, solved completely the cubic and biquadratic equations, and Vieta, in France, so improved the symbolism of algebra and so generalized the use of letters as to put algebra upon substantially the present foundation. It needed only the symbolism suggested by Descartes and a few of his contemporaries to bring elementary algebra, about 1650, to the form familiar to students at the present day.

About the time that elementary algebra was becoming crystallized a revival of interest in

geometry took place. On the side of pure geometry this was led by Kepler, Desargues, and Pascal, while to Fermat and Descartes is due the invention of the method of analytic geometry. At the same period Fermat laid the foundation for the modern theory of numbers, and the new theory of logarithms (q.v.) became generally known. The greatest progress in the seventeenth century is, however, represented by the invention of the fluxional calculus by Newton and of the differential calculus by Leibnitz. These disciplines, essentially the same and so considered at present, revolutionized mathematics and its applications.

The period of the development of elementary mathematics closes with the seventeenth century. The eighteenth century was devoted largely to the investigations of the foundations of the new analysis, to a consideration of its applications, to the study of infinite series (see SERIES), and to the understanding of the nature of complex numbers (q.v.). The nineteenth century saw the development of the so-called modern mathematics, including subjects discussed in the articles on SUBSTITUTION; QUATERNIONS; SURFACE; CURVE; COMPLEX NUMBER; DETERMINANTS; FUNCTION; and the more general articles on ALGEBRA, GEOMETRY, TRIGONOMETRY, NUMBER, and CALCULUS.

Classification. No entirely satisfactory classification of mathematics is possible. The various branches are so interrelated that exact lines of separation cannot be drawn, a fact of apparent and great advantage to the science. The most recent attempt at classification is that made in the *Encyklopädie der mathematischen Wissenschaften*. The following scheme covers the principal subjects discussed:

I. PURE MATHEMATICS

A. Arithmetic and Algebra.

(*a*) Arithmetic (q.v.).

(1) Fundamental operations with pure numbers. See NUMBER; ARITHMETIC.
(2) The combinatory theory, including combinations, permutations, determinants. See PERMUTATIONS AND COMBINATIONS.
(3) Irrationals and the convergency question. See NUMBER; IRRATIONAL NUMBER.
(4) Complex numbers (q.v.).
(5) Mengenlehre, literally the "multitude theory"; as of a multitude (unlimited number) of points.
(6) Finite discrete groups. See SUBSTITUTION.

(*b*) Algebra (q.v.).

(1) Fundamental concepts, including rational functions. See FUNCTION.
(2) Theory of invariants. See FORMS.
(3) Theory of equations. See EQUATION.

(*c*) Theory of numbers. See NUMBER.

(*d*) Theory of probabilities. See PROBABILITY.

B. Analysis.

(*a*) Analysis of real quantities.

(1) Differential and integral calculus. See CALCULUS.
(2) Differential equations. See EQUATION.
(3) Continuous transformation groups. See SUBSTITUTION.
(4) Infinite series.
(5) Calculus of variations.

(*b*) Analysis of complex quantities.

(1) General theory of functions. See FUNCTION.
(2) Special kinds of functions, elliptic, Abelian, automorphic, etc.
(3) Functional equations and operations.

C. Geometry (q.v.).

(*a*) Pure geometry. See GEOMETRY.

(1) General principles and elementary geometry.
(2) Positional geometry.
(3) Projective geometry. See GEOMETRY; PROJECTION.
(4) Descriptive geometry. See GEOMETRY.

(*b*) Algebra and analysis as applied to geometry. See ANALYTIC GEOMETRY.

(1) Coördinate systems. See COÖRDINATES.
(2) Conics.
(3) Algebraic curves and surfaces.
(4) Space of *n* dimensions. See GEOMETRY.

(*c*) Differential geometry, including transcendental curves and surfaces.

II. APPLIED MATHEMATICS

A. Mechanics (q.v.), including kinematics, kinetics, statics, the vector analysis (see QUATERNIONS), hydrodynamics, and the theory of elasticity.

B. Physics (q.v.), including thermodynamics, molecular physics, electricity, optics.

C. Geodesy and Geophysics, including navigation, geodetic mensuration, cartography, magnetism.

D. Astronomy.

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MATHER, măth'ẽr, COTTON (1663–1728). A colonial divine and author, eldest son of Increase Mather (q.v.) and Maria, daughter of John Cotton (q.v.). He was born in Boston, Feb. 12, 1663. He was very precocious and was unfortunately overestimated and praised, with the result that he became morbidly self-conscious. An omnivorous reader from the first, he entered Harvard at 11 and graduated in 1678 at 15. At 16 he studied medicine, despairing of being able

to enter the ministry on account of a propensity to stammering. This he conquered by methods of deliberate speech, and at 17 preached his first sermon and became an assistant to his father. He took his master's degree in 1681, refusing a call to New Haven, and became associate pastor with his father in the North Church of Boston. In 1686 he married; two years later his father's mission to England left him at the age of 25 in sole charge of the North Church, and probably the most important man in Boston. He was widely celebrated as a scholar and was the obvious leader of the conservative element among the Puritans of the day. He had also begun to take a great interest in the subject of witchcraft, his *Memorable Providences Relating to Witchcraft and Possessions* appearing in 1689. During the witchcraft epidemic at Salem in 1692 he became an infatuated investigator of suspected cases, a constant adviser of the magistrates, and wrote his *Wonders of the Invisible World* (1693) to confute all doubters. In 1693 Mather planned his great ecclesiastical history of New England, the *Magnalia*, which was finished in 1697 and finally appeared in 1702. Meanwhile he was overworked and much troubled by attacks made upon him for his activity in the witchcraft crisis. He was also much worried by his father's troubles as president of Harvard, and later was disappointed in not himself receiving the position. He had family troubles, and was furthermore doomed to see more liberal forms of religious thought prevailing around him. Nevertheless, he continued to be a prominent and useful citizen, waging war on intemperance and other forms of immorality. In 1703 he married again. In 1707 a final breach with Governor Dudley greatly lessened his public influence. A few years later he was made a D.D. by the University of Glasgow, but tributes to his merits as divine, scholar, and author could not compensate for domestic unhappiness caused by various deaths and by the dissolute conduct of one of his sons. His second wife dying in 1713, he took another two years later and suffered greatly in consequence of her derangement. In 1721 by his bold stand in favor of inoculation for smallpox he aroused a storm of opposition to himself. Then came his father's death, a final disappointment with regard to the presidency of Harvard, and his own death, Feb. 13, 1728.

Cotton Mather was a man of extraordinary learning, a stanch upholder of antiquity, especially in matters of theology and Church polity, a marvelously voluminous writer, an active politician, and, when not misled by excitement, a public-spirited citizen. His connection with the persecution of the witches has given him a sinister reputation, which no efforts of biographers have been able to efface; but it is certain that he was sincere in his beliefs, and not thoughtlessly cruel; and he is better remembered than any other of the early colonial divines. Few persons can now find time to read his numerous books, but no student of the period during which he lived should speak of him without gratitude. His *Magnalia* is full of errors, yet gives the very "form and presence" of its age and represents labors truly heroic. The most important of his works are: *Poem to the Memory of Urian Oakes* (1682); *Wonders of the Invisible World* (1693; reprinted in "Library of Old Authors," 1862); *Magnalia Christi Americana* (1702; reprinted in two volumes, 1820 and 1853); *Bonifacius*, etc., or, as it is better known, *Essays to Do Good* (1710; Glasgow, 1838); *Parentator* (Boston, 1724), a curious and interesting life of his father, Increase. His *Diary* (c.1687–1708) was published in 1911 by the Massachusetts Historical Society. Consult: for his life and writings the biography by his son, Samuel Mather (Boston, 1729); Enoch Pond, *The Mather Family* (ib., 1844); M. C. Tyler, *History of American Literature*, vol. ii (New York, 1881); Barrett Wendell, *Cotton Mather* (ib., 1891); A. B. Marvin, *Life and Times of Cotton Mather* (Boston, 1892); Barrett Wendell, *Literary History of America* (New York, 1900); also G. L. Kittredge, "Some Lost Works of Cotton Mather," in *Massachusetts Historical Society, Proceedings*, vol. xlv (Cambridge, 1912), and J. P. Quincy, "Cotton Mather and the Supernormal in New England," in the same, series 2, vol. xx (ib., 1907).—Cotton Mather's son, SAMUEL (1706–85), graduated at Harvard in 1723, served as minister of the North Church, Boston, until 1742, and then, in consequence of differences concerning revivals, a separate church was formed for him in North Bennett Street. He published among other works a *Life of Cotton Mather* (1729); *An Apology for the Libertie of the Churches in New England* (1738); *America Known to the Ancients* (1773).

MATHER, FRANK JEWETT, JR. (1868–). An American art critic and professor. He was born at Deep River, Conn., and graduated from Williams College in 1889 and from Johns Hopkins University (Ph.D.) in 1892; he studied also at Berlin and at the Ecole des Hautes Etudes, Paris. From 1893 to 1900 he served as instructor and assistant professor of English and Romance languages at Williams College, and thereafter was professor of art and archæology at Princeton. He was an editorial writer for the New York *Evening Post* and assistant editor of the *Nation* (1901–1906) and art critic for the *Post* (1905–06; 1910–11); from 1904 to 1906 was American editor of the *Burlington Magazine;* contributed frequently, chiefly on art subjects, to the *Nation*, the *Burlington Magazine*, *Art and Progress*, and other periodicals; and published *Homer Martin, Poet in Landscape* (1912), and a volume of short stories, *The Collectors* (1912).

MATHER, INCREASE (1639–1723). A colonial divine, youngest son of Richard Mather (q.v.). He was born at Dorchester, Mass., June 21, 1639. A precocious boy, he entered Harvard at 12 and graduated at 17. On his nineteenth birthday he preached an able sermon from his father's pulpit. Shortly afterward, at the request of his brothers, Samuel and Nathaniel, he went to Dublin, where, at Trinity College, he took his M.A. Then he preached in Devonshire and Guernsey with success, but returned to Massachusetts in 1661. For some time he divided his services between his father's church at Dorchester and the new North Church at Boston, but in 1664 he threw in his lot with the latter.

In 1681, on the death of Urian Oakes (q.v.), Mather was appointed his successor as president of Harvard, and began his duties, but his church would not let him go. In 1685, after the death of President John Rogers, he was enabled to accept the post on the condition that he should still reside in Boston. He held it until 1701, the college growing under his care, but suffering

from various dissensions. Mather objected to leaving Boston for the rural obscurity of Cambridge, but was finally forced to reside at the college, and soon after gave up the post, which had been rendered most uncomfortable to him. Meanwhile he had made himself useful to the colony by resisting the attempts of Charles II to seize the charter of Massachusetts, had patriotically opposed the tyranny of James II, and in 1688 had gone to England as agent for his fellow citizens. He could not secure from William III the restoration of the old charter, but he obtained a new and fairly satisfactory one, and gained the favor both of the King and of the people of the colony. Fortunately for him, he was absent in England during the worst of the witchcraft delusion, in which his son Cotton took a prominent part. It is plain, however, that after this excitement wore off the hold of Mather and his son Cotton upon the clergy and people of the colony was greatly weakened. He maintained his personal vigor to a considerable extent, until his death, Aug. 23, 1723. Chief among his works are: *A Brief History of the War with the Indians in New England* (1676; edited by Drake, 1862); *A Relation of Troubles of New England from the Indians* (1677; edited by Drake, 1864); *Cometographia, or a Discourse Concerning Comets* (1683); and best known and most interesting probably, *An Essay for the Recording of Illustrious Providences* (1684; reprinted in the "Library of Old Authors," 1856). The last-named book is usually known as *Remarkable Providences* and is a mine for those interested in seventeenth-century superstitions. His *Cases of Conscience Concerning Witchcraft* (1693; reprinted with Cotton Mather's *Wonders of the Invisible World* in the "Library of Old Authors," 1862) is interesting and important. For Increase Mather's life, consult: Cotton Mather's biography of him entitled *Parentator* (Boston, 1724); Enoch Pond, *The Mather Family* (ib., 1844); Barrett Wendell, *Cotton Mather* (New York, 1891); A. B. Marvin, *Life and Times of Cotton Mather* (Boston, 1892); also: M. C. Tyler, *History of American Literature*, vol. ii (New York, 1881), and Williston Walker, *Ten New England Leaders* (ib., 1901). For a list of his voluminous writings, consult Sibley, *Harvard Graduates*, vol. i (Cambridge, 1873).

MATHER, Richard (1596–1669). A colonial divine and founder of the famous Mather family in New England. He was born in Lowton, Lancashire, of a family of Puritan yeomen. He began giving religious teaching when a mere boy, then passed through Brasenose College, Oxford, and about 1619 was ordained and put in charge of the church at Toxteth, near Liverpool. In 1635 he emigrated to Massachusetts. As he was noted for his learning and his powerful preaching, there was rivalry among the New England churches to secure him. He finally settled at Dorchester in 1636, and remained there as pastor until his death, April 22, 1669. He wrote public letters on matters of Church government, helped to compile the *Bay Psalm Book* (q.v.), and had a leading share in framing the Cambridge Platform (1648). (See Congregationalism.) He transmitted his powers, especially his love of reading and writing books, to his six sons by his first wife, Katharine Holt; his second marriage with the widow of the famous John Cotton (q.v.) proved childless. Four of these sons became somewhat famous as preachers and authors. Of these the best known is the youngest, Increase Mather (q.v.). —The eldest, Samuel (1626–71), began preaching in Boston, soon removed to England, where he was very popular, and, after the ejection of the Nonconformists in 1662, became a leading clergyman of Dublin.—The third son, Nathaniel (1631–97), also attained reputation in England as a preacher and religious writer, and succeeded his brother Samuel in Dublin.—The fifth son, Eleazer (1637–69), was the first minister at Northampton, Mass. For sketches of Richard Mather, consult: Increase Mather, *Life and Death of Richard Mather* (Cambridge, Mass., 1670); Cotton Mather, *Parentator* (Boston, 1724); M. C. Tyler, *History of American Literature*, vol. ii (New York, 1881); Barrett Wendell, *Cotton Mather* (ib., 1891).

MATHER, Robert (1859–1911). An American lawyer and railroad official, born in Salt Lake City. He graduated from Knox College (Illinois) in 1882, and in 1886 was admitted to the Illinois bar at Chicago, where he practiced for three years. He was local attorney (1889–94), assistant general attorney (1894), general attorney (1894–1902), and general counsel (1902–09) of the Chicago, Rock Island, and Pacific Railway Company. In 1904–09 he served as president of the Rock Island Railway Company, and thenceforth was chairman of the board of directors of the Westinghouse Electric and Manufacturing Company which he reorganized. He was an officer and director in other important financial, railroad, and industrial concerns.

MATHER, Thomas (1856–). An English electrical engineer, born at Higher Walton, near Preston. Educated at Owens College, Manchester, and at the Normal School of Science, London, he became a fellow of the Royal Society in 1902 and professor of electrical engineering at the City and Guilds College, South Kensington, in 1909. He assisted in determining the exact value of the electrical units and improved practical instruments for measuring electricity and universal shunts. On these subjects he wrote many papers for the Physical Society of London (of which he was vice president), for the Royal Society, and for the Institution of Electrical Engineers. He published *Exercises in Electrical Engineering* (1910), with Howe, and *Practical Electricity* (1911), with Ayrton, whose assistant he was for many years.

MATHER, Sir William (1838–). An English engineer and promoter of technical and industrial education. He was born in Manchester, was educated in Germany, and rose to be chairman of the engineering firm of Mather and Platt, Ltd., of Manchester. In 1883 Mather made a study of technical education in America and Russia for the Royal Commission on Technical Instruction; in 1908 he was chairman of the British education section of the Franco-British Exhibition; and he became chairman of the Fröbel Educational Institute, London. Between 1885 and 1904, though not continuously, he represented various Lancashire divisions in Parliament in the Liberal interests. In 1902 he was knighted and honorary degrees were given him by Princeton and Manchester universities.

MATHER, William Williams (1804–59). An American geologist, born at Brooklyn, Conn. He was educated for the military profession and graduated in 1828 at West Point, where he was assistant professor of chemistry, mineralogy, and

geology from 1829 to 1835. He resigned from the army in 1836 in order to devote himself to physical science, and became professor of chemistry at the University of Louisiana, from which position he retired in a few months to superintend the geological survey of the first district of New York State, including the counties bordering upon the Hudson River. While engaged in these researches (1836–44) he was State geologist for Ohio (1837–40) and Kentucky (1838–39), and professor of natural science, vice president, and acting president at the Ohio University at Athens (1842–50). By experiments made at Athens (1845) he discovered that bromine, which at that time was selling at $16 an ounce, could be obtained at a comparatively small price from the bitter waters of the salt works near that place. Mather collected a cabinet of over 22,000 mineralogical specimens. He was State agricultural chemist for Ohio (1850–54), edited the *Western Agriculturalist*, and was the author of the "Geology of the First Geological District," in *Natural History of New York* (1843), and of *Elements of Geology*.

MATHERS, măth'ĕrs, Helen Buckingham. See Reeves, Mrs. Henry.

MATHESON, măth'e-son, Arthur James (1842–1913). A Canadian statesman. He was born at Perth, Ontario, and was educated at Upper Canada College and at Trinity College, Toronto. He was called to the bar in 1870 and practiced his profession in Perth, where he also entered municipal life and became mayor (1883–84). He was a Conservative member of the Ontario Legislature in 1894–1913 and was Provincial Treasurer in 1905–13 in the administration of Sir James P. Whitney (q.v.). He was a member of the Ottawa Interprovincial Conference (1906), of the National Conference on State and Local Taxation (1907), and vice president for Canada of the International Commission (1910). In 1908 he was made king's counsel. He entered the militia in 1866, served on the frontier during the Fenian raids (1866–70), winning promotion, and was made lieutenant colonel in 1886 and brigadier general in 1900.

MATHESON, George (1842–1906). A Scottish minister and author, born in Glasgow. He lost his eyesight in his youth, but entered the University of Edinburgh and graduated with honors in 1861. His first charge was at Innellan, Argyllshire (1868–86); afterward he became minister at St. Bernard's, Edinburgh (1886–99). He was author of the hymn "O Love that Wilt Not Let me Go." His publications include: *Aids to the Study of German Theology* (1873; 3d ed., 1876); *The Growth of the Spirit of Christianity* (2 vols., 1877); *Natural Elements of Revealed Theology* (1881); *My Aspirations* (1883); *Can the Old Faith Live with the New?* (1885); *Distinctive Messages of the Old Religion* (1893); *Bible Definition of Religion* (1898); *Studies of the Portrait of Christ* (2 vols., 1899–1900); *The Representative Men of the Bible* (1902); *Leaves for Quiet Hours* (1904); *The Representative Women of the Bible* (1907). Consult his *Life* by D. Macmillan (London, 1907; new ed., New York, 1911).

MATHESON, Samuel Pritchard (1852–). A Canadian Anglican prelate, born at Kildonan, Manitoba, and educated at St. John's College, Winnipeg. Ordained a priest of the Church of England in Canada in 1876, he was appointed canon of St. John's Cathedral, Winnipeg, in 1882; dean of Rupert's Land and prolocutor of the General Synod of Canada in 1902; and was consecrated Coadjutor Bishop of Rupert's Land in 1903. He was elected Bishop of Rupert's Land and Metropolitan, with the title of Archbishop, in 1905 and Primate of all Canada in 1909. Successively he served as professor of exegetical theology in, and warden and chancellor of, St. John's College, Winnipeg. He was elected honorary president of the Moral and Social Reform Council of Canada; was a delegate to the Pan-Anglican Congress, London, England (1908); and a delegate to, and honorary president of, the Anglican Church Congress, Halifax (1910).

MATHEW, măth'ū, Theobald, commonly known as Father Mathew (1790–1856). A total-abstinence orator. He was born at Thomastown, a few miles east of Tipperary Castle, in Ireland, Oct. 10, 1790. On the death of his father, while Mathew was still very young, the kindness of the Llandaff family enabled the boy to enter the Roman Catholic College of Kilkenny, whence he was transferred, as a candidate for the Roman Catholic priesthood, to the College of Maynooth in 1807. He left that college, however, in the next year. He relinquished the secular priesthood for that of the religious Order of the Capuchins, in which he took priest's orders in 1814 and, after a year in Kilkenny, was sent to the church of his order in the city of Cork, where he remained for 24 years. He established a religious brotherhood similar to that of St. Vincent de Paul, and he founded schools for children of both sexes. But the great work of Father Mathew's life is the marvelous reformation which he effected in the habits of his fellow countrymen and which has won for him the title of Apostle of Temperance. In 1838 he established an association on the principle of total abstinence, at first confined to the city of Cork, but afterward extending to the county and adjacent districts of Limerick and Kerry. The success which attended this first local effort led to the suggestion that Father Mathew himself should repair to the several great centres of population, especially in the south. Thence he gradually extended the field of his labors to Dublin, to the north, and even to Liverpool, Manchester, London, Glasgow, and the other chief seats of the Irish population, even in the New World. His association included a large proportion of the adult population of Ireland, without distinction of rank, creed, or sex; and so complete was the revolution in the habits of the Irish people that very many distilleries and breweries ceased from working. Mathew's munificent charities, especially during the Irish famine of 1846–47, the expenses connected with his total-abstinence association, and perhaps his own unworldly habits, involved him in pecuniary embarrassments and embittered his last years. A pension of £300, granted by the crown in 1847, was supplemented by private subscription and relieved him of his liabilities. In 1848 he had an attack of paralysis, from which he never fully recovered. From 1849 to 1851 he was in America and founded numerous total-abstinence societies. He died at Queenstown, Ireland, Dec. 8, 1856. Consult his *Life* by J. F. Maguire (London, 1869; abridged, 1890), by F. I. Mathew (ib., 1890), and by Tynan (ib., 1908).

MATHEWS, măth'ūz, Charles (1776–1835). An English comedian, born in London on June 28, 1776. He was the son of a bookseller, who

intended his son to follow the same vocation; but Charles's early inclination for the stage overcame parental counsel, and he made his appearance as an amateur, in the part of Richard III, at the Richmond Theatre in 1793. As a professional comedian, he appeared in the Theatre Royal, Dublin, the following year. In 1803 he made his first appearance in London at the Haymarket, playing the part of Jabel in *The Jew* by Cumberland. In 1818 he first introduced in London one of his entertainments, known as *At Homes*, such as he repeated for a number of subsequent seasons with immense success. In the course of his career he twice visited America, in 1822 and 1834, and his last appearance upon the stage was made at New York in February, 1835. He had been since 1828 a joint proprietor of the Adelphi Theatre of London. His death occurred at Plymouth on June 28, 1835. Mathews was a wonderful master of impersonation and mimicry. The variety of his facial expression was so extraordinary that he could alter his curious features in an instant and deceive even his friends as to his identity, a peculiarity of which many quaint stories are told. He was extremely sensitive, and the fineness of his taste and character, as well as his wit, made him a welcome companion of the most distinguished people. Charles James Matthews (q.v.), his son (1803–78), became even better known as an actor than his father. Consult: Mrs. Mathews, *Memoirs of Charles Mathews, Comedian* (London, 1838–39); id., *Anecdotes of Actors* (ib., 1844); Baker, *Our Old Actors* (ib., 1881); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States*, vol. ii (New York, 1886).

MATHEWS, Charles James (1803–78). An English actor and playwright, son of Charles Mathews, born in Liverpool, Dec. 26, 1803. He was educated at Merchant Taylors' School and at a school at Clapham kept by Richardson the lexicographer. In 1819 he began study with Pugin, the architect. With Pugin he went to Paris, whose comedians increased a lurking disposition of his to appear on the stage. He did so as an amateur in April, 1822, playing the part of Dorival in *Le comédien d'Etampes* at the Lyceum Theatre. He afterward designed and superintended the building of cottages, inns, and bridges. In 1835 he gave up his profession and turned to the stage. Though a brilliant actor in light pieces, he met with many reverses as manager. During his long career on the stage he played, in England and America, more than 200 rôles in dramas written by himself and others. Among his most famous parts were Charles Coldstream in *Used Up*, Lavater in *Cool as a Cucumber*, and Puff in the *Critic*. Besides performing at the principal London theatres, Mathews made tours through Canada, the United States, and Australia. He died at Manchester, England, June 24, 1878. Consult Charles Dickens, *Life of C. J. Mathews* (London, 1879).

MATHEWS, Edward Bennett (1869–). An American mineralogist, brother of Shailer Mathews (q.v.). He was born at Portland, Me., and graduated in 1891 from Colby College and in 1894 (Ph.D.) from Johns Hopkins, where he was instructor in mineralogy and petrography (1894–95), associate (1895–99), associate professor (1899–1904), and professor after 1904. He was also a field assistant of the United States Geological Survey in 1891–94, and in 1898 became State geologist of Maryland. His writings include: *Bibliography and Cartography of Maryland* (1897); *The Maps and Map-Makers of Maryland* (1898); *An Account of the Character and Distribution of the Maryland Building Stones* (1898); *The Counties of Maryland, their Origin, Boundaries, and Election Districts* (1907); *The Limestones of Maryland* (1910).

MATHEWS, Joseph McDowell (1847–). An American surgeon, born at Newcastle, Ky., and educated professionally at the University of Louisville (M.D., 1867). He established himself in practice at Louisville and became professor of surgery in the Louisville Hospital College of Medicine. In 1899–1900 he served as president of the American Medical Association. He is the author of *Diseases of the Rectum, Anus, and Sigmoid Flexure* (1893; 3d ed., 1903) and of *How to Succeed in the Practice of Medicine* (1902).

MATHEWS, Shailer (1863–). An American New Testament scholar, editor, and author. Born at Portland, Me., a brother of Edward Bennett Mathews (q.v.), he was educated at Colby College (A.B., 1884; A.M., 1887), and graduated from the Newton Theological Institution in 1887. He returned to Colby to be associate professor of rhetoric (1887–89) and professor of history and political economy (1889–94). In 1890–91 he studied at Berlin. At the University of Chicago he was associate professor (1894–97) and professor (1897–1905) of New Testament history and interpretation, professor of systematic theology (1905–06), professor of historical and comparative theology after 1906, also junior dean of the Divinity School (1899–1908), and dean after 1908. He was president of the Western Economic Society after 1911 and of the Federal Council of the Churches of Christ in America after 1912, and served as editor of *The World Today* in 1903–11 and of the *Biblical World* after 1913. His publications include: *Select Mediæval Documents* (1892; 2d ed., 1900); *The Social Teaching of Jesus* (1897; rev. ed., 1908); *A History of New Testament Times in Palestine* (1899; rev. ed., 1910); an excellent study of *The French Revolution* (1901; 4th ed., 1904); *The Messianic Hope in the New Testament* (1905); *The Church and the Changing Order* (1907); *The Social Gospel* (1910); *The Gospel and the Modern Man* (1910); *Scientific Management in the Churches* (1912); *The Making of To-Morrow* (1913).

MATHEWS, William (1818–1909). An American author, born at Waterville, Me. He graduated at Waterville College (Colby College) in 1835, studied law at Harvard, and was admitted to the bar. In 1841 he established the *Watervillonian*, afterward called the *Yankee Blade*, which united with the Boston *Portfolio* in 1856. He was also in newspaper work in Chicago from 1859 until 1862, when he was appointed professor of rhetoric and English in the University of Chicago, a position he resigned in 1875. His publications include: *Getting On in the World* (1872); *The Great Conversers, and Other Essays* (1874); *Words: Their Use and Abuse* (1876); *Hours with Men and Books* (1877); *Oratory and Orators* (1879); *Literary Style* (1881); *Men, Places, and Things* (1887); *Wit and Humor: Their Use and Abuse* (1888); *Nugæ Literariæ* (1896); *Conquering Success* (1903).

MATHEWS, William Smythe Babcock (1837–1912). An American musician and writer on music. He was born in Loudon, N. H., and was educated entirely under American teachers.

From 1891 to 1902 he was the editor of *Music*, a journal devoted to the interests of students of music. For many years this paper was an important influence in the musical life of America, but gradually it lost its prestige through overconservatism and increasing opposition to the music of Wagner. His publications include: *Outlines of Musical Form* (1867); *Emerson Organ Method* (1870), in collaboration with L. O. Emerson; Pianoforte Technics (1876), with William Mason; *How to Understand Music* (2 vols., 1880, 1888, respectively); *Popular History of Music* (1889); *One Hundred Years of Music in America* (1889); *Pronouncing Dictionary of Musical Terms* (1896), with Emil Liebling; *Music: Its Ideals and Methods* (1897).

MATHIAS, mȧ-thī′ȧs, Thomas James (c.1754–1835). An English author. He was educated at Trinity College, Cambridge, of which he became a fellow, and was appointed treasurer of the household to Queen Charlotte. This office he resigned in 1818 and passed the later part of his life at Naples. During his long residence in Italy he became thoroughly acquainted with its language and literature and wrote Italian verses with considerable fluency. But his principal service to Italian literature was his edition of Tiraboschi's standard work, *The History of Italian Poetry* (1805). His best work is *The Pursuits of Literature*, a poem which was published anonymously between 1794 and 1797. The chief interest of the *Pursuits* lies in its satirical critical notes, which made a sensation at the time.

MATICO, mȧ-tē′kō (Sp., from South American name). *Piper angustifolium* or formerly known as *Artanthe elongata*. A shrub of the family Piperaceæ, a native of Peru, where it is known as soldiers' herb, because its hairy leaves are used as a styptic. The name is also applied to a species of *Eupatorium* (q.v.).

MATICO. A South American armadillo (q.v.) (*Tolypeutes conurus*), allied to the apar.

MATIL′DA. A town in Ontario, Canada. See Iroquois.

MATIL′DA (1102–67). Daughter of Henry I, King of England, and wife of the Emperor Henry V, often known as the Empress Maud. After her husband's death in 1125 she returned to England, and in 1126 her father compelled the barons of the realm to swear that they would accept her as his heir. In 1128 she was married to Geoffrey Plantagenet, son of the Count of Anjou. In 1133 she gave birth to a son, who was to ascend the throne of England as Henry II. When Henry I died in 1135, Matilda immediately claimed all his possessions, but was opposed by her cousin Stephen of Blois. In Normandy she was successful, but in England Stephen was generally accepted as King, though Matilda was loyally supported by her half brother Robert of Gloucester. In 1141 she was for a time victorious; Stephen was captured and even his brother Henry, Bishop of Winchester and Papal Legate, submitted to her rule. But the nobles of England found her too haughty and rose against her authority, and her cause was hopelessly lost until Henry was old enough to participate in the contest. After Henry II came to the throne she used her influence with the King for the preservation of peace in the Kingdom and sought to be mediator between him and Becket (q.v.). Consult J. H. Round, *Geoffrey de Mandeville: A Study of the Anarchy* (London, 1892).

MATILDA (1046–1115). Countess of Tuscany, noted through her close connection with the Papacy during its struggle with the Emperor Henry IV. She was a daughter of Boniface II, Count of Tuscany, and Beatrice of Lorraine. In 1070 she married by procuration Godfrey (surnamed *Il Gobbo*, i.e., "the Hunchback"), Duke of Lorraine. Her husband did not join her until 1072, and died in 1076. After this Matilda made herself conspicuous by the zeal with which she espoused the cause of Gregory VII, and it was at her castle of Canossa that Henry IV in 1077 made his humiliating submission to the Pope. In 1089, though 43 years of age, she contracted a nominal marriage with the 18-year-old Welf, the son of Welf, Duke of Bavaria, in order to gain additional support for Gregory's successor, Urban II, but the marriage was dissolved in 1095. When she died (July 24, 1115), the Papacy claimed her extensive territories, comprising Tuscany, Brescia, Modena, Reggio, Mantua, and Ferrara, on the ground that in 1077 she had made the Church her heir. This produced a new conflict between Papacy and Empire. In the course of this contest the cities rose to great power and asserted their independence. Consult: Luigi Tosti, *La contessa Matildà ed i romani pontifici* (2d ed., Rome, 1886); Overmann, *Gräfin Mathilde von Tuscien: Ihre Besitzungen. Geschichte ihres Gutes von 1115–1320 und ihre Regesten* (Innsbruck, 1895); M. E. Huddy, *Matilda, Countess of Tuscany* (St. Louis, 1905); Nora Duff, *Matilda of Tuscany* (London, 1910).

MATILDA CASE. See Chase, S. P.

MATILE, mȧ-tēl′, George Auguste (1807–81). A Swiss-American jurist, born at La Chaux-de-Fonds (Neuchâtel). He studied law at Berlin and Heidelberg, and still later in Paris. He was admitted to the bar (1838) at Neuchâtel, and eight years afterward was appointed professor of law at the university there, and judge of the Supreme Court. He came to America in 1849, and in 1856 was made professor of history at Princeton. In 1858 he removed to the University of Pennsylvania as professor of French literature. From 1863 until his death he was connected with the State Department in Washington. His works include: *Points de coutume* (1838); *Autorité du droit romain de la coutume de Bourgogne et de la Caroline dans la principauté de Neuchâtel* (1838); *Musée historique de Neuchâtel* (1841–59); *Monuments de l'histoire de Neuchâtel* (1844–48); *Histoire de la seigneurie de Valangin* (1852).

MÂTIN, mä′tăN′ (OF. *mastin, mâtin*, from ML. **manusuetinus*, from *mansuetare*, to tame, from *mansuetus*, p.p. of *mansuescere*, to tame, from *manus*, hand + *suescere*, to become accustomed, inchoative of *suere*, to be accustomed). A large kind of dog, now almost peculiarly French, but allied to the Great Dane. It has rough hair, a rather flat forehead, a rather pointed muzzle; the ears are erect, but bent down at the tips. It is generally of a whitish color, clouded with brown. It is fierce, but not very courageous. Compare Hound.

MA′TINS. See Canonical Hours; Breviary.

MATISSE, mȧ′tēs′, Henri (1869–). A French painter and sculptor, chief leader of the movement known as Post Impressionism (q.v.). He was born at Cateau (Nord), and studied at the Ecole des Beaux-Arts, Paris. For four years (1795–99) he painted in the conventional style; then, coming under the influence of Cézanne, he launched a new school. Rejecting all art of the

past, and especially the use of nature as a standard of beauty, Matisse attempts a return to primitive, childlike art, without reference to the conventional or the natural appearance of objects. "Simplification, organization, expression"—these are the oft-quoted watchwords of his manner; they perhaps explain his method. He possesses abundant vitality, is a capable draftsman, and has a keen sense of the decorative; but to the uninitiated or to those who have a different idea of what may be called art, his work seems grotesque, purposely defective, and therefore insincere. His peculiar style can best be studied in the Stein collection, Paris. Matisse was well represented in the International Exhibition of Modern Art, New York, in 1913, especially by paintings. Among some of the much discussed examples of his work in this kind are the decorative panels "Dance" and "Music," "The Woman with the Green Eyes," and a portrait of himself. A representative and retrospective exhibition of drawings, lithographs, paintings, and sculpture was held at the Montross Galleries, New York, in February, 1915. Among the most notable of the sculptures were the powerful "Serf"; nude women in various postures; and four versions of a "Woman's Head." The paintings included the well-known "Coucous," "Nude Model Posing," "Gold Fish," and "Young Sailor." Consult: Fritz Burger, "Henri Matisse," in *Cézanne und Hodler: Einführung in die Probleme der Malerei der Gegenwart*, vol. i (Munich, 1913); J. G. Huneker, "Matisse, Picasso and Others," in *The Pathos of Distance* (New York, 1913).

MAT'LOCK. A town of Derbyshire, England, situated amid beautiful scenery, 17 miles northwest of Derby. It is noted for its fine scenery, hot mineral springs, baths, and stalactite caves. Manufactures include cotton and bleach goods and paper; there are lead mines near by. Pop., 1901, 5980; 1911, 6745.

MATOS FRAGOSO, mä'tôsh frȧ-gō'sō, JUAN DE (?1614–1689). A Spanish-Portuguese dramatist, born at Alvito (Alemtejo), Portugal, about 1614. After becoming licentiate in the humanities and jurisprudence at Evora, he went to Madrid, became intimate with Pérez de Montalbán, and thus obtained a hearing on the stage. His earliest play known to us, *La defensa de la fé y príncipe prodigioso*, was published in 1651, and a dozen more appeared in 1658. Despite his popularity and his insistence upon the "point of honor," he is no longer read. Seven of his plays appear in vol. xlvii of the *Biblioteca de autores españoles*.

MA'TRIAR'CHATE (from Lat. *mater*, Gk. *μήτηρ, mētēr*, mother + *ἀρχός, archos*, ruler, from *ἄρχειν, archein*, to rule). Any social group, as a family, a clan, or a tribe, ruled by a woman or by women. The term has been used in ethnology since the publication in 1865 of Bachofen's *Das Mutterrecht*, in which it was shown that in all races there exist survivals of a metronymic period when children took the mother's name, instead of the father's name, and when property also descended in the female line. Such a system is still in full force among the North American Indians, and has been carefully described by Morgan in his *League of the Iroquois* in 1849. As an existing system it may even now be observed among the Damaras of South Africa, the Congo tribes of West Africa, the inland negroes, the Kasias of Bengal, the Tahitians and Tongans of Polynesia, and the Hovas of Madagascar. This system, however, is in fact only metronymic, and everywhere falls short of being matriarchal. There is no proof that mankind has passed through a stage of clan or tribal rule by women, although in his account of the Iroquois Long House Morgan presents a picture of a rigorous control of domestic affairs by a matron. Moreover, in the Iroquois clan a position of importance and respect was accorded to women. They voted in the council of the clan, on equal terms with men. In various African and Polynesian tribes women have held the most exalted position, that of queen of a tribal confederacy. This, however, was no such "matriarchy" as was at one time imagined by ethnologists disposed to believe that a patriarchal system had been preceded by one in which woman's relative importance was as great as that of man at a later time became. More complete investigations have shown that under metronymic organization it is not the wife and mother who exercises an authority over children which the husband does not possess. The authority really lies in the hands of the woman's nearest male kinsman, that is, her brothers, or her maternal uncles. These male kinsmen even exercise authority over husbands who have come to live among them. Consult: Dargun, *Mutterrecht und Raubehe* (Breslau, 1883); J. J. Bachofen, *Das Mutterrecht* (2d ed., Basel, 1897); E. A. Westermarck, *History of Human Marriage* (3d ed., ib., 1902); Charles Letourneau, *Evolution of Marriage* (ib., 1911).

MATRICARIA. See CHAMOMILE.

MATRIC'ULA'TION (from ML. *matriculare*, to enroll, from Lat. *matricula*, register, diminutive of *matrix*, roll, origin, womb, from *mater*, mother). A term denoting in a general sense enrollment or admission to membership in any body or society, specifically in a college or university.

MATRIMONIO SEGRETO, mȧ'trē-mō'nē-ō sȧ-grā'tō, IL (It., The Secret Marriage). An opera bouffe by Cimarosa, first produced in Vienna, Feb. 7, 1792; in the United States, Jan. 4, 1834 (New York).

MA'TRIX, IN MATHEMATICS. See DETERMINANTS.

MA'TRONA. See MARNE.

MAT'RONA'LIA (Lat., neu. pl. of *matronalis*, relating to a matron). A festival of Juno Lucina (see JUNO), celebrated at Rome by the married women and maidens of the city on the first of March. It typified the sacredness of married life and commemorated the dedication of the temple of Juno on the Esquiline, to which in the festival the matrons marched in procession with offerings for the goddess. Consult W. W. Fowler, *Roman Festivals* (London, 1899).

MATRONS, JURY OF. In English legal procedure, an extraordinary jury, composed of "matrons or other discreet women," impaneled under special circumstances to determine whether a woman is quick with child—the only instance in which women were eligible to serve as jurors at common law. It may be employed both in civil and in criminal cases where the fact of pregnancy is in issue or where a legal right turns upon the fact. In civil cases the question may arise in suits for the annulment of marriage on the ground of the concealed pregnancy of the wife resulting from an illicit connection with another man than her husband before marriage, in cases of pedigree where there

is need of a safeguard against the fraud of a supposititious child and the like. The writ *de ventre inspiciendo*, as it is called, is issued by the Court of Chancery to the sheriff and directs him to summon a jury of women to investigate and report whether the woman named in the writ is with child or not and, if so, at about what date her delivery may be looked for. The procedure is of very ancient origin and is said to have been borrowed from the civil law of Rome. It was frequently employed in the Middle Ages and there are several instances of its use in the last century as late as 1845. Though it has not been employed since that date it is still available as a matter of right if demanded. The fact that modern medicine furnishes a surer method of ascertaining the existence of pregnancy, has, in practice, led to the practical abandonment of the jury of matrons in such cases.

In criminal cases the jury of matrons was obligatory and directed by the court on the demand of a woman convicted of felony that execution of the sentence be suspended until she had given birth to a child of which she claimed to be pregnant. The common law from motives of humanity, and in order that a child which had quickened in the womb should not also lose its life for the mother's crime, provided for the postponement of the death penalty till the child had been safely delivered. The woman was entitled as matter of right after sentence to plead her pregnancy in answer to the question, "What have you to say for yourself in stay of the execution of the sentence which has been given against you?" The course usually followed is for the clerk, immediately upon the plea being made, to impanel a jury of 12 from the women present in court. The jury then retire with the prisoner to make the necessary examination and for this purpose may have the assistance of a competent physician. They may also hear the testimony of medical men offered either in the interests of the prisoner or of the crown and given in open court. In order that the verdict of the jury shall operate as a reprieve it is not sufficient that the bare fact of pregnancy be found. The verdict must declare that the prisoner is "with quick child." As in civil cases the modern tendency is to employ a medical examination in all cases of alleged pregnancy, and in New York and several other States the jury of matrons has been abolished by statute and a jury of medical men (usually six) substituted in their stead. This is also the French procedure. In England, however, the old practice of summoning a jury of matrons in such cases still obtains. The last instance of its use appears to have been in the case of *Regina* v. *Katherine Webster*, in 1879, reported in the *Times*, July 9, 1879. Consult: J. F. Stephen, *History of the Criminal Law* (London, 1883); Sir William Blackstone, *Commentaries on the Laws of England* (4th ed., Chicago, 1899); Edward Chitty, *Criminal Law* (4 vols., London, 1816); Taylor, *Medical Jurisprudence* (5th ed., ib., 1905); *Encyclopedia of the Laws of England*, vol. ix (2d ed., ib., 1907). See PREGNANCY.

MATSUE. See MATSUYE.

MATSUKATA, mät'sōō-kä'tȧ, MASAYOSHI, MARQUIS (1835–). A Japanese statesman, born in Satsuma, the son of a samurai. After the revolution he became head of one of the new prefectures and took a prominent part in the tax reform of 1875. He became Minister of Commerce in 1880, of Finance in 1881, and cabinet president with the portfolio of Finance in 1891. He retired in 1893, but in 1896 formed a new cabinet, became Minister of Finance, introduced the gold standard, which put Japanese credit on a firm basis, and retired in December, 1897, because of opposition to his programme of taxation. In 1898–1900 he was again Finance Minister. He was made Privy Councilor in 1903, and for some years was president of the Japan Red Cross Society. His title of Marquis he held after 1906, having previously been Count since 1884.

MATSUMAI, mät-sōō'mī, or **MATSUMAYE,** mät'sōō-mä'yĕ. A seaport of Japan. See FUKUYAMA.

MATSUMOTO, mät'sōō-mō'tō. A town of Japan in the District of Nagano, situated nearly in the centre of the island of Hondo, 100 miles northwest of Tokyo (Map: Japan, E 5). It lies in a wide fertile plain surrounded by mountains, and contains a picturesque remnant of an old daimyo castle. It manufactures silks, baskets, and preserved fruits. Pop., 1903, 33,493; 1908, 35,011.

MATSUMURA, mät'sōō-mōō'rȧ, NINZO (1856–). A Japanese botanist, born in Ibaraki-Ken, of a samurai family. He took a great interest in botany as a young man and after he was 30 studied in Würzburg and Heidelberg (1886–88). In 1883 he had been made assistant professor of botany in the University of Tokyo, and in 1890 became professor and in 1897 director of the Botanical Gardens. He assisted in the preparation of Brinkley's *Unabridged Japanese-English Dictionary* (1896), and he published many important works on the flora of Japan, including: *Nomenclature of Japanese Plants in Latin, Japanese, and Chinese* (1884), *Names of Plants and their Products in English, Japanese, and Chinese* (1892), *Conspectus of Leguminosæ* (1902), *Index plantarum Japonicarum: Cryptogamæ* (1904), *Phanerogamæ* (1905); with Ito, *Tentamen Floræ Lutchuensis* (1899) and *Revisio Alni Specierum Japonicarum* (1902); with Hayata, *Enumeratio Plantarum in Insula Formosa Sponte Crescentium* (1906).

MATSUNAGA, mät'sōō-nä'gȧ, RYŌHITSU. A prominent Japanese mathematician, born at Kurume in Kiushu, or possibly at Terauchi in Awari. He died in 1744. His former name was Terauchi Gompei, and he is also known as Matsunaga Yoshisuke. He received the mathematical secrets of the Seki (q.v.) school from Araki (died in 1718), under whom he studied. His best-known work, the *Hoyen Sankyo* (1739), is devoted entirely to formulas for the circumference and arcs of circles. In this he gives the value of π to 50 figures.

MATSUOKA, mät'sōō-ō'kȧ, YASUKOWA (or KOKI) (1846–). A Japanese statesman and administrator, born in Tokushima, Awa Province, of a samurai family. He entered the Department of Justice in 1871; traveled in Europe to study judicial methods in 1886–87; became a crown member of the House of Peers in 1891; was Procurator General in 1892 and Vice Minister of Home Affairs in 1894 and 1898; presided over the Administrative Litigation Court in 1898–1906; and in 1906–08 was Minister of Agriculture and Commerce. He was president of Japan University, a private institution. Matsuoka was a political adherent of Yamagata.

MATSUSHIMA, mät'sōō-shē'mȧ. A small

village on the Bay of Sendai, on the east coast of northern Hondo, Japan, of which, in a shallow lagoon, lies a group of 808 tiny islets and rocks (also called *Matsŭshima*, or Pine Islands), ranging in height from 30 to 300 feet, rising steeply out of the water and covered with pines and stunted brushwood, forming a beautiful natural garden. It is one of the "three natural wonders" of the coast; the other two are found at Miyadzu and Miyajima (qq.v.).

MATSUYAMA, mät'sōō-yä'mȧ. A town of Japan, capital of the District of Ehime and of the former Province of Iyo. It is situated in the western part of the island of Shikoku, 5 miles from its port, Mitsu, with which it is connected by a railroad (Map: Japan, C 7). It is chiefly noted for its large feudal castle, formerly the seat of a daimyo, which was one of the few preserved as specimens by the Imperial government when feudalism was abolished. Pop., 1903, 37,842; 1908, 44,166.

MATSUYE, mät-sōō'yȧ, or MATSUE, mä'-tsōō-ȧ. A town of Japan, capital of the District of Shimane and formerly of the Province of Idzumo. It is situated on a small inlet of the Sea of Japan, on the north coast of the great southwestern peninsula of the island of Hondo, 140 miles northwest of Kyoto (Map: Japan, C 6). It is a clean, prosperous city, with numerous temples, and is noted for the manufacture of paper and the polishing of agates. Pop., 1903, 35,081; 1908, 36,209.

MATSYS, mät'sĭs', **MASSYS**, **METSYS**, **MESSYS**, QUINTEN (c.1460–1530). One of the most eminent painters of the early Flemish school. According to the most critical modern opinion, his birthplace was not Antwerp, as was formerly supposed, but Louvain. Here he studied, probably under a pupil of Dierick Bouts, for his earliest works show the influence of that master. The charming traditions of his early life, how the smith of Louvain became a painter for love of a painter's daughter, etc., deserve no credence. He removed early to Antwerp, where he was enrolled in the painters' guild in 1491, passed most of his life, and died in 1530. In Matsys's art Flemish painting of the fifteenth century reached its culmination, but he is also the earliest representative of the new era of the sixteenth century, when the Italian influence began to make itself felt in the Netherlands. He was one of the first to give to the human figure marked prominence and to understand the value of gesture and of unity of composition. Rejecting the miniature forms of his predecessors, he painted the figures life size, and subordinated detail to the general effect. His color is rich, but good in values, and subordinated to a luminous silvery tone. Among his earlier paintings are a series of "Crucifixions," the best being in the Liechtenstein Gallery, Vienna, and the Mayer van der Bergh collection, Antwerp, and a "Pietà" in the Louvre.

One of his greatest surviving works is the altarpiece for St. Ann's chapel in the church of St. Peter at Louvain, now in the Brussels Museum, completed in 1509. The subject of the centre panel is the "Family of St. Ann." The figures are nobly and solidly represented, but without dramatic expression. On the other hand, the scenes from the "Life of St. Ann" on the wings of the altar are strongly dramatic. His masterpiece is the great triptych in the Antwerp Museum, representing the "Burial of Christ," flanked by the "Martyrdom of the Two Johns" (1509–11). The action of this work is intense, and the color, though gorgeous, is well harmonized. His other works include an "Enthroned Virgin," Berlin Gallery; two half-length devotional figures of "Christ" and the "Virgin" at Antwerp and "an Adoration of the Kings" in the Metropolitan Museum, New York.

His few surviving portraits are strong and realistic and show a skillful rendition of character. Genuine examples are those of Ægidius at Longford Castle; of Jean Carondelet in the Pinakothek, Munich; Erasmus in the Stroganoff Palace, Rome; the "Man with the Eyeglasses" in the Städel Institute, Frankfort; and the "Choir Master" in the Liechtenstein Gallery. By emphasizing the worldly occupation of the sitters, as in his well-known "Banker and his Wife" (1514, Louvre), he prepared the way for the genre picture of the future. Consult Walter Cohen, *Studien zur Quinten Metsys* (Bonn, 1904), and Jean de Bosschère, *Quentin Metsys* (Brussels, 1907).

MAT'TATHI'AS (the Gk. form of the Heb. *Mittithyāh*, or, more correctly, *Mattathyāh*, gift of Yahwe). The name of several individuals of the Maccabæan period of Jewish history, the most noted of whom was the aged priest of the Hasmonæan family (cf. 1 Macc. ii), who started the revolt against Syria (168 B.C.) and whose sons, Judas, Jonathan, and Simon, brought it to a successful issue. See MACCABEES.

MAT'TAWA, măt'ȧ-wȧ, or **MATTAWAN**, măt'ȧ-wŏn. A town in Nipissing District, Ontario, Canada, at the east end of Lake Timiskaming, at the junction of the Ottawa and Mattawa rivers, 45 miles east of North Bay (direct), and on the Canadian Pacific Railroad (Map: Ontario, F 1). It is an important distributing point for lumbering districts, and a favorite rendezvous for moose-hunting parties, sportsmen, and anglers. The town has an electric-lighting plant. There are large mica deposits in the vicinity. Pop., 1901, 1400; 1911, 1524.

MATTAWA RIVER. A tributary of the Ottawa River, Canada. It has its source in Trout Lake, near Lake Nipissing, and after an eastward course of 50 miles flows into the Ottawa River at Mattawa Town. Prior to the railway era it was an important trading route from upper Ottawa to the Great Lakes and is much resorted to for the fine angling it affords. Lake Huron, at an earlier stage in its history, drained through Lake Nipissing and the Mattawa River to the Ottawa.

MATTEAWAN, măt'ȧ-wŏn'. Formerly a village in Dutchess Co., N. Y., merged in 1913 with the village of Fishkill Landing (q.v.) to form the new city of Beacon (Map: New York, A 1). It has the State Hospital for the Criminal Insane, Highland Hospital, and the Howland Circulating Library. Good water power is afforded for manufacturing, and its industries are represented by wool and straw hat shops, machine shops, silk and embroidery mills, etc. Matteawan was founded in 1814, and its population in 1910 was 6727 (excluding the patients in the insane asylum).

MATTE (măt) **COPPER.** A combination of the metal and sulphur, other elements occurring in minor proportions. It is the product formed by smelting ores containing sulphur, copper, and (usually) iron. It is essentially a mixture of cuprous sulphide (Cu_2S) and FeS, and almost

always carries a small amount of magnetite as an impurity. It has great affinity for silver and gold and collects these metals when they occur in the furnace charge, a property which is fully utilized in metallurgy. The copper and iron are replaceable by any or all of the heavy metals, nickel, cobalt, lead, manganese, etc., and also to a small extent by the alkalies and alkali earths. The sulphur may be replaced in part by antimony, arsenic, selenium, and tellurium, but when any great amount of the sulphur is so replaced, the compound assumes different characteristics both chemically and physically, and is then known as speiss. Matte assumes different colors as the sulphur content changes and is known from these appearances as blue metal, white metal, or regulus. The further treatment of matte always consists of an oxidation, the sulphur being expelled as sulphur dioxide; the iron oxidized to ferrous oxide, which is combined with silica to form a fusible slag, while that portion of the copper first oxidized reacts with the unchanged sulphide to form sulphur dioxide, leaving the metallic copper carrying silver and gold. See COPPER, section on *Metallurgy*.

MATTEO DI BASSI, mät-tā'ō dē bäs'sē. An Observantine Franciscan, founder of the Order of the Capuchins (q.v.).

MAT'TER (OF. *matière, matere, matire,* Fr. *matière,* from Lat. *materia,* matter; connected with Skt. *mā,* to measure, build). In ordinary language, the material world is discriminated from the world of mind, although it is conceded that all our knowledge of the former comes to us through sensation. In so far as matter is conceived as the basis of the reality of the physical world, the term designates the object matter of all physical science. It is defined in physical treatises wholly by its properties.

PROPERTIES OF MATTER

From the standpoint of physics, the properties of matter may be classified as inertia, weight, and various characteristics of size, shape, and molecular connections. When one changes the motion of a piece of matter in any way one is conscious of a definite sensation, the intensity of which depends upon two things—the suddenness of the change and the quantity of the matter, using this word "quantity" in a general sense. This sensation, being associated with matter, is said to be due to a definite property of matter, which is called its "inertia" (q.v.). Again, if a portion of matter is held in the hand and so kept from falling towards the earth, there is a definite sensation which is attributed to a property of matter called "weight." It can be shown that if our senses were delicate enough they would experience a similar sensation when any two pieces of matter, e.g., two bullets, were held a small distance apart. See GRAVITATION.

There are a great many properties common to all kinds of matter, but to different degrees; while other properties are confined to certain forms of matter, e.g., solids or liquids or gases. A *solid* has a definite shape and size of its own, which can, however, be changed by the application of certain forces. Some solids, e.g., copper, have *ductility* (q.v.) and can be drawn out into wires; some have *malleability* (q.v.) and can be hammered out into thin sheets; some have *porosity* (q.v.) and allow various other portions of matter to pass through them; some are "glazed" and are nearly impervious to other portions of matter; some are hard, others soft; some are brittle, others tough; some are plastic, like putty, etc.

A *liquid* is such a form of matter that, if left to itself in air (or in any gas or other liquid with which it does not mix), it forms a spherical drop, or, if contained in a hollow solid here on the surface of the earth, it takes the shape of the vessel, keeping a constant volume. A liquid has then certain molecular properties in its surface which make it contract as far as possible. See CAPILLARITY.

A *gas* is such a form of matter that, being contained within any closed vessel, it distributes itself uniformly throughout the space open to it; thus having neither a shape nor a size of its own. (See GASES, GENERAL PROPERTIES OF.) Gases and liquids are called *fluids* because they can flow; they yield to any force, however small, which is acting in such a direction as to make one layer move over the other. (See HYDROSTATICS.) Some bodies behave as liquids to feeble but long-continued forces, but as solids to intense and sudden forces; shoemaker's wax will flow so as to fill a tumbler if time is given, but it may be broken by a sudden blow, just like a piece of glass.

All forms of matter are divisible into smaller parts. (See following paragraphs on *Theories of Matter.*) They are also more or less "elastic"; that is, if the shape or size of a solid is deformed slightly by a small force, or if the volume of a fluid is so changed, they will return to their previous conditions more or less perfectly when the deforming force is removed; this proves the existence of internal molecular forces of restitution. (See ELASTICITY.) Whenever the shape of a solid is changed—not the shape of the whole solid necessarily, but the shape of the little cubical portions out of which the body may be imagined constructed—there is always to some degree a slipping of the layers of matter over each other, and corresponding internal or molecular friction. Similarly, if currents are produced in fluids, there is more or less friction between the layers, which is attributed to a property called *viscosity* (q.v.). In the case of liquids there is a superficial viscosity also, which is made manifest when a body floating on the surface is moved.

A property common to all forms of matter is that of "diffusion"; if two portions of different kinds of matter are brought closely together—"in contact"—it is believed that there is always a passage across the bounding surface of molecules of the two kinds of matter. Sometimes this passage can be actually observed, e.g., in the case of any two gases, two such liquids as water and alcohol, two such solids as lead and gold.

Since matter as such has so many properties, inertia, weight, size, elasticity, etc., two portions of matter may have some properties in common and not others. Therefore, if two portions of matter are to be defined as equal, or to have equal quantities, it is necessary to select some basis of comparison. By *definition,* two portions of matter are said to have equal quantities—or equal "masses"—if they have the same inertia; the experimental test being imagined somewhat as follows: Subject one body to the propulsive action of a compressed spring, measure its velocity along a smooth horizontal table; compress the same spring to the same

amount as before, allow it by its expansion to set in motion a second body, and measure its velocity; if these two velocities are the same, the two bodies have the same inertia.

Newton, and later Bessel, proved that the acceleration of a falling body towards the earth at any one place on the earth's surface is a constant for all kinds and amounts of matter. (See GRAVITATION.) Call it g. The weight of a body of mass m is mg; and so if two bodies have the same mass, as defined above, they also have the same weight, and conversely. Consequently the mass of a body is always in practice measured by comparing its weight with that of a combination of standards. A standard body is chosen, a gram; other bodies of the same mass are made; others whose masses are fractions or multiples of that of the standard; etc. Such a set of bodies is called a "set of weights."

It is believed that matter as such is indestructible; that is, however it changes its form or whatever reactions it undergoes, a portion of matter preserves its mass unaltered. This idea, which is entirely in accord with all experiments and observations, is called the principle of the conservation of matter. It is perfectly possible that the *weight* of a body changes as its temperature, or one of its other properties, is altered, but there is no experimental evidence in favor of such an idea. For full discussion of properties of matter, the reader may consult Tait, *Properties of Matter* (Edinburgh, 1885).

THEORIES OF MATTER

Many theories have been advanced to account for the properties of matter; some deny an objective reality to matter, others affirm it. It is possible to show that all observed phenomena in nature may be predicted from certain general mathematical equations, the quantities in which are not necessarily connected with the perceptions of man; and that our mode of interpreting these qualities in terms of matter is not the only possible one. Again, there was a theory of matter, due to Boscovich, in which all actions of matter, as revealed by our senses, are attributed to "force centres," which act on each other according to different laws for different distances. This theory fails to explain inertia.

All theories which affirm the objective reality of matter consider any portion of it as made up of "molecules" and "atoms," meaning by molecule the smallest portion of the given kind of matter which retains the properties of the whole (e.g., a molecule of copper, of water), and by atom the smallest portion obtained in chemical reactions. There are many theories of this kind, which differ in the way they regard molecules and atoms; but they all agree in one respect, they consider both the molecules and atoms to be in motion. On the idea that molecules are in motion it is possible to explain the main differences between solids, liquids, and gases and the principal features of diffusion, osmosis, evaporation, dissociation, heat conduction, fluid pressure, viscosity, etc., and in particular to deduce the most important properties of a gas. Such theories as this are called "kinetic theories." On any kinetic theory the molecules of a gas are conceived to be in motion in paths long compared with their own size, the average length of path being called the "mean free path." It is possible by identifying certain actual physical quantities, such as pressure, viscocity, diffusion, with these quantities as predicted by mathematical treatment of the simple kinetic theory of gases, to arrive at an idea as to the order of magnitude of the number of molecules in one cubic centimeter, and the length of the mean free path at different pressures, etc. The approximate number of molecules in 1 cubic centimeter at atmospheric pressure is 2.7×10^{19}, the mean distance apart of two molecules is about 2.6×10^{-7} centimeters, the mean free path is about 1×10^{-5} centimeters, and the volume actually filled by the molecules in 1 cubic centimeter is $\frac{1}{5000}$ cubic centimeter. If the pressure is diminished, these quantities all change.

If the pressure is reduced to .001 centimeter of mercury, the mean free path becomes about 1 centimeter. A space so exhausted of matter as this has special physical properties and is called a "Crookes' vacuum" or the "fourth state of matter."

In a liquid the molecules are supposed to be moving about, having encounters with each other, rebounding, etc., yet having practically no free path.

In a solid the molecules are supposed to be held more or less in fixed positions, about which they may vibrate, thus forming an elastic configuration which can be strained or even permanently deformed.

In the cases of all three—gases, liquids, and solids—while the molecules are moving about, the electrons (see ELECTRON) in the atoms forming the molecules are making immensely rapid vibrations, which produce the ether waves manifested by thermal, luminous, and chemical effects when they are absorbed. (See RADIATION.) These kinetic ideas of molecules and atoms can be used to form a concrete picture of nearly all the phenomena and properties of matter.

The question remains, What is the "atom"? One idea was that an atom is a perfectly elastic sphere, which is obviously incompatible with facts. Another theory which has been much discussed is that atoms are vortices in a perfect fluid. The simplest type of vortex (q.v.) is like a smoke ring; but there are many more complicated forms, which can be shown to be stable. A vortex once formed in a perfect fluid will maintain its identity as it moves about, not being a wave motion passing through the fluid, but always consisting of the same portion of the fluid; vortices are elastic; they can "combine," or come together and form a single system. Thus, if atoms are simply vortices of ether moving freely through the ether, many of the properties of matter may be explained. A still more recent theory of matter is based upon the fact that an electric charge has an inertia quite apart from that of the matter which carries the charge. (See ELECTRON.) Consult Ames, *The Constitution of Matter* (Boston, 1913).

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(New York, 1904); Frederick Soddy, *Matter and Energy* (ib., 1912), contains a bibliography; O. W. Richardson, *Electron Theory of Matter* (Cambridge, 1914). See ENERGETICS; LIGHT.

MATTER, mȧ'târ', JACQUES (1791–1864). A French philosopher, born in Alsace. He was educated at Strassburg, Göttingen, and Paris, and in 1820 was appointed professor of history and director of the College of Strassburg. In 1832 Guizot made him inspector general of the University of Paris. In 1845 he was chosen inspector of the French public libraries. He retired in 1846 to Strassburg to become professor in the Protestant theological seminary there. He was the author of a great number of standard works, among which are: *Essai historique sur l'école d'Alexandrie* (1820; 2d ed., as *Histoire de l'école Alexandrie, etc.*, 1840–44); *Histoire critique du gnosticisme, etc.* (1828; 2d ed., 1843–44); *Histoire universelle de l'église chrétienne* (1829–35; 2d ed., 1839); *De l'influence des mœurs sur les lois et des lois sur les mœurs* (1832; 2d ed., 1843), crowned by the Academy; *Histoire des doctrines morales et politiques des trois derniers siècles* (1836–37); *De l'affaiblissement des idées et des études morales* (1841); *De l'état moral, politique, et littéraire de l'Allemagne* (1847); *La philosophie de la religion* (1857); *La morale, etc.* (1860); *Saint Martin* (1862; 2d ed., 1864); *Emmanuel de Swedenborg* (1st and 2d ed., 1863); *Le mysticisme en France au temps de Fénelon* (1864).

MAT'TERHORN (Fr. *Mont Cervin*, It. *Monte Cervino*). The grandest mountain mass of the Alps, located near Zermatt in Switzerland, between the Canton of Valais and the Val d'Aosta in Italy, in the Pennine group (Map: Switzerland, B 3). Its height is 14,782 feet, but that fact alone gives little idea of the sublimity of its abrupt rise above the great range of which it is the sentinel peak. The vast glaciers around it have their upper sources in snows at the foot of this mighty crag, which rises on its northerly face in a sheer precipice nearly 4000 feet above them. It was deemed impossible of ascent previous to 1865, when its top was reached by Whymper, who lost four of his party in the return. Its ascent is now made less perilous by a hut built at a height of 12,526 feet, and by the familiarity of the guides with the most dangerous points, and the means to surmount them. Consult John Tyndall, *Hours of Exercise in the Alps* (New York, 1899), and Edward Whymper, *Scrambles Amongst the Alps* (5th ed., London, 1900).

MATTEUCCI, mȧt'tȧ-o͞ot'chē, CARLO (1811–68). An Italian scientist, born at Forlì, Romagna. He studied the physical sciences at the Ecole Polytechnique in Paris, and through the influence of Humboldt was made professor of physics in the University of Pisa. Previously he had taught at Bologna and Ravenna. He devoted himself especially to the investigations of the physiological effects of electricity, and published his results in French, English, and Italian journals of science. He also wrote: *Lezioni di fisica* (4th ed., 1851); *Lezioni sui fenomeni fisico-chimici dei corpi viventi* (2d ed., 1846); and *Cours spécial sur l'induction, le magnétisme de rotation, etc.* (1854). In 1860 he was made Senator by the Grand Duke of Tuscany, and in 1862 for a few months he held the portfolio of Public Instruction in the Rattazzi ministry.

MATTEUCCI, RAFFAELE VITTORIO (1846–1909). An Italian seismologist, born at Senigallia, Italy. He graduated from the University of Naples; studied at the University of Heidelberg; and then investigated seismic disturbances, especially those of Mount Vesuvius. In this connection he made especially important researches. In the Vesuvius eruption of 1900 he was severely injured, but two years later he succeeded Palmiere as director of the observatory on that mountain. In 1906 he remained at his post throughout the eruption (which he had predicted) and sent messages to allay the panic in the cities below, although the building where he was stationed was wrecked.

MATTHAEI, mȧt-tā'ē, CHRISTIAN FRIEDRICH (1744–1811). A German classical scholar, born at Grösst, Thuringia, and educated at the University of Leipzig. From 1774 to 1784 he was professor of classical literature at the University of Moscow. In 1789 he was made professor of Greek at the University of Wittenberg. He published many valuable manuscripts from the Moscow Library, a codex of Homeric hymns, and edited *Plutarchi Libellus de Superstitione* and *Demosthenis Oratio Funebris in Laudem Atheniensium qui pro Patria Pugnando Cæsi Sunt ad Chæroneam.* He also edited, among other works, *Gregorii Thessaloniensis X Orationes* (1776) and *Novum Testamentum XII Tomis Distinctum Græce et Latine* (1788).

MATTHESON, mät'ā-zōn, JOHANN (1681–1764). A German composer and writer on music, born at Hamburg. In 1697 he entered upon his career as a singer, and two years later sang one of the rôles and also conducted at the harpsichord his first opera, *Die Pleyaden.* From 1703 dates his acquaintance with Handel. In 1706 he obtained the post of secretary to the English Legation. In 1715 he was appointed musical director and canon at the Hamburg Cathedral, and while there did much towards developing the then unknown form of church cantata, and made the innovation of introducing female singers into his choir. In 1719 he also became court chapelmaster to the Duke of Holstein. From 1728, when deafness caused him to resign the post of musical director at the cathedral, to his death, he devoted himself largely to writing. His compositions are unimportant, but he made many excellent translations of English works on politics and jurisprudence. A man of wide culture, his numerous theoretical and historical works are remarkable for their catholicity of view, and are also of lasting value, as they were largely instrumental in firmly establishing the modern system of music. Most notable are: *Das neueröffnete Orchester, oder gründliche Anleitung* (1713); *Critica Musica* (1722); *Das forschende Orchester* (1721); *De Eruditione Musica* (1732); and *Die neueste Untersuchung der Singspiele* (1744). Consult L. Meinardus, *Johann Mattheson und seine Verdienste um die deutsche Tonkunst* (Leipzig, 1879).

MATTHEW, măth'ū (Lat. *Matthæus*, from Gk. *Matthaios*, *Matthaios*, from Heb. *Mattithyāh*, gift of Yahwe). The Evangelist, identical with the publican whom Mark and Luke called Levi. He was the son of Alphæus. The Hebrew name Matthew, probably meaning "the gift of Jehovah," was perhaps a surname analogous to Cephas as added to Simon. He was early called to be a disciple and was afterward numbered among the Twelve Apostles. He was a publican, living at or near Capernaum, probably one of the subordinate class who were charged with collect-

ing the taxes in a limited district. Having left all to follow Jesus, he also made him a feast in his house, at which a great multitude of publicans were present as invited guests (Matt. ix. 9–13 and parallels). After the record of his choice as one of the Apostles, given by three Evangelists—of whom only Matthew speaks of himself as the publican—no mention is made of him in the New Testament, except in the group named in Acts i. 13. A tradition as old as the beginning of the second century says that the Twelve continued in Jerusalem about 12 years after the ascension. The statement of Eusebius, made long afterward, that he preached to his own nation before he went to foreign countries, accords with this. Among the countries mentioned by other writers are Ethiopia, Persia, Macedonia, Media, and Parthia. Several of the earlier writers agree in numbering him among the few Apostles who did not suffer martyrdom, though a later tradition affirms that he, too, sealed his testimony with his blood. For his relation to the Gospel of Matthew and for bibliography, see MATTHEW, GOSPEL OF.

MATTHEW, GEORGE FREDERICK (1837–). A Canadian geologist. He was born at St. John, New Brunswick, and was educated at the University of New Brunswick. He entered the civil service in 1853, became chief clerk of customs in 1879, and in 1893 surveyor of customs. He prepared in 1872, with Professor Bailey, a preliminary report on the geology of southern New Brunswick; in 1872–73 he wrote a report on the carboniferous system of that province and a summary of his observations. For many years he conducted geological observations in the Maritime Provinces. He was elected a fellow of the Royal Society of Canada and vice president of the Natural History Society of New Brunswick. He contributed geological papers to the *Quarterly Journal of the Geological Society, Canadian Naturalist, Silliman's Journal, American Geologist, Geological Magazine, Canadian Record of Science,* and *Transactions of the Royal Society of Canada.*

MATTHEW, GOSPEL OF. The first of the four Gospels in the New Testament. After an artificially constructed genealogy of Jesus traced through Joseph's line back to Abraham are narrated the announcement to Joseph of Jesus' coming birth, the visit of the Wise Men from the East, the flight of Joseph and his family into Egypt, Herod's massacre of the children, and the return of the fugitives "into the land of Israel" (i, ii). Then follows a brief résumé of the ministry of John the Baptist, leading up to Jesus' baptism by John and his temptation in the wilderness (iii–iv. 11). The narrative proper begins with Jesus' withdrawal into Galilee and his active entrance upon his work. The record of this work is divided into three principal parts: (*a*) his ministry in Galilee (iv. 12–xv. 20); (*b*) his ministry in the regions north and east of Galilee (xv. 21–xvii. 20); (*c*) his ministry in Jerusalem (xxi–xxv). These parts cover in general the same events as the main portions of Mark and Luke, but the events themselves are arranged in a way peculiar to this Gospel. The arrangement of material is topical rather than chronological. Thus, after a short introductory passage (iv. 12–25) there follows a lengthy discourse treating of the Messianic Kingdom—the composite address known as the Sermon on the Mount (v. 1–vii. 29). Then come a group of miracles (viii. 1–ix. 34) and a collection of sayings which are of a more general character than those contained in the Sermon on the Mount (ix. 35–xiii. 48). More miracles (xiv. 13–36) and certain sayings concerning Pharisaic traditions (xv. 1–20) complete the section which describes the Galilean ministry of Jesus. The same arrangement is carried out in the second main portion of the narrative, i.e., the ministry in the regions north and east of Galilee; but the groups in this section are all relatively small. First two miracles are related, the former of which is evidently intended to represent the mission to the Gentiles (xv. 21–39), and then follow the request of the Pharisees and Sadducees for a sign, the warning against the leaven of the Pharisees, Peter's confession in the neighborhood of Cæsarea Philippi, and Jesus' first prediction of his passion (xvi). At the end of this part the transfiguration of Christ and the healing of the epileptic are recorded (xvii. 1–20). Next comes a passage of considerable length which serves as a transition from the second to the third part of Jesus' ministry (xvii. 22–xx). It consists chiefly of discourses delivered in Galilee and on the way to Jerusalem, and here too the evangelist's tendency to arrange his material in groups is noticeable. Finally we have the account of Christ's ministry in and near Jerusalem (xxi–xxv). Here, however, apart from the introductory passage containing a record of the triumphal entry into the city, the cleansing of the temple, the objection of the chief priests and scribes, and the cursing of the fig tree (xxi. 1–19), the whole narrative is concerned with the discourses and discussions of Tuesday in Passion Week. The story of Jesus' life ends with his passion—the Passover meal, the agony in Gethsemane, the betrayal, arrest, trial, crucifixion, and burial (xxvi–xxvii). The last chapter of the Gospel records the resurrection of Christ and his appearance to the 11 Apostles in Galilee (xxviii).

From this arrangement of his material it is clear that the evangelist desired to prove to his readers that Jesus of Nazareth was the long-expected Messiah. The writer's purpose is also indicated by the prophetic setting in which the narrative is placed. The birth of Jesus, the events of his life, and the circumstances connected with his death are not looked upon as accidentally corresponding to certain Old Testament predictions. They are rather regarded as part of a divinely ordered plan, according to which Jesus is at once the fulfillment of prophecy and the consummation of theocratic history. Though reared within the pale of Judaism, he is nevertheless the Messiah of a community that is wider than the confines of Israel.

The principal sources used by the evangelist were the Gospel of Mark, probably in substantially its present form, and a document known to scholars as Q (i.e., Ger. *Quelle,* 'source'). The latter, which seems to have contained some narratives of events as well as sayings of Jesus, was written by a Jewish Christian in Palestine before the fall of Jerusalem in 70 A.D. It may indeed have antedated that catastrophe by two decades. Though this work was composed in Aramaic, the language spoken by Jesus and his companions, the author of the First Gospel made use of it in a Greek translation. According to Papias of Hierapolis, who lived in the first half of the second century, the Apostle Matthew wrote down the sayings of Christ in Aramaic; and a number of modern scholars identify Q in

its original form with the work referred to by Papias. Some critics hold that the genealogy and the stories concerning Jesus' birth and infancy in chapters i and ii are based on sources of Palestinian origin. In any case, this part of the work is of much less value from an historical point of view than the sections which are based upon Mark or Q.

It can hardly be doubted that the Gospel according to Matthew is the work of a Jewish Christian, for its presentation of Jesus (cf. v. 17, x. 6 f., xv. 24, xxiii. 2 f.) as well as its general characteristics are distinctively Jewish. Moreover, quotations from the Old Testament which are not found in the parallel sections of Mark and Luke follow the Hebrew original or an Aramaic version rather than the LXX. On the other hand there are many indications that the author held no brief for the evils of Judaism (cf. iii. 7 ff., xvi. 11 f., xxiii. 3–36) and that he was in full sympathy with the Gentile element in the Church (cf. viii. 10 ff., xxi. 43), and there are some passages which betray an ecclesiastical or catholic interest (e.g., xvi. 18 f., xviii. 16 f., xxviii. 19 f.). This combination of heterogeneous elements constitutes one of the peculiar problems of the First Gospel. Since the evangelist felt it to be necessary to explain Palestinian customs and beliefs (e.g., xxii. 23, xxvii. 15) and to interpret Hebrew and Aramaic words and phrases (e.g., i. 23, xxvii. 33, 46) for the benefit of his readers, it is clear that the latter lived outside of Palestine and spoke Greek. They may have been Jewish Christians. It is impossible, however, to determine where the Gospel was written. Palestine, Syria, Asia Minor, and Rome have been suggested by different scholars for the honor, and something can be said for each; but on the whole it seems better to render a verdict of non liquet concerning the place of composition.

The date of the Gospel according to Matthew has been much discussed. It is certainly later than Mark and the collection of Jesus' sayings known as Q; for, as we have seen, the author of Matthew uses both of these as sources for his work. With Luke, however, he seems to have been unacquainted. Was the Gospel of Matthew written before or after the fall of Jerusalem in 70 A.D.? On the one hand the capture of the city and the coming of Christ are not clearly distinguished, as we should expect them to be in a work written after the former event; but on the other hand, as we have seen, Matthew reflects views or interests of an ecclesiastical or catholic type which cannot have prevailed until the latter part of the first century. It must be remembered that indications of a later time have more weight in determining the date of the Gospel than those which point to an earlier period, for the latter may be due to the sources used. A consideration of all the available data leads the present writer to the conclusion that the Gospel of Matthew was written sometime during the last quarter of the first century (75–100 A.D.). It is not necessary to assign it to a later date.

Since the time of Irenæus, who wrote c.180–185 A.D., the First Gospel has been attributed to the Apostle Matthew; but both its style and contents preclude the possibility of its having been written by a companion of Jesus. It is certainly not a translation from an Aramaic original, nor does it represent exclusively the point of view of the first disciples. How, then, did the name of Matthew, who was by no means a prominent member of the apostolic company, become attached to the Gospel? The simplest and most plausible explanation is that he was the author of Q in its Aramaic form, which in a Greek translation was one of the two chief sources used in the composition of the Gospel. The association of the work with the name of the Apostle Matthew caused it to be highly esteemed in the Church and assured it an honored place in the canon.

Bibliography. On questions relating to the characteristics, structure, date, and authorship of Matthew, see the pertinent sections in the Introductions to the New Testament by Bernhard Weiss (Eng. trans., 2 vols., London, 1887–88), Adolf Jülicher (Eng. trans., ib., 1904), Theodor Zahn (Eng. trans. from the 3d Ger. ed., 3 vols., ib., 1909), A. S. Peake (New York, 1910), and James Moffatt (ib., 1911). E. Jacquier, *Histoire des livres du Nouveau Testament* (Paris, 1902–08), represents modern Roman Catholic scholarship. Consult also J. A. Robinson, *The Study of the Gospels* (London, 1903), and E. D. Burton, *A Short Introduction to the Gospels* (Chicago, 1906). Among commentaries the following may be mentioned—*English:* J. Morison (London, 1895); Alfred Plummer (New York, 1909); W. C. Allen, in *The International Critical Commentary* (ib., 1910); A. B. Bruce, in *The Expositor's Greek Testament* (ib., 1912). *German:* Bernhard Weiss, in H. A. W. Meyer, *Kritisch-exegetischer Kommentar über das N. T.* (Göttingen, 1898); Theodor Zahn, in his *Kommentar zum N. T.* (Leipzig, 1903); Julius Wellhausen (Berlin, 1904). The student should also consult the following works: Paul Wernle, *Die synoptische Frage* (Freiburg, 1899); Adelbert Merx, *Die vier kanonischen Evangelien nach ihrem ältesten bekannten Texte* (Berlin, 1902–05); E. D. Burton, "Principles of Literary Criticism and the Synoptic Problem," in *The Decennial Publications of the University of Chicago*, vol. v (Chicago, 1904); A. F. Loisy, *Les évangiles synoptiques* (2 vols., Paris, 1907–08); Sir J. C. Hawkins, *Horæ Synopticæ* (2d ed., Oxford, 1909); Sanday and others, *Studies in the Synoptic Problem* (Oxford, 1911); Julius Wellhausen, *Einleitung in die drei ersten Evangelien* (2d ed., Berlin, 1911).

MATTHEW OF WESTMINSTER. An imaginary name by which the supposed author of the *Flores Historiarum* was designated. Luard demonstrated that no such person ever existed, and that the *Flores* was the work of several different authors. Consult Luard's preface to his edition of the *Flores*, in three volumes (London, 1890), in the "Rolls Series."

MATTHEW PARIS, or MATTHEW OF PARIS. An English chronicler. See PARIS, MATTHEW.

MATTHEWS, măth'ūz, (JAMES) BRANDER (1852–). An American author and educator, born in New Orleans. He graduated from Columbia College in 1871 and from Columbia Law School in 1873, but he turned to a literary career. From 1892 to 1900 he was professor of literature at Columbia, and thereafter held the chair of dramatic literature. It was as a critic of the drama that he became especially known. He was one of the founders of the Authors Club and of the Players Club, both of New York; one of the organizers of the American Copyright League; a member of the American Academy of Arts and Letters and president (1913) of the National Institute of Arts and Letters; the first

chairman (1906) of the Simplified Spelling Board; and president of the Modern Language Association of America (1910). In 1907 the French government decorated him with the Legion of Honor. His writings consist mainly of essays on the theatre, of comedies, and of short stories, yet *Americanisms and Briticisms* (1892) might be classified as a linguistic study. As their titles imply, *Aspects of Fiction* (1896; revised in 1902) and *An Introduction to the Study of American Literature* (1896) enter upon other fields. *His Father's Son* (1895), a novel, deals with a New York broker's influence on his son. Sketches of New York life, called *Vignettes of Manhattan*, appeared in 1894, *Studies in Local Color* appeared in 1898, and *A Confident To-Morrow* in 1900. Matthews's dramatic criticism, which is French in tone, includes *French Dramatists of the Nineteenth Century* (1881; revised in 1891 and 1901) and *Studies of the Stage* (1894), to which may be added *The Theatres of Paris* (1880). His comedies, which are literary rather than practically dramatic, include *Margery's Lovers* (1884), *In the Vestibule Limited* (1892), and *The Decision of the Court* (1893). More recent works are: *The Action and the Word* (1900); *The Historical Novel and Other Essays* (1901); *Parts of Speech, Essays on English* (1901); *The Philosophy of the Short-Story* (1901); *Actors and Actresses of the United States and Great Britain* (5 vols., 1886), with Laurence Hutton; *The Development of the Drama* (1903); *The Short Story* (1907); *Americans of the Future and Other Essays* (1909); *Molière: His Life and Works* (1910); *Introduction to the Study of American Literature* (1911); *Shakespeare as a Playwright* (1913); *On Acting* (1914); *The Oxford Book of American Essays* (1914).

MATTHEWS, măth'ūz, Edmund Orville (1836–1911). An American naval officer, born at Baltimore. He entered the Naval Academy in 1851 and graduated in 1855. He became a passed midshipman in 1858 and a master in the same year, lieutenant in 1860, lieutenant commander in 1862, commander in 1870, captain in 1881, commodore in 1894, and rear admiral in 1898. In 1861 he served on the *Wabash* and was at the capture of the forts at Hatteras Inlet. In 1864–65 he commanded the *Sonoma* off Charleston and assisted in constructing the naval battery on Morris Island. While on this duty he commanded the naval light artillery at the battles of Honey Hill and Tullifinny Cross-roads, and was also attached to the staff of Admiral Dahlgren. From 1869 to 1872 he was head of the torpedo corps of the navy and established the naval torpedo station at Newport. He commanded the *Ashuelot* (1873–77), the *Powhatan* (1881–83), and the *Brooklyn* (1885–86). He was chief of the Bureau of Yards and Docks (1894–96) and, when he retired in 1898, was president of the Examining Board; from this duty he was relieved in the following year.

MATTHEWS, Mark Allison (1867–). An American Presbyterian clergyman, born at Calhoun, Ga. He began preaching at 19; was ordained in 1887; and served as pastor in his native town (1888–93), at Dalton, Ga. (1893–96), and at Jackson, Tenn. (1896–1902). Thereafter he occupied the pulpit of the First Church at Seattle, Wash. (said to be the largest Presbyterian church in the United States), and became noted as a preacher. In addition to his pastoral duties he studied law and was admitted to the bar in 1900. In 1912 he was chosen moderator of the General Assembly of the Presbyterian Church, at Louisville. Three years later, as chairman of a committee to investigate Union Theological Seminary, he visited New York and afterward reported unfavorably to the General Assembly of 1915, held at Rochester, regarding doctrines taught in the seminary.

MATTHEWS, Marmaduke Matthews (1839–1913). A Canadian landscape painter. He was born in Warwickshire, England, and was educated at the Cowley Diocesan School, Oxford, and in London. He came to Toronto, Upper Canada, in 1860 and in 1864 removed to New York City, where he remained five years. He returned to Toronto and became one of the founders of the Ontario Society of Artists, of which he was made secretary in 1875 and president in 1894. He was one of the original members of the Royal Canadian Academy (1880). His paintings of Rocky Mountain scenery, especially well known, include "The Canadian Wonderland" and "The Conquered Portal" (Rogers Pass, Selkirk Mountains). Matthews painted also many woodland studies of old Canada and New England.

MATTHEWS, Paul (1866–). An American Protestant Episcopal bishop. He was born at Glendale, Ohio, and graduated from Princeton University in 1887 and from the General Theological Seminary, New York, in 1890. Ordained a priest in 1891, he had charge of St. Paul's and St. John's churches at Omaha, Neb., in 1891–95; at Cincinnati, Ohio, he was rector of St. Luke's from 1896 to 1904 and dean of St. Paul's Cathedral in 1904–13; and in 1913–14 he was dean of the cathedral at Faribault, Minn., and professor at the Seabury Divinity School. He was elected Bishop Coadjutor of Milwaukee in 1905, but declined; in 1914 he was elected and in 1915 consecrated Bishop of New Jersey.

MATTHEWS, Peter (?1792–1838). A Canadian patriot. He was the son of a United Empire Loyalist who fought in the Revolutionary War and who afterward emigrated to Upper Canada and settled in Pickering township. He served under Sir Isaac Brock and fought in various battles during the war of 1812–15, but in 1837 joined the insurrectionary forces under William Lyon Mackenzie (q.v.) and took part in the Upper Canada rebellion. Upon the defeat and flight of Mackenzie he was captured, tried, and, with Samuel Lount (q.v.), was executed at Toronto on April 12, 1838.

MATTHEWS, Stanley (1824–89). An American soldier and jurist, born in Cincinnati, Ohio. He graduated at Kenyon College in 1840, practiced law in Cincinnati, and was judge of the Hamilton County Court of Common Pleas in 1851–53. He was elected to the State Senate in 1855, was United States attorney for the southern district of Ohio (1858–61), and at the outbreak of the Civil War was made lieutenant colonel in the Twenty-third Ohio Regiment, of which Rutherford B. Hayes (q.v.) was major. However, he saw service only with the Fifty-seventh Ohio, of which he was colonel, and with a brigade which he commanded in the Army of the Cumberland. He resigned from the army in 1863 and was judge of the Supreme Court of Cincinnati in 1863–64. On the resignation of John Sherman he was elected to the United States Senate as a Republican and served in 1877–79. He was appointed by President Gar-

field justice of the Supreme Court of the United States in 1881. He died at Washington.

MATTHEWS, Sir Thomas (1849–). An English lighthouse engineer, brother of Sir William Matthews, born and educated in Penzance. In 1873 he became an assistant in the engineering department of the corporation of Trinity House, London (which has general supervision of English lighthouses, beacons, buoys, etc.), and in 1892 he became engineer in chief to the corporation. In 1881 he had planned the lighthouse on the island of Minicoy, north of the Maldives. For Trinity House he designed and built more than a dozen new lighthouses; greatly improved the corporation's buoy and beacon systems, notably by inventing a steel buoy with an occulting gas or acetylene light; devised a new system of fog signaling; and designed an incandescent oil burner for lighthouses. He was knighted in 1909.

MATTHEWS, Washington (1843–1905). An American physician and ethnologist, born at Killiney in Ireland. He graduated from the medical department of the University of Iowa in 1864; entered the United States army as assistant surgeon, and retired in 1895 with the rank of surgeon. He made ethnological and philological studies of North American Indian tribes, especially of the Navahos, and published: *Dictionary of the Language of the Hidatsa* (1873); *Navaho Silversmiths* (1883); *Navaho Weavers* (1884); *The Mountain Chant, a Navaho Ceremony* (1887); *Navaho Legends* (1897); *The Mystic Chant, a Navaho Ceremony* (1902). A posthumous work appeared in 1907, *Navaho Myths, Prayers and Songs,* edited by P. E. Goddard.

MATTHEWS, Sir William (1844–). An English civil engineer, brother of Sir Thomas Matthews. He was born in Penzance and was privately educated in Cornwall. Coode, Matthews, Fitzmaurice, and Wilson, the firm of engineers of which he was a member, had charge of the great harbor works at Dover, Colombo, and Singapore and were consulting engineers for harbors to the colonial crown agents. Matthews served on the admiralty committee of 1901 on naval works at Gibraltar; on the royal commission of 1906 on coast erosion; on the international technical commission on the Suez Canal (1908); and on the royal commission of 1912 on oil fuel. He was knighted in 1906.

MATTHEW (măth'ū) **TOWN.** See Inagua.

MATTHIAS, ma-thī'ăs (Lat., from Gk. *Ματθίας,* a shorter form of *Ματταθίας, Mattathias,* from Heb. *Mattithyāh,* gift of Yahwe). The disciple chosen by lot to succeed Judas Iscariot as one of the Twelve Apostles (Acts i. 15–26). This is the only reference to him in the New Testament. Later tradition (Eusebius, *Hist. Eccles.,* i, 12; ii, 1) made him one of the Seventy (Luke x. 1). He figures prominently in the fanciful legends of late Christian apocryphal literature; a Gospel of Matthias and the Acts of Andrew and Matthias deal with his doctrine and his work among the Ethiopian cannibals.

MATTHIAS (1557–1619). Holy Roman Emperor from 1612 to 1619. He was born Feb. 24, 1557, a younger son of Maximilian II. In 1577 a Catholic party in the Belgian Netherlands offered him the governorship, which he accepted. He found his authority, however, hemmed in at all points and resigned in 1581. In 1593 his brother, the Emperor Rudolph II, appointed him Governor of the Archduchy of Austria. Matthias exerted himself to suppress Protestantism, in which he had the assistance of the celebrated prelate Khlesl (q.v.). In consequence of the incapacity of Rudolph, whose oppressive acts had excited a formidable insurrection in Hungary, Matthias was formally declared by the Austrian princes head of the house of Hapsburgs in 1606. He thereupon came to terms with the Hungarian Protestants, concluding with them the Treaty of Vienna. Two years later he extorted from Rudolph, by the Treaty of Lieben, June 25, 1608, the cession of Austria, Hungary, and Moravia, and in 1611 the crown of Bohemia, of which Rudolph had been deprived by his subjects, was given to Matthias. Rudolph died without issue in 1612, and Matthias was at once chosen his successor in the German Empire. A confederation of Protestant states, known as the Union, had been established in 1608 and a Roman Catholic League had been organized in 1609. Matthias attempted unsuccessfully to bring the latter, which was under Bavarian leadership, under Austrian influence. In 1617 Matthias, who was without heirs, was compelled to have his cousin, Ferdinand of Styria, crowned King of Bohemia, and the next year King of Hungary. The Bohemians revolted against Ferdinand, enraged by the severity of his religious persecutions; the insurrection at Prague, in 1618, gave the signal for the outbreak of the Thirty Years' War (q.v.), and the last days of Matthias were embittered by the failure of all his efforts to restore peace. He died March 20, 1619. Consult J. Heling, *Die Wahl des römischen Königs Matthias* (Belgrade, 1892). See Austria-Hungary.

MATTHIAS, Gospel of. See Apocrypha, *New Testament.*

MATTHIAS I, CORVI'NUS (1440–90). King of Hungary from 1458 to 1490. He was the second son of János Hunyady (q.v.) and was elected King of Hungary in 1458, in spite of the opposition of some of the great nobles, who offered the crown to the Emperor Frederick III. The boy King fought successfully against the Emperor, who sold his claims to the crown in 1462. Matthias had in the meantime to contend against the Turks, at that time under the rule of Sultan Mohammed II. In a war of several years' duration the Hungarian arms asserted themselves successfully against the forces of the conqueror of Constantinople. After some hostilities with Stephen, Waywode of Moldavia, Matthias engaged (1468) in a war against his father-in-law, George Podiebrad, King of Bohemia, which occupied him for some years and was followed by a war with Poland, after which he again turned his arms with success against the Turks. Matthias reached the height of his power when in 1485, in a war with the Emperor Frederick III, he made himself master of Vienna, the Hapsburg capital. There he died five years later. Matthias Corvinus was a great patron of arts and letters and adorned his capital with the works of renowned sculptors, in addition to a library said to contain 50,000 volumes. He sent a large staff of literary men to Italy for the purpose of obtaining copies of valuable manuscripts. He also adorned his court by the presence of the most eminent men of Italy and Germany, and himself was an author of no mean ability. At the same time the affairs of the government were not neglected. The finances were brought into a flourishing condition, industry and commerce were promoted by wise

legislation, the army was reorganized, and justice was strictly administered. Consult Fraknoi, *Mathias Corvinus*, German translation (Freiburg, 1891).

MATTHIESEN, măt'ē-sĕn, Oscar Adam Otto William (1861–). A Danish fresco painter, born in Schleswig. He studied at the Academy of Copenhagen, in Paris, and in Rome. In 1884 he was awarded a gold medal at the Academy of Copenhagen and in 1893 was Denmark's Commissioner at the World's Fair in Chicago. He attracted attention by greatly improving the technique of the art of fresco painting, which he had studied in Rome and Pompeii during 1901–03. Afterward he was a teacher at the Kunstakademie and the Kunstgewerbemuseum in Berlin. For the palace of the Prince of Monaco at Mentone he executed decorations in fresco and stucco relief. Among his paintings are: "Bathing Dragons," "Griffenfeld at Munkholmen," "Riders" (1904–06), "Working Horses," and "Leda and the Swan" (1908).

MATTHISON, măth'ĭ-son, Edith Wynne (1875–). An American actress, born in Birmingham, England, and educated there in the King Edward Grammar School and at Midland Institute. She made her first appearance on the stage in musical comedy at Blackpool in 1896. In 1897 she joined Ben Greet's company and remained with it, except for brief intervals, for the next six years, playing a wide range of parts, including such varied rôles as Miladi in *The Three Musketeers*, Portia, Peg Woffington in *Masks and Faces*, Clara Douglas in *Money*, Lady Teazle, and Rosalind. She achieved her first notable success at the Duke of York's Theatre, 1900, when at short notice she was called upon to play the part of Violet Oglander in *The Lackey's Carnival*. In May, 1903, she created the title rôle in the revival of the fifteenth-century morality play *Everyman* and achieved a greater triumph than any before in her career. Later in the same year she repeated her success in America, where the play created something of a sensation. The following year she appeared in the United States in Goldsmith's *She Stoops to Conquer* and in a repertory of Shakespearean plays. On her return to England she was engaged by Sir Henry Irving and played Portia and Rosalind to his Shylock and Jaques. After 1905 she appeared at various times in Greek and old English plays; but, with the exception of *Everyman*, her best work was in Shakespearean repertory and in the more poetic and imaginative types of modern drama, such as *The Blue Bird*, *Sister Beatrice*, *The Piper*, and *The Arrow Maker*, all of which were produced at the New Theatre, New York, in 1910–11. She appeared in several of the plays of Charles Rann Kennedy (q.v.), her husband, with success, *The Servant in the House* being the most notable. In the spring of 1915 she took part in Granville Barker's production of *Iphigenia in Tauris* and *The Trojan Women* of Euripides, given at the principal eastern universities and colleges of the United States.

MATTHISSON, măt'ē-zŏn, Friedrich von (1761–1831). A German lyric poet, born at Hohendodeleben. Trained for the ministry at Halle, he supported himself by teaching till appointed (1794) reader to the Princess of Anhalt-Dessau, with whom he traveled in Switzerland, Tirol, and Italy. On her death (1811) he was attached to the court of Württemberg, as librarian and theatre director, and resided for some time in Italy. His prose is mediocre, his verse melodious and graceful, especially in rural description, but never strong. Matthisson's *Schriften*, as finally revised by the author, came out in eight volumes (Zurich, 1825–29). Volume ix (1833) contains a biography by Döring. Consult Boschulte, *F. Matthison, seine Anhänger und Nachahmer* (Elberfeld, 1900).

MATTIACORUM CASTELLUM. See Catti; the first article Hesse; Mainz.

MATTIACUM. See Catti.

MAT'TING (from *mat*, AS. *meatta*, from Lat. *matta*, mat). A general name for various coarse woven or plaited fibrous materials for covering the floors of rooms, passages, lobbies, etc., for doormats, for hanging as screens, for packing furniture, or for packing heavy merchandise. Matting is extensively manufactured from straw, bulrushes, grasses of several kinds, and the leaves of various palms, and forms an important article of commerce. Floor matting, now so extensively employed as a cheap, cool, and cleanly substitute for carpeting, is woven from two entirely different materials—straw, made from a species of reed or grass having culms 6 feet high, and the fibrous husk of the coconut palm, called *coir*. (See Coir.) In recent years fibre and grass rugs are extensively employed for bungalows and summer cottages or for porches or temporary furnishing. Many of these are dyed or painted in various bright colors that when new prove very attractive. Most of the straw matting comes from China or Japan; the *Bungo* matting is made from a coarse straw, and the *Bingo* matting from a finer material, which is easier to manipulate, but not so durable as the coarse straw. The loom employed is a simple hand machine, consisting merely of an upright bamboo framework, with cylindrical crosspieces above and below, over which the warp runs, the woof being woven in without a shuttle. The warp threads are of hemp, oiled to make them smooth. The straw is woven while still wet and is then dried in the sun or over slow fires. Matting is either made in sections of 2 to 5 yards, which are afterward neatly joined together into a roll of 40 yards, or the fabric is all woven in one piece, in which case it is likely to be loose in texture. To remedy this the matting is loosened and pulled down closer by coolies while it is drying over a box containing a charcoal fire.

The yarn from which coco matting is woven is sometimes spun by machinery, but it is said that the hand-spun yarn is both cheaper and better. The yarn is twisted by being rolled in a peculiar manner in the hands, the work being done by natives during the rainy season. The yarn is first bleached and then sorted into colors. The process of weaving is an arduous one, and the looms are peculiarly constructed for the purpose and very strong. The fibre and grass rugs are usually woven like a rag carpet, with the coarse filling of fibre tied together by a slender cotton warp. Such rugs are often dyed or decorated in patterns by painting.

In the United States the industry classed by the Census Bureau as mats and matting includes the manufacture of doormats, floor mattings, art squares, rugs, and carpets, of which the principal materials are grass and coir yarn. These various products are woven with cotton warp, or plaited, and differ from rugs and carpets made in the carpet factories and in establishments engaged primarily in the manufacture

of cordage, twine, jute, and linen goods, in that their chief material is not wool, cotton, or jute. The progress of the industry in the United States as classified above is shown in the accompanying table.

YEAR	Number of establishments	Wage earners (average number)	Wages	Cost of materials	Value of products	Value added by manufacture
1909	12	937	$385,434	$1,066,566	$2,431,615	$1,365,049
1904	12	625	249,104	574,168	1,242,996	668,828
1899	9	1,197	237,282	516,137	1,165,330	649,193
1889	24	383	172,874	301,591	608,625	307,034
1879	12	285	125,129	233,707	439,370	205,663

In 1914 the imports of mats and mattings for floors, comprising coir fibre, rattan, straw, etc., amounted to 25,370,152 square yards, valued at $2,097,009. In 1909 these amounts were 43,435,748 square yards and $3,290,557, and in 1904, 50,025,490 square yards and $3,609,795.

Consult *History and Manufacture of Floor Coverings* (New York, 1898).

MATTIPI, mät-tē′pē (South American name), or FROG SNAKE. A colubrine serpent (*Xenodon severus*) of northeastern South America, related to the hognose, and one of many similar species of the opisthoglyph subfamily Xenodontinæ. The snakes of this group are poisonous, although the enlarged posterior teeth which serve as fangs are solid and have no grooves for the transmission of poison from distinct venom glands. They are slow to bite, however, and in a healthy man the results are little more than local and temporary pain, swelling, and soreness.

MAT′TISON, HIRAM (1811–68). A clergyman of the Methodist Episcopal church. He was born at Norway, Herkimer Co., N. Y. He filled pastorates at Watertown and Rome, N. Y., and in 1852 removed to New York City, where he was pastor of John Street Church and afterward of Trinity Methodist Episcopal Church in Thirty-fourth Street, which he organized. He labored with great earnestness to persuade the General Conference in 1860 to take action against all slaveholding in the church, but, failing in this, he withdrew from the Methodist Episcopal church, Nov. 1, 1861, and became pastor of St. John's Independent Methodist Church, New York City. He returned in 1865 to the denomination that he had left, and was appointed to Trinity Methodist Episcopal Church in Jersey City. The last year of his life he was district secretary of the American and Foreign Christian Union. His books and contributions to the periodical press, both in prose and verse, were numerous, including among others: *Tracts for the Times* (1843); an improved edition of *Burritt's Geography of the Heavens* (1850); *Spirit-Rapping Unveiled* (1854); *Sacred Melodies* (1859); *Impending Crisis* (1859); *Immortality of the Soul* (1866); *Resurrection of the Body* (1866); *Defense of American Methodism* (1866); *Popular Amusements* (1867). He was widely known for his vigorous opposition to political Romanism. Consult his *Life*, by Vansant (New York, 1870).

MATTIUM. See CATTI; the first article HESSE.

MATTO GROSSO, mät′tô grôs′sô. A state of western Brazil, bounded by the states of Amazonas and Pará on the north, Goyaz, Minas Geraes, São Paulo, and Paraná on the east, and Paraguay and Bolivia on the south and west (Map: Brazil, F 6). Its area is estimated at 532,683 square miles. Matto Grosso is the second in size among the states of Brazil and one of the least populated, having an average of one person to each two square miles. The northern half of the state belongs to the great Brazilian plateau, and the southern is formed by lowlands, much of which is swampy and subject to inundations. There are a number of more or less isolated mountain ranges, including the Cordilheira dos Parecis, Serra Azul, Serra do Aguapehy, and Serra de Amambahy. Through the centre of the state runs the watershed which separates the drainage basins of the Amazon and La Plata rivers. The northern part of the state is drained by the Guaporé, Tapajoz, Xingu, Araguayas, and their tributaries, and the southern part by the Paraguay, Paraná, and their tributaries. Owing to the vast area of the state, climate shows considerable variation. The low, swampy depressions along the rivers have an extremely hot and unhealthful climate, while in the elevated plateaus it is more moderate and healthful, and the cool winds from the pampas sometimes reduce the temperature even to the freezing point. Agricultural land is found mainly in the valleys, while the plateaus afford good grazing. The chief industry is stock raising, together with some meat packing. The principal products are herba maté, rubber, and sugar cane. The cultivation of other agricultural products is chiefly for home consumption. The gold and diamond mines, once extensively exploited, are now abandoned. It is generally believed, however, that the mineral deposits of Matto Grosso are still very valuable. The civilized population of the state was, in 1900, only 118,025, many of whom were of mixed race, and it is estimated that there are still about 25,000 uncivilized Indians belonging to various tribes. In 1913 the total population was estimated at 300,000. The commercial centre of the state is Corumbá (pop., 30,000), on the Paraguay, and the capital is Cuyabá (q.v.). This region was not occupied by the Portuguese until the eighteenth century, the captaincy general of Matto Grosso having been organized in 1748.

MATTOLE, mät-tōl′. A small Athapascan tribe in northern California.

MATTOON′. A city in Coles Co., Ill., 170 miles south of Chicago, on the Cleveland, Cincinnati, Chicago, and St. Louis and the Illinois Central railroads (Map: Illinois, H 7). There are a Carnegie public library and reading room, the Methodist Hospital, and the Old Folks Home of the I. O. O. F. The city is the centre of a broom-corn district and carries on a considerable trade in broom corn, grain, live stock, and fruit. Among the industrial plants are repair shops of the Big Four and Illinois Central railroads, foundries and machine shops, engine works, broom factories, brick and tile works, carriage and wagon shops, flouring mills, grain elevators, and hay press. Settled and incorporated in

1855, Mattoon is governed under a revised charter of 1867, providing for a mayor, elected biennially, and a unicameral council which confirms the executive's nominations to the majority of administrative offices. The city owns and operates the electric-light plant and one of the water plants. This system furnishes water only for commercial purposes and comprises a 150-acre reservoir with a capacity of 500,000,000 gallons. Pop., 1900, 9622; 1910, 11,456; 1914 (U. S. est.), 12,218; 1920, 13,552.

MATURÍN, mä'to͞o-rēn'. The capital of the State of Monagas, Venezuela (Map: Colombia, E 2). It is situated on a savanna west of the Orinoco delta and 40 miles inland from the Gulf of Paria. It has a healthful climate, with an average temperature of 80.5° F. In the surrounding region stock raising and the cultivation of coffee, cacao, sugar cane, cereals, and fruits are carried on. There are manufactures of hammocks, hats, cigars, soap, and shoes. Maturín is connected by a highway with the port of Cumaná and is the commercial centre of the plains west of the delta. Its trade is chiefly in cattle and hides. Pop., of the municipality, 1891, 15,624; urban, estimated 1915, 4358.

MATURIN, măt'ū-rĭn, CHARLES ROBERT (1782–1824). An Irish romancer and novelist, born in Dublin and educated at Trinity College. Maturin took orders in the Anglican church, became curate of St. Peter's, and is said to have been an eloquent preacher. He died Oct. 30, 1824. His novels comprise: *The Fatal Revenge* (1807); *The Wild Irish Boy* (1808); *The Milesian Chief* (1812); *Women* (1818), the author's idea of the working effects of Methodism on those who professed it; *Melmoth the Wanderer* (1820), an extravagant romance, marked by real power and fantastic *diablerie,* which made a stir in its day and by far Maturin's most notable book; *Albigenses* (1824). In these novels he essayed chiefly the supernatural romance of the Radcliffe school, though attempting also the portrayal of manners of his own or an earlier day, as in *Women* and *The Milesian Chief.* Maturin wrote plays, of which *Bertram,* produced by Kean at Drury Lane, May 9, 1816, ran for 22 nights. The others either failed or were less successful. Consult *Melmoth,* edited with memoir and bibliography (London, 1892).

MATY, mā'tē, MATTHEW (1718–76). An English writer and librarian, born at Montfort, near Utrecht, Holland, May 17, 1718. His father was a Protestant refugee from Provence, who had settled at Montfort as minister of the Walloon church there. Matthew was educated at the University of Leyden, where he graduated Ph.D. and M.D. in 1740. The next year he came to London and began practice as a physician, but he devoted much time to literature. In 1750 he started the *Journal Britannique* (suspended 1750), a bimonthly printed at The Hague. It gave in French an account of English literary news. This periodical brought Maty numerous acquaintances among men of letters. In 1751 he was elected to the Royal Society, of which he became secretary in 1765. After serving as an underlibrarian of the British Museum, he was appointed principal librarian in 1772. He died July 2, 1776. Maty helped Gibbon bring out the *Essay on the Study of Literature,* contributed to the *Philosophical Transactions* of the Royal Society, and published several independent books. His last work was the *Memoirs of the Earl of Chesterfield,* completed by his son-in-law, Justamond, and published with Chesterfield's *Miscellaneous Works* (1777).

MATZENAUER, mät'sen-ou'ĕr, MARGARETHE (1881–). An Hungarian dramatic mezzo-soprano, born in Temesvar. From earliest childhood she moved in a musical atmosphere, her father being an orchestral conductor and her mother a dramatic soprano. She began her vocal studies with Mme. Neuendorff in Graz and then continued with Antonia Mielke and Franz Emerich in Berlin. Her début at Strassburg, in 1901, as Puck in Weber's *Oberon* resulted in a three years' engagement there. From 1904 to 1911 she was a member of the Royal Opera at Munich, appearing also in the Wagner festivals held at the Prinzregenten Theater and at Bayreuth. From her first appearance at the Metropolitan Opera House, in 1911, she established herself as one of the prime favorites of American opera goers. With a voice of rare beauty and power she combines more than ordinary histrionic ability and a queenly stage presence. The extraordinary range of her voice enables her to sing both soprano and contralto rôles. Her extensive repertory includes all the Wagnerian heroines. In 1912 she was married to the tenor Edoardo Ferrari-Fontana (q.v.).

MÄTZNER, mĕts'nĕr, EDUARD ADOLF FERDINAND (1805–92). A German philologist, born at Rostock and educated there, at Greifswald, and at Heidelberg. He taught in Gymnasia at Berlin and Bromberg and was director of the famous Luisenschule in Berlin (1838–92). His earlier labors included editions of Lycurgus (1836), Antiphon (1838), and Dinarchus (1842), but he is better known for his contributions to English and Romance philology. He wrote: *Syntax der neufranzösischen Sprache* (2 vols., 1843–45); *Altfranzösische Lieder* (1853); *Französische Grammatik* (1856; 3d ed., 1884); a very valuable *Englische Grammatik* (1860–65; 3d ed., 1880–85; Eng. trans., 3 vols., London, 1874); *Altenglische Sprachproben* (1867–69; with a partial vocabulary, to M, 1872). Consult *Englische Studien,* vol. xvii (Leipzig, 1893), and *Allgemeine deutsche Biographie,* vol. lii (ib., 1912).

MATZOON'. Milk in which lactic acid fermentation has been allowed to proceed only to a certain point, differing in this way from sour milk. It is often tolerated by irritable stomachs which will not retain milk or other fermented milk foods, as kumiss or kefir. It may be prepared by boiling milk and letting it cool to 100° F. A small amount of previously prepared matzoon is then added, and the mixture kept in a warm room for 12 hours; it is then placed on ice. See KUMISS.

MAUBEUGE, mō'bēzh'. A fortified town of the first class, France, in the Department of Nord, on both banks of the river Sambre, 23 miles east-southeast of Valenciennes (Map: France, N., K 2). It is well built and defended by nine forts on both banks of the Sambre. It has manufactures of iron bars, hardware, and marble. The town has an arsenal, a communal college, a commercial school, several old convents, a museum, and a public library. Pop. (commune), 1901, 20,826; 1911, 23,209. Maubeuge was captured by the Germans, after a heavy bombardment and siege lasting nearly a month, during the European War which began in 1914. See WAR IN EUROPE.

MAUCH, mouk, KARL (1837–75). A German

traveler and African explorer, born at Stetten, Württemberg. He went to South Africa in 1863, traveled through the Transvaal, and made an excellent map of it; discovered valuable gold fields in 1867, explored the diamond fields in 1870 and 1871, and in the latter year discovered the ruined city of Zimbabwe, in Mashonaland, which he identified with biblical Ophir. In 1872 he returned to Germany, where he became a railroad official. He wrote *Reisen im Innern von Südafrika, 1865–72* (1874) and contributions to *Petermanns Mitteilungen*. Consult the biography by E. Mager (Stuttgart, 1895), and *Allgemeine deutsche Biographie*, vol. lii (Leipzig, 1912).

MAUCH CHUNK, mąk chŭnk. A borough and the county seat of Carbon Co., Pa., 46 miles west by north of Easton, on the Lehigh River, the Lehigh Canal, and the Lehigh Valley and the Central of New Jersey railroads (Map: Pennsylvania, K 5). This town marks the passage of the river through precipitous mountains and forms the eastern gateway of a highly productive anthracite region. Its unique situation on the side of the mountain, from the Indian name of which it is named, and its picturesque surroundings, with a healthful climate, cause it to be much frequented as a summer resort. Nine miles west by south of the borough are the Summit Hill coal mines, which are celebrated as among the richest in the State. Another feature of interest here is a burning mine. The coal was formerly carried by means of a gravity railroad, called the Switchback, to Mauch Chunk, the cars being elevated by cable planes and returning by a similar road to the mines. This road is now used for tourists and excursions only, and the coal is transported through a tunnel to steam railroads in Panther Creek valley. Mount Pisgah and Mount Jefferson, both ascended by the road mentioned, Prospect Rock and Flagstaff Park, all reached by cars of the local electric railway, are points from which can be gained magnificent views of the Lehigh valley. These points are about 900 feet above Mauch Chunk and 1600 feet above sea level. The borough has a public library, the Dimmick Memorial Library, the Asa Packer Park, and the jail where a number of the notorious Molly Maguires (q.v.) were hung. Its business interests lie in a very extensive coal trade, and there are also foundries and machine shops, silk mills, and car shops. The government is administered by a burgess, elected every four years, and a unicameral council. Mauch Chunk was founded in 1818 by the Lehigh Coal and Navigation Company and rapidly became a railroad and coal-shipping centre. Pop., 1900, 4029; 1910, 3952.

MAUCHLINE, mąk'lĭn. A town in Ayrshire, Scotland, on the Ayr, 10 miles south of Kilmarnock. It is surrounded by a picturesque country and is famous because Robert Burns for four years lived at the farm of Mossgiel, about 1½ miles to the north (Map: Scotland, D 4). The scenes of some of his most admired lyrics are in the neighborhood; the cottage of Poosie Nancy, theatre of the Jolly Beggars, and Mauchline Kirk, the scene of the Holy Fair, are in the town. It is a good horse and cattle market and makes cabinetwork and curling stones. Pop. (civil parish), 1901, 2572; 1911, 2441.

MAUCLAIR, mō'klâr', Camille (1872–). A French poet, critic, and novelist, born in Paris. A man of remarkable versatility, he tried his hand at poetry, the novel, literary criticism, art and social criticism, politics, the drama, and metaphysical studies. The result of unconcentrated effort is a lack of unity in his work, although Mauclair, possessing great power of reaction, is at least intensely modern. In 1905 he became Knight of the Legion of Honor. After 1903 he devoted himself mainly to art criticism. He contributed to a great many reviews and wrote short stories for *Le Journal*. His works include: *Eleusis, causeries sur la cité intérieure* (1893); *Sonatines d'automne* (1894), poems; *Couronne de clarté* (1895), a novel; *Les clefs d'or* (1896), stories; *L'Orient vierge* (1897); *L'Ennemie des rêves* (1899); *Les mères sociales* (1902); *Les Danaides* (1903); *La ville lumière* (1904); *Ames bretonnes* (1907); *L'Amour tragique* (1908)—all novels. Among his essays are: *L'Art en silence* (1900); *Gustave Ricard* (1902); *Idées vivantes* (1904). His later poems are found in *Le sang qui parle* (1904); his art criticism in *The Great French Painters* (1903); *L'Impressionnisme* (1904); *Auguste Rodin* (1905); *J. B. Greuze* (1905); *De Watteau à Whistler* (1905); *Trois crises de l'art actuel* (1906); *La religion et la musique* (1909); *Les passionnés* (1911); *De l'amour physique* (1912).

MAUD, Empress. See Matilda (1102–67).

MAUDE, Aylmer (1858–). An English author. He was educated at Christ's Hospital, London, and in the Lyceum at Moscow, where he lived from 1874 to 1897, being a tutor for three years, then a clerk, and after 1885 manager of carpet factories. In 1898 he aided the Doukhobor migration to Canada. His mother was of an old Quaker family. His wife, Louise Shanks, was born in Russia, her father being English. Maude and his wife were intimate friends of Tolstoy, whose essays, letters, plays, and tales they translated into English. He wrote, besides, *Tolstoy and his Problems* (1901), *A Peculiar People, the Doukhobors* (1904), and a two-volume authorized *Life of Tolstoy* (1908-10), which was revised by the Countess Tolstoy.

MAUDE, Cyril (1862–). An English actor and theatrical manager, born in London and educated at the Charterhouse. At an early age he began to prepare himself for the English stage, but ill health drove him to Canada. Later he came to the United States, where in 1883 he made his first appearance at Denver, Colo., playing the servant's part in *East Lynne*. He returned to London the following year and in 1886 appeared there in *The Great Divorce Case*. He made his first popular success as the Duke of Courtland in *Racing* at the Grand Theatre, Islington, in 1887. During the next five years he appeared in a great variety of rôles, and his rise to prominence was fairly rapid. In 1892 he joined Henry Arthur Jones's company at the Avenue Theatre and created the rôles of Polsom and Juxton Prall in *The Crusaders* and *Judah* respectively. He played Cayley Drummle in the notable production of Pinero's *The Second Mrs. Tanqueray* at the St. James's, May 27, 1893. From 1896 till 1905 he was joint manager of the Haymarket, where he produced and played in many of the best-known plays of this period, *The Little Minister*, *The Manœuvres of Jane*, *The Second in Command*, and *Cousin Kate*, all being brought out there during his management. After leaving the Haymarket he acquired the old Avenue Theatre, which he rebuilt and called the Playhouse. He and his company, except for short intervals, occupied this house after 1907.

In 1913–14 he visited America again and met with popular favor in a repertory of his former successes and a new play called *Grumpy*, in the title rôle of which he achieved a great personal triumph. He came to be regarded as the leading English comedy actor of his time. Consult Maude, *The Haymarket Theatre, Some Records and Reminiscences* (London, 1903).

MAUDE, FREDERIC NATUSCH (1854–). An English writer on military subjects. He was educated at Wellington College and at Woolwich and entered the Royal Engineers in 1873. He was promoted to colonel and in 1905 was made Companion of the Bath. One of the small group of English army officers who pursued intelligent and valuable studies on the art of war, Colonel Maude wrote: *Letters on Tactics and Organization* (1891); *Military Letters and Essays* (1895); *Cavalry versus Infantry* (1896); *War and the World's Life* (1907); *The Leipzig Campaign, 1813* (1908); *The Jena Campaign, 1806* (1909); *The Ulm Campaign, 1805* (1912).

MAUD MUL'LER. A poem by John G. Whittier which appeared in the *National Era*, December, 1854.

MAUDSLEY, mądz'lĭ, HENRY (1835–1918). An English alienist and psychologist, born at Rome, near Settle, Yorkshire. He studied at University College, London, where he graduated in medicine in 1857. In 1859–62 he was medical superintendent at the Manchester Royal Lunatic Hospital, in 1869–79 professor of medical jurisprudence at University College, London, and in 1864–74 physician to the West London Hospital. He was made a fellow of the Royal College of Physicians in 1869 and served as Gulstonian lecturer in 1870. He edited the *Journal of Medical Science* from 1862 to 1878. Edinburgh gave him the degree of LL.D. in 1884. His best-known works are: *Body and Mind* (1870; 2d ed., 1873); *Responsibility in Mental Disease* (1874); *Physiology of Mind* (1867, 1876); *Pathology of Mind* (1867; 2d ed., 1895); *Body and Will* (1883); *Natural Causes and Supernatural Seemings* (1886; 3d ed., 1897); *Life in Mind and Conduct* (1902); *Heredity, Variation, and Genius* (1908).

MAUER JAW. See MAN, SCIENCE OF, *Ancient Types*.

MAUI, mä'o͞o-ē. One of the Hawaiian Islands (q.v.).

MAULE, mou'lā. A river of Chile, rising in the Andes 7218 feet above the sea. After flowing 140 miles in a westerly direction it empties into the Pacific Ocean about 100 miles north of Concepción and near Constitución (Map: Chile, E 5). It is navigable for 52 miles for small craft. It formed the north boundary of the territory of the Araucanians. Its upper course is used for irrigation.

MAULE. A maritime province of Chile, bounded by the Province of Talca on the north, Linares and Nuble on the east, Concepción on the south, and the Pacific on the west (Map: Chile, E 5). Area, 2475 square miles. A large portion of the surface is occupied by the Coast Range, which is well wooded and rises to an altitude of nearly 3000 feet. It has a temperate climate and abundant rainfall, but the soil is rather poor. The chief occupations are stock raising and agriculture. A branch railway line from Parral runs through the province and terminates at the port of Chanco on the coast. Pop., 1911 (est.), 117,324. The chief port is Constitución (pop., 8873). The capital is Cauquenes, situated on the railway line and having a population of 9683.

MAULMAIN, mąl'mān', or **MOULMEIN,** mōl'mān'. A seaport town, capital of the Amherst district and of the Tenasserim division of Lower Burma, at the junction of the rivers Salween and Attaran, 28 miles from the Bay of Bengal (Map: Burma, C 3). The town lies between the left bank of the river Salween and a fine range of densely wooded hills which, at a distance of from 1 to 6 miles, runs parallel with the river. Maulmain is one of the most beautiful and healthful towns of India; the mean annual temperature is 78° F., the highest mean for any month being 83° F. in April and the lowest 75° F. in January. The principal street extends for 4 miles along the river, while nearer to the hills, around the town, are the residences of Europeans and wealthy Burmese and numerous pagodas with gilded spires. The hills command an extensive view of beautiful and varied scenery. Martaban lies on the opposite river bank to the north. The native houses, built of bamboo and thatched with palm leaves, are raised on piles 10 or 12 feet from the ground. The principal buildings, besides three pagodas on the hills with an excellent view, include a public library, government offices, the new jail, a general hospital, and substantial barracks. There are several educational and charitable institutions, missionary establishments, and churches. Vessels of 10-feet draft reach the wharves and jetties at all states of the tide; at spring tide, when the rise and fall is from 20 to 23 feet, the town is accessible to vessels of the largest tonnage. A considerable trade is carried on, chiefly with Calcutta, Madras, Rangoon, and Penang. The chief industries are the manufacture of lumber, ironwork, gold and silver work, and carved ivory. The principal exports are timber, rice, cotton, horns, hides, ivory, wax, gums, drugs, lead, and copper; the imports are chiefly cotton and woolen piece goods, hardware, provisions, general merchandise, and—omitting timber, which is obtained from the neighboring teak forests—all the materials required for shipbuilding, which is an important industry. The United States is represented by a consular agent. The town dates from the British occupation of Tenasserim in 1826. The town owns its water, gas, and drainage systems. Pop., 1901, 58,446; 1911, 57,582, consisting, besides Burmese, of Hindus, Malays, Europeans, Eurasians, Chinese, Armenians, and Jews.

MAUMEE (mą-mē') **RIVER.** A river formed at Fort Wayne, Ind., by the junction of the St. Joseph and the St. Mary's rivers, flowing northeast through the northwestern part of Ohio. Its length is 150 miles, and it empties through Maumee Bay into Lake Erie at its western extremity (Map: Ohio, C 3). The city of Toledo (q.v.) stretches along its banks for 4 miles from its mouth, and the river is navigable for 12 miles to the Maumee Rapids, above which its course is followed as far as Defiance by the Miami and Erie Canal, connecting Lake Erie with the Ohio River. The chief tributaries of the Maumee are the Auglaize and Tiffin rivers, and its drainage area is 6723 square miles. Maumee Bay is for the most part shallow, but its channel has been deepened, straightened, and marked by lighthouses.

MAUNA KEA, mä'o͞o-nä kā'ä (Hawaiian, white mountain). The highest mountain in Polynesia. It is an extinct volcano occupying

the north and north-central portions of Hawaii, and its height is 13,805 feet (Map: Hawaii, F 4). During most of the year snow lies on its peaks, which are composed of gravel and reddish scoria. Its sides are covered with forests nearly to the summit; the lower slopes are being brought under cultivation in coffee orchards.

MAUNA LOA, lō'ä (Hawaiian, long mountain). The largest volcano in the world (though not the loftiest), occupying much of the central and south portion of Hawaii (Map: Hawaii, F 4). It is 13,760 feet in height and slopes gradually from the sea to the summit near the centre of the island, where the group of craters forms an immense caldron 1½ miles in diameter and 1000 feet deep, known as Mokuaweoweo. It exceeds by far any other volcano in the amount of lava discharged; the last great eruption (1880–81) sent a stream down the east slope 50 miles long and in some places 3 miles wide. The crater is in almost continuous activity, and large eruptions have been frequent during the past century. On the east slope is the large crater of Kilauea (q.v.).

MAUNCH. See MANCH.

MAUND. See INDIA, *Weights and Measures.*

MAUNDER, mąn'dēr, SAMUEL (1785–1849). An English compiler, born in Devonshire. His first literary work was in connection with the *Catechisms* (1837–49), published by his brother-in-law and partner, William Pinnock, with whom he was associated also in the *Literary Gazette* of London. Among his numerous compilations are: *The Little Lexicon* (1825); *Treasury of Knowledge* (1830); *Biographical Treasury* (1838); *Scientific and Literary Treasury* (1841); *Treasury of History* (1844); *Treasury of Natural History* (1848); *Treasury of Geography* (1856)—most of which passed through many editions.

MAUNDEVILLE, mąn'de-vĭl, SIR JOHN. See MANDEVILLE, THE TRAVELS OF SIR JOHN.

MAUNDRELL, mąn'drel, HENRY (1665–1701). An English traveler. He graduated in 1685 at Exeter College, Oxford, and was curate at Bromley, Kent, from 1689 to 1695. In the latter year he was appointed chaplain to the English factory at Aleppo, Syria. He wrote *A Journey from Aleppo to Jerusalem* (1703), a valuable work often reprinted, and translated into French, German, and Dutch.

MAUN'DY THURSDAY. The Thursday preceding Good Friday, also called Holy Thursday. The origin of the name is in doubt. It is referred to the Latin *dies mandati,* the day of the mandate: "A new commandment give I unto you, that ye love one another" (St. John xiii. 34); to the old *mande,* a hand basket, from which food was distributed to the poor on the day before Good Friday; and to the phrase *Accipite et manducate,* "Take and eat," occurring in the Epistle for the day in the Roman Catholic church (1 Cor. xi. 24).

MAUNOURY, mō'nōō'rē', MICHEL JOSEPH (1847–). A French soldier, born at Maintenon, Eure-et-Loir. He was educated at the Ecole Polytechnique, Paris, and served in the Franco-Prussian War of 1870 as an under lieutenant, being wounded in the battle of Champigny. He studied at the Ecole Supérieure de Guerre and in 1886–88 was an instructor in artillery at Saint-Cyr. He was regularly promoted, becoming colonel in 1897, general of brigade in 1901, and general of division in 1905. In the latter year he received command of the artillery of the forts of Paris and became president of the commission of military schools; in 1907 he was commandant of the Ecole Supérieure de Guerre; he commanded the 15th Army Corps at Marseilles in 1908 and the 20th at Nancy in 1909; and in 1910 was named military governor of Paris and a member of the Superior Council of War. At the beginning of the War in Europe (q.v.) in 1914, Maunoury was placed in command of the French reserve force near Paris, and it was his successful attack on September 6 that first checked General Von Kluck's drive towards Paris. He later commanded at Soissons, and in March, 1915, was severely wounded. He became an Officer of the Legion of Honor, and in 1915 President Poincaré conferred on him the highest French military honor, the *médaille militaire.*

MAUPASSANT, mō'pä'sän', HENRI RENÉ ALBERT GUY DE (1850–93). A French novelist, one of the greatest modern writers of short stories. He was born at the Château of Miromesnil (Seine-Inférieure), Aug. 5, 1850. After serving in the Navy Department as clerk, and as soldier in the Franco-Prussian War, Maupassant was slowly initiated into the craft of story-telling by Flaubert, an old friend of Madame de Maupassant. Restraint ripened his genius, and his first story, *Boule de suif,* published in *Les soirées de Médan* in 1880, revealed a finished master of the naturalistic school. In the same year he published some striking but sensual poems, *Des vers* (1880), and a drama, *Histoire du vieux temps,* but he saw clearly that his career was elsewhere. He confirmed the promise of *Boule de suif* in about 200 tales gathered under the titles: *La maison Tellier* (1881); *Mademoiselle Fifi* (1883); *Contes de la Bécasse* (1883); *Clair de lune* (1883); *Les sœurs Rondoli* (1884); *Yvette* (1884); *Contes du jour et de la nuit* (1885); *Contes et nouvelles* (1885); *Le Horla* (1887); *La petite Roque* (1888); *La main gauche* (1889); *Le père Milon* (1899); and others, among them *L'Inutile beauté* (1890). Besides these he wrote six novels, *Une vie* (1883); *Bel-Ami* (1885); *Mont-Oriol* (1887); *Pierre et Jean* (1888); *Fort comme la mort* (1889); *Notre cœur* (1890); and several volumes of traveler's impressions, *Au soleil* (1884); *Sur l'eau* (1888); *La vie errante* (1890). *Œuvres complètes de Guy de Maupassant* (29 vols.) appeared in 1908–10, and in the latter year a good edition in English, with critical and interpretative essays, was published in New York (9 vols.). Numerous volumes of translated short stories are to be had. Traces of insanity appear at times in all the work from 1887 onward. The condition is most strongly marked in the longer novels. It caused a practical suspension of his literary work in 1890. In 1892 Maupassant became wholly insane. July 6, 1893, he died in an asylum at Passy. His whole work is a melancholy yet fascinating study in imaginative psychology. He begins as a playful satyr, yet with an aristocratic assumption of superiority to his fellow men that masked a pessimism as deep as Flaubert's. Year by year he loses the sensuous exuberance of youth, more and more he is, as it were, hypnotized by the ghastly fascinations of death, as were Villon, Gautier, and Baudelaire. The moral gloom deepens, the moral unrest grows. The robust animalism of *Une vie* becomes a melancholy moral anatomy in *Notre cœur.* In losing its sensuality it had become morbid and morally un-

certain even in *Pierre et Jean*, artistically Maupassant's best novel. The shorter stories, because requiring less sustained effort, show this less clearly. To the very end Maupassant did work of a character similar to his early work; but from *Le Horla* onward there are stories that could not be attributed to the earlier period. As a whole and in average excellence these stories are in style and art the best in France. There are stories of his native Normandy, tales of selfishness and meanness, chiefly tragic, occasionally comic, more often grim in their irony; there are stories, usually cynical, of Parisian foibles, of life in strange lands, of hunting, medical incident, of love, crime, horror, misery, all carefully elaborated and incredibly deft in the rapid portraiture of a scene or character. All is sharply individualized and the point of view is the absence of any moral law. Characteristic of Maupassant's good humor and better nature are *Le papa de Simon, Les idées du colonel, Miss Harriet, Mademoiselle Perle*, and *Clochette;* typical of his whimsical and satirical irony are *Le parapluie, Denis, Décoré, Aux bois;* bitterly satirical are *L'Héritage, La partie de campagne, Pain maudit, Maison Tellier, Hautôt père et fils*, and most exquisite of all this group, *Yvette;* more intensely misanthropic are tales of sordid brutality or wanton cruelty such as *En mer, L'Oncle Jules, Le diable, Coco, L'Ane, La fille de ferme*, or *Les sabots*, and it is to the wanton side of war that he directs attention in *La mère sauvage* and *Saint-Antoine*. Finally there are at least 40 stories that are pathologic in their pessimism. Nauseated horror of life and haunting terror of death are whispered in the stories of 1884 and recur with growing frequency and intensity, as will appear from consecutive reading of *Petit soldat, Solitude, Un fou, Lui, La petite Roque, Le Horla*, and *Qui sait*.

Bibliography. Ferdinand Brunetière, *Le roman naturaliste* (Paris, 1883); Jules Lemaître, *Les Contemporains*, vols. i, v, vi (ib., 1885–99); René Doumic, *Ecrivains d'aujourd'hui* (ib., 1894); Henry James, *Partial Portraits* (New York, 1899); Marie Bashkirtseff, *Further Memoirs* (London, 1901); Arthur Symons, *Studies in Prose and Verse* (New York, 1904); Brander Matthews, *Inquiries and Opinions* (ib., 1907); *E. Maynial, La vie et l'œuvre de Maupassant* (Paris, 1907); P. Mahn, *Guy de Maupassant, sein Leben und seine Werke* (Berlin, 1908); P. H. Frye, "Maupassant in English," in *Literary Reviews and Criticisms* (New York, 1908); *Recollections of Guy de Maupassant, by his Valet François*, translated by Maurice Reynolds (ib., 1911).

MAUPEOU, mō'pōō', René Nicolas Charles Augustin de (1714–92). A French politician and Chancellor, born in Paris. Both his father and his grandfather had been President of the Parliament of France. He was made Councilor of Parliament, first President (1763), and finally succeeded his father, René Charles de Maupeou, as Chancellor of France in 1768. He presided over the famous Lally (q.v.) trial. He upheld the King in his plan to override the Parliament of Paris, and sided with Madame du Barry against the Duke of Choiseul. After the Duke's exile in 1770 he, the Duke of Aiguillon, and the Comptroller General, Abbé Terray, formed a triumvirate to suppress the power of Parliament. The Maupeou Parliament, as it was called, which was then formed, became very unpopular and Beaumarchais attacked it. Maupeou was forced to live in retirement after the death of Louis XV. In 1789 he presented the nation with a patriotic gift of 800,000 livres. He wrote an account of his high-handed disruption of the Parliament, under the title *Code des parlements ou collection d'édits . . . depuis décembre 1770, jusqu'à décembre 1771* (1772). Consult Jules Flammbermont, *Le Chancelier Maupeou* (Paris, 1883).

MAUPERTUIS, mō'pâr'twē', Pierre Louis Moreau de (1698–1759). A French mathematician and astronomer, born at Saint-Malo. His education was begun under a tutor and in 1714 he went to Paris to the College of La Marche. In 1718 he joined the army and soon attained the rank of lieutenant. Having acquired a taste for mathematics, he resigned five years later and became *adjoint géomètre* in the Academy of Sciences at Paris and in 1725 *associé*. For the next seven years he devoted himself to the investigation of certain geometric problems, publishing his results in a series of memoirs. He was one of the first Frenchmen to master the teachings of Newton. He went to England in 1728 and was admitted to the Royal Society of London. The next year he returned to Basel and studied the integral calculus with Bernoulli. In 1736 he conducted the expedition for measuring a degree of the meridian in Lapland. The results of this work confirmed Newton's theory of the flattening of the earth at the poles. It was on his return that he became acquainted with Voltaire and Samuel König. In 1740 Frederick the Great called him to Prussia, and he accompanied the King in the campaign in Silesia. Having been taken prisoner by the Austrians at Mollwitz, Maupertuis was set free by Maria Theresa and returned to Paris. He was elected a member of the French Academy in 1743, but the next year he was again called to Prussia and in 1746 became president of the Academy at Berlin. In 1750 König came there as professor of philosophy, and he and Maupertuis were soon quarreling over the question of the discovery of infinitesimal calculus and of certain laws of which Maupertuis claimed to be the author. Voltaire sided with König and satirized Maupertuis severely. Frederick interposed in behalf of Maupertuis, but to no avail. The latter, broken in health and spirit, returned to France, and in 1758 went to Basel, where he died in a short time. Some of his chief works are: *Sur la figure de la terre* (1738); *Discours sur la parallaxe de la lune* (1741); *Discours sur la figure des astres* (1742); *Lettre sur la comète de 1742* (1742); *Astronomie nautique* (1745 and 1756); *Essai de cosmologie* (1750); *Maupertiana ou écrits divers* (Leyden, 1753). His collected works, in four volumes, were published in Paris in 1752 and again in Lyons in 1768, under the title *Œuvres complètes de M. de Maupertuis*. Consult: L. A. de la Baumelle, *Vie de Maupertuis* (Paris, 1856); J. P. Damiron, *Mémoires sur Maupertuis* (ib., 1858); id., *Mémoires pour servir à l'histoire de la philosophie du XVIIIe siècle*, vol. iii (ib., 1864).

MAUPRAT, mō'prà'. A novel by George Sand (1836). A drama in six acts was made from the story by the author and presented at the Odéon in 1853.

MAURA Y MONTANER, mou'rà ê môntä'nĕr, Antonio (1853–). A Spanish statesman, jurisconsult, and orator. Born in Palma of Majorca, he studied jurisprudence in the University of Madrid and became a member of the

Academia Matritense de Jurisprudencia y Legislación. As early as 1881 he was sent to Congress by his native city, which he continued to represent up to 1890, serving in 1885 as president of the Council of Ministers. After 1892 he represented Palma in the Cortes, serving as Minister of the Colonies 1892–93 (during which period he published a decree granting larger electoral and representative rights to the Antilles) and Minister of Justice in 1894. A fusionist with liberal tendencies up to 1899, he then turned conservative. On the fall of Silvela he became leader of the Conservatives, and was president of the Council of Ministers 1903 to 1904. During his term of office he accompanied the King on a tour through Cataluña and was stabbed by an anarchist in Barcelona. While he was again Prime Minister (from early in 1907 to late in 1909) occurred two cases of the utmost importance to Spain—the case of Francisco Ferrer and the Rif problem, accompanied by the rebellion in Barcelona. Maura y Montaner became director of the Royal Spanish Academy of the Language and a member of the Royal Academies of Fine Arts (San Fernando) and Moral and Political Sciences. Consult Antón del Olmet and García Carraffa, *Los grandes Españoles*, vol. iii; *Maura* (Madrid, 1913).

MAUREL, mô'rĕl', Victor (1848–). A French barytone singer, born in Marseilles. He was a pupil of the Marseilles and Paris conservatories and made his first appearance at the Opera House in Paris. Afterward he went to Italy and sang at the Scala in Milan. A tour through Europe and in America followed, and in 1879 he returned to Paris. In another visit to Paris after this date he attempted to revive Italian opera in company with the brothers Corti, but without success. His fine voice and talent as an actor caused him to be chosen by Verdi to create the rôles of Iago in *Otello* and Falstaff in *Falstaff*. In 1885 he began an extended tour, appearing in Italy, North and South America, and in 1893 and 1894 sang Verdi's famous rôles in Paris at the express desire of the composer. In 1898 he appeared at the Berlin Opera House. His best-known writings are *L'Art du chant, Le chant renové par la science,* and *Dix ans de carrière.*

MAURENBRECHER, mou'ren-brĕĸ-ĕr, Berthold (1868–). A German classical scholar, born at Dorpat. From 1878 to 1887 he studied at the Gymnasium at Bonn and at the Thomasschule in Berlin and in 1887–91 at the universities of Bonn and Leipzig. From 1891 to 1894 he was an assistant in the library of the University of Leipzig; from 1894 to 1906 privatdocent at Halle. Thereafter he resided at Munich, engaged on the great *Thesaurus Linguæ Latinæ.* (See Dictionary, *History.*) His writings include: *Sallusti Crispi Historiarum Reliquiæ* (2 vols., 1891–93); *Carminum Saliorum Reliquiæ* (1894); *Forschungen zur lateinischen Sprachgeschichte und Metrik,* i (1899); *Jahresbericht über Sallustius,* i, ii (1900, 1902); *Grundzüge der klassischen Philologie,* i, ii, iii (1908–12). The last-named work is the third edition of W. Freund's well-known *Triennium Philologicum.*

MAURENBRECHER, Wilhelm (1838–92). A German historian, born in Bonn. He studied there, in Berlin, and in Munich, his great teachers being Ranke and Von Sybel, with whom he was associated on his *Historische Zeitschrift.* At Bonn he became docent in 1862. He spent a year at Simancas, Spain, in historical research, and after his return to Germany was appointed professor at Dorpat (1867), at Königsberg (1869), at Bonn (1877), and at Leipzig (1884). From 1881 to 1892 he edited the *Historisches Taschenbuch.* He wrote *England im Reformationszeitalter* (1866); *Studien und Skizzen zur Geschichte der Reformationszeit* (1874); *Die katholische Reformation* (1880); *Geschichte der deutschen Königswahlen vom 10. bis 13. Jahrhundert* (1889); *Gründung des deutschen Reiches 1859–1871* (1892). Consult Wolf, *W. Maurenbrecher: ein Lebens- und Schaffensbild* (Berlin, 1893), and *Allgemeine deutsche Biographie,* vol. lii (Leipzig, 1912).

MAUREPAS, mô'rə-pà', Jean Frédéric Phélippeaux, Count (1701–81). Minister of State in the reigns of Louis XV and Louis XVI of France. He was born at Versailles. The office of Minister of State had been held by his father, who on resigning in 1715 transferred it to his 14-year-old son. It was administered during his minority by the Marquis de Villière, his future father-in-law. Maurepas became Minister of Marine in 1725 and Secretary of State in 1738. He made some attempts towards restoring the efficiency of the navy by establishing naval academies and introducing scientific methods of instruction. A satirical couplet against Madame de Pompadour brought about his disgrace in 1749, and he was exiled from court until the death of Louis XV. When Louis XVI came to the throne in 1774 Maurepas was recalled and became his Prime Minister. Without striking ability of his own, he displayed great wisdom in the selection of the members of his council, Vergennes being made Minister for Foreign Affairs, Turgot Comptroller General, and Malesherbes Minister of the Royal Household. He supported Vergennes in the alliance with the United States and in the declaration of war against England. He belonged in spirit nevertheless to the old régime, and in alarm at Turgot's wide-reaching plans of reform he helped to bring about that minister's downfall in 1776, whose place was taken by Necker, who in turn was dismissed in May, 1781. Maurepas held his place as chief minister of the crown until his death, which took place at Versailles, Nov. 21, 1781. Memoirs of a curious nature were published under his name (4 vols., Paris, 1790–92), but were really largely the work of his secretary. The *Bibliothèque Nationale,* however, contains a voluminous collection of French *chansons* made by him. Consult J. L. G. Soulavie, *Mémoires* (3d ed., Paris, 1792).

MAURER, mou'rĕr, Georg Ludwig von (1790–1872). A German statesman and jurist, born near Dürkheim in Bavaria. He was educated at Heidelberg and Paris. In 1824 his *Geschichte des altgermanischen Gerichtsverfahrens* was crowned by the Academy of Munich, and he was appointed professor of jurisprudence in the university (1826). From 1832 to 1834, during the minority of King Otho of Greece, he was a member of the Council of Regency, his energy and ability accomplishing a complete reorganization of civil procedure. In 1847 he was Bavarian Minister of Foreign Affairs and Justice. The most valuable of his various works on history and jurisprudence are: *Das griechische Volk . . . vor und nach dem Freiheitskampfe bis zum 31. Juli 1834* (1835–36); *Geschichte der Dorfverfassung in Deutschland* (1865–66); *Geschichte der Städteverfassung in Deutschland* (1869–71).

MAURER, Konrad von (1823–1902). A German jurist, son of Georg Ludwig von Maurer. He was born at Frankenthal, Bavaria; studied at Munich, Leipzig, and Berlin; and in 1847 was appointed extraordinary professor, and in 1855 professor, of northern jurisprudence at Munich. He made an especial study of Icelandic language, literature, and history. In connection with these subjects he published: *Die Entstehung des isländischen Staates und seiner Verfassung* (1852); *Die Bekehrung des norwegischen Stammes zum Christentum* (2 vols., 1855–56); *Island von seiner ersten Entdeckung bis zum Untergang des Freistaats* (1874); *Zur politischen Geschichte Islands* (1880); *Nogle bemærkninger til Norges kirkenhistorie* (Christiania, 1893). He also edited *Gull-Thóris-Saga* (1858) and a collection of legends entitled *Isländische Volkssagen der Gegenwart* (1860). A catalogue of his library (2 vols.) was published at Munich the year following his death. For a more complete biography and critical estimate of his work, consult his obituary by Golther in the *Zeitschrift für deutsche Philologie*, vol. xxxv (Halle, 1903).

MAU'RETA'NIA, or Mau'rita'nia (Lat., Gk. Μαυρουσία, *Maurousia*, from μαῦρος, *mauros*, black). The ancient name of the most northwestern part of Africa (Map: Rome, B 3). It was so called from the Mauri or Maurusii, a general designation for its numerous tribes. At the time of its greatest expansion it included the present Morocco and more than two-thirds of Algeria, extending from the Atlantic to the Ampsaga River (Wady el Kebir). Among the kings of Mauretania were Bocchus I, the father-in-law of Jugurtha, Bocchus II, who espoused the cause of Cæsar against the Pompeians, for which his territory was considerably enlarged, and Juba II, the son of the Pompeian partisan Juba I of Numidia. Under the Emperor Claudius it was made a Roman province and divided into Mauretania Cæsarensis and Mauretania Tingitana, separated by the Mulucha (Muluya) River. The country was noted for its extraordinary fertility, and its upland plains, stretching from the Atlas Mountains to the sea, supplied Italy with grain. From the hands of the Romans it passed in succession to the Vandals, the Byzantines, and the Arabs. Consult *Cambridge Mediæval History*, vol. ii (New York, 1913). See Barbary States.

On Oct. 18, 1904, the Civil Territory of Mauretania (Fr. *Mauritanie*) was organized as a part of the Government General of French West Africa. This territory extends from the French colony of Senegal (separated therefrom by the Senegal River) along the Atlantic to the Spanish colony of Río de Oro; thence it stretches northeastward, in which direction its boundary is not definitely determined; eastward of its southern part lies the French colony of Upper Senegal and Niger. Mauretania comprises a large part of the western Sahara and embraces the mountainous regions of Tagant and Adrar (the latter not to be confused with the region known as Adrar in the Military Territory of the Niger). For the most part Mauretania is a low-lying country of sandy plains or dunes, with no permanent streams. As the northeast boundary is not fixed, the area can be estimated only arbitrarily. This is stated at 893,700 square kilometers (about 345,000 square miles). The number of inhabitants is unknown, and estimates appearing in contemporary official publications vary greatly; e.g., the French *Annuaire statistique*, published in 1913, places the population at 225,000, whereas *Annuaires* of the Government General of French West Africa, published both before and after that date, place it at about 600,000. In the south a strip of country from 6 to 25 miles broad bordering the Senegal River is rendered fertile by numerous pools, and here some cultivation, especially of millet, is carried on by the negro inhabitants. These people are of the same races as those in Senegal—Yolofs, Peuhls, Toucouleurs, Sarakolés, who dwell in villages along the river. The bulk of the population is Moorish, being a mixture of Arabs and Berbers. With the exception of palm-tending groups, the Moors of Mauretania are mostly nomads, engaged principally in grazing. They are all Mohammedans, many of them Sufistic. The principal towns or villages include Port-Etienne, Boutilimit, Aleg, Moudjeria, Kaedi, Atar, Selibaby, Tidjikdja, etc. Trade, carried on by caravan, is largely in the nature of barter. Mauretania is administered by a commissioner, resident at Saint-Louis in Senegal. Pillaging bands are not uncommon in the territory, and there have been numerous minor uprisings.

MAURI. See Mauretania; Moors.

MAURICE, mą'rĭs (Flavius Tiberius Mauricius) (c.539–602). Byzantine Emperor from 582 to 602. He was descended from an ancient Roman family. During the reigns of Justin II and Tiberius II Maurice was in the military service and in 578 was appointed by the latter Emperor to the command of the army sent against the Persians. In 582 he obtained the rare honor of a triumph at Constantinople, became the son-in-law of Tiberius II, and in August of the same year succeeded him on the throne. Immediately after his accession the Persians invaded the Byzantine territories; a fierce contest of nine years' duration ensued, which, chiefly owing to the internal convulsions that distracted Persia, resulted in favor of the Byzantines. The King of Persia, Khosru II (q.v.), driven from his throne, fled to the Byzantines; an army was immediately assembled, and in 591 Khosru was restored to his throne, giving up to Maurice the fortresses of Daras, Martyropolis, and Persarmenia. In 599 the Avars demanded ransom money for 12,000 soldiers whom they held as prisoners. The Emperor refused to ransom them and they were consequently put to death. This excited a deep resentment in the army, and in 602, when the Emperor ordered his troops to take up their winter quarters on the north side of the Danube, they broke out into open revolt, proclaimed Phocas Emperor, and marched upon Constantinople. Maurice with all his family and many of his friends was put to death on Nov. 27, 602. Consult J. B. Bury, *Later Roman Empire* (New York, 1899), and Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury (London, 1912).

MAURICE, Prince of Orange and Count of Nassau, commonly styled Maurice of Nassau (1567–1625). Stadholder of the Netherlands, and one of the distinguished generals of his age. He was the son of William the Silent, founder of the Dutch Republic, and was born at Dillenburg in Nassau in 1567. After the assassination of his father in 1584 the provinces of Holland and Zealand, and later Utrecht, elected him their stadholder (1590). He was also President of the Council of State. A great portion of the Netherlands was still in the hands

of the Spaniards; and though during the first part of his administration he was unsuccessful, later Maurice rapidly wrested cities and fortresses from the enemy. In 1591 Zutphen, Deventer, Nimeguen, and other places fell into the hands of the Dutch; in 1593 Gertruydenberg and in 1594 the Province of Groningen. In 1597, with the help of some English auxiliaries, Maurice defeated the Spaniards at Turnhout in Brabant and in 1600 won a splendid victory at Nieuwport. In 1604, however, Ostend, after a siege of three years, surrendered to the Spaniards. Finally in 1609 Spain agreed to a truce of 12 years, which meant the practical achievement of their independence by the Dutch. In 1621 the struggle was renewed. Maurice from political motives was the bitter enemy of Barneveldt (q.v.), whose death he caused. This is the only stain on his memory. Consult: G. Groen van Prinsterer, *Maurice et Barneveldt* (Utrecht, 1875); M. O. M. Nutting, *The Days of Prince Maurice* (Boston, 1894); J. L. Motley, *Life and Death of John of Barneveldt* (2 vols., New York, 1902).

MAURICE, Duke and Elector of Saxony (1521–53). He was the eldest son of Duke Henry the Pious of the Albertine line. He was born at Freiburg, March 21, 1521, married in 1541 Agnes, daughter of the Landgrave Philip of Hesse, and later in the same year succeeded his father in the Duchy of Saxony. He was early involved in disputes with his cousin, the Elector John Frederick of the Ernestine line. Though a Protestant, he did not join the Schmalkalden League (q.v.), and was finally won over by the Emperor Charles V, who, preparing to crush German Protestantism by force of arms, promised him (June 19, 1546) the possessions of the Ernestine line and the electoral dignity as soon as John Frederick, who was one of the leaders of the League, should be dispossessed. He invaded electoral Saxony (1546), but was driven from it and from his own domains, and only saved by the timely assistance of the Emperor and the Duke of Alva, who at the battle of Mühlberg (1547) annihilated the army of the Schmalkalden League and took John Frederick prisoner. Maurice now became ruler of the whole of Saxony, with the electoral dignity. The imprisonment of Philip of Hesse, whom Maurice had prevailed upon to submit to the Emperor, was the first cause of estrangement between Charles and Maurice. The attempts of the Emperor to increase his own preponderance supplied another; a further source of trouble was the refusal of the Emperor to hand over to Maurice the episcopal territories of Magdeburg and Halberstadt, the prospect of whose possession had been held out to him; in addition Maurice was alarmed for the safety of Protestantism. The new Elector gradually came to see that his close alliance with the Emperor was alienating from him the affections of his Protestant subjects. He accordingly abandoned the cause of the Emperor with as little scruple as he had formerly sacrificed the interests of his relatives and coreligionists, and arranged an alliance against Charles V, comprising a number of German princes and Henry II of France, to whom the bishoprics of Metz, Toul, and Verdun were promised as a reward for his assistance. In March, 1552, Maurice suddenly appeared with an army in south Germany and compelled the Emperor, who was then at Innsbruck, to take refuge in flight, leaving to his brother Ferdinand the conduct of negotiations. Finally, at a convocation of the electors and princes of the Empire at Passau, the terms of a treaty of peace were arranged, in which it was agreed that the Lutheran states should be free to maintain their mode of worship. In the summer of 1553 Maurice took the field against Albert, Margrave of Brandenburg-Culmbach, who had refused to accede to the terms of the Treaty of Passau and was raiding the Rhine bishoprics and Franconia. He was fatally wounded in the battle at Sievershausen, July 9, dying July 11. Although but 32 years of age, he had established his reputation as one of the ablest diplomats, administrators, and generals of his time; but he united with a most agreeable personality a dissimulation and bad faith which lost him the confidence of both parties.

Consult: F. A. von Langenn, *Moritz, Herzog und Churfürst zu Sachsen* (Leipzig, 1841); Prutz, "Moritz von Sachsen," in *Der neue Plutarch*, vol. ix (ib., 1882); S. Issleib, "Moritz von Sachsen als protestantischer Fürst," a short study in *Sammlung gemeinverständlicher wissenschaftlicher Vorträge* (Hamburg, 1898); *Cambridge Modern History*, vol. ii (Cambridge, 1904), containing a bibliography. His *Politische Korrespondenz* was published by E. Brandenburg (Leipzig, 1900-04). See REFORMATION; SAXONY.

MAURICE, mą'rĭs, ARTHUR BARTLETT (1873–). An American editor, born at Rahway, N. J., and educated in Paris, at Richmond College (Va.), and at Princeton. He served as an editor of the Woodbridge (N. J.) *Register* in 1895, as city editor of the Elizabeth (N. J.) *Daily Herald* in 1896, and as special writer for the New York *Commercial Advertiser* in 1897–98. Of the *Bookman* he was joint editor from 1899 to 1909 and editor thereafter. He contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA and is author of *New York in Fiction* (1901) and *History of the Nineteenth Century in Caricature* (1904), with F. T. Cooper.

MAURICE, (JOHN) FREDERICK DENISON (1805–72). An English author and divine, born at Normandston, the son of a Unitarian clergyman. He studied at Cambridge and became engaged in literary work in London. Influenced by Coleridge and others, he decided to become a clergyman in the Established church. He went to Oxford and took his M.A. degree and was ordained in 1831. His first position was the curacy of Buddenhall. In 1836 he became chaplain of Guy's Hospital, London; in 1840 professor of history and English literature at King's College and in 1846 of divinity in this school, losing these last positions in 1853 because of his supposedly radical religious views. He was chaplain of Lincoln's Inn, 1846–60; incumbent of St. Peter's, Vere Street, London, 1860–69; professor of moral philosophy at Cambridge from 1860 until his death, which occurred in London, April 1, 1872. At the time of his death there was probably no clergyman in England more deeply revered and loved by the people, and within the Church he had become the head of the Broad Church party and had a large following among the younger men. He founded the Working Men's College in London in 1854 and became its principal. He wrote one novel, *Eustace Conway* (1834). Other works are: *The Kingdom of Christ* (1838); *Religions of the World* (1847); *Moral and Metaphysical Philosophy* (1850–57); *Prophets and Kings of the Old*

Testament (1853); *Unity of the New Testament* (1854); *Ecclesiastical History of the First and Second Centuries* (1854); *Patriarchs and Lawgivers of the Old Testament* (1855); *Epistle of St. John* (1857); *The Word Eternal* (1863); *Conscience* (1868); *Social Morality* (1869). Consult: Sir J. Frederick Maurice, *Life of F. D. Maurice, chiefly Told in his Own Letters* (2 vols., New York, 1884); C. F. G. Masterman, *Frederick Denison Maurice* (London, 1907); also R. H. Hutton, in *Essays on Some of the Modern Guides of English Thought in Matters of Faith* (New York, 1887); F. M. Brookfield, in *Cambridge Apostles* (ib., 1906).

MAURICE, Sir John Frederick (1841–1912). An English soldier, born in London. He studied at Addiscombe College and Woolwich Academy and entered the Royal Artillery in 1861. He was private secretary to Sir Garnet Wolseley in the Ashanti campaign of 1873–74; served in the Zulu War in 1880; was deputy assistant adjutant general of the Egyptian expedition in 1882; and was brevetted colonel in 1885. In 1885–92 Maurice was professor of military history at the Staff College and in 1895 he was promoted to major general. His reputation depends chiefly on his military writings, which include: *Hostilities without Declaration of War* (1883); *Popular History of Ashanti Campaign* (1874); a life of his father, Frederick Denison Maurice (1884); *The Balance of Military Power in Europe* (1888); *War* (1891); *National Defenses* (1897); *Diary of Sir John Moore* (1904); an official *History of the War in South Africa, 1899–1902* (4 vols., 1906–10).

MAURICE, Saint. See Legion, Theban.

MAURICE, Thomas (1754–1824). An English scholar and historian, born at Hertford. He was a pupil of Dr. Parr in an academy at Stanmore and afterward entered St. John's College, Oxford, but the next year removed to University College, where he graduated in 1773. Appointed curate of Woodford in Essex, he resigned in 1785 for a pastorate at Epping. In 1798 he was appointed by Earl Spencer vicar of Wormleighton in Warwickshire and in the same year was appointed keeper of manuscripts in the British Museum. In 1800 he received the pension left vacant by the death of the poet Cowper and in 1804 was presented by the Lord Chancellor to the vicarage of Cudham in Kent. A learned Orientalist, he published a voluminous work on *Indian Antiquities* (7 vols., 1793–1800). In addition he wrote *History of Hindustan* (2 vols., 1795–98) and a *Modern History of Hindustan* (1802–10). His *Memoirs,* published at London (1820–22), give a good account of the progress of Indian literature in Britain during the preceding 30 years.

MAURICE OF SAXONY. A French soldier generally known as Marshal Saxe. See Saxe, Maurice, Count of.

MAURICIUS, mą-rĭsh'ĭ-ŭs, Flavius Tiberius. A Byzantine Emperor. See Maurice.

MAU'RĬTA'NIA. See Mauretania.

MAURITIA, mą-rĭsh'ĭ-ą (Neo-Lat., so called in honor of Prince Maurice of Nassau). A genus of palms, all natives of the hottest parts of America. Some of them, like *Mauritia vinifera,* the wine or buriti palm (q.v.), have lofty columnar smooth stems; others are slender and armed with strong conical spines. The miriti palm (*Mauritia flexuosa*) grows to the height of 100 feet, or even 150 feet in river deltas; it has very large leaves on long stalks. The stem and leafstalks are utilized for various purposes. The fibre from the young leaves is extensively used for cordage and in the manufacture of hammocks. Sago is obtained from the stems. A beverage is made from the fruit, as from that of the buriti palm and several other species.

MAURITIUS, mą-rĭsh'ĭ-ŭs (named in honor of Maurice of Nassau), formerly Ile de France. A British island in the Indian Ocean, 550 miles east of Madagascar, between long. 57° and 58° E. and lat. 19° and 20° S. (Map: Africa, K 7). Its area is 720 square miles. The coasts are low, except at three points where the mountains reach them. The surface rises in the interior to a plateau, surmounted by three groups of mountains with other outlying elevations. Extinct craters testify to the volcanic origin of the island, which, however, is fringed with coral reefs. The highest peaks are Pitou de la Rivière Noire (2711 feet) and Ponce (2650 feet). The coasts, although well indented, are difficult of access on account of the numerous coral reefs by which they are surrounded. The only good harbor is Port Louis, on the northwest coast, which is sheltered by coral reefs. The rivers are short and unfit for navigation. The climate is considerably tempered by the mountainous character of the island. There is about 10° difference between the temperature in the interior and that of the coast regions. The mean annual temperature at Port Louis, the capital and largest town, is about 79° F. The rainfall varies from 145 inches per year in the southeast to 31 in the west. The island has suffered considerably from hurricanes and fever epidemics. The present flora is almost entirely foreign, although some of the plants were introduced so long ago that they have come to be considered indigenous. The fauna of Mauritius, never very extensive, has been still more impoverished by the total destruction of the once magnificent forests, which have been replaced with plantations. Most of the domestic animals are of foreign origin. Among the extinct species may be mentioned the dodo (q.v.) and several other birds whose inability to fly was the cause of their early extermination. Mauritius has a fertile although somewhat stony soil, adapted for the cultivation of the chief tropical products. Cane sugar has been the staple of the island for a very long period, and it is mainly by the sugar crop that the economic condition of the island is determined. Formerly nearly all the export sugar went to Europe, but this outlet has been largely closed in recent years by the competition of European beet sugar. If the British East Indian markets had not been opened in the last decade of the nineteenth century, the sugar industry would have been ruined. Other products of minor importance are cereals, cotton, pepper, indigo, coconuts, vanilla, drugs, and tea. The commerce of Mauritius is chiefly with the United Kingdom and the British colonies. In 1902 imports were valued at Rs.31,143,520 (rupee=32.444 cents), of which Rs.8,218,420 from the United Kingdom; in 1912, Rs.32,266,707, of which Rs.11,569,227 from the United Kingdom. Exports in 1902 and 1912 respectively were valued at Rs.36,389,130 and Rs.37,184,189, of which Rs.4,365,350 and Rs.4,466,656 to the United Kingdom. The imports are mainly grain (rice, wheat, etc.), cotton goods, wine, coal, hardware, and manure. Ordinarily about nine-tenths of the export value represents sugar; the sugar export in 1912 amounted to

206,677 metric tons, with estimated value of Rs.34,900,000. The value of the aloe-fibre export in 1912 was Rs.681,978. Minor exports are molasses, rum, coconut oil, and vanilla. Port Louis is connected by steamship lines with Marseilles (France) and Colombo (Ceylon), as well as with England via the Cape of Good Hope. There is frequent communication by both sail and steamer with Madagascar, Natal, Réunion, India, Australia, etc.; most vessels plying between Europe and India via the Cape of Good Hope touch at Port Louis. Mauritius has 130 miles of railway comprised in seven lines, all owned and operated by the government.

Under the constitution as amended in 1884–85 the colony is administered by a Governor assisted by an executive council of 4 ex-officio members. There is a legislative council of 27 members, 8 being ex-officio, 9 nominated by the Governor, and 10 elected. The right of suffrage is contingent on certain property qualifications. The law is based on the Code Napoléon and other French laws modified by colonial ordinances.

The estimated population of Mauritius in 1767 was 19,000, and in 1837, 134,000; the census of 1881 returned 359,874; 1891, 370,588; 1901, 380,040; 1911, 377,083. Of the total in 1911, 370,393 were returned for the island of Mauritius and 6690 for the dependencies. Of the 370,393, the number of persons of European, African, or mixed descent was 108,844; Indo-Mauritians, i.e., persons of East Indian descent born in Mauritius, 222,361; other Indians, 35,526 (it is probable that a number of old Indian immigrants returned themselves as Indo-Mauritians); Chinese, 3662. The military, included in the total 377,083, numbered 1602. Indians and persons of Indian descent constituted about 70 per cent of the population. The Indian population dates from the emancipation of the slaves (about 66,000) in 1834–39. As many of the freed slaves were unwilling to work on the estates of their former masters, the latter invited immigration from India, which, except for occasional temporary stoppages, continued until 1910. The Indo-Mauritians are now predominant in commerce and agriculture, and the amount of land held by them as small planters is increasing. The white population is largely French. In 1911 Roman Catholics numbered about 122,000 and Protestants about 7000. In recent years a great part of Port Louis, the capital, has passed from European to Indian or Chinese ownership, and the population of the city has somewhat declined; in 1911 it had, with suburbs, 50,060 inhabitants. (See PORT LOUIS.) The second largest town is Curepipe, with 17,173 inhabitants in 1911; Mahebourg had 3505. Primary education is free, but not compulsory. In 1912 primary education was provided in 60 government schools, with 9522 pupils (average attendance, 5775), and 89 aided schools, with 11,987 pupils (7635). Relative numbers of the pupils according to religion were: Roman Catholics, 62.06 per cent; Anglicans, 2.32; other Christians, 0.98; Mohammedans, 10.59; Hindus and others, 24.05. The Royal College provides secondary instruction.

The dependencies of Mauritius include various small islands in the Indian Ocean. Of these, the most important is Rodrigues, in lat. 19° 44′ S. and long. 63° 34′ E., 344 nautical miles from Mauritius. It has an area of 42 square miles and a population (1911) of 4829. Diego García (pop., 517) is the most important of the Oil Islands group. Other dependencies are the Cargados Islands, Chagos Islands, and Eagle Islands.

Mauritius was discovered by the Portuguese in 1505 and remained in their possession until 1598, when it was ceded to the Dutch, who gave it its present name. Aside from erecting a fort at Grand Port, one of the smaller trading ports, the Dutch did no more for the settlement of the island than their predecessors and finally abandoned it in 1710. The island was soon taken over by the French and under their rule began to develop, especially during the second half of the eighteenth century. During the war between France and England at the beginning of the nineteenth century the island was captured by England and was formally ceded by France in 1814.

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MAURITIUS AND LAZARUS, ORDER OF. An Italian order of merit with five classes, originally an ecclesiastical order founded by Amadeus VIII of Savoy in 1434. It was suppressed in 1802, restored by Victor Emmanuel of Sardinia in 1816, and reconstituted by Victor Emmanuel II in 1868.

MAUROCORDATOS. See MAVROCORDATOS.

MAUROMICHALIS, mäv′rą-mē-kä′lēs. See MAVROMICHALIS.

MAURRAS, mō′rà′, CHARLES MARIE PHOTIUS (1868–). A French critic and journalist, born at Martigues and educated at the Collège Catholique of Aix. He founded with Moréas (q.v.) the Ecole Romane Française. A leader in the fight against romanticism, in the reaction towards a neoclassical tradition, he contributed to numerous reviews and from 1894 to 1900 was literary critic for the Larousse Encyclopædia. He wrote: *Jean Moréas* (1891); *Le chemin de paradis* (1895); *L'Idée de la décentralisation* (1898); *Trois idées politiques: Chateaubriand, Michelet, Sainte-Beuve* (1898); *Les amants de Venise: George Sand et Musset* (1902); *Jules Lemaître et son ami* (1903), with Boncour; *L'Avenir de l'intelligence* (1905); *Le dilemme de Marc Sanguier: essai sur la démocratie religieuse* (1906); *Kiel et Tanger* (1910); *La politique religieuse* (1912); *Enquête sur la monarchie* (1913).

MAU′RUS, RABANUS. A German theologian. See RABANUS MAURUS.

MAURUS, mą′rŭs, SAINT (?494–584). He was born in Rome about 494. He was of a noble family and was placed by his father, Equitius, under the tutelage of St. Benedict, who sent him to Gaul. Here he founded the monastery of Glanfeuil, or Saint-Maur-sur-Loire, in 543, over which he presided for 40 years. He died in 584, and his day is January 15. The Congregation of Saint-Maur has done

a great work in reforming the monastic orders and in ecclesiastic literature.

MAURUS, Terentianus. See Terentianus Maurus.

MAURU'SII. See Mauretania.

MAURY, mą'rê, Dabney Herndon (1822–1900). An American soldier and author, born at Fredericksburg, Va. He graduated at the University of Virginia in 1841, studied law, and afterward went to West Point, where he graduated in 1846. He served in the Mexican War and was brevetted first lieutenant for gallantry at Cerro Gordo. From 1847 to 1850 he was assistant professor of geography and ethics, and from 1850 to 1852 of infantry tactics at West Point. He then served in the West and was superintendent of cavalry instruction at Carlisle Barracks in 1858. While serving as assistant adjutant general in New Mexico in 1861 he was discharged from the army and entered the Confederate service as colonel. After the battle of Pea Ridge he was promoted brigadier general and opposed Grant during the Van Dorn raid. He also met Sherman successfully in the latter's attack on Vicksburg in 1862. Later he was promoted major general and was placed in command of the Department of Tennessee. At the end of the war he was in command of the Department of the Gulf and surrendered on May 24, 1865. In 1868 he organized the Southern Historical Society. From 1886 to 1889 he served as United States Minister to Colombia. His writings include: *Skirmish Drill for Mounted Troops* (1859); *Recollections of a Virginian in the Mexican, Indian, and Civil Wars* (1894); *Young People's History of Virginia and Virginians* (1904).

MAURY, mô'rê', Jean Siffrein (1746–1817). A French prelate, the son of a shoemaker, born at Valréas in the Department of Vaucluse, France. He studied for the priesthood at Avignon and went to Paris at the age of 20 as *abbé précepteur*. He soon made himself known as an eloquent panegyrist, became a favorite preacher at the court, and was appointed to the abbey of Frénade. He was elected also to a seat in the French Academy (1785). In 1789 he was chosen deputy of the clergy to the States-General, where he was prominent in defense of the church and royalty, and with great vigor, skill, and eloquence opposed the revolutionary measures until the flight of Louis XVI. At the dissolution of the Constituent Assembly he left France in 1792, and at the invitation of Pius VI took up his residence in Rome, where he was received with great honor. In 1794 he was made Archbishop of Nicæa *in partibus*, extra nuncio to the Diet at Frankfort, Cardinal, and Bishop of Montefiascone. On the invasion of Italy by the French in 1798 he fled in disguise to Venice and thence to St. Petersburg. Returning in 1799, he was appointed by the Count of Provence, afterward Louis XVIII, his Ambassador to the holy see. Becoming reconciled to Napoleon, he returned to France in 1806. In 1810 he was appointed Archbishop of Paris, and his refusal to abdicate this office at the command of Pius VII cost him six months' imprisonment at Rome after the Restoration. Maury published a treatise entitled *Essai sur l'éloquence de la chaire* (1810).

MAURY, mou'rê, Juan María (1772–1845). A Spanish poet, born at Malaga. He studied abroad, both in France and England, and on his return to Spain took part in the War of the French Occupation. He was a supporter of Joseph Bonaparte, and was afterward exiled and died in Paris. His works include: *La agresión británica* (1806), *L'Espagne poétique* (1826–27), *Esvero y Almedora* (1840), a poem in twelve cantos.

MAURY, mô'rê', Louis Ferdinand Alfred (1817–92). A French scholar and archæologist, born at Meaux, Seine-et-Marne. In 1860 he was made librarian at the Tuileries. He was appointed professor of history and morality at the College of France in 1862 and was general director of the archives from 1868 until 1888, when he retired. He assisted Napoleon III in his *Histoire de Jules César* and himself published: *Essai sur les légendes pieuses du moyen âge* (1843); *Les fées du moyen âge, recherches sur leur origine* (1843); *Histoire des religions de la Grèce antique* (1857–59); *Croyances et légendes de l'antiquité* (1863); *Les forêts de la Gaule et de l'ancienne France* (1867); *Exposé des progrès de l'archéologie* (1867); *La terre et l'homme* (1869).

MAU'RY, Matthew Fontaine (1806–73). An American naval officer and hydrographer, born in Spottsylvania Co., Va. He studied at Harpeth Academy in Tennessee until 1825, when he was appointed midshipman in the navy. The next year he was an officer on the *Vincennes* during her voyage around the world. Crippled for the rest of his life by fracturing his leg in 1839, he was appointed to the Naval Observatory and Hydrographic Office in Washington. There he made a study of old ships' logs, the result of which was a series of *Wind and Current Charts* that were of incalculable benefit to navigators. There also he prepared his *Physical Geography of the Sea and its Meteorology* (1855). In 1853 he was promoted to the rank of commander. At the outbreak of the Civil War he offered his services to the Confederacy, and was sent (1862) on a mission to Europe, where he remained until the conclusion of peace. He then went to Mexico and was appointed commissioner of emigration by Emperor Maximilian. Upon the overthrow of the Imperial régime Maury returned to the United States and became professor of physics at Virginia Military Institute. Among his publications not previously mentioned are *Letters on the Amazon and the Atlantic Slopes of South America* (1853) and *Lanes for Steamers Crossing the Atlantic* (1854). Consult Corbin, *Life of Matthew Fontaine Maury* (London, 1888).

MAUSER, mou'zĕr. The name of two German inventors. Peter Paul (1838–1914) and his brother Wilhelm (1834–82) were both born at Oberndorf, Württemberg, and both secured employment in the arsenal of their native town. The two brothers produced in 1863 a needle gun, which they improved in 1865. In 1867 they went to Liége, where they perfected, with the financial help of the American Norris, the breech-loading gun. Returning in 1869 to Oberndorf, they placed their invention before the Prussian government, which acquired the model in 1871, the "Mauser model 1871." To be able materially to profit by their invention they bought in 1874 the arsenal at Oberndorf, which later was changed into a stock company and taken up in 1897 by the Deutsche Waffen und Munitionsfabriken. After 1874 they invented a pistol and (1879) a revolver and repeating rifle. Soon they were in a position to fill government contracts for rifles, supplying Servia, Turkey, Belgium, Spain, Portugal,

Sweden, Mexico, and several South American republics. Peter Paul Mauser is principally known for his invention of the Mauser magazine rifle (1897), which was adopted by the German and other armies, and for a magazine pistol. See SMALL ARMS.

MAUSER GUN. See MAUSER; SMALL ARMS.

MAU'SOLE'UM (Lat., from Gk. μαυσωλεῖον, *mausōleion*, from Μαύσωλος, *Mausōlos*). A sepulchral monument of large size, containing a chamber in which urns or coffins are deposited. The name is derived from the tomb erected at Halicarnassus to Mausolus, King of Caria, by his widow, Artemisia. (See ARTEMISIA, 2.) The work is said to have been begun by Mausolus (353 B.C.), and to have been completed by the artists after the death of Artemisia (c.350 B.C.). It was one of the most magnificent monuments of the kind and was esteemed one of the seven wonders of the world. The architects were Satyrus and Pythus or Pythis, and it is said that Scopas, Bryaxis, Timotheus (or, according to Vitruvius, Praxiteles), and Leochares were employed on the sculpture. It was described by Pliny and is mentioned by mediæval writers, as late as the twelfth century, in a manner that seems to imply that it was still uninjured. The upper part was overthrown, probably by an earthquake, in the course of the next two centuries; for, when the Knights of St. John of Jerusalem, in 1402, took possession of the site of Halicarnassus, they used the ruins as a quarry in building their castle. The interior was still undisturbed, for in 1522, when repairing the castle and excavating among the ruins for building materials, the knights discovered a large chamber decorated with colored marbles, reliefs and columns. These were all destroyed to furnish lime. An inner chamber contained a white marble sarcophagus. Fragments of the frieze were used to decorate the castle walls, and in 1846 these were obtained by Sir Stratford Canning for the British Museum. In 1856–58 excavations conducted for the British government by Charles Thomas Newton (q.v.) led to the discovery of the lost site and the recovery of many fragments of architecture and sculpture. (See BUDRUN.) The foundations and fragments, combined with Pliny's rather inadequate notice, have led to at least 50 attempts to reconstruct the monument, but without any very conclusive result. The Mausoleum consisted, apparently, of a lofty rectangular base or podium, about 230 by 250 feet, on which stood a chamber surrounded by an Ionic colonnade (the *pteron*) of 36 columns; this seems to have been surmounted by a pyramid of 24 steps, on the truncated apex of which was a marble four-horse chariot. Whether the colossal statues of Mausolus and Artemisia were placed in the chariot or elsewhere in the building is a matter of dispute. The reliefs belong to three friezes and represent a battle of the Greeks and the Amazons, the contest between the Centaurs and Lapithæ, and a chariot race. Their exact position in the building is uncertain, though the first is probably the frieze of the external Ionic order. In addition to the histories of Greek sculpture, consult: Newton, *History of Discoveries at Halicarnassus, Cnidus, and Branchidæ* (London, 1862–63); id., *Travels and Discoveries in the Levant* (ib., 1865); Oldfield, in *Archæologia*, vols. liv, lv (ib., 1895–96); Adler, *Das Mausoleum zu Halikarnas* (Berlin, 1900); A. H. Smith, *Catalogue of Sculptures in the British Museum*, vol. ii (London, 1900), where the fragments are described and sketches of the proposed restorations are given; K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914).

By extension the term is used to designate any monumental sepulchral edifice, whether ancient or modern. Among the most important tomb structures of this sort the following may be mentioned. (1) The mausoleum of Augustus in the Campus Martius at Rome, a circular stone edifice nearly 300 feet in diameter, still partly extant. Its massive vaults were probably once covered by a mound of earth planted with trees. (2) Of Hadrian, now the Castel Sant' Angelo, on the right bank of the Tiber, also a vast circular structure, once richly adorned with statues and surmounted by a conical roof of stone. (3) Of Theodoric, at Ravenna, a stone structure externally circular, in two stories; only 30 feet in diameter, it is remarkable for its dome, composed of a single stone 36 feet in diameter. (4) Several remarkable domed structures in India built under the Mogul emperors, of which three are especially important—the tomb of Mahmud at Bijapur, with a dome covering a chamber 137 feet in diameter; of Humayun at Delhi, of sandstone and marble; of the Shah Jehan at Agra, known as the Taj Mahal (q.v.), the most beautiful of all mausolea, built about 1650 largely of alabaster inlaid with precious and semiprecious stones. On the other hand, the mausoleum of Akbar at Secundra is an open structure in several diminishing terraces. (5) Of Napoleon I at Paris, the famed Dome of the Invalides (q.v.), built as a royal sepulchral chapel in 1675–1735, but internally remodeled in 1843–52, with an open crypt to receive the remains of the exiled Emperor. (6) Of General Grant in Riverside Park, New York City, built by popular subscription to receive the bodies of the former President and his wife, and internally modeled somewhat after that of Napoleon.

Sepulchral chapels and tomb mosques are sometimes included under this title, as the tomb mosques of Cairo and the (unfinished) sepulchral chapel of King Manoel at Belem in Portugal; but this is hardly a correct use of the term. On the other hand, the Imperial *turbeh* of the Turkish sultans at Constantinople properly belong in this category of mausolea; they are impressive structures, especially those of Solyman and of Roxelana (Khourrem) in the precincts of the Suleimaniyeh. See AUGUSTUS, MAUSOLEUM OF; GRANT, ULYSSES SIMPSON; HADRIAN, TOMB OF.

MAUSO'LUS. See MAUSOLEUM.

MAUVAISES TERRES, mō-vāz' târ'. See BAD LANDS.

MAUVE, mouv, ANTON (1838–88). A Dutch landscape and animal painter, one of the most eminent of the nineteenth century. He was born at Zaandam, but his family removed to Haarlem when he was a boy, and Mauve studied there under the cattle painter Van Os, but he was chiefly self-taught. Afterward he spent some time in Oosterbeek and later lived at The Hague and at the village of Laren. Mauve stands with Israels and the brothers Maris in the front rank of modern Dutch painters. His subjects are usually landscapes with cows, sheep, horses, or figures of peasants, and scenes on the seashore. They are simple, truthful, yet refined, and possess that fine poetic quality which modern Dutch

art has inherited from the past. In the subtle appreciation of values and in the luminous quality of his skies he has never been surpassed. He painted in oil and water color with equal ease, although his water colors are more spontaneous. Fine examples of his paintings in oil are: "Heath near Laren" and "Milking Time," both in the Rijks-Museum; "Spring" and "Autumn," two fine sheep paintings, in the Metropolitan Museum of Art, New York; and "Watering Horses" (National Gallery, London). Among his water colors two of the best known are "Interior of a Barn" and "Shepherd and Flock." Before he was generally recognized in other countries Mauve was highly esteemed in the United States, where his paintings brought high prices, and where he is well represented in private collections; e.g., by five good cattle pieces in the collection of James G. Shephard. Consult Max Rooses, *Dutch Painters of the Nineteenth Century*, vol. iii (London, 1898–1901), and Marius, *Dutch Painters of the Nineteenth Century* (ib., 1908).

MAUVEIN. See Coal-Tar Colors.

MAV'ERICK, Peter (1780–1831). An American engraver and lithographer, born in New York City. He was the son of Peter Rushton Maverick, etcher and engraver, from whom he learned his art. He was a founder of the National Academy of Design and one of the first engravers of note in America, and conducted a flourishing business in New York. His plates, which are chiefly portraits, are deficient in technique and lifeless in expression. Among the best are: Cervantes; Oliver Ellsworth, after Trumbull; Henry Clay, after King (1822); and Andrew Jackson, after Waldo. Asher B. Durand (q.v.), the engraver, was his pupil, and his partner in 1817.

MA'VIS (OF. *mauvis, malvis*, Fr. *mauvis*, probably from Bret. *milfid, milvid, milthouid*, Corn. *melhuet, melhues*, lark). The song thrush (*Turdus musicus*, or *philomelus*) of Europe is commonly known in Scotland as the mavis, and although this name is now rather uncommon in England, where "throstle" and "redwing" are more often heard, it has passed into literature to such an extent as to be well known wherever English is spoken. (See Song Thrush.) In Scotland the missel thrush (q.v.) is known as big mavis.

MAVOR, James (1854–). A Canadian economist. He was born at Stranraer, Scotland, and was educated at the University of Glasgow. In 1888 he was appointed professor of political economy and statistics in St. Mungo's College, Glasgow. He was also assistant editor of a technical journal, editor of the *Scottish Art Review*, and took part in university-extension work and in practical schemes for the economic betterment of workmen. He went to Canada in 1892 and was appointed professor of political economy in Toronto University. In addition to his professional duties he was intrusted by the British Board of Trade and the Canadian government, as well as by important charitable and economic organizations, with investigations of labor conditions, immigration, railway rates, copyright, grain production and transportation, and other similar subjects. In making these investigations he traveled extensively in America, Europe, and the Far East. He was special lecturer in economics in Punjab University, India, in 1914–15, and was elected a fellow of the Royal Society of Canada. His publications include: *Wage Theories and Statistics* (1888); *Economic Theory, and History Tables and Diagrams* (1890); *Economic Study, and Public and Private Charity* (1892); *Report on Labour Colonies in Germany* (1893); *English Railway Rate Question* (1894); *Handbook of Canada* (1897); *Notes on Art* (1898); *Report on Immigration into Canada from Europe* (1900); *Report on Workmen's Compensation Acts* (1900); *Papers on Municipal Affairs* (1904); *Report to British Board of Trade on the North-West of Canada* (1905); *Taxation of Corporations in Canada* (1909); *Railway Transportation in America* (1909); *Taxation in Ontario* (1913); *Economic Survey of Canada* (1913); *Economics* (1914); *An Economic History of Russia* (1914); *A Short Economic History of Canada* (1915).

MAVROCORDATOS, mä'vrą-kôr-dä'tąs, Alexander, Prince (1791–1865). A Greek statesman, born at Constantinople, of a Fanariote family celebrated for the part it has played in the affairs of Greece. He was a scholar and an ardent patriot and devoted himself with singleness of purpose to the cause of Greek independence, for which he expended the bulk of his private fortune. He prepared the Greek declaration of independence and the plan of a provisional government, was elected president of the first National Assembly (1822), and undertook the same year an expedition to Epirus, which ended in the unsuccessful battle of Peta; but he distinguished himself by his bold and resolute defense of Missolonghi (1822–23). Notwithstanding the opposition of the party of Kolokotronis and Demetrius Ypsilanti (see Kolokotronis; Ypsilanti) he was able afterward to render important services to his country in the heroic defense of Navarino and Sphagia. He was a steadfast admirer of English policy and institutions and a fierce opponent of the pro-Russian government of Capo d'Istria (q.v.). After the accession of King Otho (1832) he was at different times a cabinet minister and ambassador at various courts. In 1833 he was Prime Minister. The leading feature of his policy—his endeavor to promote British influence—made him at times very unpopular among his countrymen. At the outbreak of the Crimean War he became head of the cabinet, but resigned after remaining in office for little more than a year. He died Aug. 18, 1865. Consult Oscar Browning, *History of the Modern World*, vol. i (New York, 1912).

MAVROMICHALIS, mäv'rą-mē-kä'lēs. A Greek princely family of Maina in the Morea. Its more important members were: Georgios, who led the Mainot revolt of 1770; Petros (1775–1848), often called Petro Bey, who became Bey of Maina in 1816, led the revolt of 1821 in the Morea, became president of the Congress of Astros in 1822, and as leader of the Hellenic party opposed Capo d'Istria and his Russian policy and was imprisoned in Nauplia; and his brother Konstantinos and son Georgios, who had fought bravely in the war of independence and who in 1831 assassinated Capo d'Istria to avenge the imprisonment of Petro Bey. Georgios was court-martialed and executed and Konstantinos was killed by the President's followers. Petros was set at liberty by the new administration, and as a reward for his zealous support of Otho was made vice president of the Council of State. A younger branch of the family is still active in Greek politics.

MAWER, mąr, Allen (1879–). An

English scholar, born at South Hackney. He was educated at University College, London, where he won the Morley gold medal, at the University of London, and at Cambridge, where he was a fellow from 1905 to 1911. In 1905–08 he was lecturer in English in the University of Sheffield and in 1908 became professor of English language and literature at Armstrong College, Newcastle. Examiner for the mediæval and modern languages tripos at the universities of Leeds, Liverpool, and Wales, a member of the joint matriculation board of the northern universities, vice president of the Viking Society and editor of its *Saga-Book and Year-Book*, he wrote "The Vikings" in *Cambridge Manuals of Science and Literature* (1913) and edited English classics.

MAWMOISINE, WILLIAM. See MALVOISIN, WILLIAM.

MAW SEED (*maw*, AS. *maga*, Icel. *magi*, OHG. *mago*, Ger. *Magen*, stomach + *seed*). A common name for poppy seed, which is given to cage birds, especially when they are molting.

MAWSON, mą′son, SIR DOUGLAS (1882–). An Antarctic explorer and geologist who was born in Bradford, England, but early went to Australia, where he graduated (bachelor of mining engineering) from the University of Sydney in 1901 and (D.Sc.) in 1909 from the University of Adelaide. At the latter institution he lectured on geology in 1905, having already explored geologically the New Hebrides (1903). In Shackleton's (q.v.) expedition, where he was one of the scientific staff, with David and Murray, he reached and determined the position of the south magnetic pole on Victoria Land. Mawson organized and commanded the Australasian expedition (1911–14) to explore Antarctic lands south of Australia, where three stations were to be occupied for scientific observations. An intermediate station, equipped with wireless, was located on Macquarie Island (q.v.), while the principal stations were on the continent of Antarctica. Mawson occupied Commonwealth Bay, 67° S., 143° E., whence he discovered and explored King George V Land, from 138° to 153° E., and southward to 70° 30′ S., by journeys of 2400 miles, in which Ninnis and Mertz perished and Mawson himself had the narrowest of escapes. Dr. Wild took station on Shackleton Oceanic Ice Cap (which extends from the continent 180 miles northward over the sea), in 66.8° S., 95° E., and discovered and explored Queen Mary Land, between 87° and 101° E., by sledge trips of 800 miles without disaster. Geographically the continent of Antarctica, a high glacier-covered region, is now known to extend continuously between 86° E. and 150° W. The lands of Sabrina and Côte Clarie proved to be nonexistent. While the expedition was unable to reach Totten, Budd, and Knox Lands, Mawson reported that Wilkes's report of an Antarctic continent (1840) was fully confirmed, although at points oceanic ice caps and glaciers were mistaken by him for ice-clad lands. Mawson fixed a fundamental meridian for Adélie Land, while at sea Davis located the continental slope through 55° of longitude, and discovered Mill Rise, a submarine ridge south of Tasmania. Mawson's discoveries are more important and extended than any other Antarctic explorations made in the early part of the twentieth century, and this despite the essentially scientific purpose of the expedition. Particularly valuable data were gathered regarding the forms of animal life in the region. In 1915 the officers and men of the expedition were awarded the Polar medal by King George. For his services Mawson was knighted in 1914. In 1915 he visited the United States to tell, with the aid of remarkable pictures, the story of his Antarctic experiences. Besides geological works Mawson published an account of the expedition of 1911–14 under the title *The Home of the Blizzard* (2 vols., Philadelphia, 1915).

MAWSON, THOMAS H(AYTON) (?–). An English landscape architect and expert in town planning. He studied architecture, arboriculture, and horticulture and founded the house of T. H. Mawson and Sons, with offices in Vancouver as well as London and Lancaster. He was lecturer on landscape design at Liverpool University. The Mawsons laid out many elaborate gardens, notably those for Queen Alexandra of Denmark at Copenhagen, but their best-known work is city planning. Among the towns for which they made plans are: Calgary and Banff, Alberta; Vancouver, British Columbia; and in Great Britain, Exeter, Dunfermline, Sheffield, Southport, Burslem, and Bolton. Mawson wrote, besides descriptions of many of these particular plans, *The Art and Craft of Garden Making* (1900; 4th ed., 1912), *Civic Art* (1911)—both elaborate books.

MAX, mäks, GABRIEL (1840–). A German historical painter, of the Munich school. He was born July 23, 1840, in Prague, the son of the sculptor Joseph Max (1803–54). After his father's death he studied four years at the Academy of Prague, three years in that of Vienna, and from 1863 to 1869 under Piloty at Munich. His first notable success was achieved by "The Christian Martyr" (1867), a maiden bound to a rude stone cross, at whose feet a young Roman patrician, returning at dawn from revelry, lays down a garland. His next noteworthy productions were "The Nun in the Cloister Garden" (1869, Hamburg Gallery) and "The Anatomist (1869)—both strikingly sombre and pathetic and illustrative of the painter's morbid tendencies. His strongly individual art is often marred by an unwholesome combination of the sensational and the tragic. He prefers a delicate and subdued scheme of color, and in some of his landscapes, as "The Spring Gale" and "Adagio," he shows great poetic sensitiveness. Patient suffering is depicted in "The Blind Lamp Seller in the Catacombs" (1871) and in "Nydia," the blind Thessalian flower girl of Bulwer's *Last Days of Pompeii* (1874). One of his most touching pictures is "The Last Token" (1874, Metropolitan Museum, New York). The tragic element is best represented by "The Lion's Bride" (1875, Manchester Museum), probably his best-known work. The "Handkerchief of St. Veronica" (1874) created a sensation as a pictorial phenomenon, the Saviour's eyes appearing by turns to open and close. The spiritualistic tendencies which he later developed are revealed in such paintings as "Spirit Greeting" (1879) and "The Clairvoyant of Prevorst" (Prague Museum). His illustrations for Goethe's *Faust* and Wieland's *Oberon* are well known, and his beautiful mystical girls' heads and madonnas also deserve mention. Consult: Klemt, *Gabriel Max und seine Werke* (Vienna, 1887); Nicolaus Mann, *Gabriel Max' Kunst und seine Werke* (Leipzig, 1888); Meissner in *Die Kunst unserer Zeit* (Munich, 1899).

MAX, Wilhelm August Albert Golgov Odo, Prince of Saxony (1870–). A German Catholic theologian and authority on liturgy. The son of King George of Saxony and the youngest brother of King Frederick Augustus III, he was born in Dresden and was ordained to the priesthood in 1896. He was professor of canon law and liturgiology in the University of Fribourg, Switzerland, until 1911, and in 1912 became an instructor at the archiepiscopal seminary for priests in Cologne. In 1914–15 he was at the front as a regimental chaplain with the Saxon army and was popular with the Saxon soldiers as "Chaplain Max." Many of his sermons were published, including several in French preached in Paris at various times. Prince Max was one of the editors of the *Patrologia Orientalis* (1908 et seq.). His works, mostly on liturgy and on the Eastern church, include: *Vorlesungen über die orientalische Kirchenfrage* (1907); *Ritus Missæ Ecclesiarum Orientalium*, in five parts: *Syro-Maronitica, Chaldäica, Græca, Armenica, Syriaca-Antiochena* (1907–08); *Prælectiones de Liturgiis Orientalibus* (1908–13); a revised edition (German) of Chrysostom's homily on Matthew's Gospel (1910–11); an edition of Chrysostom on the eucharist (1910); *Ephesos und seine Ruinen* (1910); *Der Berg Athos in Mazedonien* (1910); an edition of Chrysostom on *Genesis* (1914).

MAXENTIUS, măks-ĕn'shĭ-us. Roman Emperor. See Constantine I.

MAXENTIUS, Circus of. A circus (q.v.) on the Appian Way, about 2 miles from Rome, dedicated to Divus Romulus, the young son of Maxentius, who died in 309 A.D. It was 530 yards long by 86 yards in width and could accommodate, perhaps, 18,000 spectators. Its ruins throw much light on the Circus Maximus and other early circuses. Consult, for a diagram of it, W. Smith, *A Dictionary of Greek and Roman Antiquities*, vol. i, p. 432 (3d ed., London, 1890), and Baumeister, *Denkmäler des klassischen Altertums*, vol. i, p. 694 (Munich, 1889).

MAX'EY, Samuel Bell (1825–95). An American soldier, born at Tompkinsville, Ky. He graduated at the United States Military Academy in 1846 and served throughout the Mexican War. In 1850 he began to practice law at Albany, Ky., but at the outbreak of the Civil War raised a Confederate regiment, becoming its colonel; soon he was promoted brigadier general. He served under General Bragg, took part in the attack on Buell's retreating army, and was at the first siege of Port Hudson. In 1863, having been assigned to the command of Indian Territory, he organized an army of 8000, defeated Gen. Frederick Steele, and captured his train of 227 wagons. For these services he was promoted major general. In 1874 he was elected United States Senator and in 1881 was reëlected, serving as chairman of the Committee on Post Offices.

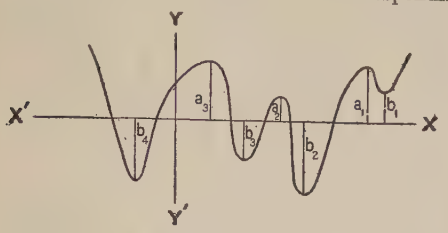
MAXIM. See Aphorism; Gnome; Maxims.

MAX'IM, Sir Hiram Stevens (1840–1916). An engineer and inventor, born at Sangersville, Me., where he received his early education. After being apprenticed to a coach builder, he worked in a machine shop at Fitchburg, Mass., later becoming foreman of an instrument factory. After this he worked at the Novelty Iron Works and Shipbuilding Company in New York. Meanwhile he had patented various improvements in steam engines and had put on the market an automatic gas machine. In 1878 he invented an improved incandescent lamp. In this field he made other important inventions, some of which were exhibited at the Paris Exposition of 1881. In the meantime in 1880 he had gone to Europe and there proceeded to develop his most celebrated invention, the Maxim gun. (See Machine Gun.) This weapon is automatically loaded and fired by the energy of the recoil. More than 100 international patents relating to petroleum and other motors, etc., were taken out by him. His inventions also included explosives and ordnance materials. For many years he was a member of the British ordnance firm of Vickers Sons and Maxim. He bought an estate near Bexley, England, where he erected his laboratories and experimental station and there carried on elaborate experiments in aëronautics (q.v.), constructing in 1894 a large-power flying machine. He became a naturalized citizen of Great Britain, alleging unfair treatment of his inventions by the United States government. He was made Chevalier of the Legion of Honor and was knighted in 1901. He published *Artificial and Natural Flight* (1908). Consult his autobiography, *My Life* (New York, 1915).

MAXIM, Hudson (1853–). An American inventor and engineer, born at Orneville, Me. He was educated in the local schools and at the Wesleyan Seminary, Kent's Hill, Me., and devoted himself to the study of chemistry, engineering, and natural science, at the age of 22 formulating an hypothesis of the compound nature of atoms. From 1883 to 1888 he was engaged in the printing and publishing business at Pittsfield, Mass., devising a process for printing daily papers in colors. In 1888 he became interested in ordnance and explosives and was among the first to make smokeless powder in the United States. Extending this business, he developed the multiperforated smokeless cannon powder, which is in use by the United States government; in 1901 he sold to the same government the secret of the high explosive, maximite (q.v.). Later inventions include various processes connected with the electric furnace; a detonating fuse for high-explosive projectiles; automobile torpedoes; stabillite, a smokeless powder invented by him and developed by him in connection with the E. I. du Pont de Nemours Powder Company; motorite, a self-combustive material for driving torpedoes; and a torpedo ram. He is author of *The Science of Poetry and Philosophy of Language* (1910); *The Game of War* (1912); *Chronology of Aviation* (1912); *Defenseless America* (1915).

MAX'IMA AND MIN'IMA (Lat., neut. pl. of *maximus*, greatest, and *minimus*, least). In mathematics, the greatest and the least values of variable quantities or magnitudes. Strictly speaking, a maximum is not necessarily *the* greatest of all the possible values of a variable; it is a value which is greater than the values *immediately* preceding and following it in the series. Similarly, a minimum, strictly defined, is a value which is less than the values *immediately* preceding and following it. Hence a function may have several maxima and minima, equal or unequal among themselves. Thus, in the accompanying figure, a_1, a_2, a_3 are maximum values of the ordinates of $f(x)$, and b_1, b_2, b_3, b_4 are minimum values. The tangent of the angle which a line tangent at any point to the curve makes with the X axis is zero at a maximum

or minimum value of the ordinate. This means that the differential coefficient $\frac{dy}{dx} = 0$ (see CALCULUS), and hence the abscissas corresponding



to the maxima and minima are the roots of $\frac{dy}{dx} = 0$.

A function of two independent variables, $f(x, y)$, has a maximum value when $f(x, y) > f(x + h, y + k)$ for all small values of h and k, positive or negative; and a minimum value when $f(x, y) < f(x + h, y + k)$. The conditions for maxima and minima in the case of a function u of two variables are $\frac{\delta u}{\delta x} = 0$ and $\frac{\delta u}{\delta y} = 0$. If $A = \frac{\delta^2 u}{\delta x^2}$, $B = \frac{\delta^2 u}{\delta x \delta y}$, and $C = \frac{\delta^2 u}{\delta y^2}$, the further conditions for a maximum are $B^2 < AC$ and $A < 0$, and for a minimum $B^2 < AC$ and $A > 0$. When $B^2 = AC$ or $A = B = C = 0$, further investigation is necessary.

A few of the important propositions of plane maxima and minima are: (1) of all triangles formed with the same two given sides, that triangle is the maximum whose sides contain a right angle; (2) of all isoperimetric triangles (those of equal perimeters) on the same base, the isosceles is the maximum; (3) of all isoperimetric triangles, that which is equilateral is the maximum; (4) of all triangles having the same base and area, the isosceles has the minimum perimeter; (5) if a line of given length be bent and its ends joined by a straight line, the area of the figure inclosed is a maximum when the curved line has the form of a semicircle; (6) of all isoperimetric plane figures, the maximum is a circle; (7) of all isoperimetric polygons of a given number of sides, the maximum is regular.

Traces of the doctrine of maxima and minima are to be found in the works of Apollonius on conic sections and among the theorems of Zenodorus. The Hindus displayed great ingenuity in solving, by ordinary algebra, problems of maxima and minima; but thorough investigation of the subject requires the aid of the calculus, and Kepler, Newton, the Bernoullis, together with Maclaurin, Euler, Lagrange, and several other eighteenth-century mathematicians, distinguished themselves in this department. See CALCULUS.

MAX'IM GUN. See MACHINE GUN.

MAXIMIAN, or **MAXIMIAN I.** See DIOCLETIAN.

MAX'IMIA'NUS. A Latin elegiac poet of the sixth century A.D. The author, whose name may be merely borrowed from a character in the fourth of the six elegies, deals in a dramatic and realistic way with variations on the theme "love and old age"; he laments the loss of his youth. His diction and metre are far above the average of the period. The elegies, which show a knowledge of the best works of the Augustan age, were popular during the Middle Ages and were frequently imitated. They were translated in part in several early English manuscripts and in their entirety, under the title *The Impotent Lover*, by H. W[alker?] (1689), who, like several early editors, ascribed them to Cornelius Gallus. They were edited by Petschenig (1890) and by Richard Webster with commentary (Princeton, 1900). Webster's edition, together with Giardelli's *Studio sulle elegie di Massimiano* (Savona, 1899) and F. Heege's *Der Elegiker Maximianus* (Blaubeuren, 1893), was reviewed by R. Ellis in the *Classical Review*, vol. xv, pp. 368–371 (1901).

MAXIMIANUS I. A Roman emperor. See DIOCLETIAN.

MAXIMIANUS II. A name sometimes applied to Valerius Maximianus Galerius (q.v.), a Roman emperor.

MAX'IMIL'IAN I (1459–1519). Holy Roman Emperor from 1493 to 1519. He was the son and successor of Frederick III and was born at Wiener-Neustadt, near Vienna, March 22, 1459. His first wife, whom he married in 1477, was Mary of Burgundy, daughter and sole heiress of Charles the Bold (q.v.), Duke of Burgundy and sovereign of the Netherlands. Maximilian became at once involved in war with Louis XI of France, who laid claim to Burgundy and other parts of Mary's inheritance. Maximilian won the battle of Guinegatte in 1479, but was finally compelled in 1482 to conclude the Treaty of Arras with Louis, who retained Burgundy, Artois, and Franche-Comté. The bulk of the Netherlands, the most opulent realm in Europe, remained with the Hapsburgs. In 1486 Maximilian was elected King of the Romans at Frankfort. In 1488 the Flemings rose against Maximilian, who was held a prisoner at Bruges for three months. In 1490 he made a successful incursion into Hungary and soon after became master of the Austrian crownlands. In the same year he got possession of Tirol. He again took up arms against France, whose King, Charles VIII, had married Anne of Brittany, in order to acquire that great duchy, after a matrimonial alliance had been concluded between that Princess and Maximilian. By the Treaty of Senlis, in 1493, Maximilian recovered Artois and Franche-Comté. In the same year he succeeded his father on the Imperial throne of Germany. Soon afterward, Mary of Burgundy having died in 1482, he married Bianca, a daughter of the late Duke of Milan, Galeazzo Sforza, and thus was involved subsequently in the Italian wars. He joined the League of Cambrai against Venice in 1508 and the Holy League against France in 1513, and after Francis I's victory at Melegnano (1515) (q.v.) was forced to cede Milan to the French. Nor was Maximilian more successful against the Swiss, who in 1499 completely separated themselves from the German Empire. By the marriage of Philip, the son of Maximilian, with the Infanta Joan, daughter of Ferdinand and Isabella, the house of Hapsburg, in 1516, ascended the throne of Spain in the person of Charles I (Maximilian's successor in the Empire as Charles V). The marriage of two of Maximilian's grandchildren with the son and daughter of Ladislas, King of Hungary and Bohemia, ultimately brought both these kingdoms to the Austrian monarchy. Maximilian died at Wels, in Upper Austria, Jan. 12, 1519. As an administrator Maximilian sought to strengthen the organization of the Empire. Reforms in the administra-

tion were introduced by the establishment of the Imperial Chamber and the Aulic Council (q.v.). Maximilian wrote works on the art of war, hunting, gardening, etc., and sketched the *Weisskunig*, an autobiographic poem. His frank and generous nature and his many accomplishments gained him the title of Last of the Knights.

Bibliography. Heyck, *Kaiser Maximilian I* (Bielefeld, 1898); Gottlieb, *Die Ambraser Handschriften Maximilians. I.* (Leipzig, 1900); R. Watson, *Maximilian I.* (London, 1902); *Cambridge Modern History*, vol. i (New York, 1903); Paul van Dyke, *Renascence Portraits* (ib., 1905); Jansen, *Kaiser Maximilian I.* (Munich, 1905).

MAXIMILIAN II (1527–76). Holy Roman Emperor from 1564 to 1576. He was the eldest son of the Emperor Ferdinand I and was born in Vienna, July 31, 1527. He was educated in Spain with his cousin, Philip II. In 1548 he married his cousin Maria, daughter of Charles V. Notwithstanding the surroundings in which he had been educated, his attitude towards the Reformation was so liberal that he was even considered by those about him to be at heart a heretic. The Protestants of Germany hoped that they might have a Protestant emperor of the house of Hapsburg. These hopes remained unfulfilled. Lack of decision, dynastic policy, his personal ambitions, all united to keep Maximilian in his allegiance to the Church. He was crowned King of Bohemia and elected King of the Romans in 1562 and was elected King of Hungary in 1563. In 1564 he succeeded his father on the Imperial throne of Germany, in Bohemia, and in the portion of Hungary not under the sway of the Turks or the Transylvanian princes. In 1566 Solyman the Magnificent (q.v.) determined to make a fresh onslaught upon the power of Austria. His vast army was arrested by the heroic defenders of Sziget, and the great Sultan died in his camp before the stronghold fell. Maximilian displayed great inactivity in the face of the impending danger and concluded a disadvantageous treaty with Solyman's successor. The marriage of Maximilian's daughter Anne with Philip II, and the hope held out to him by the Pope that he might acquire the Polish Kingdom, dampened the Emperor's interest in the Protestant cause. He interceded with Philip in behalf of the Protestants of the Low Countries, but without much success. Under his tolerant rule Germany enjoyed a period of comparative tranquillity. Consult: Koch, *Quellen zur Geschichte Maximilians II.* (2 vols., Leipzig, 1857–61); Hopfen, *Kaiser Maximilian II. und der Compromisskatholizismus* (Munich, 1895); Scherg, *Ueber die religiöse Entwickelung Kaiser Maximilians II. bis zu seiner Wahl zum römische König* (Wurzburg, 1903). See AUSTRIA-HUNGARY.

MAXIMILIAN, FERDINAND JOSEPH (1832–67). Archduke of Austria and Emperor of Mexico, born at Schönbrunn. He was the second son of the Austrian Archduke Francis Charles and a brother to the Emperor Francis Joseph of Austria. He was liberally educated, became commander of the Austrian navy in 1854, was mainly instrumental in creating the naval port of Trieste, and later served with success as Governor of Lombardy and Venetia. He traveled extensively in Europe and made a voyage to the countries of South America. In 1862–63 the French troops of Napoleon III intervened in the internal affairs of Mexico and on June 11, 1863, occupied the city of Mexico. (See MEXICO, *History;* JUÁREZ.) On July 19 the French commander convened an Assembly of Notables, which proclaimed an empire and offered the crown to Maximilian. He announced that he would accept the throne upon the condition that his choice should be ratified by "a vote of the entire country" and that guarantees for the protection of the Empire from the dangers which threaten its integrity and independence should be given. Marshal Bazaine secured the popular vote in the territory held by the French troops, and Napoleon signed the Treaty of Miramar, by which he bound himself to maintain the French army in Mexico until the army of the Empire should be thoroughly organized. Thereupon Maximilian renounced his rights to the Austrian throne and, contrary to the advice of the Emperor Francis Joseph, accepted the Mexican crown. On May 29, 1864, Maximilian, with the Empress Carlotta, daughter of King Leopold of Belgium, landed at Vera Cruz. The new ruler announced that his mission was "the regeneration of Mexico." Ignorant of the characteristics of the country and its people, he endeavored to conciliate all parties, but soon found himself without the cordial support of any. He alienated the clerical party by failing to repeal the reform laws. Desiring to rule without the French, he neglected their representatives, until he suddenly realized that the foreign army, hated equally by all divisions of his subjects, was the only power really behind his throne. Influenced by unwise councils, the Emperor issued the Decree of Oct. 3, 1865, declaring that all persons bearing arms against his Empire were bandits, and if caught would be tried by court-martial and shot. Before the end of the month four highly esteemed Republican officers had been executed in accordance with this decree, and the last hope of popular support for Maximilian's rule had been destroyed. Meantime the United States government, relieved of its embarrassments by the fall of the Confederacy, succeeded in convincing the French Emperor that his intervention in Mexico would not be tolerated. In consequence on May 31, 1866, Maximilian received dispatches announcing that all French troops would be withdrawn from Mexico. Maximilian would probably have resigned at once had not the Empress Carlotta dissuaded him, undertaking to go to Europe and use her influence with Napoleon III. She proceeded to Paris, where the Emperor at first refused to see her and finally brutally asked her to leave France. The Pope gave her little better consolation, and she became hopelessly insane. (See CARLOTTA.) Maximilian again considered abdication, but referred the decision to his Council, which voted against it. The Church party, also, came forward with an offer to support the Emperor, and he decided to make another effort to regenerate the country. Generals Miramón, Marquez, and Mejía were placed in charge of the Imperial forces, and Maximilian moved his seat of government to Querétaro. There he was surrounded by the Republican army in the early part of March, 1867. On May 14, plans were made for a sortie by which the Emperor might escape to Mexico City or to the coast. Before such plans could be carried out, Col. Miguel López, a constant favorite of the Emperor and Empress and one who had received many proofs of their gener-

osity, informed the enemy of the plan and arranged to admit them into the Imperial camp. Maximilian and his generals were forced to surrender, and after a short confinement were tried by a military court. The Emperor was accused of treason, usurpation of public power, filibustering, trying to prolong the civil war, and of signing the Decree of Oct. 3, 1865. He was declared guilty and condemned to be shot, together with Generals Miramón and Mejía. The execution took place on the morning of June 19, 1867. The Emperor's body was eventually surrendered to the Austrian government and now rests in the Imperial vault in Vienna. On account of the execution the relations of Austria and Mexico were broken and have been resumed only within recent years. Maximilian was a prolific writer; his writings were published in 1867, just after his death, at Leipzig in seven volumes, under the title *Aus meinen Leben, Reiseskizzen, Aphorismen, Gedichte.* Of this work an indifferent English translation was made the following year, entitled *Recollections of my Life.*

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MAXIMILIAN I (1573–1651). A Duke of Bavaria, prominent in the Thirty Years' War, born in Munich. He was educated at the Jesuit University of Ingolstadt. He succeeded his father in 1597 and in the internal administration of his realm displayed much statecraft, improving the judicial and executive departments, organizing a militia effective for defense, maintaining a well-disciplined standing army under the famous Count of Tilly (q.v.), and placing the treasury upon a secure basis. In the affairs of the Empire he was an active opponent of the Protestant cause. When in 1607 the ban of the Empire was pronounced against the free city of Donauwörth (q.v.), he was appointed to occupy the town, which he forthwith proceeded to make Roman Catholic. As a result of his methods, the Protestant Union was organized in 1608. He in turn established the Catholic League (1609), with himself at its head. After the disturbances in the Austrian Estates (1618–19) he sided with the Emperor Ferdinand II (q.v.), and arrangements were made (1619) by which he was to receive the Upper Palatinate and the electoral dignity of Frederick V (q.v.). His army, commanded by Tilly, defeated that of Frederick under Christian of Anhalt at the battle of the White Mountain (Nov. 8, 1620) and occupied the Palatinate, which was completely devastated, contrary to Maximilian's treaty obligations. It was he who, in opposition to any extension of the Imperial power through Wallenstein's army, effected Wallenstein's dismissal at the Diet of Regensburg (1630). During the Swedish period of the war he was driven from Munich by the entrance of Gustavus Adolphus into Bavaria in 1632. In 1637–38 he fought against the Swedes and French on the upper Rhine, but in 1647 independently concluded the Truce of Ulm. He has been considered the most important German statesman of the time. Consult Wolf, *Geschichte Maximilians I. und seiner Zeit* (continued by Breyer, 4 vols., Munich, 1807–11), and Högl, *Die Bekehrung der Oberpfalz durch Kurfürst Maximilian I.* (Regensburg, 1903). See THIRTY YEARS' WAR.

MAXIMILIAN II, EMANUEL (1662–1726). An elector of Bavaria, grandson of Maximilian I. He succeeded his father, Ferdinand Maria, in 1679; fought for Austria against the Turks in Hungary (1683); and in 1685 married Maria Antonia, daughter of the Emperor Leopold I. Appointed Governor of the Spanish Netherlands in 1692, he resigned this thankless post after the death of his son, who had been named heir to the Spanish throne. He sided with France in the War of the Spanish Succession, Louis XIV having promised him the Spanish Netherlands. But the defeat of Höchstädt (1704) more than outweighed his previous victories, as he lost all his territory; the Elector was forced to take refuge in the Netherlands and was not restored until the Peace of Baden in 1714. In 1717 he again fought with Austria against the Turks. Consult Ruith, *Kurfürst Max Emanuel von Bayern und die Donaustädte* (Ingolstadt, 1889).

MAXIMILIAN I (MAXIMILIAN JOSEPH) (1756–1825). First King (originally Elector) of Bavaria. A younger son of the Count Palatine Frederick of Zweibrücken-Birkenfeld, he entered the French army in 1777, but resigned as major general at the beginning of the Revolution, when he served in the Austrian army. In 1795 he succeeded his brother Charles II as Count Palatine in Zweibrücken, and in 1799 succeeded Charles Theodore as Elector of Bavaria. His domestic policy was excellent, looking towards general reform. He aimed at dynastic aggrandizement and, as a reward for his support of Napoleon, received the title of King, which he assumed in 1806, and important accession of territory in Swabia and Franconia, together with Tirol and later Salzburg, both of which he had afterward to relinquish. He was the most important unit in the newly formed Confederation of the Rhine. In the War of Liberation he reluctantly sided with the allies. His liberal policy at home was shown by his grant of the constitution of 1818, which unified his scattered domains.

MAXIMILIAN II (MAXIMILIAN JOSEPH) (1811–64). King of Bavaria. He was the son of Louis I; studied at Göttingen and Berlin; traveled in Germany, Italy, and Greece; and gave himself, while prince, to a quiet life surrounded by men famous in art and literature. On his father's abdication in 1848 Maximilian ascended the throne and made concessions to the liberal spirit of the time, but though he favored German unity, he looked with hostility upon Prussia and turned rather to Austria as the leader in the movement of unification. Trost and Leist published his correspondence with Schelling (Stuttgart, 1890).

MAXIMILIAN, ORDER OF. A royal Bavarian order, with but one class, founded by Maximilian II in 1853 for distinction in science and art. It is intended especially for German scholars and artists, and its membership is limited to 100. The King is the grand master.

MAX'IMIL'IA'NA. See INAJA PALM.

MAX'IMI'NUS, GAIUS JULIUS VERUS. A Roman emperor (235–238 A.D.). He was originally a Thracian shepherd. Attracting the at-

tention of the Emperor Septimius Severus by his immense size and wonderful feats of strength and agility, he was admitted to the army, was rapidly advanced for his bravery, was put in command of a new legion raised in Pannonia, and obtained great influence over the soldiers. At the head of this legion he followed Alexander Severus in his campaign against the Germans. When the army was encamped on the banks of the Rhine, he conspired against Alexander and caused him to be put to death in his tent, with his mother Mammæa (235 A.D.). Being proclaimed Emperor, he named his son Maximus Cæsar and made him colleague in the Empire. He continued the war against the Germans and devastated a large territory beyond the Rhine. But his cruelty and rapacity aroused the indignation of the people. For alleged conspiracy against him he put to death Magnus, a senator, with 4000 other persons, and for the Imperial treasury confiscated the municipal property. He opposed Christianity and persecuted the bishops who had been favored by Alexander. The provinces of Africa revolted and proclaimed Gordianus Emperor; the latter was soon after acknowledged by the Senate and people (March, 238), but died after a brief reign. (See GORDIANUS I.) Fearing the vengeance of Maximinus, the Senate then proclaimed as emperors Pupienus Maximus and Balbinus, and with them was associated, by order of the people, the third Gordianus. Maximinus, having crossed the Isonzo, laid siege to Aquileia in Italy, but met with strong resistance from the garrison and people. The soldiers mutinied and killed both him and his son June 17, 238.

MAXIMINUS DA'ZA, or **DA'IA,** GALERIUS VALERIUS. A Roman emperor (308–313 A.D.), by birth an Illyrian shepherd. When Diocletian and Maximian abdicated (305 A.D.), Galerius, uncle of Maximinus, and Constantius Chlorus were made Augusti, and Flavius Severus and Maximinus Daza became Cæsars, and Daza received the Government of Syria and Egypt. Early in 308 he proclaimed himself Augustus. In 311, after the death of Galerius, he became supreme in Asia. He is said to have persecuted the Christians relentlessly. In 313 war broke out between Daza and Licinius, the successor of Flavius Severus, and ended with the defeat and death of Daza in August of the same year. Consult *The Cambridge Mediæval History,* vol. i (New York, 1911).

MAX'IMITE (named for its inventor, Hudson Maxim, q.v.). A high explosive, used to some extent as a bursting charge for armor-piercing projectiles. Its composition is a secret, which was acquired by the United States government in 1901, but it is known to be a picric acid compound and is said to be 50 per cent more powerful than ordinary dynamite. Though easily detonated by a suitable fuse, it is practically impossible to explode maximite by shock, and it can withstand not only discharge from a gun, but also the shock of impact of the projectile on the target, not being exploded until the fuse operates. Unconfined maximite burns slowly without explosion, and its property of melting and of solidifying on cooling enables projectiles to be filled with it with great facility. See EXPLOSIVES; PROJECTILES.

MAX'IMS (Fr. *maxime,* from ML. *maxima,* maxim, abbreviation of *maxima propositio,* chief premise, fem. sing. of Lat. *maximus,* greatest, superlative of *magnus,* great), LEGAL. A term used by members of the legal profession and writers on jurisprudence to denote those brief and pithy utterances which by general consent have been accepted as stating in condensed, though necessarily imperfect, form the general principles which are the foundation of both law and equity. As the ultimate foundation of these general principles is the natural law of justice, safety, and public policy, the basis of the common or customary law is the same in all countries, and its general principles remain substantially unchanged by statute or local enactment. Hence many of the utterances of ancient Roman magistrates and authors of legal treatises retain as much force and truth as when first promulgated.

In very few instances can the maxims be traced to their original sources. Many are derived from the Roman law; many are from continental jurists of the Middle Ages; while a very large number were enunciated by early English judges and writers, and still others are of quite modern origin. Like other expressions of the common law, maxims derive their force and authority, in the first place, from the truth and justice of the principles which they enunciate, and, secondly, from the universality of their acceptance and application by courts in the past. They are not, therefore, of absolutely equal and binding authority, and it is impossible to draw a line strictly dividing accepted maxims from mere expressions of opinion. The number of those universally accepted as having some authority in law is very large indeed. Works devoted entirely to the consideration of the meaning and application of this form of law have been published by several authors.

Examples are: *Ratio est anima legis*—reason is the soul of the law; *Caveat emptor*—let the buyer be on his guard—an important principle of the law of sales, viz. that the buyer gets no better title than the vendor has; *Qui facit per alium, facit per se*—he who acts by another, acts himself—in which may be seen the main principle of the law of agency; *Æquitas sequitur legem*—equity follows the law; *Ex nihilo nihil fit*—from nothing comes nothing; *Fraus est celare fraudem*—to conceal a fraud is itself a fraud; *A l'impossible nul n'est tenu*—no one is bound to do what is impossible—the language being what is called law French; *Ubi jus, ibi remedium*—where there is a legal right there is a legal remedy; *Ignorantia legis neminem excusat*—ignorance of the law excuses no one; *Prior tempore, potior jure*—first in time, first in right; *Id certum est, quod certum reddi potest*—that is certain which may be rendered so. Among those commonly given in English may be mentioned: Acts indicate the intention; When the equities are equal the law shall prevail; Once a mortgage, always a mortgage; The king can do no wrong; Who seeks equity must do equity.

The difficulty in practically employing maxims is twofold: first, in correctly amplifying and expounding the extended meaning sought to be conveyed in the condensed form; and, secondly, in properly applying it to the adjudication of the particular facts of the case in question; and it is the work more especially of the writer of treatises on the various branches of law and equity to perform the first duty, while to the active practitioners and to the judges emergencies are constantly presented calling for the exercise of the latter function. It may safely be

said that legal maxims play a much less important part in the law than formerly. Generally they have lost whatever character they may have possessed in early times as precise governing rules determining the rights of parties to a litigation. They are now regarded only as convenient forms of expression denoting important legal principles which have many variations or modifications, and consequently are not capable of any complete statement or exposition which at the same time has the convenience of brevity. An important collection of legal maxims was published by Lord Bacon (1596). The latest is that of Broom, *Legal Maxims* (7th ed., London, 1900). Consult also Wharton's *Law Lexicon* (ib., 1902), and *Encyclopedia of the Laws of England* (2d ed., ib., 1908).

MAX'IMUS. The name of four Roman emperors.—Marcus Clodius Pupienus Maximus, elected by the Senate, when he was 74 years of age, as the colleague of Balbinus (q.v.) in 238 A.D., but soon afterward murdered by the prætorian guards. He had won distinction as a soldier and had been proconsul of Bithynia, Achæa, and Gallia Narbonensis.—Magnus Clemens Maximus, born of obscure parentage in Spain. From 368 he held high military rank in Britain, and was proclaimed Emperor by his soldiers, as a result of their disaffection towards Gratian, whom he defeated (383). (See Gratianus Augustus.) Theodosius and Valentinianus II were induced to recognize him as their colleague and as Augustus of Gaul, Spain, Britain, etc.; but, when he sought to extend his sway over Italy also, he was, in spite of initial successes, defeated by Theodosius, taken prisoner, and executed (388).—Maximus Tyrannus, proclaimed Emperor in Spain (408) when Gerontius rebelled against the usurper Constantine III. He was deposed on the defeat of Gerontius (411), but again rebelled (418), and was defeated and slain (422).—Petronius Maximus, the intimate friend of Valentinianus III, against whom he turned (455), because of the treatment of his wife by the Emperor. He succeeded Valentinianus after his murder in the same year; but at the end of three months Maximus was slain as he was fleeing from an invasion of the Vandals, invited by Eudoxia, the widow of Valentinianus.

MAXIMUS, Saint, called Confessor (c.580–662). An advocate of orthodoxy against the Monothelite heresy. He was born in Constantinople and served the Emperor Heraclius, 610–630, at which latter date he entered the monastery of Chrysopolis (Scutari). He urged Pope Martin I, at the first Lateran Synod, 649, to anathematize the Monothelite doctrine, in which condemnation Heraclius and Constans II were implicated. By command of the latter, Maximus was banished to Thrace, 655; being recalled to Constantinople in 662, he was commanded to accept the Monothelite heresy. Refusing to do so, his tongue was cut out, his right hand cut off, and he was banished to Lazika, Colchis, where he died Aug. 13, 662. He is called among the Greeks Theologos and is venerated as a saint by the Western and Eastern churches. In the Western church his day is August 13; in the Eastern, January 21 and August 12 and 13. He was a voluminous author; his works are in Migne, *Patrol. Græca,* xc–xci.

MAX-MÜLLER, Friedrich. See Müller, Friedrich Max.

MAX'WELL, James Clerk- (1831–79). One of the greatest of modern physicists. He was born in Edinburgh, the only son of John Clerk-Maxwell of Middlebie, Scotland, receiving his early education at the Edinburgh Academy, and his first published scientific paper, *On the Description of Oval Curves,* was read for him by Professor Forbes before the Royal Society of Edinburgh before he was 15. He spent three years at the University of Edinburgh, where he pursued most zealously the study of mathematics, physics, chemistry, and philosophy, devoting considerable time to experimental research. During this period he wrote two valuable papers, *On the Theory of Rolling Curves* and *On the Equilibrium of Elastic Solids.* He went to Cambridge University in the autumn of 1850 and there made a brilliant record as a student, graduating in 1854 with the position of second wrangler and being equal with the senior wrangler in the competition for Smith's prize. In 1856 he became professor of natural philosophy in Marischal College, Aberdeen, and in 1860 professor of natural philosophy in King's College, London. He was successively scholar and fellow of Trinity and became, in 1871, the first professor of experimental physics in the University of Cambridge, a post for which he was in every way preëminently qualified. The Cavendish laboratory was erected and furnished under his supervision. The great work of his life is his treatise on *Electricity and Magnetism* (2 vols., 1873). He had previously, from 1856 onward, published various papers on these subjects, following very closely the experimental procedure of Faraday. Using the discoveries of this great experimenter, Maxwell so connected and arranged them as to make the material available for mathematical discussion and treatment. He early advanced the view that electric or magnetic forces result from changes in the distribution of the energy which is stored up in the ether and are not produced by the attractions of electric or magnetic matter which is distributed over the surfaces of conductors or magnetic substances. He then demonstrated that electromagnetic action traveled through space in the form of transverse waves similar to those of light and having the same velocity. Maxwell's theory was corroborated by Hertz, who not only produced these waves, but showed that they are propagated just as waves of light are, and experience reflection, refraction, and polarization, and he also measured their velocity. Subsequent experiments amply confirmed Maxwell's hypothesis that electricity and light are the same in their ultimate nature. After Maxwell's researches on electricity and magnetism comes his work on color, the well-known Maxwell disks and color box being his inventions. He showed that any given color could be produced by the combination of three colors selected from different parts of the spectrum. These three fundamental colors would correspond to three different sets of nerves or sensations in the eye, each excited proportionately to the amount of its appropriate color in the compound color. The absence of any one set of sensations would occasion color blindness.

A paper on the *Stability of Motion of Saturn's Rings* gained for Maxwell the Adam's prize from the University of Cambridge in 1857 and led to the conclusion that the rings must either be fluid or else consist of a large number of small particles. The kinetic theory of gases was also investigated by Maxwell, and the results of

his study are given in a number of papers in the *Philosophical Transactions, Philosophical Magazine,* and the reports of the British Association. Maxwell was a member of the electrical standards committee appointed by the British Association in 1862 and served on a subcommittee to construct the standard of resistance, which was produced from experiments made in his laboratory at King's College. Among his many papers and works a small treatise on dynamics, *Matter and Motion,* will be found of great interest to the general reader, as it contains a clear and comprehensive statement of the principles underlying this science. A memorial edition of Maxwell's scientific papers published by the Cambridge University Press was published in 1890. Consult: Campbell and Garnett, *Life of James Clerk-Maxwell* (London, 1882); R. T. Glazebrook, *James Clerk-Maxwell and Modern Physics* (ib., 1896).

MAXWELL, William Babington (c.1876–). An English novelist, son of M. E. Braddon (q.v.), the novelist, and John Maxwell, a London publisher. He wrote *The Last Man In,* a drama, produced March 14, 1910, at the Royalty Theatre, Glasgow, by the Scottish Repertory Company; and, with George Paston (i.e., Emily Morse Symonds), a farce, *The Naked Truth,* which was first played at Wyndham's Theatre, London, in April, 1910, and in which Charles Hawtrey played Bernard Darrell. His better-known work includes the following novels, mostly pathological in subject, almost all rather sensational (for a British public), but well written and constructed: *The Countess of Maybury* (1901); *Fabulous Fancies* (1903); *The Ragged Messenger* (1904; American ed., 1915), a story of a modern Messiah, which in 1915 was dramatized for Walker Whiteside; *Vivien* (1905), a melodrama of earls and shopgirls; *The Guarded Flame* (1906), a well-documented story of the young wife of an eminent scientist; *Odd Lengths* (1907); *Hill Rise* (1908); *Seymour Charlton* (1909); *The Rest Cure* (1910), a contest between business ambitions and domestic affections; *Mrs. Thompson* (1911), a middle-aged woman in business and in love; *In Cotton Wool* (1912), picturing the degeneracy of the idle rich; *General Mallock's Shadow* (1912), a tale of Yorkshire mill riots; *The Devil's Garden* (1914), which was so frank that the English Libraries' Association refused to handle the book.

MAXWELL, William Hamilton (1792–1850). An Irish novelist, born at Newry, County Down. He graduated B.A. at Trinity College, Dublin, in 1812; served in the Peninsular campaigns and at Waterloo; took orders in the Church of England and was appointed to the rectory of Ballagh in Connemara, in the extreme west of Ireland. As there was no other Protestant in the parish, he devoted himself to sport and to novel writing. He retired from his living in 1844 and settled near Edinburgh, where he died Dec. 29, 1850. Maxwell has a place in the development of English fiction as the founder of the military novel. His best work is represented by *Wild Sports of the West, with Legendary Tales and Local Sketches* (1832), an account of a sporting season in the west of Ireland; *Stories of Waterloo* (1834); *Captain Blake* (1835), a capital story, racy and full of "divilment," of the gentry of western Ireland, from which—and perhaps also from parts of *Wild Sports of the West*—Maxwell's friend Lever probably took the suggestion for his own Irish novels; *The Bivouac, or Stories of the Peninsular War* (1837). He wrote an autobiography under the title *Rambling Recollections of a Soldier of Fortune* (1842) and a popular life of Wellington (1839–41).

MAXWELL, William Henry (1852–1920). An American educator, born at Stewartstown, County Tyrone, Ireland, and educated at Queen's University (Ireland). He came to America in 1874, was a teacher in the Brooklyn night schools, became assistant superintendent of Brooklyn schools in 1882, superintendent in 1887, and in 1898 was made superintendent of all the schools in Greater New York. Especially interested in the teaching of English, he published English grammars. He urged a State requirement of college education for public-school teachers and raised the requirements in teachers' examinations. His policies often brought him into conflict with Thomas W. Churchill, who became president of the Board of Education in 1913.

MAXWELL, Sir William Stirling-. See Stirling-Maxwell.

MAY. See May-Day; Month.

MAY, Cape. See Cape May.

MAY, Edward Harrison (1824–87). An American figure and portrait painter, born in London. He was brought to America when a child and first studied under Daniel Huntington. Afterward he studied with Couture in Paris and made his home there. His pictures are usually large canvases of the academic type, excellent in draftsmanship and composition and warm in color, but lacking in personal expression. They include "The Dying Brigand" (1855), in the Pennsylvania Academy, and "Mary Magdalen at the Sepulchre" (1873), in the Metropolitan Museum, New York. His portraits include those of Laboulaye (1866) and of Anson Burlingame (1869).

MAY, Field of. See Champ de Mars.

MAY, John Wilder (1819–83). An American lawyer, born at Attleboro, Mass. He graduated at the University of Vermont in 1846, was admitted to the Massachusetts bar in 1851, and practiced in Roxbury and Boston. In 1867 he was elected to the Legislature and became district attorney of Suffolk County. May was judge of the Boston municipal court (1873); editor of Angell's *Limitations* (1876), Greenleaf's *Evidence* (1876), and Stephen's *Digest of the Law of Evidence* (1877); and author of *The Law of Insurance* (1874–82, and often) and *The Law of Crimes* (3d ed., 1905).

MAY, Lyoff. See Mei, L. A.

MAY, Phil (1864–1903). An English illustrator and caricaturist, born in Leeds. He started to earn his living at 12 and was self-taught in art. After spending several years with a company of wandering actors, he went to London in 1882 and attracted attention by his drawings in *St. Stephen's Review,* and in 1884 went to Australia, where he worked on the Sydney *Bulletin* until 1889. In 1892 he published *The Parson and the Painter,* a series of remarkable sketches. Later his work was produced in the *Daily Graphic, Black and White,* the *Graphic* (for which he traveled in America), and the *Sketch;* and in 1895 he took Du Maurier's place on the staff of *Punch.* By the elimination of every unnecessary line, by a felicitous composition, a high technical excellence in the use of light and shade, keenest observation and unflagging humor, May achieved high rank among celebrated English caricaturists. His specialty

is East London, the types he made famous are the frequenters of the race course, the prize ring, and the stage, and the "guttersnipes," the children of the slums. *Phil May's Gutter-Snipes* (1896), a collection of drawings, contains much of his best work. In these his talent is at its ripest, and the quality of sympathy and kindliness, never lacking in his conception, is especially prominent. Other publications by him are *Phil May's Annual* from 1892 and *Phil May's Sketch Book*, 50 cartoons (1897). *The Phil May Folio*, with a biography of the artist, was published in 1903.

MAY, Samuel Joseph (1797–1871). An American reformer, prominent as an abolitionist in the antislavery struggle. He was born in Boston; graduated at Harvard in 1817; studied for the ministry in the Harvard Divinity School under Dr. Ware; was ordained in 1822; and soon afterward became pastor of the Unitarian Church in Brooklyn, Conn. In 1830 he became a disciple of William Lloyd Garrison and in 1832 joined the first New England antislavery society. When Prudence Crandall (q.v.) was persecuted for opening her school at Canterbury, Conn., to girls of negro blood, he became her friend and champion and later gave her advice and assistance when she was arrested and imprisoned. In the same year, 1833, he was a delegate to the convention at Philadelphia which founded the first American antislavery society and was made one of the vice presidents. In 1834 he resigned his pastorate and became general agent of the Massachusetts Antislavery Society. In October, 1835, while giving a series of lectures in Vermont, May was five times mobbed, once while addressing an audience in the hall of the House of Representatives at Montpelier. The next year he became pastor of the Unitarian Church in South Scituate, Mass., and remained there until 1842, when he took charge for three years of the Girls' Normal School at Lexington, Mass. In 1845 he became pastor of a Unitarian society at Syracuse, N. Y., and continued to hold that position until three years before his death. In 1851 he assisted in the famous rescue of the slave "Jerry," and for this offense against the Fugitive Slave Law he and 17 others were arrested on warrants issued by the United States District Court at Auburn. Anxious to test the question before the courts, May and two other participants in the rescue issued a public declaration to the effect that they had assisted in the rescue of Jerry, that they were ready to stand trial, but would base their defense upon the "unconstitutionality and extreme wickedness of the Fugitive Slave Law." They were, however, never brought to trial. He was one of the conductors of the Underground Railroad. By temperament May was averse to strife and possessed a sunny temper and a gentle disposition, but, being, in his own words, "a Unitarian, a nonresistant, a woman's rights man, an anti-capital-punishment man, and a Garrison abolitionist," it fell to his lot to be engaged in many controversies. The historian Rhodes refers to him as a "rare combination of perfect courage and gentleness of spirit." He published an interesting volume entitled *Some Recollections of our Anti-Slavery Conflict* (1869). Consult Mulford (ed.), *Memoir of Samuel Joseph May* (Boston, 1873; new ed., 1882).

MAY, Thomas (1595–1650). An English historian and poet. He was born at Mayfield, Sussex, England, of an ancient family; graduated B.A. from Sidney Sussex College, Cambridge, in 1612; became a member of Gray's Inn, London, and was admitted to the bar, but, owing to a defect in his speech, did not practice law. He devoted himself to literature and published the tragedies of *Antigone* and *Agrippina*, a comedy entitled *The Heir*, and other works. By special command of Charles I, with whom he was a favorite, he wrote a metrical history of the reigns of Henry II and Edward III. He translated into English verse *Selected Epigrams of Martial*, Vergil's *Georgics*, and Lucan's *Pharsalia*, to the last of which he wrote a continuation in English and Latin. During the Parliamentary troubles he became a Republican. He was secretary to Cromwell during the Civil War and was employed to write its history. Published originally in Latin, and translated into English in 1650, his *History of the Long Parliament* was edited by Baron Masères and translated into French by Guizot (1812; new ed., 1853); and this was followed by *A Breviary of the History of the Parliament of England*, a partisan account of the Civil War. May died Nov. 13, 1650, and was buried in Westminster Abbey, but soon after the Restoration his body was disinterred and thrown into a pit in the adjoining St. Margaret's churchyard.

MAY, Thomas Erskine, Lord Farnborough (1815–86). An English constitutional jurist. He was born in London, Feb. 8, 1815, was educated at Bedford School, became assistant librarian of the House of Commons in 1831, and entered the bar in 1838. In 1844 he published a treatise on the *Law, Privileges, Proceedings, and Usages of Parliament* (10th ed., 1893), which has become a standard authority on parliamentary law and has been translated into French, German, Hungarian, Italian, Spanish, and Japanese. In 1846 he was made examiner of petitions for private bills and the next year he was appointed taxing master to the House of Commons, of which he became clerk in 1871. In 1861–63 he published *The Constitutional History of England since the Accession of George III, 1760–1860*. This learned and impartial work is supplementary to Hallam's. He also published *Democracy in Europe: A History* (1877) and contributed to the *Edinburgh Review*, to the *Law Magazine*, and to other periodicals. He was president of the Statute Law Revision Committee, 1866–84. He resigned the clerkship of the House of Commons in April, 1886, and was created Baron Farnborough, only a few days before his death, at Westminster Palace, May 17, 1886.

MAY, Sir William Henry (1849–). An English admiral. He entered the navy at 14 and passed through the grades of lieutenant (1871), commander (1881), captain (1887), rear admiral (1901), vice admiral (1905), and admiral (1908) to admiral of the fleet in 1913. He was a member of the Arctic expedition of 1875–76; became director of naval ordnance and a lord of the Admiralty in 1901; commanded the Atlantic fleet from 1905 to 1907; was second sea lord in 1907–09; commanded the home fleet for two years; and then was commander in chief at Plymouth from 1911 to 1913.

MAYA, mä'yä. The civilized native race of the peninsula of Yucatan, Mexico, the most important of the cognate peoples constituting the Mayan stock (q.v.). In 1511 a Spanish ship was wrecked off the coast of Yucatan and two of its

men were saved. Grijalva and Cortés made landings at the sacred island of Cozumel in 1518 and 1519. Attempts at conquest, begun in 1526, were not successful till 1541, when Montejo founded Mérida. The country was mapped out into tribute districts; missionaries began to Christianize the natives, and in their zeal destroyed as heathen abominations the native temples and records wherever found. Resistance was crushed out by wholesale massacres and the Maya sovereignty was at an end. The warlike Itzá (q.v.), who had previously retired beyond the Guatemala border, maintained their independence until 1697. In 1848 occurred a general rising throughout the peninsula, the Indians seizing the opportunity afforded by internal troubles in Mexico. Massing their forces in thousands, they took one city after another, burning and destroying everything and consigning to indiscriminate massacre whole garrisons and populations. The entire strength of the Mexican government was invoked to put down the rebellion. The Maya of the northern and central area were finally subdued, while the more determined warriors retired to the difficult region along the southern coast, where they continued to defy the Mexican armies for more than half a century, while maintaining friendly relations with the English of Belize, from whom they obtained their firearms and ammunition. In 1901 the Mexican military force made a determined effort to put down the rebellious Maya and succeeded in capturing their stronghold, Chan Santa Cruz, but owing to covert hostility the eastern part of the Yucatan peninsula north of British Honduras and south of Valladolid is still closed territory. The Lacandones is a small group of Maya who have reverted to the wild and who preserve their pagan religion. The present number of those speaking the Maya language is about 300,000, about one-third of whom are mixed bloods, or persons of European descent who have adopted the language as their own. For general characteristics and archæological history, see MAYAN STOCK; MEXICAN ARCHÆOLOGY.

MAYÁGUEZ, mä-yä′gwâs. The capital of the Department of Mayáguez, and the third largest city in Porto Rico, situated near the west coast, on the Mayáguez River (Map: Porto Rico, A 3). It has a healthful climate, with a mean annual temperature of 78° F. There are three public plazas, and its principal buildings are the city hall, hospital, courthouse, and public market. Its harbor is extensive and well sheltered, but is accessible only to vessels drawing less than 16 feet. It has a system of tramways and is connected with the interior of the island by rail. It is an important commercial centre, coffee being the chief article of trade. Its exports, consisting of coffee, sugar, and oranges, go mainly to the United States. The surrounding district contains sugar estates, coffee plantations, and fruit groves. Adjoining the city is the Porto Rico Agricultural Experiment Station, which was established in 1902. Pop., 1910, municipality, 42,429; urban, 16,591. Mayáguez was established in 1836.

MAYAN (mä′yan) **STOCK.** A group of cognate tribes or nations occupying the states of Vera Cruz, Yucatan, Campeche, Tabasco, and Chiapas, in Mexico, with the greater part of Guatemala and a small portion of Salvador, and exhibiting in their ancient native culture the highest aboriginal development found upon the American continent. The stock includes about 20 languages, some with well-marked dialects. The best-known groups are the Maya proper, who occupy the entire peninsula of Yucatan, the Huaxtec of northern Vera Cruz, the Tzental of Tabasco and Chiâpas, the Mam, Chol, Quiché, Cakchiquel, Pokonchi, and Pokomam of the Guatemalan highlands; and the Chorti, who extend into western Honduras. With the exception of the Huaxtec all of these occupy contiguous territory and were embraced in the sphere of ancient civilization, which, however, seems to have been most highly developed by the Maya tribe proper in the lowland region. It has been estimated that 1,300,000 Indians still speak the Mayan languages. Since the Huaxtec occupy a lone position in the north it has been argued that the entire Mayan stock had a northern origin. Whatever the merits of this argument may be there is no doubt that the most remarkable features of Maya culture were developed in Central America after the separation of the Huaxtec from the main body.

Physically the Mayan peoples are dark, short, broad-headed, and muscular. The different tribes cover a great range of environment from the humid lowlands to the cold mountain heights of the cordillera. Agriculture was their main dependence, corn being the principal crop, to which were added beans, peppers, and cacao, the last, together with bells of copper, being used widely as the ordinary standard of value. Bees were domesticated for their honey and wax. Cotton was spun for clothing and dyed and woven into fabrics which rivaled silk in delicacy. The lands were held in common by each village and were parceled out by the chiefs on a basis of a certain corn production per year to each family. Gold, silver, and copper were used for ornamental purposes, but ordinary metal tools were unknown. The Maya of the coast region had large seagoing canoes, with which they carried on a coastwise trade. Descent was generally in the male line, and each village community was governed by a chief who derived his authority from the hereditary ruler of the tribe or province. Traditions make it clear that more centralized governments once existed. In northern Yucatan there was the League of Mayapan, founded in 960, and on the highlands of Guatemala the Quiché and Cakchiquel had a powerful hold over their smaller neighbors.

The Mayan peoples were remarkable above all other cultured American nations for their architecture, their calendar, and their hieroglyphic system. Of their architecture, as exemplified in the great ruins of Palenque, Uxmal, Mayapan, and Chichén-Itzá, with hundreds of lesser cities and isolated temples scattered through the tangled tropical forests, it is unnecessary to speak at length here. The material was usually a hard limestone, embedded in firm mortar, well cut and exactly fitted, and lavishly carved on every part with mythical and historical figures and hieroglyphic inscriptions. Their hieroglyphic records and rituals were carved or painted upon the walls of their temples and palaces or written in books of folded sheets of maguey paper. The explanation of these hieroglyphs is one of the most important problems in American archæology. In spite of wholesale destruction by the Spanish missionaries and authorities, a few of these ancient sacred books

still remain for study and interpretation, notably the *Codex Troano*, the *Codex Peresianus*, and the *Dresden Codex*, besides a number of others in the Maya language, but in Latin characters, compiled by natives of the Yucatan peninsula later than the Conquest, and usually grouped under the title of "Books of Chilan Balam." Through these books we have been able to connect the ancient dated monuments with our own system of chronology. The Quiché of Guatemala have also their sacred book, the *Popol Vuh*, of which a translation has been made by the Abbé Brasseur de Bourbourg. The calendar system of the Maya, which was practically the same among the neighboring tribes of the same stock, was more elaborate and exact than that of the Aztec tribes. Their year, beginning on July 16, when the sun crossed the zenith, consisted of 365 days, divided into 18 months of 20 days each, the days being grouped into weeks of five days each. At the end of the year there was an interval of five "nameless days" before the beginning of the new year. The years were grouped into *katuns* of 20 years each, the completion of each successive *katun* being signalized by the placing of a commemorative inscribed stone in the wall of the principal temple of the city. In late Maya chronological records the *katuns* are known by the number of the day *ahau* with which they began, and since there were 13 numbers to this day falling in a definite order, the great time cycle was 260 years. A more accurate calendar was used on the ancient monuments in which the *katuns* were recorded in a different manner. All the early dates were calculated from a beginning day and a serial number for each subsequent day was used.

Much attention has been given to the Maya languages, owing to the literary tendency, cultural superiority, and numerical strength of the people using them. Compared with other Indian languages they are comparatively simple in structure. The Maya itself forms one of the few American languages which have enough vitality not only to hold their own but even to force themselves on European settlers and supplant their own speech. In Yucatan whole families of pure white blood are found who known no Spanish, using the Maya exclusively. The earliest Maya grammar is that of Father Villalpando, published about 1555. The first dictionary is also by him, published in 1571. There is also the Maya-Spanish Dictionary of Perez, 1877, with about 20,000 words, and the manuscript Dictionary of the Convent of Motúl, in three large quarto volumes, in the Carter Brown Library of Providence. Great strides have been made in recent years in the study of codices, inscriptions, graphic art, and architecture of the Maya, with the result that the history has been pushed back to before the time of Christ. On the hieroglyphs two excellent studies are the *Commentary on the Dresden Codex* by Förstemann and the *Numerations, Calendar Systems, and Astronomical Knowledge of the Mayas* by Bowditch. The exuberant art passed through a series of remarkable changes, from which the historical sequence has been determined. This sequence is found to agree with the dates carved on the monuments in the Maya system of counting time. On this subject, see *Maya Art* by Spinden and various papers by Morley, explaining the correlation of the calendar with our own time system. The great cities have been separately described in *Memoirs of the Peabody Museum of Harvard University* (Cambridge, Mass., 1904 et seq.), and in the four volumes on archæology by A. P. Maudslay in *Biologia Centrali-Americana* (London, 1899–1902). For a summary of the history, see MEXICAN ARCHÆOLOGY. See also CHICHÉN-ITZÁ; CHILÁN BALÁM; KATUN; POPOL VUH; ARCHÆOLOGY, AMERICAN.

MAY APPLE. A North American perennial herb. See MANDRAKE; PODOPHYLLUM.

MAYBACH, mī'bäg, ALBERT VON (1822–1904). A Prussian administrator, born in Werne, Westphalia. He entered the governmental employ in the department of railroads (1854), of which he became head in 1874, when he urged the control of all railroads by the Empire. The success of this measure and the defeat of the movement for private control in the early 80's was due largely to him. In 1878 he became Secretary of Commerce and in 1879 Secretary of Public Works and President of the Railways in Alsace and Lorraine. He resigned from his executive positions in 1891. From 1882 to 1893 he was a member of the Prussian House of Deputies. Emperor Frederick III decorated him with the cross of the Black Eagle in 1888.

MAY BEETLE. See JUNE BUG.

MAY BIRD, or MAY COCK. The name of several birds which appear in May; especially, among American sportsmen, the knot (q.v.). In New England the black-bellied plover (q.v.) is locally called May cock, but in Great Britain and the southern United States a curlew is meant by this term.

MAY DANCE. A very popular old dance formerly much performed throughout England upon the first of May to celebrate the return of spring. The celebration of May Day with a dance is an old custom, being possibly of Swedish or Gothic origin, but more probably from Roman (its prototypes being the Floralia and the Lupercalia) or Egyptian and Indian sources. In England the dance was a composite one, in which the morris dance (q.v.) played an important part. There was also a milkmaids' dance, and the characters of Robin Hood, Maid Marian, Scarlet, Little John, Tom the Piper, the Hobby Horse, the Lord and Lady of the May, all joined in the various dances which centred around the May pole. See MAY DAY.

MAY DAY (OF., Fr. *mai*, from Lat. *Maius;* connected with OLat. *majus*, great, Lat. *magnus*, Gk. *μέγας, megas*, Goth. *mikils*, great Skt. *mah*, to be great). The name popularly given to the first day of May, which among the Germanic and Latin peoples has been associated from an early period with festal ceremonies religious in origin. It was long the custom on this day to start before dawn, make excursions to the woods and fields, and return laden with green flowering boughs. It is plain that this festival, which was celebrated by all classes alike, represented the continuance of an ancient pagan ceremony; and there seems to be reason for regarding it as a survival of rites originally offered to the Roman goddess Maia (q.v.), who was evidently worshiped as the principle and cause of fertility. Although recorded testimony does not enable us to reconstruct the details of her ceremony, it is possible that one essential feature was a ritual marriage to a partner who represented the male element of

growth, whence arose habitual acts of license, which were not repugnant to early moral sentiment. Songs and dances, and performances more or less dramatic in character, which were usual on similar occasions, and are reminiscent of the same spirit, have continued in popular use to our own day, as the familiar English game of children, "Here oats, peas, beans, and barley grows." The actual basis of May Day seems to have been the Roman Floralia, celebrated April 28 to May 3, and instituted at Rome, in the year 238 B.C., on account of a bad harvest. Flora (q.v.), to whom the feast was consecrated, was likewise a fertility goddess, and it may be taken for granted that the elements of her rite were similar to customs which had previously been associated with Maia. Among observances of the Floralia are mentioned gay costumes, dramatic performances, and dances described as frequently indecent. In the mediæval May festival an important feature consisted in a nocturnal expedition to the forest, whence branches were brought and afterward attached to doors. The bushes brought home were planted in the streets, and a lover might thus honor the residence of his mistress. Corresponding to this act of "bringing in the May" (see below), it was usual for the young men of the village to fetch from the wood a tree, the tallest and straightest which could be procured. This was stripped of its boughs, planted in the public green, decorated with garlands and ribbons, painted with gay stripes, and became the centre of dances and games having for the most part an amatory character. The tree thus obtained, as well as the branches of individual celebrants, was called simply "the May"; in England, the white-flowering hawthorn, especially, received this title. A Maypole, once introduced, might remain for many years, and annually be made the focus of popular amusements. With the season continued to be associated theatrical performances. These were frequently of a comic nature, and might be crowded with local jests and personal allusions often of a scurrilous sort, as may be seen from the pastoral of Adam de la Halle, *Le jeu de Robin et de Marion*, composed in the thirteenth century for use on such an occasion. In England the story of Robin Hood (q.v.) was connected with the May games, and the personages of his cycle were introduced into the performances of costumed or masked actors, called morris dancers. (See MORRIS DANCE.) In the Highlands of Scotland and in Ireland the first of May received the name of Beltane (q.v.), and was originally, no doubt, an independent ceremony. Customs analogous to May Day are widespread, in America as well as in Europe. Among the Russians there is a spring festival, celebrated by the boys and girls with a choral dance called Khorovod. (See SLAVONIC MUSIC.) The European springtide feast seems to have come from the Orient, where orgiastic merriment was common in the spring. So in modern India the Holi festival is celebrated in March or April with the singing of songs generally obscene and with the sprinkling with red powder and water or with filth. The naturalistic basis of the custom is joy at the creative impulses felt in the spring and manifested both in the vegetable and the animal world. Hence comes the erotic character of the songs and dances, while the Maypole itself is probably phallic in origin. Consult J. Strutt, *Sports and Pastimes of the People of England* (London, 1801). See PHALLICISM; SPORTS, BOOK OF.

MAYEN, mī'en. A town in the Prussian Rhine Province, Germany, on the Nette, 15 miles west of Coblenz (Map: Germany, B 3). It has a late Gothic church, ancient walls, and a partly preserved castle of the Middle Ages. Cloth, tobacco, hats, oil, basalt, and leather are manufactured, and there is trade in millstones and wine. Pop., 1900, 11,961; 1910, 14,421.

MAYENCE, mȧ'yäns'. A town of Germany. See MAINZ.

MAYENNE, mȧ'ĕn'. A department of northwestern France, traversed by the River Mayenne, a tributary of the Loire (Map: France, N., E 4). It was formerly part of the Province of Maine. Area, 2012 square miles. Its surface is mostly rolling, becoming hilly towards the northeast and culminating in the Mont des Avaloirs. Its fertile soil produces grain, flax, hemp, and apples; there are deposits of coal, iron, marble, and slate. A large number of swine, cattle, and fine horses are reared and dairy goods are produced. Much timber is cut. Pop., 1901, 313,103; 1911, 297,732. Capital, Laval.

MAYENNE. A town in the Department of Mayenne, in the northwest of France, pleasantly situated on the Mayenne, a tributary of the Loire, 19 miles north-northeast of Laval. Its streets are steep, narrow, and crooked; it has an old castle, a twelfth-century church, a school of agriculture, and a museum. It has manufactures of iron, vehicles, calico, and linen, and trades chiefly in horses and grain. Pop. (commune), 1901, 10,125; 1911, 9961.

MAYENNE, DUKE OF. See GUISE.

MAY'ER, ALFRED GOLDSBOROUGH (1868–). An American zoölogist, born at Frederick, Md. He graduated from the Stevens Institute of Technology (M.E., 1889) and from Harvard University (S.D., 1897), where he was an assistant to Dr. Alexander Agassiz from 1892 to 1900 and had charge of the radiates in the Museum of Comparative Zoölogy. He served as curator of natural sciences and curator in chief of the museum of the Brooklyn Institute of Arts and Sciences in 1900–04; was director of the Marine Laboratory of the Carnegie Institution in the Tortugas, Fla., in 1904–05; and was director of the department of marine biology at the Carnegie Institution, Washington, after 1905. He lectured also on biology at Princeton University in 1910–11. At various times he was a member of scientific expeditions to many parts of the world. He is author of *Medusæ of the World* (3 vols., 1910).

MAYER, ALFRED MARSHALL (1836–97). An American physicist. He was born at Baltimore and was educated at St. Mary's College, Baltimore. In 1856 he was appointed professor of physics and chemistry in the University of Maryland and subsequently held positions in the Westminster College in Missouri, in Pennsylvania State College, in Lehigh University, and in the Stevens Institute of Technology. In 1863 he went to Paris, where he spent two years in study and research, working under the famous physicist Regnault. He was for a time one of the editors of the *American Journal of Science* and contributed a number of papers to its pages. In 1872 he was elected a member of the National Academy of Sciences. After assuming the professorship of physics at Stevens Institute (1871) he devoted himself to acous-

tics, in which field he performed many new and interesting experiments and made some valuable discoveries. His most important work in acoustics, perhaps, was the determination of the law connecting the pitch of a sound with the duration of the residual sensation in the ear. To Professor Mayer were also due a method of determining the comparative intensity of sounds with the same pitch, and the location of the organs of hearing in the mosquito. He developed new methods for analyzing sound and he made researches into the nature of electricity, besides being the first to give accurately the temperature correction for tuning forks. An early paper on the *Thermodynamics of Waterfalls* (1869) aroused considerable interest, and one on the variation of the elasticity of metals with change of temperature showed the delicacy of Professor Mayer's experimental work. His last important research was an experimental investigation of the equilibrium of the forces acting in the flotation of disks and rings of metal and their application to measure surface tension. In addition to his scientific attainments Professor Mayer was an enthusiastic sportsman and wrote *Sport with Gun and Rod in American Woods and Waters* (1883). Consult short biographical sketch in *Science*, Aug. 20, 1897, by W. LeConte Stevens. Besides many contributions to scientific journals and encyclopædias, Professor Mayer was the author of *Lecture Notes on Physics* (1868); *The Earth a Great Magnet* (1872); *Light* (1877), with Charles Barnard; *Sound* (1878).

MAYER, Brantz (1809–79). An American author, born in Baltimore, Md. After graduation at St. Mary's College he traveled in the East, practiced law (1829–41), was secretary of the American Legation at Mexico (1843), and wrote his observations there in *Mexico as it Was and Is* (1844); *Mexico, Aztec, Spanish, and Republican* (1851); *Observations of Mexican History and Archæology* (1856); *Mexican Antiquities* (1858)—works that retain some value, especially for the period following the Spanish Conquest. He wrote also *Captain Canot, or Twenty Years of an African Slaver* (1854) and other less important books. Mayer served as paymaster in the Civil War and was a founder of the Maryland Historical Society (1844). He died in Baltimore.

MAYER, mī'ẽr, Johann Tobias (1723–62). A German mathematician and astronomer, born at Marbach in Württemberg. He was self-educated and at first taught mathematics for a living. In 1746 he became connected with a cartographic establishment and gained fame for his improvements in map making. In 1751 he was appointed to the chair of mathematics and astronomy in the University of Göttingen and in 1754 became director of the observatory, where for the remainder of his life he did much to advance the sciences of astronomy and navigation. His first published work was a treatise on curves, which was followed the same year (1745) by his *Mathematischer Atlas,* a sort of résumé of mathematics in 60 tables. At Göttingen he gave much labor to a *Zodiacal Catalogue,* which contains 998 stars and of which a newly computed edition was published by Auwers in 1894. His *Lunar Tables,* published in 1752–53, were so correct as to be adopted by the British Board of Admiralty. In 1760 he invented the repeating circle, which was afterward used with so much success by Borda in measuring the arc of the meridian. His posthumous works include: *Theoria Lunæ juxta Systema Newtonianum* (1767); *Tabulæ Motuum Solis et Lunæ Novæ et Correctæ Quibus Accedit Methodus Longitudinum Promota* (1770); *Observationes Astronomiæ Quadrante Murali Habitæ in Observatorio Goettingensi* (2d ed., 1826). He left a large number of scientific memoirs, which were published by Lichtenberg in 1775.

MAYER, Julius Robert von (1814–78). A German physicist, born in Heilbronn, Württemberg. He attended the Gymnasium at Heilbronn, studied medicine at Tübingen, and finished his university course at Munich and Paris. He made a voyage to Java in 1840 and while there made observations on the blood which led him to the investigation of the subject of animal heat and finally to that of the conservation and correlation of forces. After his return to Heilbronn he practiced medicine there, but after a few years devoted himself almost exclusively to his scientific investigations. He published a preliminary notice of his work up to 1842, in Liebig's *Annalen der Chemie und Pharmacie,* under the title "Bemerkungen über die Kräfte der unbelebten Natur," after it had been refused by Poggendorff's *Annalen* on account of its novel and revolutionary character. It was in this paper that the first announcement was made of the principle underlying the theory of the conservation of energy. In 1845 he made a fuller explanation of the subject in a memoir, under the title *Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel.* In 1848 he published *Beiträge zur Dynamik des Himmels,* and in 1851 the essay for which he is perhaps more generally known in popular science, that upon the mechanical equivalent of heat (*Bemerkungen über das mechanische Aequivalent der Wärme*), in which he developed and expanded the principles laid down in his former papers. This paper it is interesting to note was written about the time of a mental derangement from which he never fully recovered. To Mayer is due the first conception of the doctrine of the conservation of energy, though he was soon followed by Joule and Helmholtz (qq.v.) with investigations and papers on the same subjects. His collected works appeared under the title *Die Mechanik der Wärme* (3d ed., by J. S. Weyrauch, 1893). Consult: Weyrauch, *Robert Mayer* (Stuttgart, 1890); id., *Kleinere Schriften und Briefe von Robert Mayer* (ib., 1893); Gross, *Robert Mayer und Hermann von Helmholtz* (Berlin, 1898); Ernst Jeutsch, *Julius Robert Mayer; seine Krankheitgeschichte und die Geschichte seiner Entdeckung* (Berlin, 1914).

MAY'ERS, William Frederick (1831–78). A Sinologue, born in Tasmania. Educated in Marseilles and proficient in modern languages, at 28 he was appointed student interpreter in China and acted as Vice Consul at Canton and Chifu, becoming in 1872 Chinese Secretary to the British Legation in Peking. He was a master of Chinese, Tibetan, and Korean. He published "The Lamaist Septem in Tibet," in the *Journal of the Royal Asiatic Society* (1869); *The Anglo-Chinese Calendar Manual* (1869); *The Chinese Reader's Manual* (1874), his masterpiece; *The Chinese Government, a Manual of Chinese Titles* (1878); *The Treaty Ports of China* (1867), in collaboration with Dennys and King. He procured for the British Museum one of the few extant copies of the great Im-

perial cyclopædia of Chinese literature in 5020 volumes.

MAY'FAIR. One of the most fashionable sections of London. It lies east of Hyde Park, between Park Lane and Bond Street, and derives its name from a fair formerly held in the locality during May.

MAY'FIELD. A city and the county seat of Graves Co., Ky., 25 miles south of Paducah, on the Illinois Central Railroad (Map: Kentucky, B 6). It controls a large trade in tobacco, having large warehouses and a number of rehandling concerns, and there are flouring, planing, and woolen mills, tobacco and clothing factories, etc. Settled about 1820, Mayfield was incorporated some six years later. The government is administered under a charter of 1893, by a mayor, chosen every four years, and a unicameral council. Pop., 1900, 4081; 1910, 5916.

MAYFIELD. A borough in Lackawanna Co., Pa., about 14 miles northeast of Scranton, on the Delaware and Hudson and the New York, Ontario, and Western railroads (Map: Pennsylvania, K 3). The borough contains a silk mill, but coal mining is the chief industry. Pop., 1900, 2300; 1910, 3662.

MAY'FISH. The most common of American killifish (*Fundulus majalis*). See KILLIFISH.

MAY'FLOW'ER. See ARBUTUS, TRAILING.

MAYFLOWER, THE. A ship of 180 tons' burden, hired to take the Pilgrims from Southampton, England, to the New World in 1620. Some had sailed from Delftshaven in the *Speedwell*, which started with the *Mayflower* but put back after several days. The *Mayflower* arrived at Plymouth December 11, or 21 N. S. (anniversary celebrated December 22).

MAYFLOWER DESCENDANTS, SOCIETY OF. An organization founded in the city of New York Dec. 22, 1894, by lineal descendants of the *Mayflower* pilgrims, "to preserve their memory, their records, their history, and all facts relating to them, their ancestors and their posterity." Every lineal descendant over 18 years of age, male or female, of any passenger of the voyage of the *Mayflower* which terminated at Plymouth, Mass., December, 1620, including all signers of "the Compact," is eligible to membership.

The General Society of Mayflower Descendants was organized at Plymouth, Mass., in 1897. A triennial congress is held in September at Plymouth, Mass. Societies have been organized in New York, Connecticut, Massachusetts, Pennsylvania, Illinois, District of Columbia, Ohio, New Jersey, Wisconsin, Rhode Island, Michigan, Maine, Colorado, California, Washington, and Kansas.

MAY FLY. An insect of the order Ephemerida, sometimes also called shad fly and day fly, the latter, like the scientific name, derived from the ephemeral life of the adult. They have short antennæ, very large fore wings, very small hind wings, absolutely atrophied mouth parts, and two or three long, slender filaments at the end of the abdomen. The transformations are complete and the early stages are passed in the water. The larvæ are active, possess long and strong legs, and breathe by means of tracheal gills. They are found under stones in running streams or swimming among water plants in quiet waters, or they may live at the bottom, more or less covered with slime or mud; some forms also burrow into the sand banks of rivers. They both swim and crawl, and they feed largely upon vegetable matter. The pupa, or nymph, is also active and feeds. It has small wing pads, and when ready to transform it floats at the surface of the water and the subimago issues through the skin of the thorax. The emergence is very rapid, and the subimago flies away almost immediately after the skin cracks. The existence of a subimago stage is peculiar to this order of insects, and there is a subsequent molt after the subimago reaches the shore, the true imago issuing from the skin of the subimago. The May flies differ from all other insects not only in this additional transformation, but also in possessing paired sexual organs which open to the exterior by separate orifices. The life of the adult insect is very short, but the popular idea that they live but a day is erroneous. Curtis kept one alive three weeks. Most species couple during flight, and egg-laying is usually performed in fresh water, where the egg clusters disintegrate and the eggs sink to the beds of the rivers and streams. The larval life lasts from one to three years, and the larvæ form a favorite food for many food fishes. The adults are also eagerly sought for by fish, and many of the artificial flies, especially those forms known as duns, drakes, and spinners (see FLY CASTING), are imitations of May flies. About 300 species have been described—85 from temperate North America. They are strongly attracted to light and fly in enormous numbers, so that they sometimes half fill the globes of electric street lamps with their bodies in a single evening, and greatly trouble lighthouse keepers, especially along the Great Lakes, by swarming about the lantern in such crowds as to obscure the light.

MAYHEM, mā'hĕm (archaic form of *maim*, from OF. *mahaigner*, *mehaigner*, to maim). At common law, the offense of so maiming another, or doing such violence to his members, as to render him the less able in fighting either to defend himself or to annoy his adversary. It renders the wrongdoer liable to a civil action for damages by the injured person and also to a criminal prosecution as "an atrocious breach of the King's peace, and as tending to deprive him of the aid and assistance of his subjects." Destroying or disabling an arm or leg, hand or foot, putting out an eye, or breaking a front tooth, is a mayhem. It is a felony punishable by penal servitude or imprisonment for a term of years. See MAIMING.

MAYHEW, mā'hū, AUGUSTUS SEPTIMUS (1826–75). An English journalist and author, born in London. He wrote in collaboration with his brother Henry such works as *The Greatest Plague of Life, or the Adventures of a Lady in Search of a Good Servant* (1847, illustrated by George Cruikshank), and he joined H. S. Edwards in the production of such farces as *The Goose and the Golden Eggs* (Strand Theatre, 1859); *Christmas Boxes* (Strand, 1860); *The Four Cousins* (Globe Theatre, 1871). From 1848 to 1850 he edited *The Comic Almanac*, to which he had been a contributor since 1845, and his individual productions include *Paved with Gold, or the Romance and Reality of the London Streets* (1857) and *Faces for Fortunes* (3 vols., 1865). See MAYHEW, HENRY.

MAYHEW, EXPERIENCE (1673–1758). A New England divine. He was born in Martha's Vineyard, Mass., the oldest son of Rev. John Mayhew, missionary to the Indians, and great-grandson of Gov. Thomas Mayhew. He began to preach to the Indians at the age of 21, and

had the oversight of five or six Indian assemblies, which he continued for 64 years. Having thoroughly mastered the Indian language, which he had learned in infancy, he was employed by the Society for the Propagation of the Gospel in New England to make a new version of the Psalms and of the Gospel of John, which he did in 1709 in parallel columns of English and Indian. He published *Indian Converts* (1727), comprising the lives of 30 Indian preachers and 80 other converts, besides a volume entitled *Grace Defended.* Consult Hallock, *The Venerable Mayhew and the Aboriginal Indians of Martha's Vineyard,* condensed from Rev. E. Mayhew's *History of Indian Converts* and brought down to date (New York, 1874).—His son, JONATHAN, was distinguished as a preacher and patriot (see MAYHEW, JONATHAN).—Another son, ZACHARIAH, was missionary to the Marthas Vineyard Indians from 1767 to his death, March 6, 1806.

MAYHEW, HENRY (1812–87). An English author, son of a London attorney. From Westminster School he ran away to sea, making a voyage to Calcutta. On his return he was articled to his father for three years. In conjunction with Gilbert à Beckett, he started the *Figaro in London,* a comic weekly (1831–39), and *The Thief* (1832), "a paste and scissors" journal, and was one of the founders of *Punch* (1841). He made a hit with *The Wandering Minstrel,* a one-act farce (1834), which was followed by *But However* (1838), written in conjunction with Henry Baylis. With his brother AUGUSTUS (1826–75) he wrote several clever fictions, as *The Greatest Plague of Life* (1847); *The Good Genius that Turned Everything to Gold* (1847), a fairy tale; *Whom to Marry* (1848); *Living for Appearances* (1855). His most important work was a series of articles in collaboration with John Binny, written to make known the actual condition of the lower classes in London. Originally appearing in the *Morning Chronicle,* they were collected in 1851 under the title *London Labour and the London Poor.* In 1856 the series was continued in monthly numbers with the title *The Great World of London* (completed and published in 1862 as *Criminal Prisons of London*).—His brother HORACE (1816–72) was also a well-known humorist. He wrote farces and tales and was for a time subeditor of *Punch.*

MAYHEW, JONATHAN (1720–66). An American clergyman and patriot of the Revolutionary War, born on the island of Marthas Vineyard, Mass. He graduated at Harvard in 1744, studied theology, and from 1747 until his death was pastor of the West Church (Congregational), Boston. He became one of the best-known preachers in New England and his influence on the political views and theories of the colonists in the pre-Revolutionary period was probably greater than that of any other clergyman. Dr. Mayhew was an ardent believer in the rights of the American Colonies and expressed his views with great boldness from his pulpit. In January, 1750, he preached a sermon on the execution of Charles I, in which he declared that all allegiance was limited by certain inalienable rights that could not be abrogated by the sovereign without giving a corresponding right of abrogation to the subject. His fearlessness led to his being bitterly attacked by the Tories, who charged him, without warrant, with being the instigator of the Boston Stamp Act riots that resulted in the sacking of Governor Hutchinson's house. In May, 1766, he preached a Thanksgiving sermon for the repeal of the Stamp Act that was a remarkable plea for civil and religious liberty. Later in the same year and during a fatal illness he wrote to James Otis (q.v.) a letter which probably contains the earliest suggestion of a union of all the Colonies. The subsequent institution of committees of correspondence undoubtedly had its inception in Dr. Mayhew's plan. His sermons were published separately in pamphlet forms and in collections. Among them were: *Seven Sermons* (1749); *Discourse Concerning Unlimited Submission and Non-Resistance to the Higher Powers* (1750); *Sermons* (1756); *Sermons to Young Men* (1767). Consult Alden Bradford, *Memoir of the Life and Writings of the Rev. Jonathan Mayhew* (Boston, 1838).

MAYHEW, THOMAS (1593–1682). An American Colonial governor. He was born in England and was a merchant in Southampton before he emigrated to America in 1631. He settled in Watertown in 1636 or 1637, obtained in 1641 from the agent of Lord Stirling a grant of Marthas Vineyard and the neighboring islands, and in 1642 became both patentee and Governor of the granted district. His son Thomas having been called to the ministry at Edgartown, Governor Mayhew encouraged his work, both by his advice and by inducing the Indian sachems to govern their people according to the English laws. After his son's death Mayhew continued the ministrations and organized an Indian church. For 40 years while he lived among them the English and Indians were at peace. He died in Marthas Vineyard March 25, 1682. Consult C. E. Banks, *The History of Martha's Vineyard* (Boston, 1911).

MAY LAWS. The name applied to a series of laws enacted by the Prussian Diet in May, 1873, marking the opening of the conflict between Church and state generally known as the Kulturkampf (q.v.).

MAYNA, mī'nà, or **MAINA.** A group of tribes constituting a distinct linguistic stock, upon the Upper Marañon (Amazon) between the Santiago and Pastaza rivers on the Peru-Ecuador frontier. Their language is particularly harsh and difficult. A part were gathered in missions during the eighteenth century, but the majority are still wild and unsubdued, living by hunting and fishing. The name is also frequently used collectively to include all the tribes of the Ucayali and Huallaga region, the former Peruvian Province of Maynas.

MAY'NARD. A town in Middlesex Co., Mass., 28 miles by rail west by north of Boston, on the Assabet River and on the Boston and Maine Railroad (Map: Massachusetts, E 3). The town is engaged chiefly in the manufacture of woolen goods. The water works are owned by the municipality. Pop., 1900, 3142; 1910, 6390.

MAYNARD, EDWARD (1813–91). An American dental surgeon and inventor, born at Madison, N. Y. He entered the United States Military Academy in 1831, but resigned and took up the profession of dentistry, which he practiced from 1836 to 1890, at Washington. His contribution to the profession included many improvements in operative methods, especially in the filling of teeth. He became a member of the faculty of the Baltimore College of Dental Surgery and of George Washington University. It is

with improvements in the construction of firearms, however, that his name is usually associated, his first important invention (1845) being a system of priming which practically superseded the percussion cap. In 1851 he patented a breech-loading rifle, afterward known as the Maynard rifle, and five years later adapted it to the use of the metallic cartridge. In 1860 he patented a method of converting muzzle-loaders into breechloaders. He was granted the Great Medal of Merit of Sweden.

MAYNARD, mā′när′, FRANÇOIS DE (1582–1646). A French poet, born at Toulouse. In 1618 he became president of Aurillac. In 1634 he went to Italy with the Ambassador, De Noailles, but soon quarreled with him. One of the first members of the French Academy, he took little part in its deliberations, since he was practically exiled from Paris by Richelieu. For the wife of Henry IV, Margaret of Valois, to whom he was secretary, he wrote his early poems. He was a disciple of Malherbe (q.v.) and in workmanship excelled Racan (q.v.), although he lacked the power of the latter. In literature he stands between these two. His sonnets, odes, and epigrams were first published as a collection by Gomberville in 1646.

MAY′NARD, GEORGE WILLOUGHBY (1843–). An American mural, figure, and marine painter, born in Washington, D. C., the son of Edward Maynard. He studied at the National Academy of Design, New York, and at the Royal Academy of Antwerp, under Van Terins and De Keyser, from whom he acquired great thoroughness of workmanship. In 1878 he opened a studio in Paris; later he settled in New York City. He was elected to the National Academy of Design in 1885 and became a member of the Society of American Artists and of the American Water Color Society. Maynard early devoted himself to decorative painting, and his work may be seen in the Congressional Library at Washington, D. C., in the Appellate Court of New York City, in the Bijou Theatre, Boston, the Metropolitan Opera House, New York (ceiling), and the Essex County Courthouse, Newark, N. J. The brass inlay work in the floor of the entrance hall of the Boston Public Library and in the entrance hall of Columbia University Library, New York, is also by him. Among his best-known canvases are: "Vespers at Antwerp" and "1776," sent to the Centennial Exhibition of 1876; "Venetian Court"; "An Ancient Mariner" (1883); "Strange Gods"; "The Surf" (1904); "The Oceanides" (1911); "Rocks at Ogunquit" (1912); "Flood-Tide" (1912). His Pompeian decorations in the Agricultural Building at Chicago in 1893 were perhaps the most effective in the Exposition Buildings. The Metropolitan Museum in New York possesses his "In Strange Seas" and he is also represented in the collections of the Pennsylvania Academy, the Providence Museum, and the Corcoran Gallery, Washington.

MAYNARD, HORACE (1814–82). An American politician, born in Westboro, Mass. He graduated at Amherst College in 1838 and shortly afterward removed to Knoxville, Tenn., where for some years he was a tutor and then professor of mathematics and natural history in the East Tennessee College. In 1845 he became a lawyer and in 1857 was elected by the "Americans" (see AMERICAN PARTY and KNOW-NOTHINGS) to Congress, where he continued to sit until 1863. Like Andrew Johnson, W. G. Brownlow, and others, Maynard strove hard but unsuccessfully to keep Tennessee in the Union, and because of his loyalty suffered exile and loss of property. He returned to Tennessee after its occupation by Federal troops and became Attorney-General of the State in 1864. He was again a Representative in Congress from 1866 to 1875, was Minister to Russia from 1875 to 1880, and was Postmaster-General in President Hayes's cabinet from August, 1880, to March, 1881.

MAYNARD, SIR JOHN (1602–90). An English constitutional lawyer. He was born at Tavistock, England, and was educated at Exeter College, Oxford. After the regular course of study in the Middle Temple he was called to the bar in 1626; he had been elected a member of Parliament in the previous year. He was subsequently made a sergeant at law and King's sergeant, but declined the place on the bench offered him by Charles II in 1660. While an advocate for increasing the power of the people, he never concurred in the extreme views taken by the radical Republicans, and, although an earnest Presbyterian, stood aloof from the fanaticism of many in his party. He was active in the prosecution of Strafford and Laud, but opposed the arbitrary power assumed by the army and Cromwell's evident intention of making himself King in fact, if not in name; for the position he took in this respect he was, in 1647, expelled from the House of Commons and imprisoned in the Tower, and in the following year he was fined £500 for refusing to kneel at the bar of the House of Lords. At the Restoration the honor of knighthood was conferred upon him by Charles II. His political course under that monarch was judicious and conservative. In the time of the revolution and the accession of William and Mary he showed ability, notably in the great conference held between the House of Lords and the Commons in regard to the abdication of James II, a measure which he strenuously advocated. In the same year, 1689, he was made Commissioner of the Great Seal. A number of his political speeches and legal decisions have been printed in various collections. His manuscript collections in 87 volumes are preserved in Lincoln's Inn Library. He died at Gunnersbury Manor.

MAYNE, JASPER (1604–72). An English dramatist and divine, educated at Westminster School and at Christ Church, Oxford (B.A., 1628; M.A., 1631). While at the university he wrote considerable occasional verse. To him has been ascribed, on very doubtful grounds, the beautiful eulogy signed I. M. S. prefixed to the second folio of Shakespeare's works (1632). He afterward wrote verses in honor of Ben Jonson and Beaumont and Fletcher. His two plays are the *City Match*, a comedy (printed 1639), and *The Amorous War* (printed 1648), a tragicomedy, containing the quaint lyric beginning "Time is a feathered thing" (reprinted in *The Oxford Book of English Verse*, A. T. Quiller-Couch, Oxford, 1900). In 1638 he began a translation of Lucian's *Dialogues* (printed 1664), afterward completed by Francis Hicks; and for Donne's *Paradoxes* (1652) he translated several Latin epigrams. During the Civil War he lived mostly at Oxford, where he frequently preached before the King. After the Restoration he was appointed a canon of Christ Church and archdeacon of Chichester. He died at Oxford, Dec. 6, 1672.

MAYNOOTH, mā-nōōth′. A village of Kil-

dare, Ireland, west of Dublin, having a population of less than 1000 (Map: Ireland, E 5). It was the seat of the Geraldines, the ruins of whose castle remain. It was of importance in the rebellions of the Irish in the reign of Henry VIII and in the time of the civil wars and the Commonwealth. It is chiefly known now as the site of the Roman Catholic College of St. Patrick, opened in 1795. There have been 600 students in attendance, about 100 entering each year, all candidates for the priesthood, and more than half supported by funds for that purpose. Consult T. Healy, *Maynooth College: Its Centenary History* (Dublin, 1895).

MAYO, mā'ō. A maritime county of the Province of Connaught, Ireland, bounded north and west by the Atlantic Ocean; east by Sligo and Roscommon, and south by Galway (Map: Ireland, B 4). Area, 2156 square miles. The picturesque coast line is about 250 miles long, with harbors at Westport and Newport. There are many islands off its coasts. The surface is very irregular, with cliffs and mountains in the north and west and a hilly plain in the east. The highest point is Mweelrea (2688 feet). The chief stream is the Moy. The chief industry is cattle raising; fisheries, linen and woolen manufactures are also carried on. The capital is Castlebar. Pop., 1901, 199,166; 1911, 192,177.

MAYO, mä'yō. A tribe upon the river of the same name in Sonora, Mexico. They and the Yaqui (q.v.), their northern neighbors and allies, speak dialects of the same language, commonly called Cahita, and possibly belonging to the Piman linguistic stock. In physical characteristics and habits the two tribes are practically identical. The Mayo cultivate corn, cotton, squashes, beans, tobacco, and maguey, from which last they manufacture mescal. Their houses are light structures of cane and boughs, covered with palm leaves. They are now very much Mexicanized and number perhaps 7000. See Piman Stock.

MAYO, mā'ō, Amory Dwight (1823–1907). An American clergyman and educator. He was born at Warwick, Mass., was educated at Amherst College, and studied theology with the Rev. Hosea Ballou. At first a Universalist, between 1846 and 1872, he was pastor of churches in Gloucester, Mass., Cleveland, and Albany, and later of Unitarian churches in Cincinnati, Ohio, and Springfield, Mass. Afterward he devoted himself largely to educational work in the South, although from 1868 to 1898 he was professor or lectured periodically in the Meadville (Pa.) Theological School. A number of his reports were published by the United States Bureau of Education.

MAYO, Charles Horace (1865–). An American surgeon. He was born at Rochester, Minn., studied at Northwestern University, graduated from the Chicago Medical College in 1888, and thereafter practiced at Rochester, where he became surgeon of St. Mary's Hospital. He served as president of the Minnesota State Medical Society (1905) and of the Western Surgical and Gynæcological Society (1904) and also as chairman of the surgical sections of the American Medical Association (1907) and the International Tuberculosis Congress (1908). Charles Mayo became known especially for his success in operations for various forms of goitre. With his brother William J. (q.v.) he published *A Collection of Papers Published Previous to 1909* (2 vols., 1912). Subsequently appeared in medical journals and later in reprints: *Intrathoracic Goitre, with Report of Cases* (1910); *The Prophylaxis of Cancer* (1910); *Surgery of the Thymus Gland* (1912).

The father of Charles and William Mayo, William Worrall Mayo (1820–1911), was born near Manchester, England, but came early to the United States. He was educated at the University of Missouri and at the College of Physicians and Surgeons, New York, where he graduated in 1854. He was one of the pioneer surgeons of the Northwest, with his practice established at Rochester, Minn.

MAYO, Frank (1839–96). An American actor, best known for his long-continued popularity in the backwoods character of Davy Crockett. He was born in Boston. Early in life he went to San Francisco, where at 17 he began his career and within a few years was appearing with the young Edwin Booth. In 1863 he became a leading man in San Francisco and in 1865 in Boston. He won applause as Othello, Hamlet, Ferdinand in *The Tempest*, and in other classic rôles, but greater success with the public as Badger in *The Streets of New York*, till in 1872 he brought out *Davy Crockett*. Among his later productions were his own dramatizations of *Nordeck* and of Mark Twain's *Pudd'nhead Wilson*, the latter a character well suited to display his peculiar gifts as a comedian.

MAYO, Henry Thomas (1856–). An American naval officer, born at Burlington, Vt. He graduated from the United States Naval Academy as a midshipman in 1876 and was promoted to ensign, 1878; lieutenant (junior grade), 1885; lieutenant, 1890; lieutenant commander, 1899; commander, 1905; captain, 1908; rear admiral, 1913. During the early part of his career he served on the *Kearsarge* (original), *Monocacy*, and *Tennessee* on the Asiatic Station; in the Coast Survey; on the *Jamestown*, *Bennington*, and *Thetis* on the Pacific coast; on the *Bennington* (navigator) during the Spanish-American War; and as executive officer of the *Wisconsin* in 1901–04. In 1907–08 he commanded the cruiser *Albany* and in 1909–11 the armored cruiser *California*. He was Lighthouse Inspector of the Twelfth District (1905–07); Secretary of the Lighthouse Board (1908–09); and commandant of the navy yard, Mare Island (1911–13). In 1913 he became aid for *personnel* to the Secretary of the Navy. Shortly after his promotion to rear admiral he was ordered to command a division of the North Atlantic fleet and in 1915 was still serving in that capacity. While senior officer of the force off Tampico, Mexico, in April, 1914, a boat's crew of the *Dolphin*, one of the vessels under his command, was seized by Mexican soldiers. (See Mexico, *History;* United States, *History.*) Admiral Mayo's prompt and decisive action at this time won him official praise and general approval. He was the first, under a new law, to be made vice admiral (1915).

MAYO, John. See Mayow, John.

MAYO, Richard Southwell Bourke, sixth Earl of (1822–72). An English statesman. He was born in Dublin, Ireland, was educated at Trinity College there, afterward traveled in Russia, and published an account of his trip, entitled *In St. Petersburg and Moscow* (2 vols., 1846). From 1847 to 1869 he was a member of Parliament and from 1852 to 1869 was Chief Secretary for Ireland. In January, 1869, by Disraeli's appointment, he became Governor-

General of India, in which capacity he introduced extensive and careful reforms in the conduct of the public service and was an efficient and successful administrator. While inspecting the penal settlement at Port Blair, Andaman Islands, he was killed by one of the convicts. Consult Sir W. W. Hunter, *Life of the Earl of Mayo* (London, 1875), and *The Earl of Mayo*, in the "Rulers of India Series" (Oxford, 1892).

MAYO, William James (1861–). An American surgeon. Born at Le Sueur, Minn., he graduated M.D. from the University of Michigan in 1883, became a practicing surgeon at Rochester, Minn., and, served with his brother, Charles Horace Mayo (q.v.), as surgeon of the Mayo clinic of St. Mary's Hospital. He became first lieutenant in the United States Medical Reserve Corps and regent of the University of Minnesota. He was president of the Minnesota State Medical Society in 1895, of the American Medical Association in 1906 (chairman of the surgical section in 1899), and of the American Surgical Association in 1913–14. William Mayo became known as an especially successful operator in cases of gallstones, cancer, and diseases of the intestinal tract. His papers up to 1909 appeared in the collection mentioned in the article on his brother Charles. Later ones, important in medical literature, include: *Gastrojejunostomy* (1911); *Removal of the Rectum for Cancer: Statistical Report of 120 Cases* (1911); *Jejunostomy* (1912); *Surgery of the Spleen* (1913).

The world-wide fame of the Mayo brothers as operators rests not only on their skill, but also upon the development of their clinic, where they surrounded themselves by a staff of physicians and nurses recognized as leaders, each in his specialty. The clinic is annually visited by about 3000 physicians, many of whom take postgraduate courses. In 1914 more than 10,000 operations were performed. Every detail is studiously considered, and the careful notes taken appear yearly in *Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic, Rochester, Minnesota* (Philadelphia, 1910 et seq.). Consult G. W. Broome, *Rochester and the Mayo Clinic* (New York, 1914).

MAYO, William Starbuck (1812–95). An American novelist and traveler. He graduated from the New York College of Physicians and Surgeons (1833), traveled widely in little-explored regions, and first won notice in fiction by *Kaloolah* (1849), a romance of Central Africa. This was followed by *The Berber*, a story of the mountaineers of the Atlas (1850, 1883); *Romance Dust from an Historic Placer*, a collection of short stories (1851); *Never Again* (1873). Mayo's novels are strong in narration, good in plot, weak in character.

MAYÓN, mä-yōn′, or Albay. An active volcano and the highest peak in Luzon, Philippine Islands. It is situated in the Province of Albay, near the southeast extremity of the island (Map: Philippine Islands, D 4). It is a majestic cone, rising from the seashore to a height of 7916 feet, and capped by a white cloud of smoke which in the night assumes a fiery glow. Its sides are covered with grass and moss, and though apparently smooth and unobstructed, the mountain is very difficult of ascent. There have been a number of eruptions during the past century, in which the mountain emitted great quantities of lava, cinders, and incandescent rocks. The eruption of 1814 destroyed the old town of Cagsaua, with a loss of 1200 lives; and the last great eruption in 1897 emitted volumes of lava and ashes, the latter covering an area 75 miles in radius.

MAYOR, mā′ẽr (from Lat. *major*, greater, comparative of *magnus*, great). The chief executive officer of a municipal corporation. In England the mayor was originally a steward, bailiff, or overseer. Later he became the chief magistrate of a corporate town. During the reign of John the right of formally choosing their mayor was conceded to the barons of London, the election being subject to the approval of the King. During the same reign the other large towns were allowed to have mayors. The mayors of the cities of York, Dublin, and London bear the title of Lord Mayor. The Lord Mayor of London, whose jurisdiction extends only to the ancient inner city, is chosen annually from among the aldermen, practically by the liverymen of the guilds. His chief duty is to sustain the hospitality of the city, for which purpose he receives an allowance of £8000 a year, together with the use of the mansion house. The ordinary English mayor is elected by the municipal council, usually from among the aldermen, for a term of one year. He is an *ex officio* justice of the peace and usually serves as a returning officer. In France there is a mayor (*maire*) at the head of each commune, elected by the municipal council from among its own members. He serves during the term of the council. In the Germanic countries the mayor or burgomaster is usually a highly trained professional officer with more or less experience in the municipal service, and is frequently called to the headship of a larger municipality after having gained a reputation as mayor of a smaller town. He is elected by the city council for a long term, often for life. The prevailing method of selecting mayors in the larger countries of Europe is election by the municipal council. In Belgium, Denmark, Holland, Norway and Sweden, and in Italy, so far as the larger towns are concerned, the method of appointment is by the central government.

In the United States the office of mayor existed from the earliest Colonial times, being taken over as a part of the English municipal system. At first the mayor was usually appointed by the Governor, and was generally a member of the municipal council. Later he was excluded from the council and then came to be chosen by the council, although occasionally, as in the city of Boston, he was elected by popular vote from the beginning. This is now the rule in the United States almost without exception. The term of the mayor in the United States varies from one year to five, the usual term being two years. Everywhere in Europe the mayor acts as the local agent of the central government and consequently is often subject to disciplinary control by the central government. Thus, the French mayor may be suspended by the prefect for one month, by the Minister of the Interior for three months, and may be permanently removed by the President; a somewhat similar rule prevails in other continental states. In several American States the mayor may be removed by the Governor for cause, subject to the power of the courts to determine what shall constitute just cause in a given case. Besides his duty as agent of the central government the mayor is the official head of the municipal corporation. His powers are much larger in some

countries than in others. In the United States there is a marked tendency of late years towards increasing the power of this officer and making him chiefly responsible for the good government of the city. See sections *Local Government* in the various countries mentioned. Consult G. J. Bayles, *Office of Mayor in the United States: A Study in Administrative Law* (New York, 1895). See MUNICIPALITY.

MAY'OR, JOHN EYTON BICKERSTETH (1825–1910). An English classical philologist, brother of J. B. Mayor, born at Baddagama, Ceylon. He graduated from St. John's College, Cambridge (1848), and was appointed fellow in 1849; from 1849 to 1853 he was assistant master at Marlborough College. In 1853 he became lecturer at St. John's College, Cambridge. Of this university he was librarian from 1863 to 1867, and in 1872 he was made professor of Latin there. He became president of his college in 1902. Mayor became best known as editor of *Thirteen Satires of Juvenal* (2 vols., 1853; 3d ed., 1881); the chief feature of this work is its array of illustrative quotations. He also edited some of Cicero's works, especially the *Second Philippic*, Homer's *Odyssey*, books ix–xii, Pliny's *Letters*, book iii, and was the author of many other works relating to the classics, the history of education, and the Church. For a time he was one of the editors of the *Journal of Philology*. For a notice of his career, by J. E. Sandys, consult *The Classical Review*, vol. xxv (London, 1911).

MAYOR, JOSEPH BICKERSTETH (1828–). An English classical scholar, brother of J. E. B. Mayor. He was educated at Rugby and at St. John's College, Cambridge, where he graduated B.A. in 1851. After some years as fellow and lecturer he was ordained a priest in the Established church. From 1863 to 1868 he was head master of Kensington Proprietary School and in 1870 became professor of classics in King's College, London. This post he resigned in 1879. Mayor had married in 1863 a niece of the historian George Grote, and became his literary executor, editing his posthumous essays on philosophy. His other works include an edition of Cicero, *De Natura Deorum* (3 vols., 1880–85); a valuable bibliography entitled *A Guide to the Choice of Classical Books* (four editions, 1880–96); *Ancient Philosophy*, a convenient sketch (1881); *Chapters on English Metre* (1886; 2d ed., 1901); *Handbook of Modern English Metre* (1903); *The World's Desire, and Other Sermons* (1906); *Select Readings from the Psalms, with an Essay on the Growth of Revelation* (1908). He also published editions, with introduction, notes, etc., of: *The Epistle of St. James* (3d ed., 1910; with additions, 1913); Clement of Alexandria's *Stromateis*, book vii, based on Hort's notes (1902); *The Epistle of St. Jude and Second Epistle of St. Peter* (1907). From 1887 to 1893 Mayor edited the *Classical Review*.

MAYORGA, mä-yôr'gä, MARTÍN DE (c.1715–83). A viceroy of Mexico. After having been dubbed a knight of Alcántara and appointed field marshal of the royal army, captain of the Spanish Royal Guards and Governor of Alcántara in Estremadura, he was in 1773 appointed Governor of Central America. In 1779, on the death of Bucareli, he was made forty-seventh Viceroy of New Spain. While he was in power there broke out an epidemic of smallpox, to arrest which he made great exertions. He founded an academy of arts in Mexico, and sent to the royal archives of Spain for publication copies of the manuscripts of the historian Veytia. His attitude towards foreign encroachment was vigorously defensive.

MAYOR (mā'ẽr) **OF THE PALACE.** See MAJOR DOMUS.

MAYORUNÁ, mä'yô-rōō'nä. A fierce and savage tribe of Panoan stock (q.v.) living south of the Marañon (Amazon), between the Ucayali and Javari rivers, northeastern Peru. They are supposed to have lived formerly farther to the west and to have been driven into the forest by the Inca conquest. From the frequency of beards and light skins among them, traditionally due to admixture of Spanish captive blood, they are sometimes called *Barbados* (bearded) by the Spaniards. They live by hunting and keep to the forests, seldom coming down to the rivers, being at war both with all the other tribes and with the whites. Their weapons are spears, clubs, and blowpipes, and they are famous for their powerful blowgun poison. They are tall and well formed, go perfectly naked, and cut their hair across the forehead, letting it fall loosely down behind.

MAYO-SMITH, RICHMOND (1854–1901). An American economist and educator, born at Troy, Ohio. He was a brother of Henry Preserved Smith (q.v.), Mayo being his mother's maiden name. He graduated at Amherst in 1875 and then studied for two years at Berlin and Heidelberg. Between 1877 and 1883 he was assistant and adjunct professor of history and political science at Columbia University; afterward he held the chair of political economy and social science. In his researches he devoted himself especially to statistics, a field in which he became an authority. He was an editor of the *Political Science Quarterly*, vice president of the American Statistical Association (1897 to his death), and one of the founders of the American Economic Association. His publications include: *Emigration and Immigration* (1890); *Sociology and Statistics* (1895); *Statistics and Economics* (1899).

MAYOTTE, mä-yôt'. One of the Comoro Islands (q.v.).

MAYOW, mā'ô, JOHN (1643–79). An English chemist and physiologist, born in London. He studied law and medicine at Oxford and practiced medicine at Bath, but devoted himself specially to research in chemistry and physiology and is chiefly known for his ingenious speculations concerning the process of combustion, in which he anticipated, to some extent, the ideas which have since been induced from the discoveries of Priestley, Lavoisier, and others. His principal publication was *Tractatus quinque Medico-Physici* (1674). It appeared under the title *Opera Omnia Medica Physica* in 1681, and was translated into Dutch (1684), German (1799), French (1840), and English (1907). His work in anatomy and physiology, especially on the subject of muscular action and on respiration, was also important.

MAY'POP. The fruit of a passion flower (q.v.).

MAYR, mīr, GEORG VON (1841–). A German economist, born in Würzburg. He studied at Munich, where he became professor in 1868; was appointed in 1879 Undersecretary to the ministry for Alsace-Lorraine; retired in 1887, and became docent (1891) and professor (1895) in the University of Strassburg. In 1898 he was called to Munich. He was rector of this university in 1913–14. He founded the

Zeitschrift des bayrischen statistischen Bureaus (1869) and *Das allgemeine statistische Archiv* (1890) and wrote: *Die Gesetzmässigkeit im Gesellschaftsleben* (1877); *Zur Reichsfinanz-Reform* (1893); *Statistik und Gesellschaftslehre* (1895–97); *Die Pflicht im Wirtschaftsleben* (1900); *Flotte und Finanzen* (1900); *Grundriss zu Vorlesungen über praktische Nationalökonomie* (1900 et seq.); *Zolltarifentwurf und Wissenschaft* (1901); *Die Bevölkerung Britisch-Indiens* (1907).

MAYR, or **MAYER,** Johann Simon (1763–1845). A German-Italian dramatic composer, born at Mendorf, Bavaria. His father was a musician, and the boy studied under him and at a Jesuit seminary at Ingolstadt, and later under Lenzi at Bergamo, Italy, where he settled permanently. In 1791 an oratorio, *Jacob a Labano Fugiens,* was so successful that he was commissioned to write three more, and in 1794 he produced his first opera, *Saffo, ossia i riti d'Apollo Leucadio.* During the next 20 years he wrote about 70 operas, which were only surpassed in popular favor by those of Rossini. In 1802 he became chapelmaster at Santa Maria Maggiore in Bergamo, and while there refused the offers of posts at London, Paris, Dresden, and Milan. He was also professor of composition in the music school of Bergamo, and Donizetti was one of his pupils. His best operas were: *Lodoïska* (1795), *Ginevra di Scozia* (1801), *Media* (1812), and *Rosa bianca e Rosa rossa* (1814). He was blind for a number of years before his death, which occurred at Bergamo. In 1852 a monument was erected to his memory in that city. Consult H. Kretzschmar, *Die musikgeschichtliche Bedeutung Simon Mayrs* (Leipzig, 1904).

MAY SUCKER. A fish. See Cutlips.

MAYS'VILLE. A city and the county seat of Mason Co., Ky., 63 miles southeast of Cincinnati, Ohio, on the Ohio River, and on the Chesapeake and Ohio and the Louisville and Nashville railroads (Map: Kentucky, G 2). It has the Maysville and Mason County Public Library, incorporated in 1878, a fine Federal building, County Historical Association, Wilson Memorial Hospital, and Beechwood Park. There are important commercial interests, the city being the centre of a rich agricultural country, and its industries are represented by cotton mills, ice factories, flour, saw, and planing mills, foundries, distilleries, cigar, chewing-tobacco, furniture, and shoe factories, pressed-brick plants, and plow and pulley works. Settled as early as 1784, Maysville was incorporated as a town by the Virginia Legislature in 1787, and was chartered as a city in 1833, becoming a fourth-class city 60 years later. In 1848 it was made the county seat. Pop., 1900, 6423; 1910, 6141.

MAYUMO, San Miguel de. See San Miguel de Mayumo.

MAYUR PANDIT. See Marathi.

MAY'WEED (older Eng. *maieweed,* variant of *maytheweed;* influenced by popular etymology with *May,* the fifth month), Dog Fennel (*Anthemis cotula*). A plant of the family Compositæ, growing in pastures and meadows. It is a native of Europe, but, although widely spread in America, it is not an aggressive weed.

MAY'WOOD. A village in Cook Co., Ill., on the Des Plaines River, 11 miles by rail west of Chicago, on the Chicago Great Western, the Chicago and North-Western, and the Indiana Harbor Belt railroads (Map: Illinois, J 2). The most important industries of the village are the manufacture of tin plate and cans and lithographing. Maywood contains the Logan Home, the Baptist Old People's Home, the German Lutheran Theological Seminary, the Chicago Theological Seminary, Kittie Smith Home for Crippled Children, and Library Hall. The water works are owned by the municipality. Pop., 1900, 4532; 1910, 8033; 1914 (U. S. est.), 9783; 1920, 12,072.

MAZADE, mȧ'zȧd', Charles de (1820–93). A French publicist, born at Castel-Sarrazin (Tarn-et-Garonne). He studied law at Toulouse and afterward became a contributor to the French press. He became one of the contributors to the *Revue des Deux Mondes* (1846), and from 1852 to 1858 and again from 1865 until his death directed its department of politics. His publications include: *L'Espagne contemporaine* (1855); *L'Italie moderne* (1860); *La Pologne contemporaine* (1863); *L'Italie et les Italiens* (1864); *Lamartine, sa vie littéraire et politique* (1872); *La guerre de France* (1875); *Le comte de Cavour* (1877); *M. Thiers: cinquante années l'histoire contemporaine* (1884); *Un chancelier l'ancien régime: le règne diplomatique de M. de Metternich* (1889); *L'Europe et les neutralités* (1893); *L'Opposition royaliste: Berryer, De Villèle, De Falloux* (1894); and he edited the *Correspondance du maréchal Davout* (1885).

MAZAGAN, mȧ'zȧ-gän'. A seaport of Morocco, Africa, situated on the Atlantic coast, about 110 miles north of the city of Morocco, of which it is the port (Map: Africa, D 1). It is strongly fortified and is the centre of a brisk trade in agricultural products, fruit, and wool. The imports in 1912 amounted to $2,600,000 and the exports to $2,400,000, but 80 per cent of the trade is with France and Great Britain, the chief exports being wool, hides, corn, beans, and wax. The settlement was founded by the Portuguese in 1509, and numerous old houses of European design still remain. They abandoned the city in 1769 to found a new colony in Brazil. The population is estimated at 14,000, including a number of European merchants and consular agents, and the Jewish inhabitants constitute a quarter of the population.

MAZAMET, mȧ'zȧ'mȧ'. A town in the Department of Tarn, France, situated on the north slope of the Black Mountains about 50 miles east-southeast of Toulouse (Map: France, S., G 5). It is noted for its extensive manufactures of cloth, flannel, clothing, hosiery, and leather. Pop. (commune), 1901, 13,978; 1911, 14,764.

MAZANDERAN, mä'zän-de-rän'. A province of northern Persia, south of the Caspian Sea, bounded respectively east, south, and west by Astrabad, Irak-Ajemi, and the Elburz Mountains and Gilan (Map: Asia, Central, D 4). It is about 200 miles long by 50 miles broad, with an estimated area of 10,000 square miles. The surface is low and swampy near the Caspian Sea, covered partly with jungle. This part is watered by numerous small streams and is malarial. The land rises towards the south and culminates in Demavend (19,400 feet). The chief minerals are iron ore and petroleum and its by-products. The ground in many parts is swampy, but fertile, and rice, cotton, sugar cane, fruit trees, and the mulberry for the silk industry are largely cultivated. Fishing is an important industry, as also is grazing, horses, cattle, sheep,

and goats being raised in great numbers. There is a considerable export trade with Russia of silk and agricultural products, the imports being cotton and woolen goods, cutlery, and tobacco. Pop. (est.), 200,000. Capital, Sari.

MAZANDERANI, mä'zän-de-rä'nē. The natives of Mazanderan, or Taberistan, in northern Persia, on the Caspian Sea. They speak a dialect of Persian which, like the speech of the neighboring Province of Ghilan, has peculiarities justifying its classification as a special form of the Persian tongue. The Mazanderani are of smaller stature than the people of the highlands, well proportioned, with regular features, bushy eyebrows, and abundant hair.

MAZARA. See MAZZARA DEL VALLO.

MAZARIN, mà'zà'răN', JULES (1602–61). A Cardinal and Prime Minister of France during the minority of Louis XIV. He was born July 14, 1602, at Piscina in the Abruzzi, Italy, his father being intendant of the household of Philip Colonna. He was educated in the Jesuit College at Rome, and later accompanied Jerome Colonna to the Spanish University of Alcalâ, where he studied law, but also indulged in gambling and love-making—practices which were continued at Salamanca. On returning to Rome Mazarin became a doctor of canon and civil law and entered the Pope's military service as a captain of infantry in the Colonna regiment. His talents, however, were more diplomatic than military, and after being employed on several political missions in Italy he accompanied the Papal Legate to the court of France and there, about 1628, became known to Richelieu, who perceived his peculiar talents and engaged him to maintain the French interests in Italy. This he did while still employed by the Pope as Vice Legate to Avignon (1632) and Nuncio to the French court, an office to which he was appointed in 1634. The Spaniards complained of his partiality for France, and the Pope was obliged to recall him. In 1639, however, he openly entered the service of Louis XIII, was naturalized a Frenchman, and in 1641 received a cardinal's hat, through the influence of Richelieu, who, when dying, recommended Mazarin to the King as the only person capable of carrying on his political system. Mazarin's position was one of great difficulty amid the intrigues, jealousies, and strifes of the earlier years of Louis XIV's minority. The Queen mother, Anne of Austria, was at first hostile to him, but although she was declared sole Regent and guardian of the young King, Mazarin kept his place as Minister, and soon made himself indispensable to her by his wonderful business qualities, while the exquisite charm of his manner eventually gained her heart. It is said, in fact, that a secret marriage took place between the Queen Regent and her Prime Minister, but this has never been absolutely proved. The result of the close alliance between the Queen and himself was that Mazarin ruled with almost as unlimited sway as Richelieu had done. The Parlement of Paris, thinking to conquer political power, resisted the registration of edicts of taxation; but Mazarin caused the leaders of the opposition to be arrested; whereupon began the disturbances of the Fronde (q.v.). Twice compelled to retire from court, he made a triumphant entry into the capital in 1653 and in a short time had regained his former power.

In the internal government of the country those principles of despotism were established on which Louis XIV afterward acted. Mazarin continued Richelieu's foreign policy, waging war vigorously against the Hapsburg power in Austria and Spain; his most important diplomatic acts were in connection with the Peace of Westphalia in 1648 and that of the Pyrenees in 1659. The administration of justice in France under Mazarin became very corrupt, and the commerce and finances of the country underwent a great depression. As a financier, Mazarin was far inferior to Richelieu. He was avaricious and enriched himself at the expense of the country. He died at Vincennes, March 9, 1661. His magnificent library he bequeathed to the Collège Mazarin at Paris.

Bibliography. The best idea of Mazarin is obtained from his correspondence, published by Chéruel, "Lettres du cardinal Mazarin pendant son ministère," in the *Collection de documents inédits sur l'histoire de France*, first series (Paris, 1872–94). Consult also: C. Moreau, *Bibliographie des Mazarinades* (ib., 1850); Cousin, *Jeunesse de Mazarin* (Paris); Chéruel, *Histoire de France sous le ministère de Mazarin, 1651–1661* (ib., 1882); Arthur Hassall, *Mazarin* (ib., 1903); J. B. Perkins, *France under Mazarin* (2 vols., New York, 1915).

MAZAR-I-SHERIF, mà-zär'-ē-she-rēf'. The capital, a fortified town of Afghan Turkestan, situated about 9 miles east of Balkh (Map: Afghanistan, M 4). Its mosque (1420) is said to be the tomb of Ali, the son-in-law of Mahomet. It manufactures swords and other weapons. In the vicinity are mineral springs. Pop. (est.), 25,000.

MAZARRÓN, mà'thär-rôn'. A town of southeast Spain, in the Province of Murcia, situated 2½ miles from the Mediterranean coast, 16 miles west of Cartagena (Map: Spain, E 4). In the neighboring mountains are mines of iron and argentiferous lead, which date from the times of the Phœnicians and Romans; and the town contains several metallurgical establishments, besides soap factories and flour mills. A railroad 5 miles long connects it with its port in the small Bay of Mazarrón, where there is a good roadstead and a lighthouse. At this port is located one of the largest and best lead-smelting establishments of Spain, capable of producing 125 tons of lead daily. There is also considerable trade in lead and ores, machinery, coal, and timber. Pop., 1900, 23,362; 1910, 22,660.

MAZAS, mà'zà', PRISON OF. A prison in Paris in which the first trial of solitary confinement was made in France. It was built between 1845 and 1850 to replace the prison of La Force on the Boulevard Mazas (now the Boulevard Diderot), and was officially known as *Maison d'arrêt cellulaire*. The building was demolished in 1900.

MAZATEC, mä'zà-tĕk'. A tribe occupying the districts of Teotitlan and Tuxtepec in Oaxaca, Mexico. They are agricultural and are noted silk raisers, weaving gorgeous fabrics of that material, and having many curious beliefs and taboos in connection with the tending of the silkworms. In language the Mazatec are connected with the adjoining Chocho, Popoloco, Trique, and Ixcatec and the five together form the Mazatecan stock. This was formerly believed to be connected with Mixtec, but is probably distinct.

MAZATLAN, mä'sà-tlän'. A seaport in the State of Sinaloa, Mexico, situated at the entrance of the Gulf of California (Map: Mexico, F 6).

It is a well-built and picturesque town and has a handsome city hall, a nautical school, and two hospitals. A street railroad runs through the town, which is lighted by gas. The harbor is an open roadstead, but is regularly visited by several lines of steamers. It is on the main line of the Southern Pacific Railroad of Mexico and is an important distributing centre for the trade of the interior. The chief exports are silver, pearls, copper, lead, dyewoods, and skins. Pop., 1900, 17,852; 1910, 21,219. The bubonic plague appeared here in 1903 and caused many deaths. The city suffered a long siege and was captured by the Constitutionalists during the revolution in 1914. In 1912 its exports amounted to $4,263,480 and imports $2,531,800. It is the seat of a United States consul.

MAZDAK, măz′dăk (470–?). A Persian reformer, who founded a religious and social sect that existed for a time and were known as Mazdakites, after his name. He was born at Persepolis and belonged originally to the Magian faith, being a priest at Nishapur. He became imbued with communistic and reformatory views and preached the doctrine not alone of the equality of mankind but of the community of property, including women, and the consequent abolition of marriage laws. Simplicity in manner of life and dress, and abstinence from animal food, except milk and eggs, were enjoined. He succeeded in converting to his faith King Kavadh, or Kobad (488–531 A.D.); but a revolution of the nobles, urged on doubtless also by the jealous Magian clergy, resulted in dethroning the King and placing Jamasp, his brother, on the throne (497 A.D.). Three years later Kobad was restored to power, and for political purposes he outwardly recanted his Mazdakite views. Towards the end of his reign, suspecting state intrigues by the Mazdakites, he allowed Mazdak and thousands of his followers to be put to death (528–29 A.D.). Traces of the sect lingered on in the neighborhood of Hamadan as late as the Seljukid era. Consult E. G. Browne, *Literary History of Persia* (London, 1909).

MAZE. See LABYRINTH.

MAZE, mâz, HIPPOLYTE (1839–91). A French historian and politician, born at Arras. He entered the Ecole Normale Supérieure in 1859, became a fellow in history in 1863, and taught at the lycées of Cahors, Saint-Quentin, Angers, and Versailles. He was appointed a prefect of Landes in 1870. The next year, however, he returned to teaching and became first professor of history at the Lycée Fontanes in Paris. He was elected to the Chamber of Deputies in 1879 as a Republican and reëlected in 1881. From 1886 until his death he was Senator from Seine-et-Oise. A monument to him was erected in Viroflay in 1894. Among his publications are: *La république des Etats-Unis d'Amérique: sa fondation* (1869); *La fin de la révolution par la république* (1872); *Hoche en Vendée* (1882); *La lutte contre la misère* (1883); *Général Marceau* (1889).

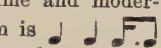
MAZELLE, mâ-zĕl′, EDUARD (1862–). An Austrian meteorologist. He was educated at Graz and in 1883 became an assistant and in 1903 director of the Maritime Observatory at Trieste. He made important researches on atmospheric electricity and demonstrated that evaporation of sea water is slower than that of fresh water. He published a textbook of meteorology and oceanography for use in nautical schools.

MAZEP′PA, IVAN STEFANOVITCH (c.1640–1709). A leader of the Cossacks, born in the Russian Province of Kiev, of a noble family. After receiving a good education, he became a page in the service of John Casimir, King of Poland. There is a good tradition that a Polish nobleman who had surprised him in an intrigue with his wife, bound him naked on his own horse and lashed the animal out into the steppes. The horse carried him to his own distant residence—not to the Ukraine, as has been often said; but Mazeppa, out of shame, fled to the Ukraine, joined the Cossacks, rose to high distinction among them, overthrew their hetman, Samilovitch, and in 1687 was elected in his place. He won the confidence of Peter the Great, who used him in the Volhyna campaign of 1705–06 and loaded him with honors never before bestowed on any Cossack hetman, finally making him Prince of the Ukraine. But on the curtailment of the freedom of the Cossacks by Russia, Mazeppa, who never really liked the Czar's new ways as well as his own, hoping to achieve complete independence, entered into negotiations with Charles XII of Sweden, joined him with a considerable band (some 80,000 Cossacks), and took part in the battle of Poltava in 1709. When Mazeppa's treachery and insubordination were discovered his stronghold in the Ukraine was razed by Peter's orders. His sudden discomfiture cost him nearly all his power and prestige with his former following among the Cossacks. Moreover, he was excommunicated by the Metropolitan of Kiev. Mazeppa, with what few followers he could still muster, followed King Charles to Turkey. Despite Peter's offer of 300,000 ducats to the Sultan to have Mazeppa extradited, the latter was not turned over to Russia. He died in Bender in 1709. His story has been widely treated in painting, poetry, the novel, the drama (notably by Byron in his poem *Mazeppa*), and in music (notably by Liszt in a symphonic poem by that name).

MAZOIS, mâ′zwâ′, FRANÇOIS (1783–1826). A French architect, born at Lorient. A pupil of the Ecole Polytechnique and of Percier (q.v.), he was employed (about 1808) by King Murat of Naples on his Portici palace, and later was pensioned and commissioned by Queen Caroline to study and report upon the ruins of Pompeii. The resulting work in four folio volumes, *Les ruines de Pompéii*, an epoch-making publication (1812), was followed by *Le palais de Scaurus, ou description d'une maison romaine* (1822) and other works. In 1820 he was appointed inspecteur général du conseil des bâtiments civils in Paris.

MAŽURANIĆ, mä′zhōō-rä′nĕch, IVAN (1814–90). A Croatian poet and statesman, born in Novi Sad (Neusatz). He studied at Fiume and Agram and practiced law for several years. He took an active part in promoting the national spirit of the Croats and wrote the influential manifesto *Hrvati Magjarom* (The Croats to the Magyars) (1848). He was made procurator general of Croatia and Slavonia in 1850. Afterward he became first chancellor of Croatia and Slavonia (1861) and from 1873 to 1880 was Ban, or governor, of Croatia. Mažuranić is one of the most representative as well as the greatest of Croatian poets. His poems first appeared in the *Danica Ilirska* (Star of Illyria) in 1835. His masterpiece is the epic poem on the death of the oppressive Ismail Čengić Aga, *Smrt Ismail Age Čengića* (1846). This fine poem has been

translated into French by Courrière (in the *Revue Britannique*, 1878) and into German by Kienberger (1874). Mažuranić also wrote (1844) two cantos in the manner of Gundulić (q.v.) to supply those missing in that poet's *Osman*.—His brother, ANTON MAŽURANIĆ (1850–88) was a distinguished philologist.

MAZURKA, mȧ-zo͝or′kȧ (Pol., Mazur dance, so named from the Mazurs, a branch of the Polish nation inhabiting Masovia in Russian Poland and a district in East Prussia). A national Polish dance in triple time and moderate tempo. Its principal rhythm is  Frequently the musical phrase ends with the second beat, so that the third becomes an up beat to the next bar. The history of the mazurka goes back to the sixteenth century, when it was a song accompanied by a dance. Augustus III (1733–63) introduced it into Germany, and from that country it spread to France and, about 1845, to England. The Russian mazurka differs from its original prototype in that it may be danced by any number of people, while the Polish mazurka is generally performed by either four or eight couples. The steps and even the figures are frequently varied. Chopin revolutionized the mazurka. He extended its form and introduced characteristic Polish melodies, leaving practically only the national character.

MAZZARA DEL VALLO, mȧt-sȧ′rȧ dĕl vȧl′lō. An episcopal city in the Province of Trapani, Sicily, 32 miles south of Trapani, where the Mazzara flows into the Mediterranean (Map: Italy, D 6). A massive wall 36 feet high encircles the city, which has many interesting ruins. Its cathedral and castle, dating from the eleventh century, and the archiepiscopal palace are the most attractive buildings. The inhabitants of the neighboring region are engaged in agriculture, and an important trade is carried on in barley, corn, olive oil, fruit, cotton, and wine. There are quarries near by. Mazzara del Vallo, the ancient Mazara, was settled by colonists from Selinus, and figured prominently in the early history of the island. Pop. (commune), 1901, 20,130; 1911, 24,865.

MAZZARINO, mät′sȧ-rē′nō. A town in the Province of Caltanissetta, Sicily, 35 miles east of Girgenti (Map: Italy, E 6). It has an old castle and sulphur springs in the vicinity. Its products consist of fruit, vegetables, and wine. Pop. (commune), 1901, 16,355; 1911, 15,920.

MAZZEI, mȧt-sȧ′ē, PHILIP (1730–1816). An Italian physician, author, and traveler, a native of Tuscany. After having studied medicine he practiced for several years in Smyrna and was engaged in business in London for more than 15 years. In December, 1773, he went to Virginia for the purpose of introducing grape and olive culture in that colony. There he became acquainted with Thomas Jefferson, and later, after his return to Italy, corresponded with him. From 1779 to 1783 he was the official agent of Virginia in Italy for the purchase of arms, ammunition, and supplies, and in 1785 he revisited America. The correspondence between him and Jefferson was renewed after this second visit, and in April, 1796, Jefferson wrote to him the famous "Mazzei letter." In it he bitterly attacked the Federalist leaders (including, by implication, Washington) for their "monarchistic" tendencies, and declared that democracy was being betrayed by "men who were Samsons in the field and Solomons in the council, but who have had their heads shorn by this harlot, England." The letter was translated into Italian and published in an Italian paper, translated into French and published in the *Moniteur* at Paris, where it was seen by an American by whom it was translated into English, and sent to the United States, where it appeared in print in May, 1797, soon after Jefferson's inauguration as Vice President. Its publication raised a furor among the Federalists, who, in their feeling against Jefferson, even suggested his impeachment. Mazzei subsequently became a privy councilor to the King of Poland, and later in life was pensioned by the Czar of Russia. He wrote *Recherches historiques et politiques sur les Etats-Unis de l'Amérique septentrionale* (4 vols., 1788).

MAZZINI, mȧt-sē′nē, GIUSEPPE (1805–72). An Italian patriot prominently connected with the struggle for Italian unity and the republican movement throughout Europe. He was born in Genoa, June 22, 1805, studied at the University of Genoa, and practiced law in his native city. In 1827 his first essay in literature, "Dell' amor patrio di Dante," appeared in the Liberal journal *Il Subalpino*, and he subsequently contributed critical, literary, and political papers to the *Antologia* of Florence and other papers. Soon after his departure from the university Mazzini threw himself with fervor into the democratic movement and in 1828 founded the *Indicatore Genovese*, which was, however, soon suppressed. In its pages originally appeared the essay subsequently republished under the title of *Scritti d'un Italiano vivente*. In 1830 Mazzini joined the Carbonari (q.v.) and at once became an active and influential member. He was soon arrested, detained for six months in the fortress of Savona, and finally liberated on condition of his departure from Italy. After short residences in several places he made his home in Marseilles, and thence addressed to Charles Albert of Sardinia the famous letter which caused him to be condemned to perpetual banishment. Having become convinced that the Carbonari was not efficient for the work of Italian regeneration, Mazzini now undertook the organization of a new Liberal league, Young Italy (1831). This organization sought to secure the overthrow of all existing Italian governments and the union of the peninsula under a republican government. In addition to its paramount aim, the general principles of this association enforced the obligation to labor for a common moral regeneration and the establishment of political equality over the world. Liberty, equality, and humanity were the watchwords of the body; education and insurrection the great agencies of its operations; assassination was erased from its statutes, and the symbolic dagger of the Carbonari was replaced by the more humane emblems of a book and the cypress. The white, red, and green tricolor flag of the society became that of the new Italian nation. Mazzini was the animating spirit of this league, which was the parent of similar associations adapted to the individual requirement of the various European nationalities. In 1834 Mazzini planned an armed invasion of Savoy from Switzerland and on February 1 an attack was made on some customhouse officials at the frontier of Savoy, but the undertaking failed utterly. In 1837 Mazzini quitted Switzerland for England and took up his residence in London. There he maintained incessant activity

in literary propaganda and was in touch with political agitators of many countries. He wrote for various periodicals, on literary subjects, communism, education, music, etc. After the February revolution of 1848 Mazzini went to Milan, where he was a resolute opponent of the proposed annexation of the smaller Italian states to Sardinia. He retired to Switzerland on the capitulation of Milan to the Austrians, only to reappear in Florence on the rising in Tuscany. He became a member of the provisional government, and when, almost simultaneously, Rome was proclaimed a republic, he was sent there as a deputy, and was elected triumvir. On the taking of Rome by the French troops under Oudinot he went to Switzerland and thence returned to London. He bitterly attacked the course of France in public letters to De Tocqueville and others. At his instigation, as president of the Italian National Committee, risings in Milan (1853) and in Genoa (1857) were attempted. In 1859, while lending the whole weight of his influence to the revolutionary movements going on in Italy, he combated the threatened French intervention. He assisted in organizing Garibaldi's expeditions of 1860, 1862, and 1867. Though repeatedly elected by Messina to the Italian Parliament Mazzini refused to take his seat under a monarchical government. In 1866 the Italian government abrogated the sentence of death under which Mazzini had been living for many years, but he refused to accept a "pardon for having loved Italy beyond all earthly things." In 1868 he fell into a dangerous illness, from the effects of which his health never recovered, though his zeal remained as ardent as ever. After an ineffective scheme for a republican rising in Sicily in 1870 Mazzini ventured to enter Italy and was arrested at Gaeta, where he remained a prisoner till Rome was occupied by the Italian army. On his death, at Pisa, March 10, 1872, the Italian government accorded him a public funeral. Of the value of Mazzini's services to the cause of Italian independence there are widely differing opinions. Republicanism was a cardinal principle with him, to which he adhered with inflexible tenacity, never being willing to yield his personal conviction to the actual necessities of Italy as did Manin, Garibaldi, and Crispi. Hence he antagonized the Sardinian monarchy and obstructed the work of Cavour. His impassioned writings often led less noble spirits into deeds that he would not at all approve. Mazzini possessed in the highest degree that personal fascination by which friends are converted into ardent partisans. In his private life he was a model of purity and frugal simplicity, as in his public career he was conspicuous for disinterestedness and self-abnegation. In his political ideas he was of the type of the democratic visionaries of the eighteenth century with his almost metaphysical and religious ideas of social harmony and justice, but he was singularly lacking in an understanding of economic forces and their rôle in social evolution. He was associated for a while with Karl Marx in the first Socialist international organization, but his failure to appreciate the true nature of the modern workingman's movement made this association unprofitable and it was soon dissolved.

Bibliography. A comprehensive edition of Mazzini's works, in 18 volumes, *Scritti edite ed inedite*, appeared in Milan, 1861–91. Editions of his letters were published at Milan in 1875, at Rome in 1885, and at Turin in 1888, and an English edition in six volumes at London in 1890–91. Consult: Simoni, *Histoire des conspirations mazziniennes* (Paris, 1870); Pietrode Nardi, *Giuseppe Mazzini, la vita, gli scritti e le sue dottrine* (Milan, 1872); E. A. Venturi, *Memoir of Joseph Mazzini* (London, 1877); Bouiller, *Un roi et un conspirateur: Victor Emanuel et Mazzini* (Paris, 1885); Saffi, *Il pensiero politico e sociale de Giuseppe Mazzini* (Rome, 1887); A. F. Schack, *Mazzini und die italienische Einheit* (Stuttgart, 1891); J. W. Mario, *Mazzini nella sua vita e nel suo apostolato* (Milan, 1891); W. J. Linton, *Recollections of Mazzini and his Friends* (London, 1892); Peretti, *Gli scritti letterarii di Giuseppe Mazzini* (Turin, 1904); Dora Melegari, *La giovine Italia e Giuseppe Mazzini* (Milan, 1906); John Maccunn, *Six Radical Thinkers* (London, 1907); R. S. Holland, *Builders of United Italy* (New York, 1908); W. R. Thayer, "Mazzini's Centenary," in *Italica* (Boston, 1908); *Cambridge Modern History*, vol. xi (New York, 1909); Bolton King, *Life of Mazzini* (new ed., ib., 1912); H. E. B. H. King, *Letters and Recollections of Mazzini* (London, 1912). See CAVOUR; GARIBALDI; ITALY.

MAZZONI, mät-sō'nē, GUIDO (1450–1518). An Italian sculptor, born at Modena and called *Il Modanino*. About 1491 he was employed at Naples and in 1495 he accompanied Charles VIII to France. His principal remaining works are groups, in colored clay, of life-sized figures lamenting over the body of Christ. The best are those in the churches of San Giovanni Decollata at Modena, Santa Maria della Rosa at Ferrara, and Monte Oliveto at Naples. They show unusual technique and a simple realistic treatment not common in that age. Other works by him are a group of the "Adoration," in the Duomo at Modena, and a bronze bust of King Ferdinand, in the Naples Museum.

MAZZONI, GUIDO (1859–). An Italian poet and scholar, born at Florence. He studied at Pisa and Bologna, was made professor of Italian language and literature at the University of Padua in 1887, and occupied the same position at the Florence Institute from 1894. His principal work as a scholar is *L' ottocento* (Milan), a history of Italian literature of the nineteenth century. Six collections of his verse appeared between 1882 and 1893.

MAZZONI, JACOPO (or GIACOMO) (1548–98). An Italian philosopher, born at Cesena. He studied at Bologna and Padua, held a professorship in the University of Pisa, and was called to a chair in the University of Rome by Pope Gregory XIII. He was one of the founders of the Accademia della Crusca. It is asserted that he defeated "the Admirable Crichton" (see CRICHTON, JAMES) three times in debate. Most of his writings were lost. Those extant include those in defense of Dante, viz., *Discorso composto in difesa comedia di Dante* (1572) and *Della difesa della comedia di Dante* (1587), and his philosophical works, *De Triplici Hominum Vita* and *In Universam Platonis et Aristotelis Philosophiam Prælucidia* (1597).

MAZZUCHELLI, mät'sōō-kĕl'lē, GIOVANNI MARIA, COUNT (1707–65). An Italian literary encyclopædist; born at Brescia. He wrote biographies of Scipio Capece and Giusto de' Conti and edited Villani's biographies of illustrious Florentines. His principal and still indispensable work is the *Scrittori d' Italia* (6 vols., Brescia, 1753–63), conceived on such vast lines

that it reached only the letter B; four additional volumes of his notes, collected by his secretary, G. B. Rodella, are still unedited (Vatican); Narducci published *Giunte* thereto (Rome, 1884).

MAZZUOLA, mât-swō'lȧ, Francesco. See Parmigiano.

MEAD, mēd (AS. *medu*, OHG. *metu, mito*, Ger. *Meth;* connected with Ir. *meadh*, Welsh *medd*, mead, OChurch Slav. *medŭ*, Lith. *medus*, Lett. *maddus*, honey, Gk. *μέθυ, methy*, mead, Av. *madu*, wine, Skt. *madhu*, honey, sweet). A fermented liquor made from honey. The honey is mixed with water, malt and often spices added, and fermentation is induced and conducted in the usual manner. Mead has been in use from very ancient times and was known equally to the nations of southern Europe and the barbarous tribes of more northern regions. The name is also applied to a beverage flavored with sarsaparilla, and often charged with carbonic-acid gas.

MEAD, Edwin Doak (1849–). An American author and editor, born in Chesterfield, N. H. In 1866 he entered the employ of Ticknor and Fields, the Boston publishers. From 1875 until 1879 he studied at Oxford, Cambridge, and Leipzig, and upon his return to America began to lecture on American literature and politics. In 1883 he became director in Boston of the Old South Historical Work, and in 1889 succeeded Edward Everett Hale as editor of the *New England Magazine*, a position which he retained until 1901. He afterward devoted himself mainly to executive and literary work connected with the cause of international peace. His publications include *The Philosophy of Carlyle* (1881), *Martin Luther: A Study of the Reformation* (1884), *The Influence of Emerson* (1903), and many pamphlets on peace and arbitration.

MEAD, or **MEDE,** Joseph (1586–1638). A Church of England theologian. He was born at Berden, Essex. While a boy at school at Wethersfield he bought a copy of Bellarmine's Hebrew grammar and soon acquired a good knowledge of the language. He graduated at Christ Church, Cambridge, in 1610. In 1613 he was made a fellow of his college and reader of the Greek lectures on Sir Walter Mildmay's foundation, which office he occupied till his death. He was learned in mathematics, medicine, and various branches of natural science, history, antiquities, and the literature and sciences of the East. His chief work was *Clavis Apocalyptica* (1627), translated into English in 1643, which has been called the first rational attempt to interpret the Apocalypse. His complete works were published at London, 1648–52; new edition, with life, 1672. Consult Neal, *History of the Puritans.*

MEAD, Larkin Goldsmith (1835–1910). An American sculptor. He was born at Chesterfield, N. H., and studied under Henry K. Brown, of Brooklyn, N. Y. His earliest work in marble was called "The Recording Angel." In 1857 he modeled the colossal statue "Vermont" for the dome of the State House at Montpelier. "Ethan Allen" adorns the same building. During the Civil War he was for six months an artist for *Harper's Weekly.* After 1862 he resided chiefly at Florence. There he executed a number of statuettes, such as "Echo," "La Contadinella," "Sappho," "Mountain Boy," and "The Returned Soldier" (1866). His other works include the Lincoln monument at Springfield, Ill.; the soldiers' monument at St. Johnsbury, Vt.; "Columbus' Last Appeal to Isabella," Sacramento, Cal.; the statue of Ethan Allen (1874) in the National Statuary Hall at Washington; and the group, "The Return of Proserpine from the Realms of Pluto," in the main entrance of the agricultural building at the Columbian Exposition at Chicago. He executed a group of the Stanford family for Stanford University, California. Among his other works of note were a colossal statue, "The Mississippi River," for the Minneapolis courthouse, and portraits in bronze of John Hay, W. D. Howells, and Henry James. His work is characterized by fine feeling for effect, by precise and conscientious though somewhat harsh modeling, and by an abundance of detail. He was a brother of William Rutherford Mead.

MEAD, Richard (1673–1754). An English physician. He was born at Stepney and at an early age entered the University of Utrecht. After three years' study he went to Leyden, where he entered upon the study of medicine under the noted Professors Pitcairne and Hermann. Having taken his degree of doctor of philosophy and physics, he returned to Stepney and began the practice of his profession in 1696. In 1703 Dr. Mead was made a member of the Royal Society and a lecturer at St. Thomas's Hospital. His reputation both as a practitioner and as a writer on medical subjects was very great, and he was in constant correspondence with the most eminent scientists of the day in his own and foreign countries. He received the appointment of physician in ordinary to George II, and in 1716 was elected a fellow of the College of Physicians. In addition to his acquirements as a physician Dr. Mead devoted much time to the study of natural history, antiquarianism, and numismatics. He was an intimate friend of Bentley, Pope, and Johnson. Some of his works were first published in Latin and subsequently translated into English, French, and Italian. They include *A Mechanical Account of Poisons* (1702); *A Short Discourse concerning Pestilential Contagion* (1720; 8th enlarged ed., 1722); and *Monita et Præcepta Medica* (1751).

MEAD, William Rutherford (1846–). An American architect, born in Brattleboro, Vt., a brother of Larkin G. Mead. He graduated from Amherst College in 1867 and studied architecture under the late Russell Sturgis (q.v.), after which he spent nearly two years in foreign travel and study. He began the independent practice of architecture in 1872 in partnership with Mr. Charles F. McKim (q.v. for some of the most notable works of the firm). Two years later Mr. W. B. Bigelow joined them, but severed this connection in 1878; and in 1879, on the addition of the late Stanford White (q.v.) to the firm, it assumed the name of McKim, Mead, and White, by which it is still known. The hand and influence of Mr. Mead are traceable in all the works of this distinguished firm, though he never assumed supreme control of any of them. He became fellow of the American Institute of Architects (1902), a member of the American Academy of Arts and Letters, and president of the American Academy in Rome. In 1902 he received the degree of LL.D. from Amherst College, was elected to the National Academy of Design in 1910, and received the Gold Medal of Honor of the National Institute of Arts and Letters.

MEADE, mēd, George Gordon (1815–72). An American soldier, born of American parentage at Cadiz, Spain, Dec. 31, 1815. He attended school in Philadelphia, Washington, and Baltimore; graduated at West Point in 1835, and served in the Seminole War. In October, 1836, he resigned from the army, adopted the profession of civil engineer, and between 1837 and 1842 was employed as an assistant engineer in the surveys made by the United States government of the delta of the Mississippi, the Texas boundary, and the northeastern boundary of the United States. In 1842 he was reappointed to the army as a second lieutenant in the corps of topographical engineers. On the breaking out of the war with Mexico, when General Taylor crossed the Rio Grande, he was ordered to the front and served with distinction throughout the war. Later he was employed in superintending river and harbor improvements and in the construction of lighthouses on Delaware Bay and off the coast of Florida. He was promoted to be first lieutenant in 1851 and captain in 1856 and had charge of the national survey of the northern lakes until 1861. At the outbreak of the Civil War he was ordered to Washington; was commissioned brigadier general of volunteers Aug. 31, 1861, and was placed in command of the second brigade of the Pennsylvania reserve corps. He was in the action at Dranesville, Va., December 20; was at Mechanicsville, June 26, 1862, and at the battle of Gaines's Mill on the following day; and served with his reserves throughout the Peninsular campaign, being severely wounded, June 30, at the battle of Frazier's Farm. On August 29–30, having recovered from his wound, he was engaged in the second battle of Bull Run, and in September took command of a division of the First Army Corps. At the battle of Antietam he was slightly wounded and had two horses shot under him. In recognition of his gallantry in this battle he received command of the Fifth Army Corps and on Nov. 29, 1862, was commissioned major general of volunteers. He was engaged in the battles of Fredericksburg and Chancellorsville, covering the retreat at Chancellorsville with his corps and guarding the crossings until the entire army was safely over the Rappahannock. On June 28, 1863, he was unexpectedly ordered to succeed General Hooker in the command of the Army of the Potomac. The main army of the Confederates, under General Lee, had invaded Pennsylvania, and it devolved upon Meade to arrest this movement and drive back the enemy. Portions of Lee's army had reached York, Carlisle, and the Susquehanna; but upon the advance of the Federal army these were called in. On July 1 the hostile armies met at Gettysburg and a three days' battle ensued, which resulted in the utter discomfiture of Lee, who, however, was not pursued with any vigor. (See Gettysburg, Battle of.) For this victory Meade was publicly thanked by a resolution of Congress passed Jan. 28, 1866. From May 4, 1864, to April 9, 1865, General Meade commanded the Army of the Potomac, under General Grant, through the bloody struggle in the Wilderness and until the surrender of Lee. On Aug. 18, 1864, he was commissioned a major general in the United States army. At the close of the war he was placed in command of the Military Division of the Atlantic, which command he retained from July 1, 1865, to Aug. 6, 1866. During the years 1866–67 he was in command of the Department of the East, and subsequently of the third military district of the South (under the reconstruction laws). From March, 1869, until his death he was again in command of the Military Division of the Atlantic. He died on Nov. 6, 1872. Citizens of Philadelphia presented him with a house, and after his death a fund of $100,000 was collected by subscription and presented to his family. Consult R. M. Bache, *Life of General G. G. Meade* (Philadelphia, 1897), and I. R. Pennypacker, *General Meade* (New York, 1901), in the "Great Commanders Series."

MEADE, Richard Worsam (1837–97). An American naval officer, born in New York City. He entered the navy as midshipman in 1850; became navigating officer of the *Cumberland* in 1856; coöperated with General Sherman as commander of a division of the squadron off Helena, Ark., in breaking up guerrilla warfare on the Mississippi River in 1862–63; commanded the marines in New York City during the draft riots there in July, 1863; and subsequently served with distinction in the South Atlantic and West Gulf blockading squadrons. After the close of the war until 1868 he acted as head of the department of seamanship and naval tactics at the United States Naval Academy. He then served for a time in Alaska, and from 1871 to 1873, in command of the *Narragansett*, cruised in the Pacific. After his return he acted as president of the board appointed to revise the ordnance instructions of the navy. He was promoted to be captain in March, 1880, and to be commodore in May, 1892. He was naval commissioner of the government to the World's Columbian Exposition at Chicago, and succeeded Admiral Stanton in command of the North Atlantic squadron in 1894. In the same year he was promoted to be rear admiral, but a disagreement between him and the Navy Department led to his retirement at his own request in May, 1895.

MEADE, William (1789–1862). A Protestant Episcopal bishop of Virginia. He was born near Millwood, Va., graduated at Princeton in 1808, studied theology, and was ordained priest in 1814. He was appointed assistant minister at Millwood, was afterward rector of Christ Church, Alexandria, Va., and in 1821 returned to Millwood as rector. In 1829 he was appointed Assistant Bishop and in 1841 Bishop of Virginia. He contributed liberally to the foundation of the Diocesan Theological Seminary at Alexandria. He was an active member of the American Colonization Society and was one of the founders of the Evangelical Knowledge Society (1847). In 1861 he labored to prevent the secession of Virginia, but acquiesced when that action was finally determined upon. Meade was strongly opposed to the Oxford Movement (q.v.) in the Church of England, and in his efforts to raise the Protestant Episcopal church in Virginia from a condition of spiritual apathy, which were successful, he was influenced by Evangelical or Low Church sympathies. (See Evangelical.) His principal literary productions are: *Family Prayers* (1834); *Letters on the Duty of Affording Religious Instruction to those in Bondage* (1834); *Companion to the Font and the Pulpit* (1846); *Lecture on the Pastoral Office* (1849); *Lectures to Students* (1849); *Reasons for Loving the Episcopal Church* (1857); *Old Churches, Ministers, and Families of Virginia* (1857); *The Bible and the Classics*

(1861). A memorial of Bishop Meade was published by the coadjutor bishop of his diocese, the Rev. Dr. John Johns (Baltimore, 1867).

MEADOW, mĕd'ō (AS. *mœd*, OFries. *mede*, meadow, OHG. *mata-screch*, grasshopper, Ger. *Matte*, meadow; probably connected with OHG. *mæn*, Ger. *mähen*, AS. *māwan*, Eng. *mow*, Lat. *metere*, Gk. ἀμᾶν, *aman*, to reap, OIr. *meithel*, party of reapers). A tract of low, level land, especially upon the margin of a stream, in which the dominant plant forms are grasses and sedges. Meadows are very characteristic of New England, northern Europe, and many mountainous regions. Some writers hold that meadows are the product of artificial conditions; others that they are natural formations. It seems scarcely to be doubted that alpine meadows are natural, either because trees fail to obtain a foothold on account of snowslides or because the snow remains long in such situations and grasses take possession during the short summer if there is sufficient soil moisture. Meadows may be due to continued grazing or mowing, because tree vegetation may be kept down by such agencies. On the other hand, they are extremely unfavorable for the development of trees, which might fail to develop even in a region specially favorable to tree growth, since seeds would germinate with difficulty. Hence a meadow may perpetuate itself naturally, even though originally artificial. Besides the grasses other plants are found in meadows, among which are species of vernal herbs, which mature before mowing time arrives. Some botanists, as Wettstein, believe that plants have acquired certain habits which adapt them to life in meadows that are annually mowed.

Since 1899 the term "meadow" has been used in the soil surveys of the United States government to designate various types of wet land, even some covered with trees.

From an agricultural standpoint a meadow is either a lowland or an upland field upon which hay or pasture grasses grow from self-sown or hand-sown seed. They are also permanent or temporary as well as natural and artificial. When the grasses are fed down by stock, meadows are called pastures. For artificial meadows the soil is plowed deep and brought to the very best condition before the seed is sown. A rich, clean soil of fine tilth adds greatly to the weight of the crop. Frequently grass seed is sown with small grain as a nurse crop, but the practice is not always successful, since the faster-growing cereal deprives the young grasses of light and they consequently fail. The best method is to sow the grass seed broadcast without a nurse crop. Timothy, redtop, fescue grass, orchard grass, oat grass, rye grass, blue grass, bent grass, and many other grasses are very commonly grown either as mixtures or alone. Timothy is often grown as a single crop. Clover is frequently added to a grass mixture. When a mixture is grown for hay, grasses which bloom about the same time are selected, but when used for pasture species that ripen at different times are preferred. Mowing machines and other implements have quite revolutionized the method of haymaking within the last 50 years and have enabled the farmer to make use of more extensive meadows than when all the work was done by hand. See also HAY; PASTURE. Consult Joseph E. Wing, *Meadows and Pastures* (Chicago, 1911).

MEADOW FESCUE. See FESCUE.

MEADOW FOXTAIL. A valuable fodder grass. See FOXTAIL GRASS.

MEADOW GRASS. A name applied to many of the numerous species of the genus *Poa*, which are chiefly natives of the temperate and colder parts of the world and form a very important part of the herbage of pastures and meadows. Most of the species are slender, nutritious, and rather abundant. The rough-stalked meadow grass (*Poa trivialis*) and the blue grass or smooth-stalked meadow grass (*Poa pratensis*) are among the most common and are esteemed among the most valuable for sowing in mixtures of grasses for pasture and for lawns. The Abyssinian meadow grass (*Poa abyssinica*), an annual species, yields immense returns of herbage in its native country. *Poa annua* is a common species, frequently found as a weed in cultivated grounds, but it is employed with advantage for sowing on lawns in towns and wherever from any cause perennial grasses are apt to be destroyed. It is often to be seen in flower, and is said to ripen its seeds in four or five weeks from the time of sowing. It is very abundant in most parts of Europe. Canada blue grass, *Poa compressa*, is a common species, the seed of which is often used as an adulterant of the true blue grass or smooth meadow grass. The name meadow grass is sometimes given to species of *Alopecurus*, which are more commonly known as foxtail grass (q.v.). See BLUE GRASS.

MEADOW LARK. A North American starling-like bird frequenting meadows and open places. Few American song birds are more general favorites. This is not a lark at all, but belongs to the family Icteridæ and is therefore a near relative of the bobolink, oriole, and blackbird. The genus (*Sturnella*) contains only two well-marked species, the common meadow lark (*Sturnella magna*) of the eastern United States and the Western meadow lark (*Sturnella neglecta*), but there are two subspecies of the Eastern bird which differ but slightly from the true *magna magna*. The common meadow lark ranges in summer from New Brunswick to the Gulf of Mexico, east of the Mississippi, and even in winter only retreats as far south as southern New England and Illinois. The Western meadow lark occupies the western half of the continent and extends southward into western Mexico, while other subspecies occur in Cuba and Mexico. Meadow larks are about 10¾ inches in length, with large feet and a long, straight, sharp bill. The feathers of the upper surface are prevailingly black, with rufous and buff borders and tips, so that the whole upper surface is variegated with those three colors. The throat, breast, and anterior half of the belly are bright yellow, with a prominent black crescent about the middle of the breast. The tail feathers are narrow and short, and when the bird takes to the wing the white outer ones become very conspicuous. The Western meadow lark has lighter upper parts, more perfect, less confluent bars on the tail feathers, and the sides, as well as the front, of the throat are yellow. The notes of the meadow lark are clear and strong—a sort of cheerful whistle—but Chapman says that they differ in different localities, so that the notes of the Florida birds are markedly different from those heard in the Northern States. The notes of the Western meadow lark are famous for their musical quality. The contrast between its brilliant song and that of the Eastern form, added to other peculiar traits, is convincing of the full

specific rank of the Western bird. Consult on this point Coues, *Birds of the Northwest* (Washington, 1874).

Meadow larks feed upon both seeds and insects, which they obtain upon the ground in the open meadows and fields. In summer they are not gregarious, though several pairs may be seen in neighboring fields; but in winter they are often found in swamps in some numbers. The nest is built upon the ground and is composed of grasses so arranged as to arch over at the top and make a more or less completely covered shelter. The eggs (see Colored Plate of Eggs of Song Birds) are four to six in number, large for the size of the bird, white, marked chiefly at the larger end with bright brown. Although not a game bird, meadow larks are frequently hunted both for sport and food, but they are not especially desirable for the table, and the shooting of them is nearly everywhere illegal. See Plate of Larks and Starlings.

MEADOW MOUSE. The American name for the short-tailed wild mice of the genus *Microtus* of the class called voles in Europe. The commonest species is the widespread *Microtus pennsylvanicus*, called in the older books *Arvicola riparia*. Many other species and subspecies are catalogued. See Plate of Mice and Jerboas in article Mouse.

MEADOW MUSSEL, or **Horse Mussel.** See Mussel.

MEADOW RUE. See Plate of Mint.

MEADOW SAFFRON. A European plant. See Colchicum.

MEADOW SNIPE. A gunner's name for snipe frequenting grassy places, especially Wilson's and the jacksnipe. (See Snipe.) The marsh hens and corn crake are often called meadow crake or drake, meadow clapper, etc., by sportsmen. See Pectoral Sandpiper.

MEADOW SWEET. A plant. See Spiræa.

MEADOW VETCHLING. See Lathyrus.

MEAD'VILLE. A city and the county seat of Crawford Co., Pa., 122 miles by rail north of Pittsburgh, on French Creek and on the Erie, the Northwestern Pennsylvania, and the Bessemer and Lake Erie railroads (Map: Pennsylvania, A 2). It is the seat of Allegheny College (Methodist Episcopal), established in 1815, and of the Meadville Theological School (Unitarian), opened in 1844; and has four schools of music, two city hospitals, a fine courthouse, and a public library. Other noteworthy features are Huidekoper, Diamond, and Oakwood parks, and three iron bridges. Meadville is in a fertile agricultural valley, and its industries are represented by railroad shops of the Erie, iron works, malleable-iron works, vise works, planing and flour mills, breweries, a distillery, and manufactories of automatic tanks and cans, tools, brass and iron castings, chemicals, lumber, mantels, corsets, vaults, etc. The city is also an important market and a shipping point for the oil regions. The commission form of government, providing for a mayor and four councilmen, was adopted in 1913. Settled in 1788, Meadville became a borough in 1823 and was chartered as a city in 1866. The municipality owns the water works and electric-light plant. Pop., 1900, 10,291; 1910, 12,780; 1920, 14,568.

MEAFORD, mē'fērd. A lake-port town of Grey Co., Ontario, Canada, on Nottawasaga Bay, an inlet of Georgian Bay, Lake Huron, 20 miles west-northwest of Collingwood, on the Grand Trunk Railway (Map: Ontario, D 4). It has a fine harbor, with a depth of 20 feet of water. There is an armory. The industrial establishments include brickyards, fruit evaporators, grain elevator, flour mills, tannery, canning factory, and manufactories of builders' materials, furniture, blankets and yarns, flooring, boxes, foundry and machine-shop products. There is excellent steamboat communication with western ports. Electric power is available for manufacturing. The town is situated in an apple-growing district. Pop., 1901, 1916; 1911, 2811; 1915 (local est.), 3200.

MEAGHER, mā'hēr, Thomas Francis (1823–67). An Irish-American soldier. He was born at Waterford, Ireland, Aug. 3, 1823, and was educated at the Jesuit College of Clongowes Wood, County Kildare, and at Stonyhurst College, Lancashire, England. On the outbreak of the French revolution of 1848 he was sent to Paris by the Irish Confederation to congratulate the republican leaders. On his return he was arrested on a charge of sedition and was later tried for high treason, found guilty, and sentenced to death, but subsequently the sentence was changed to banishment for life to Tasmania. Transported thither, he escaped in 1852 and succeeded in reaching New York. Subsequent to 1855 he practiced law in New York, and in 1856 became editor of the *Irish News*. At the beginning of the Civil War in 1861 he organized a company of zouaves, joined the Sixty-ninth New York Volunteers, was acting major at the first battle of Bull Run, and after serving the three months of the first call, returned to New York and organized the Irish brigade, being commissioned brigadier general on Feb. 3, 1862. He served in the latter part of the Peninsular campaign and participated in the second battle of Bull Run and in the battles of Antietam and Fredericksburg, in the last of which he was seriously wounded while leading a charge on Marye's Heights. After Chancellorsville he resigned because little was left of his brigade, but he was recommissioned in 1864 and for some time was in command of the District of Etowah. He was appointed secretary of Montana Territory in 1865, and in 1866 served as Governor pro tempore. On July 1, 1867, he fell from the deck of a steamer, at Fort Benton, on the upper Missouri, and was drowned. He published *Speeches on the Legislative Independence of Ireland* (1852) and *Last Days of the Sixty-Ninth in Virginia* (1861). Consult M. Cavanagh, *Memoirs of General Thomas Francis Meagher, with Selections from his Speeches, Lectures, etc.* (Worcester, Mass., 1892).

MEAGRE, mē'g'r, or **MAIGRE,** mā'g'r (OF., Fr. *maigre*, lean, from Lat. *macer*, lean; connected with Gk. *μακρός, makros*, long). Any of several European drumfish of the world-wide genus *Sciæna*. The typical meagre is *Sciæna aquila*, which ranges from Great Britain to the coasts of the Indian Ocean, but is best known about the Mediterranean Sea, where it has been very highly esteemed since the days of antiquity. It reaches a length of 6 feet, but ordinary specimens are about half that. The color is brownish gray on the back, with silvery gray sides and a white abdomen. It has always been highly valued, especially by the Italians, but to English palates the flesh seems rather dry and tasteless. A closely related species is the umbrine (*Sciæna umbrina*), also one of the favorite food fishes of the Mediterranean, and occasionally taken near Great Britain and elsewhere.

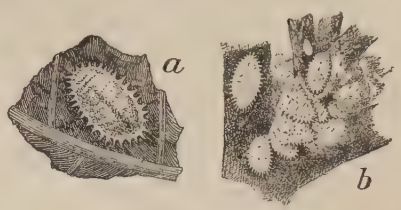
MEAL. Sometimes used to mean ground wheat (flour), but more often to mean some other ground cereal, as oat meal or corn meal, or similar product, as cassava meal or banana meal. See BREAD; FLOUR; MAIZE, *Feeding Value.*

MEAL, COTTONSEED. See COTTONSEED AND ITS PRODUCTS.

MEAL MOTH. A pyralid moth (*Pyralis farinalis*), cosmopolitan in distribution, which infests milling establishments and storerooms and which in the larval stage feeds upon stored grain, bran, and even straw, and occasionally upon dried plants in herbaria. A closely allied species (*Pyralis costalis*) is known as the clover-hay worm. There are probably four generations annually. The eggs are laid in small clusters and the larvæ live in long tubes constructed of silk and particles of meal and other material, and while thus incased in the obscure corners in which they habitually live they are completely concealed from observation. Another species, commonly called the Indian-meal moth (*Plodia interpunctella*), in the larval stages feeds not only upon Indian meal, but upon all sorts of dried vegetable products, such as peas, beans, nuts, acorns, and dried fruit, and upon root and bark preserved in drug stores.

MEAL WORM. The larva of either one of two or more beetles of the family Tenebrionidæ, which, originally of Asiatic or European origin, have become cosmopolitan enemies of meal, flour, bran, and other mill products. They develop in refuse grain dust accumulated in dark corners and out-of-the-way places in flour mills, bakeries, stores, and stables. They are also of importance as enemies to ship biscuits and other kinds of crackers. These meal worms are easily bred in confinement, have a commercial value to the bird dealer, and are kept on sale in bird stores as food for soft-billed cage birds. The yellow meal worm (*Tenebrio molitor*) is the commonest of these insects. The beetle is over half an inch in length, somewhat flattened, shining, and nearly black; and the larva is cylindrical, slender, over an inch long, and has a waxy appearance and a yellowish color. The eggs are white, bean-shaped, about one-twentieth of an inch long, and are deposited in the meal or other food substance. The dark meal worm (*Tenebrio obscurus*) is very similar to the yellow meal worm, but dull black in color; it has been found in black pepper, phosphate fertilizers, cottonseed and cotton meals, and in commercial soda ash. Perfect cleanliness about storerooms and milling establishments is the best preventive of the attacks of these insects, and rooms or buildings once infested may be freed by the use of disulphide of carbon or hydrocyanic acid gas. Consult F. H. Chittenden, in *United States Department of Agriculture, Division of Entomology, Bulletin No. 4,* N. S. (Washington, 1896).

MEALY BUG. A naked scale insect of the genus *Dactylopius,* so called because of the white, meal-like powder which covers it. Like other members of the subfamily Coccinæ, the body is not covered by a scale, and the females keep the form of the body with the segments distinct until the end, and also retain the power of motion. The antennæ of the female are six-jointed in the larva and eight-jointed in the adult; the male larva has seven-jointed antennæ. The tarsi are furnished with four digitules, and the anal ring with four hairs. Most of the mealy bugs are tropical or subtropical, but several species breed abundantly out of doors in the southern United States, e.g., *Dactylopius citri,* a well-known enemy of orange groves in Florida. It is, however, as greenhouse pests in temperate



THE MEALY BUG.

a, female (enlarged); *b,* group of mealy bugs on a tree.

regions that the mealy bugs are best known. They secrete a certain amount of honeydew, and are frequently attended by ants, which are responsible for much of the spread of mealy bugs in greenhouses, since they attend the young bugs and carry them to appropriate feeding grounds. The mealy secretion which covers these bugs renders it difficult to destroy them with some of the insecticide mixtures, but a dilute kerosene-soap emulsion is efficacious. Consult J. H. Comstock, *Report of the United States Department of Agriculture* (Washington, 1880), and J. H. and A. B. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, N. Y., 1909). See COCCIDÆ.

MEALYWING. A bug of the family Aleyrodidæ, so called from the white, meal-like excretion on the wings of the adult insect. The mealywings are allied to the aphids and scale insects. They are very small, frequently minute, and infest the leaves of plants, both of herbs and of trees, usually on the lower side. In their early stages they are scalelike and much resemble some of the Coccidæ. Unlike the Coccidæ, the two sexes develop in a similar manner, and both males and females are active and have two pairs of wings. In the early stages the body may be more or less covered with wax. The antennæ of the adults are seven-jointed, and the eyes are usually constricted near the middle, being sometimes entirely divided. The wings are broad and well rounded, and may be clear or spotted and banded in different ways. About 150 species are known, of which more than 50 occur in the United States. The most destructive species is *Aleyrodes citri,* which attacks the orange and lemon in Florida and Louisiana and causes the leaves to turn yellow and die. They secrete a considerable amount of honeydew, which attracts the spores of smut fungi, resulting ultimately in the blackening of the foliage of the orange trees.

MEAN (OF. *meien, moien,* Fr. *moyen,* from Lat. *medianus,* middle, from *medius,* middle). In mathematics, a term interpolated between two other terms of a series. The *arithmetic* mean of two quantities a, b, is $\frac{a+b}{2}$, their *geometric* mean is $\sqrt{ab}$, and their *harmonic* mean is $\frac{2ab}{a+b}$. The arithmetic mean is greater than the geometric mean, and the latter is greater than the harmonic mean. In averaging observed results of physical experiments the mean result may be found by dividing the sum of the observed results by the number of observations. But in case the observed results are not regarded as equally accurate, certain numbers may be as-

signed to these results representing their relative accuracy; e.g., four men, A, B, C, D, have determined the area of a triangle and found it to be 19.50, 19.75, 20, and 20.25 square meters, respectively. If the relative accuracy of their work may be represented by the numbers 3, 2, 2, 4 respectively, the area of the triangle will be taken as

$$\frac{3 \cdot 19.50 + 2 \cdot 19.75 + 2 \cdot 20 + 4 \cdot 20.25}{3 + 2 + 2 + 4} = 19.91.$$

For further practical methods of averages, see LEAST SQUARES, METHOD OF; GEOMETRIC MEAN.

MEAN CENTRE OF POINTS, or MEAN POSITION, CENTRE OF. See CENTRE.

MEAN'DER. A river of Asia Minor. See MÆANDER.

MEANDER, or MÆANDER. A classic form of running ornament, substantially the same as the Greek fret (q.v.), composed of elements successively turning sharp angles (usually right angles) so as to wind in and out while progressing as a whole in one direction. The name is derived from the river Mæander (q.v.), which was famed for its devious windings. The Greek wave, or Vitruvian scroll, is its curvilinear analogue.

MEAN DURATION OF LIFE. See LIFE, MEAN DURATION OF.

MEAN'ING (from *mean,* AS. *mœnan,* OHG. *meinan,* Ger. *meinen,* to think; connected with OChurch Slav. *mĕniti,* Skt. *man,* to think). The mental processes that constitute the unanalyzed consciousness of ordinary, everyday experience are always surcharged with meaning or significance. Mind, as it is given, is mind in function, mental stuff that stands for, represents, symbolizes, refers to objects and events in the outside world. The value and validity of such objective reference form a question for epistemology. (See KNOWLEDGE, THEORY OF.) The psychological problem, on the other hand, is to determine, first, whether meaning is intrinsic to mental process, and, secondly, how meaning is represented in consciousness.

The first of these questions must, apparently, be answered in the negative; there are many facts which lead us to the view that meaning is extrinsic and not intrinsic to mental process. 1. A meaning may be added to a given experience. A diagram in a scientific book lacks a meaning until we read the legend beneath it; a particular tonal experience may mean "sound," "whistle," "fire," or "fair weather," and we may add as many other meanings as we like. 2. A meaning may be observed to "grow" or to develop; as one follows the progress of a sketch beneath the artist's hand, or reads and rereads a complex argument, the meaning of lines and colors, or of successive sentences, slowly "dawns" upon one. 3. It is possible to strip the meaning from an item of experience; if a word is repeated aloud many times over, or if a printed word is stared at for some time, the sound or sight presently becomes strange and the familiar meaning drops away. (For like phenomena in the sphere of pathology, see APHASIA.) 4. Occasionally mental process and meaning are disjoined in time; we often ask to have a statement repeated, but before it is repeated the meaning has come. It seems clear, therefore, that meaning and mental process are separable; and the further treatment of meaning, in its own right, may therefore be left to logic.

There remains, however, the second psychological problem: to discover how meaning is represented in consciousness. It follows from the previous discussion that no single element of mind, no isolated sensation, can mean; meaning will appear only when some other mental process is added or accrues to it. The accruing process, as context or setting, may then "give" a meaning to the first. Analysis shows, in fact, that when meaning is consciously present the experience divides into "core" and "fringe," into presentation proper and vehicle of meaning. Let us suppose, for the sake of illustration, that two persons, A and B, are walking along a lonely road at night; that A is unfamiliar with the region and is therefore apprehensive lest wild animals may be in the neighborhood, but that B knows the country thoroughly and has no such fear. Both hear a sound in the bushes, and the two auditory experiences are to all intents and purposes identical, yet A takes the sound to mean "bear," while B interprets it, perhaps, as "dog." The associative supplementing or imaginal fringe of the presented sound differs, and this difference places a different meaning on the core of the experience. The processes of the "fringe," whatever they may turn out to be on further psychological analysis, are the context or setting of the presentation and the vehicle of its meaning.

If we now proceed to ask how this functional differentiation of core and fringe has come about we must go for an answer to biology. The organism is placed within an environment, which affects it primarily by way of the organs of sense, and to which it responds primarily by way of movement. We may assume, then, that meaning is at first carried by kinæsthesis: some environmental stimulus sets up a sensory process, the organism meets the physical situation by instinctive movement, and the "feel" of the movement is the context of the presentation. Children, we may note, begin to define objects in terms of motor response: a knife is what you cut with, a bag is what you put things into. But as evolution proceeds situations become more complicated, and may be internal as well as external, mental as well as physical. Kinæsthesis, while it remains important, ceases to be the sole carrier of meaning; all sorts of processes are pressed into that service; so that, in the instance taken, the meaning "bear" may have been carried by a verbal image and an organic shudder, the meaning "dog" by a fleeting visual image of some familiar animal.

We have not yet, however, exhausted our illustration. A and B, it is plain, are subject to different determining tendencies; the one is apprehensive of danger, the other feels himself secure. These tendencies determine the nature of the associative supplementing, and are thus responsible for the difference of meaning which comes to consciousness as "bear" and "dog." It must not be supposed, however, that meaning is always of this conscious sort. The habitual situations of everyday life are very often taken meaningfully, although their meaning has no discernible representation in consciousness: we avoid a puddle in the path, we open a book and read, we feel a draft and put down the window, without any supplementary processes that mean wet feet, or the getting of information, or an impending cold. When the situation is new every presentation has its conscious context; but as time goes on, and the same situation is

repeated again and again, this context gradually fades out, until ultimately nothing remains but a nervous predisposition, and meaning is carried in purely physiological terms.

Consult: William James, *Principles of Psychology* (2 vols., New York, 1899); E. B. Titchener, *Experimental Psychology of the Thought Processes* (ib., 1909); id., *Textbook of Psychology* (ib., 1910); W. B. Pillsbury, *Essentials of Psychology* (ib., 1911); G. F. Stout, *Manual of Psychology* (London, 1913).

MEANS SMOKE TELEGRAPH. See MILITARY AËRONAUTICS.

MEARES, mērz, JOHN (c.1756–1809). An English navigator. He entered the navy in 1771, served against the French in the West India Islands, and at the conclusion of peace in 1783 became captain in the merchant service. He went to India and formed at Calcutta what was called the Northwest America Company for opening trade with Russian America. In 1786 he explored a part of the coast of Alaska. He went to China by way of the Hawaiian Islands and entered Nootka Sound (1788). The next year he sent to Nootka Sound three ships which were seized by the Spaniards on the ground that Englishmen had no right to trade in those waters. The act caused great excitement in England and a large fleet known as the Spanish Armament of 1790 was collected to punish the Spaniards, who saved themselves only by making ample reparation. Meares published *Voyages Made in the Years 1788 and 1789 from China to the Northwest Coast of America* (1790).

MEARIM, mā'ā-rēn'. A river in the State of Maranhão, Brazil, rising in the Serra do Negro and flowing north into the Bay of São Marcos near the city of Maranhão (Map: Brazil, J 4). It is about 680 miles long and is navigable to small vessels as far as Barra do Corda.

MEARNS, mērnz. A county of Scotland. See KINCARDINESHIRE.

MEARS, mērz, HELEN FARNSWORTH (1878–1916). An American sculptor. She was born at Oshkosh, Wis., and studied at the State Normal School in Oshkosh and art in New York and Paris. Her most important works include a marble statue of Frances E. Willard (1905, Capitol, Washington); portrait reliefs of Edward MacDowell (Metropolitan Museum, New York) and Augustus Saint-Gaudens; portrait busts of George Rogers Clark and William L. G. Morton, M.D. (Smithsonian Institution, Washington). In 1904 her "Fountain of Life" (St. Louis Exposition) won a bronze medal. She made New York her residence and exhibited there and in Chicago.

MEARS, JAMES EWING (1838–). An American surgeon. Born at Indianapolis, he received his education at Trinity College, Conn. (A.M., 1861; LL.D., 1908), and Jefferson Medical College, Philadelphia (M.D., 1865). During the Civil War he served as captain and as medical cadet and practiced in Philadelphia after 1865. From 1870 to 1898 he was professor of anatomy and surgery at the Pennsylvania College of Dental Surgery and held the office of surgeon in chief of the Pennsylvania National Guard. He contributed largely to the surgical journals and is author of *Practical Surgery* (1878; 2d ed., 1885).

MEASLES, mē'z'lz (from MDutch *maselen, masselen,* spots; connected with OHG. *masala, masara,* Ger. *Maser,* dim. of OHG. *māsa,* Ger. *Mase,* spot, mark of a wound), known also as RUBEOLA and MORBILLI. One of the group of diseases termed *exanthemata.* (See EXANTHEMA.) It is communicable from person to person and seldom occurs more than once in the same individual. After a period of incubation of about a fortnight, appear headache, slight disturbance of the stomach, rise of temperature towards evening, lassitude, slight injection of the eyes, with trifling coryza. After 48 to 72 hours coryza is marked. In the mouth are seen the signs of the disease, the exanthema, "Koplik's spots." These are isolated rose-red spots, with a minute bluish-white centre on normally colored mucous membrane.

The characteristic eruption usually appears upon the fourth day from the commencement of the febrile symptoms and the catarrh, seldom earlier, but not infrequently some days later. It is a rash, consisting at first of minute red papulæ, which, as they multiply, coalesce into crescentic or irregular patches. It is two or three days in coming out, beginning on the face and neck, and gradually traveling downward. The rash fades in the same order as it occurs, and, as it begins to decline three days after its appearance, its whole duration is about a week. The red color gives way to a somewhat yellowish tint, and the cuticle crumbles away in a fine branlike powder, the process being often attended with considerable itching.

There are two important points in which it differs from smallpox (q.v.), with which in its early stage it may be confounded; they are: (1) that the fever does not abate when the eruption appears, and (2) that the disease is not more severe because the eruption is plentiful or early. The character of the eruption, after the first day, will serve to remove all doubt regarding these two diseases; and the comparative prevalence of either disease in the neighborhood will assist in diagnosis. It is distinguished from scarlet fever (q.v.) or scarlatina (1) by the presence at the outset of catarrhal symptoms, which do not occur in the latter disease, at any rate, prior to the eruption; (2) by the absence of the throat affection, which always accompanies well-marked cases of scarlet fever; (3) by the character of the rash, which in measles presents somewhat the tint of the raspberry and in scarlet fever that of a boiled lobster; which in measles appears in patches and in scarlet fever is universally diffused.

In ordinary uncomplicated measles the prognosis is favorable. The chief danger is from broncho-pneumonia, and in feeble children it often leaves chronic bronchial mischief behind it. No age is exempt from the disease, but it is much more common in childhood than subsequently, a second attack being comparatively rare.

In mild forms of the disease nothing more is requisite than to keep the patient on a low diet, attend to the bowels, and prevent exposure to cold, which is best accomplished by keeping him in bed with the ordinary warmth to which he is accustomed in health. If pulmonary complications appear they must be treated according to their nature. Bronchitis (q.v.), sometimes extending into pneumonia (q.v.), is most to be feared. If the eruption is delayed or disappears prematurely, it may sometimes be brought back by placing the patient in a warm bath. In such cases stimulants are often required. The patient must be carefully protected from exposure to cold for a week or two after the

disease has apparently disappeared, as the lungs and mucous coat of the bowels are for some time very susceptible to inflammatory attacks.

Except for the lesions of the skin there are no characteristic pathological changes in measles. As in other infectious diseases, degenerations in the internal organs, especially in the kidneys, are not uncommon. Otitis media, catarrhal or purulent, is a frequent complication. The process may extend to the mastoid cells, necessitating operation; or a chronic running ear may be left, with partial destruction of the drum and varying degrees of deafness.

Measles is looked upon by the laity as a mild affection, but when it is considered that between 12,000 and 15,000 deaths occur from it every year in the United States, this attitude is hardly justified. The mortality in different epidemics varies between 3 and 50 per cent. Among the well-cared-for and vigorous children of the better classes the disease is not severe, but among the poor, and especially in children living in charitable institutions, it is a veritable scourge. The younger the child, the worse the prognosis. There is a malignant type of the disease, called hemorrhagic, or "black" measles, characterized by a continuously high temperature (107°–109° F.) and subcutaneous hemorrhages, which is almost invariably fatal. As to the specific cause of the disease nothing is definitely known. Canon and Rielicke in 1892 reported the discovery in 14 cases of measles of a peculiar bacillus found in the blood, more rarely in the catarrhal exudate, which they considered specific. These observations as yet lack confirmation. The specific agent, which is believed to be an ultramicroscopic organism, has not been isolated. Consult Henry Koplik, *Diseases of Infancy and Childhood* (3d ed., New York, 1910), and John Ruhräh, *A Manual of the Diseases of Infancy and Childhood* (4th ed., Philadelphia, 1914).

MEASLES, French or German. See German Measles.

MEAS'URE (OF., Fr. *mesure,* from Lat. *mensura,* measure, from *metiri,* to measure). In music, the smallest metrical division of a movement or piece, represented by the notes or rests comprised within two successive bars of the staff. The time value of a measure is a fixed unit, depending on the character of the time which governs the movement. See Musical Notation, *The Bar.*

MEASURE FOR MEASURE. A comedy by Shakespeare, produced in 1604, printed in 1623. The plot is found in Cinthio's "Hecatommithi," in the romance and tragedy *Epitia.* It was used by G. Whetstone in his play *Promos and Cassandra* (1578) and in his prose tales *Heptameron of Civill Discourses* (1582). If Shakespeare used that version, he took from it merely the outline, and may have known the original. The play belongs to the period of *Othello, Hamlet* (the revised), and *King Lear,* which Darmesteter calls his pessimistic period. Though called a comedy, it is gloomy, brightened only by the character of Isabella. After the Restoration it was revised and altered by D'Avenant as *The Law against Lovers* (1662), and later adapted by Gildon (1700).

MEAS'UREMENT of Ships for Tonnage. The measurement of ships to determine their tonnage (q.v.) is now made in practically the same way by all maritime nations. The old rule in the United States was established by Act of Congress in 1799. This provided that the tonnage should be ascertained as follows: from the extreme length in feet deduct three-fourths the breadth; multiply the remainder thus obtained by the breadth and this product by the depth; divide the last product by 95 and the quotient was the register tonnage for payment of dues. In this rule the depth of a double-decked vessel was arbitrarily assumed as one-half the breadth, so that it was to the interest of shipowners to build deep ships without much regard to the effect of the deepening upon other qualities. In Great Britain a somewhat similar rule obtained. The square of the breadth was multiplied by the inboard length and the product divided by 94. This rule had the same effect on ship construction as that of the United States; and the rule is still sometimes employed in yacht and pleasure-boat measurement. Tonnage so obtained is designated as old measurement; thus, 320 tons (O.M.).

In 1835, through the efforts of Mr. Moorsom, an Act of Parliament provided for a more accurate determination of the tonnage of vessels. Instead of a thumb rule which might be—and usually was—very much in error, the measurement of the cubic contents of vessels was effected in accordance with Newton's theorem for the determination of contents of solids bounded by irregular surfaces. This act was followed by the Merchant Shipping Act of 1854, which is the basis of the present practice throughout the maritime world, though some of its provisions have been modified in England as well as elsewhere.

The method of measuring prescribed in this act and subsequent amendments is as follows: measure the length of the ship on the tonnage deck from the inside of the planking or plating at the extreme forward end at the stem to the inside of the planking or plating at the extreme after end at the stern, and deduct the rake of bow and stern in the thickness of the deck so as to reduce the measurement to the length of the ship at the underside of the deck or tops of the beams. This is the "length on the tonnage deck," which deck is the upper one in all ships which have less than three decks and second deck from below in all others. Divide the length obtained as follows: in ships which have a length on the tonnage deck of 50 feet, this length is divided into 4 equal parts; a length of 50 to 120 feet, into 6 equal parts; 120 to 180 feet, into 8 equal parts; 180 to 225 feet, into 10 equal parts; and over 225, into 12 equal parts. The division marks being established, ascertain the depth at the midship division mark; if it exceeds 16 feet, divide it into 7 equal parts; if 16 feet or less, into 5 equal parts. Measure the inside breadth of the ship at each mark and at the upper part of the depth and number them from top to bottom; multiply the second and fourth by 4 and the third by 2; add these products together and to the sum add the first and fifth; multiply the total by one-third the common interval between the breadths and this product will be deemed the transverse area of the upper part of the section. Divide the lower breadth (between the inner bottom, or upper side of double bottom, and the lower division line) into four parts by equally spaced transverse horizontal lines, measure the breadth at the four new points and at the top of the inner bottom, and proceed as before. The sum of the two areas thus deter-

mined is the total transverse area at the point. The transverse areas at the different points (4, 6, 8, 10, or 12 in number) in the length of the ship being determined, they are to be numbered from forward (or aft, either will do), the forward one being at the extreme forward end of the measured length and the other at its extreme after end. Multiply the second and every even-numbered area (except the last) by 4, and the third and every odd-numbered area (except the first) by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the sum so obtained by one-third the common interval between the areas, and the product will be the cubic contents of the ship below the tonnage deck. Add to this the cubic contents of all inclosed spaces above the tonnage deck, including poop, forecastle, deckhouses, between decks, etc. From the total so obtained the following deductions are made: 1. Space exclusively occupied by the crew and the storage of their clothing, etc.; provided that this space does not exceed 20 per cent of the remaining tonnage of the ship; if it is greater than 20 per cent the excess is to be considered as part of the tonnage space. 2. Space framed in above the upper deck for machinery or for admission of light or air. 3. In vessels propelled wholly by sails, any space set apart and used exclusively for stowage of sails, if not exceeding 2½ per cent of the tonnage of the ship. 4. Any space used exclusively for the accommodation of the master. 5. Any space used exclusively for the working of the helm or of anchor gear or for keeping charts, signals, instruments of navigation, and boatswain's stores. 6. Space occupied by donkey engine and boiler if connected with main pumps of ships. 7. Double bottom when not available for cargo, stores, or fuel. 8. Actual engine room and fire room, including shaft alley, but omitting all space not occupied by engines and boilers or necessary for working them. When the actual engine and fire rooms occupy in paddle vessels 20 to 30 per cent of the gross tonnage the deduction is to be 37 per cent of gross tonnage; when the engine and fire rooms occupy 20 per cent or less the deduction may be 37 per cent of the gross tonnage, or 1½ times the actual engine and fire-room space, the option resting with the board of trade; when the space occupied by the propelling machinery, etc., exceeds 30 per cent of the gross tonnage the deduction to be made is 37 per cent of it, or 1½ times the actual engine and fire-room space, the option remaining with the owners. In the case of screw steamers when the space occupied by the machinery and boilers is 13 to 20 per cent of the gross tonnage the deduction is 32 per cent of that tonnage; when the space occupied is 13 per cent or less the deduction is 32 per cent of the gross tonnage, or 1¾ times the actual space, the option remaining with the board of trade; when the space occupied is 20 per cent or more the deduction is 32 per cent or 1¾ times the actual space, at the option of the owners.

The total additions and deductions to the tonnage space having been made, the capacity in cubic feet so obtained is divided by 100, and the result is the *register tonnage* (or *net register tonnage*) of the ship. The *gross register tonnage* is obtained by dividing by 100 the total capacity of the hull and deckhouses without deductions.

When, owing to the presence of cargo or other reason, it is impracticable to measure a vessel as heretofore described, the tonnage is determined as follows: Pass a chain around the hull at the midship section and measure the length under the bottom from the upper deck at one side to the upper deck at the other. Call this the *girth*. Add one-half the girth to one-half the main breadth; square the sum so obtained and multiply the result by the length of the ship from outside the stem to outside the sternpost; multiply this product by .0018 for wooden ships and by .0021 for those built of iron or steel.

By the Act of Congress of May 6, 1864 (taking effect Jan. 1, 1865), the United States adopted the English system with slight changes in details which are thought to conduce to greater accuracy. This act has been supplemented by several others, notably that of March 2, 1895, which makes the American practice almost identical with the English; indeed, the wording of the law is generally the same throughout. In measuring, however, the United States law divides vessels into six classes according to length, and the divisions in each class for measurement of transverse areas are: In Class 1 (vessels under 50 feet length on the tonnage deck) the length is divided into 6 equal parts; in Class 2 (vessels 50 to 100 feet long), 8 equal parts; in Class 3 (vessels 100 to 150 feet long), 10 equal parts; in Class 4 (vessels 150 to 200 feet long), 12 equal parts; in Class 5 (vessels 200 to 250 feet long), 14 equal parts; in Class 6 (vessels over 250 feet long), 16 equal parts. The method of measuring and computing net and gross tonnage is the same as that already described. Two other differences exist. One is the omission from the American act of that paragraph of the British law which provides for the measurement of deck cargoes and adds to the tonnage (for the purpose of determining tonnage taxes) all uncovered or other space occupied by deck cargo. The second point of difference relates to shelter-deck spaces and arises from a provision in section 4151, Revised Statutes (Act of Feb. 28, 1865), by which no part of any vessel used for "cabins or state-rooms, and constructed entirely above the first deck which is not a deck to the hull" is to be measured. This provision seems to have been designed to meet the exceptional conditions of light-draft boats on the western rivers; but as this fact is not stated in the act, the procedure has been applied to all vessels.

The British system of measurement was also adopted by the following countries on the dates given: Denmark, 1867; Austria-Hungary, 1871; Germany, 1873; France, 1873; Italy, 1873; Spain, 1874; Sweden, 1875; Netherlands, 1876; Norway, 1876; Greece, 1878; Russia, 1879; Finland, 1877; Haiti, 1882; Belgium, 1884; Japan, 1884. In some of these the allowance of deductions, particularly that for propelling machinery, differs somewhat from the British rule. The regulations for the measurement of tonnage of vessels passing through the Panama Canal are similar to those for the Suez Canal. The deductions for space occupied by the propelling power and coal bunkers are made according to the so-called "Danube rule" and are considerably less than those provided by the United States, British, German, and French laws. The average difference of the two classes of measurement is about 10 per cent of the gross tonnage. See TONNAGE; PANAMA CANAL.

The most comprehensive and authoritative

treatise on the subject of the measurement of vessels is the report of Prof. Emory R. Johnson, of the Isthmian (Panama) Canal Commission. For further information, consult: *Instructions to Measuring Surveyors* (London, 1891); *Lloyd's Seaman's Almanac* (ib., 1893); *Revised Statutes of the United States*, sec. 4153; and the *Supplements to the Revised Statutes*, also the *Statutes at Large* for 1895. The *Instructions to Measuring Surveyors* gives all the British acts complete with instructions for carrying them into effect, definitions, etc.

MEASUREMENT OF BASE LINES. See GEODESY.

MEASURE OF DAMAGES. The rule of law determining the amount of money which a person whose rights have been infringed is entitled to recover from the wrongdoer as compensation or reparation for the wrong sustained. As damages technically covers only pecuniary compensation, the measure of damages does not include such remedies as the restitution of property, real or personal, which is unlawfully withheld from the one entitled thereto, nor the remedies peculiarly appropriate to equity, as injunction, account, foreclosure of mortgage, etc. The basis of the measure of damages is compensation, as closely as that can be arrived at, for the actual loss sustained by the injured party, but this is often difficult to estimate, as in actions for breach of promise to marry or for the alienation of the affections of a husband or wife, or in that numerous class of cases where mental suffering or injury to the feelings may be reckoned in assessing damages, as well as in cases of willful or malicious wrongdoing where vindictive or punitive damages may be awarded in addition to such as are purely compensatory. While the actual amount of the damages to be recovered in a given case usually rests in the discretion of the jury trying the question, the rules of law fixing the measure of damages which the jury is entitled to award are laid down by the court or judge. For a violation of the rule so prescribed, the verdict of the jury should be set aside and a new trial ordered. See CONTRACT; COURT; DAMAGES; JURY; TORT.

MEASURES. See WEIGHTS AND MEASURES.

MEASURING WORM. Any one of the larvæ of the lepidopterous superfamily Geometridæ, also called loopers. The group is a very extensive one and consists of fragile moths with comparatively large wings. The caterpillars are long and slender, with only one pair of abdominal feet placed upon the ninth segment of the body. There is also an anal pair of feet which function as claspers. The measuring worms walk by moving these two pairs of feet up to the thoracic legs, so that the body forms a large loop, giving the insect the appearance of measuring the surface upon which it is walking. It is this habit which has given the popular names "loopers," "inchworms," etc., and the scientific name Geometridæ to the insects of this group. Measuring worms feed upon the leaves of plants, with the exception of a few which bore into seeds. They are usually protectively colored so as to resemble twigs, and they have the attitude when at rest of holding the body stiff and erect at an angle from the main stem of the plant, so that they almost perfectly resemble twigs. The individuals of the same species vary in color during life, and with some species there is a well-marked dimorphism. In some species the dimorphism is potential, and the future color is settled by some condition occurring during the early life of the larva. Poulton has made a careful study of the attitudes and colors of these larvæ, and rates the value of their protecting influence at a very high point. In one variable English species he states that the dark tint is due to pigment in the skin or immediately below it and the green color to a layer of fat between the hypodermis and the superficial muscles. In some geometrids the adult females are wingless. A marked example of this group is seen in the cankerworm moths of the United States. (See CANKERWORM.) The winter moth (*Cheimatobia brumata*), a species which is common and widespread in Europe and North America, has also a wingless female. One of the currant worms common to Europe and North America (*Eufitchia ribearia*) is a member of this group in which the female is fully winged.

Certain moths of the noctuine series exist whose larvæ lack certain of the middle prolegs and which therefore walk in a looping or measuring manner, but these are not true measuring worms. The cotton caterpillar (*Aletia xylina*) is an example.

Consult: A. S. Packard, "A Monograph of the Geometrid Moths or Phalænidæ of the United States," in Hayden's *Annual Report of the United States Geological Survey*, vol. x (Washington, 1876); Edwards, *Standard Natural History*, vol. ii (Boston, 1884); David Sharp, *Cambridge Natural History*, vol. vi (London, 1899); J. H. and A. B. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, N. Y., 1909).

MEAT (AS. *mete*, Icel. *matr*, *mata*, Goth. *mats*, OHG. *maz*, meat, Ger. *Mass-leid*, aversion to meat). The flesh of animals used as food. Sometimes the word is restricted to the domestic animals, cattle, sheep, pigs, while the term "game" is applied to the flesh of wild animals, and "poultry" to the flesh of domestic fowl. The meat industry is one of very great importance. According to the most reliable data, there were in 1910 on farms and ranches in the United States over 40,000,000 cattle other than dairy cows. (This was only 82 per cent of the number reported in 1900, although this apparent fall was due in part to the fact that the census of 1910 was taken at an earlier date than that of 1900.) In 1909 there were slaughtered nearly 14,000,000 beef cattle, over 6,500,000 calves, 52,000,000 swine, more than 14,500,000 sheep, and some goats, the estimated weight of the dressed carcasses, including the lard of swine, being over 167,000,000 hundredweights.

Meat, i.e., flesh food, consists of the muscular tissue, or lean, and the varying quantities of fat which are found in the different parts of the carcass between and within membranes and tendons. Besides the fat ordinarily visible there is always present more or less of fat in particles too small to be readily distinguished from the lean which surrounds it. These particles can, however, be readily obtained by chemical methods in quantities sufficient to be seen and weighed. The lean part of the meat has practically the same final structure, regardless of its kind and source. All muscular tissue is made up of prism-shaped bundles, which can be divided into smaller and smaller bundles, until finally the muscle fibres or tubes are reached. These irregular tubes vary in diameter from $\frac{1}{1000}$ to $\frac{1}{200}$ of an inch, and are therefore invisible to the

unaided eye. They are held together in bundles by means of connective tissue between and inside which the invisible fat is stored. The envelope or wall of each tube is a very delicate, elastic membrane, composed of nitrogenous material. The walls themselves are comparatively permanent, but their contents are continually undergoing change and renewal.

Meat is very commonly eaten fresh, but large quantities are also salted, smoked, dried, and canned. The meats found in the markets consist of the lean or muscular tissue, connective tissue, or gristle, fatty tissue, blood vessels, nerves, bone, etc. No general statement can be made with regard to the proportion in which these substances occur, as it is found to vary greatly with the kind of animal, with different cuts from the same animal, and with many other conditions. Nearly all meats bought and sold in the markets contain portions not suitable for eating, which may be properly designated as refuse.

Cuts of Meat. The methods of cutting carcasses of beef, veal, mutton, and pork into parts, and the terms used for the different cuts as these parts are commonly called, vary considerably in different localities. The figures for composition quoted below apply in general to cuts as indicated by the accompanying diagrams. These show the positions of the different cuts, both in the live animal and in the dressed carcass as found in the markets. The lines of division between the different cuts will vary slightly according to the usage of the local market, even where the general method of cutting is as here indicated. The names of the same cuts likewise vary in different parts of the country. Thus, the part nearest the ribs of beef is frequently called small end of loin or short steak. The other end of the loin is called hip sirloin or sirloin. Between the short and the sirloin is a portion quite generally called the tenderloin, for the reason that the real tenderloin, the very tender strip of meat lying inside the loin, is found most fully developed in this cut. "Porterhouse steak" is a term frequently applied to either the short steak or the tenderloin. It is not uncommon to find the flank cut so as to include more of the loin than is indicated in the accompanying figures, in which case the upper portion is called flank steak. The larger part of the flank and the rump is very frequently corned, or pickled in brine. In some markets the rump is cut so as to include a portion of the loin, which is then sold as rump steak. The portion of the round on the inside of the leg is regarded as more tender than that on the outside and is frequently preferred to the latter.

The general method of cutting up a side of beef is illustrated in Figs. 1 and 2, which show the relative positions of the cuts in the animal and in a dressed side.

The method of cutting up a side of veal differs considerably from that employed with beef. This is illustrated by Figs. 3 and 4, which show the relative positions of the cuts in the animal and in a dressed side.

Figs. 5 and 6 show the relative positions of the cuts in a dressed side of mutton or lamb and in a live animal.

The method of cutting up a side of pork differs considerably from that employed with other meats. A large portion of the carcass of a dressed pig consists of almost clear fat. This furnishes the cuts which are used for salt pork and bacon. Figs. 7 and 8 illustrate a common method of cutting up pork, showing the relative positions of the cuts in the animal and in the dressed side. The hams and shoulders are more frequently cured, but are also sold as fresh pork steak. The tenderloin proper, which is not indicated in the figure, is a comparatively lean and very small strip of meat lying under the bones of the loin and usually weighing less than a pound. In cutting up pork some fat is usually trimmed off from the hams and shoulders, which is called ham and shoulder fat and is often used for sausages, etc. What is called leaf lard is made from the leaf fat of the peritoneum and the fat about the kidneys and along the belly.

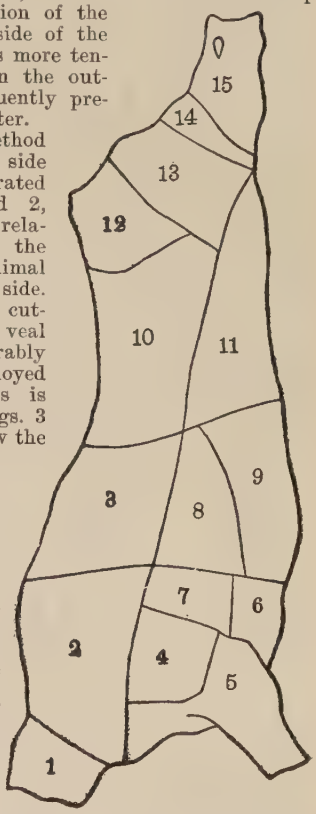


Fig. 2. DRESSED SIDE OF BEEF.

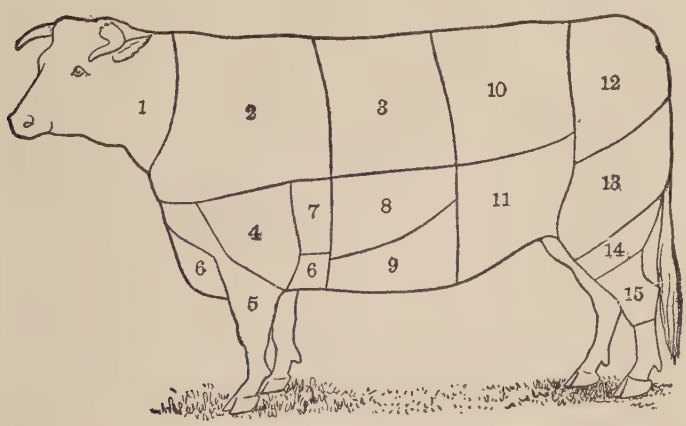


Fig. 1. DIAGRAM OF CUTS OF BEEF (live animal).

1, neck; 2, chuck; 3, ribs; 4, shouldered clod; 5, fore shank; 6, brisket; 7, cross ribs; 8, plate; 9, navel; 10, loin; 11, flank; 12, rump; 13, round; 14, second cut round; 15, hind shank.

The table on page 305 shows the average composition of a number of kinds and cuts of meat and also that of a number of meat products.

The amount of refuse, chiefly bone, in meat as purchased, varies greatly with the different

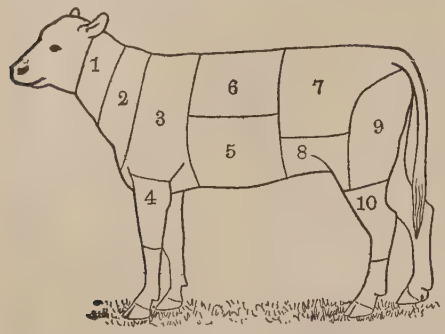


FIG. 3. DIAGRAM OF CUTS OF VEAL.

1, neck; 2, chuck; 3, shoulder; 4, fore shank; 5, breast; 6, ribs; 7, loin; 8, flank; 9, leg; 10, hind shank.

cuts. Judged by the averages of a large number of analyses, it ranges in beef from nothing in tenderloin to about 58 per cent in lean hind shank; in veal, nothing in flank to 63 per cent in medium-fat hind shank; in lamb, from 7 per cent in very fat hind leg to 20 per cent in shoulder; in mutton, from about 10 per cent in medium-fat flank to about 28 per cent in medium-fat neck; and in pork, from about 1 per cent in fresh lean ham to 68 per cent in the head. It would perhaps not be incorrect to say that, considering all meats, the refuse averages from 15 to 20 per cent of the material as purchased.

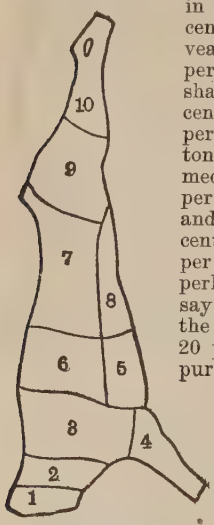


FIG. 4. DRESSED SIDE OF VEAL.

Digestibility. According to the results of a large number of experiments with beef, veal, mutton, and pork, at least 98 per cent of both the protein and the fat of meat is digested. No significant differences were observed with different cuts or different methods of cooking.

Texture (Toughness) of Meats. Whether meats are tough or tender depends upon two

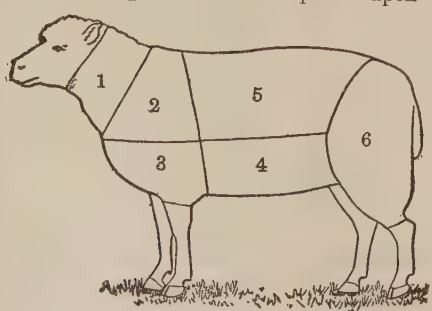


FIG. 5. DIAGRAM OF CUTS OF MUTTON OR LAMB IN THE LIVE ANIMAL.

1, neck; 2, chuck; 3, shoulder; 4, flank, 5, loin: 6, leg.

things—the character of the walls of the muscle tubes and the character of the connective tissues which bind the tubes and muscles together. In young and well-nourished animals the tube walls are thin and delicate and the connective tissue is small in amount. As the animals grow older or are made to work (and this is particularly true in the case of poorly nourished animals) the walls of the muscle tubes and the connective tissues become thick and hard. This is the reason why the flesh of young, well-fed animals is tender and easily masticated, while the flesh of old, hard-worked, or poorly fed animals is often so tough that prolonged boiling or roasting seems to have but little effect on it.

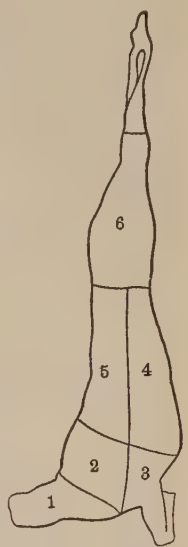


FIG. 6. DRESSED SIDE OF MUTTON OR LAMB.

After slaughtering, meats undergo marked changes in texture. These changes can be grouped under three classes or stages. In the first stage, when the meat is just slaughtered, the flesh is soft, juicy, and quite tender. In the next stage the flesh stiffens and the meat becomes hard and tough. This condition is known as *rigor mortis* and continues until the third stage, when the first changes of decomposition set in. In hot climates the meat is commonly eaten in either the first or second stage. In cold climates it is seldom eaten before the second stage, and generally, in order to lessen the toughness, it is allowed to enter the third stage, when it becomes soft and tender and acquires added flavor. The softening is due in part to the formation of lactic acid, which acts upon the connective tissue. The same effect may be produced, though more rapidly, by macerating the meat with weak vinegar. Meat is sometimes made tender by cutting the flesh into thin slices and pounding it across the cut ends until the fibres are broken.

The flavor depends largely upon the kinds and amounts of nitrogenous extractives which the muscle fibres or tubes contain. Pork and mutton are deficient in extractives, and what flavor they possess is due largely to the fats contained in them. The flesh of birds and of most game is very rich in extractives, which accounts for its high flavor. In general, the flavor of any particular meat is largely modified by the condition of the animal when slaughtered, and by its food, age, breed, etc. The flesh of young animals is more tender than, but not so highly flavored as, that of more mature animals. It is often said that the flesh of males is more highly flavored than that of females. There are at least two exceptions to this rule, since the flesh of the goose is more highly flavored than that of the gander, and in the case of pork there is little difference between the flesh of the male and that of the female. Castration, as illustrated in the familiar example of the capon, tends to make the flesh more tender, fatter, and better flavored. The flesh of the animals which feed exclusively upon fish or flesh has a strong, disagreeable taste, and is eaten only by uncivilized people or those in great need. Fish is an exception to the rule, however. Meat which is allowed to hang and ripen develops added flavors. In the first stages

of decomposition compounds quite similar to the nitrogenous extractives are formed, and it is to these that the improved flavors are due.

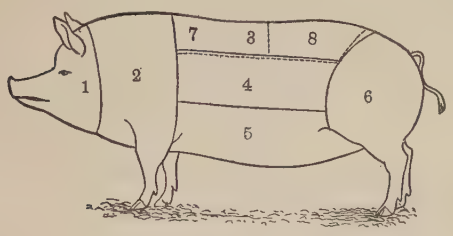


FIG. 7. DIAGRAM OF CUTS OF PORK.

1, head; 2, shoulder; 3 back; 4, middle cut; 5, belly; 6, ham; 7, ribs; 8, loins.

Characteristics of Good Meat. Meat should have little or no odor and should be without any cadaveric smell characteristic of diseased or decomposing flesh. It should have a uniform color, neither abnormally pale nor inclined to purplish, and should be firm and elastic without pitting or crackling on pressure. The surface of the meat should be just sufficiently moist to be detected, and the longer it is kept the drier it should become. There should be no evidence of any diseased condition, injury, or the presence of parasites.

Cattle. The meat of steers, which animals furnish the prime grade of beef, is very light red and of fairly firm consistency, while the fat is also firm and white in color and so dispersed through the muscle bundles as to give the much-sought-for marbled appearance. The flesh of bulls is dark red, coarse, and stringy, and contains but small quantities of fat between the muscle fibres. In old cows the meat is tough, and the fat, which is principally deposited under the skin, is yellowish and not so firm in consistency. The carcasses of fat heifers are practically indistinguishable from the carcasses of steers.

Calves. This meat is very pale, being almost white in milk-fattened animals, but is rather tough, while the fat is reddish white shortly after slaughter, gradually changing to pure white. It is soft in comparison to beef fat. The meat of calves has a characteristic odor.

"Monkey" or "bob" veal is a term applied to the carcasses of calves slaughtered during the first three or four weeks of life. It is soft and moist, the muscles are friable and poorly developed, and the fat is flabby and jelly-like and disagreeable to look upon.

Sheep. Mutton is light red in color and has a characteristic sheepy odor, while the fat is pure white and odorless. In well-fed animals the fat is abundant, especially about the kidneys and

AVERAGE COMPOSITION OF A NUMBER OF CUTS OF MEAT AND MEAT PRODUCTS

	Refuse	Water	Protein *	Fat	Total carbohydrates	Ash	Fuel value, per pound
BEEF, FRESH	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Chuck, including shoulder, edible portion	...	65.0	19.2	15.4	...	0.9	1,005
Loin, porterhouse steak, edible portion	....	60.0	21.9	20.4	...	1.0	1,270
Loin, sirloin steak, edible portion	...	61.9	18.9	18.5	...	1.0	1,130
Round, edible portion	...	67.8	20.9	10.6	...	1.1	835
Rump, edible portion	...	57.0	18.7	23.1	...	0.9	1,325
Forequarter, as purchased	20.6	49.5	14.4	15.1	...	0.7	905
Hindquarter, as purchased	16.3	52.0	16.1	15.4	...	0.8	950
VEAL, FRESH							
Breast, edible portion	...	68.2	20.3	11.0	...	1.1	840
Chuck, edible portion	...	73.8	19.7	5.8	...	1.0	610
Leg, cutlets, edible portion	...	70.7	20.3	7.7	...	1.1	705
Forequarter, as purchased	24.5	54.2	15.1	6.0	...	0.7	535
Hindquarter, as purchased	20.7	56.2	16.2	6.6	...	0.8	580
LAMB, FRESH							
Breast, or chuck, edible portion	...	56.2	19.1	23.6	...	1.0	1,350
Loin, without kidney and tallow, edible portion	...	53.1	18.7	28.3	...	1.0	1,540
Forequarter, as purchased	18.8	44.7	14.9	21.0	...	0.8	1,165
Hindquarter, as purchased	15.7	51.3	16.5	16.1	...	0.9	985
MUTTON, FRESH							
Chuck, edible portion	...	48.2	14.6	36.8	...	0.8	1,825
Flank, edible portion	...	42.7	14.9	42.6	...	0.7	2,065
Leg, hind, edible portion	...	63.2	18.7	17.5	...	0.8	1,085
Loin, without kidney or tallow, edible portion	...	47.8	15.5	36.2	...	0.8	1,815
Forequarter, as purchased	21.2	41.6	12.3	24.5	...	0.7	1,265
Hindquarter, as purchased	17.2	45.4	13.8	23.2	...	0.7	1,235
PORK, FRESH							
Chuck, ribs, and shoulder, edible portion	...	51.1	17.3	31.1	...	0.9	1,635
Flank, edible portion	...	59.0	18.5	22.2	...	1.0	1,280
Head, edible portion	...	45.3	13.4	41.3	...	0.7	1,000
Head cheese, edible portion	...	43.3	19.5	33.8	...	3.3	1,790
Ham, fresh, edible portion	...	50.1	15.7	33.4	...	0.9	1,700
Loin, chops, edible portion	...	50.7	16.4	32.0	...	0.9	1,655
POULTRY AND GAME							
Chicken broilers, edible portion	...	74.8	25.1	2.5	...	1.1	205
Chicken broilers, as purchased	...	43.7	12.8	1.4	...	0.7	295
Chicken, heart	41.6	72.0	20.7	5.5	...	1.4	615
Fowl, as purchased	...	47.1	13.7	12.3	...	0.7	775
Goose, young, as purchased	25.9	38.5	13.4	29.8	...	0.7	1,505
Turkey, as purchased	17.6	42.4	16.1	18.4	...	0.8	1,075
Chicken, gizzard	22.7	72.5	24.7	1.4	...	1.4	520
Plover, roast canned	...	57.7	22.4	10.2	7.6	2.1	985
Quail, canned	...	66.9	21.8	8.0	1.7	1.6	775

* In many cases the sum of the constituents does not equal 100, since no account is taken of the carbohydrates. In analyses of meat it is sometimes customary to estimate the protein as the difference between 100 and the sum of the other constituents.

beneath the skin. The meat of the males has at times a very strong so-called buck odor.

Goats. Goats' meat can usually be distinguished from mutton by its characteristic odor and the lack of deposits of fats except around the kidneys and the prominence of the bony processes.

Hogs. The meat of the hog is pale red, some parts being white with usually pure-white fatty tissue, although this varies somewhat with the food and breeding. Upon cooling the meat becomes white. In old hogs the meat is redder and tougher and the subcutaneous accumulation of fat is not so marked. The meat of old boars has an extremely offensive odor, especially noticed during cooking.

Cooking. Meat is not often eaten raw by civilized people. For the most part it is either roasted, broiled, fried, stewed, or boiled. Among the chief objects of cooking are the loosening and softening of the tissues, which facilitate digestion by exposing them more fully to the action of the digestive juices. Another important object is to kill parasites and microörganisms if present, and thus destroy organisms that might otherwise expose the eater to great risks. Minor, but by no means unimportant, objects are the coagulation of the albumen and blood so as to render the meat more acceptable to the sight, and the development and improvement of the natural flavor, which is often accomplished in part by the addition of condiments.

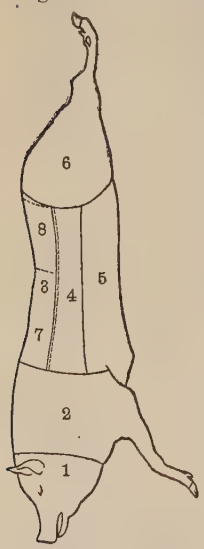


FIG. 8. DRESSED SIDE OF PORK.

If meat in cooking is placed in cold water and heated gradually, part of the organic salts, the soluble albumen, and the extractives or flavoring matters will be dissolved out. The broth or soup obtained will be rich, but the meat will be correspondingly tasteless. This tasteless material has been found to be as easily and completely digested as the same weight of ordinary roast. It contains nearly all the protein of the meat, and, if it is properly combined with vegetables, salt, and flavoring materials, makes an agreeable as well as nutritious food. If a piece of meat is plunged into boiling water, the albumen on the entire surface of the meat is quickly coagulated, and the enveloping crust thus formed resists the dissolving action of water and prevents the escape of the juices and flavoring matters. Thus cooked, the meat retains most of its flavoring matters and has the desired meaty taste. The resulting broth is correspondingly poor.

Theoretically, the principal difference between roasting or baking and boiling is the medium in which the meat is cooked. In boiling, the flesh to be cooked is surrounded by boiling water; in roasting, by hot air, although in roasting proper much of the heat comes to the joint as "radiant" heat. In both cases, if properly conducted, the fibres of the meats are cooked in their own juices.

It is interesting and at the same time important to remember that the smaller the cut to be roasted the hotter should be the fire and the shorter the period of cooking. A very hot fire coagulates the exterior and prevents the drying up of the meat juices. This method would not, however, be applicable to large cuts, because meats are poor conductors of heat, and a large piece of meat exposed to this intense heat would become burned and changed to charcoal on the exterior long before the heat could penetrate to the interior. The broiling of a steak or a chop is done on exactly this principle. An intense heat should be applied to coagulate the albumen thoroughly and stop the pores and thus prevent the escape of the juices.

Experiments on the losses in cooking meat lead to the following deductions: The chief loss in weight during the cooking of meat is due to the driving away of water. When beef is pan broiled there appears to be no great loss of nutritive material; but when it is cooked in water from 3 to 20 per cent of the total solids is found in the broth. Beef which has been used for the preparation of beef tea or broth has lost comparatively little nutritive value, though much of the flavoring material has been removed. The amount of fat found in the broth varies directly with the amount present in the meat—i.e., the fatter the meat the larger the quantity in the broth. The amount of water lost during cooking varies inversely as the fatness of the meat—i.e., the fatter the meat the less the shrinkage in cooking. In cooking in water the loss of constituents is inversely proportional to the size of the piece of meat. In other words, the smaller the piece the greater the percentage of loss. The loss appears to depend upon the length of time of cooking. When meat in pieces weighing from one and one-half to five pounds is cooked in water at 80° to 85° C. (175° to 185° F.) there appears to be little difference in the amount of material found in the broth whether the meat is placed in cold water or in hot water at the start.

Since meat nutrients are principally protein and fat, a considerable amount of carbohydrate foods (bread and other cereals, vegetables, fruits, etc.) are eaten with the meats to form a well-balanced diet. According to the results of a large number of dietary studies, beef and veal together furnished 10.3 per cent of the diet of the average American family, mutton and lamb 1.4 per cent, pork 5.4 per cent, and poultry 1.1 per cent of the total food; beef and veal 24.6, mutton and lamb 3.3, pork 8.8, and poultry 2.6 per cent of the total protein, and 19.5, 3.8, 30, and 1.2 per cent respectively of the total fat.

Export Trade in Meat and Abattoir Products. American export trade in animal products originated in 1876, from which time it was carried on in an ever-increasing scale until only a few years ago the United States furnished one-third the world's supply of meats. Within recent years, however, with the increase in population there has been a large increase in the demand for meat in America; while during the same period the production of cattle for slaughter has markedly decreased. The effect of this condition has been a strong decline in the exports of meat and an increase in the imports. This is particularly true of beef, the imports of which during 1912 were one and one-half times more than the exports. This comes chiefly from Canada, Mexico, and South America. Meats were imported into the United States in but comparatively small quantities prior to October, 1914, when the traffic law, which took effect October 4, admitted

fresh meats, chiefly beef, free of duty, and 197,000,000 pounds were imported between October 4 and June 30, and over 200,000,000 pounds in 1915. The exportation fell very rapidly in the decade 1904–14, especially of fresh and canned beef, but was stimulated by the European War.

(For information regarding the meat-inspection law and its enforcement by the United States Department of Agriculture, see article on PACKING INDUSTRY.)

Bibliography. Förster, *Der Nährwert des Rindfleisches bei den gebräuchlichsten Zubereitungsarten* (Berlin, 1897); United States Department of Agriculture, Bulletins Nos. 28 (revised), 66, 102, 141, 162, 193 (Washington, 1900 et seq.); id., Farmers' Bulletins Nos. 34, 183, 391, 526 (ib., 1903–14); Maria Parloa, *Home Economics* (New York, 1906); United States Department of Agriculture, Bureau of Animal Industry, Circulars 101, 105, 154 (Washington, 1907); R. Ostertag, *Handbook of Meat Inspection* (New York, 1907); R. H. C. Edelmann, *Text-Book of Meat Hygiene* (2d ed., Philadelphia, 1911); United States Department of Agriculture, Yearbook, 1911 (Washington, 1912). See ABATTOIR; FOOD, and the references given there.

MEATBIRD. The Canada jay. See JAY.

MEAT EXTRACT. The term meat extract is commonly applied to a large number of preparations of very different character. They may be conveniently divided into three classes: (1) true meat extracts; (2) meat juice obtained by pressure and preserved compounds which contain dried pulverized meat, and similar preparations; and (3) albumose or peptose preparations, commonly called predigested foods. True meat extract made according to Liebig's original directions contains no gelatin, fat, or insoluble albumen; it contains only those ingredients of meat which are soluble in hot water. A standard and commercial extract has been found to consist of 58.5 per cent of organic matter, 21.5 per cent of inorganic matter (salts), and 20 per cent of water. The inorganic matter is rich in phosphates. The organic matter contains a variety of chemically complex substances, including kreatin and kreatinin (qq.v.), xanthine bases, carnine, etc. Such meat extract is valuable as a stimulant, but can by no means serve as a substitute for meat. Its strong meaty taste is deceptive, and the person depending upon it alone for food would certainly die of starvation.

True meat extract is now made on a very large scale, many million acres of land being used as pasturage for the horned cattle required by the industry, and the cattle being of the best English stocks. The steps involved in the process of manufacture are as follows: after the death of the animal the meat is hung up for several hours in cooling halls, then the fat and sinews are removed, and the meat is first chopped and then minced, by machinery, of course. The minced meat is then extracted with pure hot (but not boiling) distilled water in large open pans, the fat gradually rising to the top and being skimmed off. The aqueous extract is next concentrated by evaporation, first in the air, later in vacuum pans, two filtrations being carried out during this stage, and after being further concentrated to a thick sirupy mass, the extract is ready for distribution to the blending factories, to which it is sent in hermetically sealed 100-pound cans.

Broth and beef tea as prepared ordinarily in the household contain more or less protein, gelatin, and fat, and therefore are foods as well as stimulants. The proportion of water in such compounds is always very large. The preserved meat juice and similar preparations contain more or less protein, and therefore have some value as food. The third class of preparations is comparatively new. The better ones are really what they claim to be—predigested foods. They contain the soluble albumoses (peptoses), etc., which are obtained from meat by artificial digestion.

MEAT FLY. See FLESH FLY.

MEATH, mēth. A county of the Province of Leinster, Ireland, bounded on the east by the Irish Sea and the counties of Dublin and Louth, on the north by Monaghan, Louth, and Cavan, on the west by Westmeath and Cavan, and on the south by Dublin, Kildare, and Kings. Area, 906 square miles (Map: Ireland, E 4). The chief river is the Boyne. The soil is a rich, fertile loam, but it is devoted almost entirely to pasture, about 20 per cent being under crops. The staples are potatoes, oats, and turnips. Capital, Trim. Pop., 1901, 67,497; 1911, 65,091.

MEAUX, mō. A town of France, in the Department of Seine-et-Marne, on the right bank of the river Marne, 28 miles east of Paris (Map: France, N., H 4). Opposite is its suburb, Le Marché. It has an episcopal palace, a college, a public library, and a seminary. Bossuet, whose remains lie in the sixteenth-century cathedral of Saint-Stephen, was a bishop here for 23 years. As the centre of the Brie agricultural district it has a brisk trade in cheese, corn, eggs, and poultry; its mills supply Paris with most of its meal and corn. There are manufactures of cotton and other cloths, cheese, sugar, steel, lumber, and machinery. Meaux was the turning point of the German drive on Paris in the early months of the European War which broke out in 1914. The Germans suffered heavy losses and from here began their retreat to the Aisne. See WAR IN EUROPE. Pop. (commune), 1901, 13,690; 1911, 13,600.

MEC'CA (Ar. *Makkah*, or *Bakkah*, Koran, Sura iii, 90; called also *al Musharrifah*, the Exalted, *Umm al Kura*, mother of cities, and *al Balad al Amīn*, the safe place, known to the geographer Ptolemy as Macoraba). Capital of the Turkish Province of Hejaz in Arabia, and, through being the birthplace of Mohammed, and containing the Kaaba, the central and most holy city of all Islam (Map: Turkey in Asia, D 7). The two other principal holy cities are Medina and Jerusalem. It is in lat. 21° 28′ N. and in long. 40° 15′ E., 245 miles south of Medina, and about 65 miles east of Jiddah, its port on the Red Sea, in a narrow, barren valley, surrounded by bare hills from 250 to 800 feet high. The city is about a mile and a half long and from one-third to two-thirds of a mile wide, and is divided into the upper and lower city. An aqueduct built by Zubaidah (810), wife of Harun al Rashid, brings good water from the mountains to the east. By its position Mecca commands the trade routes connecting lower Hejaz with north, south, and central Arabia, and it has at all times been a commercial and religious centre. The streets are somewhat regular, but unpaved; dusty in summer and muddy during the rainy season. The houses are often five stories high. Some of the government buildings, the Hamidiyyah, or

palace of the Governor, the printing office, the chief watch-house, and the three armories, are in the new part of the city (*al Jiyād*) southeast of the *Harām*, or sacred precincts, and this part of the city has a European appearance. The only manufactures of Mecca are rosaries and pottery; some dyeing is also done; the inhabitants make their living chiefly by letting rooms at the time of the pilgrimage (see HAJJ) to the pilgrims who come here often to the number of 100,000. The largest number of these pilgrims are Malays and Indians; then come negroes, Persians, Turks, Egyptians, Syrians, Tatars, and Chinese. Ordinarily the city contains about 60,000 inhabitants. The centre of the city is the *Masjid al Harām*, or Sacred Mosque, which lies beneath the level upon which the rest of the city stands and is always liable to inundations from the *Sail*, or mountain torrent. This sacred area is capable of holding 35,000 people; it is surrounded by colonnades, contains the sacred Kaaba, and is the only mosque in the world with seven minarets. (See KAABA.) A great number of people are attached to the mosque in some kind of ecclesiastical capacity, as *Khāṭibs* (preachers), *Kātibs* (scribes), muftis, judicial assessors, muezzins, etc. In addition to this, each section of the Mohammedan world has its representatives in Mecca, who take care of its pilgrims, provide them with lodgings, instruct them in the ceremonies, and the like. By the side of the mosque runs the *Mas'ah*, a street lined by high houses and reaching up to the hills, Safa and Marwah, through which the pilgrims must run seven times. A telegraph line connects Mecca with Jiddah on the west and with Taif on the east, where the Meccans spend their summer.

The history of Mecca has been an eventful one. Mohammedan legend holds that it was inhabited by Ishmael, whose posterity was supplanted by the *Banu Jurhum* of Yemen, who in their turn were supplanted by the *Khuzā'a*, also of Yemen, in the year 210 A.D. About 450 a certain Kussaï of the Koreish family, and an ancestor of Mohammed, seized the Kaaba, and his family is supposed to reign there to-day. Here Mohammed was born (c. 570), and in the same year the city was menaced by the Abyssinians ("Year of the Elephant"). Its patricians opposed the Prophet, but gave in eight years after he had fled to Medina in 630. Though large sums of money were lavished upon it by successive Mohammedan rulers, it was not an easy city to hold. It had its own pretender to the caliphate in Abdallah ben Zobeïr, who was besieged in Mecca in 692 by the Caliph al Hajjaj and finally slain. In 930 it was devastated by the Karmathians. But it always had its own rulers or sherifs, descendants of the Prophet through Hasan, son of Ali; and, though they recognized the supremacy of the Fatimides, Mamelukes, and Turkish sultans, they had a large measure of independence. Since Selim I (1517) they have ruled in the name of the Turkish Sultan. In 1803 the Wahhabis took the city, but were driven out by Mehemet Ali in 1813. A change in the dynasty of sherifs occurred in 1827. Since 1840 their prestige has gradually diminished, a *wali* (governor) being sent by the Porte to offset their power. Though all non-Mohammedans are strictly prohibited from visiting the sacred territory, some Europeans have been there (see HAJJ, where the literature will also be found). Consult: Christian Snouck-Hurgronje, *Mekka* (The Hague, 1888–89, with atlas); Kahn and Sparroy, *With the Pilgrims to Mecca* (New York, 1905); A. J. B. Wavell, *A Modern Pilgrim in Mecca* (London, 1912).

MÉCHAIN, mā'shăn', PIERRE FRANÇOIS ANDRÉ (1744–1804). A French astronomer, born at Laon. He attracted the attention of Lalande (q.v.), who secured him a place as government hydrographer to survey the French coasts. He still, however, managed to keep up his astronomical studies, and was in 1782 elected to the Academy. In 1791, when the government had decided to use the arc of meridian between Dunkirk and Barcelona as a basis for the new metric system, he was employed to measure that portion which lies between Rodez and Barcelona. On the completion of this work he resumed his observations at Paris, but, an error having been discovered in his measurements, he returned to Spain to correct it and was there stricken with yellow fever. He contributed memoirs on eclipses and the theory of comets to the *Transactions* of the Academy of Sciences and to the *Connaissance du Temps*, of which he was editor from 1784 to 1794.

MECHAN'ICAL ADVANTAGE. See MECHANICAL POWERS.

MECHANICAL ENGINEER. See ENGINEER AND ENGINEERING.

MECHANICAL ENGINEERS, AMERICAN SOCIETY OF. An association of professional mechanical engineers, manufacturers, and professors in technical schools, organized in New York in 1880 to promote the arts and sciences connected with engineering and mechanical construction. The headquarters are in the Engineering Societies Building, 29 West 39th Street, New York, given by Andrew Carnegie to the engineering profession. Two general meetings are held yearly—the annual meeting in New York during the first week in December and the spring meeting in some other city. Local meetings are held during the year in several cities under the direction of local sections, and student branches are established in many of the technical colleges. There are five grades of membership—honorary members, chosen from those of acknowledged professional eminence; members, consisting of engineers or teachers of applied science of 32 years of age or over who have been in active practice of their profession for at least 10 years and in responsible charge of important work for five years; associates, 30 years of age or over, connected with some branch of engineering, science, or arts, and qualified to coöperate with engineers; associate members, consisting of professional engineers not less than 27 years of age who shall have been in active practice for at least six years and in responsible charge of work for at least one year; and juniors, 21 years of age or over, who must have had such engineering experience as to enable them to fill subordinate positions in engineering work, or who have graduated from a technical school of recognized standing. The society publishes a monthly journal of engineering, an annual volume of transactions, and numerous pamphlets and reports on engineering subjects. It coöperates in maintaining the Library of the Engineering Societies in New York, a free reference library, containing over 65,000 volumes of engineering and scientific literature and receiving regularly 800 American and foreign periodicals. The membership of the society is over 6000.

MECHANICAL EQUILIBRIUM. See EQUILIBRIUM, MECHANICAL.

MECHANICAL EQUIVALENT OF HEAT. See HEAT.

MECHANICAL FLIGHT. See AËRONAUTICS.

MECHANICAL POWERS — MACHINES. Technically described a machine is a combination of resistant bodies for modifying energy and doing work, the members of which are so arranged that, in operation, the motion of any member involves definite, relative, constrained motion of the others. A brief analysis of this definition will help to make it clear. First, a machine must consist of a combination of bodies; thus, a lever must have its fulcrum, a screw its nut, a wheel and axle its bearings, and so on with other examples; the simplest machine must have at least two members between which relative motion is possible. Second, the members of a machine must be resistant in order to transmit force; they generally are rigid, but not necessarily so, since flexible belts, chains, or springs may be employed to transmit force under the particular action to which they are adapted. Third, a machine is used to modify energy and perform work. This proposition is obvious. The conception of a machine involves the conception of some source of energy and a train of mechanism suitably arranged to receive, modify, and apply the energy derived from this source to the desired end. A machine, then, consists of (1) parts receiving the energy; (2) parts transmitting and modifying the energy; and (3) parts performing the required work. Finally, (4) the relative motions of the members of a machine are constrained or restricted to certain definite, predetermined paths in which they must move, if they move at all, relatively. The first two propositions of the definition are equally true of structures (such as a bridge) as of machines, but the third and fourth are true of machines only and serve to distinguish machines from structures. A structure modifies and transmits force only, and does not permit relative motion of its members; a machine modifies and transmits force and motion, i.e., energy, and permits relative constrained motion of its members.

The distinction between a machine and a mechanism remains to be explained. A mechanism is a combination of resistant bodies for transmitting and modifying motion (not motion and force or energy as in machines) so arranged that, in operation, the motion of any member involves definite, relative, constrained motion of the other members. A mechanism does work incidentally, such as the overcoming of its own frictional resistance; its primary function is to modify and transmit motion; a mechanism or combination of mechanisms which receive energy and transmit and modify it for the performance of useful work constitutes a machine.

Machines are of various degrees of complexity, but the simple parts or elements of which they are composed are reducible to a very few. These elementary machines are called the mechanical powers, and are commonly reckoned as the lever, the inclined plane, the jointed link, or toggle joint, and the hydraulic press. All machines and all locomotor movements of animals resolve themselves into the action of one or a combination of these simple mechanical powers or machine elements. A few observations applicable to all may appropriately be made here. 1. In treating of the theory of the lever and other mechanical powers the question really examined is, not what power is necessary to move a certain weight, but what power is necessary to balance it. This once done, it is obvious that the least additional force will suffice to begin motion. 2. In pure theoretical mechanics it is assumed that the machines are without weight. A lever, for instance, is supposed to be a mere rigid line; it is also supposed to be *perfectly* rigid, not bending or altering its form under any pressure. The motion of the machine is also supposed to be without friction. In practical mechanics the weight of the machine, the yielding of its parts, and the resistance of friction have to be taken into account. 3. When the effect of a machine is to make a force overcome a resistance greater than itself it is said to give a *mechanical advantage.* A machine, however, never actually increases power—for that would be to create work or energy, a thing as impossible as to create matter. What is gained in one way by a machine is always lost in another. One pound of weight at the long end of a lever will lift 10 pounds at the short end, if the arms are rightly proportioned; but to lift 10 pounds through 1 foot it must descend 10 feet. The two weights, when thus in motion, have equal momenta; the moving mass multiplied into its velocity is equal to the resisting mass multiplied into its velocity. When the lever seems to multiply force it only concentrates or accumulates the exertions of the force. The descending one-pound weight, in the case above supposed, may be conceived as making 10 distinct exertions of its force, each through a space of 1 foot; and all these are concentrated in the raising of the 10-pound weight through 1 foot. The principle thus illustrated in the case of the lever holds good of all the other mechanical powers. 4. The object of a machine is not always to increase force or pressure; it is as often to gain velocity at the expense of force. (See LEVER.) In a factory, e.g., the object of the train of machinery is to distribute the slowly working force of a powerful water wheel or other prime mover among a multitude of terminal parts moving rapidly but having little resistance to overcome. 5. The mechanical advantage of a compound machine is theoretically equal to the product of the separate mechanical advantages of the simple machines composing it; but in applying machines to do work allowance must be made for the inertia of the materials composing them, the flexure of parts subjected to strains, and the friction, which increases rapidly with the complexity of the parts; and these considerations make it desirable that a machine should consist of as few parts as are consistent with the work it has to do. 6. The forces, or "moving powers," by which machines are driven are the muscular strength of men and animals, wind, water, electrical and magnetic attractions, heat, etc.; and the grand object in the construction of machines is with a given amount of impelling power to get the greatest amount of work of the kind required. (See WORK; FOOT POUND.) This gives rise to a multitude of problems, some more or less general, others relating more especially to particular cases—problems the investigation of which constitutes the science of applied mechanics. One of the questions of most general application is the following: if the resistance to a machine were gradually reduced to zero, its velocity would be constantly accelerated until it attained a maximum, which would be when the

point to which the impelling force is applied was moving at the same rate as the impelling force itself (e.g., the piston rod of a steam engine) would move if unresisted. If, on the other hand, the resistance were increased to a certain point, the machine would come to a stand. Now the problem is to find between these two extremes the rate at which the greatest effect or amount of work is got from the same amount of driving power. The investigation would be out of place here, but for a turbine the greatest effect is produced when the velocity of the point of application is one-half of the maximum velocity above spoken of. The moving force and the resistance should therefore be so adjusted as to produce this velocity. See MECHANICS.

MECHANICAL SENSE IN ANIMALS. In animals the simplest and most primitive form of sensory response is that to mechanical stimulation. The animal exhibits a negative or avoiding reaction to intense stimulation and a positive or accepting reaction to weaker stimuli. The flatworms, e.g., when prodded by a bristle move away, but when touched by a fine hair turn towards it. Either reaction may take more than one form. The flatworm may avoid the bristle by turning away, by hastening forward, or (in the case of violent prodding) by turning abruptly towards the bristle and beyond it. The positive reaction, when it takes the form of a tendency to remain in contact with a solid body, is frequently spoken of as thigmotaxis. Earthworms show thigmotaxis when they crawl along the corners of a box or passage in which they are placed, and their burrowing instinct undoubtedly involves the same tendency.

In its least complex form the mechanical sense is often inseparable from the chemical sense and the light sense; the reactions to mechanical, chemical, photic, and even acoustic stimuli may be identical. (See CHEMICAL SENSE IN ANIMALS; HEARING IN ANIMALS; TROPISM; VISION IN ANIMALS.) In its higher forms it becomes differentiated into the modalities of cutaneous and kinæsthetic sensibility. See KINÆSTHETIC SENSATIONS IN ANIMALS; TOUCH IN ANIMALS.

MECHANICAL TISSUE. The supporting tissue (stereome) of the plant, including not only the vascular system but also the cortical sclerenchyma and collenchyma. Cortical mechanical tissue is particularly prominent in the hypoderma of stems and leaves.

MECHANICAL UNITS. Various units or standards used in different countries and under different conditions for the expression of mechanical quantities. One system, the C. G. S. system (q.v.), is based upon the centimeter, the gram, and the mean solar second. Another uses the foot, the pound, and the mean solar second. The yard and the pound are legally defined in England as follows: "The straight line or distance between the centres of the transverse lines in the two gold plugs in the bronze bar deposited in the office of the Exchequer [London] shall be the genuine standard yard at 62° F.; the pound is the mass of a certain piece of platinum marked 'P. S. 1844, 1 pound,' and deposited at the office of the Exchequer." Both the standard yard and pound are now preserved at the Standards Office of the Board of Trade, London. In the United States the customary or Anglo-Saxon measures are referred to the Metric Standards, the yard being $\frac{3600}{3937}$ of the standard meter and the pound .4535924277 of the standard kilogram. Still another system is based upon the foot (one-third of the yard), the mean solar second, and the *weight of one pound at sea level and latitude 45°* as the unit of force. (A unit mass is given an acceleration unity by a unit force; hence, since the unit force gives per second an acceleration 32.172 feet per second to a mass of one pound, it will give an acceleration 1 to 32.172 pounds; therefore, on this system, the unit of mass is 32.172 pounds.)

The relations between these units is as follows:

1 centimeter = 0.3937 inch = 0.01093611 yard.
1 yard = 91.4402 centimeters.
1 gram = 0.00220462 avoirdupois pound = 15.4324 grains.
1 pound = 453.5924 grams.

The units for the various important mechanical quantities are derived from them. These derived units and a few others are given in the following sections:

Velocity.—One centimeter per second; one yard (or foot) per second; one nautical mile (6080 feet) per hour is called a *knot.*

Acceleration.—Unit velocity per second.

Force.—One gram with unit C. G. S. acceleration = *dyne;* one pound with unit (ft.-lb.-sec.) acceleration = *poundal* = 13,825 dynes. Weight of one pound = 444,520 dynes.

Work.—One dyne acting through one centimeter = *erg;* 10^7 ergs = *joule.* One pound raised one foot = *foot pound* = 1.356 joules. One kilogram raised one meter = *kilogrammeter* = 9.81 joules. (The last two relations are approximate.)

Power.—One joule per second = *watt;* 33,000 foot pounds per minute = *horse power* = 746 watts; force de cheval = 75 kilogrammeters per second = 736 watts.

Pressure.—One dyne per square centimeter = *barie.* One megadyne (10^6 dynes) per square centimeter = *megabarie.* Weight of one pound per square foot = 47.9 dynes per square centimeter; one poundal per square foot = 14.88 dynes per square centimeter; one centimeter of mercury = 13.5950 × 980.692 dynes per square centimeter = 13,332.5 dynes per square centimeter; hence 75 centimeters of mercury = 1 megabarie (very closely); 76 centimeters of mercury, one atmosphere = 1.0133 megabaries.

MECHANICS (Lat. *mechanica,* from Gk. *μηχανικά, mēchanika, μηχανική, mēchanikē,* mechanics, from *μηχανή, mēchanē,* device). The science which is concerned with the motion of matter: the possible kinds of motion, the conditions under which the motion remains unchanged, and those under which it changes. That branch of mechanics which discusses the possible kinds of motion is called *kinematics,* while that which discusses the properties of matter in motion is called *dynamics.* Dynamics is divided also into two parts—*statics* and *kinetics*—the former treating the conditions under which there is no change in the motion, the latter those under which there is change.

HISTORICAL SKETCH

The first mechanical problems solved were those dealing with the simple machines. Archimedes (287–212 B.C.) was acquainted with the law of the lever in its simplest form, and Leonardo da Vinci (1452–1519) stated the law for the most general case, when the forces were in any directions and applied at any points. The principle of the inclined plane was known to Galileo (1564–1642) and to Stevinus (1548–1620). Stevinus was the first to use a line to

describe a force, and to make use of the principle of the composition and resolution of forces; he also discussed the properties of pulleys and combinations of pulleys, using the principle that, if force applied to the cord (a weight) move down a certain distance, a weight fastened to the pulley must move up a distance such that the product of each weight by its distance is the same. This principle is that of virtual velocities, so called, which was applied also by Galileo, Torricelli, Bernoulli, and Lagrange. In his treatment of the inclined plane Galileo made use of the general principle that there is equilibrium in any case when the weight as a whole cannot descend farther; or, as Torricelli expressed it, when the centre of gravity cannot descend.

Galileo was the founder of the science of dynamics. He recognized the fact that, if a piece of matter were in motion and were free from external action, it would continue its motion unaltered. He proved by experiment that all bodies fall with the same acceleration towards the earth, and proposed that the value of a force's action on a body be measured by the acceleration produced. He recognized the independence of different motions in discussing the motion of a projectile. He was acquainted, too, with the general properties of a simple pendulum, especially its property of having a definite period which varied with the length of the string.

Huygens (1629–95) did fully as important work as Galileo and deserves to rank with him. He deduced the formula for centrifugal motion, $a = s^2/r$. He invented a pendulum clock and the escapement for it; he used a pendulum to determine g; and proposed a seconds pendulum as a standard of length. He solved the problem of deducing the length of a simple pendulum which would vibrate in the same period as a compound one, i.e., he determined the position of the centre of oscillation (q.v.). In this last deduction he made use of the principle that, in whatever manner the particles of a compound pendulum influenced each other, the velocities acquired in the descent of the pendulum are such that by virtue of them their centre of gravity rises just as high as the point from which it fell, whether the pendulum is considered a rigid body or as breaking up into particles each connected with the axis by a cord and thus forming a great number of simple pendulums. If p_1, p_2, etc., are the *weights* of the particles, h_1, h_2, etc., are the distances they have fallen at any instant, and s_1, s_2, etc., are their speeds at that instant. Huygens's principle leads to the relation $\frac{1}{2}p_1{s_1}^2 + \frac{1}{2}p_2{s_2}^2 +$ etc. $= (p_1h_1 + p_2h_2 + \text{etc.})\,\frac{1}{g}$ or

$$\Sigma \tfrac{1}{2}ps^2 = \frac{1}{g}\Sigma ph.$$

In the case of a rigid body turning around a fixed axis $\Sigma\frac{1}{2}ps^2 = \frac{1}{2}\omega^2\Sigma pr^2$, where ω is the angular speed and r is the distance of the particle of weight p from the axis. Thus, Huygens was led to the use of Σpr^2 as a measure of the inertia of a rotating body. He did not, however, realize the idea of mass as distinct from weight. The name "moment of inertia" was given Σmr^2 by Euler.

Newton gave the principles of mechanics their final form, and since his day there have been no important additions to them. We owe to Newton (1642–1727) the recognition of other forces than weight, the general idea of force, and in particular the conception of inertia or mass as a property of matter distinct from its weight, the general statement of the principle of the composition and resolution of forces, and the law of action and reaction being equal but opposite. Newton adopted as the proper measure of a force the acceleration produced in a given portion of matter; or, in other words, the velocity produced in a given time. According to Huygens the measure of the force is the square of the velocity produced in a given distance. Among the philosophers who came after Newton and Huygens there was a school, following Descartes, who measured forces by the change in mv; another, following Leibnitz, who measured it by the change in mv^2. Thus, to a certain extent one school succeeded Newton; the other, Huygens. The two were shown by D'Alembert to be identical, although there was a great controversy for many years concerning their relative merits.

KINEMATICS

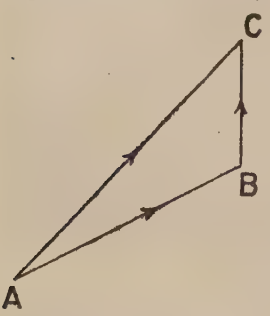
All possible motions of any geometrical figure may be divided into two classes: *translation* and *rotation*. In the former all lines in the moving figure remain parallel to themselves, i.e., the motions of all the points are identical; in the latter all the points of the figure are describing circles whose centres lie on a straight line called the axis. In the general case the motion of a figure is a combination of translation and rotation.

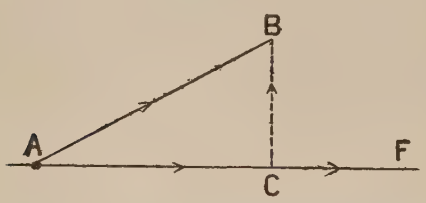
Translation. In motion of translation it is necessary to consider the motion of one point of the figure only, as that is the same for all the points. If the figure is moved from one position to another, this *displacement* may be represented by a straight line joining the initial and final positions of any one point of the figure. This line indicates by its direction and its length the displacement of the whole figure; it is called a *vector*, and displacement is said to be a *vector quantity* because it requires for its complete understanding a direction and a numerical quantity only, and so can be pictured by a straight line having the proper direction and a length equal to or proportional to the numerical quantity.

If the motion of the figure is uniform—i.e., if it passes over equal distances in equal intervals of time—the rate of motion, or the distance traversed divided by the time taken, is called the *linear speed*. If the motion is not uniform, the linear speed at any instant is the distance which the figure would move in the next second if its motion were to continue for that interval of time at exactly the same rate as it is at that instant: in mathematical symbols, if Δx is the length of the extremely short distance traversed in the extremely short interval of time Δt immediately following the given instant, the linear speed at that instant is the value of $\frac{\Delta x}{\Delta t}$ in the limit as Δt is taken smaller and smaller. Speed is therefore a number. If the speed in a particular direction is considered—i.e., if a distinction is made between the motions of figures with the same speed but in different directions—the linear speed in a given direction is called the *linear velocity* in that direction. Linear velocity is evidently a vector quantity, the linear speed giving the numerical quantity, i.e., the length of the vector.

If a figure is given simultaneously two displacements, the resulting displacement is evidently found by adding geometrically the two

components. Thus, if AB and BC represent the two component displacements, the actual one will be AC, formed by placing BC so as to continue the motion indicated by AB and completing the triangle. (A man walking across the deck of a moving ship illustrates this composition of displacements.) Similarly, if AB and BC represent the linear velocities of the two component motions, the actual velocity is represented in direction and speed by AC. In a perfectly similar manner three, four, etc., vector qualities may be added geometrically. Further, conversely, any displacement or velocity may be regarded as made up of two displacements or two velocities, the condition being that the two vectors representing the component quantities should form a broken line joining the ends of the vector representing the actual quantity. This is called "resolution" of displacement or velocity. In resolving vectors it is nearly always best to take the components so that they are at right angles to each other, for then they are independent of each other. Thus, if AB is a displacement—or any vector—its component in the direction AF is the vector AC obtained by dropping a perpendicular from B upon AF. AB is equivalent to AC and CB, but CB has no connection with the direction AF, and AC is then that component of AB which





indicates how much AB is concerned with the direction AF. In mathematical language the component in the direction AF of a vector AB is $AB\cos(CAB)$.

In general the velocity of a moving figure will not be constant, and the rate of change of the linear velocity at any instant—i.e., if Δv is the extremely small change of the velocity in the extremely small interval of time Δt, the limiting value of $\frac{\Delta v}{\Delta t}$ — is called the *linear acceleration* at that instant. It is evident that acceleration, being the change in velocity and therefore the difference between two lines, is itself a vector quantity: it has a numerical value and a definite direction, and, as with displacements and velocities, accelerations can be compounded by geometrical addition or resolved into components. Since linear velocity is characterized by a speed and by a direction, it can change in two independent ways: the speed can change, the direction remaining the same, e.g., a falling body; the direction can change, the speed remaining the same, e.g., a particle moving in a circle at a uniform rate. (In general, both speed and direction change, e.g., a vibrating simple pendulum.) There are therefore two independent types of linear acceleration. The three most interesting cases of linear acceleration are the following:

1. Motion in a straight line, constant acceleration. If the acceleration is positive, the speed increases; if it is negative, the speed decreases. Let the acceleration be called a, and the speed at any instant s_0; then, t seconds later, the speed will be $s = s_0 + at$, and the distance traversed in that time will be $x = s_0 t + \frac{1}{2} at^2$. If t is eliminated from these equations, it is seen that $s^2 - s_0^2 = 2ax$. These formulæ apply to a body falling freely towards the earth, in which case $a = 980$; to a body thrown vertically upward, in which case $a = -980$; and to many other illustrations.

2. Uniform motion in a circle. If the circle has a radius r, and if the constant speed is s, the acceleration has for its numerical value $\frac{s^2}{r}$, and its direction at any instant is along the radius towards the centre from the point where at that moment the moving point is. This last fact is evident if the change in the *velocity* is considered. At any position in its path around the circle the moving point has a *velocity* along the tangent to the circle; the following instant that velocity is changed into the next tangent; and to secure this change a small vector perpendicular to the first tangent must be added to the vector representing the first velocity. The proof that the numerical value of the acceleration is $\frac{s^2}{r}$ will be found in all textbooks on mechanics.

If the point makes N complete revolutions per second $s = 2\pi rN$; and the acceleration equals $4\pi^2 rN^2$.

3. Simple harmonic motion of translation. This is a vibratory motion, to and fro along a straight line such that, if distances from its middle point are called x, the acceleration of the moving point when it is at a distance x from the centre has the numerical value $n^2 x$, where n is a constant quantity, and its direction is towards the middle point or centre. (To distances at one side of the centre are given positive values; at the other side, negative.) This motion can be easily shown to be identical with that of the point which is the projection on a diameter of a point moving in a circle with uniform speed. It can be shown further that the *period* of this harmonic motion, i.e., the time required for the point to go from one end of its path to the other and back again, is $2\pi/n$, where $\pi = 3.1416$. Half the length of the path is the *amplitude*, and the position of the vibrating point at any instant gives its *phase*. Thus, there may be two vibrating points which have the same period and the same amplitude, but differ in phase—one point lags apparently behind the other.

A pendulum with a long supporting cord makes harmonic vibrations, if the amplitude is small; so does any point of a violin string, if the string is vibrating in its simplest mode; so does a weight hanging from a rubber band or a spiral spring, if it is set vibrating in a vertical direction.

Rotation. It can be shown by geometry that if a figure of any shape with one point fixed is displaced in any way by any series of rotations, the final position may be reached from the initial one by a single rotation around an axis passing through the fixed point. The simplest

mode of describing such a displacement is to imagine a plane section through the figure perpendicular to this axis, to take in this plane a line *fixed in space* and one *fixed in the figure*, and then to measure the rotation by the change in the angle made with the former line by the latter as the figure turns around the axis. Three things are then necessary for the representation of the angular displacement: (1) the *position* of the axis; (2) its *direction*—a line in one direction will represent rotation in the direction of the hands of a watch, while one in the opposite direction will represent opposite rotation; (3) the *numerical value* of the angle of displacement, measured as just described.

(The numerical value of the angle between two lines is obtained by describing a circle of any radius, R, with the point of intersection of the lines as the centre, measuring the length of the arc, A, intercepted between the two lines, and dividing A by R. See TRIGONOMETRY.)

This angular displacement can be completely pictured by a straight line in the proper direction made to coincide with the axis of rotation and of a length proportional to the angle of rotation. Such a line is called a *rotor*, or a *localized vector*, because it is a vector placed in a definite position.

If a rotation around a fixed axis is considered, the *angular speed* is the rate of change of the angle formed by the line fixed in space and that fixed in the figure, as described above. The *angular velocity* in this case is the angular speed around the given axis in a definite sense of rotation; it is therefore a rotor. If a figure with one point fixed is given simultaneously two angular velocities around two different axes, the resultant angular velocity will be a rotor which is the geometrical sum of the two component rotors. *Angular acceleration* is the rate of change of angular velocity, and there are two independent types: (1) the position of the axis fixed, but the angular speed changing; (2) the angular speed constant, but the position of the axis changing. A door or gate when opening or closing is an illustration of the first type; while a spinning top generally furnishes an illustration of the second, because, when the axis of the top is not vertical, it is moving so as to describe a cone in space. Actually in the case of a spinning top the angular speed is decreasing owing to friction, so it is an illustration of the combination of the two types.

The three most interesting cases of rotation are the following:

1. Position of axis fixed, constant angular acceleration. If the constant acceleration is α, and if at any instant the angular speed is ω_0, the angular speed t seconds later will be $\omega = \omega_0 + \alpha t$, and the angle rotated through in that interval of time will be $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$. If t is eliminated from these two equations, it is seen that $\omega^2 - \omega_0^2 = 2\alpha\theta$. This motion is illustrated by a flywheel or grindstone coming to rest under a constant friction or being set in motion at a uniform rate.

It is evident from the above definition of the numerical value of an angle that if the *linear* speed and acceleration of any point at a distance R from the axis are s and a, they are connected with the *angular* speed and acceleration of the whole figure by the relations $s = R\omega$, $a = R\alpha$.

2. Angular speed constant, but the position of the axis describing a cone at a uniform rate. This motion is illustrated, as explained above, by a spinning top. A piece of apparatus which furnishes a more accurate illustration consists essentially of a heavy wheel whose axle is so supported that it can turn freely within a circular ring which is fastened rigidly to a metal rod carrying sliding weights at its further end; this rod is pivoted at its middle point so as to be free to turn in any direction; and the axle of the wheel is set in the same line as this rod. This instrument is called a gyroscopic pendulum. (For a description of one made out of a bicycle wheel, see *Physical Review*, 1901, vol. x, p. 43.) To produce the desired motion, balance the wheel and its ring by means of the sliding weights until the rod is horizontal, set the wheel in rapid rotation, and disturb the balance slightly by adding a small weight to either portion of the rod. The rod will immediately begin to move around in a horizontal plane; and thus the position of the axis of rotation of the wheel will change, and will describe a plane—the limiting form of a cone. The reason for this change is that there is compounded with the angular velocity of the wheel around its own axis another one due to the disturbed balance of the rod which would of itself make the whole apparatus rotate around a horizontal axis, i.e., turn over as the extra weight pulls its side down. This added angular velocity is about an axis at right angles to that of the wheel, and both lie in a horizontal plane; the two angular velocities will compound therefore to form an angular velocity about an axis in the same horizontal plane, but in a position different from that of the axis of the wheel before it was disturbed. As fast as this axis takes up its new position it is again disturbed; and so the motion is a continuous change of position of the axis of the wheel in a horizontal plane. (This case in rotation corresponds, therefore, perfectly to the one in translation of motion of a point in a circle at a uniform speed.) In the actual use of the gyroscopic pendulum there are other phenomena depending upon the properties of matter in motion; the above description is designed to be a purely kinematic one.

3. Simple harmonic motion of rotation. This motion is illustrated by the to-and-fro rotation of an ordinary clock pendulum or by the vibrations of any body set swinging through small arcs when suspended on a horizontal axis, also by the balance wheel of a watch. Let, as before, two lines be taken in a plane at right angles to the axis, one fixed in the figure, the other in space, but so chosen that they coincide when the vibrating figure is in its central position. Then, if θ is the angular displacement at any instant of the line fixed in the figure from the one fixed in space, the angular acceleration equals $m^2\theta$, where m is a constant quantity, and the direction of the axis of the acceleration is such as always to produce an angular velocity towards the position of equilibrium. The period of a complete vibration may be shown to be $2\pi/m$. The amplitude is the extreme angle turned through by the line fixed in the figure; the phase at any given instant depends upon the position of this line at that instant.

Motion in General. Translation and rotation are particular types of motion, and in general the motion of a figure includes both. It may be proved, however, by geometry that the most general displacement of a figure, produced by any number of motions, may be reduced to a combination of a translation along a certain line

and a rotation around it as an axis; such a combination is called screw motion.

DYNAMICS

Kinematics is a science which is concerned with geometrical ideas alone; it is the application of logical principles to certain definitions and axioms; it is not concerned with any appeal to experience. On the other hand, dynamics is fundamentally a science based on our experience of certain sensations associated with the idea of matter; and the object of the science is to make such an analysis of the facts of observation and experience as will lead to the statement of a few principles from which all observed phenomena may be predicted. It is possible to have a science based entirely on definitions—which are suggested by observations, however—and to show that all observed phenomena can be regarded as consequences of these definitions, if they are identified with actual physical quantities which appeal to our senses. Such a science is called theoretical dynamics. In the following treatment statics is considered as a special case of kinetics.

Translation. The simplest property of matter (q.v.) is illustrated by an experiment due to Galileo. If a ball rolls down an inclined plane and then meets another plane inclined in the opposite direction, the ball will roll up it with a constantly decreasing velocity; the less inclined this second plane is, the less is the rate of change of the velocity of the ball as it rolls up; therefore, if the plane is perfectly horizontal, there is every reason for believing that the cause of the observed decreasing velocity of the ball is friction, and that if there were no friction the velocity of the ball would not change. In other words, it is thought to be a general law of nature that a portion of matter free from all external actions will maintain its state of motion unaltered.

If, however, the motion of one portion of matter is influenced by the presence of another piece of matter, it is observed that the effect is mutual. The simplest case of two bodies influencing each other's motion is illustrated by two billiard balls striking when rolling on a *smooth* table, i.e., a surface free from friction; by a man standing on a board which rests on *smooth* ice, and then jumping off; by a bullet fired from a gun; etc. One law applies to all such cases: if m_1 and m_2 are the masses of the two pieces of matter which are supposed to be so small as to be called particles, v_1 and v_2 their linear velocities at any instant, V_1 and V_2 their linear velocities at any later time, then

$$m_1v_1 + m_2v_2 = m_1V_1 + m_2V_2,$$

provided there are no external actions, i.e., provided that the only cause of the change in the linear velocity of one body is connected with the presence of the other. In this equation the sum of m_1v_1 and m_2v_2 and of m_1V_1 and m_2V_2 is a *geometrical* one, for each of the terms is a vector quantity. Owing to the importance of the product mass × linear velocity, it has received a name—*linear momentum.* See IMPACT.

This law can be expressed in a different way. If the positions of two particles of matter of masses m_1 and m_2 at any instant are given by coördinates x_1y_1 and x_2y_2, the coördinates of the centre of inertia (q.v.) are defined to be

$$\bar{x} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2} \text{ and } \bar{y} = \frac{m_1y_1 + m_2y_2}{m_1 + m_2}.$$

Consequently as the particles move the centre of inertia changes its position. If u_1 and u_2 are the components along the axis of X of the velocities of the two particles and w_1 and w_2 their components along the axis of Y, the components along the axes of X and Y of the velocity of the centre of inertia are

$$\bar{u} = \frac{m_1u_1 + m_2u_2}{m_1 + m_2} \text{ and } \bar{w} = \frac{m_1w_1 + m_2w_2}{m_1 + m_2}.$$

But if v_1 and v_2 are the actual velocities of the two particles, v_1 is the geometrical sum of u_1 and w_1. Consequently, if the actual velocity of the centre of inertia is $\bar{v}$, it is the geometrical sum of $\bar{u}$ and $\bar{w}$; i.e.,

$$\bar{v} = \frac{m_1v_1 + m_2v_2}{m_1 + m_2},$$

or $(m_1 + m_2)\ \bar{v} = m_1v_1 + m_2v_2 = m_1V_1 + m_2V_2$. Since $m_1 + m_2$ does not change in any physical action, $\bar{v}$ must remain constant in direction and amount, however the velocities of the two particles are altered by their mutual influence.

So far as is known this law of influence of two bodies can be extended to any number of bodies mutually influencing each other; i.e., if any number of particles of matter of masses m_1, m_2, etc., are left alone, free from external actions, their velocities, however changed by mutual reactions, must satisfy the law that the geometrical sum of the linear momenta remains unchanged,

$$m_1v_1 + m_2v_2 + \ldots = \text{constant}.$$

Expressed in terms of the properties of the centre of inertia of the system of particles, this law is that the centre of inertia of a system of particles free from external influences moves in a straight line with constant speed. A large solid is of course a special case of a system of particles; and the motion of the centre of inertia of such a body must obey the same laws as does a single particle.

This principle of dynamics is known as the conservation of linear momentum. When this principle is applied to the mutual action of two bodies, it takes the form

$$m_1v_1 + m_2v_2 = \text{constant},$$

where m_1 is the mass of one body and v_1 is the velocity of its centre of inertia, m_2 is the mass of the second body and v_2 the velocity of its centre of inertia, and the summation is a geometrical one. This equation means, then, that if m_1v_1 is changed in any way by v_1 changing either in direction or in speed, m_2v_2 must change at the same time by an amount equal and opposite to that of the change of m_1v_1. The rates of changes of the two momenta must then be equal and opposite vectors in the same straight line; i.e., $m_1a_1 = -m_2a_2$ if a_1 and a_2 are the linear accelerations of the two centres of inertia. (Illustrations are afforded by a body falling towards the earth, the earth having an acceleration upward; by a piece of iron attracted to a magnet which is suspended free to move; etc.) This may be expressed by saying that under the influence of the second body the first has received an acceleration a_1. The product m_1a_1 is called the kinetic reaction of the body of mass m_1 against the given influence, which is equal and opposite the kinetic reaction of the second body against the action of the first. The influence of any body on another of mass m is measured, therefore, by the product of m and the acceleration produced, i.e., ma. If there is a system of many bodies, the action on one due to all the others is the sum of its kinetic reactions against

all the actions; i.e., it is the product of the mass of that one into the geometrical sum of the accelerations which each in turn of the others by itself would produce—or the actual acceleration of the one. The product of the mass of any body, therefore, by the linear acceleration of its centre of inertia measures the external influences acting on it. These external influences combine to form what is called the external force. In symbols

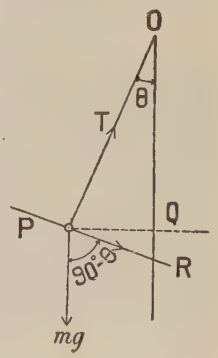
$$F = ma,$$

meaning that if a body of mass m is subjected to a given set of external influences its acceleration is given by F/m, or if bodies of different masses are subject to the same force the accelerations produced vary inversely as the masses. A unit force is such an external action as results in an acceleration of 1 when the mass is 1 or an acceleration 2 when the mass is ½, etc. If the C. G. S. system is used, the unit of mass is a gram, and a unit acceleration is a change in one second of the velocity by an amount of one centimeter per second; the unit force on this system is called the dyne. The dyne is so small, being illustrated nearly by the upward force of the hand required to keep a milligram from falling, that a megadyne (or $10^6 \times$ dyne) is used as a practical unit.

There are many kinds of forces (see FORCE)—gravitation, electrical, magnetic, muscular, elastic, etc. It should not be thought that they are *things* that exist; they are simply numerical values of quantities giving the measure of external influences on the motion of a body, e.g., the effect of pulling a string attached to a body, the effect of a magnet on a piece of iron, etc. Forces are vector quantities and may be compounded or resolved into components. The commonest illustrations of a force are given by a body falling freely towards the earth, in which case the acceleration, g, is a constant for all bodies at any one place on the earth's surface (see GRAVITATION), and so the force on a body of mass m is mg, and if a body is suspended and kept from falling there must be an upward force mg due to the suspension; g is nearly 980 centimeters per second per second, or about 32 feet per second per second. This product mg is called the weight of the body.

One of the most important illustrations of force is shown by uniform motion of a particle in a circle, which may be produced by a string whirling the body in a sling, or by making the body roll around inside a horizontal circular hoop on a smooth table. In the former case the string is said to exert a tension on the particle; in the latter, the hoop is said to exert a pressure on it. In both cases the acceleration is s^2/r, where s is the linear speed of the particle and r is the radius of its path and has the direction from the moving particle towards the centre of the circle; consequently the force is ms^2/r in this direction. In other words, to make a particle of mass m move at a uniform speed s in a circle of radius r requires a force acting on it directed towards the centre and with a numerical value ms^2/r, or, if ω is the angular speed of the particle, $mr\omega^2$. If this force is decreased, the particle will cease to move in a circle and will move farther away from the centre; if the force is removed at any instant—by cutting the string—the particle will continue to move with the same velocity that it has at that instant, i.e., along the tangent to the circle with a constant speed. This fact that, unless the force is sufficiently great, the particles of a rotating body will move farther away from the axis of rotation is illustrated in many ways. The body is said to move under the action of a centrifugal force.

A simple pendulum is defined to be a particle of matter suspended by a long massless string. If it swings through small angles in a vertical plane, the motion of the particle, or bob, is practically in a straight line, and is simple harmonic. Let O be the point of suspension of the pendulum, let OQ be its position when hanging at rest, and OP its position at any instant while it vibrates; call the angle QOP, θ. There are two forces acting on the particle of mass m placed at P: one is the tension of the string along the string towards O, the other is its weight mg, vertically down. The actual motion at this instant is tangent to the circle whose radius is OP, i.e., it is in the direction PR, either up or down. The force T has no component in this direction, being perpendicular to it; and that of the force mg is $mg\sin\theta$ (using the general formula for resolving a vector). Therefore the acceleration of the vibrating particle, in the direction PR, the force divided by the mass, is



$$\frac{mg\sin\theta}{m} \text{ or } g\sin\theta.$$

This acceleration may be written

$$g\frac{PQ}{OP}; \text{ or calling } PQ, x, \text{ and } OP, l, \; g\frac{x}{l}.$$

If the amplitude is very small, PQ is practically the path of the moving particle; and thus the motion is harmonic, in accordance with the definition of such motion; and its period, therefore, is

$$2\pi\sqrt{\frac{l}{g}}.$$

For other illustrations of forces, see ELECTRICITY; MAGNETISM; ELASTICITY; GRAVITATION; CENTRAL FORCES.

It has been shown that, if there are no external influences, the centre of inertia of a system of particles or of a large body continues, if in motion, to move in a straight line with a constant speed. This is owing to the fact that the action and reaction of each pair of particles are equal and opposite. If, however, there are external forces, the acceleration of the centre of inertia in any direction is the sum of the components of these forces in this direction divided by the mass of the whole system. This is equivalent to saying that the motion of the centre of inertia of a system of particles is exactly as if a single particle of the mass of the system were under the influence of the given forces. Thus, if an iron beam falls from a building (without touching anything as it falls), the motion of its centre of inertia is like that of a falling particle—vertical—however the beam revolves. If a hammer is thrown at random into the air, its centre of inertia will describe a parabola, because that is the path of a projected particle. See PROJECTILE.

Many forces are not constant and some are abrupt, like the blow of a hammer; and in these cases it is impossible to measure them. Their *effect* is evidently to produce a sudden change in velocity; and it is measured by the *total* change in the linear momentum. Force itself is the rate of change of linear momentum; so if a force F acting on a particle produces a change of momentum from mv_0 to mv in an interval of time t,

$$F = \frac{mv - mv_0}{t},$$

and thus the total change of momentum equals the product of the force and the interval of time. This product Ft is called the impulse of the force, and may be measured even if both F and t are unknown. Similarly, if an impulsive force acts on a large body, the velocity of its centre of inertia will be changed from v_0 to v in the *direction* of the force. In other words, the change of velocity of the centre of inertia, $v - v_0$, equals the amount of the impulse divided by the mass of the body, entirely regardless of the *point* of application of the force. The *time* required for a force F to change the velocity from v_0 to v is

$$\frac{mv - mv_0}{F}.$$

The *distance* required for this same force F to produce this change in velocity from v_0 to v in its direction is found by the formulæ of kinematics, which show that under a constant acceleration a the distance traversed while the speed changes from s_0 to s is such that $2ax = s^2 - s_0^2$. Therefore, in this case, since $a = F/m$,

$$x = \frac{\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2}{F}.$$

The product Fx, i.e., the force multiplied by a distance in its line of action, is called the work; the quantity $\frac{1}{2}ms^2$ is called the kinetic energy of translation of the body whose mass is m when it has the speed s. This formula is expressed in words by saying that the *work done by the force* on the body equals the *increase* in its kinetic energy of translation, provided the speed is increasing, e.g., a train being set in motion. If the speed is decreasing, e.g., a train slowing up by virtue of its brakes and the resulting friction, it is said that the body *loses* an amount of kinetic energy of translation equal to the work it does in overcoming friction or *against the force* F.

Rotation. A rigid body is defined as one which is not deformed in any way under the forces acting on it. If such a body is pivoted on an axis whose position is fixed, e.g., a door, a grindstone, etc., it is self-evident that the angular motion produced in it by a force such as a push or pull depends not alone on the amount of the force and its direction but also on its point of application. Thus, if the force is at right angles to the door and near the hinges, there is only a slight effect; if it is applied near the edge of the door, it is much greater; and if the line of action of the force passes through the axis of rotation, there is no effect so far as rotation is concerned. If a plane section be imagined in the body, at right angles to the axis, it is evident that a force perpendicular to this plane, i.e., parallel to the axis, has no effect on the angular motion; while a force lying in this plane has an effect which depends upon both the force and the perpendicular distance from the point where the axis cuts the plane to the line of action of the force. This perpendicular distance is called the lever arm of the force with reference to the axis; and the product of the numerical value of the force and its lever arm is called the moment of the force around the axis. A moment such that the resulting effect of the force is to produce rotation in one direction is called positive; while if its effect is to produce the opposite rotation it is called negative. A moment is, then, a rotor. It can be shown that the moment of a force about an axis is the proper numerical value to give the rotational effect of the force; for, if a body pivoted on an axis is kept from turning under the opposing actions of two forces differently placed, it is found that the moments of the two forces about the axis are equal and opposite.

If a moment is acting on a pivoted body such as a door, its immediate effect is to produce angular acceleration; just as the effect of a force in translation is to produce linear acceleration. It is important to determine the connection between the moment of the force and the resulting angular acceleration. The simplest case is that of a particle of matter joined to an axis by a massless rigid rod, and a force acting on the particle at right angles to the rod. If the rod has a length r and the particle has a mass m, the moment of the force F around the axis is Fr, and the *linear* acceleration of the particle in the direction of the force is $\frac{F}{m}$. Therefore the *angular* acceleration (α) is $\frac{F}{mr}$; and if the moment of the force is called L,

$$L = Fr = mr^2\alpha.$$

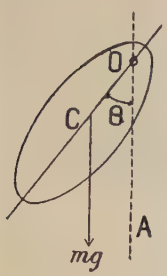
The coefficient of α, mr^2, is called the moment of inertia of the particle around the axis. If, now, the rotating body is of any shape or size, it may be shown that the angular acceleration (α) resulting from a moment (L) is given by the formula $\alpha = \frac{L}{\Sigma mr^2}$, where Σmr^2 is the sum of the products of the mass of each particle of the body by the square of its distance from the axis. Σmr^2 is called the moment of inertia of the whole body around the axis and is commonly written I. Hence

$$L = I\alpha,$$

a formula for rotation of a rigid body around an axis whose position is fixed, which corresponds perfectly with the formula $F = ma$ for translation. In the same way, therefore, that m measures the inertia of a body so far as translation is concerned, I measures its inertia for rotation.

A simple illustration is that of a body pivoted about a horizontal axis so that it can make oscillations under the action of gravity, like a common clock's pendulum. Take a plane section of the body at right angles to the axis of rotation (at O) and passing through the centre of inertia (C), to describe the rotation choose the line fixed in the body as the one joining the centre of inertia of the body and the point where the axis meets the plane (OC), and as the line fixed in space the one where OC comes when the body is hanging at rest (OA). As the body vibrates, it will occupy in turn different positions which are completely described by the angle

(θ) between OC and OA. The problem is to find the angular acceleration. There are two forces acting on the body: one is the supporting force at the pivot, and its moment about the axis is zero because it passes through O; the other is the weight of the body, which is mg, where m is the mass of the body and g is the linear acceleration of a body falling freely, and its line of action is vertically down through the centre of inertia—both of which facts will be explained later. Calling the length of the line OC, l, the moment of the force mg about the axis through O is $mgl\sin\theta$; therefore the angular acceleration is $\frac{mgl\sin\theta}{I}$, and it is in such a direction around the axis as to produce angular motion tending to bring OC to coincide with OA. If the amplitude of the vibration is small the $\sin\theta$ may be replaced by θ; and the angular acceleration is $\frac{mgl}{I}\theta$. Consequently the motion is simple harmonic, and the period of one complete vibration is $2\pi\sqrt{\frac{I}{mgl}}$. Such an oscillating body is called a compound pendulum, and it has many interesting properties. (See CENTRE OF GYRATION; CENTRE OF OSCILLATION.) A simple pendulum is a special case of a compound one; in it $I = ml^2$ and so the period becomes, as before, $2\pi\sqrt{\frac{l}{g}}$.



Since $L = Ia$, if the angular velocity around the axis is called ω, this equation may be written

$$L = \frac{I\omega - I\omega_0}{t},$$

where $\omega - \omega_0$ is the change in the angular velocity in t seconds. The product Lt is called the impulse of the moment of the force, or the moment of the impulse of the force. As a result of an impulsive moment, the product $I\omega$—called the angular momentum—is changed.

The time taken for a moment L to change the angular velocity from ω_0 to ω is evidently

$$t = \frac{I\omega - I\omega_0}{L}.$$

The angle through which the body turns while this change is going on is given by the formula of kinematics $2a\theta = \omega^2 - \omega_0^2$; and as $a = L/I$, the angle

$$\theta = \frac{\frac{1}{2}I\omega^2 - \frac{1}{2}I\omega_0^2}{L}$$

or

$$L\theta = \tfrac{1}{2}I\omega^2 - \tfrac{1}{2}I\omega_0^2.$$

The product $L\theta$ is called work; and the work is said to be *done by* the moment if ω is increasing, and *against* the moment if ω is decreasing. $\frac{1}{2}I\omega^2$ is called the kinetic energy of rotation of the body whose moment of inertia about a given axis is I and whose angular speed is ω. (One should note that these values of work and kinetic energy can be derived from the corresponding values for translation if the rotating body is considered made up of particles each of which therefore has motion of translation.)

Motion in General. If the rigid body is not pivoted around a fixed axis but is free to move in any direction or manner, it will receive, in general, both linear and angular acceleration under the influence of a force, e.g., if a body is thrown in the air. (Under the action of gravity alone there is, however, only linear acceleration, for reasons to be given immediately.) It has been shown that the linear acceleration of the centre of inertia of a body acted on by any forces is the same as that which a particle having a mass equal to that of the body would have under the action of the same forces. A force in general does not have a line of action passing through the centre of inertia; imagine a plane section of the body through the line of action and the centre of inertia; the force will then in general have a moment about an axis through the centre of inertia perpendicular to this plane. Since the translation of the centre of inertia of the body under the action of the force is quite independent of the rotation, the rotation will be exactly as if the above axis is fixed; i.e., if m is the total mass of the body, I its moment of inertia about this particular axis, F the force, and L its moment about the axis, the linear acceleration of the centre of inertia will be $\frac{F}{m}$ and the angular acceleration $\frac{L}{I}$. So, if the force has its line of action through the centre of inertia, there will be no angular acceleration, e.g., the action of gravity upon a falling body.

If an impulsive force, whose impulse is K and whose lever arm with reference to an axis through the centre of inertia is k, acts upon the body, the velocity of the centre of inertia in the direction of the force will change according to the formula $v - v_0 = K/m$, and the angular velocity about the axis through the centre of inertia will be given by the formula $\omega - \omega_0 = \frac{Kk}{I}$. If the body is originally at rest, its centre of inertia will move in the direction of the force with a velocity K/m, and it will rotate with an angular velocity $\frac{Kk}{I}$. If the line of the force is through the centre of inertia, $k = 0$ and there is no angular motion. This fact furnishes an experimental method for the determination of the centre of inertia (q.v.).

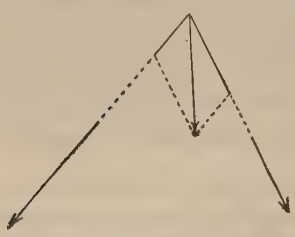
If the linear velocity of the centre of inertia at any instant is v, and if the angular velocity is ω, the entire kinetic energy is $\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$, where m is the total mass and I is the moment of inertia of the body about the axis of rotation through the centre of inertia.

All applications of mechanics to astronomy, etc., are based upon this fundamental equation of Newton, force = mass × acceleration. If in the future it is proved that matter owes its distinctive properties to its contained electric charges, it will be possible to deduce the laws for mechanics from the laws for electricity; but these laws must certainly agree, within the limits of experimental accuracy, with the Laws of Newton.

Composition of Forces—Statics. If several forces are acting on a rigid body there will be produced as a rule both linear and angular accelerations; it is a problem then to determine what single force, if any, can produce the same result. If such can be found, it is called the resultant. Since, as stated in kinematics, the most general motion is a screw motion, it is impossible in general to have a resultant. If,

however, the forces all have their lines of action in one plane, they have a resultant except in one case to be noted hereafter. Such forces are called coplanar. It is simplest to distinguish between two groups of pairs of forces, parallel and nonparallel.

Two Nonparallel Coplanar Forces. The lines of action of two such forces meet in a point in their plane. Consider a case in which this point is in the rigid body on which the two forces are acting. The effect of a force upon a rigid body is evidently the same wherever its *point* of application is, provided it is in the line of action of the force. Therefore the action of the two forces in this case is as if they were both applied at that point of the rigid body where their lines of action cross. Their resultant is then found by constructing their geometrical sum at this point; for such a force has obviously a translational effect equivalent to the sum of the effects of the two forces, and it may be shown by simple geometry that its moment around any axis is equal to the sum of the moments of the two forces around that axis, and so its rotational effect is the same as the combined effects of the two forces. The line of action of the resultant passes through the point of intersection of the two forces, but its *point* of application can be anywhere in this line; consequently it is entirely immaterial whether the point of intersection itself is a point of the body or not.



Since the process of determining the geometrical sum of two forces consists in forming the parallelogram with these forces as adjacent sides and drawing the diagonal, this principle of the composition of two nonparallel coplanar forces is sometimes called the parallelogram of forces.

It is evident that if the body is under the action of three forces, one of which is equal and opposite to the resultant of the other two, there is no resulting force or moment; i.e., there is neither linear nor angular acceleration. Such a condition is called equilibrium (q.v.). The stability, instability, etc., of equilibrium are discussed in the article on EQUILIBRIUM.

Conversely, if a rigid body is in equilibrium under the action of three nonparallel forces, their lines of action must meet in a point, they must lie in one plane, and one must be equal and opposite to the geometrical sum of the other two. It is obvious that, if these conditions are satisfied, the three forces will, when drawn as lines, form a closed triangle. For this reason this principle is sometimes referred to as the triangle of forces.

Two Parallel Forces. Two parallel forces form a limiting case of two nonparallel coplanar forces whose point of intersection recedes to an infinite distance. Their geometrical sum then becomes their *algebraic* sum; if the two forces are in the same direction, their resultant is a force parallel to them, in the same plane, and numerically equal to the sum of their numerical values; if they are in opposite directions, their resultant is a force parallel to them, in the same plane, and numerically equal to the difference of their numerical values. (For the time being the case is excluded in which the two parallel forces are equal and opposite; such a combination is called a couple, q.v.) This resultant must have such a position relative to the two forces that its moment about any axis equals the sum of their moments about the same axis. If the forces are as shown in the figure, F_1 and F_2 being at a known distance $\overline{AC}$ apart and O being the intersection of any axis perpendicular to their plane with the plane, $OCBA$ being a line perpendicular to the forces, the resultant R must have such a position that

$$R\overline{BO} = F_1\overline{AO} + F_2\overline{CO}.$$

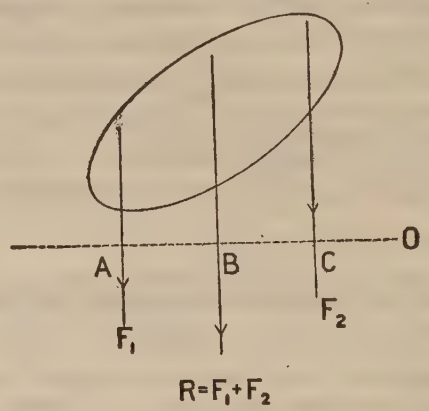
Substituting for R its value $F_1 + F_2$, this becomes

$$(F_1 + F_2)\,\overline{BO} = F_1\overline{AO} + F_2\overline{CO},$$

$$\text{or} \quad F_1\overline{AC} = (F_1 + F_2)\,\overline{BC};$$

$$\text{hence} \quad \overline{BC} = \frac{F_1}{F_1 + F_2}\overline{AC},$$

and therefore the position of the resultant is given in terms of known quantities. (This expresses the obvious fact that the moment of the resultant around an axis through C equals the moment of F_1 around the same axis; for the moment of F_2 around this axis is zero.) In a perfectly similar manner the resultant of two parallel forces in opposite directions may be found.



One of the most important illustrations of parallel forces is given by the gravitational action of the earth on a body. Experiments show that the accelerations of all bodies—all materials and all quantities—when falling freely towards the earth at any point on its surface are the same, g. Therefore each particle of matter of mass m near the surface of the earth is being acted upon by a force mg, whose direction is towards the centre of the earth. Any large rigid body is, then, under the action of a great number of parallel forces. Their resultant is a vertical force Mg, if M is the total mass of the body. Its centre, i.e., the point through which its line of action always passes, however the body is turned, is called its centre of gravity (q.v.). It may be shown analytically and by experiment that this point coincides with the centre of inertia of the body. This is further evident from the fact that, if a body falls, however it revolves in so doing, its centre of gravity must have the acceleration g; and this property has been shown to be peculiar to the centre of inertia.

It is evident that if a rigid body is under the action of three coplanar parallel forces, one of which is equal and opposite to the resultant of the other two, the body is in equilibrium. The conditions then are (1) that the algebraic sum of the three forces equals zero; (2) that the algebraic sum of the moments of the three forces around any axis equals zero. If any number of coplanar forces, parallel or nonparallel, act on a rigid body, their resultant may be found by compounding them in pairs, as described. If, however, the final pair of forces is a couple, i.e., consists of two equal and opposite forces, there is no resultant. The moment of a couple around any axis perpendicular to their plane is the product of either of the forces by their distance apart; this product is called the strength of the couple. The action of a couple is to make a body rotate about an axis perpendicular to its plane and passing through the centre of inertia of the body; and this can be balanced, not by a single force, but by another couple of equal strength and opposite in direction. A couple is, then, a rotor.

The action on a rigid body of any number of forces in all directions can be reduced in the end to a single force through the centre of inertia and a couple; for each force can be replaced by a parallel force through the centre of inertia and a couple lying in its plane, and so all the forces reduce to the sum of a number of forces all passing through the centre of inertia and to the sum of an equal number of couples each tending to produce rotation around its own axis passing through the centre of inertia.

The dynamics of fluid bodies are considered in HYDRODYNAMICS and PNEUMATICS.

Work and Energy. Two general formulæ were developed in the discussion of translation and rotation,

$$Fx = \tfrac{1}{2}ms^2 - \tfrac{1}{2}ms_0^2,$$
$$L\theta = \tfrac{1}{2}I\omega^2 - \tfrac{1}{2}\omega_0^2.$$

The first formula may be expressed in words as follows: if a particle whose mass is m is moving with a speed s_0 in any direction, this will be changed to s in that same direction under the action of a constant force F in that direction, provided the distance traversed in that time is x as given by the relation $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. An illustration is afforded by an arrow shot from a bow: $s_0 = 0$, then $Fx = \frac{1}{2}ms$. Fx is called the work done by the bow, and the quantity $\frac{1}{2}ms^2$ is called the *kinetic energy of translation.* Any body, not itself in motion, which has the power of producing kinetic energy in another body is said to have *potential energy.* Thus, a bent bow, a compressed spring, a stretched elastic cord, etc., have potential energy. To bend the bow, compress the spring, stretch the cord, etc., a force must be overcome; i.e., motion is produced in a direction contrary to the elastic force of the body. The numerical value of the potential energy is defined as equal to the product of the force overcome and the distance through which this has been done, i.e., to the work done on the bow, spring, or string. If the spring is compressed by a body falling upon it, the spring gains potential energy, since work is done on it and the body loses kinetic energy. (The spring and body together would naturally continue to vibrate up and down, but it may be supposed here that the spring is caught and held when it is compressed to its greatest extent.) If F is the force of opposition due to the spring and x the distance required to change the speed of the body of mass m from s to s_0, the gain of potential energy of the spring in that distance is Fx and the loss of kinetic energy is $\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$, where $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. Similarly, if the spring expels the body, the spring does work on the body and loses potential energy and the body gains kinetic energy, the loss in potential energy being Fx and the gain in kinetic energy being $\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$ if in the distance x the speed is increased from s_0 to s; and as before, $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. The kinetic energy of the spring itself is neglected.

In words, this formula means that the loss of potential energy of the system producing the acceleration equals the gain of kinetic energy of the particle accelerated; or, the gain of potential energy of a system producing retardation equals the loss of kinetic energy of the retarded particle. Kinetic energy may also be produced by the impact of another body; and all experiments are in accord with the idea that the kinetic energy gained by a body in this case equals that lost by the impinging particle *provided no other effects are produced.* This is illustrated by the impact of perfectly elastic bodies. (In general, when there is impact, heat effects, such as rise of temperature, are produced, in which case the kinetic energy gained by the particle does not equal that lost.) In general, then, in mechanics, whenever one body loses energy another body gains an equal amount, work being simply the transfer of the energy. Work is done in two ways—producing a change in speed and overcoming some opposing elastic force. Unless there is *motion* in the direction of the force no work is done.

It is evident that the kinetic energy of a moving body involves the idea of *speed,* not *velocity,* because the amount of work it can do is independent of the *direction* of the motion. (Also, if there is no change in the speed of a body, the force is at right angles to the motion, and so no work is done, whatever the change in direction may be.) Illustrations of the second formula, $L\theta = \frac{1}{2}I\omega^2 - \frac{1}{2}I\omega_0^2$, are given by the turning of a grindstone and by a flywheel being set in motion or stopped.

There are other ways of doing work than in overcoming elastic forces and producing speed, e.g., raising a body up from the earth, separating a piece of iron from a magnet, separating two bodies electrified oppositely, overcoming the force of friction, etc. In all these cases the body doing the work loses energy and the system on which work is done gains energy. The principle of the conservation of energy is that in every case the energy lost by the former equals that gained by the latter; so that on the whole there is no change. Every phenomenon in nature is in accord with this principle so far as is known.

When a body is raised from the earth work is done equal to the product of the weight of the body and the *vertical* height it is raised, mgh. This amount of energy is gained by the system consisting of the earth and the body whose mass is m; but until gravitation is understood it will be impossible to locate the energy in any definite place or places. If a body falls through a height h, it and the earth lose potential energy, mgh, which is gained in the form of kinetic energy by the falling body and the earth, principally by the former, since the change in the speed of the earth occasioned by the body as it falls towards

it is so infinitesimal. If, after the body falls a distance h, its speed is s, its kinetic energy is $\frac{1}{2}ms^2$, and therefore $mgh = \frac{1}{2}ms^2$, or $s^2 = 2gh$. This formula shows that the speed of a falling body depends upon the *vertical* height traversed, not on the slope or length of the path itself; it may fall vertically, or down an inclined plane, or down a spiral, etc.

The cases of work being done against electrical and magnetic forces are discussed under ELECTRICITY and MAGNETISM. Whenever work is done in overcoming friction it is observed that heat effects are produced, which can be traced to the fact that the minute portions of the body on which the work is done gain energy. This question is fully discussed under HEAT. Since, when any inelastic body is deformed in any way, there is internal friction, part of the energy gained by such a body when it strikes another body goes into producing heat effects.

It is a general property of motion, which follows at once from the definition of potential energy, that all motions take place of themselves in such a manner as to make the potential energy of the system decrease, and that equilibrium is not reached until the potential energy has reached a value such that it is a minimum—i.e., is as small as is possible under existing conditions.

The unit of work or energy is that corresponding to a unit force acting through a distance of a unit length. On the C. G. S. system this unit is, then, that corresponding to a force of one dyne acting through one centimeter; it is called an erg. An erg is, however, such a small unit that 10^7 ergs—a joule, as it is called—is ordinarily used as the practical unit. The amount of work done in a unit interval of time by any agency is called its activity or power (q.v.). On the C. G. S. system the unit is, then, one erg per second. The practical unit is, however, one joule per second; this is called a watt.

Machines are mechanical appliances by means of which a force applied at one point and in a definite direction is made to produce a different force at another point and generally in a different direction; the work done by means of the latter force can never be greater than that done by the former—it is in practice always less, owing to friction and other causes. The mechanical advantage of the machine is the ratio of the two forces described above. There are many forms of machines—levers, pulleys, inclined plane, wedge, screw, windlass, etc. (See the separate articles.) The problem in any one case is to determine the theoretical mechanical advantage of a machine; i.e., on the assumption that there is no friction when the forces are working. There are two general methods of solving this: one is to imagine a certain force acting on the machine and to determine by the ordinary principles of equilibrium what second force will just balance the action of the first; the second is to consider the machine in equilibrium under the action of these two forces, then to imagine a small displacement, and to express the fact that the work done by one force equals that done against the other. For the application of these principles to the various machines reference should be made to the separate articles in which they are described.

Bibliography. A brief useful treatise for the general reader, which gives a clear conception of the elementary principles of mechanics, is J. C. Maxwell, *Matter and Motion* (New York, 1892). The following works, all of which are standard, can be recommended to the student of mechanics: Routh, *Elementary Rigid Dynamics* (London, 1891); id., *Advanced Rigid Dynamics* (ib., 1892); id., *Statics* (2 vols., Cambridge, 1892); E. Mach, *Science of Mechanics* (Eng. trans., Chicago, 1893); Love, *Theoretical Mechanics* (Cambridge, 1897); Routh, *Dynamics of a Particle* (ib., 1898); Ziwet, *Theoretical Mechanics* (New York, 1904); John Cox, *Mechanics* (ib., 1904); Goodman, *Mechanics Applied to Engineering* (London, 1904); Barton, *Mechanical Processes* (Annapolis, 1906); W. B. Anderson, *Physics for Technical Students: Mechanics and Heat* (New York, 1914); E. R. Maurer, *Technical Mechanics* (3d ed., ib., 1914); also the invaluable *International Catalogue of Scientific Literature: Mechanics* (London, 1902 and annually).

MECHANICSBURG, mĕ-kăn'ĭks-bûrg. A borough in Cumberland Co., Pa., 8 miles west of Harrisburg, on the Cumberland Valley Railroad (Map: Pennsylvania, H 7). It is the seat of Irving Female College (Lutheran) and has a public library. The city is surrounded by a rich agricultural country and has extensive drop-forging works, knitting mills, wheel works, foundry and machine shops, and a spoke factory. The government is vested in a burgess and a council. Mechanicsburg was settled in 1806 and was incorporated as a borough in 1828. It was the most northern point at which the Confederates established headquarters during the Civil War. Colonel Jenkins was in command of a regiment of cavalry quartered here June 28–30, 1863. Pop., 1900, 3841; 1910, 4469.

MECHANICS INSTITUTE. An institution founded in 1891 by a consolidation of the Rochester (N. Y.) Athenæum, incorporated in 1830, and the Mechanics Institute of Rochester, founded in 1885. The institute aims to furnish thorough and efficient training to those who may be engaged in industrial or domestic pursuits which will fit them for positions of trust or as instructors in the same lines of work. It is a technical school and, while it confers no degrees, it grants diplomas and certificates for the satisfactory completion of the various courses of instruction. There are four departments—industrial arts, household arts, applied and fine arts, and academic. The institute occupies a block within two squares of the centre of the city of Rochester. The most important buildings are the Eastman Building, containing laboratories; the Bevier Memorial Building, containing classrooms and an exhibition room; mechanical shops; and a power plant. The regular courses are for nine months. The coöperative industrial and coöperative engineering departments have a twelvemonth's session. There are also evening sessions in practically all departments of instruction and a summer-school session. The total attendance in all departments of the institute in 1913–14 was 522, and the faculty numbered 94. There is an endowment fund of about $112,000 and an annual current expense fund of about $120,000, as well as scholarship and students' loan funds. There is a technical reference library of 3500 volumes, and the institute is within two blocks of the Reynolds Library, containing 72,000 volumes. The president in 1915 was Carleton B. Gibson, A.M., LL.D.

MECHANIC'S LIEN. A statutory lien or charge upon real estate to secure payment for work and labor performed on, or materials fur-

nished for, buildings or other improvements thereon at the request or with the consent, express or implied, of the owner. Under the early English law no liens on real estate were recognized, as it was against the policy of the feudal system to permit a tenant thus to charge land which he held of his feudal lord, who in turn held of the King. After the feudal system was abolished lands might be charged with liens by express agreement of the owner, and this became common in the form of mortgages. Courts of equity also recognized certain agreements and transactions as having the force of mortgage liens. Strictly speaking, therefore, there are no common-law liens on real estate. By statute, however, several such liens were created, such as judgment liens and liens for taxes and assessments.

With the development of business customs much work which was formerly done by persons acting as servants for a master came to be performed by independent contractors. For the protection of such contractors and of materialmen whose wares are used in buildings and other improvements on real estate, the statutes known as mechanic's lien laws have been enacted in all the United States and in Canada, but not in England. There was a precedent by analogy for such laws in the common-law liens of artisans on personal property for labor bestowed on it, such as the repair of a wagon or a pair of shoes. Somewhat similar liens on real estate were also recognized and protected by the civil law. The theory on which mechanics' liens are given by statute is that the value of the real estate has been increased by the addition of the improvements on which the work was performed or materials furnished, and that the property so improved may fairly be subjected to such claims. This creates a preference of these claims over those of unsecured creditors of the owner, but a mechanic's lien is subject to valid prior liens on the real estate, such as mortgages, judgments, taxes, etc.

The term "mechanic's lien" is used in a general sense to cover all liens for labor, whether skilled or unskilled, as well as for materials furnished in the construction or repair of buildings. These liens give a right to look to the property for compensation, but, unless the work was directly ordered by him, do not create a personal claim against the owner. As a general rule, the lien attaches both to the building or improvement and to the land on which it is erected; but if the improvement is placed on the land without the owner's consent the lien will not extend to the land, but may nevertheless cover the improvement to the extent of the interest of the person, as the tenant or contractor, who ordered the work and materials. The lien attaches only to the very property on which the work was done, and will not affect the other real estate of the owner. A mechanic's lien may be filed against any title or interest in real estate, even though it is quite limited, as a lease for a year, provided it is such an interest as may be sold on execution.

The statutes in the different States vary in their provisions as to the character of the improvements which will serve to raise a lien. In general, however, such liens will attach to the real estate where any structure in the nature of a building is constructed, altered, or repaired. In some States the right is extended to cover the erection of fences, laying pipes, building sewers, grading, terracing, or sodding the land, and all other improvements which may be said to benefit the land. The idea of benefit is usually consistently followed, in that the lien does not attach where buildings are torn down or moved from the land. In most States only a person who does work or furnishes materials at the request of the owner or his authorized agent, as a general contractor, is entitled to protect himself by a mechanic's lien. However, in a number of States, subcontractors, i.e., those who work or furnish materials for the one who contracts directly with the owner, are allowed to file direct or subordinate liens against the property.

As a general rule the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien, but where an owner defaults in his payments or otherwise breaks his part of the contract, the right to file a lien usually attaches at once. In order to perfect a mechanic's lien the statutes of most jurisdictions provide that a notice setting forth the names of the owner and the party claiming the lien, the character of the work done, a description of the premises, the total contract price, the amount paid thereon, the amount still due, and the date when the last item of work was performed, shall be filed in the county clerk's office and a copy thereof served on the owner of the property affected. In a number of the States this lien attaches and relates back to the time of the commencement of the work upon its being filed, and is prior to all liens for work done subsequent to that time; but this is not the general rule, as liens usually attach and take precedence according to the order of their being filed. The statutes of the States vary in their details as to procedure, time of filing, etc., and must be consulted to ascertain those particulars. See GARNISHMENT; LIEN; MORTGAGE.

MECHANICS OF DEVELOPMENT. This term, or Entwicklungsmechanik of the German embryologists and cytologists, is in frequent use, suggested by the changes undergone during cell division (see MITOSIS) and also in the egg of all animals previous to and following fertilization. These changes are so orderly and complex as to suggest mechanical causes for them. As early as the first quarter of the last century Pander (1817) inquired into the mechanics of development, and Lotze followed him with some luminous suggestions. The subject was continued by His and by Rauber, Van Beneden, and more recently through observation and experiments in artificial fertilization and in animal grafting carried on by O. Hertwig, Boveri, Fol, Bütschli, Pflüger, Born, Roux, Driesch, Schultze, Gerlach, Wilson, Loew, and others. Thus, Bütschli by his researches on foam has shown that the forms of the amœba and other Protozoa may be due to mechanical causes of the environment. His studies may be called protoplasmic mechanics. Here also come in the suggestions of Herbert Spencer and of Ryder as to the mechanics and mathematics of the initial steps taken during the growth of organisms. See GROWTH.

MECHANICSVILLE, mē-kăn'ĭks-vĭl. A village in Saratoga Co., N. Y., 19 miles north of Albany, on the Hudson River and the Champlain Canal and on the Delaware and Hudson Company and the Boston and Maine railroads (Map: New York, G 5). It has a public-school library and fine municipal and high-school buildings. The

industrial interests are favored by abundant water power and include extensive manufactures of pulp and paper, knit goods, sash and blinds, shirts and collars, metal goods, brick, iron beds, and mattresses. The water works are owned and operated by the municipality, which has adopted the commission form of government. Pop., 1900, 4695; 1910, 6634.

MECHANICSVILLE, BATTLE OF. A battle fought at Mechanicsville, on the Chickahominy River, 7 miles from Richmond, Va., June 26, 1862, between a Federal force of about 5000 under the immediate command of General Fitz John Porter and a Confederate force of about 10,000. The Confederates, under A. P. Hill, made a fierce and reckless attack on the strong Federal position, but, after suffering great loss, were finally driven back. Early on the morning of the 27th, however, General Jackson with a strong Confederate reënforcement having arrived in the vicinity, General Porter abandoned his position for a stronger one several miles to his rear, where later in the day he was again attacked. (See GAINES'S MILL.) In the engagement at Mechanicsville the Federals lost about 360, the Confederates about 2000. The engagement was the first of the so-called Seven Days' Battle of the Peninsular campaign, and is sometimes known as the battle of Beaver Dam Creek. Consult: Ropes, *The Story of the Civil War,* part ii (New York, 1907); Alexander, *Military Memoirs of a Confederate* (New York, 1907); Steele, *American Campaigns* (Washington, 1909).

MECHANISM, mĕk'*a*-nĭz'm (Lat. *mechanisma,* contrivance, from Gk. *μηχανή, mēchanē,* device). In philosophy often this term is employed to designate any view which seeks to explain the universe in terms of the machinery of its processes, and, as this machinery is understood only in its movement, mechanism is frequently restricted to designate the view that the universe is a vast system of motions. In this sense mechanism is practically equivalent to materialism (q.v.). It is, however, often used as a synonym for naturalism (q.v.); in this latter sense its usual antonym is teleology (q.v.). The modern physical sciences have been elaborated on a mechanistic basis in the sense that the fundamental formulas of physical science are kinematic and kinetic formulas. Now the question arises whether in biology and in psychology these same formulas hold good: they may not be alone in being applicable to biological and psychological facts, being counteracted by vitalistic and conscious forces. The mechanist maintains that they and they alone are applicable everywhere and that there are no non-mechanistic forces, such as vitalism, opposed to mechanism. Such a contention is unobjectionable, provided "mechanism" be held as an elastic conception and not exclusively identified with the methods of behavior of matter in its inorganic forms. If mechanism be rigidly confined to denote the laws of inorganic matter, then it is sheer dogmatism to insist that these are the only laws of matter. One of the most satisfactory discussions of this subject is given by Prof. H. S. Jennings. "Does not the knowledge of the properties of matter given by physics and chemistry show that the phenomena of life cannot be considered manifestations of the properties of matter? This question is based on the abandonment of the radically experimental point of view. What the properties and activities of matter are can be known only through experience. Knowledge so acquired has the same validity when the matter examined is in the combinations called living, as in other conditions . . . if reproduction, regulation, sensation, thought, and the like so occur and are not identifiable with the activities of matter known in physics and chemistry, then they are merely to be added to the latter, on the same footing. It is a vulgar error to assume that if in certain combinations matter is 'inert and lifeless' it must be so in all. Matter has precisely the characteristics that we find it to have. Development, regulation, purpose, consciousness, reason—these are not annulled or altered by the discovery that they are bound up with the phenomena called matter; such discovery changes our knowledge of matter. It is no more and no less extraordinary that they should occur in connection with the phenomena we call matter than separately. What we find throughout the scale is that matter in certain combinations manifests certain activities; in other combinations, other activities. The more complex the combination the more complex and varied the activities. The union of many of the most complex substances in certain arrangements ('structure') gives the phenomena of life; observation of this fact stands on the same footing as observation of the gravitation or extensity of matter." In other words, the ascertained properties of *living* matter are properties of living *matter.* Now, if we choose to give the name of mechanism to the orderly procedure of matter wherever found, then mechanism is an adequate system of categories; but it must be remembered that it is, from the point of view of the development of knowledge, a growing system. We do not know all about mechanism and cannot predict with infallibility what under new conditions may occur. If on the contrary we mean by mechanism a definite number of already ascertained laws of material behavior, then mechanism is a partial truth, perhaps limited in its range just to those phenomena which have yielded to us the knowledge of these laws.

Much has been made of the opposition between mechanism and teleology. In this antithesis it is generally stated that a mechanistic view of the universe admits of the absolute predictability of the future, whereas the teleological view leaves room for unforeseeable novelties. If mechanism means predictability with the help of such laws as we have, then we must admit that mechanism is absolutely false. Nobody with our body of science can predict the future except in a most general fashion. But predictability presupposes *knowledge* of the laws in accordance with which an event is to occur, and an empiricist admits that laws must be obtained from experience. New laws therefore are possible, and the fact that prediction is impossible in the absence of knowledge of such laws is no proof that the unpredictable is not going to be determinate and orderly in its behavior. Mechanism as naturalism is thoroughly consistent with the recognition of purpose provided purpose occurs in accordance with law.

Among the most prominent recent opponents of mechanism the best known are Bergson and William James (qq.v.). Both have identified mechanism with predictability. In doing this they have had some justification in the claims of mechanists themselves.

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James, *Pluralistic Universe* (ib., 1909); Henri Bergson, *Time and Free Will*, translated from the French (ib., 1910); id., *Creative Evolution*, translated from the French (ib., 1911); William James, *The Will to Believe* (new ed., ib., 1912); J. S. Haldane, *Mechanism, Life, and Personality* (ib., 1914); Jennings, "Life and Matter," in *Johns Hopkins University, Circular No. 10*, N. S. (Baltimore, 1914).

MECHANOTHERAPY, měk'ă-nō-thĕr'ă-pĭ. A form of physical therapeutics which may be defined as a species of gymnastics in which the movements are applied mechanically with "fixed duration, direction, and purpose" (Ling) either by the hand of the operator or by means of specially devised machines. A systematic employment of such exercise is the object of the so-called Swedish movements, a development of massage. To Pehr Henrik Ling (q.v.), born in 1776, in Småland, Sweden, belongs the credit of systematizing this form of mechanical therapy. According to his definition a movement consists in a change of the body or part of it from one position to another under certain definite conditions, the movement beginning with a fixed position of the body except the part to be manipulated. Ling recognized five principal positions of the body (lying, kneeling, sitting, standing, and hanging), with many secondary positions; and three principal movements (flexion, extension, and rotation), with numerous subvarieties, all of these movements being in accordance with the natural motion of the parts. *Passive* movements are performed by the operator without the patient's volition. *Active* movements are performed by the patient of his own will and volition, unhindered and unaided by the operator. A *concentric* movement is made when the patient overcomes resistance while performing a movement; if, on the other hand, the patient resists the efforts of the operator to flex or rotate certain muscles the movement is called *eccentric*. According to a strict definition, massage is not included under mechanotherapy; but modern systems of physical therapeutics often combine the various movements with massage, baths, electricity, and vibration. The benefits derived are the same as those conferred by other forms of exercise (q.v.).

A great number of devices for self-massage or exercise have been introduced; the "cannon ball" for abdominal massage in cases of constipation is a familiar example. Rowing machines and pulleys, elastic or weighted, are found in most gymnasia. Mechanotherapy, however, has probably reached its highest development in the ingenious inventions of Dr. Gustaf Zander, of Stockholm. About the middle of the last century Zander introduced the first of these contrivances for administering the well-known Swedish movements. From crude beginnings he developed his system until he had perfected over 70 varieties of apparatus, some of them weighing nearly a ton, by which the most delicate child and the most unwieldy adult can be treated with equal ease and advantage. These machines range from a simple apparatus for moving a single joint or group of muscles to complicated mechanisms which closely imitate the motion of the body performed on horseback or even camel riding—the latter technically known as "trunk circumduction." Zander institutes have been established in all the important cities and health resorts in Europe, while in the United States some of the large hospitals have a department devoted to this work. Among these are the Neurological Hospital and the Montefiore Home in New York City and the Massachusetts General Hospital in Boston.

Mechanotherapy is not designed, nor should it be resorted to, as a substitute for the natural, unconscious exercise in the open air, such as is obtained in the various outdoor recreations, but is applicable to those suffering from general weakness, or from affections of particular portions of the body, such as local paralysis or joint affections, which would render general movement painful, harmful, or impossible. Another large class of persons who are likely to find benefit are those who are afflicted with deformities, due either to habit or disease. In such cases the orthopedist often finds a valuable ally in the "movement cure." The subject is intimately related to massage (q.v.). For fuller information, consult: Grafstrom, *Mechano-Therapy* (2d ed., Philadelphia, 1904); Nissen, *A Manual of Instruction for Giving Swedish Movement and Massage Treatment* (ib., 1906); Juettner, *Modern Physiotherapy* (Cincinnati, 1908).

MECHERINO, mā'kā-rē'nō, IL. A name sometimes applied to the Italian painter Domenico Beccafumi (q.v.).

MECHITARISTS. See MEKHITARISTS.

MECHLIN, měk'lĭn, or **MALINES.** One of the chief cities of the Province of Antwerp, Belgium, situated 13 miles south-southeast of the city of Antwerp, on the navigable river Dyle, which flows through the city in a number of arms (Map: Belgium, C 3). The city is circular in shape, has broad and regular streets, and is surrounded by a canal and a wide boulevard. As the see of the Cardinal Primate of Belgium, it retains a considerable ecclesiastical importance; of its numerous churches the most noteworthy is the cathedral of St. Romauld, a vast Gothic structure of the sixteenth century, adorned in the interior with many fine paintings and choice carvings, its altarpiece, "The Crucifixion," by Van Dyck being one of that master's finest works. Its chimes rival any in Belgium. One tower, 320 feet in height, remains unfinished. Other buildings are the churches of St. John and of Our Lady, the latter containing "The Adoration of the Magi" and the "Miraculous Draught of Fishes" by Rubens; the town hall, dating from the fifteenth century, and known as the Beyard; the palace of justice; the market hall, erected in 1340; the lodge of the Teutonic Order, the old cloth hall; and the splendid modern archiepiscopal palace. Mechlin has an archiepiscopal seminary with a library of 31,000 volumes, an academy of painting, an academy of music, a Gymnasium, an athenæum, a museum, and a botanical garden. It was formerly the seat of important lace manufactures, but its chief products now are caps and woolen goods, Gobelin tapestry, linen, furniture, carpets, candles, needles, large bells, tobacco, starch, and beer. There are also extensive railway shops outside the city. Mechlin was occupied by the Germans during their advance on Antwerp in the European War which broke out in 1914. It was recovered by the Belgians by a sally in force from Antwerp. After a heavy bombardment, which destroyed the greater part of the city, it again fell into the hands of the Germans. See WAR IN EUROPE. Pop., 1900, 56,013; 1910, 59,191.

MECHLIN LACE. A lace so named from being originally manufactured at Mechlin in Belgium. It is a hexagon mesh of three threads

in which the pattern is worked. The mesh has four plaited and two twisted sides. See LACE.

MECK'EL'S GANGLION, or THE SPHENOPALATINE GANGLION. The largest of the four sympathetic ganglia connected with the fifth cranial nerve, the others being the ophthalmic (q.v.), the otic (q.v.), and the submaxillary (q.v.). It lies deep in the sphenomaxillary fossa (a small triangular space just beneath the apex of the orbit), close to the sphenopalatine foramen. The ganglion is a small triangular or heart-shaped body, of a reddish-gray color, and was first described by Meckel. Like the other ganglia of the fifth nerve, it possesses a motor, a sensory, and a sympathetic root. Its sensory root is derived from the superior maxillary branch of the fifth nerve, through its two sphenopalatine branches; its motor root from the facial nerve, through the large superficial petrosal nerve; and its sympathetic root from the carotid plexus, through the large deep petrosal nerve. The ganglion gives off branches of distribution in four groups—an ascending group, which passes to the orbit; a descending, to the palate; an internal, to the nose; and posterior branches to the pharynx and nasal fossæ. See NERVOUS SYSTEM AND BRAIN.

MECK'LENBURG DECLARATION OF INDEPENDENCE. In American history, a series of resolutions purporting to have been adopted at Charlotte, Mecklenburg Co., N. C., May 20, 1775, by a convention of delegates representing each militia company of the county. Another set of resolutions is attributed to a similar meeting on May 31, 1775, but the use at that time of both modes of reckoning time makes it probable that only one meeting was held, although this has always been a debatable question and has given rise to a detailed and prolonged controversy. The copy of the resolutions made by the secretary of the meeting is said to have been destroyed by fire in 1800, but on April 30, 1819, what purported to be a copy, made probably from recollection, was published in the Raleigh (N. C.) *Register*. The use of phrases in the published copy similar to certain passages in the real Declaration of Independence of July 4, 1776, caused doubt to arise as to the authenticity of the Mecklenburg Declaration. The Legislature of North Carolina in 1831, after an investigation of the subject, declared May 20 a legal holiday. The weight of authority at present is overwhelmingly against the authenticity of the Declaration and favors the opinion that only one meeting was held—the one of May 31—and that the resolutions there adopted, bearing no resemblance to Jefferson's Declaration, constitute the nearest approach there was to a Mecklenburg Declaration of Independence. The resolutions, as published in the Raleigh *Register* in 1819, are five in number. They declare: (1) that whoever aids or abets the invasion of American rights is "an enemy to this country—to America—and to the inherent and inalienable rights of man"; (2) that all political bonds between those passing the resolutions and the mother country are dissolved, the allegiance of the citizens of Mecklenburg County to the British crown being absolved and all political connection with that nation broken off; (3) that "we do hereby declare ourselves a free and independent people; are, and of a right ought to be, a self-governing association, under the control of no power other than that of our God and the general government of the Congress; to the maintenance of which independence we solemnly pledge to each other our mutual coöperation, our lives, our fortunes, and our most sacred honor"; (4) that those passing the resolutions acknowledge the existence of no law or public officer, but readopt their former laws in so far as these laws do not recognize the authority of the crown, thus vacating all civil and military commissions granted by the crown; and (5) that all military officers in the county are retained in their former command and that every member of the convention be henceforth a civil officer with power to issue process, hear and determine all matters of controversy, preserve peace and harmony, and endeavor to spread the love of country until a more general organized government be established in the province.

Bibliography. W. M. Hoyt, *The Mecklenburg Declaration of Independence* (New York, 1907), is an able study, and sufficient to convince most historians that the Declaration of May 20 is spurious. G. W. Graham, *The Mecklenburg Declaration of Independence, May 20, 1775, and Lives of its Signers* (New York, 1905), and J. H. Moore, *Defense of the Mecklenburg Declaration of Independence* (Raleigh, 1908), are the ablest attempts to prove that it is authentic.

MECKLENBURG-SCHWERIN, mĕk'lenbŭrk-shvâ-rēn'. A grand duchy and constituent state of the German Empire, bounded by the Baltic Sea on the north, the Prussian Province of Pomerania and the Grand Duchy of Mecklenburg-Strelitz on the east, the Prussian provinces of Brandenburg and Hanover on the south, and Schleswig-Holstein, the Principality of Ratzeburg (belonging to Mecklenburg-Strelitz), and the territory of Lübeck on the west (Map: Germany, E 2). Area, including the three enclaves in Brandenburg and Mecklenburg-Strelitz, 5068 square miles.

The country is generally flat, with the exception of the central part, which is traversed from southeast to northwest by a chain of low hills, forming the watershed between the Elbe and the Baltic Sea. The flat coast line is 100 miles long and is broken by a number of deep indentations, including the Bay of Wismar. Numerous rivers traverse the country from north to south. The Recknitz, the Warnow, and the Stepenitz flow towards the Baltic, and the New Elde and the Sude are tributaries of the Elbe, which for a few miles forms the south boundary of the grand duchy. The country abounds in lakes (650 in round numbers) of glacial origin, the largest of which are the Müritz See (51 square miles), the Schweriner See (23 square miles), the Kölpiner, and the Plauer See.

The climate is mild and healthful, although somewhat raw. The average annual temperature is 46° F. and the annual precipitation 21 inches. There are chalybeate springs at Doberan and Goldberg and saline springs at Sülze. According to the industrial census of 1907 nearly one-half of the population depended for their livelihood on agriculture. The land is divided between the crown, the aristocracy, the clergy, and the towns, the peasantry forming an hereditary tenantry class. About 90 per cent of the area is under cultivation in pastures and in forests. The crops exceed the local demand and are partly exported. Rye, wheat, oats, barley, sugar beets, and potatoes are the staples. Tobacco is cultivated to some extent. Stock raising is carried on extensively, and dairying is an important adjunct to agriculture.

The manufacturing industries are far inferior to the agricultural interests. There are a number of foundries, machine works, sugar refineries, breweries, distilleries, paper mills, tanneries, tobacco factories, brickyards, etc.; but many manufactures are imported for local consumption, and the native exports contain no manufactured product of importance. The trade is very extensive and favored by the situation of the country. The imports pass chiefly through the seaports of Warnemünde and Wismar. The chief exports are agricultural, dairy, and animal products, live animals, etc., and are transported mostly by rail. The outward and inward shipping was 2,429,963 tons in 1910. The transportation facilities are excellent, consisting of a system of navigable rivers and canals and a number of state railway lines with a total length of 1094 miles in 1914.

The constitution of the two duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz is based on the agreement concluded in 1755 between the Duke of Mecklenburg-Schwerin and his estates and adopted in the same year by the Duchy of Mecklenburg-Strelitz. The crown is hereditary in the male line in both duchies and on the extinction of the reigning dynasty in either state the succession reverts to the other house. In the case of the extinction of both houses the right of succession passes to Prussia. The government of the two Mecklenburgs is semifeudal in character, and the proprietors of the land, whether belonging to the nobility or not, are endowed with many special privileges. The common assembly, or Landesunion, of both grand duchies consists of the representatives of the landed aristocracy, or Ritterschaft, and the burgomasters of 49 towns, or the Landschaft. The tenants of the royal domains are not represented.

The assembly convenes every year for a short period, alternately at Sternberg and at Malchin. There are also a permanent committee of nine members at Rostock representing the two estates when the Landtag is not in session, and convocation and deputation diets which can be assembled for special purposes in either of the duchies. The Principality of Ratzeburg is under the direct authority of the Grand Duke of Mecklenburg-Strelitz. The executive authority in Mecklenburg-Schwerin is vested in a cabinet of four ministers. Mecklenburg-Schwerin is represented by two members in the Bundesrat and sends six deputies to the Reichstag. These are the only elective offices in the duchy. The capital is Schwerin; the summer residence of the Grand Duke is Ludwigslust.

The two duchies have two separate systems of lower courts and a common supreme court at Rostock. There is no general financial system in the Grand Duchy of Mecklenburg-Schwerin. The revenue is divided into three classes, of which by far the largest (derived from the royal domains and ordinary taxes) is under the sole control of the Grand Duke. A part of it goes to cover the ordinary expenses of the government. The total public debt, incurred to some extent for the purchase of railways, amounted to approximately $32,717,025 on July 1, 1913. General and technical education is on a high plane. The university at Rostock (q.v.) provides higher education. Pop., 1900, 607,770; 1910, 639,958, of which 96 per cent were Protestant.

History. The territory of Mecklenburg was anciently occupied by Germanic peoples, and at the beginning of the Middle Ages the Wends, Obotrites, and other Slavic tribes took possession of the region. The Slavic inhabitants long resisted the power of Germany, but were finally subdued in the second half of the twelfth century by Henry the Lion, Duke of Saxony. Henry left a part of the country (which took its name from Michilenburg, the principal settlement of the Obotrites, near the modern Wismar) under the rule of the Obotrite princes, while at the same time the Germanization of the region was prosecuted. After 1229 the territory was frequently divided and subdivided among the descendants of the original Slavic rulers. In 1348 Mecklenburg was elevated into a duchy by the Emperor Charles IV. In 1363 Albert III, Duke of Mecklenburg, was called to the throne of Sweden, but in 1389 was dethroned by Margaret, Queen of Denmark and Norway. In the middle of the sixteenth century Lutheranism was made the established religion in Mecklenburg. About this time there was a division into the two ducal lines of Mecklenburg-Schwerin and Mecklenburg-Güstrow. In the Thirty Years' War the dukes of Mecklenburg joined Christian IV of Denmark in the struggle against the Roman Catholic powers and, as a result, were deprived of their possessions, which were conferred in 1629 upon Wallenstein. In 1631, however, the dukes were restored by Gustavus Adolphus of Sweden. After various subdivisions of the ducal line into the branches of Schwerin, Strelitz, and others, and the successive extinction of several of these collateral houses, the Imperial Commission, which met at Hamburg in 1701, brought about a family compact, by which it was arranged that Schwerin and Güstrow should form one duchy and Strelitz with Ratzeburg, Stargard, etc., another. In 1815 the dukes of both the Mecklenburgs assumed the title of Grand Duke. Frederick Francis (1785–1837), Grand Duke of Mecklenburg-Schwerin, abolished serfdom in his dominions, to which he added Wismar. The reign of Frederick Francis II (1842–83) of the same duchy, who succeeded his father, Paul Frederick, was disturbed by a contest between the nobles and the burghers and smaller landowners. The revolutionary movement of 1848 gave a fresh stimulus to the popular ferment in both duchies, and the disturbances could only be quelled by the intervention of the Prussian troops; but a reaction took place in 1850 and matters were restored to their former condition. Frederick Francis II (q.v), Grand Duke of Mecklenburg-Schwerin, was one of the principal generals in the Franco-German War of 1870–71. As members of the German Empire, the two duchies have maintained their internal constitution very much on the old footing. Consult Wilhelm Raabe, *Mecklenburgische Vaterlandskunde* (2d ed., 3 vols., Wismar, 1894–96).

MECKLENBURG-STRELITZ, -strā'lĭts. A grand duchy and constituent state of the German Empire, consisting of the grand duchy proper, bounded by the Prussian provinces of Pomerania and Brandenburg and the Grand Duchy of Mecklenburg-Schwerin, and of the Principality of Ratzeburg, which is separated from it by the width of Mecklenburg-Schwerin and bounded by Lauenburg and the free town of Lübeck (Map: Germany, E 2). Total area, 1131 square miles. In the formation of its surface the grand duchy proper resembles Mecklenburg-Schwerin. It is watered chiefly by the Havel and the Datze and contains numerous

lakes. The Principality of Ratzeburg is watered by a tributary of the Stepenitz.

Agriculture is the chief occupation, and the system of land tenure does not differ from that prevailing in the Grand Duchy of Mecklenburg-Schwerin, though the trade is less developed, but there is considerable inland traffic, and the railway facilities are good. Mecklenburg-Strelitz is governed by the same constitution as Mecklenburg-Schwerin (q.v.). The executive power is vested in a Minister of State and a small council. Capital, Neustrelitz. The financial system also resembles that of Mecklenburg-Schwerin. Mecklenburg-Strelitz is represented by one member in the Bundesrat and returns one deputy to the Reichstag. Pop., 1910, 106,347, almost exclusively Protestant. For history, see MECKLENBURG-SCHWERIN.

MECON'IC ACID (Gk. *μηκωνικός, mēkōnikos*, pertaining to the poppy, from *μήκων, mēkōn*, poppy), $C_7H_4O_7 + 3H_2O$. An acid existing in opium, which, when good, yields from 6 to 8 per cent of it. Both the acid and its salts assume a characteristic blood-red tint with ferric salts; and this test, which is very sensitive, is employed by the toxicologist in searching for traces of opium. As, however, the alkaline sulphocyanides which exist normally in the saliva give a precisely similar tint with the ferric salts, it is necessary to be able to distinguish the meconate or iron from the sulphocyanide of iron. A solution of chloride of gold or of corrosive sublimate removes all doubt by discharging the color of the sulphocyanide but not affecting the color of the meconate of iron. The constitution of meconic acid is represented by the formula C_5HO_2 (OH) $(COOH)_2$, showing it to be chemically a monohydroxy-dibasic acid. The alkaloids morphine, codeine, narcotine, thebaine, papaverine, and others exist in opium in combination partly with meconic, partly with sulphuric, acid.

MECO'NIUM (Lat., from Gk. *μηκώνιον, mēkōnion*, poppy juice, from *μήκων, mēkon*, poppy). The earliest matter discharged from the bowels of a newborn infant. It is of a brownish-green or almost black color, acid, devoid of odor, and rapidly putrefies on exposure to air. It is usually regarded as a product of the fœtal liver. It contains biliary salts and bile pigments and an abundance of desquamated epithelium of a green tint, of mucus corpuscles, and of fat, with which there is a good deal of cholesterine (7 per cent).

MEDAD. See ELDAD AND MEDAD.

MEDAL (OF. *medaille*, Fr. *médaille*, from Lat. *metallum*, from Gk. *μέταλλον*, metal). A piece of metal, more or less of the form of a coin, stamped on one side or both with image and inscription, with the object of commemorating an event or of honoring a person, and not intended for circulation as money. This use of the word excludes all ancient and modern coins, even those which, like the American Columbian half dollar, are commemorative pieces struck only for a special occasion but designed for circulation as money. The coins of the Greeks and the Romans have so many medallic, i.e., commemorative, characteristics, that the belief once held that they were really medals rather than coins was a natural one; as a result of that belief the word medal long meant coin, as in the title of Addison's *Dialogues on Medals*. (See NUMISMATICS, *Material of the Study; Nomenclatures.*) There is hardly any event of popular interest, whether public or private, in ancient times, especially under the Roman Empire, that is not recorded on the coins. The term *medallion* is for convenience still used of certain classes of ancient coins that surpass the rest in size and technique; but the strictly monetary character of even these is now sufficiently proved. Though objects of real art, often designed for royal gifts or for ornament, they were still multiples of the regular coins, and as such could be entered into circulation. Such were the magnificent "medallions" of Syracuse, real gems of the die engraver's art signed with the artist's name, and the "medallions" in gold, silver, and copper of the Roman Emperors, coined under their special control, and hence lacking the usual S. C. (*Senatus consulto*, "by order of the Senate") of the senatorial bronze money. Sometimes these Roman medallions are found set in a circlet of fine metal. This was not the work of the coiner, however, but of the jeweler who adapted the coin to artistic use. For another use of the term "medallion," see MEDALLION. If we are to seek anything approximating the medal in ancient times, it may perhaps be found in certain pagan talismans and in the little Christian medals of devotion.

Modern medals begin in the period of the Renaissance. The earliest bear the portraits and inscriptions (in Latin) of rulers and potentates. The subjects are at first drawn exclusively from classical art; hence their value as documents of contemporary history, though not as documents of art, is materially lessened. The most famous Italian medalist of the fifteenth century was Vittorio Pisani, of Verona, whose splendid works are signed "Opus Pisani Pictoris." It became the custom for a ruler to inaugurate his reign and celebrate its chief events by striking medals. The series of the popes begins with Paul II (1464–71) and continues without a break to the present time. Medals of popes earlier than Paul II are the work of a later period. A medallic mint is connected with the Vatican, where the best artists are employed. Some of the medals of Julius II, Leo X, and Clement VII have an especial interest as having been designed by Raphael and Giulio Romano and engraved by Benvenuto Cellini. A sixteenth-century medal of Sicily is probably the first instance in modern times of the use of a medal as a vehicle of political satire; it is directed by Frederic II against his adversary, Ferdinand of Spain. Satirical medals were afterward common in the Low Countries. Some of the Dutch medals are noted for the elaborate views, maps, and plans engraved on them. Of many reigns a complete medallic history can be written, as, e.g., of that of Napoleon Bonaparte. American Presidents, beginning with Washington, are commemorated in a series of portrait medals. But it is no longer merely kings and rulers and great military and naval events that are commemorated in medals. Events of general interest in science, art, or literature, movements for the amelioration of conditions, learned societies, are all found recorded in these artistic little documents of history.

Besides the purely commemorative medals there is another class—that of "decorations"—which, beginning at the end of the eighteenth century, has attained an enormous development. These are conferred by the sovereign or the state as marks of distinction for eminent services, particularly in the army and the navy. Such

medals of honor are seldom of much intrinsic value, their worth depending mainly on the associations connected with them. They have ribbons attached, with clasps or small bars, each of which often bears the name of a battle. Such medals are intended to be worn on the breast. They are of very varied form, the cross being the most common. See LEGION OF HONOR; MEDAL OF HONOR, UNITED STATES; MEDAL OF HONOR LEGION; ORDERS; VICTORIA CROSS.

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MEDAL'LION (Fr. *médaillon*, augmentative of *médaille*, medal). In architecture, a circular or oval panel carved in bas-relief with a head, bust, figure, ornamental design, etc. The term is also used of a similar design in color.

MEDAL OF HONOR, UNITED STATES. The medal of honor of the United States, given for bravery on the field of battle, was first instituted in 1862 by a law approved July 12 of that year. It is authorized by Congress and is awarded in the name of Congress for particular deeds of most distinguished gallantry in action. The New Medal of Honor, adopted 1905, is a five-pointed star of rose-gold finish. On the medallion in centre is the head of Minerva in bold relief, surrounded by a band bearing the inscription "United States of America." Upon each point of the star is an oak leaf. The star is encircled by a green-enamel laurel wreath. Surmounting the star and wreath is an eagle resting on a bar, upon which "Valor" is in raised letters. The decoration is pendent from a concealed pin by blue-silk watered ribbon, upon which are emblazoned 13 stars in white. The reverse side is plain for engraving the name of recipient, which is preceded by the inscription "The Congress to ———." The medal is worn with the full-dress uniform and the special evening dress, pendent from the neck about 1 inch below the opening of the collar. It will not be worn by officers suspended from rank and command, nor by enlisted men serving sentence of confinement. On March 25, 1776, before even independence had been proclaimed, Congress ordered that a gold medal be struck and presented to General Washington. Benjamin Franklin, who at the time was in Paris, was instructed to employ the greatest artists in France to execute a suitable design. Although this was the first medal voted, the first one struck was a silver medal presented to Lieutenant Colonel Fleury, a volunteer officer from the French regular army, who, entering the United States army in 1777 as a private, distinguished himself so greatly and rendered such valuable services that Congress promoted him to be lieutenant colonel. For his gallantry in the assault upon Stony Point, July 15, 1779, Congress voted him a silver medal, and afterward a vote of thanks. It was not until the institution of the medal of honor that the United States possessed a military equivalent to the Victoria cross (q.v.) of England or the iron cross (q.v.) of Prussia. Like the former decoration, it is bestowed on both commissioned and noncommissioned ranks alike, the decoration being the same in every instance. Medals of honor are only awarded to officers or enlisted men for most distinguished personal bravery or self-sacrifice which has been manifested in action, by conduct distinguished above the others, and that involved risk of life, or service more than ordinarily hazardous the omission of which would not justly subject the person to censure. An interesting account of the deeds by which the medal of honor has been won will be found in Rodenbough, *Uncle Sam's Medal of Honor* (New York, 1886). Consult *United States Army Regulations*, 1913.

MEDAL OF HONOR LEGION. A patriotic society whose membership comprises officers and enlisted men who have received the medal of honor (q.v.). The society was originally organized in 1890 to admit those who had participated in the Civil War, but the membership was subsequently extended to include all who have received the medal of honor, regardless of the war in which they engaged. The number of members on the rolls in December, 1914, was about 400.

MEDANO, mā-dä'nō. A Spanish term applied to the curious traveling, crescent-shaped sand hills which occur in numbers on the elevated pampa of Islay, near Arequipa, Peru. They move across the desert from south to north in the direction of the prevailing day wind. They are composed of a white sand apparently quite different from that which makes up the rest of the desert surface.

MED'ARY, SAMUEL (1801–64). An American editor and politician. He was born in Montgomery Co., Pa., and began newspaper work at 16 years of age. In 1825 he removed to Ohio and in 1828 became editor of the *Ohio Sun*, a Democratic paper. After serving in both Houses of the Ohio Legislature he was editor from 1836 to 1857 of the *Ohio Statesman*, which became a great power in the West and Southwest. He was high in the confidence of President Jackson and the succeeding Democratic Presidents, and is said to have originated the phrase "Fifty-four forty or fight" during the Oregon boundary dispute. In 1844 he was chairman of the Democratic National Convention held at Baltimore and secured the enthusiastic nomination of James K. Polk for the presidency by reading a letter from Andrew Jackson in which Polk was recommended for that office. In 1853 Medary declined the position of United States Minister to Chile. He was the last territorial Governor of Minnesota in 1857–58, was postmaster of Columbus, Ohio, in 1858, and was Governor of Kansas Territory in 1859–60, when he resigned to found the *Crisis*, which he continued to edit until his death. The Ohio State fairs owe their origin largely to him. He helped Samuel F. B. Morse

in his struggle to make a success of the electric telegraph. The Democrats of Ohio erected a handsome monument to Medary's memory at Columbus.

MEDE, JOSEPH. See MEAD, JOSEPH.

MEDE'A (Lat., from Gk. Μήδεια, *Mēdeia*). In Grecian legend, a famous sorceress, the daughter of Æetes, King of Colchis, and of the Oceanid Idyia, or of Hecate, and niece of Circe. On the arrival of the Argonauts (q.v.) at the court of Æetes, in search of the Golden Fleece, she fell in love with Jason, aided him by her magic arts to perform the tasks set him, and finally to carry off the fleece. Pursued in her flight with the Argonauts by her father, she killed her brother Absyrtos and scattered the fragments of his body on the sea. Since her father paused to gather up the remains, the Argonauts gained time for their escape. On the return of Jason to Iolcus, she aided him to take vengeance on Pelias, who had murdered Jason's parents. Having cut up an old sheep and boiled the pieces with magic herbs, she brought forth from the caldron a young lamb, an incident represented not infrequently on Greek vases. She then easily persuaded the daughters of Pelias to cut their father in pieces, that by the same process he might regain his youth; but when they had yielded she refused to employ her art. For this she and Jason were forced to flee to Corinth, where Jason repudiated Medea to marry Glauce, or Creusa, the daughter of the King. Medea sent her rival a poisoned robe and crown, whereby both the princess and her father were destroyed. To complete her revenge, she then slew the children she had borne Jason, and fled on her dragon chariot to Athens, where she was received by King Ægeus, to whom some said she bore a son, Medos. On the arrival from Trœzen of Theseus, the son of Ægeus, she plotted against his life, but was discovered, and with her son fled back to Colchis and restored her father to the throne, of which he had been deprived by his brother Perses. Story said also that Medos gave his name to the Medes. As a sorceress she seems, like Circe, immortal in some of the writers, while others regarded her as a heroine and united her to Achilles in the Elysian fields. These outlines of the legend were often very variously filled in, and it is clear that in the story many elements are combined. Much points to an original divinity sunk to heroine (she was honored as a goddess at Corinth), as is so often the case, and much also to an original good sorceress, a counterpoise to the wicked Circe. Medea was especially honored in Thessaly, the home of magic. The attempts to interpret the myth in the light of natural phenomena (some scholars have regarded Medea as a moon goddess) cannot be regarded as successful. The figure of Medea was a favorite one in art, especially with the vase painters. The Corinthian episode is common on Roman sarcophagi. It attained especial prominence through the great tragedy *Medea,* by Euripides (q.v.). Medea's story is told at length by Ovid, *Metamorphoses,* vii, 1–348, and *Heroides,* xii. Ovid also wrote a tragedy called *Medea,* as did Seneca the philosopher; of these the latter is extant, but the former is lost. The story of Medea has been handled in modern times by T. Corneille and F. Grillparzer, and in an opera by Cherubini. Consult: Léon Mallinger, *Médée: étude sur la littérature comparée* (Paris, 1898); the editions of the *Argonautica* of Apollonius Rhodius and of the *Medea* of Euripides, especially the edition of the latter by M. L. Earle, pp. 32–62 (New York, 1904); the article "Medeia" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MEDEA. 1. A tragedy by Euripides represented in 431 B.C., when it obtained only the third prize. The delineation of the passionate heroine makes it one of the most famous of Greek tragedies. Euripides' *Medea* was translated into Latin by Ennius. 2. A play of considerable power by Seneca, 1027 lines in length. It is only occasionally like the play of Euripides. It is distinguished by the beauty of its choral odes. 3. A tragedy by Richard Glover (1761).

MÉDECIN MALGRÉ LUI, mā'd'săn' mâl'grā' lwē, LE (Fr., The Physician in Spite of Himself). A three-act farce comedy in prose by Molière, produced at the Palais Royal in 1666. The plot is taken from an old fabliau of the thirteenth century, *Le médecin de Bray* or *Le vilain mire.* The comedy was set to music by Gounod and presented at the Opéra Comique in 1858. It was given in London as "The Mock Doctor" in 1865.

MÉDECIN VOLANT, vō'lăn', LE (Fr., The Flying Doctor). A comedy by Molière (1659).

MÉDÉE, mā'dā' (Fr., Medea). The title of several French tragedies inspired by the *Medea* of Euripides. 1. A play by Jean de la Péruse (1553), a translation of Seneca's version of the tragedy. 2. A tragedy by Pierre Corneille (1635), based on Euripides with an admixture of Seneca, but with a number of new minor characters and with variations in the details of the plot. 3. A play by Clément (1779) which eliminates the supernatural features. 4. A play by Catulle Mendès, produced at the Renaissance in 1898 with Sarah Bernhardt in the title rôle. It is based on Euripides and Seneca, with modifications ingeniously introduced.

MEDELLÍN, mā'dā-lyēn'. The capital of the Department of Antioquia, Colombia, situated between the ranges of the central and western Cordilleras (Map: Colombia, B 2). It is a beautiful town, and, its elevation being about 5000 feet above sea level, the climate is pleasant. Its streets are broad and straight and it has several parks and squares adorned with handsome buildings, among which are a number of churches, a high school, a museum, and a public library. It has a college, a seminary, a school of mines, two normal schools, and a number of private schools. The manufactures of the city include cloth and clothing, chocolate, matches, cigarettes, shoes, clocks, paper, and articles of gold and silver. There are also a number of foundries. It is a growing commercial centre and is the residence of a United States consular agent. Medellín was founded in 1674. Pop., 1912, 70,547. Consult *Censo general de la república de Colombia* (Bogotá, 1912).

MEDES, mēdz. See MEDIA.

MEDFIELD. A town in Norfolk Co., Mass., 18 miles by rail southwest of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). It contains the Medfield State Hospital. There are manufactories of straw hats and bricks. Medfield is the birthplace of Hannah Adams, the historian, who was one of the pioneer literary women of America. Pop., 1900, 2926; 1910, 3466.

MED'FORD. A city, including the villages of Hillside, Glenwood, South Medford, Welling-

ton, and West Medford, in Middlesex Co., Mass., 5 miles north by west of Boston, on the Mystic River and on the southern and western divisions of the Boston and Maine Railroad (Map: Massachusetts, E 3). The city, which extends 4 miles in length and breadth and occupies an area of about 8 square miles, is a popular residential suburb of Boston, and the seat of Tufts College (q.v.). It has a public library; several historically interesting buildings, of which the old Cradock House, built in 1634, is said to be the oldest structure retaining its original form in the United States; Royall House; Middlesex Fells Park, Mystic Valley Parkway, Brooks Playstead, Salem Street Common, and several smaller parks; and several cemeteries, the largest of which, Oak Grove, contains about 34 acres. The principal manufactures include carriages, bricks, machinery, chemicals, dyes, calico, etc. The government is administered under the revised charter of 1903, which provides for a mayor, elected every two years, a board of aldermen, consisting of 21 members, elected for one year, seven of whom are elected at large and 14 by wards, and subordinate administrative officials. The water works are owned by the city. Pop., 1890, 11,079; 1900, 18,244; 1910, 23,150; 1914 (U. S. est.), 25,240; 1920, 39,038. Founded as Meadford by a company from Salem in 1630, Medford became a town in the following year and was chartered as a city in 1892. Consult Usher, *History of the Town of Medford, Mass.* (Boston, 1886).

MEDFORD. A city in Jackson Co., Oreg., 5 miles east of Jacksonville, on the Southern Pacific, the Pacific and Eastern, and the Rogue River Valley railroads (Map: Oregon, C 5). It contains a Carnegie library, fine Federal and high-school buildings, the Sacred Heart Hospital, St. Mary's Academy, city parks, a United States Weather Bureau station, and is adjacent to the picturesque Crater Lake, National Park, and Sugar Pine forests. Pears and apples are grown in the surrounding region and shipped from Medford in large quantities. The water-supply system, comprising 28 miles of mains, and erected at a cost of $350,000, is owned by the municipality. Pop., 1900, 1791; 1910, 8840; 1914 (U. S. est.), 12,490.

MED'HURST, Walter Henry (1796–1857). An English Congregational missionary. He was born in London and went, by appointment of the London Missionary Society in 1816, to Malacca as a missionary printer. His fitness for the ministry induced the missionaries to ordain him in 1819, and he did good service in various Eastern fields, Malacca, Penang, Batavia, Parapattan, and, from 1842 to 1856, at Shanghai. For six years he performed mission work in the interior of China amid much peril. In 1847 delegates from several stations convened in Shanghai for the revision of the New Testament. In this work he was engaged until 1850, when he devoted his time to the Old Testament. In 1857 he returned to England in impaired health and died three days after his arrival. He was well versed in the Chinese, Japanese, Javanese, and other languages, besides Dutch and French, in all of which he wrote. His special works are: *An English and Japanese Vocabulary* (1830); *Dictionary of the Hokkien Dialect* (1832); *China: Its State and Prospects, with Especial Reference to the Diffusion of the Gospel* (1838); *A Chinese and English Dictionary* (1842–43); *Chinese Dialogues* (1844; new ed., 1861); *Dissertation on the Theology of the Chinese* (1847); *English and Chinese Dictionary* (1847–48).

MEDIA, mē'dĭ-ȧ. A borough and the county seat of Delaware Co., Pa., 12 miles west of Philadelphia, on the Philadelphia, Baltimore, and Washington Railroad (Map: Pennsylvania, L 8). It is finely situated in a fertile and picturesque region and is a popular residential suburb of Philadelphia and a summer resort. The Delaware County Institute of Science, founded in 1833, has a valuable scientific library of 5000 volumes, and there are a public library and a splendid county courthouse building. The water works are owned by the municipality, also the street-lighting plant. Media, first incorporated in 1850, is governed by a chief burgess and a town council. Pop., 1900, 3075; 1910, 3562.

ME'DIA (Lat., from Gk. Μηδία, from Μῆδος, *Mēdos*, from OPers. *Māda*, Mede). In ancient times, the name of the northwestern part of Iran, bounded by the Caspian Sea on the north, by Persia on the south, by Parthia on the east, and by Assyria on the west. The northern portion of the country is very mountainous; the south is a rich and fertile tract. Media covered probably the present Persian provinces of Azerbaijan, Ghilan, Ardilan, and Irak-Ajemi, and the northern portion of Luristan.

The Medians were in language, religion, and manners very nearly allied to the Persians. After they had shaken off the yoke of the Assyrians their tribes united, according to Herodotus, about 708 B.C. under Deioces, whom later Persian tradition seeks to identify with Kai Kobad. Deioces made Ecbatana (q.v.) his capital. He was succeeded by his son Phraortes (647–625 B.C.), whose name has been brought into possible connection with the early history of Zoroastrianism. The King who followed was his son Cyaxares, who reigned 625–585 B.C. (See Cyaxares I.) This monarch, in alliance with Nabopolassar, King of Babylon, overthrew the Assyrian Empire about 604 B.C., spread the terror of his arms as far as Egypt and the farthest bounds of Asia Minor, and vanquished the brigand hordes of Scythia, who had extended their ravages to Syria. He was succeeded by his son Astyages (585–549), in whom the later tradition apparently wrongly seeks to recognize the tyrant Azh-dahak, or Azhi-dahaka, of Babylon, who was overthrown by Cyrus (q.v.). Persia now became the mistress instead of the vassal of Media, and from this time the two nations are spoken of as one people. After the death of Alexander the Great (323 B.C.) the new portion of Media became a separate kingdom, *Media Minor*, and existed till the time of Augustus, the other portion, under the name of *Media Major*, forming a part of the Syrian monarchy. Media was on several occasions separated from Persia. In 152 B.C. Mithridates I took Great Media from the Syrians and annexed it to the Parthian Empire, and about 36 B.C. it had a king of its own, named Artavasdes, against whom Mark Antony made war. Under the Sassanian dynasty the whole of Media was united to Persia. It became, during the fourteenth and fifteenth centuries, the stronghold of the Turcoman tribes Kara-Koinlu (Black Sheep) and Ak-Koinlu (White Sheep).

In early times the Medes were a warlike race, possessed of an enthusiastic love of independence, and distinguished for their skill with the bow. They were also celebrated for their

horsemanship, and it was from them that the Persians adopted this and other favorite exercises and acquirements. Media played an important part in the early religious history of the East, when we consider that the Magi sprang from Media and Zoroaster probably arose there, although part of his activity is located in Bactria.

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ME'DIANT (It. *mediante*, from Lat. *mediare*, to divide in the middle, from *medius*, middle). The third degree of the musical scale. The chord of the mediant is the triad built upon the third degree. In mediæval music, the tone that lies midway between the final and dominant. See MODES.

MEDIASTINUM, mē'dī-ăs-tī'nŭm. The space in the thorax between the lungs, divided by the heart into an anterior and a posterior portion. The anterior, which is the smaller, is occupied by the thymus gland, together with muscular and areolar tissues. The posterior or larger portion contains certain very important structures, viz., the aorta, thoracic duct, the œsophagus, trachea, the splanchnic nerves and some lymphatic glands, together with the nerves and arteries supplying them. A middle mediastinum, containing the heart and the origin of the great blood vessels and the bifurcation of the trachea, is sometimes described. The mediastinum is important surgically from its difficulty of access, the grave conditions sometimes developed in it and the difficulty of their diagnosis. The most frequent diseases developing in the mediastinum are inflammation and abscess, emphysema, aneurism, various tumors, tubercular glands and syphilitic gummata. Malignant growths in the mediastinum are apt to progress very rapidly, and in their early stages the diagnosis is obscure. In children an enlarged thymus gland may fill the anterior mediastinum, and in adults goitres sometimes extend into this space. The symptoms of growths in the mediastinum are those of mechanical pressure upon the important nerves, arteries, and other structures immediately adjacent. Among these may be mentioned cough, hæmoptysis, severe neuralgic pains, and difficult breathing.

ME'DIATE (Lat. *mediatus*, p.p. of *mediare*, to divide in the middle). Under the feudal system, and especially in Germany, a term applied to those lordships or possessions which were held by feudal tenure under one of the greater vassals, and so only *mediately* under the Emperor as the supreme feudal lord. The wars of the French Revolution and Napoleon resulted in many small German states being mediatized, i.e., annexed to larger ones. When the Confederation of the Rhine was formed by Napoleon in 1806 many German cities and ecclesiastical as well as secular states were consolidated.

MEDIATE INFERENCE. See LOGIC.

MEDIATION. In international law the attempt of a friendly power or the sovereign of such a power to compose differences which have arisen between two or more other powers. Mediation must be distinguished from *intervention* by the fact that the latter is always an unfriendly or at least an unwelcome act, involving usually the employment of force or the threat of force. It should also be distinguished from *good offices*, which consist in suggestions or advice made to governments at variance with each other for the purpose of inducing them by negotiation or otherwise to adjust their differences amicably, whereas mediation is more in the nature of a diplomatic intervention whereby the mediating power takes an active part in the controversy and, by submitting proposals on its own initiative to the powers at variance, by acting for both in the exchange of proposals and otherwise, seeks to compose and adjust the differences between them. In the spring of 1915 the good offices of the United States were being exercised in the protection of the interests of enemy subjects in the several belligerent states of Europe. The action of the Pope in suggesting the exchange of disabled prisoners of war by certain of the belligerent powers was also the exercise of his good offices. The action of President Roosevelt in bringing the governments of Russia and Japan to participate in the Peace Conference of Portsmouth in 1905, as well as his coöperation in securing the adoption of proposals on one side and the other, was a good instance of mediation.

With the design of increasing the resort to mediation as a means of settling international differences and of making the process more effective, The Hague conferences of 1899 and 1907 sought to regularize the procedure and give it a defined status in international law by laying down certain rules for its use. The provisions adopted are as follows:

"In case of serious disagreement or dispute, before an appeal to arms, the contracting powers agree to have recourse, so far as circumstances allow, to the good offices or mediation of one or more friendly powers. . . . Independently of this recourse, the contracting powers deem it expedient and desirable that one or more powers, strangers to the dispute, should, on their own initiative and as far as circumstances may allow, offer their good offices or mediation to the states at variance. . . . Powers, strangers to the dispute, have the right to offer good offices or mediation, even during the course of hostilities.

"The exercise of this right can never be regarded by either of the parties at variance as an unfriendly act.

"The part of the mediator consists in reconciling the opposing claims and appeasing the feelings of resentment which may have arisen between the states at variance." (Convention for the Pacific Settlement of International Disputes (1907), Articles 2, 3, and 4.)

The mediation contemplated by these provisions has come to be known as "special mediation." In view of the failure of the efforts made by Sir Edward Grey, the British foreign secretary, and by other friendly powers to mediate between Austria-Hungary and Servia, and thus to avert the War of the Nations in the summer of 1914, it may be doubted whether The Hague provisions have accomplished their purpose of making mediation a really effective means of adjusting serious differences between nations. See INTERNATIONAL LAW, and consult the authorities there referred to.

MEDIC, or MEDICAGO. See HEDGEHOG PLANT.

MEDICA'GO. A genus of annual or perennial leguminous plants of wide distribution, some of the species of which are valuable forage plants, as alfalfa, medick, bur clover, and snail clover. There are about 50 species of medicago, most of which are native of Europe, Asia, and western Africa. There are about half a dozen species rather widely disseminated in the United States and since 1906 a number have been introduced from Russia and Siberia as forage plants for the northern Great Plains region. Among the species so introduced are *Medicago falcata, Medicago ruthenica, Medicago platycarpa,* and *Medicago media.* Some of these appear quite hardy and can grow with less rainfall than others and as a consequence are considered a valuable acquisition in the Dakotas and elsewhere. See MEDICK.

MEDICAL ASSOCIATION, AMERICAN. An association organized in 1847, and having in 1915 a membership of about 77,000, of whom 42,630 are fellows. Its annual sessions are held in the different large cities of the United States, but the headquarters are in Chicago, Ill., where the weekly *Journal* is published. The business body, the house of delegates, is composed of 150 members from the various State associations and from various branches of the Federal medical service. The object of the association is to promote the science and art of medicine. Its scientific work is conducted through 15 sections.

MEDICAL CODE. A collection of rules governing professional conduct, based upon medical history and tradition. The Code of Medical Ethics was adopted in due form by the American Medical Association in 1847, and was ratified by all the regular State and territorial medical associations of the United States. The medical departments of the army, navy, and public-health service of the United States are represented by delegates at the meetings of the national association. The articles of the code describe in detail the duties of physicians to their patients, the duties of physicians to each other and to the profession at large, the duties of physicians in regard to consultations and compensation, and the duties of the profession to the public. This code was in effect without change or amendment from 1847 to 1903—56 years. In 1882 the Medical Society of the State of New York refused to be governed by the medical code, especially the sections relating to consultations, and as a result its delegates were refused admittance to the meetings of the American Medical Association. To meet the situation thus created the New York State Medical Association was founded as the constituent State body of the national association. In 1902, at the annual meeting of the national body held at Saratoga, N. Y., the delegation of the New York State Medical Association introduced a complete revision of the Code of Medical Ethics which modified the objectionable features of the article on consultations. The revision was unanimously adopted at the meeting in New Orleans the following year. The revision called for a change from the Code of Medical Ethics with its regulations and penalties to the Principles of Medical Ethics, which are suggestive and advisory. The revision considers the American Medical Association as holding a relation to its constituent State and territorial medical associations analogous to that of the United States through its Constitution to the several States and Territories. Large discretionary powers are left to the respective State and territorial associations to form such rules governing the professional conduct of their members as they may consider proper, provided, however, that there shall be no infringement of the adopted ethical principles of the American Medical Association. The adoption of this revision resulted in the consolidation of the Medical Society of the State of New York and the New York State Medical Association under the name of the former and the plan of organization of the latter. The revision under its new title, the Principles of Medical Ethics, was submitted on May 10, 1906, by order of the supreme court of the State of New York to a referendum vote of the full membership of the consolidated society. By a vote of 3306 in the affirmative and 197 in the negative the Principles of Medical Ethics became binding on the Medical Society of the State of New York, and thus ended a division of the medical profession in the State of New York which continued 24 years—from 1882 to 1906. Consult Flint, *Medical Ethics and Etiquette* (New York, 1883), and *Principles of Medical Ethics,* issued by the American Medical Association (Chicago, 1912).

MEDICAL DEPARTMENT, UNITED STATES ARMY. The medical department is charged with the duty of investigating the sanitary condition of the army and making recommendations thereon; of advising with reference to the location of permanent camps and posts, the adoption of systems of water supply and purification, and the disposal of waste; with the duty of caring for the sick and wounded, making physical examinations of officers and enlisted men, the management and control of military hospitals, the recruitment, instruction, and control of the hospital corps and of the nurse corps (female), and furnishing all medical and hospital supplies except for public animals. In 1915 the authorized strength of the medical department, in time of peace, was 1 brigadier general, with the title of surgeon-general, 14 colonels, 24 lieutenant colonels, 105 majors, 205 captains, 254 first lieutenants (of whom 99 were first lieutenants of the medical reserve corps on active duty and 60 dental surgeons); total, 603 commissioned officers. The authorized enlisted strength (hospital corps) is 4012 men. Under an Act of Congress approved March 1, 1887, the enlisted men are not to be counted as a part of the strength of the army. In addition to the commissioned officers, civilian physicians and dentists may be employed as *contract* surgeons and *acting* dental surgeons under contracts entered into by or with the authority of the surgeon-general of the army. Of these there were 16 contract surgeons and 40 acting dental surgeons in 1915.

This department is also charged with the organization and training of the various units of the sanitary service required in the field in time of war. The functions of the sanitary service are as follows: (*a*) the institution of all practicable sanitary measures, to the end that the fighting forces suffer no depletion in strength due to avoidable causes; (*b*) the temporary care and professional treatment of the sick and wounded and their transportation to accessible points where they are transferred with as little delay as possible to the line of communications; (*c*) the supply of the necessary sanitary equipment. In addition, the sanitary service is charged with the preparation and preservation

of individual records of sickness and injury in order that claims may be adjudicated with justice to the government and the individual.

The *personnel* of the sanitary service in the zone of the advance may be classified into two general groups, as follows: first, that attached to organizations smaller than a brigade, which functions under the immediate orders of the organization commander and accompanies its unit into combat; second, that attached to the sanitary train, which functions under the orders of the division surgeon in accordance with such general or specific instructions as he may receive from the division commander. When necessary the sanitary *personnel* attached to organizations may be temporarily detached, in whole or part, and directed to operate with the sanitary train.

For the relief, care, and evacuation of the sick and wounded in battle the sanitary service provides, from front to rear, the following: (*a*) first-aid packets carried on the person; (*b*) regimental aid stations as near the firing line as possible; (*c*) dressing stations in the immediate rear of the regimental aid stations; (*d*) a station for the slightly wounded; (*e*) field hospitals, located 3 or 4 miles from the battle field, to which the wounded are carried by the ambulance companies; (*f*) evacuation hospitals still further to the rear. The services and equipment of the American National Red Cross Association are utilized under the immediate direction of medical officers. General hospitals, under the exclusive control of the surgeon-general of the army, are located as follows: Army and Navy General Hospital, Hot Springs, Ark.; General Hospital, Fort Bayard, N. Mex.; Letterman General Hospital, San Francisco; Walter Reed General Hospital, Washington, D. C.

The Army Medical School is located at Washington, D. C., and is organized under the supervision of a board of four or more instructors selected from officers of the medical department stationed in Washington and such assistant instructors as may be required. The senior officer, usually a colonel or lieutenant colonel, acts as commandant. Student officers are selected by the surgeon-general from medical officers, candidates for appointment, and militia officers. The course of instruction is for eight months and includes lectures and practical instruction in the duties of medical officers in war and peace; military medicine; microscopy, sanitary and clinical; military surgery, the care of the wounded in war, and hospital administration; pathology, histology, bacteriology, and urinology; hospital-corps drill; first aid to wounded; X-ray work; equitation. Consult: *United States Army Regulations* (Washington, 1913) and *Field Service Regulations* (ib., 1914). See CONTRACT SURGEON; SURGEON, MILITARY; HOSPITAL CORPS; HOSPITAL, *Military Hospitals.*

MEDICAL DEPARTMENT, UNITED STATES NAVY. This comprises the Bureau of Medicine and Surgery of the Navy Department and the officers, men, and affairs under its cognizance, including all matters pertaining to the health and hygiene of the *personnel* of the navy, naval hospitals, hospital ships, etc. The chief of the bureau is selected from among the senior officers of the medical corps; he has the title of surgeon-general of the navy and the rank of rear admiral. At or near each important naval station there is a naval hospital in charge of a medical director, medical inspector, or surgeon. There is also a hospital at the Naval Medical School (Washington, D. C.) and at Las Animas (Colo.). The chemical laboratory and naval-supply depot is at New York. The North Atlantic fleet is accompanied by a hospital ship commanded by a surgeon of the navy and in times of war there would be several such ships. On each vessel of the navy, except very small ones, there is at least one surgeon—on the larger ones two or three. The *personnel* of the medical department is made up of the medical corps, the medical reserve corps, the dental corps, the pharmacists, the nurse corps, and the enlisted men. In 1915 the medical corps consisted of 17 medical directors (rank of captain), 15 medical inspectors (rank of commander), 85 surgeons (rank of lieutenant commander), 154 passed assistant surgeons (rank of lieutenant), 41 assistant surgeons (rank of lieutenant, junior grade), 20 acting assistant surgeons (rank of lieutenant, junior grade), and 116 assistant surgeons (rank of lieutenant, junior grade) of the medical reserve corps. Candidates for the medical corps of the navy were formerly appointed directly to the medical corps from civil life. A candidate is now first given a preliminary examination for appointment as assistant surgeon in the medical reserve corps and, after taking the course at the naval medical school, comes up for final examination. Should he pass this he is appointed an assistant surgeon in the medical corps. A candidate for the position of assistant surgeon must be not less than 21 nor more than 30 years of age. The services of the medical reserve corps, which are entirely without pay, are rendered mainly in connection with recruiting stations and naval hospitals. A candidate for appointment in the reserve corps must be between 22 and 45 years of age and a citizen of the United States. He must be a graduate of a reputable medical school legally authorized to confer the degree of doctor of medicine and must have qualified to practice medicine in the State or Territory in which he resides. Appointment to this corps is made by the President upon the recommendation of the Secretary of the Navy after the candidate has passed the prescribed examinations. Permission to appear for examination must be obtained by application to the Bureau of Navigation through the surgeon-general. These examinations are conducted by officers of the medical corps of the navy.

The dental corps of the navy is under the cognizance of the Bureau of Medicine and Surgery. It consists of 1 dental surgeon, 28 acting assistant dental surgeons, and 11 assistant dental surgeons of the dental reserve corps; all have the rank of lieutenant, junior grade.

There are 14 chief pharmacists with the rank of ensign and 11 pharmacists with the rank of warrant officer. The nurse corps (female) is in charge of a superintendent. At each hospital there is a head nurse, or nurse in charge. Nurses serve only in hospitals and on hospital ships. On men-of-war the sick are nursed by hospital stewards and hospital apprentices. See UNITED STATES, *Navy.*

MEDICAL EDUCATION. The earliest institutions for the teaching of medicine were situated in temples and groves dedicated to the worship of the deities who were supposed to preside over the health of their worshipers. Thus, in Egypt the god Osiris and his wife Isis were the tutelary deities of the medical arts, and in Greece the god of health was Æsculapius.

The temples were situated in the neighborhood usually of streams and springs which were supposed to possess healing properties. One of the most famous of these ancient temples was that situated on the island of Cos; its most celebrated disciple was Hippocrates, who flourished early in the fourth century B.C. and whose teachings ruled medical science even to the close of the eighteenth century. Throughout Italy the same methods prevailed, the Romans deriving most of their medical lore from Greek teachers. Thus, Galen was a native of Pergamum, where there was a famous medical school in which he was educated. His great work as a teacher, however, was done in Rome. Greek teachers were also responsible for the rise of the Arabian school of medicine. In the sixth century A.D. the Nestorians, being driven out of Syria because of their heretical opinions, settled largely among the Arabs and transmitted to them their medical knowledge. By this time the teacher of medicine was practically divorced from his religious functions, although even down to the mediæval period much of the medical learning of the world appertained to the priesthood.

Until the time of the Renaissance the teaching of medicine in the mediæval medical schools consisted almost solely in dissertations and lectures upon the writings of Hippocrates and Galen. The dissection of the human body was only intermittently practiced. In 1315 Mondino dissected in Bologna the cadavers of two women. Master Albert, a lecturer in the same institution, dissected, in 1319, a body stolen from the cemetery by the students. Bertucci and Pietro de Angela, a little later, made systematic dissections. But, on the whole, anatomical science had made little advance.

Clinical teaching was on no better basis. The only way in which the student received bedside instruction was through apprenticing himself to some practitioner and accompanying him on his rounds, or by acting as his servant and assistant. Although the great universities conferred degrees in course, there were, nevertheless, enormous numbers of quacks and charlatans who flourished in the absence of any efficient laws regulating the right of persons to practice the healing art.

In the Middle Ages the most famous of all the medical schools was that of Salerno, near Naples, which was organized in connection with a monastery of Benedictine monks. Its graduates were to be found teaching in all quarters of the globe, and its influence was widespread, not only at the period in which it flourished, but for many years subsequent. Another celebrated medical school was that of Montpellier in France. The University of Paris was founded in 1205 and graduated very large classes. Its graduates were held in high esteem. They were not allowed to practice surgery, and held practitioners of that art in the greatest contempt. France, however, was the pioneer in recognizing the necessity for a higher education of surgeons and for their elevation to a rank corresponding to that of physicians. In surgical teaching the French were always greatly in advance of other nations. It was in the University of Paris, likewise, that midwifery was first taught to classes of male students.

Among the most famous centres for medical teaching in the sixteenth century were the schools of Bologna, Padua, and Pisa in Italy. At the present time Italian physicians are doing a large amount of scientific research work. The facilities offered to students in their medical colleges, however, are not to be compared with those accorded by the other continental medical schools. In Germany there were numbers of universities with flourishing medical departments at a very early period, among which may be mentioned Erfurt, Wittenberg, and Vienna. With the nineteenth century a new era dawned in German medicine. To it more than to any other single nation is due the credit of the wonderful achievements of the present-day medicine. Virchow, Koch, and the other distinguished occupants of professorial chairs have had in their classes and laboratories eager students from all over the world. A more general education and a larger acquaintance with the various branches of the natural sciences are required of the German medical student than is customary elsewhere; a term of five years is requisite to obtain the degree of M.D.

In England the teaching of medicine was established upon a scientific basis chiefly by the efforts of Thomas Linacre, who founded chairs for the teaching of medicine in the universities of Oxford and Cambridge. As physician to Henry VIII he possessed an extensive influence at court, and this he wielded to great advantage, inducing the King to take the power of licensing persons to practice medicine out of the hands of the bishops, and rendering it necessary for the candidates to pass an examination and receive a degree from one of the other of the two universities. In England, as in France, it was many years before the education of the surgeon was considered as of equal importance with that of the physician. Until 1745 the surgeons were associated with the barbers in the corporation of the barber surgeons. In that year they separated, although it was not until more than 50 years later that the Royal College of Surgeons was incorporated.

The medical profession in England consists of three classes: first, physicians, who have received their degree from one of the universities; second, surgeons, who have graduated from one or another of the schools which exist in connection with the hospitals; and third, apothecaries, who dispense their own drugs and are generally considered as family physicians. Dispensers like American apothecaries are in England called chemists. The large hospitals in London have, in many instances, medical schools connected with them. Of the more prominent may be mentioned St. Thomas's, St. Bartholomew, St. George's, and Guy's. The course of instruction at these hospitals is three years; the teachers are the physicians and surgeons who serve the hospitals. After passing the examinations at his medical school, in order to obtain authority to practice the graduate is obliged to pass an examination before a board composed of representatives of some of the leading medical societies, such as the Royal College of Physicians, the Royal College of Surgeons, or the Society of Apothecaries, or of some of the faculty of one of the universities.

The medical schools of Scotland are of great antiquity. That of St. Andrews was founded in 1411, and the University of Edinburgh dates back to the year 1582, although it was many years subsequent to this before medical teaching there was placed on a scientific basis. The latter university exerted an incalculable influence on medical teaching in the United States,

owing to the large number of American students who attended its courses.

From a very early period in the history of North America public lectures on medical topics were given in various parts of the country. To Dr. Cadwallader Colden is ascribed the credit of the first attempt to establish a systematic course on medicine in the Colonies. He tried to have the Assembly in the Province of Pennsylvania pass an act imposing a tax upon every unmarried man for the purpose of supporting a "public physical lecture in Philadelphia." His efforts were fruitless. In 1730 Dr. Thomas Cadwallader lectured on anatomy in Philadelphia, and in 1752 Dr. William Hunter, a cousin of the great John Hunter, lectured on anatomy at Newport, R. I. Dr. Charles F. Wiessenthal, of Baltimore, delivered lectures on surgery in that city prior to the Revolution.

The first medical school in the United States was founded by Drs. John Morgan and William Shippen, Jr., in 1765, when they established a medical department of the College of Philadelphia, which institution subsequently became the University of Pennsylvania. This was shortly followed by the organization, in 1767, of the medical department of King's College, New York, the lineal ancestor of Columbia University. Harvard University established its medical department in 1782, and in 1898 a medical department was established by Dr. Nathan Smith at Dartmouth College. Previous to the foundation of medical schools the education of physicians in America had been entirely by means of the apprenticeship system, except when a young man possessed sufficient means to go abroad and study in the medical schools of Edinburgh, London, or the Continent. It has been estimated that at the outset of the War for Independence there were upward of 3500 practitioners in the Colonies, of whom not more than 400 had received medical degrees. Most of the early teachers in American medical schools had been educated at the University of Edinburgh. This led to a close perpetuation of the traditions of the medical school of Edinburgh in the United States. In the early part of the nineteenth century it became customary for American physicians desirous of studying abroad to take their postgraduate work in France. In this way the teaching of Laennec, Trousseau, and above all of the great Louis, became familiar to the American profession and served to give an immense impetus to scientific medical work in the United States. The most prominent medical colleges of the United States now require candidates for admission to possess a collegiate degree. In 1914 34 medical schools required as a minimum for entrance two or more years of work in a college of liberal arts in addition to a four-year high-school education; and five require, in addition to a four-year high-school course, one year of college work in physics, chemistry, biology, and a modern language. See MEDICAL STATISTICS.

In almost every State of the Union there are now examining boards which hold periodical examinations, which it is necessary for a physician to pass before he can establish himself in practice in the State. In 1875 there were no medical schools in the United States which required even so much as a three years' course. In 1914 a four years' course leading to the degree of doctor of medicine was the standard required for admission to membership in the Association of American Medical Colleges.

In the last 10 years there has been a marked reduction in the number both of medical colleges and of students. Colleges were decreased from 165 to 101. The number of students fell from 28,142 to 16,502, the number of graduates from 5747 to 3594. This was in response to a movement for reform inaugurated by the American Medical Association. Since the Civil War the number of colleges, many of them of low standing, had multiplied so rapidly that by 1906 there were more medical schools in the United States than in all other countries of the world combined. In response to a widespread demand for reform many of the small colleges were induced to dissolve and many others merged with stronger and better-equipped institutions. Finally the council on medical education created a standard classification of schools into grades denominated A, B, and C, according to the severity of their entrance requirements, length of course, and the quality of teaching and equipment. There was also a marked tendency for independent medical colleges to affiliate with universities and to establish closer relations with hospitals. Three colleges require a fifth year to be spent by the student as a hospital interne before conferring the degree of doctor of medicine. Twenty-eight States now have medical schools as integral parts of the State university. Twenty of these give a complete medical training and confer the degree of doctor of medicine and eight give only the first two years of the medical course. In 15 States no other medical schools exist, this branch of education being entirely in charge of the State university. A similar arrangement went into effect in Alabama in 1915.

Medical Education of Women. The proposition to admit women into the medical profession met with bitter opposition, which has gradually given way. Although the Boston Homœopathic School for Women was opened as early as 1848, the Association for the Advancement of the Medical Education of Women, organized some time afterward, first brought the subject clearly to public attention. The Woman's Medical College at Philadelphia was opened in 1850, and graduated 18 students in 1914. The Woman's Medical College of the New York Infirmary was opened in 1868 by Dr. Elizabeth Blackwell and her sister Emily (qq.v.), the Infirmary for Women and Children having been in successful operation since its establishment by Dr. Blackwell in 1853. The college was closed in June, 1898, having fulfilled its mission. There is a homœopathic institution in New York. In 1914 there were only two medical colleges exclusively for women students, the necessity for the existence of such institutions having declined with the practice of accepting students of both sexes by most medical colleges. In this year there were over 54 coeducational schools. Altogether there were 496 matriculants and 121 graduates.

Medical schools for women have been founded by American women in Turkey, and 15 graduates of the Woman's Medical College of Philadelphia in 1884 were especially prepared for missionary work in foreign lands. One of the first female practitioners in England was Dr. Elizabeth Blackwell, who settled in London in 1868 and became connected with the Woman's Medical College there. As late as 1867 the Apothecaries' Society passed resolutions excluding women from examinations for degrees. The admission of women to the University of Edinburgh led to

open riots among the students. The "enabling bill," giving permission to medical schools and societies to grant qualifications for the registration of physicians without regard to sex, was passed by Parliament in 1876; King's and Queen's College of Physicians, Dublin, and the London University threw open their doors to women soon afterward; and a preparatory medical school in London annually recruits the number of female matriculates in these institutions. There are dispensaries at London, Leeds, and Bristol superintended by female physicians; and Queen Victoria during her reign interested herself in behalf of medical missions carried on by Englishwomen in the East. The faculty of medicine at Paris has given a number of diplomas to women, as have the universities of Bern, Zurich, and Geneva. The first woman medical graduate in Germany was Mrs. Dorothea Christiana Erxleben, who received the medical degree from the University of Halle in 1754, upon recommendation by Frederick the Great in a royal decree. But medical colleges in Germany were closed to women till 1900, when by a decision of the German Federal Council female medical students were entitled to be admitted to the state examinations in medicine. Heidelberg University opened its doors to women in 1900. There are medical courses for women at the Carolinian institutions at Stockholm and at Upsala. The Spanish universities of Madrid, Valladolid, and Barcelona extend the same privileges. The War Department of the Russian government founded a medical school for women at St. Petersburg; a similar institution is now open at Moscow. All the medical societies in the United States and many in foreign countries admit female physicians to their congresses and discussions. For a complete presentation of medical education, consult "Medical Colleges of the United States" in the *Journal of the American Medical Association* (Chicago, 1914). See Medical Statistics.

MEDICAL ELECTRICITY. See Electricity, Medical Uses of.

MEDICAL INSPECTION OF SCHOOLS. See Schools, Medical Inspection of.

MEDICAL JURISPRUDENCE, or Forensic Medicine. The application of medical science to the elucidation of legal questions which have a medical aspect. Although the principles of medical jurisprudence engaged the attention of the earliest lawmakers, Germany is given the credit of first providing by law for the examination of medical witnesses. This law was enacted in 1532 during the reign of Charles V and provided that in every case where death had been brought about by violence the opinion of physicians should be sought. It was not until the nineteenth century that forensic medicine developed any importance. In 1867 the Medico-Legal Society of the city and State of New York, the first of its kind, was organized. At the present time there are many such societies both in America and Europe. The questions included in modern medical jurisprudence are divided by Godkin into five general classes: (1) those arising out of sex relations, as impotence and sterility, pregnancy, legitimacy, and rape; (2) injuries inflicted on the living organism, as infanticide, wounds, poisons, injuries, and death from violence; (3) questions arising out of disqualifying diseases, as the different forms of mental alienation; (4) those arising out of deceptive practices, as feigned diseases; (5) questions of a miscellaneous nature, as age, identity, presumption of seniority, and life assurance. Writers on medical evidence hold that all testimony of a medical witness is expert evidence, but it admits of classification into (1) ocular evidence, which embraces such facts as may be observed in the ordinary attendance upon a patient, and (2) expert evidence, which includes evidence bearing on such cases as those in which a practitioner is required to give testimony based on a hypothetical statement propounded at a trial, or where he is called upon to testify as to the mental or physical condition of an individual examined by him for this special purpose.

In criminal trials in the United States each side hires its own experts, and, owing to the use of hypothetical questions and the advocate's eliciting only part of the truth, the spectacle is often presented of equally competent medical experts flatly contradicting each other. The effect which this has had in casting doubt upon the value of expert opinion, and the dissatisfaction to which it has given rise in the minds of judges, juries, and experts themselves, have led to numerous plans for remedying this defect in the present system of calling expert witnesses by establishing a class of official experts; but most of these plans conflict with one or all of the fundamental principles of the common law relating to the conduct of criminal trials: that the court shall be the sole judge of the law, that the jury shall pass upon facts, and that the defendant shall have the right to present any proper evidence on his own behalf.

In France experts are generally selected from a list of official specialists, termed *experts assermentés*, and if the parties cannot agree upon the experts, the court appoints them. The court may order an investigation and report by experts whenever necessary, and the order contains a statement as to the exact object of the investigation and appoints a referee or *juge commissaire*. Barristers, or *avocats*, do not appear before the experts; but the parties are represented by solicitors, or *avoués*, or sometimes by persons specially skilled in the matter under investigation. The report must be signed by all the experts (who are three in number), the reasons for any dissenting opinion being embodied in the report. The judges, however, are not bound by the report if it is contrary to their convictions.

In Germany official experts are scientifically trained in medicine, surgery, and obstetrics, and must pass an examination in their specialties of medical jurisprudence before the supreme board of the state. Every district has its expert governmental physician or surgeon. A medical college is selected in each province, to which appeal may be made when experts differ, and there is a final appellate court for the whole state to which further appeal may be made. Professional experts are paid by the government, are dependent upon neither side for compensation, and are given the preference in trials where their special knowledge is required; but the calling of outside experts is not thereby precluded. After the issues are determined upon which expert testimony is sought the parties may agree upon the experts and the court may appoint them. The court may limit the number of experts, or may submit to the parties the names of a number of experts, permit each side to challenge a certain number, and appoint those remaining.

The plan suggested by Sir James Stephen in his *History of the Criminal Law of England*, and used for some years in Leeds, has given much satisfaction. Under this plan, which requires a high standard of professional honor and knowledge, medical men refuse to testify unless before doing so they can meet in conference with the experts of the opposing side and have an exchange of views. As a result it is stated that at Leeds medical witnesses are rarely cross-examined, and often they are called on one side only.

Consult: *Medical Serials, with Bibliography of Medical Jurisprudence*, published by the New York State Library (2d ed., Albany, 1910); J. J. Reese, *Textbook of Medical Jurisprudence and Toxicology* (8th ed., Philadelphia, 1911); Robertson, *Manual of Medical Jurisprudence, Toxicology, and Public Health* (2d ed., London, 1913); Brothers, *A Statement of the Law of Forensic Medicine* (St. Louis, 1914). See EVIDENCE; BLOODSTAINS; HOMICIDE; INFANTICIDE; INSANITY.

MEDICAL SCHOOL. See MEDICAL EDUCATION.

MEDICAL SCHOOL, NETLEY. An establishment at Netley, near Southampton, England, for the technical education of medical officers for the British and Indian military service. Candidates are examined competitively in the ordinary subjects of professional knowledge, and, passing satisfactorily through that ordeal, are then required to attend for six months at the Military Medical School, where they go through practical courses of military hygiene, military and clinical-military surgery and medicine, and pathology with morbid anatomy. There is a training school for army nurses in connection with the hospital at Netley, where women enlist for life or during competency for work in army hospitals, in the field, or in foreign lands in care of the sick soldiery.

MEDICAL STATISTICS OF THE UNITED STATES. In the United States of America, including the Philippine Islands, Porto Rico, Hawaii, Alaska, and the Canal Zone, there were, in 1914, 138,443 physicians. The population of the United States alone was approximately 100,000,000. The United States has one physician to every 600 to 650 people, while the normal proportion of physicians to population in the leading nations of Europe is one to every 1500 to 2500 people. The figures given for the United States do not include the osteopaths, Christian Scientists, and other so-called drugless practitioners scarcely found in other countries. In 1914 there were 101 medical colleges and schools in the United States, with 16,502 students and 7411 instructors. Of the 101 schools 87 are regular or nonsectarian, 10 are homœopathic, 4 are eclectic; 54 are coeducational and 2 are colleges solely for women. There were also 17 postgraduate medical schools. The graduates in 1914 numbered 3320 nonsectarian, 154 homœopathic, and 70 eclectic, in all 3594. The status of medical colleges and schools in the United States is determined by the rating accorded them in the third classification of the Council on Medical Education of the American Medical Association. Statistics published in 1914 show a decrease during the last decade of about 35 per cent in the number of medical colleges and corresponding reductions in the number of students and graduates. See MEDICAL EDUCATION.

MEDICI, mā'dē-chē, THE. The most celebrated family of the Florentine Republic. The Medici owed their earliest distinction to the success with which they had pursued various branches of commerce and the liberal spirit in which they devoted their wealth to purposes of general utility. From the thirteenth century the Medici took part in all the leading events of the Republic. From the time when Salvestro de' Medici attained the rank of *gonfaloniere* in 1378 the family rose rapidly to preëminence, the foundation of its greatness being especially due to Giovanni, who died in 1429, leaving to his sons, Cosimo and Lorenzo, a heritage of wealth and honors hitherto unparalleled in the Republic. With Cosimo (1389–1464), on whom was gratefully bestowed the title of "Father of his Country," began the glorious epoch of the Medici; while from Lorenzo was descended the collateral branch of the family, which in the sixteenth century obtained absolute sway over Tuscany. Cosimo's life, except during a short period, when the Albizzi and other families reëstablished a successful opposition against the policy and credit of the Medici, was one uninterrupted course of prosperity. At once a munificent patron and a successful cultivator of art and literature, he did more than any sovereign in Europe to revive the study of the ancient classics and to foster a taste for mental culture. He assembled about him learned men of every nation and gave liberal support to numerous Greek scholars, and by his foundation of an academy for the study of the philosophy of Plato, and of a library of Greek, Latin, and Oriental manuscripts, he inaugurated a new era in modern learning and art. But, though he retained the forms of the Republic, and nominally confided the executive authority to a *gonfaloniere* and eight *priori*, or senators, he totally extinguished the freedom of Florence.

His grandson, LORENZO THE MAGNIFICENT (1449–92), became the virtual head of the Florentine state in 1469. In 1478 the conspiracy of the Pazzi nearly succeeded in overthrowing the Medici. Lorenzo's brother Giuliano was slain and he himself barely escaped. The result of the conspiracy was to give Lorenzo a firmer hold upon the state. He pursued with signal success the policy of his family, which was to win the favor of the lower classes and thereby make absolute their own power. He encouraged literature and the arts, employed learned men to collect choice books and antiquities for him from every part of the known world, established printing presses in his dominions, founded academies for the study of classical learning, and filled his gardens with collections of the remains of ancient art. When, however, his munificence and conciliatory manners had gained for him the affection of the higher and the devotion of the lower classes, he lost no time in breaking down the forms of constitutional independence that he and his predecessors had hitherto suffered to exist. Some few Florentines, alarmed at the progress of the voluptuous refinement, which was smothering every spark of personal independence, tried to stem the current of corruption by an ascetic severity of morals, which gained for them the name of *piagnoni*, or weepers. Foremost among them was the Dominican friar Girolamo Savonarola (q.v.), whose eloquent appeals to the people in favor of a popular and democratic form of government and a life of asceticism threatened for a time the overthrow of the Medici. Lorenzo achieved some reputa-

tion in belles-lettres. We have from him poems of many kinds, lyric, moral, dramatic, and descriptive. His *Canzoni* and *Sonetti* are love poems, to which he added a prose commentary. A true feeling for nature appears in the *Caccia del falcone*, and a rather pleasing picture of rural life is to be found in his *Nencia da Barberino*. A dramatic composition of a kind held in favor at the time is the *Rappresentazione di Santi Giovanni e Paolo* (performed in 1489). Like so many writers of the period, he cultivated the form of the *ballata* or dance song. He wrote also a number of *canti carnascialeschi*, or carnival songs. The religious spirit prevails in his *Laudi spirituali*. His love poetry is the best of all that he produced, and the most distinctive characteristic in it is the note of melancholy.

PIETRO (born in 1471), who succeeded his father Lorenzo in 1492, possessed neither capacity nor prudence; and in the troubles which the ambition of her princes and the undue use of the temporal power of the popes brought upon Italy, by plunging her into civil and foreign war, he showed himself treacherous and vacillating, alike to friends and foes. When Charles VIII of France, in 1494, marched into Italy in order to achieve the conquest of Naples, Pietro, in hopes of conciliating the powerful invader, hastended to meet the troops on their entrance into the dominions of Florence, and surrendered to Charles the fortresses of Leghorn and Pisa, which constituted the keys of the Republic. The magistrates and people, incensed at his perfidy, drove him from Florence and formally deposed the family of Medici from all participation in power. Pietro lost his life in the battle of the Garigliano in 1503 while fighting in the French ranks. In 1512 the Medici were reinstated in Florence, and the elevation of Giovanni de' Medici to the papal chair, under the title of Leo X (1513–21), completed the restoration of the family to their former splendor. The accession of Giulio de' Medici to the pontificate as Clement VII (1523–34), the marriage of Catharine, the granddaughter of Pietro, to Henry II of France in 1533, and the military power of the cadet branch (descended from a younger brother of the "Father of his Country") widened the rôle which the Medici were enabled to play.

Expelled from Florence in 1527, they were reinstated, and this time permanently, in 1530, by the combined forces of the Emperor Charles V and Pope Clement VII. The Florentines were forced to accept as their ruler a worthless prince, Alessandro de' Medici, a natural son of Lorenzo II (the father of Catharine), who was invested with the ducal dignity. On his death by assassination without direct heirs, in 1537, Cosimo I, the descendant of a collateral branch, was raised to the ducal chair. Cosimo, known as the Great, possessed the astuteness of character, the love of elegance, and taste for literature that had distinguished his great ancestors; but none of their frank and generous spirit. He founded the academies of painting and of fine arts, made collections of paintings and statuary, published magnificent editions of his own works and those of others, and encouraged trade, for the protection of which he instituted the ecclesiastical Order of St. Stephen. He was implacable in his enmity and did not scruple to extirpate utterly the race of the Strozzi (q.v.), the hereditary foes of his house. His acquisition of Siena gained for him in 1569 the title of Grand Duke of Tuscany from Pius V. He died in 1574, leaving enormous wealth and regal power to his descendants, who, throughout the next half century, maintained the literary and artistic fame of their family. In the seventeenth century the race rapidly degenerated, and after several of its representatives had suffered themselves to be made the tools of Spanish and Austrian ambition, the dynasty of the Medici became extinct with Giovanni Gastone, who died in 1737. In accordance with the stipulation of the Peace of Vienna, the Grand Duchy of Tuscany passed to the house of Lorraine. The name of the Medici family was kept alive by a house which pretended to have emanated from it in the thirteenth century, and which acquired the Principality of Ottojano towards the end of the sixteenth century. To this house belonged Luigi de' Medici (1760–1830), Duke of Sarto, known as the Chevalier de' Medici. He was a minister of Ferdinand I and Francis I of the Two Sicilies, and died while visiting Madrid in 1830.

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MEDICI, TOMBS OF THE. The burial place of the Medici family in the new sacristy of the church of San Lorenzo at Florence. It contains Michelangelo's statues of Giuliano and Lorenzo de' Medici, the former represented as a general of the Church, the latter in deep meditation. The sarcophagus of Giuliano is adorned by the famous sculptures of Day and Night, and that of Lorenzo by those of Evening and Dawn. The work was left unfinished in 1534.

MEDICI, VILLA. See VILLA MEDICI.

MEDICINA, mā'dē-chē'nā. A town in the Province of Bologna, Italy, 15 miles east of the city of Bologna. It is situated in a low-lying region which is extensively cultivated. It has some manufactures, and trades in grain, wine, and mineral waters. Pop. (commune), 1901, 12,535; 1911, 13,632.

MEDICINAL PLANTS (mē-dĭs'ĭ-nal). Plants of which some part or product is used in medicine. Consult White, *Materia Medica* (London, 1914).

MED'ICINE (OF. *medicine*, Fr. *médecine*, from Lat. *medicina*, medicine, from *medicinus*, relating to a physician, from *medicus*, physician, from *medere*, Av. *mad*, to heal), HISTORY OF. While medical practice, in an elementary form, is probably as old as man, the oldest records of medical matters extant are those of Egypt. Most of our knowledge of Egyptian medicine is

derived from the Greeks, but recent discoveries of ancient papyri and better methods of deciphering inscriptions have yielded much original information. The Papyrus Ebers dates from about the sixteenth century B.C., and much of the learning therein recorded had been traditional for centuries. Certain facts concerning Egyptian medicine are well established. This art, as most others, was vested in the priests; there was an extensive formulary, combined with many ceremonial rites; practice was widely specialized—there were physicians, gynæcologists, veterinarians, and military surgeons; but there was nothing like progress from one age to another. Egyptian medical lore was preserved in the last six volumes of the Sacred Book. These treated of anatomy, general diseases, instruments, remedies, diseases of the eye, and diseases of women, and in completeness and arrangement rival the Hippocratic collection, which they antedate by a thousand years.

The Hebrews derived their medical knowledge from Egypt, and are chiefly remarkable for their thorough conception of the value of public hygiene and sanitation, of which systems they may be considered the originators. In the early days of the existence of the Hebrew nation disease was looked upon as a punishment for sin, and the Levites were the sole practitioners. Later in their history the Jews received the impress of Assyrian, and later still of Greek, thought. After two captivities we find a class of temple physicians and special surgeons, and in the centuries immediately preceding the Christian era there were communal or city physicians who were held in high esteem. Jewish medical records embraced in the Talmud (q.v.) show the Jewish physicians had, like the Egyptian, little knowledge of human anatomy, that their surgery was crude, and that no operations in midwifery were performed.

The Vedas (q.v.), the sacred books of India, show that medicine as a separate science was in that country very ancient. The Indian physicians combined a close observation of pathological phenomena with a genius for misinterpretation, so that their study availed them little. Demonology played a large part in their practice and belief. Physicians were drawn from the highest caste (the Brahmans), and long training, decorum, and piety were required of them. Their therapeutic methods embraced diet, bathing, and innumerable drugs.

The origin of Chinese medicine is lost in tradition and fable. The Chinese attributed the invention of medicine to the Emperor Hwang-ti, who was supposed to have lived about 2687 B.C. They had elaborate rules for noting the pulse, and a portentous array of curious remedies, drawn from the animal, vegetable, and mineral kingdoms. They knew no anatomy, and their surgery was of a barbarous type. No bloody operations were performed, but cupping, acupuncture (q.v.), plasters, and fomentations were used. Medical practice was entirely unregulated. Chinese medicine remained practically unchanged until recent years, when the medical missionaries introduced modern methods.

It is Greece that furnishes us with the most interesting and significant remains of the history of medicine during antiquity. Chiron (q.v.), the Centaur, is fabled to have introduced the art of healing into Greece and to have been the preceptor of Æsculapius (q.v.), who was as eminent among the Greeks as was Hermes in Egypt. Some scholars consider them identical. The followers of Æsculapius early formed a separate cult or worship. They had temples situated in groves and near springs, where healing was practiced and instruction given. Treatment consisted of the interpretation of dreams, propitiatory sacrifices, the offering of votive tablets, etc., but dieting, pure air, temperate living, and bathing also had their part in the cure, together with frictions, emetics, and purgatives. The system finally degenerated into mere mysticism, and by the time of Hippocrates only the superstitious resorted to it. Besides the temple medicine there were gymnasia, older even than Æsculapius, each of which had its *gymnasiarch* or director; a *gymnast*, under him, who directed the treatment of the sick; and *iatroliptes*, who anointed, gave massage, bled, and dressed wounds and ulcers.

The period prior to the dispersion of the followers of Pythagoras (q.v.) (c.500 B.C.) is sometimes called the *sacred period* of medicine. It was followed by the *philosophical period*, inseparably linked with the name of Hippocrates (q.v.) (460–c.357 B.C.), the first great apostle of rational medicine. He classified diseases into epidemic, endemic, and sporadic; he wrote extensively on surgery (though ignorant of dissection), on obstetrics, hygiene, regimen, and on climatic influences; and his works display an immense range of knowledge and high powers of description.

From the time of Hippocrates, for several centuries, we find medical beliefs crystallizing about several schools or systems. The *Dogmatic*, or rationalistic, school of Hippocrates, founded by his sons, Thessalus and Draco, and his son-in-law, Polybius, based its principles of practice on theories derived from known facts and observations, and regarded maladies as units from their beginning to their termination; i.e., they recognized diseases as distinct entities. The *Empirics*, on the other hand, taught that remedies could only be suggested by experience. Their school was founded, according to Celsus, by Serapion, a pupil of Herophilus, mentioned later in this article. The *Methodists* occupied a position somewhere between the Empirics and Dogmatists, and the *Eclectics* chose, or pretended to choose, from each system what suited them, and adhered to none.

The philosophic period ended and the *anatomic period* began with the foundation of the Alexandrian Library, after the death of Alexander the Great, by Ptolemy, one of his lieutenants. This was in 320 B.C., and the centre of medical thought and teaching was now shifted to Alexandria. Here the Ptolemies gathered about them the learned men of the day. Although Egyptian prejudice was strong against it, Ptolemy encouraged dissection of the human body. Among the famous teachers of Alexandria were Herophilus and Erasistratus (q.v.). The former is supposed to have been the first to dissect a human body, and between them they made many notable discoveries, concerning the structure of the brain, eye, heart, and intestinal canal. Erasistratus died about 280 B.C. During this period medical thought was practically divided into two schools, the Dogmatist and Empiric.

The first native Roman writer on medicine was Celsus (q.v.), born at about the time of Christ. His work, *De Medicina*, gives a sketch of the history of medicine up to his time and

the state in which it then existed. He followed the teachings of Hippocrates and exercised a dominant influence until Galen (q.v.) (130–c.201) totally supplanted him. Galen wrote over 100 works, some of them on anatomy. He described every bone in the human body, and the functions of the muscles; he recognized two kinds of nerves—those of sensation, which he thought came from the brain, and those of motion, which he believed to originate in the spinal marrow. He divided the body into the cranial, thoracic, and abdominal cavities, whose proper envelopes he described. Galen strove to popularize the study of anatomy, with but little success, and with his death came the end of the anatomical period and the end for several centuries of medical progress.

The first names of any renown that occur after the death of Galen are those of Oribasius, Alexander of Tralles, Ætius, and Paulus Ægineta, who flourished between the fourth and seventh centuries. They were all zealous Galenists. With the death of Paulus the Greek school may be said to have ended, for after his time no works of merit were written in this language.

Arabian medicine was an offspring of the Greek, through the Nestorian monks, who settled in Persia and Arabia in the sixth century and established many schools of learning. Fragments of the sect still remain in these countries. By the seventh century Arabian physicians were in high repute. The earliest Arabic writer on medicine was Ahrum, who was contemporary with Paulus; but the most celebrated physicians of this school were Rhazes, who lived in the ninth century and was the first to describe smallpox; Avicenna (q.v.), of the eleventh century, whose *Canon Medicinæ* embraced all that was then known of medicine and the collateral sciences; Albucasis, whose works on surgery were the standard for several centuries; Avenzoar; and Averroës, who lived in the twelfth century and was equally celebrated as a physician and a philosopher. The works of Hippocrates and Galen, which, together with those of Aristotle, Plato, and Euclid, were translated into Arabic in the ninth century, formed the basis of their medical knowledge; but the Arabian physicians did good service to medicine by introducing new articles from the East into the European materia medica, e.g., rhubarb, cassia, senna, and camphor, and in making known the first elements of pharmaceutical chemistry, such as distillation and the methods of obtaining various metallic oxides and salts. During this period that part of Europe not in the hands of the Saracens was subjected to successive invasions of northern barbarians, and medicine, as other arts, was at a standstill. There was a brief period of quiet during the reign of Charlemagne, when medical practice seems to have again passed into ecclesiastical control, and from the ninth until the thirteenth century the Jews (who acquired their learning from the Saracens) shared with the clergy the art of healing.

Upon the decline of the Saracenic universities of Spain, which may be dated from the death of Averroës, the best medical teaching was to be found in Italy, where the school of Salerno became celebrated. It was gradually eclipsed in its turn by the rising fame of other medical schools at Bologna, Vienna, Paris, Padua, and elsewhere. Contemporary with Mondino lived Gilbert, the first English medical writer of note; and the prior century gave birth of Linacre (q.v.), who studied at the continental universities and subsequently founded the London College of Physicians. It was in the fifteenth century that the sect of chemical physicians arose, who maintained that all the phenomena of the living body may be explained by the same chemical laws as those which rule inorganic matter. The chemical school, with Paracelsus (q.v.) at their head, did nothing to advance medicine except to introduce into the materia medica several valuable metallic preparations. During this period many new diseases were recognized and described.

In the sixteenth century the study of human anatomy was first fairly established by the labors of Vesalius (q.v.), and in this century and the following we meet with the names of many physicians whose anatomical and physiological studies materially advanced medical science. This was the epoch of Eustachio (q.v.), Fallopio (q.v.), Assellius, Harvey (q.v.), Rudbeck, Bartholin, Glisson, Sylvius, Willis, Bellini, and others. Ambroise Paré (1517–90) made important additions to surgical knowledge and technique. The Cæsarian operation, which had been known among the Greeks and Romans, was revived. Malpighi (q.v.) and Grew founded the cell doctrine. Besides many discoveries in minute anatomy, made possible by the invention and gradual improvement of the microscope, the materia medica was enriched by the addition of Peruvian bark, or cinchona, by the Countess Chinchon in 1632. The seventeenth century is also marked by great advance in obstetrics; medical jurisprudence had its beginning about this time; and bedside or clinical teaching was introduced. Chemistry was now becoming distinct from alchemy and advancing to the dignity of a science, and an alliance between its principles and those of physiology was formed, which resulted in a new sect of chemical physicians, quite distinct, however, from the sect represented two centuries previously by Paracelsus. These chemical physicians believed that diseases were referable to certain fermentations which took place in the blood, and that certain of these *humors* were naturally acid and others alkaline, and that when one or the other of these predominated certain specific diseases were the result, which were to be removed by the exhibition of remedies of a nature opposite to that of the disease. They were soon succeeded by the Iatromathematical school, of which Borelli, Sauvages, Kneill, Jurin, Mead, and Friend were among the best known. Another sect was that of the Vitalists, which originated with Van Helmont, and which, with some modification, was adopted by Stahl and Hoffmann. Among other physicians whose names stand out prominently in the annals of the seventeenth century are Sir Thomas Browne and Sydenham (q.v.), both Englishmen, the latter the greatest clinical physician of his time; Wharton, who discovered the submaxillary duct; Schneider, who described the Schneiderian mucous membrane of the nose; Stenson, Peyer, Brunner, Pacchioni, Havers, and Cowper.

The most eminent teacher of medicine in the early part of the eighteenth century was Boerhaave (q.v.), elected to the chair of medicine at Leyden in 1709. Among the pupils of Boerhaave was Van Swieten, whose comments on the aphorisms of his master formed a valuable collection of practical observations; and Haller (q.v.),

who has been called the father of modern physiology and who first enunciated the theory that irritability and sensibility are specific properties of muscular and nervous tissues. Most of the distinguished physicians of the latter part of the eighteenth century belonged to the Cullenian school of medicine. (See CULLEN.) Cullen's views were attacked with great acrimony by his former assistant, John Brown (q.v.), who became the founder of the Brunonian system of medicine. In Great Britain the views of Brown were regarded as too purely theoretical and did not attain any great popularity; but in some parts of the Continent, and especially in Italy, they found acceptance and became for a considerable time the prevailing doctrine in the leading medical schools. Among the medical curiosities of the later years of this century were the doctrine of animal magnetism, or mesmerism (q.v.), and homœopathy (q.v.). The latter was founded by Hahnemann (q.v.) and served a useful purpose in protesting against the enormous dosage of medicines and the excessive bloodletting then in vogue. The eighteenth century witnessed a steady progress in all branches of medicine and surgery, the social status of the practitioner was raised, and medicine became a conscientious vocation and not a mere trade. The greatest single discovery of the age, and that which conferred the most benefit on mankind, was vaccination (see JENNER), and next to this, perhaps, a reform in the methods of treating the insane. To supplement this outline of the progress of medicine in the eighteenth century, the reader is recommended to consult the biographical sketches of Monro, the Hunters, and others.

The nineteenth century was one of epoch-making discoveries, only a few of which can even be mentioned within the limits of this article. In the early years of the century Laennec (q.v.) invented the stethoscope and thereby instituted a complete revolution in the methods of physical diagnosis; Virchow (q.v.) founded modern cellular pathology; Pasteur (q.v.), by his studies in fermentation and putrefaction, prepared the way for the germ theory of disease; and Lister (q.v.), stimulated by Pasteur's discoveries, gave to surgery the antiseptic treatment of wounds. Laveran (q.v.) in 1880 discovered the plasmodium of malaria (q.v.), and Koch (q.v.) in 1882 the bacillus of tuberculosis. Since then it has been proved that anthrax, Asiatic cholera, and most of what are called the specific infectious diseases, are due to minute vegetable or animal organisms. (See BACTERIA.) The discovery of general anæsthetics was no less important and remarkable. Morton (q.v.), of Boston, demonstrated the anæsthetic properties of sulphuric ether in 1846; and Simpson, of Edinburgh, introduced chloroform in 1847. The introduction of cocaine as a local anæsthetic in 1884 by Koller made possible the performance of painless operations on the eye and in the nose and throat and other parts of the body. The materia medica has been enriched by the addition of quinine, morphia, strychnine, iodine and the iodides, the bromides, hydrocyanic acid, and cod-liver oil, and, more interesting than these, of antitoxic serums. (See ANTITOXIN; SERUM THERAPY.) Diphtheria antitoxin especially has saved thousands of lives. Among the more important instruments invented during the nineteenth century are the ophthalmoscope and the laryngoscope.

The early years of the twentieth century may be looked upon as the beginning of a new era, that of organized preventive medicine. Nearly all efforts have been in the direction of prophylaxis and control of disease. Tropical medicine in particular has been the subject of intense and organized study in Africa, America, and the East. Hookworm disease was brought under control in Porto Rico (1903–04) by Ashford, an American army surgeon, and in the southern United States by Stiles (1910–12), who named the American species *Necator americanus* (1912). In 1910 Loos demonstrated that the hookworm larvæ penetrate the skin. To the studies of Reed, Carroll, and Lazear must be credited the control of yellow fever. These observers proved the transmission of the virus of the disease by a mosquito, *Stegomyia*, and thereby enabled Gorgas to clear Havana of yellow fever in three months and afterward to accomplish the brilliant feat of sanitation which made possible the building of the Panama Canal. The control of tropical dysentery, sleeping sickness, beriberi, and other fatal tropical diseases has been measurably successful and life for the white man in the tropics has been rendered comparatively safe. Through the labors of Metchnikoff, Wright, and others the defensive properties of the blood and the subject of immunity in general have been enormously advanced and have resulted in the production of a new system of treatment of bacterial infection, viz., vaccinotherapy. Among the many new drugs discovered the most important is salvarsan (q.v.), a specific for syphilis introduced by Ehrlich in 1909. Schaudinn discovered the parasite in 1905, Wassermann the serodiagnosis in 1907, and Noguchi the luetin test for the disease in 1901. In 1913 Noguchi demonstrated the spirochetes in the tissue of the nervous system and thus cleared up many speculations as to the relation of syphilis to certain nervous diseases. These discoveries with respect to syphilis have put the diagnosis and treatment of this malady and its allied affections on an entirely new basis. The Roentgen rays (X rays) have found increasing employment both in treatment and diagnosis. Lastly this period has been marked by investigations of the internal secretions and the functions of ductless glands, which have been of valuable help in the elucidation of obscure diseased conditions. Other advances in contemporary medicine will be dealt with more fully under their own titles. Surgical developments, which have been great, will be noticed in full under the title SURGERY. For a complete review of medical progress year by year, consult the NEW INTERNATIONAL YEAR BOOK. See HYGIENE.

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MEDICINE, AMERICAN ACADEMY OF. An association organized in 1876 and incorporated in 1913, holding annual meetings in different large cities of the United States. It was organized to conduct an active propaganda for

the proper education of physicians and gradually developed into a society studying the questions of social medicine. It has a membership of nearly 700 and its publication is the *Journal of Sociologic Medicine*, appearing in Easton, Pa.

MEDICINE, Forensic. See Medical Jurisprudence.

MEDICINE, New or Eclectic School of. See Eclectic School of Medicine.

MEDICINE, Veterinary. See Veterinary Medicine.

MEDICINE DANCE. A name sometimes applied to the sun dance of the Cheyenne and other Plains Indians. The same ceremony among the Blackfoot Indians is spoken of as the medicine lodge. See Sun Dance; Cheyenne.

MEDICINE HAT. A city and the capital of the electoral division of Medicine Hat, Alberta, Canada, situated on the South Saskatchewan River and on the main line of the Canadian Pacific Railway, about 165 miles east-southeast (direct) of Calgary and about 600 miles west (direct) of Winnipeg (Map: Alberta, K 8). Its public buildings and institutions include the Dominion Lands Office, a general hospital, a business college, and the exhibition buildings and grounds. There are two parks and a dry-farming demonstration farm. Among manufacturing industries and establishments are a grain elevator, flour, linseed-oil, rolling and planing mills, brick plants, a steel plant, and manufactories of cement, graphite and crayon products, lumber, glass, clay products, and foundry and machine-shop products. Clay and coal are found in the surrounding district. The city owns its electric-lighting and gravitation water systems and eight natural-gas wells, which supply power for manufacturing. Pop., 1901, 1570; 1911, 5608.

MEDICINE MAN. A name used for a shaman among the American Indians. The term "medicine" in the same connection has no reference to the treatment of disease, but to supernatural relations between persons and objects, or between persons and higher powers. A true medicine man is in reality a priest rather than a doctor, though he may exercise both functions, since most medical practice among the Indians is based upon magic rather than upon therapy. See Indians.

MED'ICK (OF. *medique*, from Lat. *medica*, from Gk. *μηδική, mēdikē*, median grass, from Μηδικός, *Mēdikos*, median, from Μῆδος, *Mēdos*, OPers. *Māda*, Mede), *Medicago*. A genus of plants, natives of temperate and warm climates of the Old World, of the family Leguminosæ, distinguished from the closely related genus *Trifolium* (clover) by the sickle-shaped or spirally twisted pods. The species, which are very numerous, are mostly annual and perennial herbs with leaves of three leaflets like those of clover. A number of them are found in Europe, and have also been introduced into the United States. The most important species is the purple medick, lucerne, or alfalfa (q.v.); other important species are bur clover (*Medicago denticulata*), distributed in California and the grazing regions of the South and Southwest; yellow lucerne (*Medicago falcata*), which grows wild in northern Europe; black medick (*Medicago lupulina*), widely grown as a pasture plant; and spotted medick (*Medicago maculata*), introduced into the Eastern and Southern States. They are generally valuable as forage and pasture plants. Consult *Texas Agricultural Experiment Station, Bulletin 108* (College Station, Brazas Co., 1908), and *Alabama Agricultural Experiment Station, Bulletin 165* (Opelika, 1912).

MÉDICO DE SU HONRA, mā'dē-kō dā sōō ōn'rä, El (Sp., The Physician of his own Honor). One of the strongest dramas of Calderón.

MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN AND IRELAND, The. An association founded in 1841, with headquarters in London, England, and incorporated in 1895. Its objects are the study and promotion of mental pathology and the improvement of the treatment of the insane. The membership, which is over 600, is made up of registered medical practitioners and of honorary corresponding members. The regular publication of the association is the *Journal of Mental Science*. The association is subdivided into five divisions, which also hold divisional meetings. Meetings are held on the third Thursday in February at some city in Britain other than London, and in the latter city on the third Tuesday in May and November. The president in 1914 was D. G. Thomson, M.D., and the honorary secretary M. A. Collins, M.D.

MEDILL', Joseph (1823–99). An American journalist. He was born in New Brunswick, Canada, but at the age of eight removed with his parents to Stark Co., Ohio, afterward studied law and practiced his profession at Massillon. In 1849 he entered journalism and took charge of the Coshocton *Republican*, a Free Soil paper. Two years later he established the Cleveland *Forest City*, a Whig organ, but in 1852 united it with the *Free Democrat*, the new paper being called the *Leader*. A little after he left the Whig party and in 1854 was an organizer of the Republican party in Ohio. In 1856, with two partners, he bought the Chicago *Tribune*. In 1870 he helped frame a new State constitution for Illinois, in 1871 was appointed a member of the first Civil Service Commission, and in 1872 was elected mayor of Chicago. He spent a year in Europe (1873–74) and on his return became chief proprietor and editor in chief of the *Tribune*, and he continued in that position until his death. He was instrumental in establishing the Chicago Public Library and in securing the Columbian Exposition for Chicago.

MEDI'NA (Ar. *al Medinah*, the city; or more fully *Medinat al Nabi*, the city of the Prophet; called also *Tayyibah*, the perfumed, or *al Munawwarah*, the illumined; before the time of Mohammed known as *Yathrib*, whence it is mentioned by Ptolemy as *Jathrippa*). One of the sacred cities of Islam, the scene of Mohammed's labors after his emigration from Mecca (see Mohammed; Hejira), and the place of his tomb (Map: Turkey in Asia, D 6). It is about 250 miles north of Mecca and 140 north by east of the port of Yambu. The population was estimated by Burton at the time of his visit (1852) at 16,000; a later estimate places it at 50,000. In the third century A.D. the tribes of *Aus* and *Khazraj* emigrated to Yathrib from Yemen. It was by representatives of these tribes that Mohammed was invited to Medina; with them he entered into an alliance, and they were his "helpers" (*ansar*) after he had taken up his residence in Medina (622 A.D.), though among the members of both tribes there were many who hesitated, vacillated, and occasionally took sides with the opponents of the Prophet, the so-called *Munafikuna*. There was also a large Jewish

population in Medina, the leading tribes being the Kainuḳa and the Nadhir, who were driven out after the battle of Ohod (625), and the Kuraiza, who were slaughtered by the Moslems later. Medina remained the residence of Mohammed even after the capture of Mecca in 630, and he died there in 632. It was the capital of Abu Bekr (630–632), Omar (632–644) and Othman (644–656), until Ali removed the seat of government to Kufa (656–661) and Moawiyah made Damascus the capital of the Ommiad dynasty. It consists of three principal parts—a town, a fort, and suburbs of about the same extent as the town itself, from which they are separated by a wide space. Medina forms an irregular oval within a walled inclosure, 35 to 40 feet in height, and flanked by 30 towers—a fortification which renders the city the chief stronghold of Hejaz. Two of its four gates, viz., the *Bab al Jum'ah* (Assembly Gate, in the eastern wall) and the *Bab al Misri* (Egyptian Gate), are massive buildings with double towers. The streets, between 50 and 60 in number, are narrow and paved in only a few places. The houses are flat-roofed and double-storied and are built of a basaltic scoria, burned brick, and palm wood. Very few public buildings of any importance are to be noticed except the mosque, erected near the spot where Mohammed died. It is of smaller dimensions than that of Mecca, being a parallelogram, 420 feet long and 340 feet broad, with a spacious central area called *al Ṣaḥn*, which is surrounded by a peristyle with numerous rows of pillars. The Mausoleum, or *Ḥujrah*, itself behind the mosque proper, is an irregular square, 50 to 55 feet in extent, situated in the southeast corner of the building and separated from the walls of the mosque by a passage about 26 feet broad. A large gilt crescent above the "green dome" springing from a series of globes surmounts the *Ḥujrah*, a glimpse into which is attainable only through a little opening, called the Prophet's window; but nothing more is visible to the profane eye than costly carpets or hangings, with three inscriptions in large gold letters stating that behind them lie the bodies of the Prophet of Allah and the two caliphs (Abu Bekr and Omar) and an empty tomb for Jesus. These curtains, changed whenever worn out or when a new Sultan ascends the throne, are supposed to cover a square edifice of black marble, in the midst of which stands Mohammed's tomb. Its exact place is indicated by a long, pearly rosary (*Kaukab al Durrī*) suspended from the curtain. The Prophet's body is supposed to lie (undecayed) stretched at full length on the right side with the right palm supporting the right cheek, the face directed towards Mecca. Outside the drapery is the tomb of Fatima, the daughter of Mohammed. Close behind him is placed, in the same position, Abu Bekr, and behind the latter, Omar. The fact, however, is that when the mosque, which had been struck by lightning, was rebuilt in 892, three deep graves were found in the interior, filled only with rubbish. Many other reasons make it more than problematic whether the particular spot at Medina really contains the Prophet's remains. Of the fabulous treasures which this sanctuary once contained little now remains. As in Mecca, a great number of ecclesiastical officials are attached in some capacity or other to the mosque, as ulemas, imams, khatibs, etc.; and not only they, but the townspeople in general, live to a great extent on the pilgrims' alms, the city having little trade. The mosque was destroyed by fire in 1257 and was rebuilt 1258–88; it was restored in 1487 by Khaid Bey of Egypt. It is one of the very few mosques with three minarets. From 929 to 950 the Karmathians (see Mohammedan Sects) were masters of the city. Medina recognized the authority of Selim I in 1517. It fell into the power of Saud, the Wahabi general, in 1803, and was reconquered by Tussun Pasha in 1815. There are few other noteworthy spots to be mentioned in Medina, save the minor mosques of Abu Bekr, Ali, Omar, etc. The private houses, however, surrounded by gardens, fountains, etc., have a very pleasing appearance, and the city, although in its decay, is yet busy and agreeable. A number of madrasahs, or endowed schools, represent what learning there is left in Medina, once famed for its scholars. As is the case with Mecca, non-Mohammedans are rigorously excluded from the sacred city, yet it has been visited by Varthema (1503), Wild (1604), Pitts (c.1685), Seetzen (1806), Burckhardt (1814), Wallin (1845), Burton (1854), Keane (1878), and Wavell (1912).

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MEDINA. A village in Orleans Co., N. Y., 41 miles west of Rochester and equally distant to the northeast from Buffalo, on Oak Orchard Creek, the Erie Canal, and the New York Central and Hudson River Railroad (Map: New York, B 4). It is in a fertile agricultural region and derives good water power from the creek, where a storage dam has been constructed. There are valuable sandstone quarries, foundries, iron works, pump works, flouring mills, and manufactories of furniture, shirts, vinegar, cigars, and extracts. Medina Falls are noted for their scenic beauty. Settled about 1830, Medina was incorporated in 1832. The present government is administered under a charter of 1874, which, as subsequently amended, provides for a president, annually elected, and a board of trustees who act with the executive in electing subordinate officials. Medina owns its water works. Pop., 1900, 4716; 1910, 5683.

MEDINA. A village and the county seat of Medina Co., Ohio, 32 miles southwest of Cleveland, on the Baltimore and Ohio and the Northern Ohio railroads (Map: Ohio, G 3). It contains the Pythian Sisters' Home, Sylvester Library, and the beautiful Spring Grove cemetery. The chief industrial establishments are bee-supply works, foundries, and bending works. The surrounding country is adapted to farming. Pop., 1900, 2232; 1910, 2734.

MEDINA. The sister of Elissa and Perissa, in Spenser's *Faerie Queene*. She represents the golden mean.

MEDINA, mā-dē'nä, José Toribio (1852–). A Chilean bibliographer and historian,

born in Santiago de Chile. He was educated at the National Institute and the University of Santiago, receiving the law degree in 1873. In 1874 he was appointed secretary to the Chilean Legation at Lima, where he made investigations in the archives during his spare time. Thence he traveled in the United States and Europe, visiting libraries and archives. Returning to Chile in 1878, he served in the Chilean-Peruvian War and at its close was appointed judge in the newly acquired territory. In 1884 he was made secretary to the Chilean Legation at Madrid and was commissioned by the government to make investigations in the Spanish archives respecting the history of Chile. After several years' study in Spain, he returned to Chile, but in 1902 he made a third voyage to the United States and Europe to continue his studies. He spent his life in investigation, writing, editing, and publishing, having set up a printing plant in his own house. His first literary effort was a translation of Longfellow's *Evangeline* (1874). His fame, however, rests upon his indefatigable investigations in history and bibliography, in which he spent more than 35 years. He ranks as one of America's greatest bibliographers. His principal work, the *Biblioteca hispano-americana, 1493–1810* (7 vols., 1898–1907), is remarkably erudite and valuable, containing the description of about 10,000 books. Other works of the same character are *Historia y bibliografía de la imprenta en el antiguo virreinato del río de la Plata* (1892), *La imprenta en Manila desde sus orígenes hasta 1810* (1896), *Biblioteca hispano-americana septentrional* (1897), *Biblioteca hispano-chilena, 1523–1817* (3 vols., 1897–99), *La imprenta en Bogotá, 1739–1821* (1904), *La imprenta en Guadalajara de México, 1793–1821* (1904), *La imprenta en Guatemala, 1660–1821* (1910), *La imprenta en la Habaña, 1707–1810* (1904), *La imprenta en Lima, 1584–1824* (4 vols., 1904–07), *La imprenta en México* (1907 et seq.), *La imprenta en puebla de los Angeles, 1640–1821* (1908), and many similar works covering books published in various cities of Spanish America. His historical works, all based upon manuscript sources, include *Historia de la Inquisición en Lima* (1887), *El Tribunal del Santo Oficio de la Inquisición en Chile* (2 vols., 1890), *Juan Diaz de Solis* (2 vols., 1897), *La Inquisición en las Islas Filipinas* (1899), *La Inquisición en México* (1905), *El Portugués Estebán Gomez* (1908), *El veneciano Sebastian Caboto* (2 vols., 1908). He also published *Medallas coloniales hispano-americanas* (1900), *La instrucción pública en Chile* (2 vols., 1905), *Diccionario biografico colonial de Chile* (1906), and many other works, and edited 30 volumes of the *Colección de documentos ineditos para la historia de Chile*. Consult V. M. Chiappa, *Noticias acerca de la vida y obras de Don José Toribio Medina* (Santiago, 1907).

MEDINA DE RIO SECO, dâ rē′ō sā′kō. A small town of Spain, in the Province of Valladolid, 20 miles northwest of the city of that name (Map: Spain, C 2). Here, on July 14, 1808, a Spanish army of 50,000 was defeated by 12,000 French. Pop., 1910, 4949.

MEDI'NA SERIES. A subdivision of the Silurian system, of which it forms the basal part, or else is preceded only by the Oneida conglomerate. The rocks are conglomerates, sandstones, and shales. They are abundant in the eastern United States, and attain a thickness of over 1000 feet in New York and Pennsylvania. At Medina and other places in western New York large quarries of building stone occur in the formation. See GEOLOGY; SANDSTONE.

MEDINA SIDONIA, mā-dē′nà sē-dō′nyà. A town of south Spain, in the Province of Cadiz, situated on a steep eminence, 20 miles southeast of Cadiz (Map: Spain, C 4). It has a picturesque appearance, contains a beautiful Gothic church and the ruins of the ancestral palace of the dukes of Medina Sidonia. Pop., 1900, 11,003; 1910, 11,602. The dukes of Medina Sidonia played an important part in the internal political life of Spain, and to one of them was intrusted the command of the Armada for the invasion of England in 1588. See ARMADA.

MEDINA SIDONIA, DON ALONSO PEREZ DE GUZMAN, seventh DUKE OF (1550–1615). A Spanish admiral who is safe from deserved oblivion because he commanded the ill-fated Armada, which was defeated by the English in 1588. In his time he was the highest (and richest) nobleman in Spain, and although he lacked ability, naval training, and stomach for the sea, Philip II placed him in supreme command of his "invincible" fleet, because his rank would insure the obedience of the officers under him. Philip did not regard the confessed incompetence of the Duke as a serious obstacle to the success of the expedition, for he had very detailed instructions and also a technical adviser. The charge of personal cowardice is probably unmerited. On his return to Spain with the remnants of the Armada he had not the good fortune to sink into obscurity. He was "captain general of the ocean sea" and commander of the Spanish forces which failed to prevent the sack of Cadiz in 1596, and he bears responsibility for the defeat of a Spanish squadron off Gibraltar in 1606. Consult: *Documentos relativos á Don Alonso de Guzman el Bueno, séptimo duque de Medinasidonia* (Madrid, 1856), being volume xxviii of the *Colección de documentos inéditos para la historia de España*; C. Fernández Duro, *La Armada Invencible* (2 vols., ib., 1884–85); J. K. Laughton (ed.), *State Papers Relating to the Defeat of the Spanish Armada, Anno 1588* (2 vols., London, 1894); J. S. Corbett, *Drake and the Tudor Navy* (2 vols., ib., 1898); *Cambridge Modern History*, vol. iii (New York, 1905).

MEDINET EL FAYUM, me-dē′nĕt el fī-o͞om′. The capital of the Egyptian Province of Fayum (q.v.), situated on the Bahr-Yusuf, 55 miles south of Cairo (Map: Egypt, C 2). It is a well-built town, with an interesting mosque and a fine bazar. The chief industry is the manufacturing of woolens; there is a considerable trade in grain, woolens, and roses. The town is the seat of an American mission. Pop., 1897, 31,262; 1907, 37,320.

MEDÎNET HABU, me-dē′nĕt hä-bo͞o′. The modern Arabic name of a ruined Coptic village, built in early Christian times, on the west bank of the Nile in about lat. 25° 50′ N. It stood around and upon the ruins of a group of temple buildings in the western quarter of ancient Thebes. These ruins include a small temple built by Queen Hatasu and King Thothmes III, with additions by several later monarchs, and a large temple built after the model of the Rameseum (q.v.) by Ramses III. The larger temple originally stood within an inclosure surrounded by a wall of which considerable traces yet remain. The main entrance to the inclosure is through a gateway in a massive pavilion built

in imitation of a Syrian fortress and containing several chambers whose walls are beautifully decorated with reliefs. Within the inclosure a great pylon gate faces the pavilion and gives entrance to a colonnaded court 115 feet in length and about the same in breadth. A second pylon gate forms the entrance to a second colonnaded court (125 feet long and 138 feet broad) which in Christian times was converted into a church. At the upper end of this court is a terrace from which a door leads to the hypostyle hall, supported by 24 columns. To the rear of the hall are two smaller halls and a number of chambers, most of which are in a ruinous condition.

Close to the temple of Ramses III lie the buildings of the smaller temple. Between two pylons—the outer built by Ptolemy X, the inner by Taharka—is a small chapel (32 feet long), built by Nectanebo. The inner pylon forms the entrance to a court, at the upper end of which is the temple built in the eighteenth dynasty by Hatasu and Thothmes III. It consists of a chamber surrounded by a colonnaded portico and adorned with reliefs and inscriptions. To the rear lie six smaller chambers, in one of which is a shrine for a divine image. Consult: *Description de l'Egypte* (Paris, 1809–29); Sir J. G. Wilkinson, *Topography of Thebes* (London, 1835); Johannes Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878); Daressy, *Notice explicative des ruines de Medinet Habu* (Cairo, 1897). See also THEBES.

MEDING, mā'dĭng, OSKAR (1829–1903). A German novelist, whose pseudonym was Gregor Samarow. He was born in Königsberg, Prussia, studied law, and in 1870 retired from the civil service. From 1873 to 1879 he lived in Berlin and then at Castle Wohldenberg, and in 1900 settled at Charlottenberg. His novels are sensational and deal mostly with modern politics. He wrote, under the pseudonym of Samarow, *Um Scepter und Kronen*, a cycle (1872–76); *Die Römerfahrt der Epigonen* (1874; 4th ed., 1887); *Höhen und Tiefen* (20 vols., 1879–80); *Krieg oder Frieden* (1897); *Ein Gespenst* (1902). He also wrote under his own name and the pseudonym Leo Warren. More purely historical and biographical are his *Memoiren zur Zeitgeschichte* (1881–84); *Erinnerungen aus der Zeit der Gärung und Klärung* (1896); *Aus vergangenen Tagen* (1896).

ME'DIOLA'NUM. The Latin name of Milan (q.v.).

MEDITERRANEAN (mĕd'ĭ-te-rā'nĕ-an) **FEVER.** See MALTA FEVER.

MEDITERRANEAN RACE (Lat. *mediterraneus*, midland, from *medius*, middle + *terra*, land). That portion of the white or Caucasian division of mankind dwelling now or formerly about the Mediterranean Sea, characterized by long heads and faces, dark brown or black hair, dark eyes, medium stature, slender bodies, and broad noses. It is called Iberian by English ethnologists, Ligurian by the Italians, Ibero-Insular or Atlanto-Mediterranean by Deniker, and Ibero-Pictish by Rhys.

There are four subraces of the Mediterranean race. In the southwestern portion of Europe, including Spain and Portugal, and moving onward as far as Iceland and Scotland, were the Iberians (q.v.), who left their name on the Iberian peninsula. In the middle projection into the Mediterranean were the Ligurian subrace, whose territory stretched westward into southern France. The eastern peninsula and the isles of Greece were the home of the Pelasgians (q.v.), who moved northwestward through ancient Illyricum into Italy and are supposed to have been of one race with the Hittites (q.v.) of Asia Minor. The northeastern and north African subrace may be called in general terms Hamite (see HAMITES), to which belonged among others the Egyptians and Libyans. Consult Giuseppe Sergi, *The Mediterranean Race* (New York, 1901), with references to his numerous writings and the best authorities.

MEDITERRANEAN SEA. A great inland sea of the Eastern Hemisphere, almost entirely inclosed by the continents of Europe, Asia, and Africa, and communicating with the Black Sea by the Dardanelles, the Sea of Marmora, and the Bosporus (Map: Europe, D 5). It extends from long. 5° 21′ W. to 36° 10′ E., a distance of 2320 miles. Its breadth differs widely in different parts, the maximum breadth being 1080 miles. It is connected with the Atlantic by the Strait of Gibraltar. The south or African coast is comparatively smooth and unindented. The north or European coast, on the other hand, is extremely broken, with several long peninsulas, deep bays and gulfs, and many islands. It abounds in good harbors, which early conduced to extensive commerce. The Balearic Isles, Sardinia, Corsica, Sicily, Crete, and Cyprus are the largest islands. The Italian peninsula, with Sicily and the extended shallows that lie between Sicily and Tunis, divides the Mediterranean into two parts.

The depth of the Mediterranean differs greatly in different parts, the maximum depth being 14,400 feet in the eastern basin south of the Morea and 12,200 feet in the western basin east of Sardinia. The depth at the Strait of Gibraltar is over 2500 feet, while 50 miles outside the water shoals to 1200 feet. The specific gravity and salinity of the water are slightly greater than those of the Atlantic, probably because of greater evaporation over the Mediterranean, the proportions being 1.029 to 1.028. The temperature of the surface water in summer is commonly a few degrees higher than that of the Atlantic in the same latitudes, and the temperature at depths is much higher, as is often the case in partly inclosed seas. While the temperature in the greater depths of the Atlantic is very near the freezing point, in the Mediterranean it reaches only 54° F. to 56° F. In winter the surface temperatures do not differ materially. The tides are very slight, at most places being only a few inches in height. In the summer the northeast trades blow over the Mediterranean, while in the winter, with the shifting of the wind belts, the prevailing winds are westerly. Specially designated winds are the Bora, in the Adriatic, and the Sirocco, blowing from the African desert.

The great rivers which flow into the Mediterranean are few in number, the principal ones being the Ebro, Rhone, and the Po from Europe, and the Nile from Africa. Into the Black Sea flows much more water, hence there is a constant current from the Black Sea into the Mediterranean. From the Atlantic flows a constant surface current into the Mediterranean, due probably to the excess of evaporation over supply in the latter body of water, while there is a lower current flowing in the contrary direction. The chief divisions of the Mediterranean are known as the Levantine Sea (in the east), the Ægean Sea, Ionian Sea, Adriatic Sea, Tyrrhenian Sea

(immediately west of the peninsula of Italy), and Balearic Sea.

Of the European sea fishes over 400 species inhabit the Mediterranean Sea, some of which are peculiar to it. It has a greater number of species than the British and Scandinavian seas, but does not nearly so much abound in useful kinds. The sponge, tunny, and sardine fisheries are important on some parts of its coasts. It is rich in red coral, which is procured in great quantity on the coasts of Provence, of the Balearic Isles, and of Sicily, but particularly on the coasts of Tunis and Tripoli in Africa.

The shores of the Mediterranean Sea are in many parts subject to frequent earthquakes. Besides the existing active volcanoes of Etna, Vesuvius, and Stromboli, there are many evidences of recent volcanic action, and instances have occurred of islands suddenly upheaved by it, where volcanic fires have appeared for a short time.

Bibliography. W. H. Smyth, *The Mediterranean: Memoir Physical, Historical, and Natural* (London, 1854); R. L. Playfair, "The Mediterranean, Physical and Historical," in *Smithsonian Institution Report, 1890* (Washington, 1891); J. Cook, *The Mediterranean and its Borderlands* (Philadelphia, 1910); Angelo Mosso, *Dawn of Mediterranean Civilization* (London, 1910).

MEDITERRANEAN SUBREGION. In zoögeography, that subdivision of the Palæarctic region which includes the basin of the Mediterranean Sea, Asia Minor, Persia, and the south coast of Asia as far as the Indus. The Canary, Azores, and Madeira islands are also included. It is bounded on the north by the line of mountains which extends from the Pyrenees to the Himalayas, and on the south by the Atlas Mountains, the deserts of northwestern Africa and central Arabia, and east of that by the Indian Ocean. It is a region of subtropical warmth, and except along the north shore of the Mediterranean is largely treeless, arid, and elevated. Within recent times the Mediterranean has been of much less extent, enabling animals to pass freely across its basin at two or more places; and much of the country now barren was formerly wooded. It is not surprising to find, therefore, a general similarity and great variety of life throughout the entire area. Among the possible indigenes of this subregion were the horse, camel, and some other now wholly domesticated animals. Of the few remaining or recently extinct mammals of the larger sort, the Barbary ape, fallow deer, aoudad, moufflon (of Sardinia), and civets are most prominent. Several gazelles and antelopes, which do not range south of the Sahara, the Asiatic wild ass, and many small animals are peculiar. Most of the north European birds pass across it in their migration to and from their winter homes; but it has many resident species of its own, especially among the birds of prey and the game birds. See DISTRIBUTION OF ANIMALS; and consult the accompanying maps, and the authorities there cited.

MEDJIDIE, mĕ-jĭd'ī-ā (Turk. *majidī*, from Turk., Ar. *majid*, glorious, from Ar. *majd*, glory, from *majada*, to be glorious). A Turkish order of distinction, first instituted in 1852 by the Sultan Abd ul Medjid. The Order of Medjidie has five classes, each differing in size, the decoration on which is a silver sun of seven triple rays, the crescent and star alternating with the rays. In the centre of the decoration, on a circle of red enamel, are the legend signifying "zeal, honor, and loyalty" and the date 1268, the Mohammedan calendar year corresponding to 1852. The Sultan's name is inscribed on a gold field within this circle. The first three classes of the order are worn suspended from the neck, and the fourth and fifth on the left breast. A star closely resembling the badge is worn on the left breast by the wearers of the first-class order, and on the right breast by those of the second class. The ribbon is red with green borders. See Plate of ORDERS.

MED'LAR (OF. *medler, mesler, meslier*, medlar tree, from *mesle, mesple, neple*, Fr. *nèfle*, It. *nespila*, medlar fruit, from OHG. *mespila, nespela*, Ger. *Mispel*, medlar, from Lat. *mespilus*, Gk. *μέσπιλον, mespilon, μεσπίλη, mespilē*, medlar; probably connected ultimately with Heb. *shāpēl*, to be low), *Mespilus*. A genus of trees or shrubs of the family Rosaceæ sometimes combined with the genus *Pyrus* by botanists. The common medlar (*Mespilus germanica*), a large shrub or small tree, spiny in a wild state, but destitute of spines in cultivation, is a native of, and in general cultivation in, the south of Europe and the temperate parts of Asia, seldom seen in America. It has lanceolate leaves, not divided nor serrated, solitary large white flowers at the ends of small spurs, and somewhat top-shaped fruit, of the size of a small pear or larger, according to the variety. The fruit is very astringent, even when ripe, and is not eaten until its tough pulp has become soft and vinous by incipient decay.

MEDLEY. See POTPOURRI.

MED'LEY, SAMUEL (1738–99). Baptist pastor in Liverpool, England, from 1772, and favorite hymn writer. In early life he was in the navy, but was obliged to retire on account of wounds in 1759. He then taught school, till in 1767 he became a preacher. Two of his hymns, "Oh, could I speak the matchless worth" and "Awake, my soul, to joyful lays," are well known. Collections of his hymns were published in 1785, 1794, and 1800. Consult *Memoirs* by his son (1800) and his daughter (1833).

MÉDOC, mā'dŏk'. See WINE.

MEDOWS, mĕd'ōz, SIR WILLIAM (1738–1813). An English soldier. In 1756 he entered the British army, in which he served for many years, first in Germany, then in the war with the American Colonies, in which he commanded the Fifty-fifth Regiment. He was soon placed at the head of the First Brigade of Grenadiers and distinguished himself by his bravery at the battle of Brandywine and in the expedition of 1778 against Santa Lucia. He afterward lived in India from 1783 to 1792, was Governor of Bombay in 1788–90, and commander in chief of Madras in 1790–91. His military renown was greatly increased by gallant conduct at the siege of Seringapatam in 1792, and in 1793 the rank of lieutenant general was conferred upon him. In 1798 he was made general and was Governor of the Isle of Wight, and afterward, as the successor of Cornwallis, was commander in chief in Ireland (1801–03).

MEDRANO, mā-drä'nō, FRANCISCO DE. A Spanish poet of the late sixteenth and early seventeenth centuries, born at Seville. (He is not to be confused with the Sevillan cleric and poet, Dr. Sebastián Francisco de Medrano, who died in 1653.) It is known that he visited Rome, but no other details of his life are authenticated. He is one of the best of Spanish lyric poets, and is especially noted for his odes in the manner of Horace. His works

were first published at the end of the *Sestinas*, or *Remedios de Amor* (an imitation of Ovid), composed by Pedro Venegas de Saavedra, a poet of Seville (1617). They are reprinted in Rivadenera's *Biblioteca de autores españoles*, vols. xxxii, xxxv, and xlii (1854); and the author's name appears in the Academy's *Catálogo de autoridades de la lengua*.

MEDRESS, or **MEDRESSE**. See MADRASAH.

MEDUL'LA OB'LONGA'TA. See NERVOUS SYSTEM AND BRAIN.

MED'ULLARY RAY (Lat. *medularis*, pertaining to marrow, from *medulla*, marrow). The woody cylinder of stems is usually broken up into what are called "vascular bundles" by plates of intervening tissue. These vertical plates, which in cross section are seen to radiate from the pith to the cortex, crossing the vascular cylinder, are medullary rays or pith rays. These plates are relatively short in the vertical direction, so that they do not divide the woody cylinder into long bundles. When secondary thickening occurs in a woody stem new medullary rays begin in the new wood. In the cross section of a woody stem several years old, therefore, two kinds of medullary rays appear, viz., the primary ones, which extend from pith to cortex, and secondary ones, which traverse only the new wood or parts of it. See WOOD.

MEDULLARY SARCO'MA. A variety of cancer, also known as encephaloid, cellular cancer, medullary cancer, fungus medullaris, etc. It grows more quickly, distributes itself more rapidly, attains a more considerable bulk, and is more rapidly fatal than any other form of cancer. See TUMOR.

MEDUL'LA SPINA'LIS. See NERVOUS SYSTEM AND BRAIN.

MÊDÛM, mâ-dōōm'. A village in Egypt, on the western side of the Nile, some 40 miles south of Cairo, in about lat. 29° 30′ N. Near it, on the edge of the desert, is the pyramid of King Snefru (q.v.), the first King of the fourth dynasty and the immediate predecessor of King Cheops (q.v.). From a great mass of rubbish, which covers its base, it rises in three stages to the height of about 122 feet, the upper stage being almost entirely destroyed. The outer walls consist of finely polished blocks of Mokattam stone, beautifully joined together. The pyramid was opened in 1881 by Maspero, who discovered a long passage leading from the north face into the sepulchral chamber, which is built upon the surface of the underlying rock. The chamber had, however, been robbed as early as the time of the twentieth dynasty, and in it were found only some broken fragments of the wooden coffin and a wooden jar. Flinders Petrie, who later made a careful examination of the pyramid, found against its eastern face a funerary chapel consisting of an open court and two small chambers. Ancient visitors to the chapel had left upon its walls numerous graffiti, in five of which Snefru is mentioned as the King to whom the pyramid was attributed. Petrie's researches showed that the present peculiar form of the pyramid resulted from the removal of its outer layers in order to obtain stone for building purposes.

Near the pyramid are the tombs (mastabas, q.v.) of a number of high personages of Snefru's court. The most important of them are the mastabas, richly adorned with mural paintings, of Prince Rê-hotep and Nofret, his wife, and of Prince Nofer-ma't and his spouse, Yetet. The statues of Rê-hotep and Nofret, found in their tomb, are now in the Museum of Cairo. In the cemetery of Mêdûm have been found a number of graves exhibiting a peculiar mode of burial. The bodies lie upon the left side, with the face towards the east and the knees drawn up; coffins and the usual accessories of Egyptian graves are absent. Consult W. M. F. Petrie, *Mêdûm* (London, 1892), and British School of Archæology in Egypt, *Meydum and Memphis*, vol. iii (ib., 1910).

MEDUNTA. See NANTES.

MEDU'SA. See GORGO.

MEDUSA (Lat., from Gk. Μέδουσα, *Medousa*, name of one of the three Gorgons, from μέδειν, *medein*, to rule). A general name applied to the disklike, umbrella-shaped jellyfish, with long marginal feelers, and so called from their resemblance to the fabled Medusa's head. (See Plate.) While the term "medusa" is now generally applied to the sexual free-swimming adult stage of any hydroid, it is particularly applicable to our common North Atlantic *Aurelia flavidula* of the class Scyphozoa (the group formerly called Discophora). Another general name is acaleph.

Our most abundant medusa is *Aurelia flavidula*, which late in summer abounds along the coast from New York northward. It grows to

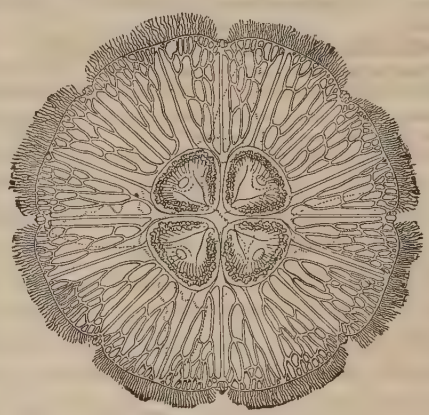


FIG. 1. AURELIA FLAVIDULA.
Adult, natural size, seen from above.

the diameter of from 8 to 10 inches, becoming fully mature in August. Its rather tough jellylike disk is moderately convex and evenly curved, while four thick oral lobes depend from between the four large genital pouches; the edge of the disk is minutely fringed to the ends of the tentacles. On the fringed margin are eight eyes, each covered by a lobule and situated on a peduncle, and occupying as many slight indentations, dividing the disk into eight slightly marked lobes. The subdivisions of the water-vascular canals or tubes are very numerous and anastomose at the margin of the disk, one of them being in direct communication with each eye peduncle. When in motion the disk contracts and expands rhythmically, on the average 12 or 15 times a minute. On the approach of danger the

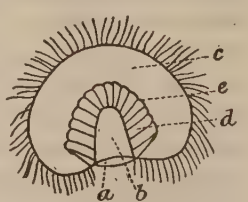
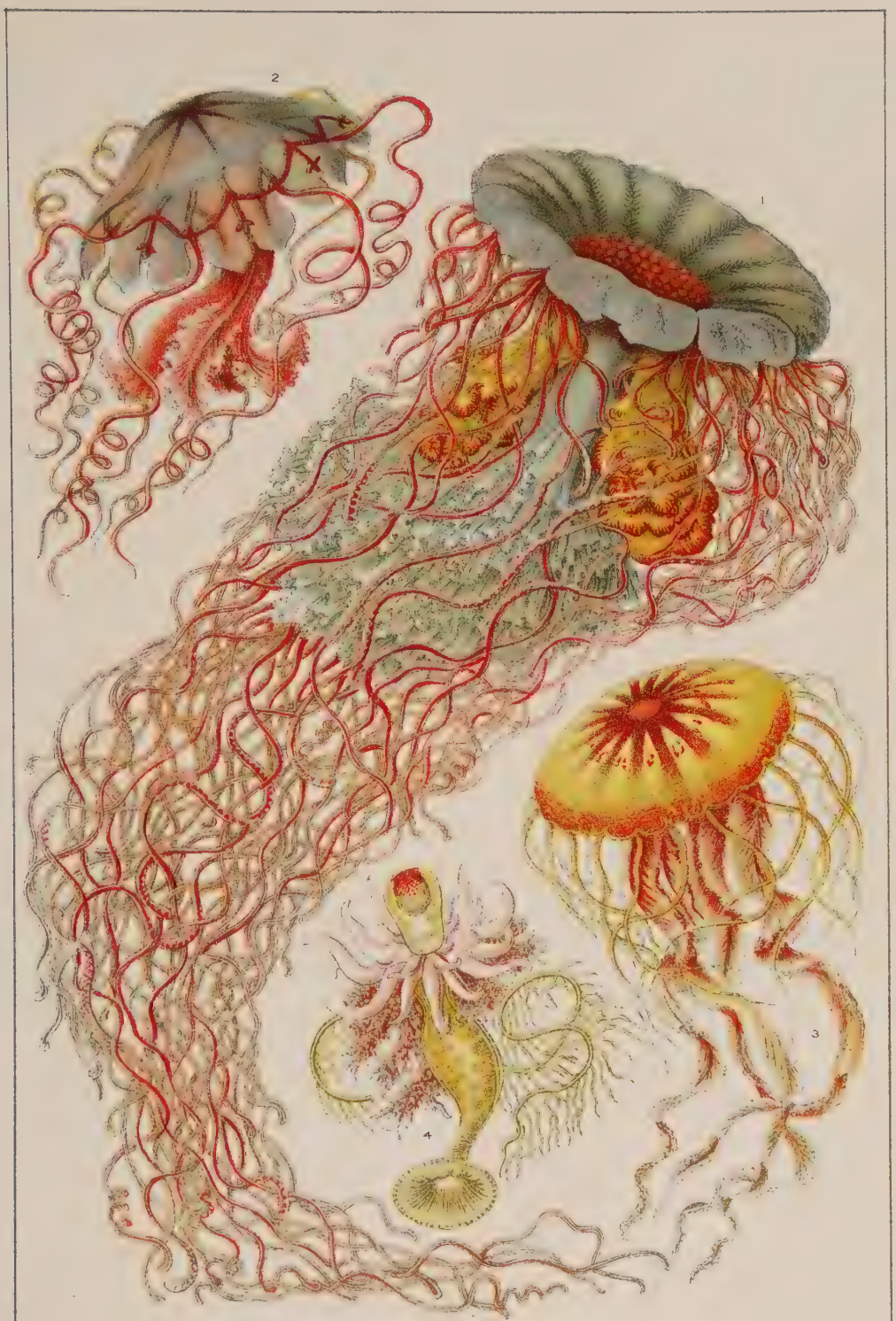


FIG. 2. GASTRULA OF AN AURELIA-LIKE MEDUSA.
a, primitive mouth; *b*, gastrovascular cavity; *c*, ectoderm; *d*, endoderm; *e*, mesoderm layer.

MEDUSÆ AND SIPHONOPHORA



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1 DESMOMEMA ANNASETHE, 3/5 NATURAL SIZE, FROM SOUTH AMERICA
2 FLOSCULA PROMETHA, 3/5 NATURAL SIZE, FROM INDIAN OCEAN
3 CHRYSAORA MEDITERRANEA, 1/6 NATURAL SIZE, FROM SMYRNA
4 CYSTALIA MONOGASTRICA, MAGNIFIED FOUR TIMES, FROM CEYLON

animal sinks below the surface. Though it has lasso cells, it is not poisonous to bathers, while the great *Cyanea arctica* is very much so.

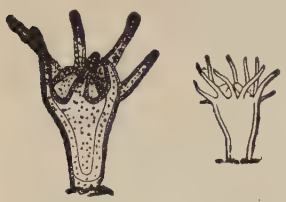

FIG. 3. SCYPHISTOMA OF AURELIA FLAVIDULA, AT DIFFERENT STAGES. Magnified. (After Agassiz.)

The *Aurelia* spawns in late summer, the females being distinguishable by their yellow ovaries, the corresponding male gland being roseate, while the tentacles of the female are shorter and thicker than in the males. The eggs pass out of the mouth into the sea along the channeled arms, and in October the ciliated gastrula (Fig. 2) becomes pear-shaped and attaches to rocks, dead shells, or seaweeds, and then assumes a hydra-shaped scyphistoma stage (Fig. 3), with often 24 very long tentacles; in this stage it remains about 18 months. Towards the end of this period the body increases in size and divides into a series of cup-shaped disks. These saucer-like disks are scalloped on the upturned edge, tentacles lead out, and the animal assumes the strobila stage (Fig. 4). Finally the disks separate, the upper one becomes detached and with the other disks swims away in the ephyra form (Fig. 5). When about a fifth of an inch in diameter, and towards the middle or end of the summer, this young medusa becomes an adult aurelia.

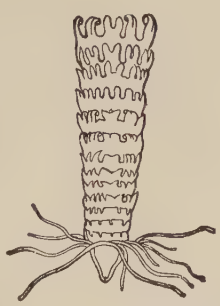

FIG. 4. STROBILA OF AURELIA FLAVIDULA.

Other forms of greater beauty occur in the Mediterranean and the tropics. A much larger kind of medusa than *Aurelia*, *Cyanea arctica*, is common on the Grand Banks and off the coast of northern New England. It sometimes attains a diameter across the disk of from 3 to even 5 feet, though it is produced from a scyphistoma not more than half an inch in height. Its tentacles stream behind, sometimes to the length of several fathoms, and poison the hands of fishermen. Species of *Pelagia* do not undergo an alternation of generations (see PARTHENOGENESIS), but grow directly from the egg, without passing through a strobila stage.

FIG. 5. EPHYRA OR EARLIEST FREE CONDITION OF AURELIA. (After Agassiz.)

For various Mediterranean and tropical forms, see Colored Plate of MEDUSÆ AND SIPHONOPHORE.

Medusæ shelter various kinds of animals, which live as fellow boarders or commensals, i.e., temporary nonattached parasites. Some of them live in or under the mouth cavity or between the four tentacles of the larger medusæ. Such is the little amphipod crustacean, *Hyperia*, which lives within the mouth, while small fishes, such as the butterfish, swim under the umbrella of the larger jellyfishes, *Cyanea*, etc., for shelter and protection. Besides small animals of various classes, the larger jellyfishes kill by means of their nettling organs small cuttlefishes and true fishes, the animals being paralyzed by the pricks of the minute barbed darts. See CŒLENTERATA; CTENOPHORA; NEMATOCYST.

Fossil Medusæ. Because of the jelly-like nature of the body and the absence of any hard parts in medusæ, these animals would seem to present the most unfavorable conditions for fossilization. Indeed, they are rarely found in the ancient rocks, but there are some noteworthy exceptions, especially in the Cambrian and Jurassic formations. Impressions and also what have been considered to be casts of the medusoid bodies have been found in rocks of the Lower Cambrian in both Sweden and North America. The peculiar fossil called *Dactyloidites* found in the green roofing slates of Granville, Washington Co., N. Y., is generally regarded as of this nature. Fine impressions of jellyfish are found in the surfaces of the fine-grained lithographic limestones of Jurassic age at Solenhofen and other places in Bavaria.

Bibliography. Louis Agassiz, *Contributions to the Natural History of the United States*, vols. iii, iv (Boston, 1862–66); Alexander Agassiz, *North American Acalephs* (Cambridge, 1865); Ernst Haeckel, "Ueber fossile Medusen," in *Zeitschrift für wissenschaftliche Zoologie*, vols. xv, xix (Leipzig, 1865–70); id., *System der Medusen* (Jena, 1880–81); id., "Report on Medusæ," in *Challenger Reports*, vol. iv (London, 1881); Von Ammon, "Ueber jurassische Medusen," in *Abhandlungen der Königlich baierischen Akademie der Wissenschaften*, vol. xvii (Munich, 1883); C. D. Walcott, "Fossil Medusæ," in *Monographs of the United States Geological Survey*, vol. xxx (Washington, 1898). For the most recent and complete account, consult A. G. Mayer, "The Medusæ of the World," *Carnegie Institution, Publication No. 109* (3 vols., Washington, 1911). See HYDROID; HYDROZOA.

MEDU'SITES. The name of peculiar star-shaped fossils that are found in the Lower Cambrian strata of Sweden. They are thought to represent the casts of the gastric cavities of jellyfishes, thus indicating the existence of medusæ in the earliest Paleozoic time.

MED'WAY. A town in Norfolk Co., Mass., 25 miles from Boston, on the Charles River and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). There are manufactories of straw and felt goods and woolens. The water works are owned by the town. Pop., 1900, 2761; 1910, 2696. Medway was once part of Medfield, but was incorporated as a town in 1713. On Feb. 21, 1676, the town was ravaged by King Philip and several of its inhabitants killed.

MED'WIN, THOMAS (1788–1869). The biographer of the poet Shelley, born at Horsham in Sussex, England, March 20, 1788. His mother, Mary, a daughter of John Pilfold, was first cousin to Elizabeth Pilfold, the mother of Shelley. Medwin and Shelley were educated at Sion House School, Brentford, and they spent their vacations together at Horsham. Medwin entered the army and became a lieutenant in 1813. With his regiment he passed some time in India. In 1819 he retired on half pay and soon quitted the service. In 1821 he went to Italy, where he associated intimately with Shelley and Lord Byron. He afterward led an unsettled life. He died at Horsham, Aug. 2, 1869. His *Journal of the Conversations of Lord Byron* (1824) created a sensation, owing to its personalities. A *Memoir of*

Shelley (1833) was afterward expanded into *The Life of Shelley* (2 vols., 1847), of which a recent edition (Oxford) appeared, with introduction and commentary by H. Buxton Forman, in 1913.

MEEHAN, mē′an, THOMAS (1826–1901). An American botanist and horticulturist, born at Potter's Bar, near London, England, and educated in the public schools of his native town and of Kew. In 1847 he came to America to manage Buist's nursery at Rosedale, near Philadelphia, and six years later started his own nurseries at Germantown. Meehan was prominent in Philadelphia, as a member of the council and "father of the small parks." He proposed the theory that sex is determined by the vitality of the branch bearing the flower. In 1883 he was elected to the city council of Philadelphia and held this office for several terms. As a member of the Philadelphia Academy of Natural Sciences and of the American Association for the Advancement of Science, he contributed to their *Proceedings*. He edited the *Gardeners' Monthly* from 1859 to 1889 and *Meehan's Monthly* from 1892 to 1901 and wrote *An American Handbook of Ornamental Trees* (1853), *The Native Flowers and Ferns of the United States* (1st series, 1878; 2d, 1880; 3d, 1887), and *Wayside Flowers* (1881).

MEEK, ALEXANDER BEAUFORT (1814–65). An American journalist and jurist. He was born in Columbia, S. C., graduated at the University of Alabama in 1833, and, having studied law, was admitted to the State bar in 1835. He served in Florida as a lieutenant of volunteers against the Seminoles in 1836 and was Attorney-General of Alabama in 1836. He was made county judge in 1842. In 1853 and 1859 he was a member of the State Legislature. There he distinguished himself by organizing and establishing the free-school system in Alabama. From 1848 to 1852 he was associate editor of the Mobile *Register*. He was a probate judge at Mobile (1854–55) and a member and Speaker of the Legislative Assembly (1859–61). He wrote: *Red Eagle* (1855); *Songs and Poems of the South'ron* (1857); *Romantic Passages of Southwestern History* (1857); an unfinished *History of Alabama*.

MEEK, FIELDING BRADFORD (1817–76). An American geologist and paleontologist, born at Madison, Iowa. In 1848 he assisted in the geological survey of Iowa, Wisconsin, and Minnesota, and after completing this work was attached to the New York State Geological Survey under the leadership of James Hall. He accompanied F. V. Hayden in 1853 on a geological expedition to Dakota. During the latter part of his life he was engaged in describing the fossil invertebrates collected by government expeditions; particularly by the geological surveys of the United States and Canada. He identified and defined a large number of new species. His larger works are: *Paleontology of the Upper Missouri* (1865); *Check-List of the Invertebrate Fossils of North America* (1864); *Report on the Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country* (1876).

MEEK'ER, ROYAL (1873–). An American statistician, born at Silver Lake, Susquehanna Co., Pa. He graduated from Iowa State College in 1898 and studied at Columbia University (1899–1903; Ph.D., 1906) and at the University of Leipzig (1903–04). He was professor of history, politics, and economics at Ursinus College, Collegeville, Pa., in 1905–06, and at Princeton University he served as preceptor in 1906–09 and as assistant professor of political economy in 1909–13. In 1913 he was appointed by President Wilson Commissioner of Labor Statistics. He wrote a *History of Shipping Subsidies* (1905) and contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA.

MEERANE, mâ-rä′ne. A flourishing industrial town in the Kingdom of Saxony, 37 miles south of Leipzig (Map: Germany, E 3). It is an important centre of the textile industry and has a number of manufactories of woolen and semiwoolen materials, spinning and dyeing establishments, machine and boiler works, and manufactures of footwear, paper boxes, electric motors, buttons, and cement. Its chief educational establishments are a Realschule, a school of commerce, and a textile school. The products of Meerane are extensively exported to the Orient and America. Pop., 1900, 23,797; 1910, 25,470, chiefly Protestants.

MEERKAT, mēr′kăt, or **SURICATE,** sū′-rĭ-kāt (Dutch, sea cat). A small, furry, diurnal, vegetable-eating and burrowing civet (*Suricata tetradactyla*) of South Africa, allied to the mongooses. It is gregarious, and a colony makes burrows close together, like a prairie-dog "town." In captivity it becomes an amusing and delightful pet. Consult Martin, *Home Life on an Ostrich Farm* (New York, 1903).

MEERSCHAUM, mēr′shąm (Ger., sea foam), or SEPIOLITE. A compact, earthy mineral hydrated magnesium silicate. It is grayish white or white with a faint yellowish or reddish tint. It occurs in stratified earthy or alluvial deposits on the plains of Eski-Shehr and elsewhere in Asia Minor; also in Greece, at Hrubschitz in Moravia, and in Morocco. The deposits in Asia Minor are worked by pits and galleries at a depth of 24 to 30 feet. The mineral when brought to the surface is so soft as to be easily cut with a knife. It is scraped to remove any adhering material, dried in the sun for about a week, then again scraped and polished with wax. Meerschaum is used chiefly in the manufacture of bowls for tobacco pipes, and factories for their production exist in Austria and in France.

MEERUT, mē′rŭt. The capital of the district and division of Meerut, United Provinces, India, 39 miles northeast of Delhi, on the Northwestern Railway (Map: India, C 3). It is irregularly laid out, with narrow, unclean streets; there are several mosques and temples, of which the Jumma Musjid, dating from 1019, is the most noteworthy. The city has a fine town hall with a library, Meerut College, a normal school, and several church schools. The military cantonment is one of the largest and most important in India. There are excellent systems of water supply and drainage, and manufactures of soap, flour, and oil. The first uprising of the Indian Mutiny of 1857 occurred here. Pop., 1901, 118,129; 1911, 116,227.

MEES, ARTHUR (1850–). An American musical conductor, born in Columbus, Ohio. He graduated in 1870 from Concordia College, Fort Wayne, Ind., and after preparation under American instructors he studied from 1873 to 1876 at Berlin under Kullak, Weitzmann, and Dorn (the latter for score reading and conducting). He was conductor of the Cincinnati May Festival Chorus, assistant conductor of the Chicago Orchestra, and then he took up his residence in New York and became the conductor of impor-

tant choral organizations. In 1898 he was elected, on the resignation of MacDowell, to the conductorship of the Mendelssohn Glee Club. In 1908 he became conductor of the Worcester Music Festival and the Cecilia Society of Boston. From 1887 to 1896 he wrote the analytical programmes for the New York Philharmonic Society. He published in 1901 *Choirs and Choral Music*, which has been accepted as a standard authority. A book of piano studies also obtained general recognition.

MEFISTOFELE, mā'fê-stō'fā-lā. An opera by Boito (q.v.), first produced in Milan, March 5, 1868; completely rewritten, Bologna, Oct. 4, 1875; in the United States (New York), Nov. 24, 1880.

MEG'ABAR'IE (from Gk. *μέγας, megas*, great + *βαρύς, barys*, heavy). The practical unit of pressure in the C. G. S. system; it equals one barie $\times 10^6$. See BARIE.

MEGACHIROPTERA. See BAT; CHIROPTERA.

MEG'ADAC'TYLUS (Neo-Lat., from Gk. *μέγας, megas*, great + *δάκτυλος, daktylos*, finger). A Triassic dinosaur. See ANCHISAURUS.

MEGÆ'RA. One of the Eumenides.

MEG'ALE'SIA, or **MEG'ALEN'SIA** (Lat., from Gk. *Μεγαλήσια*, from *Μεγαλή, Megalē*, epithet of the Great Mother, fem. sing. of *μέγας, megas*, great). A festival at Rome, instituted in honor of Cybele (q.v.), the Great Mother of the Gods, in 204 B.C., when her symbol, a black stone, was brought to Rome (consult Livy, 29, 14, and see the article CLAUDIA QUINTA). The celebration included a stately procession in which the eunuch priests of Cybele carried through the streets the sacred ensign, games held on the Palatine and in later times in the theatres, and a great carnival. The festival lasted for seven days, April 4 to 10, and was originally under the charge of the curule ædile, later of the prætor. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

MEG'ALICH'THYS. A genus of fossil ganoid fishes, characterized by their great size and formidable appearance. The body was covered by huge bony plates, and the teeth attained a length of 4 inches or more. The remains of *Megalichthys* are found in the Carboniferous rocks of Europe and America.

MEGALITH'IC MONUMENTS (from Gk. *μέγας, megas*, great + *λίθος, lithos*, stone). Gigantic monuments, the materials of which in the earliest stages of industrial development were huge undressed stones, and also associated with tumuli. Megalithic monuments are found in both hemispheres, and in the progress of culture they marked the crude beginnings of larger coöperative effort as well as of engineering and of massive architecture. A most instructive lesson as to the manner in which the stones were set on end is furnished by one of the northern tribes of Hindustan visited by Wurmbrand. These people are in a region where megalithic monuments have had a long history. A slab weighing several tons rests on a number of stout poles laid parallel and just far enough apart to allow men to walk between them. The ends of these poles are lashed to end bars and a firm gridiron frame is made beneath the slab. The whole mass is then lifted by as many men as can get into the framework, and carried to the proper place, one man beating time for their steps. The point of destination reached, the framework is laid flat, the hole dug, and the gridiron set upright by lifting with the hands aided by shear poles, sliding props, guy ropes, and all other labor-saving devices known to them. As the angle between the gridiron and the earth increases, the labor of erection decreases, until the slab is let down carefully into its resting place.

Megalithic monuments really belong to two classes, monolithic and polylithic. The former is a simple great slab or bowlder stood on end; the latter consists of several blocks put together to form a chamber. The differences between the two classes is not great, and there are mixed examples where both exist side by side.

Monoliths receive different names in the countries where they are found, and often the same name applies to quite different things in different countries. They receive names also from the manner of grouping. The single great stone, weighing perhaps hundreds of tons, set on end, is a menhir; if a number of these stand in rows, they become an avenue or an alignment; and a stone circle is a number of menhirs arranged about a centre. The final development of this simple beginning is seen in the Egyptian obelisk, in the memorial column or shaft, or in the gigantic statue. The enormous size of many of the rude monoliths is a matter of surprise. The largest one, in Brittany, at Locmariaquer, weighs 347 tons. Thousands have been counted in Brittany and other portions of France. See Plate of MEGALITHIC MONUMENTS.

The polylithic monument also receives different names from its associations. If a number of stones are built into a memorial pile, or over the dead, it is a cairn; a tumulus containing a dead person is in Ireland a galgal; and if a passageway be formed on one side allowing reëntrance to a vault, it becomes a chambered barrow; a stone box in a barrow to hold cinerary urns and relics is a cistvaen. The typical composite monument of great stones belonging to this class is the dolmen (locally termed quoit), a slab of stone laid on the top of two or more upright slabs, forming a burial chamber from which the earth has been removed by the elements. The word cromlech was at one time used to denote a dolmen, as it was originally covered with a tumulus and surrounded by a circle of standing stones. The term is out of use now in England, but the French apply it to one of the former elements of the complete dolmen, the stone circle. The essential part of all is the stone box or capsule, whether underground, aboveground, or covered with a tumulus.

The areas of greatest abundance of megalithic monuments, beginning in Asia, are to be found in Japan, Burma, Assam, and the Deccan; the Persian uplands; Asia Minor, Caucasus, the Crimea, Syria, Palestine, and Arabia; across northern Africa to the Atlantic; in Spain, Portugal, western France, and Belgium; in the British Isles and Scandinavia. Examples of huge monuments are also found in northeastern Asia. See EASTER ISLAND.

Stonehenge, on Salisbury Plain, near Amesbury, County of Wilts, southern England, is one of the most important among the megalithic monuments of the world, since it not only is composed of immense pieces, but combines in itself a number of types. In the centre lies a great slab 15 feet in length. Just outside of this are two oval rings, the larger one made up of five pairs of trilithons, which increase in

height towards the west. The smaller oval, containing 19 monoliths, is tapering in form; outside these ovals and inclosing them is a circle of standing stones, not massive in size; outside of all is the most interesting feature of Stonehenge, a circle 300 feet in circumference, made up of immense standing stones varying in height from 18 to 22 feet, some of them 6 feet in diameter. On the top of them are blocks of similar size joining them and forming a series of doorways or trilithons. On the outside of this circle is a ditch and avenue, in which is a menhir, called the Friar's Heel.

Not the least interesting feature about these remains is the veneration and folklore that has gathered around them. No doubt the belief that the ghosts of the dead hover about them aided in the preservation of many of them. Their authorship has puzzled the antiquaries as well as the folk, by whom they were attributed to the Druids, the Celts, and other historic peoples.

The megaliths of the Pacific islands pertain, with two exceptions, to the neolithic culture. They occur in a roughly orbicular line which somewhat closely corresponds to the outer boundary of the three divisions of the South Sea islands. Stone structures are reported by savage informants as existing in the inland valleys of Bougainville, Solomon Islands, but it is not yet safe to attempt exploration, and by Prebendary Codrington in Gog of the Banks group, and in New Caledonia; these are of Melanesia. In nuclear Polynesia occur the Nanga in Fiji, the trilithon of Tonga, in Samoa walls in the mountains and the Fale-o-le-Fe'e. In southeastern Polynesia walls and platforms are found in Rapa Iti, Pitcairn, and Easter islands, and walls in the Marquesas. In Micronesia there are stone remains on Howland Island; extensive remains at Tapak, Lele, and Metalanim in the Caroline Islands; interesting structures at Tinian in the Ladrones. The walls and platforms are built of unworked country rock, in general of cyclopean dimensions, erected without builder's art or any use of cement. There are a few instances of grouped stones, approximately of the cromlech type; such are the Nanga of Fiji, the Fale-o-le-Fe'e of Samoa, the alignments of Tinian. The trilithon type is represented by a solitary instance, that at Mua in Tonga; each upright is 17 feet high; they carry a crosspiece 5 feet deep sunk its full depth into sockets chipped in the full width of the uprights. In but three instances do these megaliths vary from the true unworked paleolithic—this trilithon, and the terminalia statues of Easter Island, the product of chipping, and the Tinian alignments which after chipping have been smoothed by abrasion. In not a single instance is it necessary to deduce the use of metal. The modern Polynesian, an advanced neolithic type, has been less than 1000 years in the Pacific. The appearance of age in these megaliths and the absence of tradition of their erection (all the more noteworthy in a race which recites the history of a fragile mat through 15 generations and the story of a greenstone spearhead from even remoter antiquity) are strong evidence that the megalithic monuments of the Pacific islands far antedate the arrival of the Polynesians and are the work of a lost population.

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MEGALOKASTRO. See CANDIA.

MEG'ALON'YX (Neo-Lat., from Gk. *μέγας*, *megas*, great + *ὄνυξ*, *onyx*, claw). An extinct edentate mammal, allied to *Megatherium*, found in the Pleistocene deposits of Kentucky, Tennessee, and Cuba. See MEGATHERIUM.

MEG'ALOP'OLIS (Lat., from Gk. *Μεγαλόπολις*, Great City). A town in Southwestern Arcadia, founded in 370 B.C. by Epaminondas (q.v.), who desired to make it the capital of an Arcadian confederacy and a bulwark against Sparta (Map: Greece, Ancient, C 3). Pausanius says 40 townships were combined to form the new city. It was laid out on a large scale, with strong walls 50 stadia (5½ miles) in circumference; it also had a large territory. But it by no means fulfilled expectations. It maintained its independence, indeed, against frequent Spartan attacks, sometimes with Athenian aid, sometimes with help from Macedon, but in 222 B.C. it was sacked by Cleomenes III. Though rebuilt, it never seems to have regained its importance. It was the native town of Philopœmen (q.v.), the great general of the Achæan League, and of the historian Polybius (q.v.). The city was situated in a fertile plain on both banks of the river Helisson, near its junction with the Alpheus. Excavations which were conducted on the site by the British School at Athens from 1890 to 1893 laid bare the theatre and the Thersileion, or great hall where the Arcadian Assembly met, and on the other (north) side of the river the temple of Zeus Soter, a long colonnade, and foundations of other buildings adjoining the market place.

Bibliography. E. A. Gardner and others, *Excavations at Megalopolis*, containing papers by various scholars (London, 1892); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); J. P. Mahaffy, *Rambles and Studies in Greece*, 307–312 (7th ed., New York, 1913). On the remains of the very important theatre at Megalopolis, consult W. Dörpfeld and E. Reisch, *Das griechische Theater* (Athens, 1896); A. E. Haigh, *The Attic Theatre* (3d ed., by A. W. Pickard-Cambridge, Oxford, 1907); E. R. Fiechter, *Die baugeschichtliche Entwicklung des antiken Theaters* (Munich, 1914).

MEG'ALOSAU'RUS (Neo-Lat., from Gk. *μέγας*, *megas*, great + *σαῦρος*, *sauros*, lizard). A carnivorous dinosaur allied to, and perhaps identical with, *Ceratosaurus* (q.v.), found in the Jurassic and Cretaceous deposits of Europe and India. The North American genus *Lœlaps* of Cope from the Cretaceous formations is probably identical. The animal was from 15 to 20 feet long with a medium-sized head, the jaws of which were provided with formidable teeth. The skeleton is light, and the bones are partly hollow. The fore limbs are five-toed and small

MEGALITHIC MONUMENTS

1. "MERCHANT'S TABLE" NEAR LOCMARIAQUER

2. "LINES OF MENEC" AT CARNAC

and were probably of little use in locomotion. The hind limbs, on the other hand, are large and strong and terminate in three toes armed by heavy claws. The tail was long and heavy. See CERATOSAURUS; DINOSAURIA.

MEGANEURA, mĕg'â-nū'râ. See INSECTS, FOSSIL.

MEGANITE. See EXPLOSIVES.

MEG'APHONE (from Gk. *μέγας, megas*, great + *φωνή, phonē*, voice, sound). A form of speaking trumpet used to render the voice audible at considerable distances. It consists of a large funnel of tin or papier-mâché, in which the sound waves are so reflected that they issue from its mouth in approximately parallel directions. Theoretically a megaphone of parabolic section would act as the best form of megaphone, especially if the resonance of the cavity did not affect the propagation of sound by strengthening certain sounds and destroying others by interference. (See ACOUSTICS.) The size and shape of the megaphone, however, are so regulated that the usual tones of the voice undergo the largest possible amount of strengthening. For this reason a megaphone to be used with the best effect by a woman would be different in size from that suited to the deeper notes of a man's voice. The megaphone has succeeded the old speaking trumpet for use at sea and is generally employed by naval officers and mariners for communicating with the shore or with a distant vessel.

MEG'APODE. See MOUND BIRD.

MEG'APOLEN'SIS (Latinized form of *Van Mecelenburg*), JOHANNES (1603–70). The first Protestant missionary to the North American Indians. The first patroon, Van Rensselaer, brought him to America from Holland in 1642, so that he might be a missionary to the Indians on the frontier, near Albany, and in this capacity he antedated John Eliot by several years. He learned to preach in the Mohawk language and made converts among them. He also befriended the heroic Jesuit fathers, Jogues, Bressani, and Poncet. From 1649 till his death, Jan. 24, 1670, he was pastor in New Amsterdam, and it was he who urged Peter Stuyvesant to surrender without bloodshed in 1664. His Dutch account of the Mohawk Indians is translated in the New York Historical Society's *Collections*, vol. iii (New York, 1870).

MEG'ARA (Lat., from Gk. *Μέγαρα*). The capital of Megaris (q.v.), on the isthmus between the Peloponnesus and northern Greece. It was built at the base of two hills, Caria and Alcathous, each defended by a citadel. Two walls, built by the Athenians during their protectorate over Megara, between 461 and 445 B.C., connected the city with its chief harbor, Nisæa. In the time of Pausanias the city contained many temples and public buildings, but of these only very scanty traces are now visible, of which the most interesting are perhaps the remains of the aqueduct and fountain built by the architect Eupalinus for the tyrant Theagenes. The origin of Megara is lost in legend, but as early as the eighth century B.C., thanks to its two harbors, Pegæ on the Corinthian Gulf and Nisæa on the Saronic Gulf, it was a flourishing commercial city and sent out many colonies, of which the most famous were Byzantium, Chalcedon, the Sicilian Megara (see HYBLA), and Selinus (q.v.); to the last-named city colonists came also from the Sicilian Megara. Megara also early had vigorous trade in the region of the Black Sea; its settlements here included Byzantium, Chalcedon, Astacus, Heraclea in Bithynia, and a Heraclea in the Crimea. Near the end of the seventh century we find it engaged in a fierce and protracted struggle with the Athenians for the island of Salamis, of which it long retained possession. From this time, too, it had to face commercial and colonizing competition in the Black Sea district from Miletus, in Sicily from Corinth and Corcyra. The loss of Salamis to Athens in 598 B.C. further crippled Megara. The government had originally been in the hands of the Dorian landed aristocracy, from whom it was usurped about 620 B.C. by Theagenes, who led the popular faction and established himself as absolute ruler of the state. Upon his expulsion, however, soon after, a fierce contest took place between the democratic and the aristocratic parties. After the Persian wars Megara carried on hostilities with Corinth, against which she formed an alliance with Athens (461 B.C.). Athens established a sort of protectorate over the city and built the walls referred to above. Later the Athenians were compelled to surrender their hold on the city, and under a strict oligarchy it became a member of the Peloponnesian League. It was easily open to the attacks of the Athenians and was by the "Megarian decree" of Pericles deprived of all markets in Attica. It was frequently ravaged during the Peloponnesian War and almost captured at one time by the Athenians aided by the democratic party within (424 B.C.); they did secure Nisæa and held it until 410 B.C. After this war the city plays but a small part in history. A democratic form of government was reëstablished in 357 B.C.; after the death of Alexander the Great the city passed under the control of Demetrius Poliorcetes and Ptolemy Soter successively. Demetrius, the son of Antigonus Gonatas, captured and nearly destroyed it. It was afterward partially rebuilt and finally surrendered to the Romans under Metellus. Alone among the cities of Greece it was not restored by Hadrian; Alaric still further reduced it, and in 1687 the Venetians completely destroyed it. Megara was celebrated in antiquity as the seat of the Megarian School of Philosophy, founded by Euclid, a native of the city. (See MEGARIC SCHOOL.) The site is now occupied by a prosperous Greek town, bearing the ancient name, with a population of about 6500, mostly of Albanian origin. Consult F. Cauer, *Parteien und Politiker in Megara und Athen* (Stuttgart, 1890), and K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

MEGAR'IC SCHOOL. A school of Greek philosophers who, as partial disciples of Socrates, expanded one side of their master's teaching. While the Cynic and Cyrenaic schools developed his ethical teaching, the Megaric devoted itself rather to dialectical investigations. Their principal leader was Euclid of Megara, who was probably one of the earliest disciples of Socrates. He united the ethical principle of Socrates with the Eleatic theory of one immutable substance. Consult the standard histories of philosophy, such as those of Ueberweg-Heinze, Ziller, Gomperz.

MEG'ARIS (Lat., from Gk. *Μεγαρίς*). In ancient geography, a district in Greece, covering about 140 square miles, lying between the Corinthian Gulf on the north and northwest and the Saronic Gulf on the southeast (Map: Greece, Ancient, C 2). It was bounded on the north

by Bœotia, on the northeast by Attica, and on the southwest by the District of Corinth. The capital was Megara (q.v.).

MEG'ARON. The large outer hall or atrium of the primitive Greek house, reserved for the men, as at Mycenæ and Tiryns. See HOUSE.

MEG'ASPORAN'GIUM (Neo-Lat., from Gk. *μέγας, megas,* great + *σπόρος, sporos,* seed + *ἀγγεῖον, angeion,* vessel, from *ἄγγος, angos,* jar). The sporangium (spore case) which produces the megaspores (q.v.). Ordinarily the term is applied only among pteridophytes, because the megasporangia of seed plants have long been called ovules, and the older name remains in common use. An obsolete name is macrosporangium. See HETEROSPORY; SPORANGIUM; MEGASPORE.

MEG'ASPORE (from Gk. *μέγας, megas,* great + *σπόρος, sporos,* seed). In some of the pteridophytes and all of the seed plants, two kinds of spores are produced, which differ very much in size, and the larger ones are called megaspores. The significant difference between the two spores, however, is not that of size, but is the fact that the megaspore in germination produces a female plant. It follows that, when plants develop these two kinds of spores (heterospory, q.v.), they have become sexually differentiated. In seed plants the megaspore is not shed from its sporangium (ovule), but germinates where it is formed, and this results in transforming the ovule into the seed. This means that, when spores were differentiated into megaspores and microspores, seeds became possible. An obsolete term for megaspore is macrospore. See ALTERNATION OF GENERATIONS; HETEROSPORY; SPORE.

MEG'ASPOR'OPHYLL (from Gk. *μέγας, megas,* great + *σπόρος, sporos,* seed + *φύλλον, phyllon,* leaf). In some of the pteridophytes and all of the seed plants, two kinds of spores are produced, called microspores and megaspores. These are formed by two kinds of sporangia, called microsporangia and megasporangia, and these in turn are usually borne upon different leaf structures (sporophylls), which are called microsporophylls and megasporophylls. In seed plants the megasporophylls have long been called carpels, which bear the megasporangia, called ovules, which in turn contain the megaspores. An obsolete term for megasporophyll is macrosporophyll. See HETEROSPORY; SPOROPHYLL.

MEGAS'THENES (Lat., from Gk. *Μεγασθένης*) (fl. c.300 B.C.). A Greek writer of the early Alexandrian period. He was assigned by Seleucus Nicator (312–280 B.C.) to the service of the Governor of Arachosia, by whom he was sent on several diplomatic missions to the Indian King Sandrocottus. He published a work called *Indica* (*Ἰνδικά*) in four books, in which he discussed the flora and the fauna of India, as well as many of the customs of the Indians. Like Herodotus, Megasthenes admitted wonderful stories into his narrative and tried to identify foreign myths with those of the Greeks. Recent investigations, however, have shown the general trustworthiness of the work, which was the most valuable account of India possessed by Europeans down to the time of the establishment of the Bengal Asiatic Society in 1784. Diodorus (ii, 35–42) gives an abstract of the contents of the *Indica,* and there are numerous fragments in Strabo and Arrian which have been collected by Schwanbeck, *De Megasthene Rerum Indicarum Scriptore* (Bonn, 1845), and by Müller, *Fragmenta Historicorum Græcorum* (Paris, 1841–70), vol. ii, pp. 397–439, and translated by McCrindle, "Ancient India as Described by Megasthenes and Arrian," in the *Indian Antiquary,* vol. vi (Calcutta, 1877). Consult Christ-Schmid, *Geschichte der griechischen Litteratur,* vol. ii (5th ed., Munich, 1911).

MEG'ATHERI'IDÆ (Neo-Lat. nom. pl., from *Megatherium,* from Gk. *μέγας, megas,* great + *θηρίον, thērion,* dim. of *θήρ, thēr,* wild beast). An American family of edentate mammals, of which the genus *Megatherium* is the type, comprising a number of fossil ground sloths of gigantic size. It is intermediate between the modern anteaters (Myrmecophagidæ) and the true sloths (Bradypodidæ) and contains the genera *Hapalops, Hyperleptus,* and others of the Santa Cruz formation of Miocene age in Patagonia, and *Megatherium, Mylodon, Megalonyx,* and *Scelidotherium* of the Pleistocene of North and South America. See MEGATHERIUM.

MEG'ATHE'RIUM (Neo-Lat., from Gk. *μέγας, megas,* great + *θηρίον, thērion,* dim. of *θήρ, thēr,* wild beast). A gigantic fossil edentate mammal, larger than a rhinoceros, which lived in comparatively recent geological time in South America and of which skeletons are found in the pampean deposits (Pleistocene) of Argentina, Chile, and Brazil. Its skeleton, which shows points of resemblance to both the anteaters and sloths, is of very massive construction, indicating a most powerful animal, about 18 to 20 feet in length. The head was small, the jaws of a form to support powerful chewing muscles, and the teeth, of which there are only 10 upper and 8 lower molars, are of a prismatic form and of such size as must have rendered them most effective grinding organs. The structure of the forward portion of the jaws shows the lips to have been elongated and prehensile, and the grooved inside of the lower jaw suggests a powerful prehensile tongue, which served to pull off the twigs and leaves upon which the animal fed. The neck was short and strong, the trunk heavy and round. The leg bones are extraordinarily massive and of peculiar form. The fore limbs are longer than the hind limbs, and the form of their joints indicates considerable flexibility; they probably served somewhat as arms. The very heavy hind-limb bones and the tail bones indicate that the greater portion of the weight of the animal was borne by these parts, and it is reasonable to conclude that the favorite position of the beast was that of resting upon its haunches. The surfaces of the bones are provided with ridges and rough places for the attachment of powerful muscles. The size of the animal, its evidently very great muscular power, and the structure of its hind quarters indicate that it squatted beside a tree and with its mobile fore limbs, the middle fingers of which were armed with strong claws, pulled down and broke off the upper trunk and branches from which it derived its food. The body of the animal is thought to have been covered by tough hide and coarse hair. *Megatherium* was one of the first fossil mammals described. A nearly complete skeleton was found in 1789 near Buenos Aires and sent to the museum of Madrid, where it was described and named by Cuvier, *Megatherium americanus.*

Three other allied genera are *Scelidotherium, Megalonyx,* and *Mylodon,* all of Pleistocene age. Of these, *Scelidotherium,* from South America, closely resembles a gigantic anteater in the struc-

ture of its skull. *Megalonyx*, differing slightly from *Megatherium* in the structure of its teeth, has been found in the cave deposits of Kentucky and Tennessee and in the Pleistocene beds of Cuba. The remaining form, *Mylodon*, remains of which have been found in Kentucky and South America, is the only member of the family Megatheriidæ in which the skin contains calcareous plates similar to those of the other group of gigantic edentates, the Glyptodontidæ; and in *Mylodon* these plates, though numerous, are small and not joined to each other. Consult Woodward, *Outlines of Vertebrate Paleontology* (Cambridge, 1898), and G. B. Scott, *A History of Land Mammals in the Western Hemisphere* (New York, 1913).

MEGENBERG, Konrad von. See Konrad von Megenberg.

MEGERLE, mĕg'ĕr-le, Ulrich. See Abraham a Santa Clara.

MEGIDDO, me-gĭd'dō. A fortified city of great importance in ancient Syria, situated in the valley of Esdraelon, at the modern Tell el Mutesellim, 4 miles northwest of Tell Ta'annak, as recent excavations have shown (Map: Palestine, C 2). It is mentioned in the reign of Thothmes III (1501–1447 B.C.), in the Amarna letters (c.1400 B.C.), in a papyrus of the time of Seti I (c.1320–1310 B.C.), and in an inscription of Shishak (960–939 B.C.), and is also referred to in Assyrian inscriptions. But the ancient fortifications uncovered by the Deutsche Orientgesellschaft go back to the third millennium B.C. According to Josh. xii. 21 it was the residence of a Canaanitish king at the time of the Hebrew invasion. From Judg. i. 27 it is evident that it did not fall into the hands of the tribes invading the plain. David possibly conquered it, and Solomon fortified it (1 Kings ix. 15). King Ahaziah of Judah found refuge there when fleeing from Jehu of Israel in 843 B.C. (2 Kings ix. 27). Jerome calls the valley of Esdraelon "the Plain of Megiddo." The "waters of Megiddo," mentioned in Judg. v. 19, probably refer to the river Kishon, the present Nahr el Makatta. At Megiddo, King Josiah was overpowered by Pharaoh Necho in 608 B.C. To the south of the *tell* on which the old castle of pre-Israelitish times stood and the inclosing brick wall, 28 feet thick, there is an abundant stream, and in Roman times a fortified post was established here, the Legio of the Onomasticon, the modern El Lejjun. A number of gems and cylindrical texts were discovered at Tell el Mutesellim, among them the oldest-known Hebrew seal, which belonged to Shama, a high official of Jeroboam, probably Jeroboam II (782–740 B.C.). Consult: Müller, *Asien und Europa nach altägyptischen Denkmälern* (Leipzig, 1893); Buhl, *Geographie des alten Palästina* (Freiburg, 1896); Savignac, "Les fouilles de Megiddo," in *Revue Biblique* (Paris, 1907); Schumacher, *Tell el Mutesellim: Bericht über die 1903 bis 1905 veranstalteten Ausgrabungen I* (Leipzig, 1908).

MEG MER'RILIES. A very tall, masculine gypsy woman in Scott's *Guy Mannering*. This character in the dramatized form of the novel was a favorite rôle played by Charlotte Cushman.

MEG'NA, or **MEGHNA.** A deltaic estuary of Bengal, British India, forming the outlet of the Brahmaputra, of the easternmost channel of the Ganges (qq.v.), and of tributary streams. It flows into the Bay of Bengal by four mouths, which inclose three large islands. It is navigable by steamers and large river craft, which, however, are often imperiled by shifting sands and snag and by the tidal bore, which ascends at the rate of 15 miles an hour and often attains over 18 feet in height during the equinoxes; the river is also subject to cyclonic storm waves, which at various times have caused great destruction of property and loss of life.

ME'GRIM. See Migraine.

ME'GRIMS (OF., Fr. *migraine*, It. *migrana*, *emigrana*, from Lat. *hemicranium*, from Gk. *ἡμικρανία*, *hēmikrania*, pain in one side of the head, from *ἡμι-*, *hēmi-*, half + *κρανίον*, *kranion*, head), Congestion of Brain, or Blind Staggers. A disease of the horse. It is indicated by the following symptoms: the animal when at work reels, and then either stands for a minute dull and stupid or falls to the ground, lying for a time partially insensible. The eyes are staring, breathing is hurried and stertorous, and the nostrils are widely dilated. Occasionally these symptoms are followed by coma, convulsions, and death. More frequently, however, the animal gains relief in a little while. The attacks come on suddenly, are often periodical, are most frequent during hot weather, and when the animal is drawing up a hill or exposed during heavy work to the full rays of a hot sun. Liability to megrims constitutes unsoundness and usually depends upon the circulation through the brain being temporarily disturbed. Horses subject to megrims should be used with a well-adjusted collar, with a strap running to the girth to hold down the collar when pulling upgrade, so as to prevent, as much as possible, pressure on the veins carrying the blood from the head; they should be moderately and carefully fed and during hot weather be given plenty of water and an occasional laxative. Consult Leonard Pearson et al., *Special Report on Diseases of the Horse* (Washington, 1911), and James Law, *Text-Book on Veterinary Medicine*, vol. iii (Ithaca, N. Y., 1910–12). See Meningitis, *Cerebrospinal.*

MEHÁDIA, mĕ-hä'dĕ-ȧ (Lat. *Ad Mediam*). A small town in the County of Krassó-Szörény, Transylvania, Hungary, situated in the Carpathians, on the Belareka River, 6 miles west of the Rumanian and 15 miles north of the Servian frontier (Map: Hungary, H 4). It is noted for its old cemetery with Greek and Roman inscriptions and for its Roman ruins. In the vicinity are coal mines. Pop., 1911 (commune), 2497, mostly Rumanians. About 3 miles southeast is the bathing resort of Herkulesbad, with numerous hot springs (some of them containing sulphur), ranging in temperature from 106° F. to 143° F. They were known to the Romans as Thermæ Herculis. The place is visited by about 7000 guests annually.

MEHEMET AALI, Pasha, 1815–71. See Aali, Mehemet, Pasha.

MEHEMET ALI, mā'he-mĕt ä'lē (1769–1849). Viceroy of Egypt. He was born in 1769 at Kavala, a little town in Macedonia. Left an orphan, he was taken into the service of a captain of the janizaries. He learned much of military matters and of intrigue, made a rich marriage in 1787, and was thus able to obtain a commission as an officer in the irregular troops of the Sultan. Through relations which he formed with a Marseilles merchant he amassed wealth in trade. He received a command in Egypt to coöperate with the British against the French invaders and at length became commander of the Albanian or Arnaut Corps. In

1805 he was recognized by the Porte as Viceroy of Egypt and Pasha of Three Tails, but was soon involved in disputes with the Mamelukes (q.v.), who had long practically ruled Egypt. The struggle was finally terminated in 1811 by the massacre of the greater number of these at Cairo. The rest fled to Upper Egypt, but were expelled by Mehemet in the following year. They then took refuge in Nubia, but in 1820 he followed them there and completely vanquished them. From 1811 to 1818 he carried on war against the Wahabis in Arabia, who were subjugated by his adopted son, Ibrahim Pasha. Shortly after he conquered Kordofan, added it to his dominions, and opened a great trade in slaves from the interior of Africa. About this time he began to reorganize his army on something like European principles, built a fleet, and erected fortresses, military-shop works, and arsenals. He sent a strong force to assist the Sultan in suppressing the Greek revolt in 1824, but his new fleet was destroyed at Navarino in 1827. In 1830 the Porte conferred on him the Government of Crete, but this did not satisfy his ambition. He determined to annex Syria to his dominions and in 1831 dispatched an army under Ibrahim Pasha, who overran the country, defeating the Turks at Horas, July, 1832, and by his victory at Konieh (Dec. 20, 1832) brought the Turkish government to the brink of ruin. Russia now stepped in, and a treaty was concluded (May 4, 1833) by which Syria was handed over to Mehemet. Neither of the belligerents was satisfied, and Mehemet continued to plot till Sultan Mahmud II declared war in 1839 against his dangerous subject. At Nisib, June 24, 1839, the Turkish army was crushed by the forces of Mehemet Ali, but the European Powers again interfered, and Mehemet was compelled to give up Syria and Crete and to content himself with the hereditary viceroyalty of Egypt (1841). Mehemet was at once a remorseless tyrant and an able, progressive administrator and did much to develop Egypt. He cleared his dominions of robbers, executed great public works, and may be said almost to have introduced the cultivation of cotton, indigo, and sugar into the country. He also established a system of national education in Egypt. He died Aug. 2, 1849.

Bibliography. Mangin, *Histoire de l'Egypte sous Mohammed Ali* (Paris, 1839); H. L. H. Pückler-Muskau, *Egypt and Mehemet Ali* (3 vols., London, 1845); Mouries, *Histoire de Mohammed Ali* (Paris, 1855–58); Von Prokeschosten, *Mohamed, Vizekoenig von Aegypten* (Vienna, 1879); Sir C. A. Murray, *Memoir of Mehemet Ali* (London, 1898); Dehérain, *Le Soudan égyptien sous Mehemet* (Paris, 1898); W. A. Philipps, in *Cambridge Modern History*, vol. x (Cambridge, 1907), containing a bibliography. See EGYPT.

MEHEMET ALI PASHA, pä-shä′ (1827–78). A Turkish soldier. He was born in Magdeburg, Prussia, and his name originally was Karl Detroit. In 1843 he ran away to sea and embarked for Turkey. Aali Pasha, later Grand Vizier, took an interest in him and in 1846 sent him to a military school. He embraced Mohammedanism, received a commission in the Ottoman army in 1853, and fought against Russia in the Crimean War. In 1865 he was made a brigadier general and Pasha, in 1875–76 he commanded in Bosnia, and in the war of 1877–78 against Russia he was at the head of the Turkish army in Bulgaria. He was successful in his operations on the river Lom (August–September, 1877), but was afterward forced back by the enemy. He failed to effect a junction with Suleiman Pasha and was superseded by the latter (1878). He was second plenipotentiary at the Berlin Congress, and on his return was sent to Albania, where he was mobbed and killed by insurgents at Diakova, Sept. 7, 1878.

MEHER′RIN. A small tribe of Iroquoian stock, formerly living on the lower course of the river of the same name, on the Virginia-Carolina border. They made some trouble during the Tuscarora War of 1711–12, but soon afterward disappear from notice, having apparently been absorbed by that tribe or by the Tutelo. See CONESTOGA.

MEHRING, mā′rĭng, FRANZ (1846–). A German writer, especially on Socialism. He was born in Schlawe, Pomerania, and became an editor of *Die Neue Zeit*. He wrote *Fall Lindau* (1890), *Lessing-Legende* (1893), *Gustav Adolf* (1894), *Schiller* (1905), and *Jena und Tilsit* (1906); but he is better known for his valuable work on German Socialism, partly in German periodicals and partly in his books *Die deutsche Sozialdemokratie* (3d ed., 1879), *Geschichte der deutschen Sozialdemocratie* (1897), *Aus dem literarischen Nachlass von Karl Marx, Friedrich Engels, und Ferdinand Lassalle* (1902), and *Sozialistische Neudrucke* (1908 et seq.), writings of Engel, Weitling, Wolff, and Lange.

MÉHUL, mā′ül′, ETIENNE NICHOLAS (1763–1817). A French operatic composer, born at Givet. At the age of 10 he was organist of his native village; in 1778 he went to Paris, where he gained the interest of Gluck. After several unsuccessful efforts in composition his *Euphrosine et Corradin* finally achieved fame (1790), and other compositions previously written were then brought to light. *Stratonice* appeared in 1792; and this was followed by patriotic national hymns for the Army of the Republic, entitled "Le chant du départ," "Le chant de victoire," "Le chant du retour," which won him high popularity. Other works appeared in rapid succession; in 1806 *Uthal;* previously, *Une folie, ou les aveugles de Tolède* (1802); and in 1807 *Joseph,* his most esteemed composition. In 1795 he was elected a member of the Academy, and also appointed an inspector of the Conservatory, which had but recently been established. His works comprise every form of music, but it is wholly by his operas that he is known to fame. They are marked by dramatic truth, noble melodies, and, though his work constantly shows a lack of thorough training, he was one of the first French composers adequately to express the meaning of the words in music. Consult A. Pougin, *Biographie* (Paris, 1889), and R. Brancour, *Méhul* (ib., 1912).

MEI, mā, or **MAY,** LEV ALEXANDROVITCH (1822–62). A Russian poet. He was born in Moscow and was educated at the Institute of Tsarskoi Selo. He attracted a great deal of attention by his drama *Tsarskya Nevĕsta* (The Bride of the Czar) (1849), which was followed by the dramas *Servilia* and *Pskovitianka* (The Woman of Pskov). Besides publishing several minor poems on classical and biblical themes, he also considerably enriched Russian literature by his translations from Milton, Byron, Schiller (*Wallensteins Lager* and *Demetrius*), Goethe, Heine, Béranger, Victor

Hugo, and others. His works were published at St. Petersburg (1862–63).

MEIBOM, mī'bŏm, Victor von (1821–92). A German jurist, born at Cassel. He studied law at Marburg and Berlin, and was for several years assistant judge at tribunals of Rotenburg and Marburg. In 1858 he was appointed professor of German law at the University of Rostock, and from 1866 to 1873 held a similar appointment at Tübingen. He then went to Bonn, where he remained till 1875, when he became a member of the Supreme Court of the Empire in Leipzig. He retired in 1887. His chief work is *Das deutsche Pfandrecht* (1867), a thorough and historically reliable discussion of the laws and regulations relating to mortgage before the introduction of Roman law.

MEIDERICH, mī'dĕr-ĭk. An industrial town in the Rhine Province, Prussia, between the Emscher and the Ruhr, 15 miles northeast of Krefeld (Map: Germany, B 3). It contains the Rhine Steel Works, employing 4300 men, and a number of other iron and steel works, machine shops, phosphate works, saw mills, and brick-kilns. In the vicinity are extensive coal mines and saline springs. The trade in cattle is important. The industries date from 1850. Meiderich became a town in 1894 and was annexed to Duisburg in 1905. Pop., 1900, 33,684; 1910, 41,017.

MEIER, mī'ĕr, Edward Daniel (1841–1914). An American mechanical engineer, born in St. Louis, where he graduated from Washington University in 1858. After spending four years at the Royal Polytechnic College at Hanover, Germany, he returned to the United States and enlisted in the 32d Pennsylvania Volunteers in 1863. After the battle of Gettysburg he served in the artillery and in the Engineer Corps, and finally became a lieutenant of cavalry. At the close of the war he entered the Rogers Locomotive Works at Paterson, N. J., in 1867 became superintendent of machinery of the Kansas Pacific Railroad, in 1870 chief engineer of the Illinois Patent Coke Company, and in 1872 constructing engineer of the Meier Iron Company. In 1884 he organized the Heine Safety Boiler Company of St. Louis, of which he was president at the time of his death; and he was also the head until 1908 of the American Diesel Engine Company. Meier served as president of the American Boiler Manufacturers' Association, of the Machinery and Metal Trades Association in 1908–14, and of the American Society of Mechanical Engineers in 1911.

MEIER, Moritz Hermann Eduard (1796–1855). A German classical scholar, born at Glogau. When 24 years of age he became professor extraordinarius at the University of Greifswald, and in 1824 he was made professor ordinarius at Halle, where he remained until his death. Friedrich August Wolf, and especially Wolf's great pupil, August Boeckh, whose classic work on the public economy of Athens appeared in 1817, had a great influence on Meier. His own first important publication dealt with a question in the legal antiquities of Athens, *Historia Juris Attici de Bonis Damnatorum, etc.* (Berlin, 1819); but his greatest work was written in collaboration with G. F. Schoemann, *Der Attische Process* (Berlin, 1824), and was crowned by the Berlin Royal Academy. This treatise, now revised by J. H. Lipsius (Berlin, 1883–87), remains the standard work on Athenian legal procedure. Meier also prepared an edition of Demosthenes, *Against Meidias*, and published many papers on subjects relating to classical antiquity, especially Andocides and Theophrastus; these were collected after his death in *Opuscula* (1861–63). Much of his energy, however, while resident at Halle, was spent on editorial duties, as he was an editor of the Halle *Allgemeine Zeitung* for many years, and also coeditor of the *Allgemeine Encyclopädie der Wissenschaften und Künste* from 1830 to 1855.

MEIGGS, mĕgz, Henry (1811–77). An American contractor. He was born at Catskill, N. Y., was engaged in the lumber business in 1835, and failed in the commercial crisis of 1837. It was not until the outbreak of the gold excitement in California that he again became prosperous. He then shipped lumber in large quantities to the Pacific coast, and his trade so increased that he was encouraged to build a large number of vessels. At length a financial stringency in the San Francisco money market drove him to borrowing, and eventually, his business collapsing, he fled to South America. He settled in Chile and entered into the business of bridge-building contractor. Later he devoted himself to railroad construction, and in Peru accomplished engineering works which are objects of general admiration. He made contracts for the construction of six railroads in that country, one of which, the Callao, Lima, and Oroya Railroad, over the Andes, ranks among the first public works of the kind in the world.

MEIGS, Fort. See Fort Meigs.

MEIGS, Charles Delucena (1792–1869). An American physician. Born in St. George, Bermuda, he studied medicine at the University of Georgia, graduating in 1809, and later at the University of Pennsylvania (M.D., 1817). For a short time he practiced in Augusta, Ga., but in 1817 established himself in Philadelphia and soon gained recognition as an obstetrician. From 1841 to 1861 he held the chair of obstetrics and diseases of women and children at the Jefferson Medical College. In 1826 he assisted in founding the *North American Medical and Surgical Journal*, being one of the original editors. He contributed many articles to medical literature, and is the author of *The Philadelphia Practice of Midwifery* (1838; 2d ed., 1842); *Lectures on Some of the Distinctive Characteristics of the Female* (1847); *Females and their Diseases* (1848; 2d ed., as *Woman: Her Diseases and Remedies*, 1851; 3d ed., 1854); *Remarks on Spasmodic Cholera* (1849); *Obstetrics* (1849; 3d ed., 1856); *Observations on Certain Diseases of Children* (1850); *Treatise on Acute and Chronic Diseases of the Neck of the Uterus* (1854); *On the Nature, Signs, and Treatment of Childbed Fevers* (1854). He translated Hufeland, *A Treatise on the Scrofulous Disease* (1829); Velpeau, *An Elementary Treatise on Midwifery* (1831); Colombat de L'Isère, *A Treatise on the Diseases and Special Hygiene of Females* (1845). Consult College of Physicians, Philadelphia, *Transactions*, N. S., vol. iv, pp. 417–448 (Philadelphia, 1872); John F. Meigs, *Memoir of Charles D. Meigs* (ib., 1872).

MEIGS, Montgomery Cunningham (1816–92). An American soldier and military engineer. He was born in Augusta, Ga., studied for a short time at the University of Pennsylvania, graduated at West Point in 1836, and immediately afterward became second lieutenant in an artillery company. In 1837 he was trans-

ferred to the Corps of Engineers, in which he became a lieutenant in 1838 and captain in 1853. From 1836 to 1852 he was employed by the War Department on various important engineering works. Between 1852 and 1860 he superintended the construction of the Potomac Aqueduct from the Great Falls in Maryland to Washington, D. C., the erection of the Capitol extension in Washington, the Post Office extension, and the great iron dome of the Capitol. In the winter of 1860–61 he was engaged in placing Fort Jefferson, Fla., in a condition for defense, and in April, 1861, organized and conducted the Fort Pickens relief expedition. On May 15 he was appointed Quartermaster-General of the United States army, with the rank of brigadier general. In this important position he had the direction of the supply and equipment of the United States forces in the field during the continuance of the war. Though generally stationed at Washington, he frequently made personal inspections of the quartermaster's departments of the various armies during siege and field operations. On July 5, 1864, he was brevetted major general for "distinguished and meritorious services during the Rebellion." After the war until his retirement in 1882 he was a member of many important boards and commissions in connection with the War Department. After his retirement until 1887 he was employed as architect on the construction of the United States Pension Bureau Building in Washington. The historian Rhodes has grouped him with Stanton, Dana, and Fry, who, he says, "may challenge comparison with any administrators for honesty and efficiency."

MEIGS, Return Jonathan (1734–1823). An American soldier and pioneer, born in Middletown, Conn. He joined the Continental troops before Boston shortly after the battle of Lexington, and later in the same year, as a major of militia, accompanied Benedict Arnold on the latter's expedition against Quebec. During the assault on that city he was made prisoner, but was exchanged the following year. He became a colonel in 1777, defeating in May of that year the British at Sag Harbor, L. I.; he also participated in Anthony Wayne's storming of Stony Point in 1779. After the close of the war he became interested in schemes of Western colonization, was one of the promoters of the Ohio Company, and crossed the Alleghanies himself in 1788 to settle at Marietta, Ohio. Later he was interested in the Muskingum settlement, and is said to have devised for emigrants a code of rules which was fastened to a tree at the junction of the Ohio and Muskingum rivers. In 1794 he was commissary general of the troops in General Wayne's expedition against the Indians, and distinguished himself at the battle of Fallen Timbers. In 1801 he was appointed Indian agent, and took charge of the Cherokee agency in Georgia, where he remained until his death. His *Journal of the Expedition to Quebec,* first printed in the *American Remembrancer,* was published in 1864.

MEIGS, Return Jonathan (1765–1825). An American politician, born in Middletown, Conn., son of Return Jonathan Meigs, the elder. He graduated at Yale in 1785 and studied law. In 1788 he removed with his father to Ohio Territory, and from 1803 to 1804 was Chief Justice of the State. He was judge of the United States Court for Michigan Territory in 1807 and 1808; served as Democratic United States Senator from Ohio in 1808–10; and from 1810 to 1814 was Governor of Ohio. His services during the War of 1812 were particularly efficient in organizing militia and supplying garrisons to the forts. In 1814 he was appointed Postmaster-General by President Madison, and he was continued in this office until 1823 by President Monroe.

MEIJI TENNO, mā′ē-jē tĕn′nō (1852–1912). The posthumous name of an emperor of Japan; during life he was known in Europe and America as Mutsuhito (gentleman), but in Japan he was called by the common people Tenshi Sama (august son of heaven) and by the educated class Shu-jo (supreme master). He was born Nov. 3, 1852, in the mountains of Kyoto, and was the one hundred and twenty-first of his line. His education, liberal as measured by the standards of the time, was supervised by his mother, who had been a lady of the Imperial household. He succeeded his father, Osahito, in 1867, but was not crowned (at Osaka) until Oct. 31, 1868. Immediately, in order to carry out a purpose of concentrating power in the hands of the Emperor himself, the capital was moved from Kyoto to Yeddo, and the city renamed Tokyo. The next year Mutsuhito returned to Kyoto and took as his consort Haruko (died 1914), a princess of the house of Ichijo. During a reign of 45 years he did much to promote the progress of his country, his biography being merged in the history of the New Japan. Largely through his exertions Japan was freed from the restraints of centuries and took her place among the great powers of the world, after triumphing over China and Russia. The Emperor was the first constitutional monarch in the Far East; as an administrator he is generally held to have been very successful, although opinions differ as to his activity in later years. He followed a policy of trusting state affairs in large measure to such loyal advisers as Iwakura, Kido, Okubo, and Ito. A lover of books and the collector of a large library of Japanese and Chinese classics, he was also one of the notable writers of verse of his time and country. It is said that he composed 38,000 poems of five lines or *tanka.* He died July 29, 1912, and was succeeded by his son Yoshihito (q.v.). For an account of the events of his reign, see Japan, *History.* Consult J. H. Longford, *The Evolution of New Japan* (New York, 1913), and the bibliography under Japan.

MEIKLEJOHN, mĭk″l-jŏn, Alexander (1872–). An American college president. He was born at Rochdale, Eng.; came to America in 1880; and was educated at Brown University (A.B., 1893; A.M., 1895) and at Cornell (Ph.D., 1897). In the latter year he returned to Brown as a member of the department of philosophy—instructor (1897–99), assistant professor (1899–1903), and associate professor (1903–06). From 1906 to 1912 he was professor of logic and metaphysics and from 1901 to 1912 he was dean. In 1912 he was called to the presidency of Amherst College.

MEIKTILA, mīk-tē′lä. A division of southeast Upper Burma, comprising the districts of Meiktila, Kyauske, Myingyan, and Yamethin (Map: Burma, C 2). Area, 10,852 square miles. Pop., 1901, 992,807; 1911, 1,170,502. Capital, Meiktila.

MEILHAC, mā′yȧk′, Henri (1831–97). A French dramatist, who worked chiefly in collaboration with Ludovic Halévy (q.v.). He was born Feb. 23, 1831, in Paris, where he studied

at the Lycée Louis-le-Grand. From working in a book shop he turned to writing for the stage. *Satania* and *Garde-toi, je me garde* pleased the critics, who discerned Meilhac's cleverness and technical knowledge. He succeeded not only in vaudeville, but in higher and more delicate comedy. It is, however, impossible to tell what belongs to Meilhac and what to Halévy, so well did these two men blend their genius. Meilhac and Halévy excelled in operetta and opera bouffe, as well as in more dramatic, less musical composition. Together they wrote *Frou-frou,* and the librettos of *La belle Hélène* and *La grande duchesse* for Offenbach's music. Of Meilhac's work before 1861 *La vertu de Célimène* is most significant; of that after 1881, *Décoré* (1888) and *Grasse fortune* (1896). He was made a member of the French Academy in 1888 and died in Paris, July 6, 1897.

MEILI, mē′lē, FRIEDRICH (1848–1914). A Swiss authority on international law, born at Hinwil, Canton of Zurich. He was educated at the universities of Zurich, Leipzig, and Berlin and at the Ecole de Droit of Paris; practiced law from 1871 to 1895; and became docent (1880), professor extraordinary (1885), and regular professor (1890) of private international law in the University of Zurich. He retired in 1913. He was one of the jurists who made awards in the Swiss national railway cases, including the St. Gotthard railway (1910), and one of the three arbitrators in the Lourenço Marques railway case between Portugal and Great Britain (1900); was employed by the Russian Imperial government in the Hillfeld case on the pawning of Russian titles in Berlin and by the Austrian ministry of commerce in planning a new patent code; and represented Switzerland in The Hague conferences on private international law (1893, 1894, 1900, and 1904). Among his important works, dealing particularly with the law of transportation, are: *Das Telegraphenrecht* (2d ed., 1873); *Das internationale Zivil- und Handels-Recht* (2 vols., 1902; in English, 1905); *Das internationale Zivilprozessrecht* (1904–06); *Die Kodification des Automobilrechts* (1907); *Die drahtlose Telegraphie* (1908); *Privat- und Zivil-Prozessrecht auf Grund der Haager Konventionen* (1911), with Mamelik.

MEILLET, mā′yā′, ANTOINE (1866–). A distinguished French philologist, born at Moulins-sur-Allier and educated at the universities of Paris and Vienna. He was maître de conférences at the Paris Ecole des Hautes Etudes in 1891 and became professor of Armenian at the School of Oriental Languages in 1903. In 1906 he was elected to the chair of Slavic in the Collège de France. For his linguistic work he received an honorary degree from the University of Berlin, and was elected corresponding member of a number of academies, among them that of St. Petersburg. He published: *Recherches sur l'emploi du génitif-accusatif du vieux slave* (1897); *Grammaire comparée de l'arménien* (1903); *Introduction à l'étude comparative des langues indo-européennes* (1903; 3d ed., 1912; Ger. trans., 1909, by Printz); *Dialectes indo-européens* (1908), in which, like Kretschmer, he attempts to trace the Indo-European subfamilies back to early dialectical differences; *Aperçu d'une histoire de la langue grecque* (1913), a brilliant work of revolutionary character, which restores the written language to its position of paramount importance; *Altarmenisches Elementarbuch* (1913); and studies of old Slavic. In 1902 a volume of *Mélanges linguistiques,* made up of contributions by his numerous pupils, was prepared in his honor.

MEILLEUR, mā′yĕr′, JEAN BAPTISTE (1795–1878). A Canadian author and educator. He was born at St. Laurent, near Montreal, Province of Quebec, and was educated at the College of St. Sulpice, Montreal. He studied law, but left it for the medical profession and in 1825 graduated at the Carleton Medical College in Vermont. He returned to Lower Canada, did editorial work for the *Tessier Journal,* and in 1834 was elected a member of the Lower Canada Legislative Assembly. He was appointed Superintendent of Public Instruction by Sir Charles Bagot in 1842, and held that position for 15 years, during which time 45 educational institutions were established, largely through his efforts. In 1862 he was appointed postmaster of Montreal. He was one of the founders of L'Assomption College. He published in French several textbooks on chemistry, grammar, and education.

MEINEKE, mī′ne-ke, JOHANN ALBRECHT FRIEDRICH AUGUST (1790–1870). A distinguished German classical scholar. He was born at Soest in Westphalia and was educated at Leipzig, especially under G. Hermann. He was director of the Gymnasium at Danzig (1817–26) and of the Joachimsthal Gymnasium at Berlin (1826–57). His many works, chiefly critical editions of the Greek authors, include: *Fragmenta Comicorum Græcorum,* three volumes, with an introductory volume giving a "Critical History of the Greek Comic Poets" (1839–43; a fifth volume came in 1857); *Analecta Alexandrina* (1843), containing collections and admirable explanations of the fragments of Euphorion, Rhianos, Alexander Ætolus, and others; and text recensions of Strabo (1852–53); of Horace (1834), in which the so-called four-line strophe law, discovered by Meineke and Lachmann, is applied; of Stobæus (1855–64); of Athenæus (1859); and of Aristophanes (1860). Consult: F. Ranke, *Albert Meineke* (Leipzig, 1871); H. Sauppe, *Zur Erinnerung an Meineke und Bekker* (Göttingen, 1872); E. Förstemann, in *Allgemeine deutsche Biographie,* vol. xxi (Leipzig, 1885); J. E. Sandys, *A History of Classical Scholarship,* vol. iii (Cambridge, 1908).

MEINHOF, mīn′hōf, CARL (FRIEDRICH MICHAEL) (c.1857–). A German philologist, noted for his knowledge of African languages. He was born in Barzwitz, Pomerania, the son of a clergyman; was educated at Halle, Erlangen, and Greifswald; in 1879–86 was a school-teacher in Wolgast and Stettin; and then became pastor at Zizow in Pomerania. In 1902–03 he traveled in Africa to make linguistic studies. He then taught African languages in the Berlin Seminary for Oriental languages until 1909, when he was made professor of the same subject in the Hamburg Colonial Institute. Meinhof edited the *Abhandlungen* of this institute and the *Zeitschrift für Kolonialsprachen.* Among his valuable works are: *Grundriss einer Lautlehre der Bantusprachen* (1899; 2d ed., 1910); *Grundzüge einer vergleichenden Grammatik der Bantusprachen* (1906); *Deutsche Kolonialsprachen: Herero, Swahili, und Duala* (1909–12); *Die Sprachen des dunkeln Weltteils* (1909); *Lehrbuch der Namasprache* (1909); *Moderne Sprachforschung in Afrika* (1910);

Dichtung der Afrikaner (1911); *Afrikanische Religionen* (1912); *Die Sprache der Hamiten* (1912). *An Introduction to the Study of African Languages*, translated by A. Werner, appeared in 1915.

MEINHOLD, mīn'hōlt, JOHANNES (1861–). A German Old Testament scholar. He was born in Kammin; studied theology in Leipzig, Berlin, Greifswald, and Tübingen; taught at Greifswald (1888) and after 1889 at Bonn, where he became professor of Old Testament exegesis and Hebrew in 1903. Among his published works are: *Komposition des Buches Daniel* (1884); *Beiträge zur Erklärung des Buches Daniel* (1888); *Die geschichtlichen Hagiographen und das Buch Daniel* (1889), with Ottli; *Jesus und das alte Testament* (1896); *Jesaja und seine Zeit* (1898); *Die Lade Jahves* (1900–01); *Biblische Urgeschichte* (1904); *Sabbat und Woche* (1905); *Weisheit Israels* (1908); *Sabbat und Sonntag* (1909); *Der Mischnatraktat Ioma* (1913).

MEININGEN, mī'nĭng-en. The capital of the little Duchy of Saxe-Meiningen, Germany, 40 miles south of Eisenach, on the right bank of the Werra (Map: Germany, D 3). Since a fire in 1874 it has been largely rebuilt on a modern plan, but there still remain the eleventh-century parish church and the seventeenth-century ducal palace, now the home of the Henneberg Antiquarian Society. Its collections include coins, paintings, and a library of 50,000 volumes. Modern buildings include two ducal palaces and a town hall. It has manufactures of machinery, toys, books, and there are railway shops. The Meiningen stock company, which for 16 years enjoyed a European reputation for the excellence of its staging and acting, was dissolved in 1890. Pop., 1910, 17,131.

MEINONG, mīn'ŏng, ALEXIUS, KNIGHT VON HANDSCHUCHSHEIM (1853–). An Austrian psychologist and philosopher, born in Lemberg and educated in Vienna under Brentano. From Vienna he went in 1882 as professor to the University of Graz, where he established in 1894 the first psychological institute in Austria. Among his important publications are: *Hume-Studien* (1877–82), devoted especially to Hume's nominalism, and supplemented by many articles in periodicals; *Ueber philosophische Wissenschaft und ihre Propädeutik* (1885); *Psychologisch-ethische Untersuchung zur Werttheorie* (1894) —like Ehrenfels basing a theory of value on psychological grounds; *Ueber Annahmen* (1902; 2d ed., 1910), in which he frames a sort of transcendental realism with a "Gegenstandstheorie" of ideal objects or objects of a higher order; *Ueber die Stellung der Gegenstandstheorie im System der Wissenschaften* (1907); *Gesammelte Abhandlungen* (3 vols., 1913–14). For his psychological interpretation of Weber's Law, see WEBER'S LAW. Consult the excellent article on Meinong in Eisler's *Philosophen-Lexikon* (Berlin, 1912).

MEISSEN, mī'sen. An old town of the Kingdom of Saxony, Germany, on both sides of the Elbe, 16 miles by rail northwest of Dresden (Map: Germany, E 3). The old town is situated on the left bank opposite the more modern quarters on the right bank. Above it rises the Schlossberg (160 feet), with the cathedral and the Albrechtsburg. The cathedral, a masterpiece of Gothic architecture, was erected in 1260–1450. It is surmounted by a fine spire of openwork, contains many monuments and tombs of Saxon rulers, and a notable altarpiece by an unknown German painter. There are numerous other old churches. The Albrechtsburg, an excellent late Gothic castle, erected in 1471–83 and occupied by the royal porcelain factory from 1710 to 1864, has been restored since 1873, and some of the halls have been decorated with fine frescoes by modern artists. The most noteworthy educational institution is the Fürstenschule on the Afraberg, founded in 1543. Lessing and Gellert attended school here. There are also a fifteenth-century council hall, a Realschule, and schools of commerce, agriculture, and navigation.

Meissen has played a prominent part in the porcelain industry of Saxony. It was here that Böttger established in 1710 the first porcelain factory in Europe and produced the famous Meissen ware. (See BÖTTGER; POTTERY.) The factory was transferred in 1863 from the Albrechtsburg to Triebischthal, a short distance from Meissen, and now employs over 700 persons. Meissen has a number of other porcelain manufactories, also foundries and machine works, and manufactures of stoves, gunny, tin goods, shoes, lamps, chemicals, sugar, bricks, sewing machines, pianos, and furniture. There are large granite quarries and vineyards. The chief articles of commerce are local manufactures and wine.

Meissen was founded in 928 by the Emperor Henry I, and rose to great importance as the residence of the margraves of Meissen, the direct ancestors of the present royal house of Saxony. The bishops of Meissen had until 1581 the rank of princes of the Empire. Pop., 1900 (including Cölln, annexed in 1901), 20,123; 1910, 33,884, chiefly Protestants.

MEISSEN, HEINRICH VON. A German minnesinger. See FRAUENLOB.

MEISSNER, mīs'nĕr, ALFRED (1822–85). An Austrian poet, born at Teplitz, grandson of the following. His *Gedichte* (1845; 12th ed., 1880) attracted much attention, and the lyrical epic *Ziska* (1846; 2d ed., 1884) shows the influence of Byron, George Sand, and Lenau. During a stay in Paris he wrote his *Revolutionäre Studien aus Paris* (1849). His tragedies, *Das Weib des Urias* (1850) and *Reginald Armstrong, oder die Welt des Geldes* (1853), were not very successful. Better are his novels, chief among which are: *Sansara* (1861); *Neuer Adel* (1861); *Zur Ehre Gottes.* The last named is an interesting narrative of the events which took place in Austria during the reactionary period of 1850-54. His *Heine-Erinnerungen* (Hamburg, 1856) is also important. Consult his autobiography, *Geschichte meines Lebens* (Teschen, 1884), and Ernst Ziel, *Litterarische Reliefs* (Leipzig, 1895).

MEISSNER, AUGUST GOTTLIEB (1753–1807). A German miscellaneous writer, born at Bautzen. He studied law at Wittenberg and Leipzig, and in 1785 was appointed to the chair of belles-lettres in the University of Prague. For the last two years of his life he was director of the Fulda Gymnasium. Best known of his works are his *Skizzen*, a collection of miscellaneous stories, dialogues, anecdotes, and essays. He also wrote several historical novels, such as *Alcibiades* (1781–88); *Bianca Capello* (1785); *Epaminondas* (1798). His complete works were published in fifty-six volumes (Vienna, 1811–12). Consult R. Fürst, *A. G. Meissners Leben und Schriften* (Stuttgart, 1894).

MEISSONIER, mā'sō'nyā', JEAN LOUIS ERNEST (1815–91). A French military and genre

JEAN ERNEST MEISSONIER

"FRIEDLAND, 1807," FROM THE PAINTING IN THE METROPOLITAN MUSEUM, NEW YORK

painter. He was born at Lyons, Feb. 21, 1815. In 1830 he went to Paris and worked for a short time in the studio of Cogniet, but he received his most valuable training in art from his study of the old masters in the Louvre, especially those of the Dutch school. At first he illustrated books and made etchings as a means of livelihood. His first painting, "The Visitors," was exhibited at the Salon in 1834. In 1843 and 1848 he received first-class medals from the Salon, and in the expositions of 1855, 1867, and 1878 the Grand Medal of Honor. In 1848 he was captain of artillery in the National Guard. He was with Napoleon III at Solferino in 1859, and during the siege of Paris in 1870 he was lieutenant colonel of infantry in the National Guard. He received the cross of the Legion of Honor in 1846 and the Grand Cross in 1889; was chosen a member of the Institute of France in 1861 and president in 1876 and 1891. He died in Paris, Jan. 31, 1891.

His subjects are historical, military, and scenes from everyday life. Most of his pictures are on small canvases and studies of one or two figures. The characters are almost entirely men; in very few of his pictures do women or children appear. He was the chief of a school of genre painters, among the most prominent of whom were his son, Jean Charles, Detaille (q.v.), and Vibert (q.v.). Every detail is as faithfully and carefully studied and portrayed as if it were of sole importance, and sometimes, particularly in his larger pictures, to the detriment of the general effect. His drawing is masterly, the color is fresh and true, and the light and shade excellent; but his paintings usually lack beauty of tone, and their bald realism precludes real inspiration. He excels in the portrayal of action, and in his power to depict the subtlest shades of expression on the faces of his characters. Of his military pictures one of the most famous is "Friedland, 1807" (1875), a large painting in the Metropolitan Museum, New York. Other famous military pictures are: "Cavalry Charge" (1867); "Napoleon III at Solferino" (1864), in the Louvre; "The Retreat from Moscow"; "Napoleon Overlooking a Battle"; "Napoleon and his Staff in 1814" (1864, Louvre). The Metropolitan Museum of Art, New York (inclusive of the Vanderbilt collection), possesses 12 other paintings by Meissonier and he is excellently represented in the Louvre and in the Wallace collection, London. Among his best-known genre pictures are: "The Quarrel" (1855), belonging to the King of England; "Ball Players at Antibes"; "Amateurs of Painting" (1843, Musée Condé, Chantilly); "The Halt" (1869); "The Chess Players" (1834); "Throwing Dice" (1836); "Man Reading," "Man at a Window," and "The Voyage" (Louvre); "The Farrier" (1861); "The Barricade." He also designed for lithography and was an etcher of note. For his biography, consult: Jules Claretie (Paris, 1884); Larroumet (ib., 1893); Gréard (ib., 1897); Fromentin (ib., 1901); Robinson, in the *Art Annual* (London, 1887); in *Masters in Art*, vol. v (Boston, 1904).

MEISSONIER, Juste Aurèle (1695–1750). A French decorative designer and goldsmith whose work was unexcelled for originality and in style constitutes the best and most complete definition of rococo. (See Interior Decoration.) He was appointed by Louis XV to a court position of draftsman, and he published many illustrated books on ornament, engraved mostly by Huquier. Some of his designs are accessible in T. A. Strange, *French Interiors, Furniture, etc.* (London, 1907).

MEISTER, mī'stẽr, Richard (1848–1912). A German classical scholar, born in Dresden, where his father was regisseur at the Court Theatre. He was educated at Leipzig (under Curtius, Ritschl, and Overbeck) and at Berlin. In 1872 he became a teacher in the Leipzig Nikolaischule, of which he was Konrektor for the last 12 years of his life. In the fourth volume of Curtius' *Studien zur griechischen und lateinischen Grammatik* (1871) appeared Meister's work on the dialect of Heraclea. He revised Ahrens's *De Græcæ Linguæ Dialectis* (1839–43) in two volumes as *Die griechischen Dialekte* (1882–89), which was supplemented by *Zum eleischen, arkadischen, und kyprischen Dialekte* (1890) and by his "Beiträge zur griechischen Epigraphik und Dialektologie," in *Berichte der kgl. sächs. Gesellschaft der Wiss.* (1899–1911).

MEISTERSINGER, mīs'tẽr-sĭng-ẽr. The name given to those poets and poetasters who, succeeding the minnesingers (q.v.), gradually deteriorated into very inferior rhymesters, who organized themselves into schools according to trade guilds and who produced an immense number of master songs, almost wholly doggerel. Hans Sachs (q.v.) was the best of them all. The word "meister" (derived, like English "master," from Latin *magister*) means a poet who has studied, as all laymen did, in Church schools. Accordingly the meistersingers were distinguished from the common minstrels. They also formed a guild or caste. The meistersingers were wont to trace their origin back to "the 12 old masters." Various legends arose, explanatory of their origin. One Spangenberg even thought Moses was a meistersinger. David, also, was looked upon as a patron in whose time hundreds of meisters were supposed to have taught 4000 scholars, and Solomon also was reckoned in. Furthermore, the minnesingers were reckoned as members of their caste, but, as a matter of fact, they were different in many ways. Individual meistersingers out of modesty called themselves "lovers of art" (*Liebhaber der Kunst*), and the whole body of them named themselves the "honorable" or "praiseworthy society." We may suppose that associations existed as early as 1200. Heinrich von Meissen, called Frauenlob, may have had a school of song at Mainz. We cannot be sure of a regular school till 1450 in Augsburg. But the meistergesang had flourished in the fourteenth century at Mainz, Strassburg, Colmar, and Frankfort; in the fifteenth and sixteenth at Nuremberg; later still it flourished in Breslau, Görlitz, and Danzig. In 1492 Strassburg had the first school founded by written statutes, and Nuremberg had what became, thanks to Richard Wagner, best known to this generation. The last school died out at Memmingen in 1844.

Each school had for the head meistersinger a chair called *der Künste Stuhl* (chair of the arts), or, as in Nuremberg, the *Meisterstuhl* (master's chair). In England this was called "the bard's seat." Later the singer seems simply to have stood in the midst of his hearers. To enter the guild a candidate had to pass an examination before four markers, usually in a church. He must devise some new arrangement or a new melody (*Weise*) without infringing any rule. One of the markers determined

whether the theme was right, another whether the versification was right, and the others looked to rhyme and melody. One need hardly add that, in a school whose whole attention was given to technicalities, the possible mistakes were limited by set rules. The success of a meistergesang hung upon its conformity with these rules. Indeed, the very essence became a formula or a series of formulas. The *Tabulatur*, or tablature, a term borrowed from music and not found among the earliest documents, signified, in musical nomenclature, a bit of music written not with notes, but with letters or figures, designed to initiate the student into vocal or instrumental music. But as a code for the meistersingers it had to be mastered by whoever wished to be of the guild. In order to teach scholars more easily the content of the code, it was drawn up in short poems. In fine, it was a book of rules, the text book of the meistergesang. This *Tabulatur* dealt with three matters: (1) the kinds of poems and the parts of a meistergesang; (2) permissible rhymes; (3) the mistakes, which are the main business, and have to do (*a*) with errors of delivery, of melody, of structure, and of opinion and (*b*) chiefly, however, with errors of rhyme or mangling of words or cacophony.

The school had inside and outside members, called by divers names. Those who were still studying the *Tabulatur* were called *Schüler;* those who had mastered it, *Schulfreunde;* those who could correctly sing the songs of others, *Singer;* those who could write new words to a tune already accepted as correct, *Dichter;* and those who had both written and composed a new and original song true to the *Tabulatur* were *Meister.* Meetings were held on festivals, chiefly on Sunday after service and in the church. Very often the singers met in the town hall or at an inn. Prizes were awarded, and those who sang ill were fined. The prize was sometimes money, sometimes a crown, as at Nuremberg in the time of Hans Sachs. Flowers had also an important part in these competitions. Often in the older days one singer would hang up a wreath as a challenge and as a reward for victory. Finally may be mentioned the fact that the meistersinger often wore a costume which was not seldom motley and which was often sumptuous.

The various songs were divided into three strophes, and each strophe was divided into two *Stollen*, alike in metrical structure, and a distant or *Abgesang.* Plate gives a long list of the various features of rhythm and rhyme in this complicated poetry, in all of which we observe a singular likeness to the technicalities invented or slavishly aped by the lesser, and indeed often enough by the better, poets two centuries earlier in southern France. The best feature of the meistersinger's art was that it throve among the humbler folk, refined them, gave them a sense of nationality, opened the way for the artistic treatment of better themes, and spread widely the love of artistic music among those who needed most a sense of form.

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MEISTERSINGER VON NÜRNBERG, nu̇rn'bĕrk, Die. A musical comedy in three acts by Richard Wagner; first produced in Munich, June 21, 1868; in the United States, Jan. 4, 1886 (New York). It is a faithful and historically accurate picture of the meistersinger's art. See Meistersinger.

MEITZEN, mīts'en, August (1822–1910). A German statistician and political economist, born in Breslau and educated at Heidelberg and Tübingen. He was a prominent member of the Statistical Bureau and in 1892 was made honorary professor of the science of statistics and of political economy at the University of Berlin. His contributions to the science of statistics include *Die internationale land- und forstwirtschaftliche Statistik* (1873) and *Geschichte, Theorie und Technik der Statistik* (2d ed., 1903); he also wrote *Die Mitverantwortlichkeit der Gebildeten für das Wohl der arbeitenden Klassen* (1876) and *Siedelung und Agrarwesen der Westgermanen und Ostgermanen, etc.* (1896).

MEJERDA, me-jĕr'dĕ, or **MEJIRDA**, me-jĭr'dĕ. A river of north Africa. It rises in the Great Atlas Mountains in eastern Algeria and, after an easterly and northeasterly course of over 200 miles, mainly through Tunis, flows into the Gulf of Tunis on the Mediterranean, 24 miles north of the capital. It was the ancient Bagradas, with its mouth at Utica, now Bu-Chateur, 7 miles to the south.

MEJÍA, mȧ-hē'ȧ, Tomás (c.1812–67). A Mexican general, an Indian by race. He took a prominent part in the war with the United States and served with Miramón (q.v.) and Zuloaga against Juárez in 1858 and 1859. On the occasion of the French intervention he did good service on the Imperialist side. He was present at the siege of Querétaro in 1867, was captured with other officers in Maximilian's army, and was with them court-martialed and shot. See Maximilian.

MEJIR'DA. A river of north Africa. See Mejerda.

MEKHITARISTS, or **MECHITARISTS**, mĕk'ĭ-tȧr-ĭsts. A congregation of Armenian Christians who reside on the island of San Lazzaro at Venice, but have also obtained a footing in France, Austria, Turkey, Russia, and elsewhere. They derive their name from Mekhitar or Mechitar (i.e., the Comforter) da Petro (born 1676, died 1749), who in 1701 founded at Constantinople a religious society for the purpose of introducing Western culture among the Armenians. He had already become a Catholic and soon had to flee. In 1702 he founded a convent at Modon in the Morea, then under the rule of Venice. Pope Clement XI in 1712 confirmed the congregation, gave it the Benedictine rule, and made Mekhitar its abbot. The war between Turkey and Venice compelled its transference in

1715 to Venice, where, on the island of San Lazzaro, the Mekhitarists held a convention in 1717. In 1773 a split in the congregation occurred, and a branch is now established in Vienna. The Mekhitarists acknowledge the supremacy of the Roman pontiff. The most useful occupation of the Venetian branch is printing the classic writings of Armenian literature, including an Armenian translation of the Bible (1734); their editions are universally admitted to be the best and most correct. They also issue a journal, which is much read throughout the Levant. Those in Vienna conduct a German bookstore. For the history of those at Venice, consult Boré, *Le couvent de Saint Lazare à Venise, ou histoire succincte de l'ordre des Méchitaristes arméniens* (Paris, 1837) and *Méchitaristes arménien de Venise* (ib., 1869); for those at Vienna, consult Scherer, *Die Mechitaristen in Wien* (5th ed., Vienna, 1892); for the life of the founder, consult *Le vie du serviteur de Dieu Mechitar* (Venice, 1901).

MEKLONG, mā'klŏng'. An important port on the south coast of Siam at the mouth of the Meklong River, 40 miles southwest of Bangkok (Map: Siam, C 4). The population is about 10,000, consisting chiefly of Chinese merchants and Siamese fishermen.

MEK'NEZ. A city in Morocco. See MEQUINEZ.

MEKONG, mā-kŏng', or **CAMBO'DIA.** The largest river of Indo-China. Its ultimate source has not been ascertained, but it is supposed to rise in the mountains of central Tibet, not far from the sources of the Yang-tse-kiang (Map: French Indo-China, E 4). It flows in a generally southeasterly direction, first through Tibet and China proper, where it is generally called Lantsang, and then through Indo-China, where it forms at first the boundary between Burma and Tongking, then between Annam and Siam. Its lower course is through Cambodia and Cochin-China. The course of the Mekong after it enters Indo-China becomes very crooked and interrupted by rapids and falls, which prevent the use of this great river as a waterway. It is only for the insignificant part of its length below Khong, a town in the southeast corner of Siam, that the river becomes navigable. Here its flow becomes less turbulent as it enters its great alluvial plain. Finally it divides into a number of arms, forming a marshy delta which occupies almost the whole of Cochin-China and through which the Mekong enters the China Sea after a total flow of about 2800 miles. At the town of Pnom Ponk in Cambodia an arm extends northwestward from the Mekong to the large lake Tonle Sap, which at one time discharges into the Mekong and at another is fed by it.

ME'LA, POMPONIUS. A Latin writer, the first to compose a strictly geographical work. He was a native of Spain and is believed to have lived in the time of the Emperor Claudius, but nothing whatever is known concerning him. Mela's compendium of geography is a brief work, in three books, and is entitled *De Situ Orbis*. The text is greatly corrupted, on account of the abundance of proper names; but the style is good, and the author shows a very creditable diligence in research and discrimination in the use of his authorities. The work is valuable too because this book and the geographical parts of the *Historia Naturalis* of Pliny are the only formal treatises on geography known to us from classical times. The editio princeps appeared at Milan in 1471, and there is an early translation by Arthur Golding (London, 1585). There are good editions by Tzschuche (Leipzig, 1807), Parthey (Berlin, 1867), and Frick (Leipzig, 1880). Consult: E. H. Bunbury, *Ancient Geography*, vol. ii (London, 1879); W. S. Teuffel, *Geschichte der römischen Litteratur*, vol. ii (6th ed., Leipzig, 1909); M. Schanz, *Geschichte der römischen Litteratur*, vol. ii, part ii (3d ed., Munich, 1913).

MEL'ALEU'CA. A genus of plants. See CAJEPUT.

MELAM'PUS (Lat., from Gk. Μελάμπους, *Melampous*, Blackfoot, from Gk. *μέλας*, black + *πούς*, foot. Tradition said Melampus' foot was deeply burned by the sun when he was a boy). In Greek legend, the son of Amythaon; his mother is said by different authors to be Aglaia, Rhodope, or Eidomene. He is represented as a physician and prophet. Since two serpents, whose lives he had saved, licked his ears while he slept, he had power to understand the language of birds and beasts. He is said to have acquired his powers of divination from Apollo, who imparted to him all the secrets of the art of medicine, and he was said to have discovered the herb melampodium, a kind of hellebore (q.v.). Melampus appears in two groups of legends. In one he and his brother Bias came from Thessaly to Pylus, where Bias fell in love with Pero, daughter of Neleus. Her father, however, required her suitor to bring to him the herds of Iphiclus, a Thessalian prince. Melampus went on this mission, was seized and thrown into prison, but overheard the worms in the beams predict the speedy fall of the building. He told his jailers, who believed, and with him escaped before the fall. The King, hearing of his gifts, secured his aid in curing a disease of his son, of long standing, and as his fee gave him the much desired cattle. He was also said to have left Neleus and to have gone to Argos, where he cured the Argive women, or, according to others, the daughters of King Prœtus, of madness sent by Dionysus or Hera. As a reward he received for himself the hand of one of the daughters, Iphianassa, and a third of the land of Argos and another third for Bias. Thus their descendants, including the prophet Amphiaraüs, ruled along with the descendants of Prœtus. At Ægosthena in Megaris Melampus was worshiped as a god, having a temple and apparently games in his honor.

MELANCHOLIA, mĕl'an-kō'lĭ-ȧ (Lat., from Gk. *μελαγχολία*, black bile, from *μέλας*, *melas*, black + *χολή*, *cholē*, bile). A form of insanity characterized by depression, a painful emotional state, intellectual enfeeblement, weakened attention, and abulia. The melancholiac is gloomy, full of forebodings and fearful anticipations, convinced of physical inferiority and of moral worthlessness, and often contemplates, even if he does not commit, suicide. See MANIC-DEPRESSIVE INSANITY; INSANITY.

Involutional Melancholia. An insanity of the involutional period of life, characterized by great emotional depression, apprehension, and painful anxiety. It occurs in women between 40 and 50 years of age, in men after 50. Many show senile changes, especially arteriosclerosis. The menopause seems to be an etiological factor in woman. The exciting cause is often emotional shock or prolonged mental strain. Heredity has little influence. After months of headache, pressure, vertigo, insomnia, mental weakness,

neurasthenia, the patient is plunged into a deep apprehensive depression, and, tortured by delusions of sin, cowering with fear, she passes into a condition of very painful anxiety. She may be diverted at times, in cases where apprehension is slight and consciousness is unclouded, orientation being preserved; but in most cases agitation is shown by groaning, wringing the hands, and repeated appeals to God for help. Rare cases become mute, inactive, and resistive, refusing to eat, and quite negativistic, because of controlling delusions and hallucinations, rarely because of retardation. There may be hypochondriacal delusions, delusions of sinfulness, of persecution, of poverty, of unworthiness, or of possession; nihilistic ideas, or ideas of grandeur. The last are unfavorable symptoms.

Hydrotherapy best controls the wasting agitation. Constant watchfulness, day and night, is essential, the insomnia must be relieved, and nutrition must be sustained. The possibility of suicide must always be borne in mind. Usually three years elapse before the recoverable cases begin to improve. See INSANITY.

MELANCHTHON, mē-lăṅk'thon, *Ger. pron.* mă-lăṅk'tôn, PHILIPP (1497–1560). The associate of Luther in the Protestant Reformation and the foremost teacher of his time; in the words of Hallam, "far above all others the founder of general learning throughout Europe." He sprang from the middle class, as did Luther from the lower. His father was an armorer in favor at court, his mother the daughter of the burgomaster of Bretten in Baden, where he was born Feb. 6, 1497. By the advice of his granduncle, the learned Reuchlin, he changed his family name, when he entered the University of Heidelberg at the age of 12, from Schwarzerd (Black Earth) into its Greek equivalent, Melanchthon, a common practice among scholars. Having taken the bachelor's degree when 14, he took the master's degree at Tübingen when 17 and at once began to lecture on Terence, Vergil, and rhetoric; when 19 he published an edition of Terence, which ran through 73 editions in the course of about a century. His Latin and Greek grammars enjoyed still larger use even in Catholic schools.

Most opportunely for Luther, who had posted his theses the year before, Melanchthon was now called to the chair of Greek at Wittenberg and in 1518 delivered his inaugural upon "Reform in the Studies of Youth." This address won the admiration of those who had depreciated him for his boyish appearance. The next year Melanchthon took the bachelor's degree in theology, but modestly declined the doctorate. Never ordained, never preaching, he remained, like Calvin, a lay theologian to the end of his days. His lectures were thronged, sometimes, as reported, to the number of 2000, including even princes and noblemen.

From his classical studies he was drawn by Luther's urgency and the prevailing ferment into the field of theology. By his *Loci Communes*, i.e., general outlines of theology, he made in 1521 his first great contribution to the Reformation. From Melanchthon's architectural and organizing spirit, according to Dorner's view, the truth born in Luther's heart received its objective form and the stamp of validity. Equally important was the aid he gave to Luther's Bible work, in which the accuracy is his, while its idiomatic force and beauty are Luther's. In 1526 he became professor of theology in name, as for years he had been in fact.

Among the Reformers, Melanchthon was characteristically the peacemaker. The Augsburg Confession, presented by the Protestants at the Diet in 1530, surprised even the Catholics by its moderate tone. The tone was Melanchthon's, who drafted it from articles drawn up by Luther. In 1531 Melanchthon published his *Apology*—a vindication of the Augsburg Confession and the most learned of the Lutheran symbols. After this date he wrote his name Melanthon, as easier to pronounce. His irenic spirit prompted him to issue a modified edition of the Confession, the *Variata* (1540), generalizing specific statements of the Lutherans objectionable to the Calvinists, with the design of removing impediments to the union of the two parties. But such efforts brought only bitter trouble upon Melanchthon. He had now reached the limit of his successes, and his remaining years were darkened by the failure of his efforts for a more ethical theology and for the union of the Protestant factions.

Melanchthon's treatises on ethics, in which Aristotle was his master, became standard textbooks. These ethical studies revealed to him defects in his theological masterpiece, the *Loci Communes*, which he amended by successive revisions in 1535 and 1543. They also occasioned a serious breach between the Philippists and the strict Lutherans, whose extreme denial of the freedom of the will made Christian ethics impossible. Cries of heresy arose, which no explanations could still. Another breach was caused by Melanchthon's slow but sure change from the Lutheran conception of the mode of Christ's presence in the Lord's Supper to the Calvinistic. A third ground of odium was Melanchthon's willingness, for the sake of avoiding civil war, to compromise with the Catholics by securing tolerance of evangelical doctrine, but retaining most of the Roman ceremonies, as adiaphora (things indifferent). In the bitter controversy which ensued the Philippists were hounded as knaves, Samaritans, and Baalites. Melanchthon's relations with Luther were strained, but to the last his gentle spirit held captive that fiery heart. He looked forward to death as "escape from the madness of theologians." His last prayer was "that the churches might be of one mind in Christ." He died April 19, 1560.

Melanchthon seems from one point of view to have been born before his time and has been long in coming to his rights. In a period of fanatical strife, he earnestly strove to bring about Christian unity. But on the honor roll of the Reformation his is conspicuously the historical, judicial, progressive spirit. His one great weakness was his consenting with Luther and others to the bigamy of Philip of Hesse, and his regret for it threw him into a dangerous illness. Declining invitations to other German cities, to France, to Denmark, to England, he stood unflinchingly at his post in stormy Wittenberg. The churches he found it impossible to reconcile now unite in honoring him. Lacking the dramatic element which draws the popular heart to Luther, his blending of progress and tolerance, of sweetness and light, attracts the cultivated mind.

Bibliography. Melanchthon's works, including his correspondence, fill volumes i–xxviii of the *Corpus Reformatorum*, edited by Bretschneider and Bindseil (Halle, 1832–50). The Wittenberg edition of his works was published in

1562–64. His *Loci Communes*, edited by Plitt (Erlangen, 1864), was reëdited by Kolde (ib., 1890). In German: his *Leben und Wirken*, by Matthes Altenburg (1841; 2d ed., 1846); his *Leben und Schriften*, by C. Schmidt (Elberfeld, 1861). For biography: his *Life* (in Latin), by his friend Camerarius (Leipzig, 1566), edited by Neander in *Vita Quattuor Reformatorum* (Berlin, 1846); also Krotel's English translation of the *Life* by Ledderhose (Philadelphia, 1855). J. W. Richard, *Philipp Melanchthon* (New York, 1898), is both popular and accurate. Valuable in special points of view are: Galle, *Charakteristik Melanchthons* • (Halle, 1840); Hartfelder, *Philipp Melanchthon als Præceptor Germaniæ* (Berlin, 1889); Herrlinger, *Die Theologie Melanchthons* (Leipzig, 1878). Philip Schaff, *History of the Christian Church*, vols. vi, vii (New York, 1890); id., *Creeds of Christendom* (ib., 1878), contain much valuable biographical and theological matter concerning Melanchthon; also *Cambridge Modern History*, vol. ii (Cambridge, 1904), contains an exhaustive bibliography.

MEL'ANE'SIA (Neo-Lat., from Gk. *μέλας, melas*, black + *νῆσος, nēsos*, island). A name applied to that division of Oceanica in which the inhabitants have a dark skin, as distinguished from those of Micronesia and Polynesia, who are much lighter. (See MELANESIANS.) It comprises all the islands lying between New Guinea and the Fiji Islands and between the Equator and the Tropic of Capricorn (Map: East Indies, H 5). It includes the following groups: Admiralty Islands, Bismarck Archipelago, Solomon Islands, Santa Cruz, New Hebrides, New Caledonia, Loyalty Islands, and Fiji Islands. Politically Melanesia is apportioned to Germany in the north, to England in the Solomon Islands and Fiji, to France in the south, while the New Hebrides and Santa Cruz are ruled by a mixed Franco-British commission. For details, see the articles on the separate groups.

MELANESIANS. The natives of that part of Oceanica known as Melanesia (q.v.). Some authorities consider them physically and linguistically a compound of the woolly-haired black Papuans, who may have been the aborigines of Melanesia, with the smooth-haired, light-colored Malays, who came to the archipelago as adventurers and immigrants. Of all the islanders of these regions they present in individual cases the strongest likeness to the equatorial African negro. Other scholars recognize a "Melanesian race," divided into Papuans and Melanesians proper, the latter being taller and more dolichocephalic than the former, and having generally the large square or lozenge-shaped face with the straight or *retroussé* nose of the Melanesian race. The Melanesians are in general sedentary and devoted to agriculture, being only occasionally hunters and fishers, and they use the pig as a domestic animal. Many of the Melanesians make, or once made, pottery, an art practiced by none of the Polynesians. Its present distribution is limited to New Caledonia, and Espiritu Santo, the Shortland Islands, Bougainville, Buka, and the Fiji group; but ceramic remains have been found in Malikolo, Pentecost, Lepers' Island, and Ambrym. The Melanesians have double canoes and outriggers, but are not given, like the Polynesians, to long voyages. With most of them the characteristic dwelling is built on piles (see LAKE DWELLINGS), and often artistically decorated, while communal houses are found all over the Melanesian area. The bow and arrow (sometimes poisoned) are in use, with the club and spear, which lend themselves to ornamentation. Some of the hafted stone axes of the Melanesians are very fine specimens of their kind. Kava, the characteristic drink of the Polynesians, is absent or subordinate, but betel chewing prevails generally except in New Caledonia. The Solomon Islands and a few other places still present examples of cannibalism, while head hunting, together with the preservation of the skulls of the dead, is well known. Taboo assumes in Melanesia a less clear form than in Polynesia, amounting to simple interdiction without the intervention of mysterious forces. Tribes proper are rare in Melanesia. The regulation of "group marriages" is very strict. Secret societies abound, including the famous *duk-duk* (q.v.), which corresponds in several curious respects to the modern club. There is usually a strict segregation of the sexes, the men living together in distinctive "men's houses" and the women being debarred both from these and from ceremonial performances.

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MEL'ANI'IDÆ (Neo-Lat. nom. pl., from Lat. *melania*, from Gk. *μελανία*, blackness, from *μέλας, melas*, black). An extensive group of fresh-water gastropod mollusks characterized by the long spiral shell, with the whorls more or less knobbed or tuberculated, ribbed or striated, and a horny operculum. The animal has a broad foot or creeping disk, grooved in front; it is ovoviviparous. The species date from the Cretaceous period. They live in rivers, and the tubercles protect them from injury in rapid rocky streams. The species are distributed throughout north Africa, Syria, China, India, the Philippine Islands, Polynesia, and South America. In the southern United States, mostly in a rough square formed by the Tennessee, the Mississippi, the Chattahoochee rivers and the Gulf of Mexico, occur in abundance the Pleuroceridæ, represented by the genius *Io*, which were formerly associated with the Melaniidæ.

MEL'ANIP'PE. 1. In Greek mythology, a daughter of Chiron. Being about to bear a child, she fled to Mount Pelion to conceal herself from her father, and was changed into a mare by Artemis and placed among the constellations. She is also called Evippe. 2. A sister of Mele-

ager, who died with grief at her brother's fate. 3. A sister of Hippolyte and Queen of the Amazons.

MEL'ANIP'PUS. In Greek mythology, a Theban, son of Astacus. In the expedition of the Seven against Thebes (see SEVEN AGAINST THEBES, THE) he dealt Tydeus (q.v.) the wound which caused his death. He was himself killed by Amphiaraus (q.v.).

MEL'ANISM (from Gk. *μέλας, melas,* black) and **AL'BINISM** (from Lat. *albus,* white). Melanism is a phenomenon due to excess of pigment, while albinism is due to its absence. Albinism is a pathological condition, while melanism is usually normal. Melanism occurs in insects, fishes, reptiles, birds, and mammals, and is noticeable in man. While in animals and man albinism is the result of disease, it may occur in nature as a sport; thus we have albino varieties. The absence of pigment is normal in such Arctic animals as the polar bear, the northern or white owl, etc.; others turn white in winter, as the Arctic fox, the American varying hare, the ptarmigan, etc. The change of color in such cases is apparently due to cold and is associated with the development of numerous air bubbles in the hair; in some cases there is no loss of pigment, which is merely concealed by the air bubbles (Newbigin).

In man the dark races owe the color of their skin to a black pigment deposited in the deeper layers of the epidermis, this pigment in the blond or white race being but slightly developed. As the darkest negroes inhabit the low torrid coast of west Africa, the pigmentation seems due to light, heat, and moisture combined. On the other hand, the cool damp climate of elevated or mountain regions and of the polar lands causes melanism. It is well known that the insects, more especially moths and butterflies, inhabiting alpine slopes or mountain regions are darker than individuals of the same species, or of allied species, living on the drier and warmer lowlands. Packard has called attention to the melanotic moths on the summits of the White Mountains of New Hampshire and along the coast of Labrador. Leydig was the first, perhaps, to point out that variation towards greater darkness of coloring is connected with the action of moisture. The temperature experiments of Weismann, W. H. Edwards, and Merrifield have proved that besides moisture and elevation cold is an important agent in excessive pigmentation, at least, of Lepidoptera and beetles. The most striking experimental evidence of the importance of humidity in the inducing of melanistic conditions is that presented by Beebe in his experiments with ground doves and other birds. Under conditions of intense humidity the birds became successively darker with each molt, until signs of iridescence were apparent. But melanism is not entirely confined to northern animals. The black leopard of southern Asia is a melanotic variety or sport of the common leopard. The varying hare is infrequently melanistic.

The prevailing coloring matters in the pigments of mammals are the dull-colored melanins. It has been thought that in mammals the pigment is directly derived from the hæmoglobin of the blood. Floyd, however, has shown that the skin of the negro contains about twice as much iron as the white skin, apparently due to the proteid present in the pigment granules. Consult: Newbigin, *Color in Nature* (London, 1898); Delépine, "Origin of Melanin," in *Journal of Physiology,* vol. xi (ib., 1890); C. W. Beebe, in *Zoologica,* vol. i (New York, 1907).

MEL'ANITE (from Gk. *μέλας, melas,* black). See GARNET.

MEL'ANORRHŒ'A (Neo-Lat., from Gk. *μέλας, melas,* black + *ῥοιά,* rhoia, a flowing). A genus of trees of the family Anacardiaceæ. To this genus belongs the black varnish tree (*Melanorrhœa usitata*) of Burma and the northeast of India, called *Theet-see* or *Zitsi* in Burma, and *Khew,* in Manipur, attaining a height of 100 feet, with large, leathery, simple, entire, deciduous leaves and axillary panicles of flowers. It is much valued as a varnish for painting vessels intended to contain liquids, and also as a size glue in gilding. The varnish, which is obtained by tapping the stems, turns black on exposure to the air. See VARNISH TREE.

MELAPHYRE, mĕl'ă-fīr. See BASALT.

MELAZZO, mâ-lät'sō. See MILAZZO.

MEL'BA, NELLIE (1861–). An Australian operatic soprano. Her family name was Mitchell, Melba being an adaptation from Melbourne, in which city she was born. She studied under Marchesi and made her first public appearance as Gilda in *Rigoletto* at Brussels in 1887. An unsurpassed coloratura singer, she became known and admired in every great city of the world, being especially successful in grand opera in America. Her first appearance in the United States was at the Metropolitan Opera House, New York, in 1893, in *Lucia di Lammermoor.* Though possessing a voice of exceptional purity and beauty, she failed to develop real dramatic intensity and histrionic ability. After some years in concert, Mme. Melba returned to opera in 1915–16 as a member of the Chicago Company. Consult A. G. Murphy, *Nellie Melba: A Biography* (London, 1909).

MELBOURNE, mĕl'bûrn. The capital of Victoria, Australia, situated chiefly on the north bank of the Yarra, which river finds its outlet a few miles from the city in Hobson's Bay (Map: Australasia, G 6). The bay is the north bend of the spacious inlet known as Port Phillip, the entrance of which is 40 miles south of the city, near the southernmost extremity of the continent. The chief port is about 2½ miles distant from the business centre, but vessels with a 22-foot draft may go to the heart of the city. Melbourne occupies a high rank among British colonial ports. Its tonnage in the arrival of vessels in the over-sea trade is second to that of Sydney, but in interstate trade exceeded that of any other Australian port in 1912, the entrances in interstate trade in that year being 2,929,486 tons against 2,466,763 at Sydney. In the over-sea trade the entrances direct from other countries were 690,951 tons against 1,189,215 at Sydney, and from foreign countries via other commonwealth ports 1,679,459 against 2,076,067 at Sydney. In total tonnage, however, of foreign, interstate, and local from other ports of the state it was in 1912 second to Sydney. Melbourne is connected with all state lines of railway and is the centre of the system. It is the see of a Roman Catholic archbishop and of a Protestant bishop, and the seat of various consuls, including a United States consul general. The city is laid out with straight, wide, and regular streets, wood-blocked or macadamized, and supplied with gas, electric lighting, street tramways, and fresh water. The princi-

pal streets are 99 feet wide. It has been said that Melbourne's public buildings are finer than those of any other city of the same size in any part of the world. Among the most notable must be mentioned the magnificent Houses of Parliament, with a library of about 60,000 volumes; the Treasury; the Law Courts; the building assembling within its walls: (1) the Public Library of about 200,000 volumes, (2) the National Gallery, (3) the Technological Museum, and (4) the Sculpture Gallery; the Post Office; offices of the Mining, Lands, and other government departments, the Custom House; the Mint; the Treasury; the University, with its fine attached museum, its magnificent Wilson Hall, and affiliated Trinity, Ormond, and Queen's colleges; the Town Hall, with its grand organ and its assembly room; the Stock Exchange; the Exhibition Building in the Carlton Gardens, in which the commonwealth's first Parliament was inaugurated by King George V, then Prince of Wales, in the presence of an illustrious and representative gathering; the Produce Markets; the Eastern Market; the Fire Brigade Station; the City Baths; the London Bank of Australia; the Banks of Australasia, Victoria, and New Zealand; the Colonial, the English, Scottish, and Australian, and the Commercial banks; a Mint, opened in 1872; the National Mutual Life Office; the Equitable Life Assurance Society of the United States of America; the Western, the Queen Victoria, and the Fish, Cattle, and Hay markets; St. Patrick's Roman Catholic Cathedral; St. Paul's Anglican Cathedral; the Scots, the Wesley, the Independent, and the Baptist churches; and theatres and numerous amusement halls. There are many parks and pleasure grounds in Melbourne and its suburbs, each of the principal suburbs maintaining its own separate park, a beautiful government domain, botanical and zoölogical gardens, and cricket and football grounds. The Governor-General's and State Governor's residences are here; the commonwealth headquarters barracks; an observatory and a meteorological station; numerous schools for secondary education, including the famous Scotch College; and the institutions of many learned and scientific and literary societies.

Melbourne is a manufacturing city in the widest sense. The entrance to Port Phillip, which is only 2 miles wide, is formed by two projecting and strongly fortified promontories, called the Heads. Vessels drawing 22 feet reach Melbourne at ordinary tides. There are two dry docks at Melbourne and the splendid Alfred Graving Dock at Williamstown. The chief exports are gold, silver, wool, hides, cattle, and sheep. Six-sevenths of the commerce of the state is carried on by Melbourne. For further information regarding trade, etc., see VICTORIA.

Melbourne was first colonized in 1835 under the name of Dootigala, and received its present name in 1837 from Sir Richard Bourke, Governor of New South Wales, who named it after Lord Melbourne, then British Prime Minister. It became the see of a bishop in 1847, and in 1851 the capital of the newly formed colony of Victoria. The discovery of gold in Victoria in 1851 gave an extraordinary impetus to the material prosperity of Melbourne. The Australian centenary was commemorated at Melbourne in 1888 by an international exhibition. The first federal Parliament of the Australian commonwealth was opened in the exhibition building on Wednesday, May 9, 1901, by King George V, then Prince of Wales, Melbourne being chosen as the temporary capital pending the choice of a seat on federal territory in New South Wales. The commonwealth has acquired an area of about 900 square miles from the state of New South Wales for a national capital. Population of Melbourne proper (1901), 67,881, including suburbs, 493,956; estimated, 1912, including suburbs and shipping, 628,430. Consult: Labilliere, *Early Days of Melbourne* (Melbourne, 1857); id., *Early History of the Colony of Victoria* (London, 1860–81); Finn, *Chronicles of Early Melbourne* (Melbourne, 1889); Gordon and Gotch, *Australian Handbook* (ib., 1906).

MELBOURNE, WILLIAM LAMB, second VISCOUNT (1779–1848). An English statesman. He was born at Melbourne House, London, March 15, 1779; was educated at Eton and at Trinity College, Cambridge, where he graduated in 1796, and at Glasgow (1799), where he studied jurisprudence and politics under Millar. One year after his admission to the bar (1804) he entered the House of Commons for Leominster and joined the Whig opposition, under the leadership of Charles James Fox. He represented several other constituencies within the next 15 years and his whole career in the House of Commons was characterized chiefly by indolence. Drifting towards conservatism, he accepted the chief secretaryship of Ireland in Canning's government. In 1828 the death of his father transferred him to the House of Lords. In 1830 he accepted the seals of the Home Office in the government of Earl Grey, but his administration was by no means popular or successful. In July, 1834, Earl Grey retired and William IV sent for Melbourne. In November, however, on a slight pretext, the King, who had become entirely alienated from the Whigs and Melbourne, invited Sir Robert Peel to form a Conservative ministry. On Peel's arrival in England he dissolved Parliament and appealed to the country, but was defeated. The new Commons, resenting the interference of the King, made Peel's task an impossible one, so early in 1835 Melbourne again became First Lord of the Treasury and Premier. On the accession of Queen Victoria in 1837 it became the duty of Melbourne to instruct the young sovereign in the various duties of her high station, and but few other functions did he perform so well. In 1841 his government was succeeded by that of Sir Robert Peel. Henceforward Melbourne took little part in public affairs. His administrations advocated reform of Church tithes in both England and Ireland, of municipal corporations, taxation, criminal law, postal rates and education, yet he himself cared little for reform. He married (1805) a daughter of the Earl of Bessborough, who, under the title of Lady Caroline Lamb, attained some celebrity as a novel writer and a correspondent of Lord Byron. Lord Melbourne died Nov. 24, 1848. Consult W. M. Torrens, *Memoirs of Lord Melbourne* (London, 1878), and Lloyd Sanders, *Lord Melbourne's Papers* (ib., 1889).

MELCHERS, mĕlK'ĕrs, GARI J. (1860–). An American genre, figure, and portrait painter. He was born in Detroit, Mich., studied at the Düsseldorf Academy, under von Gebhard, and at the Ecole des Beaux-Arts, Paris, under Lefèbvre and Boulanger, and early made a specialty of Dutch peasant life, which he depicts with great insight and sympathy. He paints in cool grayish tones, with firm outlines,

and his work is simple, sincere, and often of almost brutal directness and naturalism. Melchers received many decorations and prizes, including medals of honor at Paris (1889) and Berlin (1891), and gold medals at Amsterdam, Munich, Vienna, Dresden, Antwerp, Philadelphia (1892), Buffalo (1901), and St. Louis (1904). Among his chief works are: "Maternity" and "Nurse and Children" (both in the Luxembourg, Paris); "The Family" (National Gallery, Berlin); "The Ship Builder" (Royal Gallery, Dresden); "Dutch Skaters" (Pennsylvania Academy, Philadelphia); "Sailor and his Sweetheart" (Carnegie Institute, Pittsburgh); "Penelope" (Corcoran Gallery, Washington); "The Madonna" (Metropolitan Museum, New York). Melchers also painted religious pictures, mural decorations, notably "Peace and War" in the Congressional Library at Washington, and many portraits, among which are Colonel Roosevelt (National Gallery, Washington) and Mrs. Melchers (Detroit Museum). He became Commander of the Legion of Honor and a member of the National Academy of Design, New York.

MELCHERS, Paul (1813–95). A German cardinal. He was born at Münster, Westphalia. First he studied law at Bonn, but after a few years of practice in his native town he turned to the ministry, for which he was prepared at Munich. In 1841 he was ordained priest and in 1857 was made Bishop of Osnabrück. In 1865 he was nominated Archbishop of Cologne by Pius IX. At the Vatican Council Melchers at first opposed the doctrine of infallibility, but afterward acknowledged it, when the majority decided in favor of it. He took a prominent part in the Kulturkampf, and thereby frequently came in contact with the government authorities, and was removed from office in 1876. He escaped to Maestricht (Holland) from where he administered his diocese for nearly 10 years, resigning in 1885. He then went to Rome, became Cardinal in 1885, and joined the Jesuits in 1892. He wrote: *Eine Unterweisung über das Gebet* (1876); *Die katholische Lehre von der Kirche* (1881); *Das Leben der allerseligsten Jungfrau und Gottesmutter* (1884); *De Canonica Diœcesium Visitatione* (1892).

MELCHIADES, měl-kī′ă-dēz. See Miltiades.

MELCHIOR, Charles Jean. See Vogué, C. J. Melchior, Marquis de.

MELCHITES, měl′kīts (MGk. Μελχίτης, *Melchitēs,* from Syr. *malkāyē,* royal, from *melek,* king). Originally a nickname given by the Monophysites in the fifth century to the Christians who remained orthodox in the patriarchates of Jerusalem, Alexandria, and Antioch. Since the thirteenth century, however, the name has been applied to the Christians of Eastern rite in Syria and Egypt who are in communion with Rome. They have had a patriarchate of their own, taking its title from Antioch, since 1744. Besides Damascus, there are 12 other dioceses subject to his authority, with between 300 and 400 priests and over 100,000 lay people. See Eastern Rite, Churches of; Uniates.

MELCHIZEDEK, or **MELCHISEDEC,** měl-kĭz′ĕ-dĕk (Heb. *Malki-sedek,* king of righteousness, or Zedek is my king). A personage introduced in Gen. xiv. 18 as "king of Salem" and "priest of the most high God." After Abraham's return from the successful pursuit of Chedorlaomer (q.v.), King of Elam, and his allies, which he had undertaken in order to rescue Lot, he was met by Melchizedek; the latter offered the patriarch bread and wine and blessed him; whereupon Abraham gave Melchizedek tithes from the spoil. Many scholars regard this story as a legend or a legendary elaboration of an historical tradition and think that this Midrashic character is indicated by the names Salem, 'Peace,' and Melchizedek, 'king of righteousness,' which seem to them symbolical. But it is generally admitted that the names of the invading kings are historical; those of the kings of the Pentapolis seem to be Amoritish. *Urushalimmu,* or 'the city of Salim,' is the name of Jerusalem in the Amarna tablets; Melchizedek may mean '(the god) Zedek is my king' and should be compared with Adonizedek (q.v.), 'Zedek is king,' another ruler of Jerusalem, and some scholars maintain that an early document has been used, that the reference to "Abram, the Hebrew," renders it probable that it was a foreign source, and that it is essentially historical, though they are willing to concede that it may have been worked over at a later time. In the Haggada Melchizedek is identified with Shem; the reference to Melchizedek in Psalm cx. 4 is late and obscure, but points to other conceptions current about this mysterious personage. In the Epistle to the Hebrews (vi. 20, vii. 1–21) he is taken as typifying Christ. Various other views arose with regard to Melchizedek. A small sect in the fourth century called after his name Melchizedekians taught that he was a power or incarnation of God greater even than Christ. Epiphanius says that some in his day believed that Melchizedek was the Son of God in human form.

MELCHORA, měl-kō′rȧ. See Rama.

MELCHTHAL, mĕlk′tăl, Arnold von. A legendary hero of the Swiss struggle for independence against Austria in the early part of the fourteenth century. Arnold was said to have killed the servant of an Austrian bailiff, who had come to Melchthal to seize the oxen of Melchthal's father, a well-to-do proprietor in Unterwalden. In revenge the Austrian put out his father's eyes. When Melchthal heard of his father's blindness he met his friends Fürst, of the Canton of Uri, and Stauffacher, of the Canton of Schwyz, on the banks of Lake Lucerne, and all three took an oath to do all in their power to liberate the three cantons from Austrian rule. This was in 1307, and the next year the mountaineers of the three cantons successfully waged war against the Austrians. The story is a myth. It is found in the *Chronicon Helveticum* of Ægidius Tschudi (1505–72), and was adopted by von Müller in his *History of the Swiss Confederation.*

MELCOMBE, měl′kŭm, George Bubb Dodington, Baron. See Dodington.

MELCOMBE REGIS AND WEYMOUTH, měl′kŭm rē′jĭs ănd wā′mŭth. A seaport of England. See Weymouth.

MELDE′NIUS, Rupertus. The real or more probably pseudonymous author of the *Paræenesis Votiva, pro Pace Ecclesiæ, ad Theologos Augustanæ Confessionis,* which appeared in Germany about 1630 without place of publication or date. It is a plea to the Lutheran theologians to lay aside their acrimonious controversy.

MELEAGER, měl′ĕ-ā′jĕr (Lat., from Gk. Μελέαγρος, *Meleagros*). In Greek legend, the hero of the Calydonian boar hunt. (See Calydonian Boar.) In the earliest-known form of

the legend, which is found in the *Iliad*, he is the son of Œneus, King of Ætolia, and Althæa, daughter of Thestius. When the Calydonian boar laid waste the land he gathered a band of heroes and, after a hard struggle and much loss of life, slew the monster. A strife arose between the Ætolians and the Curetes over the spoils of the hunt; the Curetes were led by his mother's brothers. Meleager led his people to victory, until he killed his mother's brothers. Althæa then cursed her son and prayed the Furies and gods of the lower world to punish him. The hero in anger withdrew from the fight and, knowing his fate, refused to return until the Curetes had actually stormed the town, when he yielded to the prayers of his wife and went forth to save his people, and met his death, according to one story at the hands of the Furies, according to another at the hand of Apollo. A later and more popular version introduced many alterations. When Meleager was seven days old the Fates told his mother that the child would live till a brand then blazing on the hearth should be consumed. Althæa thereupon quenched the brand, and put it in a chest. Later, on the news of the death of her brothers, she, in her grief and rage, put the brand again upon the fire, and the hero at once wasted away. This story appears in an ode of Bacchylides. Later still new features were introduced. The Calydonian Hunt brought together many heroes, among them the wild Arcadian maiden Atalanta, with whom Meleager fell in love. (See ATALANTA, 2.) She first wounded the boar, and received from her lover the head and hide. These the sons of Thestius, brothers of Althæa, in jealousy, took from her, and were killed by their nephew, whereupon Althæa allowed the brand to be consumed. Althæa was said to have killed herself in remorse, while the lamentations of his sisters and the women of Pleuron so moved the gods that they changed them into guinea hens (*μελεαγρίδες*), with the exception of the two sisters, Deianira, later the wife of Hercules, and Gorge. This story seems due to Sophocles.

The Calydonian Hunt was a favorite subject with the vase painters from early times, and on Greek and Roman sarcophagi; it was also taken by the great artist Scopas as the subject for one of the pediments of the temple of Athena Alea at Tegea. Fragments of these sculptures are now in Athens. A statue of Meleager, copied from a work of Scopas, is now in the Vatican at Rome, and a finer copy of the head and torso in the Fogg Art Museum of Harvard University.

MELEAGER (fl. c.60 B.C.). A Greek philosopher and epigrammatist, born at Gadara in Syria. As philosopher, he wrote *Menippean Satires*, imitated by Varro (q.v.), perhaps also a work (*Περὶ Δοξῶν*) giving a summary of the views of various philosophers. He compiled the first known Greek anthology, a collection called the Garland (*Στέφανος*), which contained epigrams by 40 authors, as well as 130 epigrams of his own, mostly of an erotic character. (See ANTHOLOGY, 1.) These are preserved in the later collection of Constantinus Cephalus, known as the *Palatine Anthology*. Consult: Symonds, *Studies of the Greek Poets* (London, 1893), chap. xxi; Ouvré, *Méléagre de Gadara* (Paris, 1894); Radinger, *Meleagros von Gadara* (Innsbruck, 1895); Pomeroy, *Meleager, etc.* (London, 1895); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

MELEAGER, STATUE OF. A celebrated marble in the Vatican, representing the hero with his dog and a boar's head. The statue belongs to the Imperial period and was found near the Porta Portese at Rome about 1500. From its pathetic intensity of expression it is supposed to be a copy of an original by Scopas.

MEL'EA'GRIS (Lat., from Gk. *μελεαγρίς*, sort of guinea fowl, named after *Μελέαγρος*, *Meleagros*, Meleager). One of the two genera of the family Meleagridæ, containing the American turkey (q.v.); but the term belonged originally to one of the guinea fowls (q.v.). See Colored Plate of PEACOCK.

MELEGNANO, mā'lā-nyä'nō (formerly *Marignano*). A town of northern Italy, 10 miles southeast of Milan (Map: Italy, B 2). Pop., 1911, 7151. It is famous for a great victory won by Francis I of France over the Swiss and Milanese, Sept. 13–14, 1515. The defeat at Melegnano did much to destroy the prestige of the Swiss pikemen, who for a long time had enjoyed the reputation of being the best soldiers in Europe. Francis accepted the honor of knighthood on the field from the Chevalier Bayard. After the battle Francis I made a treaty with the Swiss, which lasted until the French Revolution. A second battle was fought here June 8, 1859, between a French force of 16,000 men, under Marshal Baraguay d'Hilliers, and a somewhat larger body of Austrian troops, the latter being routed.

MELEGUETTA (mĕl'ĕ-gĕt'tä) **PEPPER.** See GRAINS OF PARADISE; GUINEA PEPPER.

MELE'NA, ELPIS. A pseudonym of Marie Espérance von Schwartz. See SCHWARTZ.

MELÉNDEZ VALDÉS, mā-lān'dāth vāl-dās', JUAN (1754–1817). A Spanish poet, born at Ribera del Fresno in Estremadura, March 11, 1754. He graduated in law at Salamanca, where he soon fell under the influence of the so-called French school of writers. In 1780 he won the prize of the Spanish Academy for an ode. Coming to Madrid in 1781, Meléndez there enjoyed the favor of the minister and author, Jovellanos, who appointed him to a chair at the University of Salamanca. In this intellectual centre he became the chief figure of the Salamancan circle of lyric poets, who played an important part in the regeneration of Spanish literary production. With his comedy, *Las bodas de Camacho*, he won a prize offered by the city of Madrid in 1784; but the play failed on the stage. The next year he published his first volume of collected poems, which marked a decided improvement over most of the poetry that had been written since the *siglo de oro*. Meléndez now entered upon a political career that was to lead to his ruin. At his own request, made a judge of the court of Saragossa in 1789, two years later he was promoted to the chancery of Valladolid and in 1797 was given a post at the royal court. In 1798 Meléndez's constant friend, Jovellanos, fell from favor, and both were involved. Meléndez himself was exiled for a while, but in 1802 was allowed to settle in Salamanca. Having identified himself with the endeavors of the Napoleonic government in Spain, he incurred the hatred which his countrymen felt for the *Afrancesados*, and on several occasions he nearly lost his life at the hands of the excited populace. With the end of Joseph Bonaparte's rule he had to leave Spain, and, going into exile in France, he died at Montpellier, May 24, 1817. During this last period of exile he prepared a final edition of his lyrics,

which did not appear, however, until 1820. Meléndez was one of the few genuine poets that Spain produced during the decadent period of the eighteenth century. Consult the life of Meléndez by Quintana, prefixed to the edition of his poems of Madrid (1820), and also published with Quintana's prose works in volume xix of the *Biblioteca de autores españoles* (Madrid, 1852), and see also the edition of his poems in the *Biblioteca*, vol. lxiii (ib., 1869), and E. Mérimée's essay on him in the *Revue Hispanique*, vol. i (Paris, 1894).

MELETIUS, mē-lē′shĭ-ŭs (Lat., from Gk. Μελήτιος). The dates of his birth and death are unknown. Bishop of Lycopolis in the Thebaid in the beginning of the fourth century and founder of the sect of the Meletians. According to Epiphanius, during the persecution under Diocletian and Maximinus, many Christians were led through torture to renounce their faith; afterward repenting of their sin, they repaired to the bishops to receive absolution and to be reconciled to the Church. Peter, Archbishop of Alexandria, was willing to receive the backsliders on their doing penance, but Meletius refused to have any intercourse with them until the close of the persecution. This caused a schism, and Meletius became the leader of the disaffected. He traveled through the patriarchate, ordaining and excommunicating according to his own will, obtaining many followers, and disregarding the protest of the Egyptian bishops. This proselyting tour was extended to Palestine. But in 325 the Council of Nicæa checked his career, compelling him to remain at Lycopolis as a mere titular bishop without active jurisdiction. He died soon after this. The Meletians afterward allied themselves with the Arians against Athanasius, continuing, however, a distinct sect until the fifth century.

MELETIUS OF ANTIOCH (?–381). A famous Greek ecclesiastic. He was born in the beginning of the fourth century at Melitene in Armenia Minor. His first important appointment was to the bishopric of Sebaste, but he soon resigned this and retired to Berœa (Aleppo) in Syria. In 360 he was chosen Bishop of Antioch. The church in that city was rent in twain by the Arian controversy, but Meletius, whose position was not well understood, was accepted by both parties. He was generally respected for his virtues, and the Arians believed him on their side. He disappointed their expectations, however, and the dispute raged more fiercely than ever. Meletius was several times banished and recalled. The Council of Alexandria sent representatives to Antioch to settle the dispute, but Lucifer (q.v.) of Cagliari by his hot-headed advocacy of the orthodox cause defeated the plan. Meletius died at an advanced age, while presiding over the Council of Constantinople, in 381. His body was taken to Antioch and buried with great honor. His funeral oration was pronounced by Gregory of Nyssa. A part of the inaugural discourse of Meletius at Antioch is printed in the fifth volume of Galland's *Bibliotheca Patrum* (Venice, 1765–81).

MELFI, měl′fē. A town in the Province of Potenza, Italy, 41 miles south of Foggia (Map: Italy, E 4). It is situated on one of the sides of the extinct volcano, Monte Vulture, 1591 feet above the sea. Frequent earthquakes have destroyed most of its ancient buildings; the cathedral, dating from 1155, and the castle founded by Robert Guiscard, in which the Norman rulers lived, alone remain. The town hall has a Roman sarcophagus among its relics. The soil of the vicinity is extremely fertile and produces grain, wine, and olives. Melfi is a very ancient city and is mentioned as early as the fourth century. It was the capital of Apulia at the time of the Norman occupation; was pillaged by Frederick Barbarossa in 1167; and in 1528 was captured by the French general Lautrec, who put to death thousands of its inhabitants. Pop. (commune), 1901, 14,649; 1911, 13,744.

MELGAREJO, měl′gȧ-rā′hō, MARIANO (1818–72). A Bolivian soldier and revolutionist, born of illegitimate parentage at Cochabamba. Poorly educated, he entered the army as a common soldier, but through daring and bravery achieved high rank and fame. Taking part in various revolutionary movements, he became a power in politics. In 1865 he headed a successful revolution against President Achá and, assuming the presidency, exercised dictatorial powers. He became unpopular at once and his rule of six years was very stormy. He crushed out a revolt under General Belzú at La Paz (1866), and made a treaty with Chile adjusting a boundary dispute. He was overthrown in 1871 by a revolution led by Agustín Morales and was forced into exile. While living in Lima he was killed in an altercation with his son-in-law, José Sanchez.

MELI, mā′lē, GIOVANNI (1740–1815). An Italian dialect poet, born at Palermo. He studied and practiced medicine and in 1787 was appointed professor of chemistry at the University of Palermo. Meli wrote a number of *canzonette*, odes, and epigrams, mostly in Sicilian dialect, and made collections of Sicilian proverbs. His best work appears in his *Bucolica*, the *Fata galante*, the *Origini di lu mannu*, the mock-heroic *Don Chisciotti e Sanciu Panza*, and the *Favole morali*, in virtue of which he may be styled a Sicilian La Fontaine. His *Poesie* are included in the *Parnaso siciliano* (Palermo, 1874) and the best edition of his works is by Alfano (Palermo, 1894). Consult: Natoli, *Giovanni Meli: studio critico* (ib., 1883); De Sanctis, "Giovanni Meli", in his *Nuovi saggi critici* (Naples, 1914); Biondilillo, "L'arte di G. Meli," in *Rivista d'Italia* (Rome, 1912).

ME′LIA′CEÆ (Neo-Lat. nom. pl., from *melia*, from Gk. μελία, ash tree; so called because the leaves resemble those of the ash). A family of mostly tropical dicotyledonous trees and shrubs, containing about 40 genera and 750 species, natives of warm climates. Many of the species possess bitter, astringent, and tonic properties; some are used in medicine; the seeds of some yield useful oil; some are poisonous; some yield pleasant fruits; and the wood of some is valuable. (See CARAPA; MAHOGANY.) The cape ash (*Ekebergia capensis*) deserves notice among the timber trees of this order. It has a trunk 2 feet in diameter and yields excellent tough timber, useful for many purposes. *Melia azedarach*, the familiar chinaberry tree of the southeastern United States, a tree about 40 feet high, with large bipinnate leaves and large spikes of fragrant flowers, a native of Syria and other parts of the East, has long been planted as an ornamental tree in the south of Europe and is now common in California and the southern United States. The fruit is of the size of a cherry, somewhat elongated, pale yellow, when ripe, containing a brown nut. The nuts are bored and strung for beads in Roman Cath-

olic countries, whence the tree is often called bead tree. It is also known as the pride of India and is sometimes erroneously called Persian lilac. The fruit is sweetish, and not poisonous, although generally reputed so. The bark of the root, which is bitter and nauseous, is used as an anthelmintic. The pulp of the fruit of the neem tree or margosa tree (*Melia azadirachta*) yields a bitter fixed oil. The mahogany and Spanish cedar are both members of this family.

MEL'IBŒ'A (Lat., from Gk. Μελίβοια, *Meliboia*). 1. A daughter of Oceanus, and mother, by Pelasgus, of Lycaon. 2. One of the daughters of Niobe.

MELIBŒ'US (Lat., from Gk. Μελίβοιος, *Meliboios*). A shepherd in the first eclogue of Vergil.

MELIBŒUS, TALE OF. A prose tale in Chaucer's *Canterbury Tales,* taken probably from the *Livre de Melibée et de Dame Prudence,* a French rendering of Albertano da Brescia's Latin work, *Liber Consolationis et Concilii.*

MEL'ICER'TES (Lat., from Gk. Μελικέρτης, *Melikertēs*). Son of Athamas (q.v.) and Ino (q.v.), who leaped with him (or his dead body) into the sea. Thereupon both were changed to gods, Ino to Leucothea and Melicertes to Palæmon, who was the guardian of tempest-tossed ships. The Romans identified Palæmon with their god of harbors, Portunus. Palæmon was worshiped at Corinth, especially in connection with the Isthmian Games. (See ISTHMUS.) Story declared that dolphins conveyed the body of Palæmon to the Isthmus; Sisyphus, uncle of Palæmon, conveyed it to Corinth and at the order of the Nereids established the Isthmian Games in his honor. At Tenedos children were sacrificed to Melicertes. It is said that the name is the Greek transcription of the Semitic Melkart (or Moloch), meaning "the king"; at any rate, many have regarded the cult of Melicertes as of Phœnician origin. The Greeks seem rather to have identified Hercules with the Tyrian Melkarth, and, if Melicertes is derived from the Phœnician word, it is more probable that it is the title which Phœnicians gave to the Greek divinity, misunderstood as a proper name by the Greek worshipers. Consult the article "Melicertes" in W. H. Roscher, *Lexicon der griechischen und römischen Mythologie,* vol. ii (Leipzig, 1890–97), and Robert Brown, *Semitic Influence in Hellenic Mythology* (London, 1898).

MEL'IC GRASS (from Neo-Lat. *Melica,* from It. *melica,* great millet, from Lat. *mel,* honey; connected with Gk. *μέλι, meli,* Goth. *milip,* honey, OHG. *mili-ton,* AS. *mile-dēaw,* Eng. *mildew,* literally honeydew), *Melica.* A genus of grasses of which nearly half of the species (about 30) occur in the United States. The others are found in temperate climates. They are perennials of small economic importance, with soft flat leaves and rather large spikelets in open or dense panicles. *Melica uniflora* is a common species growing in woods in Great Britain and Europe, and *Melica mutica* and *Melica nitens* in similar situations in the United States. Most of the American species are found from the Rocky Mountains westward.

MEL'ICOC'CA (Neo-Lat., from Gk. *μέλι, meli,* honey + *κόκκος, kokkos,* berry). A genus of trees or shrubs of the family Sapindaceæ, embracing five or six species, one of which, *Melicocca bijuga,* is a native of the West Indies, where it is cultivated for its fruit, known as the honeyberry, Jamaica bullace plum, and genip. It is from 20 to 40 feet high. The fruit is about the size and shape of a plum, yellow or green in color, with a very agreeable flavor. It has been successfully grown in southern Florida and California. The seeds are roasted and eaten like chestnuts. Other species of *Melicocca* yield eatable fruits.

MELIKOV, mĕl'yĭ-kôf, LORIS. A Russian soldier and statesman. See LORIS-MELIKOV.

MEL'ILITE (from Lat. *mel,* honey), or HONEY STONE. A complex mineral silicate of sodium, calcium, magnesium, aluminium, and iron, of uncertain formula. It crystallizes in the tetragonal system, has a vitreous lustre, and is white or of light shades of yellow, green, brown, and red in color. It occurs in various igneous rocks, certain varieties of which are known as *melilite basalts.* Melilite is found in Württemberg, Germany, in Italy, the Hawaiian Islands, and in several localities in the United States. It is also produced in furnace slags. The name is also given to a group of minerals including gehlenite.

MELILLA, mâ-lē'lyä. A Spanish presidio on the north coast of Morocco (Map: Africa, D 1). It is built on a rocky peninsula extending into the Mediterranean and ending in the Cape of Tres Forcas. It is protected on the land side by a circle of forts, and a citadel commands the harbor, which in 1902 was opened as a port of commerce. Pop., 1910, 39,852, including the Spanish garrison. Melilla was occupied without resistance by the Spaniards in 1496. The Kabyles have made several unsuccessful attempts to capture it, the last being made in 1893, after which a neutral zone was established outside the fortifications. In 1908 a new revolt was brought on by certain mining operations. In 1910 the Riffians having yielded, the Spanish government restarted the mines and undertook harbor improvements.

MEL'ILOT, MELILOTUS (Neo-Lat., from OF. *melilot,* Fr. *mélilot,* from Lat. *melilotos,* from Gk. *μελίλωτος, melilōtos, μελίλωτον, melilōton,* a kind of clover, from *μέλι, meli,* honey + *λωτός, lōtos,* lotus). A genus of plants of the order Leguminosæ, natives of the Old World and widely disseminated. The species have upright stems, bear trifoliate leaves resembling those of alfalfa, and small white or yellow flowers from early summer until frost. They often take possession of waste ground, especially if composed largely of clay. All the species contain an ethereal oil known as cumarin, which gives them a strong, peculiar, sweetish odor, especially when drying. The white melilot (*Melilotus alba*), also known as sweet, Bokhara, or tree clover, is a common weedy biennial from 3 to 6 feet high, which is cultivated as a honey plant, and also to some extent for forage. For plowing under as green manure it is of some importance, especially upon heavy soil. Its roots perforate the substratum, and when they decay leave drainage tubes. In this way it may be used two or more years before being turned under as green manure. Another species which has become naturalized in the United States is the common yellow melilot (*Melilotus officinalis*), an annual growing 2 to 3 feet high and occurring in swamps and wet meadows. Its flowers are used in the manufacture of perfumery. The blue melilot (*Melilotus cœrulea* or *Trigonella cœrulea*), a native of northern Africa, is cultivated in Europe, and was formerly much used in medicine as an anodyne.

Melilotus is used for pasturage and for hay.

The green crop, cut when in bloom, has the following average percentage composition: water, 76.5; protein, 2.8; fat, 0.4; nitrogen-free extract, 12.1; crude fibre, 6.6; and ash, 1.6. Melilotus must be cured with care, as too much sun causes shedding of the leaves. At first animals commonly refuse to eat it, but later become used to it; its hay is generally used for home consumption. It is not as salable as other kinds of leguminous hay. Consult: *United States Department of Agriculture, Farmers' Bulletin 485* (Washington, 1912), and *Ohio Agricultural Experiment Station Bulletin 244* (Wooster, 1912). See CUMARIN.

MEL'ILO'TUS. A genus of Leguminosæ (pea family), commonly called sweet clover, because the leaves are fragrant in drying. There are about 20 species, natives of Europe, Africa, and Asia, three of which have become naturalized in the United States, occurring as weeds in waste places and along roadsides. They are *Melilotus alba* (white sweet clover), *Melilotus officinalis* (yellow sweet clover), and *Melilotus indica*, the common names referring to the color of the flowers. The white sweet clover is much the commonest, is coming into use as a forage plant, and is also an excellent bee plant. See MELILOT.

MELIN, mâ-lēn', KARL ALFRED (1849–). A Swedish author, born at Utö and educated at Stockholm and Upsala (Ph.D., 1875). He published several collections of poems which became popular, among them *Humleplockningen* (1882), *Princessen och svennen* (1885), a fairy poem in the style of old country ballads, *Dikter* (1888), *Skärgårdsbilder* (1891), and a new collection of *Dikter* (1904), all of which show lyric talent. In the field of drama he wrote *Vid Breitenfeld* (1893) and *Snöhvit* (1897). His stories *De svarte vikingarnas saga* (1910) and *Tjuvbandet i Dagö skärgård* (1911) are favorites among young people. In 1898 Melin became a member of the Academy and in 1903 a member of the committee for the award of the Nobel prize.

MÉLINE, mâ'lēn', FÉLIX JULES (1838–). A French statesman. He was born at Remiremont, studied law in Paris, and in 1860 was admitted to the bar. His earliest political activity was in the democratic opposition to the Empire. In 1871 he refused an election to the Commune, but in the following year was returned to the National Assembly, where he upheld Thiers and became a member of the Republican Union. For a few months in 1879 he was Undersecretary of State in Jules Simon's cabinet, and in 1880 made himself prominent by his able advocacy of the policy of protection. From 1883 to 1885 he was Secretary of Agriculture in Ferry's cabinet. Three years afterward, as President of the Chamber of Deputies, Méline carried through his great protective measure which went into force in 1892. Méline refused to form a ministry in 1893; undertook the management of the *République Française*, which he carried on until 1896; and in the winter of 1894 was reëlected President of the Chamber. In 1896 he was made Prime Minister by Félix Faure and again took the portfolio of Agriculture. The May elections of 1898 forced the cabinet out, however, and Méline returned to the Chamber of Deputies. There he acted as the leader of the Conservative branch of the Republican party in opposition to the Radical wing, which, with the aid of the Socialists, had come into power under Waldeck-Rousseau. In 1899 he was a candidate for the presidency of France. During the Dreyfus affair he was considered as an opponent of the accused captain and for that reason lost his political influence. After 1903 he was a member of the Senate from the Department of the Vosges. He founded the Society for Agricultural Merit and wrote *Le retour à la terre et la surproduction industrielle* (3d ed., 1905).

MÉLINGUE, mâ'lăng', ETIENNE MARIN (1808–75). A French sculptor and actor, born at Caen. He worked as a sculptor on the ornaments of the church of the Madeleine, Paris, at an early age, but soon went on the stage. After playing with a touring company he attained distinction at the Porte St. Martin in *Les sept infants de Lara, Les mousquétaires, La reine Margot, Monte Cristo, Fanfan la tulipe, La dame de Montsoreau*, and *Le Bassu*. In *Benvenuto Cellini* he displayed his talents both as an actor and sculptor. His sculptures include: "Francis I," "M. Duprez as William Tell," "Rabelais," "Satan," "Histrion," and "Œneïs." His wife was the actress Théodorine Thiesset (1813–86).

MEL'INITE. Fused picric acid (melting point 122.5° C.), used in France as a bursting charge for armor-piercing shells, it having been found by Turpin that such a charge could be caused to detonate violently by the detonation of a primer of guncotton in contact with it. In England this bursting charge, made as described above, was styled lyddite. Turpin's original melinite (1886) consisted of picric-acid crystals cemented into cartridges by collodion. See EXPLOSIVES.

MELIS'MA (Neo-Lat., from Gk. μέλισμα, song, from μελίζειν, *melizein*, to sing, from μέλος, *melos*, song). A term applied in modern music to melodic groups of notes executed upon one syllable of a word. It is particularly employed to give Oriental color. The songs of Rubinstein dealing with Oriental subjects (*Der Asra*), Verdi's *Aïda*, and Goldmark's *Königin von Saba* offer fine examples of melismatic writing.

MELIS'SA. A genus of plants. See BALM.

MELISSA. 1. In Greek mythology, a nymph by whom the use of honey was said to have been discovered, whence bees were called μέλισσαι. The actual derivation is from μέλι, honey. 2. The daughter of Procles and wife of Periander, who, in jealousy, killed her by a blow while she was with child. 3. In Ariosto's *Orlando Furioso*, a kindly fairy who protects Rogero and Bradamant (q.v.).

MEL'ITA. The Latin name of Malta (q.v.).

MEL'ITO, SAINT (Lat., from Gk. Μελίτων, *Melitōn*). Bishop of Sardis, in the second half of the second century. He is mentioned by Eusebius as an upholder of Catholic orthodoxy, and is known to have written many works, only fragments of which are extant. Among those mentioned by Eusebius are an *Apologia* addressed to Aurelius concerning the paschal controversy, and *Eclogæ*, containing the first Christian catalogue of "the books of the Old Covenant." Consult: Otto, *Corpus Apologetarum Christianarum Sæculi Secundi*, vol. ix (Jena, 1842–72); Adolf Harnack, *Texte und Untersuchungen*, vol. i (Leipzig, 1882); the translation in the *Ante-Nicene Fathers*, vol. viii; Adolf Harnack, *Geschichte der altchristlichen Literatur* (Leipzig, 1893).

MELITOPOL, mā'lê-tŏ'pŏl-y'. A town in the Government of Taurida, south Russia, situated

on the river Molótchnaya, 150 miles north-northeast of Simferopol (Map: Russia, E 5). It has a Gymnasium and a Realschule and carries on some trade in agricultural products and salt. It was founded in the beginning of the nineteenth century. Pop., 1897, 15,120; 1910, 18,519.

MEL'ITOSE and **MEL'ITRI'OSE.** See SUGARS.

MELITZASE. See ENZYME.

MELK, HEINRICH VON. See HEINRICH VON MELK.

MEL'KARTH. A Phœnician divinity identified by some with the Greek Melicertes (q.v.). He was the special god (Baal, q.v.) of Tyre, where he had a magnificent temple. He represents the old Chaldæan sun hero and god of navigation. Because of his adventures, strength, and labors the Greeks identified him with Hercules (q.v.); on later Greek coins Baal-Melkarth is frequently represented as Hercules.

MEL'LEN, CHARLES SANGER (1851–). An American railroad president, born at Lowell, Mass. After a public-school education he entered railroad work as a clerk in the cashier's office of the Northern New Hampshire Railroad in 1869, and did other clerical work on that railroad and the Central Vermont until 1880. He was assistant to the manager (1880–81), auditor (1881–83), superintendent (1883–84), and general superintendent (1884–88) of the Boston and Lowell and the Concord railroads; served as general purchasing agent (1888), assistant general manager (1888–89), and general traffic manager (1889–92) of the Union Pacific System; and for four years was general manager of the New York, New Haven, and Hartford Railroad. After serving as president of the Northern Pacific from 1896 to 1903, he was head of the New Haven in 1903–13 and of the Boston and Maine in 1910–13. He incurred much criticism because of the alleged effort which the road made to secure a monopoly of transportation lines in New England, and because of a defectiveness of organization, administration, and equipment which made possible an unusual succession of wrecks. In 1915 he announced his retirement from all business interests.

MELLIN DE SAINT-GELAIS. See SAINT-GELAIS, MELLIN DE.

MELLO, mâl'lô, CUSTODIO JOSÉ DE (c.1845–1902). A Brazilian admiral. Having entered the navy and attained the rank of admiral, he came into political prominence, upon the establishment of the Republic, as a deputy in the national Congress. Attached to the federalist group, he opposed the dictatorial policy of President Fonseca and aided in the latter's overthrow (1891). He then became Minister of Marine, but when President Peixoto's actions indicated his intention to maintain himself in the position of a dictator, Mello resigned his position, issued a long pronunciamento (Sept. 6, 1893) embodying the charges against the administration, and took command of the revolt of the navy. The revolt had little chance of success, for it was not supported by an army. The navy bombarded Rio de Janeiro from time to time, but was prevented from doing much damage because of the opposition of the Powers, especially the United States, which refused to recognize the rebels as belligerents or allow any interference with commerce. Leaving the fleet, Mello went south, hoping to effect a conjunction with the revolt under Gumercindo Saraiva in Rio Grande do Sul. Having conferred with the provisional government at Desterro, Mello conducted a successful expedition against Paranaguá, but he failed to take sufficient reënforcements back to Rio de Janeiro to bring success to the rebel cause. When he received news that Admiral Saldanha da Gama (q.v.) had surrendered the navy at Rio de Janeiro to Peixoto's new fleet Mello gave himself up to the Argentine authorities in April, 1894. He maintained that his sole purpose was to purify the Republic, but in 1901 he was suspected of being implicated in an Imperial plot and was arrested and confined on the island of Cabras.

MELLO, or **MELO,** FRANCISCO MANOEL DE (1611–66). A Portuguese poet and historian, born at Lisbon of a noble family and there trained in the humanities by the Jesuits. He became an army officer, first serving with the Spanish fleet, and for 10 years having a varied experience in Spain, Portugal, and Flanders in many positions of importance, and being commissioned to write the *Historia de la guerra de Cataluña,* a war in which he took part. Later we find him in the Portuguese service when his native country asserted its independence. Despite his loyalty, he was imprisoned by order of John IV on a false charge of attempted assassination made by the jealous Count of Villa Nova, and, after an incarceration that lasted from 1644 to 1653, he was banished to Brazil. There he remained six years, until the death of the monarch permitted his return to Portugal. From 1659 to 1663 he spent most of his time in Lisbon, where he frequented the Academia dos Generosos, whose president he was for five elections. Mello is one of the best Portuguese poets of the seventeenth century, commendably free from most of the mannerisms of the time. His numerous poetical compositions, first collected under the title of *Las tres musas de melodino* (1649), which contains only his Spanish verses, were later published as *Obras métricas* (Lyons, 1665) and included his Portuguese poems. These latter reveal him as a true poet and are not without popular and patriotic elements. Of Mello's other works in Portuguese may be mentioned certain prose compositions: the *Hospital das lettras,* a dialogue containing much sound literary criticism; the *Apologos dialogaes* (1721); and the *Carta de guia de casados* (1651), in which the author gives a picture of Portuguese family life of the period. Not the least meritorious of Mello's productions is the previously mentioned historical work, *Historia de los movimientos, separación, y guerra de Cataluña* (1645), which is in Spanish. An historical treatise in Portuguese is the *Epanaphoras de varia historia portugueza* (1660).

Bibliography. The *Obras metricas de D. Francisco Manoel* and his *Obras* in general (Lyons, 1665); the verse comedy *Auto do Fidalgo Aprendiz* in the *Musas,* and also separately in 1676, cf. T. Braga in his *Theatro portuguez no seculo XVII* (Lisbon, 1870–71); also I. F. da Silva, *Diccionario bibliographico portuguez* (ib., 1858 et seq.); P. Chasles, *Voyages d'un critique* (Paris, 1869); Branco in the edition of the *Carta de guia de casados* (Oporto, 1873); Edgar Prestage, *Don Francisco Manuel de Melo, esbozo biografico* (Coimbra, 1914). For a discussion of Mello's prose style: Melo, *Carta de Guía de Casados,* edited by C. Castello Branco (Lisbon, 1898); Georges Cirot, in *Mariana, historien* (Bordeaux, 1905); Melo, *His-*

toria de los movimientos, separación y guerra de Cataluña, edited by J. O. Picón (Madrid, 1912).

MELLONE, mĕl-lōn′, SYDNEY HERBERT (1869–). An English Unitarian educator, son of an Irish clergyman. He was educated at University College, London, at Edinburgh University, and at Manchester College, Oxford. From 1898 to 1909 he was minister of the First Presbyterian (Unitarian) Church, Holywood, County Down, and in 1909–11 of St. Mark's Chapel, Edinburgh. He then became principal of the Unitarian Home Missionary College, Manchester. He contributed to Hastings, *Encyclopædia of Religion and Ethics* and published: *Studies in Philosophical Criticism and Construction* (1897); *Leaders of Religious Thought in the Nineteenth Century* (1902); *Text Book of Logic* (1903; 6th ed., 1913); *Elements of Psychology* (1907; 2d ed., 1910), with Miss Margaret Drummond; *Laws of Life* (1908); *The Immortal Hope* (1911).

MELLONI, mĕl-lō′nē, MACEDONIO (1798–1854). An Italian experimental physicist, famous for his researches on the subject of radiant heat. He was born in Parma. In 1824 he was called to the chair of natural philosophy in the University of Parma. Banished from Italy, he was a professor in the Department of the Jura until his return in 1839, when he became director of the cabinet of arts and trades in Naples. He was appointed by the King of Naples director of the meteorological observatory on Mount Vesuvius (1839). In the same year he was elected a member of the Royal Society. He discovered the existence of heat in lunar light, and was a pioneer worker in the field of radiant heat. Realizing the identity of radiant heat and light, he investigated the transparency of various substances to radiant heat and first used the word diathermancy (q.v.) to express this property. He successfully developed the use of the thermopile for heat measurements. Melloni published numerous memoirs on various topics in natural philosophy, and the unfinished book *La thermochrose, ou la coloration calorifique* (1850). Consult biographical sketch by J. Lovering in *Proceedings of the American Academy of Arts and Sciences*, vol. iii (1857), and S. P. Langley, *Address before American Association for the Advancement of Science* (1888).

MEL'LON INSTITUTE OF INDUSTRIAL RESEARCH. An integral part of the University of Pittsburgh (q.v.), but possessing an endowment of its own, totaling over half a million dollars. The system of coöperation between science and industry, founded by Robert Kennedy Duncan, forms the basis of the work of the institute. According to this system, an individual or a company having a problem requiring solution establishes a fellowship by contributing to the institute a definite sum of money for a period of not less than one year; the money is used to pay the salary of the man or men selected to carry out the investigation desired, while the institute furnishes all necessary laboratory facilities and guidance in the work. The results obtained become for the time being the property of the donor of the fellowship. The present director is Dr. Raymond F. Bacon, and at the present time 40 research chemists are engaged in the study of 23 different industrial problems. In 1915 a department of research and graduate instruction in pure chemical science was established within the institute and placed under the direction of Dr. M. A. Rosanoff (q.v.). The expenditure for salaries and maintenance amounted to over $150,000 in 1914. The institute occupies a building specially designed for its needs and erected at a cost of $350,000.

MEL'MOTH, COURTNEY. The pen name of the English miscellaneous writer Samuel Jackson Pratt (q.v.).

MELO. See MELLO.

MELOCRINUS, mĕ-lŏk′rĭ-nŭs. A genus of crinoids with large, melon-shaped, many-plated calyx and biserial arms, found in the Silurian of Europe and especially in the Devonian of eastern North America. It furnishes some of the most beautiful fossil forms, as *Melocrinus nobilissimus*. It was formerly known as *Mariacrinus*. See CRINOIDEA.

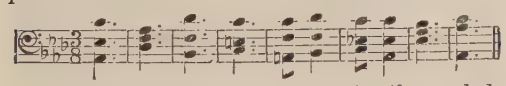
MELO'DEON. The early American organ, in which an exhaust or suction bellows draws the air inward through the reeds. About 1836 J. Carhart made a number of improvements in the melodeon, and upon the application of still further inventions by E. P. Needham and E. Hamlin the instrument became widely popular. The supply of wind for the reeds is obtained by means of a pair of treadles worked by the performer, and the reeds themselves are controlled by stops and slider mechanism. The tone of the instrument has been steadily improved, and now successfully imitates a number of orchestral instruments. See HARMONIUM; ORGAN.

MELODRAMA, mĕl'ō-drä′mȧ (from Gk. *μέλος, melos*, song + *δρᾶμα, drama*, action, play). Properly a half-musical drama, or a dramatic performance in which the dialogue is interspersed with music. Rousseau's *Pygmalion* is commonly cited as the first French melodrama, and some of the earlier English operas are of this type. In Italy, however, the name was first applied to the opera by its inventor, Ottavio Rinuccini, near the end of the sixteenth century. In Germany the term has been particularly used to designate a declamation with instrumental accompaniment (as distinguished from the *recitative*, which is characteristic of the regular *opera*, q.v.). The object of the music is to intensify the emotions evoked by the spoken words, which may be a poem like Schiller's *Lied von der Glocke* or a regular drama; but the æsthetic value of the practice has been much disputed and it has almost fallen into disuse in serious works. At present the word is commonly used to designate the type of play which depends for its interest on sensational incidents and extravagant situations rather than on a truthful representation of life. This use of the word appears to have originated in France, where, in the latter part of the eighteenth century, it came to be applied to the style of popular tragedy in which were presented the conventional types of stage villains, persecuted innocent heroines and their kind, along with elements of comedy as well as of music and dancing, and with a regularly happy ending in deference to well-known popular preferences in this respect.

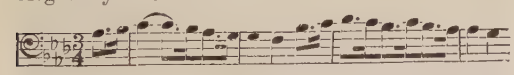
MEL'ODY (Lat. *melodia*, Gk. *μελῳδία*, from *μέλος, melos*, song + *ᾠδή, ōdē*, song). A succession of tones constituting a musical phrase. That this succession be pleasing is not absolutely essential. Whereas harmony considers all the tones sounded simultaneously in the various voices or parts, melody primarily considers the various tones of only a single voice or part, i.e., in relation to every preceding or succeeding tone. Broadly speaking, it has been stated that a

melody rising in pitch corresponds to the more violent emotions, such as determination, desire, longing, striving; while a melody falling in pitch corresponds to the more passive states, as resignation, contemplation, sadness. But in reality a melody can never be considered absolutely by itself. The character of every musical phrase is determined by a combination of three vital and fundamental elements, melody, harmony, and rhythm, each of which affects the others. This is easily seen by examining any of Wagner's leading motives, where the same melodic phrase is rendered capable of great emotional variety by changes in the harmonic or rhythmic elements. In fact, the same succession of notes may sound noble or trivial according to the choice of refined or commonplace harmonies supporting it. There is an endless variety in the succession of musical tones forming a melody, some being so easily intelligible that even people of little musical taste can distinguish them, as is the case with some popular dance forms. The term "melody" is by no means synonymous with *cantilena*, as many seem to think. The former term is infinitely broader than the latter. No special course in melody is given in conservatories, although in recent years several theoretical treatises on the subject have appeared. The pupil almost unconsciously acquires the practical elements of melodic formations while pursuing the study of harmony and the higher forms of composition.

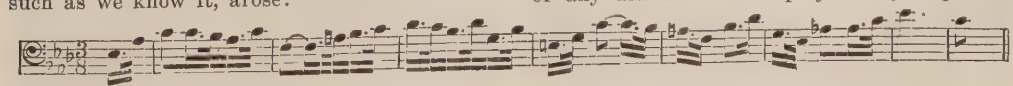
Upon any harmonic basis a practically endless number of melodies may be written, and, vice versa, all melodies can be reduced to a simple harmonic basis. To illustrate this let us take the opening theme of the famous andante of Beethoven's Fifth Symphony. The harmonic plan is as follows:



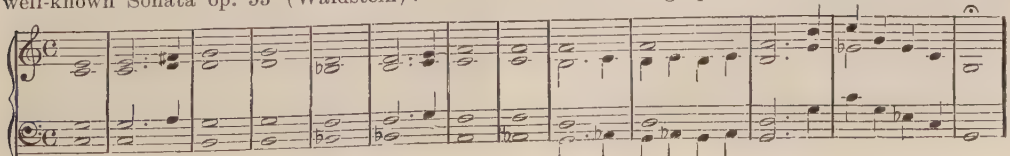
Upon this basis Beethoven wrote the melody originally in this form:



When he came to write the full score the master felt that his theme was commonplace. By retaining the harmonic basis and only altering the melodic intervals the following noble melody, such as we know it, arose:

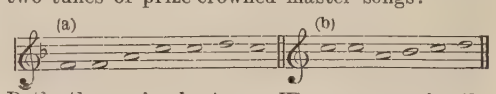


The following is a reduction to the simplest harmonic basis of the principal themes of the well-known Sonata op. 53 (Waldstein):

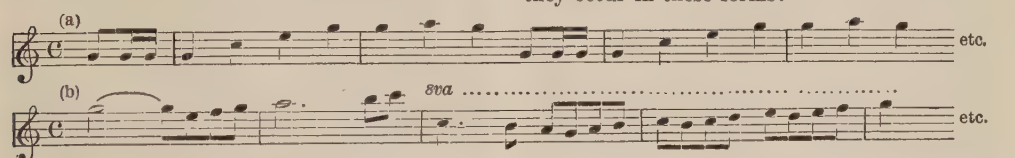


Comparing this with the original, it will be seen how Beethoven constructs his melody. The reader should examine in the score the successive melodic changes which the theme of the third example undergoes in the course of the movement. Wagner in the prelude to *Die Meistersinger* reduces the Mastersinger's motive and the second theme from Walter's Prize Song to a common harmonic basis (slightly different from that of either of the themes in its original form), and thus is enabled to make both themes resound simultaneously on different instruments. (Piano score, p. 7.) Without making the slightest alteration in Bach's C major prelude from the *Well-tempered Clavichord*, Gounod writes an additional melody to the harmonic basis, which has become famous as Gounod's *Ave Maria*.

The following examples show how a mere succession of intervals can be changed by the infusion of the rhythmic element into a distinctive melody. In Wagenseil's book, *Von der Meistersinger holdseligen Kunst*, we find the following two tunes of prize-crowned master songs:



Both these simple tunes Wagner uses in the Processional March of *Die Meistersinger*, where they occur in these forms:



All melody can be conceived as a rhythmic evolution from a succession of intervals in notes of equal value, and, vice versa, all melodies can be reduced to a monotonous succession of intervals. It is the composer's individual genius that imparts its character to each melody. Within recent years several theorists have attempted a scientific exposition of the principles of melodic formations with practical hints towards their invention. Among the best works of this kind are: Bussler, *Elementarmelodik* (Berlin, 1879); Riemann, *Neue Schule der Melodik* (Hamburg, 1883); E. Cremers, *L'Analyse et la composition mélodique* (Paris, 1898).

MEL'OGRAPH (from Gk. μελογράφος, *melographos*, song writing, from μέλος, *melos*, song + γράφειν, *graphein*, to write). A mechanical device for making a record of music as it is played on a pianoforte. It is supposed to reproduce on paper, by means of characters, all the notes struck on the keyboard (with their duration), so that there may be a readable record of any music which a player may improvise.

Since 1747 numerous melographs have been patented, but with the exception of Fenby's "electric melograph" or "phonautograph" none

has given lasting satisfaction. In the phonautograph under each key is placed a stud; when the key is depressed an electric connection is formed, and the particular note struck and its duration are recorded on paper. All these devices were superseded by the invention of Edison's phonograph (q.v.).

MELOIDÆ, mē-lō'ī-dē. A family of moderate-sized beetles, with the head constructed behind the eyes, the prothorax at its hinder edge narrower than the elytra, the legs long, with front haunches large and conical, the feet with the last segment but one not bilobed, and the claws split to the base. The larvæ of several undergo metamorphosis (q.v.); and most of the species exude an odorous oil, highly serviceable in medicine. Consult: Le Conte, "Synopsis of the Meloids of the United States," in *Proceedings of the Academy of Natural Science,* vol. vi (Philadelphia, 1853); Horn, "Revision of the Meloidæ of the United States," in *Proceedings of the American Philosophical Society,* vol. xiii (ib., 1873); id., "Studies among the Meloidæ," in *Transactions of the American Entomological Society* (ib., 1885).

MEL'ON (OF. *melon, millon,* Fr. *melon,* from Lat. *melo,* for *melopepo,* from Gk. *μηλοπέπων, mēlopepōn,* melon, from *μῆλον, mēlon,* apple + *πέπων, pepōn,* melon, so called from the shape). The plants and fruits of *Cucumis melo* and *Citrullus vulgaris* of the family Cucurbitaceæ. See MUSKMELON; WATERMELON.

MELON CATERPILLAR MOTH. See MELON INSECTS.

MEL'ONECHI'NUS (Neo-Lat., from Gk. *μῆλον, mēlon,* apple + *ἐχῖνος, echinos,* the sea urchin). A fossil sea urchin found in the Sub-Carboniferous rocks of North America and Europe. The test is melon-shaped with vertical grooves, is 4 to 6 inches in diameter, and made up of numerous thick hexagonal or pentagonal plates that are regularly arranged in vertical series and that are covered by minute tubercles and small needle-like spines. Large slabs of limestone on the surfaces of which are several finely preserved specimens of this sea urchin have been obtained from the vicinity of St. Louis, Mo. See ECHINODERMATA; SEA URCHIN.

MEL'ON INSECTS. Most of the insects which attack melons also feed upon certain other cucurbitaceous plants. Thus, the squash-vine borer (*Melittia ceto*) also bores in the stems of melons. The striped squash beetle (*Diabrotica vittata*) also feeds upon the leaves of melons, as does the cucumber flea beetle (*Crepidodera cucumeris*). The melon caterpillar (*Margaronia hyalinata*) is a widely distributed insect found through the greater part of North and South America, and is particularly destructive in the southern part of the United States. The caterpillars of the first generation feed upon the leaves and those of the second generation eat into the fruit of melons, cucumbers, and pumpkins. The wings of this moth are pearly white with a peculiar iridescence, are bordered with black, and measure about an inch from tip to tip. A similar and closely related caterpillar, the larva of *Margaronia nitidalis,* also feeds in the fruit of melons and cucumbers. Poisoning the foliage with some arsenical mixture to destroy the larvæ of the first generation is the standard remedy. The melon plant louse is perhaps the most destructive insect enemy of this plant. This insect has a wide range of food plants, but is an especial enemy of melons, and feeds on the undersides of the leaves. Underspraying with a kerosene-soap emulsion is the only remedy in large fields, but in small gardens carbon disulphide may be used under inverted tubs or paper coverings. See Colored Plate of MOTHS, AMERICAN.

MELONITES, mĕl'ō-nī'tēz. See MELONECHINUS.

MEL'ON TREE. See Plate of PAPAW.

ME'LOS (Lat., from Gk. Μῆλος), or MILO. The southwesternmost island of the Cyclades in the Ægean Sea, about 70 miles northeast of Crete and 65 miles east of the Peloponnesus (Map: Greece, Ancient, D 3). It is 14 miles long and 8 broad, with an area of 52 square miles, and has on its northern coast one of the best and safest natural harbors in the Levant. The island is crescent-shaped and seems to be part of the rim of the crater of an old volcano. The highest eminence is Mount St. Elias (2539 feet), in the southwestern part. The island shows many traces of its volcanic character and contains hot mineral springs and considerable deposits of sulphur. The soil is fertile and produces good crops of grain, especially barley, as well as wine and oil. Salt, gypsum, and millstones are exported. The chief town is Plaka, in the northern part of the island near the site of the ancient capital, Melos, of which extensive remains are to be seen. Near the sea the ground is marshy, and the air is unwholesome in summer. In prehistoric times the island seems to have been of some importance, on account of the obsidian found in its rocks, used in the Stone age for knives and arrowheads. The chief settlement was on the northeast coast near the modern Phylakopi, where are remains of three successive towns, extending from the Stone age to the end of the Mycenæan period. There are traditions of Phœnician occupation at a later time, but during the classical period Melos was inhabited by Dorians, and during the Peloponnesian War was one of the few islands not in the Athenian League. Though the inhabitants were willing to remain neutral, the Athenians in 416 B.C. seized the island, killed the men and sold the women and children into slavery. With the fall of Athens, however, the Athenian colonists were expelled by Lysander, and the former inhabitants were brought back so far as possible. Melos fell successively under the dominion of the Romans, the Byzantine emperors, Venice, and the Turks; it is now a part of Greece. During the later classical period the island evidently enjoyed considerable prosperity and was enriched with many works of art, some of which have been recovered from time to time. Notable among these are the fine "Poseidon" in the National Museum at Athens, the Asclepius now in the British Museum, and especially the "Venus of Milo," discovered in 1820 by a peasant, and now one of the chief treasures of the Louvre. From 1896 to 1899 excavations were conducted on the island by the British School at Athens, on the site of the ancient town of Melos, which led to the discovery of the hall of the "Mystæ," or "Initiated," and some foundations at the site of the ancient capital, near the modern village of Klima on the great bay. A theatre of Roman date, parts of the walls of the town, and houses of Greek times were also discovered. The chief result, however, was the recovery of the prehistoric settlements at Phylakopi, with a wealth of early pottery and some very interesting frescoes.

Bibliography. The reports of the excavations may be found in the *Annual* of the British School at Athens, vols. ii–v (London, 1897–1900), and the *Journal of Hellenic Studies*, vols. xvi–xix (ib., 1896–99); "Excavations at Phylakopi," in *Hellenic Society, Supplementary Papers*, vol. iv (London, 1904); *Annual of the British School at Athens*, vol. xvii (London, 1910–11). See VENUS OF MELOS.

MELOS (Neo-Lat., from Gk. *μέλος*, song). A musical term denoting the continuity of the melodic outline in any single movement of a composition. A symphonic movement, e.g., consists of several themes complete in themselves. In the movement, however, they do not appear as so many independent musical phrases with a full cadence, but follow one another in a certain order, one leading either directly or by means of a transition passage into the next, so that their connection, unbroken by any full cadence, forms a continuous melodic chain from the first bar to the last. This chain or aggregate of melodic phrases constitutes the *melos* of the movement. The term "melos" was first used in this sense by Wagner in his theoretical works. Every act of his musical dramas resembles a symphonic movement insomuch that the melodic outline is never interrupted by a full cadence. The leading motives are treated and developed exactly like the themes in a symphony. Wagner is, therefore, justified in speaking of his "endless melody." In the opera every number closes with a full cadence. An act consists, therefore, of a collection of several numbers, each complete in itself, having no connection whatever with the preceding or following number. Although each number has its melos, the act can have none, and consequently no artistic unity, because the fundamental principle of unity is continuity. See also LEITMOTIV; MUSICAL DRAMA; RECITATIVE.

MELO'SA. A Chilean plant. See MADIA.

MELOZZO DA FORLÌ, mâ-lŏt'sô dȧ fôr-lē' (c.1438–94). An Italian painter of the early Renaissance, born at Forlì. He was a pupil of Piero della Francesca, who was then at the height of his fame, and worked with him in the castle of Urbino for Duke Federigo di Montefeltro. Melozzo was also introduced to the notice of Pope Sixtus IV and became a favorite painter. For this Pope and his nephew, Cardinal Riario, he executed his two great frescoes, "An Audience of Sixtus IV" for the Vatican Library, and an "Ascension" for the cupola of Santi Apostoli. The first of these has been transferred to canvas and is in the Vatican Gallery; the latter is in fragments, the figure of Christ being in the Quirinal and "Angels Making Music" in the inner sacristy of St. Peter's. The latter, with their majestic forms, glowing vitality, and rapt personality, are among the most exquisite examples of early Italian art. The whole work shows that Melozzo understood foreshortening, a part of perspective then little studied. His "Pesta Pepe" fresco, in the Pinacoteca at Forlì, representing an apothecary's apprentice pounding herbs, also furnishes an example of his strong feeling for tactile values and movement. The series of fine frescoes representing "Prophets and Angels" and the "Entry into Jerusalem" for the Casa Santa at Loretto were executed after his designs almost entirely by Palmezzano. Many other paintings are now doubtfully attributed to him, notably the fresco of "The Arts and Sciences" for the ducal library at Urbino, portions of which are in London and Berlin, in which he is thought to have collaborated with Joos van Ghent. Consult: A. Schmarzow, *Melozzo da Forlì* (Stuttgart, 1886); Bernhard Berenson, *Central Italian Painters of the Renaissance* (New York, 1903); Ricci, *Melozzo da Forlì* (Rome, 1911); A. Schmarzow, *Joos van Ghent und Melozzo da Forlì* (Leipzig, 1912).

MELPOMENE, mĕl-pŏm'ĕ-nē (Lat., from Gk. Μελπομένη, the singing one, pres. pt. of *μέλπεσθαι*, *melpesthai*, to sing). In Grecian mythology, one of the nine muses. When to the individual muses specific functions were assigned, Melpomene was called the muse of tragedy. In ancient art she was represented with a mask in her right hand and a roll of a part of a play in her left. See MUSES.

MEL'ROSE. A village of Roxburghshire, Scotland, on the Tweed, at the foot of the Eildon Hills, 37 miles southeast of Edinburgh (Map: Scotland, F 4). It is a popular resort with a hydropathic institute. It is noted for the remains of its Cistercian abbey, celebrated in history and literature, and the finest Gothic ruin in Scotland. Its erection dates from 1326, after the destruction by the English in 1322 of the Abbey of the Virgin Mary built by David I between 1126 and 1146 at Old Melrose on a promontory overlooking the river 2 miles to the northeast. The abbey was built from a fund supplied by King Robert Bruce and his son David II and was not finished until the middle of the sixteenth century. It was much mutilated and despoiled by the English in 1385 and in 1545. The present remains are the major portions of the abbey church, the choir, the transept, part of the nave, and the southern aisle with its eight small chapels, and fragments of the cloister, a square of 150 feet. The church is 258 feet long, width of transept 115 feet, height of central square tower 84 feet. It is a composite of late flamboyant Gothic architecture, rich in elaborate ornamentation; traceried windows, shafts, capitals, vaultings, and flying buttresses being its distinctive features. Abbotsford (q.v.), the home of Sir Walter Scott, is about 3 miles south of Melrose Abbey. Pop., 1901, 2195; 1911, 2166.

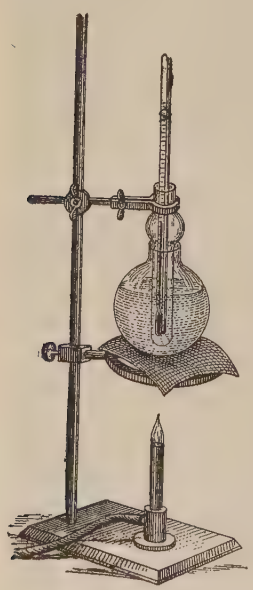
MELROSE. A city, including the villages of Melrose Highlands, Fells, and Wyoming, in Middlesex Co., Mass., 7 miles north of Boston, on the Boston and Maine Railroad (Map: Massachusetts, E 3). It is an attractive and popular residential suburb of Boston, has a public library, hospital, and public parks, and engages in some manufacturing, the principal products being rubber boots and shoes. Noteworthy features are Middlesex Fells, a State reservation of 1800 acres, and a large natural reservoir, Spot Pond. The government is administered, under the charter of 1900, by a mayor, annually elected, and a board of aldermen, one-third of whose members are elected at large. The board elects the city clerk, treasurer, auditor, and collector, and confirms the executive's nominations of other subordinate officials. The school board is independently chosen by popular vote. POP., 1900, 12,962; 1910, 15,715; 1914, 16,887; 1920, 18,204. Melrose was settled probably as early as 1633, and formed a part of Charlestown until 1649, and of Malden from 1649 until Melrose was incorporated in 1850. In 1900 it received a city charter. Consult S. A. Drake, *History of Middlesex County*, vol. ii (Boston, 1880), and E. H. Goss, *History of Melrose* (Melrose, 1902).

MELROSE. A city in Stearns Co., Minn., 100 miles northwest of St. Paul, on the Great Northern Railroad (Map: Minnesota, C 5). There are granite works, flour and planing mills, and a brewery. The water works and electric-light plant are owned and operated by the city. Pop., 1900, 1768; 1910, 2591.

MELROSE PARK. A village in Cook Co., Ill., 12 miles west of Chicago, on the Chicago and Northwestern and the Indiana Harbor Belt railroads (Map: Illinois, J 2). It is a residential place, but has some industries, including the manufacture of malleable iron and milk cans and the quarrying of stone. There are municipal water works. Pop., 1900, 2592; 1910, 4806.

MELSTED, mĕl'stĕd, HENNING FINNE VON (1875–). A Swedish author, born in Stockholm. He was educated there and at Upsala, practiced law, traveled in England, Germany, France, Spain, and Italy, and then turned to literature. After two anonymous stories, *Georg Dahna* (1898) and *Leo Dahna* (1899), his collection of tales, *Noveller i dialog* (1901), attracted attention, as did the drama *Starkare än Lifvet—Brottningar* (1902) and the romances *Kärleksresa* (1902), *Stormtider* (1903), and *Nöd* (1904), a novel. He wrote also the romances *Kvinnoöden* (1905), describing life among the higher classes in Stockholm; *Fantomen* (1906); *Milla* (1907); *Fariséens hustru* (1908); *Passionsnoveller* (1908); *Damen utan nåd* (1909); *Juristerna* (1910), describing Swedish sentiment in the crisis of 1905. Melsted is considered one of the ablest prose writers of modern Sweden.

MELTING POINT. The temperature at which a given substance passes from the solid into the liquid state. Different substances generally have different melting points. Thus, mercury if solidified by cold would melt at a temperature of 40° below 0° C. (— 40° F.); ordinary ice (see ICE) melts at 0° C. (32° F.); sulphur at 115° C. (239° F.); tin at 230° C. (446° F.); lead at 324° C. (615° F.); zinc at 418° C. (784° F.); aluminium at 727° C. (1341° F.); silver at 968° C. (1774° F.); gold at 1072° C. (1862° F.); copper at 1082° C. (1980° F.); pure iron at 1505° C. (2741° F.); platinum at 1777° C. (3231° F.); etc. The presence of more or less impurity in a given substance generally causes a corresponding depression of its melting point, and hence the latter is often determined when it is required to ascertain whether a given substance, especially a carbon compound of known melting point, is perfectly pure. Such determinations may be conveniently carried out by means of the apparatus shown in the accompanying figure.



MELTING-POINT APPARATUS.

The apparatus consists of an ordinary round-bottomed flask of about 250 cubic centimeters' capacity, with the greater part of the neck cut off; in this is an ordinary test tube widened in one place so as to be readily held by the flask without touching its bottom; both contain, to about the same level, some liquid (say, strong sulphuric acid) that may be heated to a somewhat high temperature without boiling. To carry out a determination, a small amount of the given substance is introduced into a capillary tube of glass, the latter is tied on to a thermometer so that the substance is very near the mercury bulb, the thermometer with the capillary tube is immersed in the liquid of the test tube, the temperature is allowed to rise very slowly, and the point is carefully noted at which the contents of the capillary tube begin to change color and become transparent. For very precise determinations, however, this method should not be employed. Instead, the investigator uses much larger quantities of substance, reduces the latter to a fine powder, and immerses the thermometer directly into it. While it is known that different modifications of one and the same chemical substance may have different melting points, and hence the melting point cannot be considered as strictly characteristic of a given chemical species, it is so easy to determine with great precision, that it is considered as one of the most useful constants and is very frequently employed by chemists for the purpose of identifying substances and, as already mentioned, for the purpose of testing their purity. Further, in spite of but too many exceptions, certain interesting relations have been shown beyond doubt to exist between the melting points of organic substances and their molecular weights and constitution. See article BOILING POINT.

Under FREEZING POINT that point has been defined with reference to the vapor tension of the given substance in the solid and liquid states. The same definition, and for precisely the same reasons, is of course applicable to the melting point. Concerning the "latent heat of fusion," see FREEZING MIXTURES; HEAT.

Influence of External Pressure on Melting Points. Strictly speaking, the melting point of a solid substance, just as the boiling point (q.v.) of a liquid, depends upon the external pressure. In the case of the melting point, however, the influence exercised by the external pressure is so slight that it may generally be safely left out of account altogether. The subject was first theoretically investigated, from the standpoint of thermodynamics, by James Thomson, and later by Clausius, who found that for a given substance the change of melting temperature caused by an increase of one atmosphere in pressure must be represented by the formula,

$$\frac{T(V - V')}{r},$$

where T denotes the melting point (on the absolute scale, i.e., the centigrade temperature increased by 273) corresponding to some given pressure; V denotes the volume occupied by one gram of the liquid substance at the melting temperature; V' denotes the volume occupied by one gram of the solid substance at the same temperature; and r denotes the mechanical equivalent (in terms of "liter atmospheres") of the heat absorbed, at the same temperature, during the melting of one gram of the substance. (By a "liter atmosphere" is meant the minimum mechanical work required to cause a diminution of

one liter in any volume against the constant resistance of a pressure of one atmosphere.) It will be observed that if V is greater than V', i.e., if the melting is accompanied by an increase in volume, the above expression is positive, and hence an increase of pressure causes the melting temperature to rise. On the contrary, if V' is greater than V, the expression is negative, and hence an increase of pressure causes the melting temperature to *fall*. These theoretical results are in perfect agreement with experimental observation. In the case of ordinary ice, melting is accompanied by a contraction in volume, i.e., V' is greater than V, and the above formula leads to the result that while under normal atmospheric pressure ice melts at 0° C. (32° F.), the melting point under a pressure of two atmospheres would be — 0.0074° C. (31.9867° F.). As far back as 1851 William Thomson (Lord Kelvin) obtained practically the same result by direct observation, and the formula has since been found to hold similarly good in the case of other substances examined.

It must be observed that the Thomson-Clausius formula correlates the *change* of melting point with the *change* of external pressure. In recent years Rosanoff discovered an equation correlating the melting point itself and the external pressure itself. According to this equation the melting point of ordinary ice, e.g., would be reduced to — 5° C. (+ 23° F.) by a pressure of 615.2 kilograms per square centimeter. Experimentally, Tammann found that ice melted at — 5° C. under a pressure of 615 kilograms.

The melting point is generally also affected by the state of subdivision of the solid—the smaller the particles, the lower the melting point. In 1909 Pavloff established a mathematical relationship between the melting point of a substance and the diameter of its particles.

Eutectic Mixtures. It was shown in the article FREEZING POINT that if a solution happens to be saturated at its freezing point, the solid gradually separating out by freezing and the liquid remaining unfrozen cannot but have the same composition, and hence the freezing temperature must remain constant. It is perfectly obvious that the solid mixture thus obtained must entirely melt at the same constant temperature. Mixtures of salts thus obtained from solutions are termed cryohydrates. More generally, and whatever its origin, a mechanical mixture that melts at a constant temperature lower than that of any other mixture of the same substances is termed a eutectic mixture. Following are a few examples of eutectic alloys: an alloy containing 55.58 per cent of bismuth and 44.42 per cent of lead melts at the constant temperature of 122.7° C. (252.86° F.); an alloy of 46.70 per cent of bismuth and 53.30 per cent of tin melts at 133° C. (271.4° F.); an alloy of 59.19 per cent of bismuth and 40.81 per cent of cadmium melts at 144° C. (291.2° F.); an alloy of 92.85 per cent of bismuth and 7.15 per cent of zinc melts at 248° C. (478.4° F.); an alloy of 47.75 per cent of bismuth, 18.39 per cent of lead, 13.31 per cent of cadmium, and 20.55 per cent of tin melts at 71° C. (159.8° F.). See FREEZING POINT; FUSIBLE METALS; PHASE RULE.

MELTON-MOWBRAY, mĕl'ton mō'brâ. An urban district and market town in Leicestershire, England, 14 miles northeast of Leicester, in the valley of the Eye, near its junction with the Wreak (Map: England, F 4). It has a fine early English parish church and is famous for its Stilton cheese and pork pies. It has large quarries of iron ore, smelting furnaces, and an important cattle market. It is the Midlands "metropolis of fox hunting," with numerous hunting seats, and in the winter is crowded with sportsmen. It is a very ancient town, being called in the Domesday Book *Medeltune*. In 1644 it was the scene of a defeat and slaughter of the Parliamentarians. Pop., 1901, 7454; 1911, 9202.

MELTZER, mĕlts'ĕr, SAMUEL JAMES (1851–1920). An American physiologist. Born in Russia, he was educated at Königsberg, Prussia; studied philosophy and medicine at the University of Berlin (M.D., 1882); and in the following year he emigrated to the United States, where he practiced his profession in New York City, serving as consulting physician to Harlem Hospital. In 1906 he became head of the department of physiology and pharmacology in the Rockefeller Institute for Medical Research. He served as president of the Harvey Society, of the Association for the Advancement of Clinical Research in 1909, and of the Association of American Physiologists in 1915.

MELUN, me-lĕn'. The capital of the Department of Seine-et-Marne, France, built on an island and on both banks of the Seine, 28 miles southeast of Paris (Map: France, N., H 4). It has an eleventh-century church, a communal college, normal school, and several learned societies. The town is an important railroad centre. The manufactures are carriages, cotton and woolen goods, earthenware, chocolate, agricultural tools, furs, lumber, and cement; and there is trade in grain, flour, cattle, and poultry. Pop. (commune), 1901, 13,059; 1911, 14,861. Melun was taken five times during the ninth century by the Northmen. It fell into the hands of the English in 1419, but they were driven out by Joan of Arc in 1430.

MEL'USI'NA. A powerful water fairy, half woman and half fish, in French folklore. She became the wife of Count Raymond of Poitiers and built a castle which from her own name was called Lusinia, the present Lusignan. When her husband surprised her in her double form in the bath she disappeared. When the death of a member of the family or of the King of France was about to occur she appeared in a high tower of the castle, in mourning garments, and announced the approaching event by three shrill cries. The legend was used in 1387 by Jean d'Arras as the basis of a romance, which was rendered into French verse by Conedoette in 1401, and in translations and other forms made the character of Melusina famous. Consult: Kohler, *Der Ursprung der Melusinensage* (Leipzig, 1895); Roy, *Melusine* (1898); Leo Desaivre, "Notes sur Melusine," in *Bulletin de la Société des antiques de l'Ouest* (Poitiers, 1899); Baudot, *Les princesses Yolande et les ducs de Bar* (Paris, 1900); E. S. Hartland, "Romance of Melusine," in *Folk-lore*, vol. xxiv (London, 1913).

MEL'VILLE, or **MELVILL**, ANDREW (1545–1622). A Scottish reformer. He was born Aug. 1, 1545, at Baldovie, near Montrose, Forfarshire. In 1580 he was chosen principal of St. Mary's College, St. Andrews. In 1582 he preached the opening sermon before the General Assembly and boldly "inveighed against the bloody knife of absolute authority, whereby men intended to pull the crown off Christ's head

and to wring the sceptre out of his hand." The Assembly applauded his intrepidity, drew up a remonstrance in a similar spirit, and appointed Melville and others to present it. In 1584 Melville was summoned before the Privy Council. He maintained that whatever a preacher might say in the pulpit, even if it should be called treason, he was not bound to answer for in a civil court, until he had been first tried in a church court. For this denial of secular jurisdiction he was condemned to imprisonment, but escaped to London, where he remained till the downfall of Arran in the following year. After an absence of 20 months he returned to Scotland and resumed his office at St. Andrews. In 1606 Melville was called to England to attend the famous conference at Hampton Court. Having ridiculed the service in the Chapel Royal in a Latin epigram, he was twice summoned before the English Privy Council, and on the second occasion his temper gave way and he broke out into a torrent of invective against the Archbishop of Canterbury for encouraging popery and superstition, profaning the Sabbath, etc. The King immediately sent him to the Tower, where he remained for more than four years. In 1611 he was released on the solicitation of the Duke of Bouillon, who wanted his services as a professor in his university at Sedan in France, where he spent most of his remaining years. Melville died at Sedan, in 1622, but neither the exact date of his death nor the events of his last years are ascertained. He published much in prose and verse, in Latin and English. Consult his *Life* by McCrie (2 vols., London, 1819; rev. ed., 1856), and W. L. Mathieson, *Politics and Religion: A Study in Scottish History, 1550–1695* (2 vols., New York, 1902).

MELVILLE, George John Whyte (1821–78). An English author. He was born near St. Andrews, Scotland, and entered the army in 1839. In 1846 he became captain in the Coldstream Guards and during the Crimean War served as a volunteer in the Turkish cavalry. Melville may be justly regarded as the founder of the fashionable novel of the high-life sporting variety. In describing the hunting field he aroused much interest, as shown by the popularity of his score or more of novels from *Kate Coventry* in 1856 to *Black but Comely* in 1878.

MELVILLE, George Wallace (1841–1912). A distinguished American naval officer, engineer, scientist, and polar explorer, born in New York City, Jan. 10, 1841. He was educated in New York and at the Brooklyn Polytechnic Institute, and entered the navy as a third assistant engineer in 1861. He served on the *Dakotah* in the action at Lambert's Point, in the capture of Norfolk, and in the attacks on Drewry's Bluff. Later, he was attached to the *Wachusett* and was commended for his conduct in connection with the capture of the Confederate cruiser *Florida*. In 1873 he volunteered as engineer of the *Tigress* and served on her in the search for the survivors of the *Polaris*. Six years later he volunteered as engineer of the ill-fated *Jeannette*. He commanded one of the three boats after the *Jeanette* sank, and, after a terrible journey of 100 days and 2200 miles, he reached the Lena Delta, the party under his command being the only one that survived. After his arrival he set out on a long search for the other officers and men, but after 23 days illness and bad weather compelled him to return. Setting out again in the spring, he found the camp and the bodies of his comrades. For his conduct on this expedition he was highly commended by the Navy Department, was given a gold medal by Congress, and by special act promoted to the grade of chief engineer. He again volunteered for the Greely relief expedition and was one of the first to reach the survivors at Cape Sabine. From 1887 to his retirement in 1903 he was engineer in chief of the navy. His services as chief of the Bureau of Steam Engineering for this long period were of the greatest importance, covering nearly all the engineering work in the building of the new navy. He was a strong advocate of high speed in warships, vertical engines instead of horizontal, and was the first to use triple screws in large ships (*Columbia* and *Minneapolis*). He established the engineering experimental station and postgraduate school, and from his long series of experiments with coal and liquid fuel much was learned. He was an early advocate of water-tube boilers, putting them on board the *Monterey* in 1889, but opposed their general use until suitable types were developed; in the successful development of these he was largely concerned. He received many marks of distinction at home and abroad, including decorations, honorary degrees, and the presidency of the American Society of Mechanical Engineers (1899). By the naval personnel act of 1899 he became a rear admiral, and with that rank he retired in 1903. He died March 17, 1912.

MELVILLE, Herman (1819–91). An American novelist, born in New York City and noteworthy for his stories of the sea. He was educated at the Albany Classical School and in New York City, and went to sea in 1837 in a merchant vessel bound for Liverpool. In 1841 he rounded Cape Horn on a whaling cruise, and was so ill treated that in the next year he and a companion made their escape from the ship and were taken captives by the Typees, a warlike tribe of Nukahiva, one of the Marquesas Islands. His companion soon escaped and Melville was finally rescued after four months by the crew of an Australian whaler. He spent the next two years (1842–44) in and about the Pacific Islands, and on his return to New York told the story of his experiences at sea and his romantic captivity in *Typee: A Peep at Polynesian Life during a Four Months' Residence in a Valley of the Marquesas* (1846), which enjoyed a sensational and not undeserved success. In 1847 Melville married the daughter of Chief Justice Lemuel Shaw of Massachusetts. In 1850 he moved with his family to Pittsfield, Mass., but returned in 1863 to New York. There he occupied a place in the customhouse continuously from 1866 till 1885, when because of failing health he resigned. The period of his popularity, embraced in the years 1846–52, was one of rapid production of such stories as *Omoo* (1847); *Mardi* (1848); *Redburn: His First Voyage* (1848); *White Jacket, or the World in a Man of War* (1850), in which the horrors of flogging in the navy were so graphically set forth that the abolition of the practice soon followed; *Moby Dick, or the White Whale* (1851); and *Pierre, or the Ambiguities* (1852). After 1852 he published three other volumes of fiction, *Israel Potter: His Fifty Years of Exile* (1855); *Piazza Tales* (1856); *The Confidence Man* (1857); and later several books of poems,

lyric and epic, such as *Battle Pieces and Aspects of the War* (1866); *Clarel: A Pilgrimage in the Holy Land* (1876); *John Marr and Other Sailors* (1888); *Timoleon* (1891). His *Typee, Omoo, Moby Dick,* and *White Jacket* were reëdited in 1892 with an introduction by Arthur Stedman.

MELVILLE, Sir James (1535–1617). A Scottish soldier and diplomat. He served under the Constable Montmorenci in Flanders in 1553 and in 1557 was taken prisoner at the battle of St. Quentin. Two years after he obtained his release and was dispatched to Scotland on a secret mission. During his absence occurred the tournament in which Montmorenci killed Henry II; and at Melville's return he judged it best to turn his steps towards Germany, where he was employed by the Elector Palatine. While on a visit to France in 1561 he met Queen Mary of Scotland, to whom he tendered his allegiance and sword. In 1564 he returned to his native land and presented himself to Mary at Perth. Shortly afterward he was sent to England as ambassador to Queen Elizabeth. Again in 1566 he was sent to England to bear the news of the birth of an heir to the Scottish throne. He adhered to the Queen so long as there appeared to be any hope of her ultimate success, but after she was committed to Lochleven Castle, was sent by the nobles to offer the regency to the Earl of Murray. During Morton's regency he retired from court, but when James began to reign was received with favor. He was knighted and appointed Privy Councilor and gentleman of the bedchamber to Queen Anne. On James's accession to the English throne, Melville retired into private life and died at Hallhill, Nov. 13, 1617. *The Memoirs of Sir James Melvil of Hallhill; Containing an Impartial Account of the most Remarkable Affairs of State during the Last Age, etc.,* accidentally discovered in Edinburgh Castle in 1660, were published in 1683 by his grandson, George Scott, but in an incomplete form. An accurate edition was printed in 1827–33 at Edinburgh, by the Bannatyne Club, and is of great historic value. Consult J. H. Burton, *The History of Scotland* (Edinburgh, 1867–70).

MELVILLE, James (1556–1614). A Scottish reformer, nephew of Andrew Melville. He was born at Mayton, near Montrose, and graduated B.A. at St. Andrews in 1571. He was professor at Glasgow (1575–80) and at St. Andrews (1580–84), but in 1584 was compelled by Bishop Adamson to follow his uncle in flight to Berwick. In the following year he returned to Scotland, renewing his quarrels with the Bishop. In 1586 he was ordained to the Presbyterian ministry. James VI made him vicar of Abercrombie and in 1589 Melville was chosen moderator of the General Assembly. After James became King of England he detained Melville at Newcastle-on-Tyne because of his refusal to support episcopacy, although high honors were promised him if he would take the King's side. His published works include prose and poetry, but his diary (1556–1610), printed by the Woodrow Society (Edinburgh, 1842), is especially valuable as a source for the ecclesiastical history of the time.

MELVILLE, Lewis. The pen name of Lewis S. Benjamin (q.v.).

MELVILLE, Viscount. A British statesman. See Dundas, Henry.

MELVILLE ISLAND. One of the Parry Islands of Arctic North America, situated in lat. 74° to 77° N., north of Melville Sound and between Bathurst and Prince Patrick Islands, the latter being the westernmost island of the group (Map: America, North, G 2). Melville Island is very irregular in outline, 200 miles long and about 100 miles broad, it is of carboniferous lime and sandstone formation, and contains coal beds. It was discovered by Parry, who wintered there (1819–20). Although several times skirted by sledge parties (1853–55) during the Franklin relief search, it has been visited by only one other ship, the *Arctic,* under Bernier in the Canadian expedition (1908–09). He wintered there and examined fully the resources of Melville and other adjacent islands.

MELVILLE PENINSULA. A projection of the north shore of North America, extending north of Hudson Bay, and belonging to the Canadian Territory of Keewatin (Map: America, North, K 3). It is connected with the mainland by Rae Isthmus, and bounded on the west by Committee Bay, discoveries which were made by Dr. John Rae in 1846. It is separated from Cockburn Island on the north by Fury and Hecla Strait, from Baffin Land on the east by Fox Channel, and from Southampton Island on the south by Frozen Strait.

MELVILLE SOUND. One of the numerous passages between the islands of Arctic North America (Map: America, North, H 2). It lies between Melville Island on the north and Prince Albert Land on the south, and extends from Prince of Wales Island in the east, where it communicates through Barrow Strait and Lancaster Sound with Baffin Bay, to Banks Land in the west, where Banks Strait opens into the Arctic Ocean. Its length is 225 miles and its width is from 50 to about 175 miles. Its southern extent was largely unknown until Hansen, of Amundsen's expedition, extended the coast of Victoria Land northwest to Cape Nansen, calling the new regions King Haakon VII Land (1903–04). From Cape Nansen to Glenelg Bay the exact outlines are yet unknown.

MEM'BERED (from *member,* OF., Fr. *membre,* from Lat. *membrum,* limb). A term in heraldry applied to a bird having its beak and legs of a different color from its body; it is then said to be membered of that color.

MEMBRA'NA PU'PILLA'RIS (Lat., pupillary membrane). The name given to a very thin membrane which closes or covers the central aperture of the iris in the fœtus during an early period of gestation; it begins to disappear in the seventh month.

MEM'BRANE (Lat. *membrana,* from *membrum,* limb), in Anatomy. The term applied to those textures of the animal body which are arranged in the form of laminæ and cover organs, or line the interior of cavities, or take part in the formation of the walls of canals or tubes. The structure and special uses of some of the most important of the animal membranes are noticed in separate articles, such as Mucous Membrane, Serous Membrane, etc.; and the membranes in which the fœtus is inclosed—commonly called the fœtal membranes—are described in the article Placenta. Bowman's membrane and Descemet's membrane are special structures, being respectively the second and fourth layers of the cornea. (See Eye.) The membranes which cover and protect the brain and spinal cord are commonly termed *meninges,* from the

Greek word *meninx*, a membrane. Simple membranes are of three kinds—mucous, serous, and fibrous. Mucous membranes line the cavities which communicate externally with the skin, as the mouth, intestinal canal, genito-urinary passages, internal surface of the eyelids, and the ramifications of the respiratory passages, the Eustachian tubes, and middle ear. Mucous membrane has three layers: a fibrovascular layer, composed of blood vessels, nerves, and connective tissue, which is continuous with the tissue beneath and interlacing with it; a more superficial layer, called basement membrane, which is described as structureless, and upon which rests the superficial layer, or epithelium, the latter presenting a variety of structure in different parts of the body. This membrane is at times elevated into papillæ or villi, or else depressed in the form of glands. The mucous membranes secrete mucus to lubricate the various passages, and also other fluids for special physiological purposes. The saliva, the gastric and pancreatic juices which aid digestion, are examples of special secretions. The serous membranes are of two kinds: those lining visceral cavities, such as the pericardium, pleuræ, and peritoneum; and those lining joint cavities (synovial membranes). A third species of simple membrane is the fibrous, divided into two kinds—enveloping aponeuroses, the fibrous capsules of joints and the sheaths of tendons; and the enveloping membrane of bone, the periosteum, the dura mater (the internal periosteum of the skull), the fibrous membrane of the spleen and of other glandular organs. See SPLEEN.

MEMBRÉ, măn′brā′, ZENOBIUS (1645–87). An early missionary to Canada, born at Bapaume, France. He became a Recollect of the Franciscan Order and went as a missionary to Canada in 1675; accompanied La Salle upon his expedition to the Mississippi in 1679, stopping at Fort Crèvecœur, on Lake Peoria, where, with Father Gabriel de la Ribourde, he conducted a mission among the Illinois until driven by the Iroquois to the Jesuit settlement at Green Bay. He descended the Mississippi with La Salle in 1682 and returned the same year to France, where he published an account of the expedition. After acting for a time as warden of a convent at Bapaume he came again to America with La Salle in his final expedition by sea to Texas in 1684, and remained in Fort St. Louis, where, with his companions, he was massacred by the Indians. Consult J. D. G. Shea, *Discovery and Exploration of the Mississippi Valley* (2d ed., Albany, 1903).

MEMEL, mā′mel. A river emptying into the Baltic. See NIEMEN.

MEMEL. A seaport town of Prussia, in the Province of East Prussia, the most northern town of Germany, situated near the Russian border at the entrance of the Dange into the north end of the Kurisches Haff, 58 miles by rail north-northwest of Tilsit (Map: Germany, J 1). It has an excellent harbor protected by two lighthouses and a fort, and is of great importance in the Baltic lumber trade. The logs, sawed in the local mills, are brought down from the forests of Russia by the König Wilhelm Canal and by the Niemen, here known as the Memel. Memel manufactures machinery, soap, amber, celluloid, cigarettes, vinegar, and rope, and has trade in agricultural products imported from Lithuania, coal, petroleum, herrings, and local manufactures. It has several dry docks. The educational institutions include a Gymnasium, a seminary for teachers, and a school of navigation. Memel was founded in 1252 by the Teutonic Order. It joined the Hanseatic League in 1254 and soon rose to a position of considerable commercial importance. It was held by the Swedes for some time during the seventeenth century, was taken by the Russians in 1757, and was the residence of Frederick William III after the battle of Jena in 1807. Here also, in 1807, a treaty of peace was concluded between England and Prussia. It was again seized by Russia in 1812. Memel was occupied for the third time by the Russians in the European War which broke out in 1914. They were forced to retire when the Germans brought up superior forces. See WAR IN EUROPE. Pop., 1910, 21,470, chiefly Protestants.

MEMLING, mĕm′lĭng, or **MEMLINC**, HANS (c.1430–94). One of the most eminent painters of the early Netherlands school. According to the best available evidence he was born at Mömlingen, near Aschaffenburg, Bavaria, and appears permanently settled in Bruges in 1478, although he was probably active there some years earlier. On the evidence of two documents, which do not, however, prove the supposition, he is said to have been the pupil of Rogier van der Weyden. But his work bears little resemblance to that master's. His earlier paintings, in particular a triptych (c.1468) belonging to the Duke of Devonshire at Chatsworth, and "St. John the Baptist" and "St. Lawrence" in the National Gallery, London, show rather the influence of Dierick Bouts. As his name never appears in the painters' guild at Bruges, he is thought to have been employed in the service of Charles the Bold, Duke of Burgundy, which would have exempted him from registering. He attained a reputation far beyond Bruges, his pictures being bought by the Medici in Florence and by Cardinals Grimani and Bembo in Venice, as well as in England, France, and Spain. That he enjoyed material prosperity is evident from his subscription to the war loan of Emperor Maximilian and from the terms of his testament.

Memling's works, of which a large number survive, may be best studied at Bruges, especially in the Hospital of St. John. One of the most important there is a magnificent though somewhat damaged altarpiece representing in the centre the "Marriage of St. Catharine," with the two St. Johns and St. Barbara, and, on the wings, the "Death of John the Baptist" and "St. John's Vision at Patmos." To the same year (1479) belongs the triptych known as the Floreins altarpiece, representing the "Adoration of the Magi" and the "Presentation in the Temple." Other important works in the Hospital of St. John are a diptych (1487) with the Madonna, and on the other wing the donor, Martin van Nieuwenhoven, one of the best of Memling's portraits, and the "Shrine of St. Ursula" (1489), a reliquary in the shape of a Gothic chapel. Its 14 scenes are remarkable for the freedom and grace with which he has treated groups and figures of small proportions, but some are probably the work of pupils. A triptych (1484) with "St. Christopher and the Infant Christ" in the centre, in the Museum at Bruges, also ranks high among his works. The Museum at Brussels possesses a fine "Crucifixion" and that of Antwerp a large and magnificent triptych, once in the church of Najara. The latter, executed in collaboration with pupils, represents "Christ

as the King of Heaven," surrounded by 12 beautiful angels making music on the different instruments used in that day. Other celebrated pictures by Memling are: a triptych containing more than 200 figures, the centre occupied by the Crucifixion (1491), in the cathedral at Lübeck, in which he was aided by his pupils; the "Seven Joys of the Virgin" (1480), in the Pinakothek, Munich; the "Seven Sorrows of the Virgin," in the Gallery of Turin; the Madonnas in the Uffizi, Florence, the Louvre, the Berlin Museum, and the National Gallery, London; a large altarpiece with the "Last Judgment" (1470–77), in the church of St. Mary at Danzig, one of the best of his early works. The Metropolitan Museum of New York possesses in the Altman collection a smaller and more intimate version of the "Betrothal of St. Catharine," besides a fine portrait of an unknown old man and portraits of Tommaso Portinari and his wife. Other fine examples of his portraits are those of the Burgomaster Moreel, his wife and daughter (the so-called "Sibylla Zambetha"), in the Brussels Museum; the "Old Canon," at Antwerp; and other examples at Frankfort and Florence. Memling was, along with Gerard David, the most important master of the Flemish school during the late fifteenth century.

Bibliography. Michiels, *Memling, sa vie et ses ouvrages* (Verviers, 1883); Wauters, *Sept études pour servir a l'histoire de Hans Memling* (Brussels, 1894). Good brief works are: Kaemmerer, *Memling* (Bielefeld, 1899); Bock, *Memling-Studien* (Düsseldorf, 1900); Gaederiz, *Der Altarschrein von Hans Memling in Dom zu Lübeck* (Leipzig, 1901); *Masters in Art*, vol. vi (Boston, 1905), containing an exhaustive bibliography; Voll, *Altniederländische Malerei* (Leipzig, 1906); Fierens-Gevaert, *Les primitifs flamands* (Brussels, 1909); Weale, *J. C. Memlinc* (New York, 1909).

MEMMI, měm'mē, Simone. See Martini, Simone.

MEMMINGEN, měm'ĭng-en. An ancient town of the Kingdom of Bavaria, Germany, situated on the river Ach, a tributary of the Iller, 33 miles south-southeast of Ulm (Map: Germany, D 5). It is still partly surrounded with walls, and its church of St. Martin has fine late Gothic choir stalls dating from the fifteenth century. The Roman Catholic church with its fine altarpieces, the sixteenth-century Renaissance Rathaus, and the Fuggerbau, in which Wallenstein received his dismissal from the command of the army in 1630, are also noteworthy. The educational institutions of the town include a Realschule, a seminary for teachers, a theatre, a museum, and a library, with an important collection of archives. Memmingen manufactures woolens and linen, cordage, machinery, fertilizer, fire extinguishers, iron goods, leather, soap, and there are foundries for large bells and structural steel. There is a good trade in agricultural products, hops, cheese, wool, and live stock. The town is first mentioned in 1010 and became a free city of the Empire in 1286. It was a member of the Schmalkalden League; it became Bavarian in 1802. Pop., 1910, 12,362.

MEMMINGER, měm'ĭn-jēr, Christopher Gustavus (1803–88). An American political leader, Secretary of the Treasury in the government of the Confederate States. He was born in Württemberg, Germany, but was brought at an early age to South Carolina by his mother, who died not long after their arrival. He was for a time in an orphan asylum in Charleston, and was then adopted by Governor Thomas Bennett. Memminger graduated from South Carolina College in 1820, studied law, and practiced in Charleston. He was an opponent of Calhoun and in 1832 wrote the *Book of Nullification*, a satire in biblical style upon that leader's favorite doctrine. He was for many years a member of the State Legislature, and for nearly 20 years was the head of the finance committee. He was one of the first to plan for the organization of a system of public schools in South Carolina. In January, 1860, he was sent as a special commissioner to Virginia in order to induce that State to participate in a scheme for obtaining redress of Southern grievances. Some months later he was one of the leaders in the convention which declared that the connection of South Carolina with the United States was dissolved. Upon the formation of the Confederacy he was made Secretary of the Treasury, which office he held until June, 1864, when he resigned. He failed to display sufficient capacity to cope with the difficulties that beset the financial policy of the Confederate government. For an account of his administration, consult J. C. Schwab, *The Confederate States of America, 1861–65: A Financial and Industrial History of the South during the Civil War* (New York, 1901).

MEM'NON (Lat., from Gk. Μέμνων). In Greek legend, a son of Tithonus and Eos (the dawn), King of the Ethiopians, who led an army to aid his uncle, Priam, King of Troy, after the death of Hector. Clad in armor made by Hephæstus (or Vulcan), he made great slaughter among the Greeks, and finally killed Antilochus, who was defending his father, Nestor. Over the body of Antilochus he met Achilles and fell before him. His mother by her tears obtained from Zeus his immortality, and his body or, in another story, his ashes were carried to his native country. The river Paphlagonius was said to flow blood yearly on the anniversary of his death. His comrades were changed to birds, and it was said they returned yearly from the south and fought around the funeral mound erected for their leader at Troy. In the earlier writers Memnon leads his forces from the extreme East, or Assyria; later his native land was sought in Syria, and not earlier than the end of the fifth century B.C. was it localized in Egypt and Æthiopia. Memnonia (see Memnonium) were said to exist at Susa in Persia and at Abydos and Thebes in Egypt. Indeed, in Ptolemaic times the west bank of the Nile at Thebes was the Memnonium, as the east was Diospolis. Near by are two colossal statues of King Amenophis III (q.v.) of the eighteenth dynasty, the southern one of which was said to give forth a sound when struck by the rays of the rising sun, a sound probably due to the sudden expansion of the sandstone conglomerate from which the statue is hewn, and the consequent passage of air through the pores of the stone. Consult J. B. Mayor's note on *Juvenal*, 15, 5, in his edition of *Juvenal* (London, 1888). Strabo (c.20 B.C.) does not mention the name of Memnon in describing this phenomenon, but early in the first century of our era the story gained currency that the statue represented Memnon, who thus greeted his mother in the morning. From the time of the Flavian emperors to that of Septimius Severus the world seems to have been fond of visiting this place, and the sides of the figure are covered with names and verses re-

ferring to the legend. Among the visitors were Hadrian and his wife, Sabina, in 130 A.D. At some time before Strabo's visit the upper part of the statue had been overthrown by an earthquake (popular tradition said by Cambyses); when the statue was rebuilt by Severus the sounds ceased.

Memnon has been regarded by many scholars as properly a solar deity. In art the combat of Memnon and Achilles in presence of Eos and Thetis, and the removal of the body of Memnon by his mother or by sleep and death, were favorite subjects with the Attic vase painters. Memnon figured largely also in the writings of the cyclic poets (q.v.), especially in the *Æthiopis* of Arctinus: for this poem consult Monro's edition of the *Odyssey*, books xiii–xxiv (Oxford, 1901). The chief ancient source, however, is the *Posthomerica* of Quintus Smyrnæus. Consult: Friedrich Jacobs, *Ueber die Gräber des Memnon* (Munich, 1830); Thirlwall, in *Philological Museum* (Cambridge, 1832); J. A. Letronne, "La statue vocale de Memnon," in *Mémoires de l'Institut Royal de France* (Paris, 1833); Curzon, in *Edinburgh Review* (Edinburgh, 1886); the article "Memnon" in W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. ii (Leipzig, 1890–97).

MEMNO'NIUM (Lat., from Gk. Μεμνόνιον). The name applied in Ptolemaic times to an Egyptian temple about 8½ miles from the Nile, near Abydos. The geographer Strabo (c.30 B.C) mentions it with admiration and compares it with the celebrated Labyrinth (q.v.). In 1859 Mariette, with the financial aid of the Egyptian government, cleared away the sand and rubbish which covered the building and made it accessible to visitors and students. The temple, begun by Seti I, and completed by his son, Ramses II, was dedicated to the gods of Abydos and to the manes of Seti and of his predecessors on the throne of Egypt. Among the numerous reliefs that adorn its walls are some of the finest specimens of Egyptian sculpture. The most important are in a long gallery known as the Gallery of Kings. On the right wall of this room are depicted King Seti I and his son Ramses adoring their royal ancestors whose cartouches are inscribed in two long lines. The list contains the names of 76 kings of Egypt, beginning with Menes (q.v.) and ending with Seti I (q.v.), but it is far from complete. It does not contain the names of monarchs regarded as illegitimate or unimportant, and it omits all the rulers from the thirteenth to the seventeenth dynasty. Copies of the list are to be found in Meyer, *Geschichte des alten Aegyptens* (Berlin, 1887), and in W. M. F. Petrie, *A History of Egypt* (New York, 1897). Similar lists exist at Karnak and at Sakkarah (q.v.). Consult: A. E. Mariette, *Abydos* (Paris, 1869–80); id., *The Monuments of Upper Egypt* (London, 1877; rev. by L. Dickerman, Boston, 1890); Baedeker, *Egypt and the Sûdân* (7th ed., Leipzig, 1914).

MEM'ORABIL'IA (Lat., memorable things). Something worthy of being remembered or noted down, especially the Latin title of *Memoirs of Socrates*, by Xenophon (q.v.).

MEMO'RIAL ARCH. See ARCH, TRIUMPHAL, or MEMORIAL.

MEMORIAL ARCHITECTURE. In all ages men have sought to preserve the memory of their own transitory lives and deeds by the erection of cairns, mounds, pillars, tombs, and other structures capable of defying the destroying power of time. (Consult Gen. xxviii. 18; Josh. iv. 3–9; see also MEGALITHIC MONUMENTS; OBELISK; PYRAMID.) With the progress of art such monuments took on forms of greater elegance and complexity. The Assyrians set up inscribed stelæ; that of Shalmaneser, a square shaft of black basalt inscribed on all four faces, is in the British Museum. The commemorative stelæ and sculptured gravestones of the Greeks were of moderate size but of great beauty of form and execution. The Roman pride of conquest and love of grandeur led to the development of two forms of memorial which have continued to be used or imitated down to modern times—the arch and the column. The Roman triumphal arches were erected to commemorate victories; of these, three of the most famous are in Rome, those of Titus, of Septimius Severus, and of Constantine; other celebrated examples are at Ancona and Benevento in Italy, Rheims and Orange in France, Baalbek in Syria, in Africa, Spain, etc. (See ARCH, TRIUMPHAL.) Memorial columns were erected for a like purpose, usually of the Doric or Corinthian order, and of imposing size, sometimes in reality towers in the form of columns, as the columns of Trajan and of Marcus Aurelius at Rome, covered with reliefs in ascending spirals depicting their campaigns. (See COLUMN; ANTONINE COLUMN; TRAJAN'S COLUMN.) Both these kinds of memorial have been often imitated in modern times. Among modern arches are those erected by or in honor of Napoleon in Paris—Arch of the Carrousel, Arc de l'Etoile; the Arch of Peace at Milan, the Washington Arch (New York) and Soldiers' and Sailors' Memorial Arch in Brooklyn (N. Y.); and the Brandenburger Thor, Berlin—not an arch, properly speaking, but a triumphal gateway. Among modern columns two of the most beautiful and famous are in Paris—the Colonne Vendôme in the square of that name (see VENDÔME) and the Colonne de Juillet on the site of the Bastille. (See COLUMN, Plate, Fig. 17.) In memory of the victory of Commodore Perry on Lake Erie a lofty Doric column was being erected in 1915.

Modern memorial structures other than obelisks, statues or groups (see SCULPTURE), tombs, arches, and columns are of very varied kinds. Churches, hospitals, chapels, homes, and libraries are often built as memorials, e.g., the Crimean Memorial Church at Constantinople, the Rylands Memorial Library at Manchester (England), Memorial Hall of Harvard University, etc. The Ruhmeshalle at Munich and the Hall of Fame of New York University are galleries to commemorate the great men of Bavaria and of the United States respectively. The Soldiers' and Sailors' Memorial at New York is a lofty temple-like circular edifice. The Lincoln Memorial now (1915) under erection at Washington, D. C., is a severe and stately Doric hall. The Champlain Memorial at Crown Point, N. Y., is in the form of a government lighthouse. Memorial halls often take the form of historic museums containing documents and objects of historic interest associated with the person or event commemorated. The mere enumeration of the varieties of memorial buildings, monuments, parks, and decorations would require several pages. Next to religion, commemoration offers the highest inspiration and the widest opportunity to artistic creativeness, both for the architect and the sculptor; for except in the case of purely sculptural monuments and of utilitarian build-

ings erected as memorials, both these arts must be associated in order to secure the highest results. See MAUSOLEUM; MONUMENT; TOMB.

MEMORIAL CROSS. See CROSS.

MEMORIAL DAY. See DECORATION DAY.

MEM'ORY (OF. *memorie, memore, memoire,* Fr. *mémoire,* from Lat. *memoria,* from *memor,* mindful; connected with Gk. *μέρμερος, mermeros,* anxious, Skt. *smar,* to remember). The conscious representation of past experience. To say that a man has a good memory means that he is able to recall past events fully and accurately. The term is also used, more broadly and loosely, to include the capacity of retention. Thus memory is figuratively called a storehouse. This implies that within memory are preserved bits of experience which may reappear in consciousness from time to time in the form of recollections. It is well to keep distinct the terms "retention," which properly considered is a physiological fact, a matter of cerebral mechanics, and "conscious representation," or "recollection"—memory in the strictly psychological sense.

Recollection involves no new or peculiar mental processes. The core of a recollection or a memory, as it may be called, is the memory idea. This may appear either as an image—visual, auditory, tactual, etc. (see IMAGINATION; IMAGE)—or as a word or a series of words. The thing that brands the image or word as a memory idea is, first of all, a feeling of familiarity (see FAMILIARITY). Memory is thus intimately related to recognition, which is likewise characterized by the feeling of familiarity; but it differs from recognition in that the latter has as its content a present perception instead of an idea. In imagination, on the other hand, we find as a characteristic mark the feeling of strangeness or unfamiliarity. Furthermore, a recollection is ordinarily specific; the idea comes not only as familiar but also as specifically placed and dated. These references of place and time are meanings which are themselves represented in consciousness by organic sensations and other associated ideas, and which thus form a further mark of distinction between memory on the one hand and recognition and imagination on the other. It is always necessary to distinguish between the memory idea, as mental process, and the meaning carried by that idea; e.g., the memory idea of the capitol at Washington may be only a vague visual image of the dome, but this image stands for, means, the entire building. (See MEANING.) The failure to draw this distinction has led to misunderstanding of the true nature of memory imagery. Another point to notice is that, with lapse of time, the memory idea is subject to change of various kinds: it tends to fade out completely or to be replaced by typical and habitual images, or, again, to be replaced in part by foreign imaginal contents; so that after an interval, say, of some months or years a memory idea shows in numerous details a lack of correspondence with the original perception. The fading of the memory idea and its filling out with imaginal contents are due, first, to the decay of the impression made on the nervous system, and secondly to a general determining tendency to make a full and complete picture out of a fragmentary one; the same tendency is seen in the reconstruction of dreams after waking, and again in the invention of details to round out a good story. The true memory idea, indeed, is found experimentally to be far less complete, more filmy, of poorer coloring, and less stable, than it is commonly thought to be.

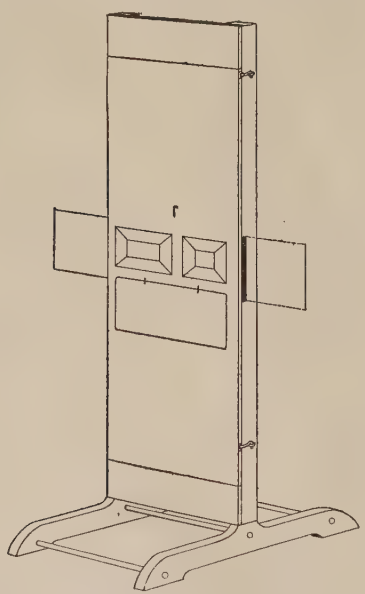
There are, in strictness, numerous partial "memories"—auditory, visual, kinæsthetic, etc. —and not one single "memory." Auditory imagery usually occurs in combination with throat kinæsthesis; gustatory and olfactory memories are rare. Since individuals are found to differ as regards the predominant forms of imagery, it has become customary to distinguish memory types and to assign observers accordingly to a visual type, an auditory-kinæsthetic type, a kinæsthetic type, or, if the various forms of imagery appear to be more or less evenly balanced, to a mixed type. These type differences are, however, gross differences; subclasses within type may be distinguished. For example, individuals who are predominantly visual may still differ as regards the prevalence of the spatial and the qualitative attributes: one visualizes forms clearly with poor coloring; another visualizes color with marked fidelity, but outlines with vagueness; and in the same way persons who belong to the auditory type may differ in ability to image pitch, timbre, etc. Furthermore, there are individuals who tend to reduce as many ideas as possible to spatial terms: differences in pitch are visualized in steps, or felt kinæsthetically as up or down; loud tones are near, soft tones are far; short intervals of time are represented as lines of different lengths. It seems, therefore, that we must eventually distinguish "attributive types." But, finally, this whole doctrine of types must not be taken too rigorously. Nervous predisposition, the mode of presentation of the original material, the purpose or intention with which the material is recalled, are all concerned in determining the nature of the imagery that occurs at any one moment; so that the same individual may learn with one form of imagery and recall with another; and a person whose word imagery is auditory-kinæsthetic may recall objects in visual imagery.

Recollection is either active or passive. The effort to "call up" a name or a situation in which a known event occurred is an instance of active recollection; whereas, in passive recollection, memories "come of themselves," as in the case of a reverie or in the successive appearance of the words and music of a remembered song. The former demands active attention, the latter passive. Almost any phase of consciousness may initiate recollection; the perception of a color may do it, or that of a sound, or a shiver of cold, a feeling, a bracing effort, etc. See ASSOCIATION OF IDEAS for the incentives to recollection.

Retention rests upon some modification of the cortex during excitation. The most acceptable theory of retention is the theory of "functional dispositions" (Wundt). Excitation so disposes nerve elements that their functions are more or less permanently altered. In this manner a reëxcitation renews a function which has already been impressed upon the nervous substance. The concept of physical memory has been extended to cover all changes in organic matter which outlast the operation of their causes. It is thus made synonymous with physiological habit. See HABIT; DISPOSITION.

Experiment has attacked most of the major problems of memory. Three general methods have been used: (1) reproduction: the observer reproduces, e.g., a line of poetry or a tone that he has heard previously; (2) recognition: e.g.,

a color is shown twice in succession, and the observer reports whether he recognizes it the second time as the same color or whether it looks lighter or greener or paler; (3) comparison: emphasis is laid on the memory image, which is compared with a similar perception. The first important work was done by H. Ebbinghaus in 1885 under the first method. Series of meaningless syllables (e.g., bul, rom, cil) were read over and over, and then an attempt was made to write them from memory. The investigator found that as the interval between learning and reproducing was gradually lengthened, the amount remembered fell off at first rapidly and then more and more slowly. The influence of length of series, order, repetition, rhythm, etc., was also studied. Ebbinghaus' method, which is known as the method of complete mastery, has been repeated with many modifications and improvements in technique. The most important investigator of memory, after Ebbinghaus, is G. E. Müller, who has devised two other methods: the method of retained members, in which the learner is required, after an interval, to reproduce as many syllables as possible without regard to order; and the method of right associates, in which the observer is first required to repeat the syllables in trochaic rhythm (a procedure which breaks up the series into groups of two syllables each) and is then shown the first syllable of a group, with the instruction to respond with the first syllable that comes to mind. The nature of the response and the time elapsing between presentation of stimulus syllable and response are both important for the scoring of the results. Many forms of apparatus have been devised for the



JASTROW'S MEMORY APPARATUS.
From Titchener, *Experimental Psychology.*
(Series of colors or letters are exposed, to be memorized by the observer.)

presentation of the material to be learned; the Jastrow memory apparatus shown in the cut is one of the older and simpler forms. Other subjects related to memory which have been investigated are the character of the stimulus, combination of sense modalities, association and arrangement, the effects of disease, of age, race, and individual differences. The results of the experimental investigations of memory are treated in the articles ASSOCIATION OF IDEAS and LEARNING (qq.v.).

The systematic attempt to improve the efficiency of memory is known as the art of mnemonics, which is said to have originated with the Greek poet Simonides. Most mnemonic devices include the formation of artificial associations as an aid to recollection. A common device for remembering dates, e.g., is the association of the digits with letters. Then the letters corresponding to the figures in a date are brought together in a word which is associated, in turn, with the event whose date is to be retained.

Memory is subject to many disturbances or diseases, most of which fall under the head of amnesia, or loss of memory. Amnesia may be either general or partial. In general amnesia a greater part of memory disappears, (1) temporarily, as in epilepsy, or (2) periodically, as in altered personality, or (3) progressively (e.g., proper names are forgotten before adjectives and verbs). Partial amnesia covers loss of memory for colors, sounds, numbers, proper names, etc. (See APHASIA.) A less frequent disorder of memory is hypermnesia, or exaltation of memory. A person's general memory, or his memory for a language or for some event of his childhood, is remarkably clarified. Finally come illusions of memory, or paramnesias, in which the subject believes that a new experience has been passed through before (illusion of familiarity), or assigns to a recent date experiences which have occurred at a remote time.

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MEMORY IN ANIMALS. The more precise definition of memory as a conscious representation of past experience means that memory is characterized by the free memory idea. The existence in animals of the free idea is, however, doubtful; the evidence which is usually accepted by the layman is by no means unequivocal. In the absence of his master the dog may show signs of grief, but there is no reason to assume that symptoms of grief imply an idea of the master. The unhappiness may be consciously represented without ideation of its cause. Nor does the dog's later recognition of his master imply that he has had his master in mind, any more than recognition in man implies that the

object recognized has been thought about in its absence. (See RECOGNITION.) The movements that animals make in their sleep, or the sounds that they may then utter, have been taken as evidence of dream imagery; but there is no assurance that such behavior is not entirely reflex, or associated merely with some vague perception.

Several criteria of the free idea have been suggested. For example, very rapid learning has been held to indicate the presence of free ideas. Animals, however, seem never to learn so rapidly that the assumption of a purely representational consciousness is safe. (See LEARNING IN ANIMALS.) Inferential imitation, another proposed criterion, is seldom if ever found in animal activity; usually, when the animal imitates, the fact is that certain movements are aroused by interest in an object and not by a free purposive idea. (See IMITATION IN ANIMALS.) Still another index of memory might lie in the animal's ability to respond to a stimulus some considerable time after that stimulus had lapsed. In experiments made in a dark room, certain animals, which were accustomed upon the exposure of a light to go in its direction to obtain food, were restrained by the experimenter when the light was shown and released only after an interval. The length of time during which the animal could remember the direction in which the food lay varied from a few seconds in the case of rats to one minute for raccoons and five minutes for young children. It was found further that during the intervals preceding successful trials all the animals, except the raccoons, preserved some form of bodily orientation towards the position of the light: a mode of behavior which suggests that the memory was not a matter of ideas, but merely a persistence of kinæsthetic sensation. Even in the case of the raccoons, a kinæsthetic localization might have continued for a minute without being evident in bodily posture. In general it may be said that those who affirm the occurrence of free ideas in animals base their arguments less upon positive experimental evidence than upon the genetic presumption that the developmental difference between man and animals is not so great as the absence of the idea in the latter would imply.

The term "memory" is often employed in a less exact sense to denote retention; so that any modification of behavior by past experience is held to involve memory, and the facts of memory are the facts of learning. (See LEARNING IN ANIMALS.) To this type of memory belongs associative memory, an explanatory phrase used to characterize a reaction given, not to its usual stimulus, but to some other stimulus which has occurred previously, together with the usual one. Consult general texts cited in ANIMAL PSYCHOLOGY; also Hunter, "The Delayed Reaction in Animals and Children," in *Animal Behavior Monographs*, vol. ii (New York, 1913), and Watson, *Behavior* (ib., 1914). See ANIMAL PSYCHOLOGY; INTELLIGENCE IN ANIMALS; INSTINCT; MEMORY.

MEM'PHIS. A city of ancient Egypt, situated about 12 miles south of modern Cairo, on the left bank of the Nile (Map: Egypt, E 2). It is said to have been founded by Menes, the first historical King of ancient Egypt, but this is as little probable as the statement in Herodotus that Menes gained the ground for building Memphis by diking off the Nile. King Uchoreus, whom Diodorus calls the founder of Memphis, cannot be identified. It is certain that a city called the White Wall stood on the spot from prehistoric times; this name (Leukon Teichos) was still attached to the citadel and the neighboring quarter of Memphis in the Greek epoch. The kings of the fourth to the sixth dynasty built their residences not very far from Memphis, and their pyramids are in the vicinity, but Memphis proper received its name and importance from the second King of the sixth dynasty (Pepy or Apopi I), who built his pyramid and residence not far west of the small ancient city of the White Wall. The name of that pyramid, Men-nofer (good abode), extended to the whole city and, corrupted to Menfe, came down to the classical writers. In the seventh century B.C. the Assyrians called the city Mempi; in the Bible the name has been corrupted to Moph and Noph. Memphis, which had a very favorable situation, near the head of the delta, became the capital of Egypt. In later times several dynasties preferred other capitals, but Memphis always remained at least the second capital of Egypt and the second city of the land in wealth and population. The conquests by the Ethiopians, Assyrians, and Persians do not seem to have affected it much, and the writers of the earlier Roman period still describe it as filled with temples and palaces of amazing size and beauty, the Iseum, the Serapeum, and others. The decline of the city was rapid after the Arab conquest (at which time it was still the seat of a governor), when Fostat (Old Cairo) was erected in the neighborhood. Fostat and subsequently Cairo were built of stones taken from the deserted buildings of Memphis, and thus it came about that the ancient city entirely disappeared. The only remarkable monuments left there at present are the two colossal statues of Ramses II (originally 42 feet high), lying on the mound near the modern village of Mit-Rahîneh and marking the entrance to the principal and earliest temple of Memphis, that of Ptah (Greek Hephæstus), and the centre of the White Wall. Abd-ul-Latîf, as late as the thirteenth century A.D., found remarkable ruins on the site of old Memphis. The insignificant rubbish mounds (of Mit-Rahîneh, Bedrashên, Ennagîzîyeh, etc.) extend 3 or 4 miles from north to south. The classical writers give very exaggerated accounts of the size of the city. The immense necropolis west of it, including the pyramids and tombs of Saqqara, still bears testimony, however, to the former importance of Memphis. The principal god of the city was Ptah, the master craftsman among the gods, who was believed to have formed the world; afterward the conception of this deity was called Ptah-Sokar (a combination of Ptah and Sokar, the god of the western suburb), embodied in the Apis bull and others. The numerous Phœnician merchants had a quarter of their own with a temple of Astarte.

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MEMPHIS. The commercial metropolis and largest city of Tennessee, a port of entry, and the county seat of Shelby County, situated on the Mississippi River, 454 miles below St. Louis and 739 miles above New Orleans (Map: Tennessee, A 4). Embracing 19.3 square miles, the city rests upon the lower or fourth Chickasaw Bluff, an undulating plateau that rises 32 feet above the flood tide of the river at the water front and about 77 feet at the eastern city limits. Among the public buildings are the customhouse and post office, county courthouse, costing $1,500,000, in which the municipal offices are installed, police station, costing $250,000, city and United States marine hospitals, and a market house. In addition there are the St. Joseph's (Roman Catholic), Baptist Memorial, and Tuberculosis hospitals and several private sanitariums and hospitals. The city contains also the Goodwyn Institute, Cossitt Library, a country and other clubs, and a number of fine modern business buildings. Educational institutions include a State normal school, medical departments of the University of Tennessee, and 37 private schools and colleges. The public-school system is composed of a central high school, a vocational school, and 35 grammar schools. In 1915 there was a total enrollment in the public schools of more than 22,000 pupils.

There are 13 State and four national banks, with a total capital stock of $5,848,624 and surplus and undivided profits amounting to $3,051,692. The clearings for the year ending July 1, 1914, amounted to $425,726,391. Memphis ships freight by 175 steamboats, and 11 trunk lines of railroad have terminals here. Two belt lines convey the heavy traffic. The river is spanned at this place by a massive cantilever bridge, 1900 feet in length over the channel, and continuing as a truss bridge into the lowlands of Arkansas, a total distance of 15,635 feet. This bridge is owned by the St. Louis and San Francisco Railroad. Another great steel bridge of the same character, but somewhat larger, is now (1915) being built by the Rock Island System. The railway lines entering the city are served by two large Union stations, costing $6,000,000.

On account of its situation at the head of deep-water navigation on the Mississippi, Memphis has become an important commercial, manufacturing, and distributing centre. It is one of the largest inland cotton markets of the world, the gross receipts for 1914 having been 1,129,553 bales and the net receipts 644,773 bales, which sold for $46,296,137. Memphis also ranks high as a hardwood lumber market, having 155 concerns in the business with an annual output valued at about $19,500,000; and it is of considerable importance as a cottonseed-oil producing centre, operating 12 oil mills, four refineries, and five by-products factories. Besides these there are repair shops of two railroads and more than 600 industrial plants within the city limits, embracing a large variety of products, the total value of which in 1914 was $45,242,000. In the same year the city distributed $24,000,000 worth of wholesale groceries, grains and foodstuffs amounting to $18,000,000, and $5,000,000 worth of candies and confectioneries.

The financial statement of Memphis for the year 1914 showed total receipts of $3,617,330, while its disbursements amounted to $3,234,305, the chief items of expenditure being $238,000 for the police department, $227,000 for the fire department, $164,000 for health, and more than $500,000 for education. The tangible assets of the city amounted to $18,454,000.

The site of Memphis was an ancient crossing place of the Indian tribes on both sides of the river. It was first visited by De Soto, May 8, 1541, who crossed the river here. The Bluff was seen by Marquette and Joliet in 1673, by La Salle in 1682, and by De Tonti in 1686, but none of these made a settlement there. Bienville, the French Governor of Louisiana, in his war with the Chickasaw Indians, came with a large force in 1739 and built Fort Assumption on the Bluff. Gayoso, the Spanish Governor of Louisiana, occupied it in 1795 and erected Fort Ferdinand, but abandoned it two years later when Capt. Isaac Guion, with a detachment of United States troops, arrived and built Fort Adams on the same site. On May 1, 1819, Gen. Andrew Jackson, Judge John Overton, and Gen. James Winchester, the proprietors of Memphis, laid out a small town on the Bluff and gave it its present name, after the Egyptian city. In December, 1826, Memphis was incorporated. The city suffered much during the Civil War when the Confederate gunboat fleet, under Commodore Montgomery, was destroyed by the Union fleet, commanded by Commodore Davis, and as a result Memphis came under the control of the Union armies until the close of the war. In 1855, 1867, 1873, 1878, and 1879 the city was ravaged by epidemics of yellow fever, and in the two latter years its very existence was imperilled. This disaster was followed by a collapse of its financial system, and, to avoid bankruptcy, the municipal charter was repealed (1879) by the State Legislature and the city reduced to a Municipal Taxing District of Shelby County. But the city quickly recovered, its indebtedness was bonded, and in 1893 its name and municipal form of government were restored. In 1895 the power to levy its own taxes was reconferred, and the city began a new career of progress and prosperity. Since then its growth has been rapid.

In 1909 the city was granted an amended charter which gave it the commission form of government, and this still continues in successful operation, the municipal powers being vested in a mayor and four commissioners. One of the first acts of the Taxing District government had been to install the Waring system of sewers, and this, with other sanitary measures, cleansed the city thoroughly and greatly reduced the mortality rate. More than 340 miles of sewer mains have been laid, and the city has acquired its own artesian water system, the wells, 350 to 500 feet in depth, furnishing an almost unlimited supply of clear, wholesome water. Memphis maintains a splendid system of woodland parks, embracing about 1000 acres and including a beautiful park driveway, 11 miles long, connecting the larger parks. To these have been added several extensive playgrounds for children. Five miles distant is a National Cemetery, in which are 14,039 graves, 8822 of unknown dead. Memphis is the see of a Protestant Episcopal bishop. Pop., 1850, 8841; 1860, 22,623; 1880, 33,592; 1890, 64,495; 1900, 102,320; 1910, 131,105, including 6467 persons of foreign birth and 52,441 negroes; 1914 (U. S. est.), 143,231; 1920, 162,351. Consult: Keating and Vedder, *History of the City of Memphis* (Syracuse, 1888); Young, *History of Memphis* (Knoxville, 1912).

MEMPHIS, Ancient and Primitive Order of. See Masons.

MEM'PHREMA'GOG. A lake situated in the Province of Quebec, Canada, and extending 7 miles into Vermont (Map: Vermont, E 2). It has an irregular shape, is 30 miles long by from 2 to 5 miles wide, and discharges its waters northeastward through the Magog River into the St. Francis. Along the west shore is a range of mountains, reaching a height (in Owl's Head) of about 3000 feet; the lake is noted for its picturesque scenery. It is a favorite summer resort; numerous handsome villas dot its shores; and in summer a steamer runs from Newport, Vt., at the south end, to the Canadian village of Magog at the north extremity.

ME'NA. A city and the county seat of Polk Co., Ark., 84 miles by rail south of Fort Smith, on the Kansas City Southern Railroad (Map: Arkansas, A 3). It has a public library, a beautiful natural park, and St. Joseph's Academy, and is a popular summer resort. Among its industries are the manufacture of lumber and the shipment of fruit and cotton. There are municipal water works. Pop., 1900, 3423; 1910, 3953.

MENA, mā'nà, Juan de (1411–56). A Spanish poet, born at Cordova. After studying at Salamanca he went to Rome. He was secretary to King John II of Castile and court historian. Despite this latter position, he had nothing to do with the *Crónica de Don Juan II.* For many years he was credited with having written the first act of the *Celestina* (q.v.), but that assignment is now rejected. The *Coplas de la panadera* were also ascribed to him, but this is no longer seriously maintained, and long ago Argote de Molina credited them to Iñigo Ortiz de Zúñiga. His principal work is *El laberinto de fortuna* (1496), a poem modeled on the *Divine Comedy.* The oldest manuscripts give it as a poem of 297 stanzas, but when in later manuscripts three more were added, it received the popular title *Las trezientas.* Consult Mena, "Cancionero," edited by R. Foulché-Delbosc, in the *Nueva biblioteca de autores españoles,* vol. xix (Madrid, 1912), and in the latest edition of Fitzmaurice-Kelly's *Bibliographie de l'histoire de la littérature espagnole* (Paris, 1913).

MENA, Pedro de (?–1693). A Spanish sculptor. He was born in Adra (Alpujanas), where he studied with his father, as he did later in Granada under Alonzo Cano. His first important work comprised several statues of saints for the convent of El Angel, Granada; this was followed (1658–62) by a commission for sculptures in high relief of 40 saints for the choir stalls of the Malaga Cathedral. In 1663 he was appointed sculptor to the cathedral chapter of Toledo, and he was also employed at Madrid, Cordova, and elsewhere. The greatest Spanish sculptor of the later seventeenth century, Mena excelled in the rendering of the nude and in the expression of fervid religious sentiment. He is at his best in single contemplative figures. His works include, besides those mentioned: a statuette of St. Francis, in the cathedral at Toledo; "A Madonna and Child with St. Joseph," in the church of St. Isidoro, Madrid; a "Crucifixion," in the church of Innestra Senoia della Gracia, Madrid; the equestrian statue of St. James, in the cathedral at Toledo. Consult Haendcke, *Etudien zur Geschichte der spanischen Plastik* (Strassburg, 1900).

MENABREA, mā'nà-brā'à, Luigi Federigo, Count (1809–96). An Italian general and statesman. He was born at Chambéry in Savoy and was educated for an engineer. On completing his studies he entered the Sardinian army as lieutenant in the engineer corps, but was soon called to a professorship of mechanics in the military academy and at the University of Turin. In 1848 he was promoted to the rank of captain, served in the war against Austria, and was then employed on diplomatic business. During the War of 1859 Menabrea acted as chief of staff of the engineers in the Sardinian army. After the defeat of the Austrians by the French and the handing over of Savoy to France, he left the province to retain his Italian citizenship and was created a Senator by Victor Emmanuel and made chief of the Department of Engineers. In 1860 he became a lieutenant general and was director of the siege operations against Gaeta, where the King of Naples had taken refuge. It surrendered after a three months' siege, for which success he was made Count. In 1861 he succeeded Ricasoli as Minister of Marine, to which he added in 1862 the duties of Minister of Public Works. He assisted in framing the Treaty of Prague in 1866, which gave Venice to Italy. He was called in 1867, on the retirement of Rattazzi, to form a new cabinet. He continued to carry on the government until near the close of 1869, and in two years of his premiership did much for Italian stability, both at home and abroad. After resigning, Menabrea was appointed Italian Ambassador to London (1876) and Paris (1882). He remained at Paris for 10 years. He died at Chambéry, May 25, 1896. Among the works he wrote are: *Etudes sur la série de Lagrange* (Turin, 1844–47); *Le génie italien dans la campagne d'Ancône et de la Basse-Italie* (Paris, 1866); *République et monarchie dans l'état actuel de la France* (ib., 1871).

MENAC'CANITE. See Ilmenite.

MENADO, mā-nä'dō. The capital of the Dutch Residency of Menado in north Celebes. It is situated near the extremity of the northeast peninsula of the island, on both sides of the river Tondano (Map: East Indies, F 5). It has an ethnological museum and is defended by the old Fort Amsterdam. Its unsafe roadstead detracts greatly from its commercial importance, though it is the outlet for a large amount of coffee grown in the province. Pop., 1895, 8996; 1905, 10,578, including 694 Europeans.

MENÆCHMI, mē-nēk'mē. One of the best comedies of Plautus, so called from the twin brothers whose resemblance to each other and the amusing situations arising from their confusion form the plot of the play. The comedy is one of the earliest preserved plays of Plautus. It suggested in part the plot of Shakespeare's *Comedy of Errors.* William Warner translated the comedy into English in 1595.

MÉNAGE, mā'näzh', Gilles de (Ægidius Menagius) (1613–92). A French lexicographer and linguist, the original, perhaps, of Vadius in Molière's *Femmes savantes,* born at Angers. Disliking the profession of an advocate, he renounced it, entered the Church, and fixed his residence in the convent of Notre Dame. Besides writing Latin verses and observations on the French language, he possessed a broad erudition, ranging from Hebrew and Greek to Italian. His *Dictionnaire étymologique, ou*

origines de la langue française (Paris, 1650–94; best ed. by Jault, 2 vols., Paris, 1750) and his *Origini della lingua italiana* (1669) are erudite and valuable works. His Latin poems, originally published in 1656, were issued in a sixth edition in 1673. The *Menagiana*, a record of his conversations and witticisms, were collected by his friends the year after his death and republished by La Monnoye in four volumes in 1729. Consult Dumont, *Gilles Ménage considéré comme poète* (Angers), and Samfiresco, *Ménage polémiste, philologue, poète* (Paris, 1902).

MENAGERIE, mĕ-năj′ēr-ĭ. See ZOÖLOGICAL PARK.

MENAI (mĕn′ī) **STRAIT.** The channel which separates the island of Anglesey from the mainland of Wales (Map: England, B 3). It is 13 miles long and varies in width from about 250 yards to 2 miles, widening out north of Bangor into Beaumaris Bay. Navigation of it is hazardous, but the strait is nevertheless much used by vessels under 100 tons in order to save time. At the entrance of the strait the tides sometimes rise to a height of 30 feet, and the ordinary neap tide rises from 10 to 12 feet. The strait is spanned by a suspension bridge, built in 1819–26, and by a tubular bridge, built in 1849–50, which carries the London and Northwestern Railway across Britannia Rock.

MENAM, mă-năm′. The chief river of Siam. It rises in the northwestern part of that country and flows southward, emptying by several arms into the Gulf of Siam, after a course of about 700 miles, or 900 miles if its length is measured from the source of its large tributary, the Mei Ping (Map: Siam, D 4). The Menam is navigable for large steamers to Bangkok, 15 miles from its mouth, and for small vessels for about 250 miles. The river divides itself several times by arms rejoining farther down, and from June to November it overflows a large part of the surrounding country, leaving an alluvial deposit of extraordinary fertility. Thousands of tons of fish are caught and cured during the falling stages of the river at Pichai.

MENAN′DER (Lat., from Gk. Μένανδρος, *Menandros*) (342–c.291 B.C.). One of the greatest poets of the Attic New Comedy, born at Athens, of a distinguished family. By his uncle, Alexis, the eminent poet of the Middle Comedy, he was initiated into the dramatist's art; his philosophical education he received from association with Theophrastus and Epicurus. He was intimate also with Demetrius. He was handsome and fond of luxury. The greater part of his time he spent at his villa in the Piræus with his beloved mistress Glycera. When Ptolemy Soter gave him a flattering invitation to his court Menander declined, preferring his native city and easy independence to royal favor. About 291 B.C. he was drowned while swimming in the harbor of the Piræus. Menander is said to have won a victory on the comic stage at the age of 21. Yet during his lifetime he was less a favorite than his contemporary Philemon (q.v.). Of his 105 or 108 plays but eight won the highest place. After his death, however, he became the favorite above all other comic poets of his time and was much read and quoted far into the Christian era. Copies of his plays were known to Suidas and Eustathius; 23 of his plays, it is said, were known in Constantinople in the sixteenth century. A well-known statue in the Vatican has been regarded by some scholars as a statue of Menander and has been identified by them with the statue of him known to have been set up in the theatre at Athens; another statue of Menander is in the Boston Museum of Fine Arts. (Consult R. Delbrück, *Antike Porträts*, Tafel 20, Bonn, 1912.) According to ancient critics he was distinguished for his wit, the refinement and perfection of his language, and his ingenious plots, his analysis of emotions, and his penchant for moral maxims. Until recently scholars were obliged to form their opinions of his comedies chiefly from the adaptations of them by the Roman comic writers Plautus and Terence, even though they had over 1000 fragments of his plays, about 1650 verses, and a considerable collection of gnomes attributed to him. The latter collection has, however, suffered greatly from additions. The fragments are best published by Kock, *Comicorum Atticorum Fragmenta*, vol. iii (Leipzig, 1888). Within the last 20 years, however, our knowledge of Menander has greatly increased. Two leaves of papyrus containing new fragments were published by Nicole, *Le laborateur de Ménandre* (Basle, 1898), and by Grenfell and Hunt (Oxford, 1898). In the *Oxyrhynchus Papyri*, vol. iii (London, 1903), 100 more verses from one play were given by Grenfell and Hunt. In 1906 a papyrus fragment, giving in all 1200 lines from four plays, among them 500 from each of two plays, was unearthed by Gustave Lefebvre, and was published in 1907, at Cairo, as *Fragments d'un manuscrit de Ménandre*. This discovery has given rise to an immense number of editions and of papers in the learned periodicals. For the earlier and more important part of this literature, as for these fragments themselves, consult E. Capps, *Four Plays of Menander* (Boston, 1910). Through the fragments the plots of two of the plays at least can be made out quite clearly. On the whole the fragments have been disappointing; they hardly by themselves explain Menander's great reputation in antiquity. For a translation of the fragments of one play, consult C. H. Weller, "Menander's *Arbitrants*," in *The Classical Journal*, vol. viii, pp. 275–280 (Chicago, 1912–13). A complete translation of the fragments of Menander, by F. N. Allinson, is to appear in the Loeb Classical Library. Consult: W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911); J. W. Cohoon, "Rhetorical Studies in the Arbitration Scene of Menander's *Epitrepontes*," in the *Transactions of the American Philological Association*, vol. xlv (Boston, 1915).

MENANDER. A powerful Græco-Bactrian King who ruled at the beginning of the second century B.C. Strabo refers to some of his conquests and Plutarch records that on his death, 115 B.C., various towns contended for the honor of cherishing his ashes. The large number of coins that bear his name and the wide-extended territory over which they are found seem to point to a long reign and to a domain of considerable influence. He appears in Buddhistic literature as Milinda (q.v.).

MENANT, me-năN′, JOACHIM (1820–99). A French Orientalist, born at Cherbourg. He was a judge in several towns and finally vice president of the higher court at Rouen, resigning in 1890. For his skill in deciphering the cuneiform inscriptions and his valuable contributions to Assyrian literature he was made a member

of the Académie des Inscriptions. His numerous writings include: *Zoroastre* (1844; 2d ed., 1857); *Notices sur les inscriptions en caractères cunéiformes de la collection épigraphiques de M. Lottin de Laval* (1859); *Eléments d'épigraphie assyrienne: les écritures cunéiformes, etc.* (1860; 2d ed., 1864); *Les noms propres assyriens, etc.* (1861); *Inscriptions de Hammourabi, roi de Babylone (XVIe siècle avant J. C.), etc.* (1863), with J. Oppert; *Inscriptions du revers de plaque du palais de Khorsabad, traduites sur le texte assyrien* (1865); *Exposé des éléments de la grammaire assyrienne* (1868); *Les Achémenides et les inscriptions de la Perse* (1872); *Le syllabaire assyrien* (1873); *Annales des rois d'Assyrie, traduites et misses en ordre sur le texte assyrien* (1874); *Babylone et la Chaldée* (1875); *Documents juridiques de l'Assyrie et de la Chaldée* (1877), with J. Oppert; *Découvertes assyriennes: la bibliothèque du palais de Ninive* (1880); *Empreintes de cachets assyro-chaldéens relevés au musée britannique sur des contrats d'intérêt privé* (1883); *Les pierres gravées de la haute Asie: recherches sur la glyptique orientale* (part i, 1883; part ii, 1885); *Les langues perdues de la Perse et de l'Assyrie* (1885, 1886); *Ninive et Babylone* (1887); *Les fausses antiquités de l'Assyrie et de la Chaldée* (1888); *Les Hétéens* (1891), with A. H. Sayre; *Eléments du syllabaire hétéens* (1892).

MENANTES, mȧ-năn′tȧs. The pseudonym of Christian Friedrich Hunold (q.v.).

MEN'APHON, or CAMILLA'S ALARM TO SLUMBERING EUPHUES IN HIS MELANCHOLIE CELL AT SILEXEDRA. A story by Robert Greene, published under the title *Arcadia* in 1589, the year before the publication of Sidney's *Arcadia*. It contains some of the author's finest poems.

MÉNARD, mȧ′när′, MICHEL BRANAMOUR (1805–56). A pioneer, born of French parentage at Laprairie, Lower Canada. At an early age he entered the service of a fur-trading company at Detroit and afterward went to Missouri as an Indian trader for his uncle. He became a chief of the Shawnee Indians and gained much influence over other tribes. About the year 1833 he went to Texas and engaged in trading with the Mexicans and Indians. Owing to his influence over the Indians he was able, upon the revolt of the Texans, to prevent the Indians from assisting the Mexicans. He was a member of the convention that declared Texas independent, and afterward served in the Congress of that State. In 1836 he bought a square league of land that included most of the site of the present city of Galveston and became in effect the founder of that city.

MENASH'A. A city in Winnebago Co., Wis., 93 miles by rail north by west of Milwaukee, on Lake Winnebago, at its outlet into the Fox River, on the United States government canal of the Fox and Wisconsin River Improvement and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, E 4). It has a public library and there are paper mills, a woodenware factory, flour, saw, and woolen mills, machine shops, brickyards, and manufactories of lumber products. Lake Winnebago is a popular summer resort. Settled in 1847, Menasha was incorporated first in 1874. The present government is administered under a charter of 1892, which provides for a mayor and a unicameral council. The city owns its water works and lighting plant. Pop., 1900, 5589; 1910, 6081.

MENASSEH BEN ISRAEL, mē-năs′ĕ bĕn ĭz′rā-ĕl (1604–57). A Jewish writer and leader, born at Lisbon, Portugal. His family emigrated to Holland, where he became a rabbi and where he established the first Hebrew press in that country. His reputation was won by publishing *El conciliador* (4 vols., 1632–51), and he became a director of a Jewish college. An English translation of his tract, *Esperança de Israel* (Hope of Israel), appearing in 1650, markedly influenced English public opinion in behalf of the Jews. In 1655 he visited London to urge the Commonwealth government to grant to Jews right of residence in England. Upon his arrival there he issued his *Humble Addresses* to the Lord Protector, which called forth Prynne's *Short Demurrer*. The courts declared that there was no law forbidding the Jews to return. In 1656 Menasseh ben Israel published his brilliant refutation of calumnies against the Jews, *Vindiciæ Judæorum*.

MENCIUS, mĕn′shŭs (Latinized form of Chinese MÊNG-TSE or MUNG-TSE) (c.371–287 B.C.). A Chinese sage, ranking next after Confucius in the estimation of the Chinese. He was born about 371 B.C. (108 years after the death of Confucius), in the small Principality of Tsŏu in the present Province of Shantung, at no great distance from the birthplace of Confucius. As a youth he was known as Mêng K'o. His father died when the future philosopher was only three years old. The widow gave the fatherless boy every attention, and in due course he went to school, but does not seem at first to have been specially diligent or enthusiastic in his studies. It is said that he studied later with the disciples of Tszŭ-tse, the grandson of Confucius, and from them learned the doctrines of the master, of whom he became an enthusiastic admirer. When he was 40 he appeared as a public teacher with a large following of disciples. Like Confucius, he moved about from state to state, inculcating, expounding, and amplifying the Confucian teaching. He was more courageous and outspoken than Confucius and was fearless in following his teachings to their logical consequences. He taught that man's nature is good, though it may appear otherwise, and that all his vices and all his misfortunes are due to evil influences from without. Humanity, righteousness, propriety, and knowledge are as natural to man as his four limbs. He condemned warfare and held that man should and need not fight, but should be benevolent, for "the benevolent man has no enemy." He regarded wars as unjust in the main, and an instigator of wars as a criminal. What is wanted is a return to this original goodness, and this can be accomplished only by the rectification of the heart. He laid special stress on humanity and righteousness, one the complement of the other, as the two main elements in man's moral being, humanity representing the fullness of virtue in the individual and righteousness the due observance of all man owes to his fellow men. "Humanity is internal," he says; "righteousness external." "There has never been a man trained to humanity who neglected his parents; nor one who, having been trained to righteousness, made his sovereign an after consideration." Mencius was well versed in historical, political, and economic questions, in which his views were always

rational and the result of deep understanding. In politics he taught that government is from God, but is *for* the people, whose welfare is of supreme importance; and he emphatically inculcated the application of these two principles, humanity and righteousness, to the conduct of rulers. And he did not hesitate to indicate the duty of the subject in regard to the removal of oppressive rulers or wicked men in high places, when asked if a subject might put his sovereign to death. "He who outrages the humanity proper to his nature," he said, "is called a robber; he who outrages righteousness is called a ruffian. The robber and the ruffian we call a mere fellow. I have heard of the cutting off of Chóu-sin [the ferocious tyrant and last Emperor of the Shang dynasty, 1123 B.C.], but I have not heard in his case of putting a sovereign to death";—only a cruel monster, a mere fellow. With Mencius the happiness of the people is the first essential, and loyalty to the sovereign, as taught by Confucius, of secondary importance.

Mencius died at 84, after passing the last 15 years of his life in retirement, during which he edited the *Book of History* and the *Book of Poetry* and prepared with the aid of some of his disciples a record of his sayings and of his conversations with the princes—a fact which may account for their greater fullness as compared with those of Confucius. It is the last of the *Four Books* which form the basis of the Confucian philosophy. He was buried near the present Tsóu Hien, in Shantung, where there is a temple in his honor and where his descendants still dwell. It was not till the second century A.D. that his writings were fully studied and appreciated. In 1083 he was created Duke of Tsóu; in 1088 he was admitted into the Temple of Confucius as an Associate, and titles were conferred on his father and mother.

Bibliography. Rémusat, *Nouveaux mélanges asiatiques*, vol. ii (Paris, 1829); Legge, *Chinese Classics*, vol. ii (London, 1861), containing the Chinese text of the Mencian discourses, with a translation in English, Critical Notes, Prolegomena, and a Life; Faber, *Ene Staatslehere auf ethischer Grundlage, oder Lehrbegriff des chinesischen Philosophen Mencius* (Elberfeld, 1877), or Hutchinson's translation, *The Mind of Mencius* (London, 1880); Johnson, "China," vol. ii, in *Oriental Religions and their Relation to Universal Religion* (Boston, 1878); Watters, *A Guide to the Tablets in the Temple of Confucius* (Shanghai, 1879); E. H. Parker, *Studies in Chinese Religions* (London, 1910); Friedrich Hirth, *The Ancient History of China* (New York, 1911).

MENDAÑA DE NEYRA, mân-dä′nyȧ dȧ nā′ê-rȧ, ALVARO DE (1541–95). A Spanish navigator, born in Saragossa. He went to Peru in 1565, and had resided some time at Lima when his uncle, Lope García de Castro, the Viceroy of the country, in 1567 put him in command of an expedition for purposes of discovery among the islands of the Pacific. Among his discoveries was that of a group of islands which he named Solomon Islands, on the pretense of believing that here Solomon obtained the gold used in the temple at Jerusalem. Returning to Lima in 1568, he circulated reports of the wealth of these islands, which led, 27 years later, to an expedition for their colonization, of which he took the command. Sailing from Callao April 11, 1595, he discovered another group of islands, which he named the Marquesas, after the wife of the Viceroy of Peru, the Marchioness Mendoza. Other groups of islands were visited, but Mendaña died without having reached the end of his voyage. Mendaña's narrative of his expeditions is in the National Library at Paris. This, with other contemporary accounts of the expedition, is translated in the Hakluyt Society publications for 1901, edited by Lord Amherst of Hackney and Basil Thomson (2 vols., London, 1901). Consult also Justo Zaragoza, *Historia del descubrimiento de las regiones australes* (Madrid, 1876–82).

MENDAÑA ISLANDS. See MARQUESAS ISLANDS.

MENDE, mänd. The capital of the Department of Lozère, France, on the left bank of the Lot, 110 miles southwest of Lyons. It is situated at the foot of a cliff rising 1000 feet above the town (Map: France, S., H 4). Its cathedral of St. Peter was founded in the fourteenth and rebuilt in the seventeenth century, with two towers, 280 and 210 feet high. In front of it stands a bronze statue of Pope Urban V, a native of the town. The town has also several normal schools, a communal college, and a library. It is the seat of a bishop. The chief industry is the manufacture of woolens, flannels, serges, and shalloons. Pop. (commune), 1901, 7319; 1911, 7005.

MENDEANS, měn-dē′anz. See CHRISTIANS.

MEN′DEL, GREGOR JOHANN (1822–84). An Austrian botanist. He was born at Heinzendorf, Austrian Silesia, and in 1843 entered the Augustinian Königinkloster at Brünn. He became a priest in 1847; studied at Vienna (1851–53); returned to the cloister; taught at Brünn, and became abbot. While Mendel was teacher of natural science in the Brünn Realschule (1853–68) he was largely occupied with experiments in hybridization, with a view to obtaining some evidence as to the laws of heredity. His results are discussed under MENDEL'S LAW (q.v.). After 1873 Mendel's duties as abbot at Brünn prevented further biological work. See HEREDITY.

MENDELÉEV, myĕn′de-lĕ′yĕf, DMITRI IVANOVITCH (1834–1907). A Russian chemist, born in Tobolsk, Siberia. He graduated from the local Gymnasium and in 1850 entered the Institute of Pedagogy of St. Petersburg, where he applied himself to the study of natural sciences. In 1856 he was appointed docent at the University of St. Petersburg and in 1859–61 he worked in Heidelberg and published a monograph *On the Capillarity of Gases*. Shortly afterward he published his *Organic Chemistry*. He was made professor of chemistry at the St. Petersburg Institute of Technology in 1863, and three years later at the university. In 1871–75 he made extensive studies on the compression of gases, embodied in his *On the Elasticity of Gases*. In 1876 he was commissioned by the authorities to study the petroleum industry in Pennsylvania and the Caucasus. His work on *Aqueous Solutions* (1886) was received by chemists as a notable contribution to experimental chemistry, although his "theory of solutions," according to which solvents invariably form chemical compounds with the substances dissolved in them, has been strongly criticized by physical chemists of the modern German school. As member of the Council of Commerce and Industries, Mendeléev was the champion of protection of home industries, and the policy of Russia in that direction dates practically from the publica-

tion of his *Tariff Elucidated* (1890). He worked out the formula for the *pyrocollodial* smokeless powder, serviceable for all firearms, when Russia undertook to rearm her forces. In 1893 he was made conservator of weights and measures in the new Chamber of Weights and Measures established in the Department of Finance.

His *Elements of Chemistry* (1st ed., 1868–70; 3d Eng. trans. from the 7th Russian ed., 1905) is a standard work and has been translated into German and French, as well as English. In it he first set forth his celebrated principle, later embodied in *La loi périodique des éléments chimiques* (Paris, 1879), and now generally known as the periodic law (q.v.), viz.: "The properties of the elements, as well as the forms and properties of their compounds, are in periodic dependence on, or form a periodic function of, the atomic weights of the elements." This law enabled Mendeléev to foretell the existence and even the properties of several unknown elements, which have since been actually discovered. Mendeléev is also the author of an interesting hypothesis on the nature of the universal ether embodied in *Attempt toward a Chemical Conception of the Ether* (Eng. trans., New York, 1904). His scientific contributions (over 150), dealing mostly with physical chemistry, have appeared in German and French scientific periodicals. Consult T. E. Thorpe, *Essays in Historical Chemistry* (London, 1902).

MENDELISM. See MENDEL'S LAW.

MENDEL'S LAW. A law of heredity announced in 1865 by Gregor Mendel (q.v.) in the *Proceedings* of the Natural History Society of Brünn, under the title *Versuche über Pflanzenhybriden.* It attracted no attention until 1900, when it was brought to light simultaneously by De Vries (Holland), Correns (Germany), and Tschermak (Austria), who were conducting genetic experiments with plants. This law has now become the working basis of most of the investigations in genetics. Mendel chose for his experiments the garden pea (see PISUM), because the plants are grown easily, the generations are short, and the contrasting characters are sharp. For example, in the various races the colors of the flowers are purple, red, or white; the mature seeds are smooth or wrinkled; the stature of the different races is either distinctly tall or just as distinctly dwarf. Hybrids were used because by this means the contribution of each parent could be recognized. Mendel's genius as an experimenter was indicated by the fact that, instead of studying the total results of inheritance through successive generations, he selected a single pair of contrasting characters, neglecting all other characters. These contrasting characters were traced through a series of generations, and, since all behaved alike, Mendel was able to formulate his general law. A single illustration will indicate the results obtained from all of the characters. When purple-flowered and white-flowered forms were crossed, all of the hybrid progeny were purple-flowered. In genetics this first hybrid generation is called the F_1 generation. The disappearance of the white character in the F_1 generation, followed by its reappearance in the next generation, led to the conclusion that the white character is present in all of the F_1 individuals, but does not express itself on account of the presence of the purple character; therefore, purple was said to be "dominant" over white, which was said to be "recessive." Mendel's law appears, however, in the behavior of the next generation (F_2). In the F_2 generation three kinds of individuals appear in a definite ratio, which becomes evident if four individuals are selected as an illustration. One of the four is a pure purple individual, as shown by breeding true generation after generation; a second is a pure white individual, as shown by subsequent breeding; while two of the four are purple individuals, but contain the white character as a recessive, as shown by subsequent breeding, behaving simply like all of the individuals of the F_1 generation. This ratio is expressed in two different ways: (1) by writing it 1 : 2 : 1, thus indicating the occurrence and proportion of the three kinds of individuals; or (2) by writing it 3 : 1, which in the experiment cited indicates that there are three purple individuals to one white one. Of course this latter expression does not show that there are two kinds of purple individuals. In general Mendel's law is often described as showing that hybrids "split" into the definite ratio 3 : 1. Involved in the law, however, is the idea of "unit characters," which means that characters retain their individuality, being transmitted intact and not blending with other characters. When two characters are mutually exclusive, one of them is always "dominant" over the other, which is then said to be "recessive." Mendel's explanation of this behavior of unit characters is that paired characters received from the two parents are segregated in the germ cells (eggs and sperms) of the progeny, so that each germ cell contains only one of the characters. In such a case there would be two kinds of eggs and sperms, and the chance of mating is expressed by the Mendelian ratio. For example, an egg of the pea in the experiment cited could contain either the purple character or the white character, but not both; i.e., two contrasting characters are mutually exclusive in the germ cells. The most fundamental feature, therefore, of Mendel's law is the theory of the so-called "purity of the germ cells" in reference to characters. Consult: William Bateson, *Mendel's Principles of Heredity* (New York, 1909); R. H. Lock, *Recent Progress in the Study of Variation, Heredity, and Evolution* (ib., 1906; new ed., 1910); R. C. Punnett, *Mendelism* (3d ed., ib., 1911); A. D. Darbishire, *Breeding and the Mendelian Discovery* (ib., 1911). See BREEDING; HEREDITY; HYBRIDITY.

MENDELSSOHN, měn'del-sōn, MOSES (1729–86). A German philosopher of Jewish parentage. He was born Sept. 6, 1729, at Dessau. From his father, a schoolmaster and scribe, he received his first education; and in his thirteenth year proceeded to Berlin, where, amid very indigent circumstances, he contrived to learn Latin and modern languages and to apply himself to the study of philosophy. After many years of comparative poverty he became part heir to a rich silk manufacturer, whose children he had educated. The intimate friend of men like Lessing—whose *Nathan der Weise* had its prototype in him—Sulzer, and Nicolai, he contributed in a vast degree to the mitigation of the brutal prejudices against the Jews. On the other hand, he broadened the outlook of his own coreligionists. He died Jan. 4, 1786. His principal works are: *Pope, ein Metaphysiker* (1755), with Lessing; *Briefe über die Empfindungen*

(1755); *Ueber die Evidenz in den metaphysischen Wissenschaften; Phädon, oder über die Unsterblichkeit der Seele* (1767); *Jerusalem, oder über religiöse Macht und Judenthum* (1783); *Morgenstunden* (1785). His works have been collected and edited by G. B. Mendelssohn (7 vols., Leipzig, 1843–45). Consult: Hensel, *Die Familie Mendelssohn* (9th ed., Berlin, 1898; Eng. trans., London, 1882); Kayserling, *Moses Mendelssohn* (Leipzig, 1882); Ritter, *Mendelssohn und Lessing* (Berlin, 1886); Dessauer, *Der deutsche Plato* (ib., 1879); Galestein, *Moses Mendelssohn und die deutsche Æsthetik* (Königsberg, 1904). His philosophy was of a rather superficial popular sort, whose aim was to find good reason for opinions currently regarded as correct.

MENDELSSOHN-BARTHOLDY, měn'dĕl-sōn-bär-tōl'dĭ, Felix (1809–47). A famous German composer. He was born at Hamburg, Feb. 3, 1809, the son of Abraham Mendelssohn and Leah Salomon. The latter's brother, after embracing Christianity, assumed the name Bartholdy, which the Mendelssohns then added to their family name. The family was wealthy and highly refined. Felix's grandfather was the celebrated Moses Mendelssohn (q.v.). His children were brought up in the Protestant faith. Felix received piano instruction first from his mother; afterward Ludwig Berger became his teacher. His instructor in counterpoint and musical composition was Zelter; and the finishing touches to his skill as a pianist were given by Moscheles. His eldest sister, Fanny, shared this instruction.

Mendelssohn began to compose before he was 12 years of age, and also showed great taste in drawing, and was rapid, yet accurate, in his general studies. Notwithstanding his remarkable achievements for one so young, his education continued on broad lines. Much of the charm which he exerted through life was due to his combining with musical genius the tastes of a man of high culture. When 11 years old he paid a visit to Goethe, who was delighted not only with his musical accomplishments but with his modesty and refinement.

The home of the Mendelssohns was the centre of a cultured circle. At the Sunday concerts which were given there the most eminent people residing or visiting in Berlin were met—musicians like Weber, Spohr, Paganini, Liszt, Schumann; painters like Ingres, Vernet, Verboeckhoven, Kaulbach; singers like Lablache, Grisi, Pasta; and in addition to these, actors, sculptors, poets, and scientists, among the latter the Humboldts, Bunsen, and Jakob Grimm. One can imagine the rich life which unfolded itself within such a circle and its influence upon Felix's development. One of the intimates of the circle was Hensel, the portrait painter, who married Fanny, herself scarcely inferior to Felix at the piano. Notwithstanding his pronounced musical gifts, Felix's father, in order to make sure that he was acting wisely in the choice of a musical career, took him in 1825 to Cherubini in Paris. After examining several of the boy's compositions, Cherubini gave an affirmative answer. In the same year Mendelssohn composed his octet (Opus 20). In February, 1827, his *Midsummer Night's Dream* overture was played at Stettin and was received with great applause. April of the same year saw the production of his opera, *The Wedding of Camacho*, in Berlin, but it was not a success.

In 1828 he composed his overture to Goethe's poem, *A Calm Sea and a Happy Voyage;* and a letter from Fanny, Dec. 8, 1828, to his friend, the poet Klingemann, refers to his composition of *Songs without Words.* One of Mendelssohn's finest achievements, the first performance since Bach's death of the *St. Matthew Passion,* took place in Berlin in 1829. The greatest difficulties had to be overcome, not the least being the indifference of musicians and public, but Mendelssohn brought the affair to a triumphant issue, and thus gave the first impetus to the great Bach revival through which that composer at last obtained due recognition. In April, 1829, Mendelssohn made the first of several visits to England, where his former teacher, Moscheles, was settled. He was well received socially, and his concert appearances both as pianist and composer were highly successful. He made a tour of Scotland and visited the Hebrides. During a visit to the ruined palace of Holyrood, with its traditions of Queen Mary, he hit upon the beginning of his *Scotch Symphony;* and his trip to the islands inspired his *Hebrides* or *Fingal's Cave* overture. The germ of his *Reformation Symphony* also dates from this time. The *Scotch Symphony,* however, was not completed until many years later, having its first performance in Leipzig in March, 1842, and in London at a Philharmonic concert in June of the same year.

In 1830 he declined an offered professorship of music in the University of Berlin, and in the same year he traveled to Italy. In Rome he began one of his most important works, the cantata to Goethe's *First Walpurgis Night,* and in a letter to Fanny, dated from Rome, in February, 1831, he writes that the *Italian Symphony* is making great progress. After various travels, including visits to Paris and London, where his appearances again were highly successful, he accepted an invitation to conduct a music festival at Düsseldorf. This led to his taking, in 1833, the post of musical director of the city, where he remained, quickening the musical life of the place and engaging in the composition of the greater part of his oratorio of *St. Paul,* until 1835, when he became conductor of the famous Gewandhaus concerts in Leipzig. Here his activity was of the utmost importance. He not only brought the orchestra to a high state of perfection, but he was chiefly instrumental in the founding of the Leipzig Conservatory.

His oratorio of *St. Paul* was brought out at the Lower Rhenish Musical Festival (q.v.), at Düsseldorf, under his own direction, in May, 1836. In 1837 he married Cécile Jean-Renaud, the daughter of a French clergyman in Frankfort. The union was a most happy one. During his incumbency at Leipzig he made frequent tours, and in 1841 went, at the invitation of Frederick William IV, to Berlin, and at his instigation composed the music to *Œdipus, Œdipus Colonos,* and *Antigone; Athalie;* and the rest of his music to the *Midsummer Night's Dream.* Late in 1842 he returned to Leipzig. Previously during that year he had visited England for the seventh time, and by invitation had played for Queen Victoria and the Prince Consort at Buckingham Palace. In 1844 he was again in England, and in August, 1846, brought out with overwhelming success at the Birmingham festival his oratorio *Elijah.* In 1847 the sudden death of his beloved sister Fanny came as a great shock to him, and his system, weak-

ened by overwork, succumbed. In September, in Leipzig, while listening to his own recently composed *Night Song*, he swooned away. Nervous prostration followed, and on November 4 he died.

Probably no composer ever was so fêted during his lifetime or lost so much ground after his death as Mendelssohn. He was the idol of the public and a large circle of friends. In England his popularity amounted to a Mendelssohn worship. His music, polished like himself, perfect in form, melodious, easily understood, and not too difficult technically, immediately became popular in concert and drawing rooms. It presented no problems and solved none. He was, as a rule, a rapid producer; the music to *Antigone* was composed in 11 days. But the very quality which made his music attain such immediate popularity, a certain superficial prettiness, has caused much of it to be laid aside. His oratorios are still given, and the *Elijah* especially holds its own; the violin concerto is an admirable composition; the *Midsummer Night's Dream* overture has fairylike grace; certain *Songs without Words* and the *Variations sérieuses* have a definite value in the pianoforte curriculum; and several of his choral works are highly valued. But the bulk of his product, including his fine symphonies, is less and less heard of. As a conductor, his attitude towards new departures was not friendly. Wagner's *Tannhäuser* overture he played at a Gewandhaus concert "as a warning example." But for Bach and the appreciation of Beethoven's later works he did much.

Bibliography. A. Reissmann, *Mendelssohn, sein Leben und seine Werke* (Berlin, 1867); F. Hiller, *Mendelssohn, Letters and Recollections* (London, 1874); W. A. Lampadius, *Life of Mendelssohn* (Eng. trans. by Gage, London, 1876; new ed., New York, 1911), a standard work; Hensel, *The Mendelssohn Family, 1729–1847, from Letters and Journals*, Eng. trans. by Carl Klingemann (New York, 1881); W. S. Rockstro, *Mendelssohn*, "Great Musicians Series" (London, 1890; new ed., New York, 1911), an excellent short life; J. C. Hadden, *Life of Mendelssohn* (London, 1903); E. Wolff, *Mendelssohn* (Berlin, 1906).

MENDELSSOHN SCHOLARSHIP. The most valuable musical prize in Great Britain, which entitles its holder to a course of study abroad. The movement for founding such a scholarship began in 1848, when the proceeds from a performance of *Elijah* were set aside for the purpose. In 1856 the first scholar, Arthur Sullivan, was elected. The capital has been gradually added to until the annuity now consists of about $500. There is also a Mendelssohn scholarship in Berlin, whose value is about $720, half of which is awarded to composers and half to virtuosos.

MENDENHALL, mĕn'den-hąl, GEORGE (1814–74). An American physician. He was born at Sharon, Pa.; graduated Ph.D. from the University of Pennsylvania in 1835; and in 1843 established himself in Cincinnati, where he specialized in obstetrics. In Miami Medical College he served as professor of obstetrics and as dean. In 1870 he was president of the American Medical Association. He was the author of *Medical Students' Vade-Mecum* (1852).

MENDENHALL, THOMAS CORWIN (1841–). An American physicist, born near Hanoverton, Ohio. He received a common-school education, became professor of physics and mechanics in the Ohio State University in 1873, and in 1878 accepted the chair of physics in the Imperial University at Tokyo, Japan. His labors there were later incorporated into the government meteorological system; and his interest in the phenomena of earthquakes led him to help found the Tokyo Seismological Society. Returning to Ohio State University in 1881 as professor of physics, he developed the State weather service. Three years later he was called to the United States Signal Service at Washington. In 1886 he was appointed president of Rose Polytechnic Institute, Terre Haute, Ind.; in 1889 he became superintendent of the United States Coast and Geodetic Survey; and in 1894–1901 he was president of the Worcester Polytechnic Institute. In 1889 he served as president of the American Association for the Advancement of Science, and in 1911 he was decorated with the Order of the Sacred Treasure of Japan. He made several important contributions to physical science and is the author of *A Century of Electricity* (1887).

MENDENHALL, WALTER CURRAN (1871–). An American geologist, born at Marlboro, Stark Co., Ohio. He graduated from Ohio Normal University in 1895 and studied at Harvard (1896–97) and at the University of Heidelberg (1899–1900). On the United States Geological Survey he served as assistant (1894–96), assistant geologist (1896–1901), and geologist after 1901. In 1907–10 he had charge of the ground-water investigations of the United States and in 1910 he became chief of the Land Classification Board. The results of his work in various States and in Alaska and Hawaii were published in government reports and bulletins and in contributions to the scientific press.

MENDERES, mĕn'dĕr-ĕz. The modern name of the Mæander (q.v.), a river of Asia Minor.

MENDÈS, mäN'dàs', CATULLE (1841–1909). A French poet, novelist, and playwright, born in Bordeaux. He founded (1859) the *Revue Fantaisiste*, devoted to the interests of the Parnassian poetic group. In 1866 he was married to Judith Gautier (q.v.), but they soon separated. His *Poésies* appeared in 1872 (new ed., 3 vols., 1892), and *Les braises du cendrier* (1900) is also verse. Although accomplished and versatile as a poet, Mendès lacked the inspiration that would have placed him with Coppée or Sully Prudhomme. Among his novels are: *Histoires d'amour* (1868); *Le roi vierge* (1880), the best known; *Mephistophela* (1890); *Gog* (1896). His plays include: *La part du roi* (1872); *Les frères d'armes* (1873); *La justice* (1878); *Le femme de Tabarin* (1887); *Médée* (1898); *La reine Fiammette* (1898); *Scarron* (1904); *Glatigny* (1906); *Sainte-Thérèse* (1906), in which Sarah Bernhardt appeared with success. Definitive collections of his plays appeared as *Théâtre en prose* and *Théâtre en vers* (both 1908). He wrote librettos for Chabrier's *Gwendoline*, Hahn's *Carmelite* (1902), Erlanger's *Le fils de l'étoile* (1904), and Massenet's *Ariane* (1906) and *Bacchus* (1909). In criticism he published *Richard Wagner* (1886); *L'Art au théâtre* (1896–1900); *Le mouvement poétique, 1867–1900* (1903).

MENDES LEAL, mâN'dĕsh lâ-äl', JOSÉ DA SILVA (1820–86). A Portuguese dramatist, statesman, and diplomat, born at Lisbon. He produced a number of plays which have been

very successful. The following are the best: *Os dous renegados* (1839); *Egas Moniz* (1861); *Madre Silva* (1847); *A pobre das ruinas* (1846); *Os homens de marmore* (1854); *Os homens de ouro* (1855); *Pedro* (1857); *A escala social* (1858); and especially the comedies *O tio André que vem do Brazil* (1855) and *Receita para curar saudales* (1857). He became a member of the Portuguese Academy (1845) and was director of the National Library (1850–67). As early as 1851 he was elected to Parliament, served twice as Minister of State, was elected President of the Chamber of Deputies in 1868, and was raised to the peerage in 1871, after which he entered the diplomatic service. Consult A. Romero Ortiz, *La literatura portuguesa en el siglo XIX* (Madrid, 1869).

MENDES-PINTO, mǎn'dĕsh-pēn'tō, Fernão. See Pinto, Fernão Mendes.

MENDI. See Semang.

MENDIBURU, mĕn'dē-bo͝o'ro͝o, Manuel de (1805–85). A Peruvian statesman and historian, born in Lima. He was educated at the University of San Marcos. When the movement for independence reached Peru, he joined the patriot army as color sergeant in 1821. As lieutenant he distinguished himself in various battles, and after the conclusion of the war was made captain (1830) and by 1851 had reached the rank of general. In 1831 he was sent on special missions to Brazil and Spain. From 1834 to 1870 he was employed in the government service, filling successively the positions of prefect of various departments; holding the portfolios of Government, Treasury, Foreign Relations, and War and Marine; serving as deputy in congress, Vice President of the Constituent Assembly, and Minister of Peru to England, to Bolivia, and to Chile. In 1870 he was placed in charge of the School of Arts and Trades at Lima. During his long and active political career he found time for writing and historical study. His *Diccionario histórico-biográfico del Perú* (1874–85) is a monumental work based upon manuscript sources, existing in the Archivo Nacional de Lima, which he reorganized, and is invaluable for the study of Peruvian history, especially during the colonial epoch.

MEN'DICANCY (from *mendicant*, from Lat. *mendicans*, pres. p. of *mendicare*, to beg, from *mendicus*, poor). The practice of begging. A beggar is one who seeks to get his living, in whole or in part, by soliciting alms. The word "beggar" is probably derived from the Beghards, a religious order of the Middle Ages corresponding to a similar order among women, the Beguines (q.v.). Small communities of the Beguines still exist in Belgium.

In primitive societies beggars have little chance for existence. Whenever and wherever a surplus results from labor, there appears a class of the economically unfit ready and anxious to live as parasites on the labor of others. If, through the influence of religion or other causes, almsgiving comes to be looked upon as a virtue, mendicants will rapidly increase. Such a condition existed in Europe in the Middle Ages, and beggars became so numerous that they threatened to overrun the Continent. The Church inculcated almsgiving and emphasized it as a means of obtaining future happiness. The great success of the orders of the begging friars, the Franciscans, Dominicans, Carmelites, and Augustinians, encouraged begging among the laity. Meantime there was a gradual development of monasteries, hospitals, guilds, and private benevolence, entirely independent of each other, yet all giving alms, and this without any thought of investigation as to the worthiness of the recipient.

In 1349 England began to forbid begging. France followed in 1350, and later some of the German towns, as Esslingen (1384) and Brunswick (1400). Such legislation was of little effect. During the fifteenth century the idea gradually gained ground that the able-bodied poor must be set at work. The adoption of this view involved the overthrow of the old theory of almsgiving, and it was steadily opposed by the Church.

The sixteenth century marks a great change. Luther said that one of the most crying needs of Christian countries was the prohibition of begging, and measures to this effect introduced in the "Regulation of the Common Chest" became the basis for subsequent reforms. Under the influence of Zwingli, Zurich prohibited begging in 1525. The Catholic Vives wrote *De Subventione Pauperum* (Bruges, 1526), which led to the breakdown of the old system in Catholic Europe, in the north at least, for in Spain, through the influence of the Dominican monk Soto, the prohibition was not decreed, and Italy has only partially forbidden the custom.

Germany after the Thirty Years' War made more stringent regulations, but the various states were not in harmony, and the root of the evil was not reached. Frankfort (1620), Anhalt (1770), Hesse (1777) forbade begging entirely. Hamburg followed in 1788 and forbade also gifts to beggars. Here was introduced more effective investigation of the individual cases, and other cities copied the plan. By 1791 it is reported that open begging had been stopped. The general German law is that vagabonds (Landstreicher—best translated "tramps") may be imprisoned. Beggars, those who ask alms either in person or through letters, may be put to hard work. In some of the states appeals for assistance may not be published in the papers without special permission. Bavaria made a statistical investigation of mendicancy between 1870 and 1880 which showed that some 20,000 persons were convicted each year. In Saxony, between 1880 and 1887, of those convicted 47 per cent were Saxons, 42.7 from other German states, and 10.3 foreigners. In many towns there is a Verein gegen Verarmung und Bettelei.

France forbade mendicancy in 1566, but the efforts made to enforce the law were ineffective. In 1627 it was ordered that beggars be impressed into the navy. Later, beggars were commanded to leave Paris under penalty of being sent to the galleys. After the Revolution, however, penal colonies, dépôts de mendicité, were established.

Italy prohibited begging in 1865, but local authorities may issue permits (permissi di mendicare), and begging, licensed or not, abounds, particularly in the southern provinces.

The practice has also been prohibited in other countries—Denmark (1789, 1803, 1860), Norway (1863), Russia (1864), Sweden (1885). In Mohammedan lands, where almsgiving is still a religious obligation, beggars abound.

England in 1536 decreed that an able-bodied beggar should be whipped for the first offense, have his ears cropped for the second, and be executed as a felon and common enemy for the third. In 1547 he was to be branded and be-

come the slave of any one who would care for him for two years. In the Act of 1536 "common and open doles" were prohibited, and the parish authorities instructed to care for the worthy poor. The civic authorities were still trying various schemes. Oxford had four "bedells of the beggars" who "took a ward every Friday to gather the devotion of the houses" and on other days "daily the streets to walk, to look what other beggars or vagabonds do come into the city and then to give notice to the constables." In Southampton in 1540 a "master of beggars" with a silver gilt badge and small annual fee is mentioned. York (1538) decided that "from henceforth no Headbeggars shall be chosen," and by the end of the reign of Elizabeth the other towns had followed her example. In 1562 compulsory labor was made possible. In 1601 came the famous poor law of Elizabeth (43 Eliz., c. 2) which emphasized the necessity for work; 1676 marked the establishment of the first workhouse at Bristol; and with these changes the modern system is inaugurated. Yet begging was not abolished, and in Scotland (see *The Antiquary*, Walter Scott) in the early part of the nineteenth century the Bedesmen or Blue Gowns were licensed. The present English law is that of 1824. Habitual begging is a criminal offense, punishable in a summary manner, i.e., without trial by jury. (See VAGRANT.) For the first offense one may be committed as "idle and disorderly" to one month at hard labor; for the second offense as a "rogue and vagabond" for three months; for a third as an "incorrigible vagabond" for one year. One who solicits charitable contributions by lying letters, false writings, or any other cheat is liable to punishment for obtaining money under false pretenses (q.v.). If begging be accompanied by threats of violence, it may subject the offender to punishment for robbery (q.v.).

In the United States mendicancy has been looked upon as bad and is generally forbidden. The laws have been very leniently enforced and in many places are almost dead letters. Only one State, Massachusetts, has provided a farm colony to which beggars may be sent and made to work. In some cities energetic steps are being taken to make begging unprofitable, and special attention is being paid to parents who send young children out to beg, or who cover their begging by pretense of selling odds and ends.

The experience of all countries has shown that mendicancy will thrive wherever indiscriminate almsgiving prevails. In modern society it may practically be stopped if steps are taken to care properly for the worthy poor and to compel others to work or else go hungry.

For an account of the general development of the care of the poor, see PAUPERISM. See also CHARITY ORGANIZATION SOCIETY; LABOR COLONIES; SOCIAL DEBTOR CLASSES; TRAMPS.

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MEN'DICANTS. See AUGUSTINIANS; CARMELITES; DOMINICANS; FRANCISCANS.

MENDOCINO, mĕn'dō-sē'nō, CAPE. See CAPE MENDOCINO.

MENDO'TA. A city in La Salle Co., Ill., 83 miles west of Chicago, on the Chicago, Burlington, and Quincy, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads (Map: Illinois, F 2). It has a public library, Blackstone and Lincoln schools, and manufactories of machinery, agricultural implements, water-tank heaters, etc. The water works and sewage system are owned by the city. Pop., 1900, 3736; 1910, 3806.

MENDOTA, LAKE. One of the so-called "Four Lakes" (q.v.) of Wisconsin.

MENDOZA, mĕn-dō'sȧ. A province of Argentina, comprising 16 departments, situated in the western part of the Republic and bounded on the north by the Province of San Juan, on the east by San Luís, on the south and southeast by the territories of La Pampa and Nequen, and on the west by Chile (Map: Argentina, F 5). Its area is estimated at 56,517 square miles. The western portion is occupied by the slope of the Andes Range, which rises on the boundary to a height of over 22,000 feet in Mount Aconcagua. Several lofty passes, including the famous and most frequented Uspallata, lead from the province into Chile. The eastern portion, from the foothills of the Andes to the border, is divided into two regions by the Río Diamante. That to the north is dry and arid, and that to the south consists of a well-watered grassy plain. The principal rivers are the Mendoza, Diamante, Tunuyán, and Atuel. The climate in the Andean region is cold, in the southeast temperate, and in the northeast hot. Owing to climatic conditions, irrigation is necessary in many parts of the province. The most important industry is vine culture and the production of wine, which is carried on chiefly in the Andean region. Agriculture and stock raising are carried on in the eastern section. Barley, fruits, hemp, wheat, corn, and lucern are the chief agricultural products. Cattle, hides, and wool are important exports. The extensive mineral deposits consist of coal, gold, silver, copper, and lead. There are, also, many mineral springs. The province has a national college, a normal school, and 286 primary schools. The Trans-Andean Railway crosses the northern part of the province. Pop., 1912, 247,848. Capital, Mendoza.

MENDOZA. The capital of the Province of Mendoza, Argentina, situated at the eastern base of the Andes, 647 miles west of Buenos Aires, on the Trans-Andean Railway (Map: Argentina, F 4). The town is well built and has beautiful drives and parks. It has a national college, an agricultural institute, normal

schools for both sexes, and a street railway. It is the chief centre of trade between Argentina and Chile. Pop., 1913 (est.), 60,000. Mendoza was founded in 1560. Here San Martín organized the army with which he won the independence of Chile. In 1861 a severe earthquake destroyed the city and killed 10,000 people. Consult V. Letelier, *Apuntes sobre el terremoto de Mendoza* (Santiago de Chile, 1907), and V. Blasco Ibánez, *Argentina y sus Grandezas* (Madrid, 1910).

MENDOZA, mĕn-dō'thȧ, ANNA DE, PRINCESS OF EBOLI. See EBOLI.

MENDOZA, ANTONIO DE, COUNT OF TENDILLA (c.1485–1552). A Spanish administrator, born in Granada. He was a member of an illustrious family and became a great favorite with the Emperor Charles V. Constant quarrels in New Spain between the Governor, the nobility, and the Audiencia (the commission representing the Emperor) led to the determination to appoint in each territory a personal representative of the Emperor's authority, and Mendoza was appointed the first Viceroy of New Spain. He arrived there in 1535. With him he brought a printing press on which was printed the next year *La escala de San Juan Climoça*, the first book printed in Mexico. A mint was established the same year, schools and hospitals were built, and a college was founded. The breed of sheep was improved, silk culture was encouraged, and better methods of agriculture were introduced. An expedition under Vásquez de Coronado was sent to discover the mythical city of Cíbola and the no less mythical Quivira, and explored much of what is now New Mexico and Colorado. In 1542 a formidable insurrection of the Indians, called the Mixton War, was suppressed. Mendoza was not able to carry into effect the prohibition of further enslavement of the Indians, but succeeded better than might have been expected. In 1550 he was appointed Viceroy of Peru. He was an amiable but dignified and just man, a striking contrast to many of the Spanish rulers.

MENDOZA, DIEGO HURTADO DE (1503–75). A Spanish statesman and man of letters, born at Granada. Trained at Salamanca for the Church, he entered instead upon a military career and passed through the Italian campaigns of Charles V. The latter sent him as Ambassador to Venice (1539), whence he passed (1547) to Siena as the Imperial Governor. He had (1545) represented his Imperial master at the Council of Trent, and in 1549 he went to Rome to carry out Charles's policy of bullying the papacy. In 1554 he returned to Spain. As a poet, Mendoza has left compositions in the older conventional Spanish manner and some that show the influence of his classical attainments; he gained greatest repute in his own time, however, as one of the leaders in the movement which accomplished the Italianizing of Spanish lyric poetry. Mendoza's prose work of the most importance is his *Guerra de Granada*, dealing with an insurrection of the Moors. His acquaintance with Arabic equipped him admirably for the performance of this historical task, but his outspoken honesty prevented the appearance of a complete edition of the work until 1730, for the editions of Madrid (1610) and Lisbon (1627) are defective. Competent scholars no longer accept the attribution to him of the *Lazarillo dè Tormes*. Morel-Fatio in a recent study points out some grave defects of style, even in the much praised *Guerra de Granada*, and questions the right of Mendoza to be considered the sole author thereof. Consult his verse in vol. xxxii of the *Biblioteca de autores españoles* (Madrid, 1854) and, in vol. xxi of that same collection (ib., 1852), an edition of the *Guerra de Granada;* J. D. Fesenmair, *D. Hurtado de Mendoza, ein spanischer Humanist des 16ten Jahrhunderts* (Munich, 1882); A. Señán y Alonso, *D. Diego Hurtado de Mendoza apuntes biográfico-críticos* (Granada, 1886); Foulché-Delbosc, in the *Revue Hispanique*, vols. i, ii (Paris, 1894–95); Alfred Morel-Fatio, "Quelques remarques sur La Guerre de Grenade de D. Diego Hurtado de Mendoza," in *Annuaire de l'Ecole des Hautes Etudes, 1914–15* (ib., 1914).

MENDOZA, IÑIGO LÓPEZ DE, MARQUÉS DE SANTILLANA. See SANTILLANA, IÑIGO, LÓPEZ DE MENDOZA, MARQUÉS DE.

MENDOZA, JUAN GONZÁLEZ DE (c.1540–1617). A Spanish prelate, born at Toledo. He joined the army, but after some years resigned to enter the Order of St. Augustine. In 1580 he was sent by Philip II to China, where he spent three years in gaining information as to the politics, commerce, and customs of the country. He spent two years in Mexico before returning to Spain. He was afterward Bishop of the Lipari Islands, of Chiapas, and of Popayán, where he died. He published an account of his observations in China in a work entitled *Historia de las cosas más notables, ritos y costumbres del gran reyno de la China* (1586). An English translation by R. Parke appeared in 1588 and was reprinted by the Hakluyt Society in two volumes, edited by Sir George T. Staunton, Bart. (London, 1853–54).

MENDOZA, PEDRO DE (c.1487–1537). A Spanish explorer. He was of a noble family high in the favor of the Emperor Charles V. In 1529 he offered to explore South America at his own expense and establish colonies. He was made military governor of all the territory between the Río de la Plata and the Strait of Magellan, and the Emperor gave 2000 ducats and advanced 2000 more on the condition that within two years Mendoza should transport 1000 colonists, build roads into the interior, and build three forts. He was to have half the treasure of the chiefs killed and nine-tenths of the ransom. The office of Governor was also made hereditary. In 1534 with a considerable fleet he set sail, but a terrible tempest scattered it off the coast of Brazil. Here his lieutenant, Osorio, was assassinated, according to some authorities by the orders of Mendoza himself because of suspected disloyalty. Mendoza sailed up the Río de la Plata and founded Buenos Aires in 1535. Pestilence broke out, and the natives became unfriendly. His brother Diego, who led a force against the hostile tribes, was killed with three-fourths of his men. A general conspiracy of the natives was formed, and the city was captured and burned. Another brother, Gonzalo, arrived with reënforcements and founded the city of Asunción in Paraguay in 1536. Mendoza, disappointed and broken in health, embarked for Spain, but died a maniac during the voyage, in 1537.

MEN'EDE'MUS (Lat., from Gk. Μενέδημος) (c.350–c.277 B.C.). A Greek philosopher, a native of Eretria. According to some authorities, he studied under Plato (to this statement chronological difficulties are opposed); according to

others, under Stilpo at Megara and under Phædo of Elis. He founded the Erctrian school of philosophy and was also one of the leading men in the political affairs of his state. If we may trust the testimony of the ancients, especially Cicero, the philosophy of Menedemus closely resembled that of the Megarian school. Consult Ritter-Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913).

MEN'ELA'US (Lat., from Gk. Μενέλαος). In ancient Greek legend, a king of Lacedæmon, the younger brother of Agamemnon and husband of the famous Helen. The abduction of his wife by Paris is represented as the cause of the Trojan War. In the *Iliad* he appears most prominently in the duel with Paris, when the life of the latter is saved only by the divine interposition of Aphrodite, and in the battle over the body of Patroclus, where he is one of the foremost combatants and eventually carries the corpse from the field. He entered Troy in the wooden horse (Vergil, *Æneid*, ii, 264). After the capture of Troy he slew Deiphobus, who had wedded Helen after the death of Paris, and in some versions intended to kill Helen also, but was disarmed by her beauty. After the fall of Troy he sailed with Helen for his own land; but his fleet was scattered by a storm, and he wandered for eight years about the coasts of Cyprus, Phœnicia, Egypt, and Libya. After his return he lived at Sparta with his wife, Helen, in great happiness; he was translated living to Elysium (*Odyssey*, iv, 561). Both Menelaus and Helen were worshiped as gods at Therapne, near Sparta, and it is probable that here, as so commonly in Grecian heroic myths, we have two local deities who have been reduced to hero and heroine. Consult the article "Menelaos," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MENELAUS. A Greek mathematician, who lived c.100 A.D. He wrote a book on the calculation of chords, not now extant, and a work in three books, under the title *Sphærica*. The latter, although not now extant in Greek, is known in Arabic and Hebrew, and in several Latin translations. It is a treatise on spherical triangles, with respect not to their solution, but to their geometric properties. One of the most interesting propositions is that concerning a spherical triangle cut by a transversal, the corresponding proposition for plane triangles being stated as a lemma. This theorem, known by the name of Menelaus, asserts that if the lines of the three sides of a triangle are cut by a transversal, the product of three segments which have no common extremity is equal to the product of the other three. For spherical triangles "the cords of three segments doubled" replaces "three segments." The proposition was often called in the Middle Ages the *regula sex quantitatum*. Menelaus also knew essentially the projective property of the unharmonic ratio of the segments determined by four collinear points.

MENELIK, mĕn'ĕ-lĭk (1844–1913). A king of Abyssinia, officially *negus negusti* (king of kings, or emperor). He was born in Ankobar, where his father, Ailu Malakoth, was Crown Prince of the Kingdom of Shoa. After his father's death in 1855 Menelik was for 10 years interned in Gojam by Theodore, Ailu Malakoth's rival, who attempted to make peace with him by giving him his daughter to wife. But in 1865 he escaped to Shoa, where he managed to establish himself, thanks to England's interference in Abyssinia, and as King (or *Ras*) of Shoa had little trouble in defeating the son of John, Ras of Tigré, in 1889 and in coming to the Abyssinian throne, to which he claimed a family right by a supposed descent from King Solomon (by the Queen of Sheba). He showed remarkable ability in bringing his army to a high pitch of efficiency. England's intervention between Italy and Abyssinia had already checked an open break, but when Italy claimed a protectorate by the Treaty of Uchali, Menelik protested in 1893, and in 1896 by the victory at Adowa forced Italy to sign the Peace of Addis Abeba, thus giving up all claim to a protectorate. He came to a complete understanding with Great Britain in 1898. In 1908 he announced that his grandson Lidj Jeassu, then a boy of about 12, would succeed him. In 1910, because of Menelik's ill health, a council of regency was formed. See ABYSSINIA.

MENÉNDEZ DE AVILÉS Y MÁRQUEZ, må-nän'dåth då ä'vē-lās' ē mär'kåth, PEDRO (1519–74). The founder of St. Augustine, Fla. He was born at Avilés in Asturias, Spain. Philip II placed him in command of the fleet which escorted the treasure vessels to and from the West Indies. Securing a grant of Florida with the title of Adelantado and Governor, he set sail, June 29, 1565, with 19 vessels carrying 1500 settlers, with orders to occupy the country and expel the French, who were making this their headquarters for privateering. On St. Augustine's Day, August 28, Menéndez discovered the harbor, on whose shores, on September 6, he began to build a fort, around which the present city of that name has grown up. Here the French Huguenots under Ribaut (q.v.) attacked him, but a hurricane drove them off, and before they could return to their settlement at Fort Caroline on the St. John's River, Menéndez attacked that post and massacred 142 of the garrison. The French fleet meanwhile had been wrecked, and the crews were forced to surrender to Menéndez, who put 180 of them to death. In 1567 Menéndez returned to Spain, and during his absence, in April, 1568, his colony was attacked by a French fleet under Dominique de Gourgues, who hanged a number of Spaniards. Meanwhile Menéndez had already started back, sailing from San Lucas on March 13 with supplies and reënforcements, with which he reëstablished St. Augustine. He had been appointed Governor of Cuba, and his efforts during the next few years were mainly devoted to that island and the gulf mainland. In 1570 he sent an expedition to the Chesapeake, which ascended the Potomac and built a chapel on the Rappahannock, where the party were killed by the Indians. In 1572 Menéndez revisited Florida and went on to the Chesapeake, where he captured several Indians supposed to have taken part in the massacre of his colony two years previously and hanged them. Philip II soon after this recalled him to Spain, where he died at Santander, Sept. 17, 1574. Consult Justin Winsor, *Narrative and Critical History of America*, vol. ii (New York, 1886), which contains also a critical essay on the sources of information.

MENÉNDEZ PIDAL, må-nän'dåth, JUAN (1861–1915). A Spanish archivist, jurisconsult, historian, and poet, brother of Luís and Ramón Menéndez Pidal. Born at Madrid, he studied law until he obtained his title, and then devoted himself to journalism. His *Dios y el César*, an ecclesiastical and legal study of the re-

lations of church and state, attracted much attention. He first published two legends: *El conde de Muñazán* (Burgos, 1880) and *D. Nuño de Rondaliegos;* the latter, by a tour de force, written in Old Castilian. His *Alla-lá* (1890) is a defense of Asturian literature from the general attacks on regional literature. Previous thereto he had published (Madrid, 1885) a much more important work, *Poesía popular: colección de los viejos romances que se cantan por los asturianos en la danza prima, esfoyazas, y filandones, recogidos directamente de boca del pueblo.* Other works of importance are: *San Pedro de Cardeña; D. Francesillo de Zúñiga; Las leyendas del último rey godo* (1906), a masterly study which exhausts the subject; *Poesías* (1913). Long a director of the Archivo Histórico Nacional at Madrid, and a director of the Revista de Archivos, Bibliotecas, y Museos, in 1914 he was elected a member of the Spanish Royal Academy of the Language.

MENÉNDEZ PIDAL, Luís (?1860–). A Spanish genre painter, brother of Juan and Ramón Menéndez Pidal. Born at Oviedo, he studied in the School of Bellas Artes at Madrid and took part in the National Exposition held there in 1887. In the exposition of 1890 he won a second-class medal for "A buen juez mejor testigo," and another picture attracted the attention of the Queen Regent, who bought it. In 1892 his "La cuna vacía," when published in *El Liberal,* obtained the first-class medal without a dissenting vote. His "Salus infirmorum," hung in the General Exposition of Bellas Artes at Madrid in 1899, won a first medal. His style is eminently personal, and he is considered one of Spain's best colorists. He chooses by preference country scenes and those of family life, especially such as show the family affections; but he is also a good portraitist. In 1906 he was elected a member of the Royal Academy of Bellas Artes de San Fernando.

MENÉNDEZ PIDAL, María Goyri de (1873–). A Spanish Hispanist, wife of Ramón Menéndez Pidal. Born in Madrid, she began her studies there in the normal and business courses of the Association for the Education of Women. Later, despite the difficulties due to the unusualness of the proceeding, she studied philosophy and letters in the University of Madrid, obtaining the titles of normal school professor (1893), licentiate in philosophy and letters (1896), and doctor of philosophy and letters (1909). Among her publications are the following: "Romance de la muerte del Príncipe D. Juan," in the *Bulletin Hispanique,* vol. iv (1902); "Romances que deben buscarse en la tradición oral," in *Revista de Archivos, Bibliotecas, y Museos* (1907); various articles on "El Conde Lucano," in *Revue Hispanique* (1899); *Romania* (1900), and *Revista de Archivos, etc.* (1902); "La difunta pleiteada en la literatura española: estudio de literatura comparada," in *Revista de Archivos* (1909).

MENÉNDEZ PIDAL, Ramón (1869–). A Spanish philologist, born at Coruña, March 13, 1869. He studied at the universities of Madrid (under Marcelino Menéndez y Pelayo, q.v.) and of Toulouse and after 1899 held the chair of Romanic philology at Madrid. In addition he lectured in Spain, South America, and the United States. At Johns Hopkins he delivered the Turnbull lectures in 1909, published the next year as *L'Epopée castillane à travers la littérature espagnole;* and his Hispanic Society lectures at Columbia (1909) appeared as *El romancero español.* His interest in education led to his being made a member of the board created in 1907 for the advancement of university work in Spain (the Junta para Ampliación de Estudios), director of the summer session of the board, and (1913) Counselor of Public Instruction for the Kingdom. His varied public service included a journey to Quito and Lima in 1904–05 as Royal Commissioner to investigate the claims in the Peru-Ecuador boundary dispute. Menéndez Pidal is to be compared with Friedrich Diez and Gaston Paris (qq.v.). His services were recognized by membership in the Spanish Royal Academy of the Language, the Royal Academy of History, Madrid, and the Hispanic Society of America, among other learned bodies at home and abroad. From 1906 to 1909 he was editor of the philological section of *Cultura Española,* and later he undertook the editorship of the *Revista de Filología.* His *Gramática y vocabulario de poema del Cid* and *Leyenda de los infantes de Lara* were awarded prizes by the Spanish Royal Academy of the Language and the Royal Academy of History, respectively, in 1895 and 1897. His *Gramática histórica española* (2d ed., 1905) is his most important work. Other writings include: *Leyenda del Abad Don Juan de Montemayor* (vol. ii, *Gesellschaft für romanische Literatur,* 1903); *Primera crónica general* (vol. v, *Nueva biblioteca de autores españoles,* 1906); *Cantar de mio Cid* (3 vols., 1908–11); *Cancionero de romances impreso en Amberes sin año* (1914). A critical bibliography entitled *Obras de D. Ramón Menéndez Pidal* (Madrid, 1912) fills 35 pages and is complete to the time of its appearance.

MENÉNDEZ Y PELAYO, på-lä′yō, Marcelino (1856–1912). A Spanish historian of philosophy and letters. He was born at Santander, Nov. 3, 1856, and studied at the universities of Barcelona (where he was a pupil of Manuel Milá y Fontanals, q.v.) and Madrid. At Madrid he was appointed professor of philosophy and letters when 22, and at 25 he was admitted to the Spanish Royal Academy of the Language (which, strangely, never made him president). His precocity developed into a ripe scholarship, so that he came to be regarded as one of the greatest humanists of the nineteenth century. After 20 years of teaching he accepted the directorship of the National Library, keeping in touch with academic life by lecturing frequently at the Madrid Athenæum. Menéndez y Pelayo was famous for his insatiable appetite for books and his wonderful memory. He appeared to read everything and to make all that he read a part of his mental acquisition. This, however, will not account entirely for the quantity and nature of his published work. Of his nationality and the fact that he was a Catholic he was equally proud; his patriotism and religious fervor together made him a tireless defender of traditional Spain. As a critic, he held himself at the service of any student or scholar who needed his services. Nor was he destructive in his criticism—he first pointed out defects that he found in a work and then went on to search for and generously to recognize all its good qualities. Among his pupils who afterward became distinguished were Ramón Menéndez Pidal and Adolfo Bonilla y San Martín (qq.v.). As a writer of both prose and verse, Menéndez y Pelayo exercised a most wholesome influence on

the younger generation by the quality of high seriousness always present in his work. He was appointed dean of the Faculty of Letters at Madrid University, chief of the Board of Archivists, and Counselor of Public Instruction; was elected Deputy in the Cortes and Senator; became a member of the academies of Moral and Political Sciences, Fine Arts (San Fernando), and History (librarian and director), besides being honored by societies at Lisbon, Barcelona, and Seville and receiving the grand cross of the Order of Alfonso XII. He died May 19, 1912, at Santander.

The literary activity of Menéndez y Pelayo, beginning with various studies that won prizes in the literary tournaments at which they were presented, finally placed him at the head of Spanish critics of literature and philosophy. His two greatest works are his critical histories of philosophy, entitled *Historia de los heterodoxes españoles* (3 vols., 1880–82) and *Historia de las ideas estéticas en España* (1883–91). His editorial work includes: *Antología de poetas líricos castellanos* (13 vols., 1890–1908); *Obras de Lope de Vega* (15 vols., 1890–1902); *Antología de poetas hispano-americanos* (4 vols., 1893–95). In the same field as the last named he published *Historia de la poesía hispano-americano* (1911). *Horacio en España* (1885) and *Bibliografía hispano-latina* (1902) are representative of his classical researches. Poetical, dramatic, and miscellaneous writings, both originals and translations, appeared as *Odas, epístolas, y tragedias* (1883; 2d ed., 1906).

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MENEP'TAH, or **MERNEPTAH** (Egypt. *Meri-en-Ptah,* Beloved of Ptah; Lat. *Amenephthes;* Gk. *Ἀμμενεφθίς, Ammenephthis*). A king of Egypt, the son and successor of Ramses II (q.v.). He reigned for some 20 years about the middle of the thirteenth century B.C. and, in the fifth year of his reign, repelled a formidable invasion of Libyans and pirates. He built largely at Tanis and left monuments in various parts of Egypt. Formerly there seemed to be good grounds for identifying this King with the Pharaoh of the Exodus, but an inscription, discovered in 1896, mentions Israel as settled in Palestine in the fifth year of Meneptah's reign, and the identification is therefore impossible. The text of this interesting inscription, which contains the only mention of Israel to be found on the Egyptian monuments, was published with a German translation by Spiegelberg, in the *Zeitschrift für ägyptische Sprache*, vol. xxxiv (Leipzig, 1896), under the title "Der Siegeshymnus des Merneptah auf der Flinders Petrie Stele." The mummy of Meneptah was found at Thebes in 1898, and is now in the Museum of Cairo. Consult E. A. T. W. Budge, *A History of Egypt* (New York, 1902), and J. H. Breasted, *A History of Egypt* (2d ed., ib., 1909). See also EGYPT.

MENES, mē'nēz (Egypt. *Meni;* Gk. *Μήν, Mēn,* *Μήνης, Mēnēs*). A king of Egypt whom the Egyptians regarded as their first historical monarch. His name invariably stands at the head of all monumental lists of Egyptian kings, but little is known in regard to him. According to Manetho he was a native of This, and reigned for 62 years. Herodotus and other Greek writers attribute to him the foundation of Memphis and relate many other fables concerning him. But the list of Saqqara begins with the sixth king of the first dynasty. This may invalidate Menes's claim as founder of Memphis. In modern times certain scholars have believed that he was the Pharaoh who united Upper and Lower Egypt under a single monarchy, but recent discoveries indicate that the union took place at an earlier date. At present there is a tendency to identify Menes with an early king of whom many small memorials have been found near This. Two large tombs—one at Naggadah, near Coptos, the other near Abydos—are filled with objects bearing the name of this King. The reading of the name is, however, not altogether certain, and the proposed identification is therefore doubtful. Consult: *Sitzungsberichte der Berliner Akademie der Wissenschaften* (Berlin, 1897); *Revue Critique* (Paris, 1897); *Zeitschrift für ägyptische Sprache*, vol. xxxvi (Leipzig, 1898); E. A. T. W. Budge, *A History of Egypt* (New York, 1902); J. H. Breasted, *A History of the Ancient Egyptians* (ib., 1908).

MENEVILLE, FÉLIX EDOUARD GUÉRIN-. See GUÉRIN-MENEVILLE, F. E.

MENFI, mĕn'fē. A town in the Province of Girgenti, Sicily, 30 miles south by east of Marsala. It exports corn, wheat, barley, cotton, oil, and wine. The quarries of the vicinity are supposed to have furnished the building material for the temples of ancient Selinus. Pop. (commune), 1901, 10,281; 1911, 11,189.

MENGELBERG, mĕng'el-bĕrg, WILLEM (1871–). A Dutch orchestral conductor, born in Utrecht. He received his first musical education in his native town and then entered the Cologne Conservatory, where Wüllner, Seiss, and Jensen were his teachers. In 1891 he began his career as municipal music director at Lucerne. In 1895 he went to Amsterdam as conductor of the Concertgebouw Orchestra, which under his energetic leadership soon became one of the finest orchestras in Europe. During the season 1905–06 he was one of the guest conductors of the New York Philharmonic Society. In 1907 he was called to assume the leadership of the Museumskonzerte in Frankfort. Extensive tours took him through all European countries. As an interpreter of the works of Richard Strauss he became especially distinguished.

MENGER, KARL (1840–). An Austrian economist, born at Neu-Sandez in Galicia. He studied law and political science in Vienna and Prague, and after 1872 was identified with the University of Vienna, in 1879 becoming full professor of political economy. In 1900 he was made a life member of the Austrian House of Peers. The leader of a reaction against the historical method in economics, he became one of the most prominent leaders of the so-called Austrian school of political economy. His most important work, from a theoretical standpoint, is

Grundsätze der Volkswirtschaftslehre (1871). Other important works are: *Untersuchungen über die Methode der Sozialwissenschaften und der politischen Oekonomie insbesondere* (1883); *Die Irrtümer des Historismus in der deutschen Nationalökonomie* (1884); *Beiträge zur Währungsfrage in Oesterreich-Ungarn* (1892). His article "Geld" in the *Handwörterbuch der Staatswissenschaften* (3d ed., 1909) is regarded by competent authorities as the best brief exposition of the money question in existence.

MENGS, měngs, ANTON RAPHAEL (1728–79). A German historical and portrait painter. He was born at Aussig, Bohemia, March 12, 1728, the son of Ismael Mengs, a miniature painter of some repute, who in 1741 took him to Rome. On his return to Dresden in 1744 he was appointed court painter by the Elector Augustus III, who permitted him to continue his studies at Rome. There he painted the first of his large compositions, a "Holy Family," now in the Gallery of Vienna, and of additional interest because the model for the Madonna was Marguerita Guazzi, a beautiful peasant girl whom he married, and for whose sake he embraced Roman Catholicism. The financial distress occasioned by the Seven Years' War caused his pension to be stopped, but he received numerous commissions from the art patrons of all nationalities, among others the Duke of Northumberland, who employed him to paint a copy of Raphael's "School of Athens." In 1754 he was made director of the new Art Academy on the Capitol; in 1757 he painted the ceiling in San Eusebio, and soon afterward the celebrated "Mount Parnassus" in the Villa Albani. In Rome also he became the intimate friend of the great art critic Winckelmann.

On a visit to Naples he attracted the attention of the King, who, on his accession to the throne of Spain as Charles III, invited Mengs to Madrid. During this first sojourn at Madrid (1761–69) he executed several frescoes in the Royal Palace, of which "Aurora and the Four Seasons" is the best. Intrigues against him and feeble health caused his return to Italy, but he was summoned back to Madrid in 1774 to complete his work in the Royal Palace. He painted there the "Apotheosis of Trajan," his most important fresco, and the "Temple of Fame." In 1777 he returned to Rome, where he died, June 29, 1779.

His fresco paintings are superior to his canvases. Good examples of the latter are a "Nativity" in Madrid, an "Annunciation" in the Vienna Gallery, and the "Ascension" in Dresden. The Dresden Gallery contains a number of his pastels, including portraits of himself and his father. Mengs was an eclectic who endeavored to blend the beauty of antique art with that of the great Italian masters. Living at a time of extreme degradation in art, he commanded great admiration by his skill in composition and his thorough knowledge of technical processes, but his color was cold and lacked the fire of genius. He exercised a profound influence upon his contemporaries by his writings on eclectic art, as well as by his paintings, and trained numerous pupils. Consult Woermann, *Ismael und Raphael Mengs* (Leipzig, 1893).

MÊNG-TSE, mŭng-tsĕ'. See MENCIUS.

MENGTSZE, měng'tsĕ'. A town in the Province of Yunnan, China, situated amid mountains at an elevation of about 4600 feet, about 40 miles from the frontier of Tongking (Map: China, H 7). It is a well-built city with traces of its splendor and importance before the Taiping Rebellion. It was opened to foreign commerce in 1889 in accordance with the French Treaty of Tientsin of 1886. The trade is mostly transit and with Hongkong. The merchandise is transported by the Red River as far as Manhas, a village on the left side of the river about 40 miles from Mengtsze, and from there is carried by coolies and pack animals inland. The chief exports are tin from the adjacent mines and opium; textiles and tobacco are imported. Mengtsze is connected by telegraph lines with Yunnanfu and the frontier of Tongking. The French government has obtained a concession for the construction of a railway line from Laokai on the frontier to Yunnanfu via Mengtsze. Pop., 1912, est., 11,000. In 1912 net foreign imports amounted to 7,721,840 taels and exports to 11,847,849 taels, a total trade for the year of 19,569,689 taels (in 1912 a tael was equal to 74 cents United States gold).

MENHADEN, měn-hā'den (corrupted from Narragansett Indian *munnawhatteaûg*, fertilizer, in allusion to its use as a fertilizer in the cornfields). A small fish (*Brevoortia tyrannus*), closely related to the shad (q.v.), which is caught in great quantities on the eastern coast of North America during the summer months. Its length varies from 12 to 18 inches; the color of the upper parts is greenish brown, with a black spot on the shoulder, the belly silvery, and the whole surface iridescent. The flesh is not highly esteemed as food and is very full of small bones; but it is rich in oil and nitrogen.

Economic Uses. The menhaden is one of the most interesting and valuable of American sea fishes, and its catching and utilization give occupation to a large amount of capital and number of men and vessels. (See FISHERIES.) It is extremely irregular in its movements and numbers, migrating into deep water or to warm latitudes on the approach of cold weather and reappearing north of Cape Hatteras with advancing warm weather. In some years it has been extremely numerous as far north as Nova Scotia; while there have been periods when the fish seemed to have forsaken America altogether. It appears alongshore in schools, which may contain a million or two of fishes, swimming near the surface. With ordinary care such a school may be surrounded by a net, operated from two rowboats, and then hauled to the ship's side, where the net is pursed and the fish are dipped out and thrown into the hold. A catch of half a million is not unusual. Formerly small sailing vessels were altogether used, but since about 1875 high-powered, tuglike steamers have mostly replaced them. All along the shore from the Carolinas to eastern Maine are factories where these loads of menhaden are sold. Their bodies yield oil of a superior sort, useful for every purpose to which any fish or whale oil may be applied. This is obtained by boiling and pressing. (See OIL.) From the residue is made a nutritious animal food called fish meal, and a highly nitrogenous ingredient of artificial guanos. In early times, following the example of the Indians, the fish themselves used to be spread upon the farms near shore and plowed into the soil; but it was found that, apart from the extremely disagreeable taint this gave to the air of the whole region, the soil was injured by saturation with oil.

Great quantities of menhaden are also used as bait in the Banks fisheries; are sold fresh in the markets, very cheaply; and are salted for do-

mestic use or to be exported to the West Indies; and the young are extensively canned in oil as "American sardines" and "shadines." The fish has, however, a still higher economic value in serving as the food of other fishes important to us. It itself subsists mainly upon minute vegetable material contained in the mud of bays and soft shores, and is enormously fecund. Every predacious animal in the sea eats menhaden. Goode estimated that the total number of menhaden devoured by fishes annually could only be counted by millions of millions, and he declared that were the menhaden to disappear three-fourths of the value of the American fisheries would instantly vanish.

FISH LOUSE OF THE MENHADEN.

A degraded entomostracan parasite (*Lerneonema radiata*); the "rooted" head is at the right.

The menhaden is known by an extraordinary number of different names: as pogy in Maine; bony fish in eastern Connecticut; whitefish in western Long Island Sound; bunker, a shortening of mossbunker (q.v.), about New York and New Jersey; bugfish or bughead in Delaware and Chesapeake bays, referring to a parasitic crustacean (see PARASITE, ANIMAL) in the mouths of the southern menhaden; and farther south as fatback, yellowtail, and savega—the last the Portuguese term in South America. The menhaden of the Gulf of Mexico is a variety locally called alewife, herring, etc.; and other varieties extend the range of the species to Brazil.

Consult: G. B. Goode, "The Menhaden," an elaborate memoir, in *Report of the United States Fish Commission*, part v (Washington, 1877), and a more condensed account in *Fishing Industries*, sec. i (ib., 1884); W. E. Hathaway, *Effects of Menhaden Fishing upon the Supply of Menhaden and of the Fishes that Prey upon them* (ib., 1910). For a picturesque account of catching menhaden, see "Around the Peconics," in *Harper's Magazine*, vol. lvii (New York, 1881). See FISHERIES; Plate of HERRING AND SHAD.

MENHIR. See CARNAC; MEGALITHIC MONUMENTS.

MÉNIÈRE'S (mā'nyârz') **DISEASE.** A condition marked by sudden and complete loss of hearing and attended with nausea, vomiting, tinnitus, twitching movements of the eyeball (nystagmus), and vertigo. There is as a rule no previous history of ear disease, the tympanic membrane and other auditory tissues being normal in appearance. The condition is thought to be due to hemorrhage into the labyrinth (q.v.). The acute symptoms disappear as a rule within a few days or weeks, but the deafness remains permanent. Unsteadiness of gait and tremulous handwriting persist in some patients for a long time. Treatment has little influence on the disease, but some improvement may be expected from sweats induced by pilocarpine; and iodide of potash given for long periods is supposed to promote absorption of the blood clot.

Ménière's "symptom complex" is a condition similar to the above except that the attacks do not come so suddenly, are apt to be repeated, and there generally exists previous ear disease. The symptoms may be brought on by obstructive lesions in the Eustachian tube or middle ear with a consequent rise of pressure in the labyrinthine fluids. See EAR.

MENILIK. See MENELIK.

MENIN, *me-năn'*. A frontier town of West Flanders, Belgium, situated 30 miles southwest of Ghent, on the left bank of the Lys, which here forms the French boundary (Map: Belgium, B 4). It has a handsome church, a bishop's college, manufactures of lace and cotton textiles, tobacco, and a famous old brewery. There are salt baths near by. Menin was taken by the Germans in their envelopment of Belgium during the European War which began in 1914. It was recaptured by the British expeditionary force. The latter were forced to evacuate the town, which they later damaged by an aërial attack. See WAR IN EUROPE. Pop., 1900, 18,611; 1910, 18,636.

MENIN. The ancient name of the island of Terba.

MEN'INGI'TIS. An inflammation of the meninges, the membranes covering the brain and spinal cord. These are three in number: the *pia mater*, lying in contact with the substance of the brain and cord; the *dura mater*, lining the cranial cavity and spinal canal; and the *arachnoid*, a delicate weblike structure lying between the *pia* and *dura*. The term "meningitis" is specifically applied to an inflammation of the pia mater of the brain, described in this article under the heading of *Cerebral Meningitis*. Inflammation of the dura, whether of the brain or cord, is called *pachymeningitis*, and of the pia, *leptomeningitis*. The term "arachnitis" was formerly used on the supposition that the arachnoid might be the seat of an independent inflammatory process, but this is no longer believed to be possible. An inflammation involving the meninges of both the brain and cord is termed *cerebro-spinal meningitis*. For convenience of description the subject may be arranged under the following heads: pachymeningitis, involving the dura of the brain and cord; cerebral meningitis, of which two forms are recognized, tubercular and simple; spinal meningitis; and epidemic cerebro-spinal meningitis.

Pachymeningitis. This disease occurs in the external or internal form. Inflammation of the outer surface of the dura mater is uncommon and occurs nearly always by extension from neighboring disease. Either the cerebral or the spinal dura may be attacked. The cerebral form occurs as a consequence of blows and injuries of the skull, erysipelas of the scalp, or tumors of the cranium. A localized external pachymeningitis may arise from inflammation of the mastoid cells or middle or internal ear. The spinal form of pachymeningitis may be either widespread or localized; it also is due to extension from diseased adjacent structures, such as tuberculosis of the spine. Gowers describes a primary form in young, ill-nourished adults, the exciting cause being usually exposure to cold. The symptoms of pachymeningitis externa vary according to the nature and extent of the process. In acute cases severe pain, headache and a rise of temperature, hyperæsthesia, muscular spasms, and stiffness of the neck are seen. The treatment is that of the primary disease. Pachymeningitis interna occurs as a rare result of extension of purulent inflammation from the leptomeninges; as a pseudomembranous inflammation during pneumonia (Osler); in a hemorrhagic form; and in a chronic hypertrophic form. The hemorrhagic form is a rare condition and is also known as hæmatoma of the dura mater. In this disease the internal surface of the dura is the seat of a peculiar hemorrhagic inflammation, characterized by the formation of adventitious membranes, which appear to be repetitions of the arachnoid, having blood ves-

sels which rupture, the extravasated blood collecting in the form of cysts containing from an ounce to a pound of blood. The symptoms are primarily those of inflammation and secondarily due to pressure. There are some fever, irregularity of the pulse, headache, giddiness, somnolence, gradually deepening to coma; and there may be twitching and convulsions, followed by muscular weakness and paralysis. The disease affects the dura of both brain and cord, but the symptoms referable to the latter are often overshadowed by the cerebral effects. The diagnosis is difficult and the termination almost invariably fatal. The chronic hypertrophic form of internal pachymeningitis occurs in the spinal dura, producing an extensive thickening of the membrane. This in turn causes severe compression of the cord and spinal nerve roots. After a first stage of shooting pains along the course of the nerves affected, with muscular twitchings and spasms, there gradually supervene anæsthesia, paralysis, and atrophy. As the compression increases, paraplegia, secondary degeneration, and rigidity of the paralyzed parts appear. This form of pachymeningitis is due to syphilis, alcoholism, or injury, and is thought by some writers to follow the hemorrhagic form. Treatment consists of counterirritation over the spine, with remedies for the pain and spasms. When the trouble is syphilitic great improvement may be derived from mercurials and potassium iodide or from salvarsan.

Cerebral Meningitis. Acute inflammation of the pia mater of the brain occurs chiefly in two forms—tubercular and simple or purulent. The arachnoid takes part, to a greater or less extent, in the inflammatory process.

Tubercular meningitis occurs at all ages, but is more common in children than in adults. The disease is caused by the *bacillus tuberculosis* and is usually secondary to a tuberculous process in some other portion of the body, e.g., pulmonary phthisis, hip-joint disease, or caries of the spine. The characteristic lesions of the disease are found in the pia mater at the base of the brain or over the optic chiasm, crura, or pons. Tubercles are deposited along the vessels of the pia, which becomes thickened, opaque, and studded with grayish-white granules. There is an exudation of lymph, gray or grayish yellow, but rarely purulent, into the meshes of the membrane in the same portions in which the tubercles exist and extending along the fissure of Sylvius and the middle cerebral artery. The upper surface of the hemispheres is only slightly affected, so that the disease is sometimes called basilar meningitis. The ventricles are generally distended with fluid (whence the old name, acute hydrocephalus), clear, milky, or even bloody. The onset of the disease is often preceded by a period of general ill health. The child is peevish, irritable, with constipation and loss of appetite. The first or irritative stage then sets in suddenly, with a convulsion, or more commonly with vomiting, headache, and fever. The headache is severe and continuous, and the child moans and occasionally utters a sharp cry—the so-called hydrocephalic cry. Sometimes the patient screams until utterly exhausted and has to be kept under the influence of powerful sedatives all the time. There are moderate fever and excessive sensitiveness to light and sound. In the second period of the disease, the stage of depression, the irritative symptoms subside. The child no longer complains of headache, but is dull and apathetic, drowsy, or slightly delirious. Pulse and respiration are irregular and fever continues. The head is retracted and the neck stiff. If the finger nail is drawn across the skin of the forehead or abdomen a broad red streak appears, the *tache cérébrale*, which may last for five minutes. In the last or paralytic stage all these symptoms are intensified; the drowsiness increases to coma; paralysis of various parts of the body occurs, and death takes place in from 10 days to three weeks after the onset of pronounced symptoms. Few cases recover. Treatment is entirely symptomatic and palliative. An ice cap is put upon the head, and sedatives are given internally.

Simple acute meningitis is as a rule purulent or suppurative. It may be caused by inflammation of neighboring tissues, e.g., otitis, suppurative phlebitis, or abscess of the brain; or may occur as a complication of pyæmia, septicæmia, malignant endocarditis, or the specific fevers, particularly smallpox, typhoid, and scarlatina. The pia mater and arachnoid become infiltrated with purulent material and the brain beneath them is inflamed. The symptoms resemble in a general way those of the tubercular form just described, but the onset and course of the malady are much more rapid. When simple meningitis occurs in the course of other acute illnesses its features may be masked to a certain extent, but in other cases the symptoms begin acutely with a high temperature, chill, severe pain in the head, and vomiting, and the case passes on to convulsions, paralysis, coma, and death. A fatal termination is the rule, but some recoveries occur after a long period of convalescence.

Quincke has described a serous form of meningitis occurring in acute infectious diseases or intoxications or arising spontaneously. It may precede acute purulent otitis media, also, but no microörganisms are found. Lumbar puncture shows that the cerebrospinal fluid is increased in amount and under great pressure, and this procedure may ameliorate or cure the condition if it is not a mere precursor of purulent meningitis.

Spinal Meningitis. The membranes of the spinal cord may be affected separately, but it is common for inflammation to spread from one to the others. Inflammation of the dura, pachymeningitis, has already been described. Acute leptomeningitis, or acute spinal meningitis, as it is called, involving the pia, is often of obscure origin, but is known to be due to exposure to cold, sunstroke, and injuries to the spine; and it sometimes complicates pneumonia, scarlatina, typhoid fever, and septicæmia. Not infrequently a tubercular inflammation accompanies a like process in the cerebral pia mater. The attack begins with the usual symptoms of meningeal inflammation, viz., vomiting, chill, fever, and pain. The pain is in the back; it may be local or general, and it is increased by movement or pressure. There are also shooting paroxysmal pains, radiating along the course of the nerves arising in the affected area, and extreme sensitiveness of the skin and muscles to which those nerves are distributed. Irritation of the anterior nerve roots leads to spasms of the muscles, producing rigidity of the spine with sometimes extreme arching (opisthotonos). In addition there is the usual accompaniment of fever. After a few days the symptoms of irritation give way to paralysis and insensibility, and the disease either proves fatal from exhaustion and failure of the respiratory muscles or lapses into a chronic condition with wasting and shortening of the mus-

cles. Some patients recover after several months, while others ultimately die from bed sores, or from renal or vesical complications. In this form of meningitis the pia mater is reddened and congested and small hemorrhages may occur. An exudation, at first grayish in color, but later purulent and yellow or greenish yellow, takes place into the meshes or upon the surface of the pia, and the spinal fluid is rendered turbid and opaque. The inflammatory process may extend to the substance of the spinal cord (causing myelitis), or to the inner surface of the dura mater, involving of course the arachnoid and gluing the three membranes together. Treatment comprises rest in bed, upon the side or face, active purgation, and cups or leeches along the spine, followed by the application of ice. Internally drugs are given to relieve pain and diminish sensibility. In the chronic stage counterirritants are applied along the spine, and mercurials or iodides are administered. During convalescence tonics, massage, cold douches, and the electric current are of great service.

Chronic leptomeningitis may be a continuation of the acute form or it may be chronic from the beginning, and has been attributed to cold and exposure, syphilis, chronic alcoholism, and injury. It often occurs in connection with degenerative processes of the cord itself. The condition is one of gradual thickening of the pia mater with compression and atrophy of the nerve roots. The symptoms are the same as in the acute form, with the difference that they come on gradually and there is no fever. Muscular spasm and rigidity are less marked.

Epidemic Cerebro-Spinal Meningitis has been known only since the beginning of the nineteenth century, being first recognized in Geneva, Switzerland. It made its first appearance in America in Massachusetts in 1802. Many severe epidemics have since occurred both in Europe and America. The disease visited Ireland in a very fatal form in 1846 and again in 1866–68. It is a specific infectious disease due to a microorganism, the *diplococcus intracellularis* of Weichselbaum. The diplococcus has been found in the secretions of the nose, eye, bronchial tubes, joints, and in the blood. Infection is believed to spread through contact with mucous secretions of the upper respiratory tract. Epidemics occur most frequently in winter and spring, and the disease has assumed its most fatal type during times of famine and among squalid tenement dwellers or soldiers in crowded barracks. The changes observed in the meninges are those characteristic of a widespread and severe leptomeningitis. The pia mater is intensely congested and its blood vessels dilated. Pus and lymph are abundant on the convex surface of the brain, along the large blood vessels, and in the fissures. The ventricles contain turbid serum or pus. Small hemorrhages and sometimes abscesses are found in the cortex of the brain. There is in addition congestion of the lungs, liver, spleen, and kidneys. Several clinical varieties of the affection have been noted and the course and symptoms vary remarkably in the different types. In the malignant or fulminant type the disease may prove fatal in a few hours. The abortive type presents only a few symptoms and is characterized by rapid recovery. Remittent and intermittent forms are recognized in which the fever is lower or entirely absent for two or three days, and there is a form that much resembles typhoid fever. The average duration of the disease is three or four weeks, and the mortality from 30 to 70 per cent in the different epidemics. As might be expected from the extent of tissue involved, the symptoms are very numerous and diverse. No single set of symptoms occurs in all cases. In some there is an indefinite premonitory stage, with malaise, nausea, and headache; but usually the onset is sudden, with a chill, severe headache, vomiting, pains in the back and limbs, and fever. With these manifestations comes stiffness of the muscles of the neck and back, so that the head is retracted and the back arched. Inability to extend the legs fully when the thigh is bent at right angles to the trunk (Kernig's sign) is an important diagnostic phenomenon. There are also pains in the lower extremities and hyperæsthesia of the skin. In addition to these symptoms due to irritation of the spinal nerve roots there are others referable to implication of the cranial nerves. These are, in different cases, drooping of the eyelids (ptosis), squint, contraction, dilatation, or inequality of the pupils, or spasms of the facial muscles. The temperature runs a very irregular course. An important feature of the disease is the occurrence in many cases of a herpetic eruption or petechial or purpuric spots, whence the names spotted fever and petechial fever. Recovery is apt to be marked by the occurrence of many disagreeable sequels. Deafness is common and sight is often impaired. Chronic hydrocephalus with headache, muscular weakness, and mental deficiency occurs in a few instances. Lumbar puncture may relieve headache and delirium and is useful as a diagnostic procedure and as a preliminary to the introduction of Flexner's serum or urotropin. The serum may also be injected directly into the lateral ventricles of the brain when, as frequently happens in meningitis, communication between the cerebral and spinal centres is shut off. Great reduction in mortality is claimed from serum treatment. Consult: Koplik, *Diseases of Infancy and Childhood* (Philadelphia, 1910); an article by the same author on epidemic cerebrospinal meningitis in Osler's *Modern Medicine* (New York, 1914); Flexner, "Results of Serum Treatment in 1300 Cases of Epidemic Meningitis," in *Journal of Experimental Medicine* (New York, May, 1913).

Cerebro-Spinal Meningitis, BLIND STAGGERS, FORAGE POISONING, BORNA DISEASE. A disease of horses characterized by inflammation of the membranes of the brain and spinal cord and the adjacent nerve tissue. It has been considered by some authors to be infectious, owing to an occasional epizoötic-like outbreak. Others consider toxic fungi on forage to be the cause. Recent investigations have failed to determine the specific cause and it still remains an obscure and puzzling problem.

Occurrence.—The disease has occurred throughout Europe and outbreaks from time to time become widespread in the United States causing heavy loss, as was the case in the Kansas and Nebraska outbreak of 1913, while at other times there are only sporadic cases.

Symptoms.—Disturbance of the appetite, depression, and weakness are in most cases the first manifestations observed. The characteristic symptoms of the disease soon disappear. There are difficult swallowing, drooping of the head, and sleepiness which may give way to excitement and attacks of vertigo. Impairment of vision is noted, with loss of coördination, resulting in a staggering gait or reeling while standing. There are muscular twitching, cramp of certain muscles,

chiefly of the neck and flanks, and grinding of the teeth. Sometimes colicky pains are noted. If in an open space, the animal will walk in a circle, sometimes to the right, at other times to the left, and will try to push through any obstacle with which he comes in contact. If the temperature is taken at the beginning of the disease it will be found to be from 103° to 107° F., but within 24 hours the temperature gradually falls until it reaches normal and then becomes subnormal. The animal is often down on the second or third day and may or may not get up when urged to do so. Coma or somnolence may be marked in animals going down within the first few days. Those which remain standing may become violent or delirious, but ordinarily the horse is tractable and easily managed. Death usually occurs in from four to eight days, although in the acute form death may follow within 10 or 12 hours after the first symptoms are observed, while in chronic cases the disease may last two or three weeks. The prognosis is very unfavorable, as 85 to 90 per cent of the affected animals die in the beginning of the outbreak, but later the cases become milder, with a consequent drop in the mortality. There are no constant post-mortem lesions in the vital organs, the most important alterations being found in the membranes of the brain.

Treatment.—It appears to be the consensus of opinion of practically all investigators that the disease can be controlled effectively only by a total change of feed and forage; i.e., by preventive measures and not by medicinal treatment. That there is direct connection between ingestion of green forage, exposed pasturage, newly cut hay and fodder, and the development of the disease is quite obvious, and that the ingestion of such forage when contaminated is the most important factor is equally obvious, since almost 100 per cent of the cases in Kansas and over 95 per cent of the cases in Nebraska of which there is any record were maintained all or part of the time under such conditions. Medicinal treatment has proved unsatisfactory in the vast majority of cases. However, the digestive tract should be thoroughly cleaned out through the use of active and concentrated remedies given subcutaneously or intravenously. Arecolin given subcutaneously in half-grain doses has given as much satisfaction as any other drug. After purging the treatment is mostly symptomatic. The horse owner should beware of all kinds of drug specifics, serums, and vaccines unless recommended by a reliable veterinarian.

Consult R. W. Hickman, *Epizoötic Cerebro-Spinal Meningitis of Horses* (Washington, 1906), and J. R. Mohler, *Cerebrospinal Meningitis* (ib., 1914). See MEGRIMS.

MÉNIPPÉE, mā'nē'pā'. A political satire in prose and verse, published in France in 1594, directed against the Catholic League and in favor of political religious toleration. The name is borrowed from the *Satira Menippea* of the Roman satiric poet Varro, who had taken as a model the Greek cynic Menippus, Diogenes' pupil. Its full title was *De la vertu du Catholicon d'Espagne et de la tenue des Etats de Paris.* It was the joint work of Leroy, Gillot, Passerat, Rapin, Chrestien, Pithou, and Durant, chiefly lawyers. It ostensibly reports an assembly of the states at Paris, with a satirical introduction and a burlesque close, and is the best travesty of its kind in any language before Butler's *Hudibras* (1663). Its political effect was immediate and lasting. The *Ménippée* is well edited by Labitte (1801). For a clear analysis of this satire, consult Suchier and Birch-Hirschfeld, *Geschichte der französischen Litteratur* (Leipzig, 1900).

MENIP'PUS (Lat., from Gk. Μένιππος) (c.250 B.C.). A Greek philosopher of the Cynic school, born at Gadara, in Syria. He is said by Diogenes Laertius to have been a slave by birth, and to have acquired considerable wealth, the loss of which caused him to hang himself. His writings, now completely lost, were a medley of prose and verse in which he satirized the follies of men, particularly of philosophers. These were the model for Varro's *Menippean Satires,* as well as for satires of Meleager and Lucian. See MÉNIPPÉE. Consult Rudolf Helm, *Lucian und Menipp* (Leipzig, 1906), and Christ-Schmid, *Geschichte der griechischen Litteratur,* vol. ii, part i (5th ed., Munich, 1911).

MENKEN, mĕn'ken, ADAH ISAACS (1835–68). An American actress, born at New Orleans, La. Her maiden name was Dolores Adios Fuertes. She made her début as a danseuse at the New Orleans French Opera House and subsequently appeared in Cuba and New Mexico. In 1858 she took part in *Fazio* in her native city; played with great success the rôle of Mazeppa in England in 1863–64; and appeared at Paris in *Les pirates de la Savane* in 1866. Subsequently she played in Vienna and again in London and Paris. She was noted as a woman of extraordinary beauty, culture, and brilliancy. She was married successively to Alexander Isaacs Menken, musician (1856), John C. Heenan, pugilist (1859), Robert H. Newell, humorist (1863), and James Barclay (1866). A volume of poetry by her was published as *Infelicia* (1868).

MEN'NONITES. A denomination of evangelical Protestant Christians which arose in Switzerland in the sixteenth century but took its name from Menno Simons, who was the leader of the sect in Holland. The beginning of the sect was in a congregation formed in Zurich in 1525 by Conrad Grebel and his associates, Manz and Blaurock. Stress was laid upon discipline rather than dogma; abstinence from the vanities of the world was imposed; and (the state being regarded as unchristian) the principle of refusing to participate in civic duties, to bear arms, and to take oaths was upheld. The movement begun at Zurich extended through Switzerland and into southern Germany and Austria. The attitude of its adherents towards the state exposed them to persecution, which continued in Switzerland through the whole of the sixteenth century and provoked emigrations into Moravia and Holland. The Anabaptists (q.v.) were active in Westphalia at the same time, and, professing some of the same views with Grebel's followers, gave occasion for the introduction of heresies and troubles. After the Anabaptist disaster at Münster Menno Simons (q.v.) became a leader among the followers of Grebel and placed their movement upon a sounder footing. He organized congregations in northern Germany and Holland, and by virtue of his piety, discretion, and ability made such an impression upon the body that, although he was not its founder, his name became identified with it. The Mennonites, like the Waldenses, were lovers of peace. The Mennonite Confession of Faith, in 18 articles, was adopted in Holland in 1632. It embodies the usual evangelical doctrines concerning God, the fall of man, the authority of the Scriptures, re-

pentance, and baptism, and contains articles relating to discipline and conduct. The view taken of the Lord's Supper accords with that of Zwingli. In the United States the sacrament is observed twice a year, usually in the spring and fall, the communicants having been previously examined concerning their spiritual condition. The rite of foot washing (q.v.) is observed in connection with it. Baptism, which is only upon confession of faith, is administered by pouring. After baptism the kiss of peace is given by the minister, or by a representative sister, if the convert is a woman. Correct discipline and rectitude are considered more important elements in the Christian life than learning and the elaboration of doctrinal points. Divorce is condemned, except for adultery. The bearing of arms and taking of oaths are regarded as wrong, and the holding of offices under the state is not encouraged. The church polity is congregational, with bishops, priests or elders, and deacons.

The Mennonite church has been divided in both Holland and Switzerland. The different branches in Holland were reunited in 1801. A division took place in Switzerland in 1620 between the Upland and Lowland Mennonites when Jacob Amen, of the Bernese Alps, held that excommunication of one party dissolved the marriage tie, and proscribed the use of buttons and the trimming of the beard. Traces of this separation are found in the United States and Canada in the Amish congregations.

The first settlement of Mennonites in the United States was made in 1683, when immigrants, induced by William Penn's offer of religious liberty, settled in Pennsylvania and built a church in Germantown, on a spot still occupied by a Mennonite meetinghouse. Another considerable immigration has taken place from southern Russia since 1871, the immigrants establishing colonies in the United States (Minnesota, Dakota, and Kansas) and Canada. So far as it is possible to ascertain, the Mennonites had in 1914 in the United States 57,337 communicants, with 1413 ministers and 736 churches. They are divided among 12 branches, which differ on points of doctrine, ritual, and discipline, or in historical origin.

I. The oldest and largest of these branches is the **Mennonite church**, the members of which are represented in 17 States, but most largely in Pennsylvania and Ohio. Their 289 churches, with 430 ministers and 23,169 communicants, are for the most part affiliated with some of the 12 district organizations, but a few of them are independent. A publishing house is established at Scottdale, Pa., where a weekly newspaper in English, the *Gosped Herald*, Sunday-school and children's periodicals, Mennonite historical and doctrinal works, and other books are published.

II. The **Bruederhoef Mennonite church** traces its origin to Jacob Huter, who was burnt at the stake at Innsbruck, Tirol, in 1536. It was at one time represented by 24 communities in Moravia, whence they were driven to Hungary. They removed to Rumania in 1767 and two years afterward to Russia, and finally, in 1874, to the United States, where they settled in South Dakota. They live under the communal system. Their language is German and their books, preserved in manuscript, including their history (*Gemeinde-Geschichtsbuch*), are in that tongue. Their 20 congregations have about 1000 communicant members and are served by 32 ministers.

III. The **Amish Mennonite church** originated in the division already mentioned, which took place in Switzerland in 1620, and represents the Oberland Mennonites, or followers of Jacob Amen, of the Bernese Alps, after whom it is named. It is second in importance among Mennonite bodies in the United States and has 176 ministers, 91 churches, and about 11,000 communicants, being most largely represented in Illinois, Pennsylvania, and Ohio. A settlement of Amish Mennonites was formed in 1824 in Wilmot Township, Ontario, where land was bought for the purpose by Christian Nafziger, of Munich.

IV. The **Old Amish Mennonite church** is the result of a separation from the Amish body which took place about 1865 over questions concerning forms of worship and methods of Church work, the separatists protesting against certain steps which they regarded as innovations, and insisting upon a strict adherence to the ancient forms and practices. They have about 2000 members, with 74 ministers and 25 churches, and are strongest in Indiana and Ohio.

V. The **Apostolic Mennonite church** is a branch derived from the Amish, which came to the United States by immigration from Europe about 1840. The discipline is less strict than in the other Amish branches. Fourteen churches are included, with 34 ministers and about 900 members.

VI. The **Reformed Mennonite church** originated in 1812, under the leadership of John Herr, who protested against laxity in the Mennonite church and insisted upon the preservation of purity in teaching and the maintenance of exact discipline. Its adherents are strict in the observance of the old ways and in their discipline, and do not as a rule hold fellowship with other denominations. They have about 1000 members, about half of them being in Pennsylvania, with 32 ministers and 32 churches.

VII. The **General Conference Mennonite church** has adopted modern views and practices to a larger extent than most of the other branches. It originated as a result of proceedings which were instituted in 1848 in Pennsylvania against a minister, John Oberholtzer, who was charged with attempting to introduce new teachings and practices. Oberholtzer and his sympathizers withdrew and formed a body called the New Mennonites. This body united with churches whose members had come from Germany and settled in Illinois and Iowa, and a General Conference was formed with three districts—eastern, central, and western. A new constitution, described as being evangelical in tone, was adopted in 1898. A publishing house is maintained at Berne, Ind., and several periodicals, in German and English, are issued. The number of members is about 13,000, with 172 ministers and 112 churches.

VIII. The **Church of God in Christ** was founded in 1859, under the leading of John Haldeman, who believed himself inspired with the spirit of prophecy. It inculcates a strict adherence to the teachings of the founders of the Mennonite church. The estimate of its numbers gives it 11 ministers, 9 churches, and 300 members.

IX. The **Old**, or **Wisler, Mennonites** represent a separation from the Mennonite church in Indiana which took place about 1870 by those who opposed the introduction of Sunday schools, evening meetings, and other new features. The first conference of this division was held in 1898.

They number about 1200 members, with 20 ministers and 12 churches.

X. **Die Bundes Conferenz der Mennoniten Brüdergemeinde** originated in Russia about 1840, and was brought to the United States by immigrant adherents between 1873 and 1876. It practices baptism by immersion and attaches special importance to evidences of conversion. It is one of the most active of the Mennonite bodies in missionary enterprise and has missionaries in China, Africa, and India. Its 27 churches have 2700 members and 46 ministers.

XI. The **Defenseless Mennonites** are likewise distinguished by the stress they lay upon the necessity of conversion and regeneration, and represent a separation from the Amish, which was led by Henry Egli. They have about 735 members in 10 churches, with 16 ministers.

XII. The **Church of the Mennonite Brethren in Christ** is the most recent in organization of the Mennonite bodies, having been formed about 1880. The Brethren are open communionists and administer baptism in any of the usual forms. They have 97 churches, 149 ministers, and about 5000 members in the United States and in Canada.

The larger Mennonite branches have in recent years displayed increased activity in missionary enterprise, in consequence of which they have enjoyed a greater relative prosperity. A general tendency has been observed towards a closer drawing together of the different branches. This was exemplified in an effort which was made in 1898 to secure the holding of a General Conference of the Mennonite and Amish district conferences, and in the coöperation of all the bodies with the Home and Foreign Relief Commission at Elkhart, for famine relief in India, for the education of the famine orphans, and for the support of the missionaries among them.

Bibliography. Starck, *Geschichte der Taufe und der Taufgesinnten* (Leipzig, 1789); S. Blaupet ten Cate, *Geschiedeniss der Doopsgezinden* (Amsterdam, 1839–47); A. Brons, *Ursprung, Entwickelung und Schicksale der Taufgesinnten* (2d ed., Norden, 1891); C. H. Wedel (ed.), *Abriss der Geschichte der Mennoniten* (4 vols., Newton, Kansas, 1900–04); also Hauck, "Mennoniten," in Hauck-Herzog *Realencyclopädie*, vol. x (Leipzig, 1901), which has full bibliography. In English, consult: Menno Simons's complete works, and *The Mennonites: Their History, Faith, and Practice*, published by the Mennonite Publishing House, at Elkhart, Ind.; E. K. Martin, *The Mennonites* (Philadelphia, 1883); H. P. Krehbiel, *The History of the General Conference of Mennonites of North America* (St. Louis, 1898); S. P. Pennypacker, *Historical and Geographical Sketches* (Philadelphia, 1883), the first half of which relates to the history of the Mennonites; H. P. Krehbiel, *Mennonites in North America* (Berne, Ind., 1911); Carroll, *Religious Denominations in the United States* (New York, 1912); also *The United States Census of Religious Denominations* (Washington, 1906). The principal periodicals are: *Mennonitische Rundschau*, weekly (Elkhart, Ind.); *Herald of Truth*, weekly (ib.); *Christlicher Bundesbote*, weekly (Berne, Ind.); *Gemeindesbote und Waisenheim*, monthly (Hillsboro, Kans.); *Zions Bote*, weekly (Medford, Okla.); the *Mennonite*, monthly (Quakertown, Pa.). The *Gospel Banner*, weekly, and the *Evangeliums Panier*, semimonthly (Berlin, Ontario), represent the Mennonite Brethren in Christ.

MEN'NO SI'MONS (1492–1559). The founder of the later school of Anabaptists (q.v.) in Holland, from whom the Mennonites (q.v.) take their name. He was born at Witmarsum in Friesland in 1492; took orders in 1516; and was a priest in his native place from 1531 to 1536. The study of the New Testament, however, excited grave doubt in his mind regarding the truth both of the doctrine and constitution of the Church, and in 1536 he withdrew from it altogether. He attached himself to the party of the Anabaptists, was rebaptized at Leeuwarden, and in 1537 was appointed a teacher and bishop in the university of what was then known as the Old Evangelical or Waldensian church at Groningen. Henceforth his great endeavor was to organize and unite the scattered members of the Anabaptist sect in Holland and Germany. With this design he spent much time in traveling; but Friesland was his chief residence until persecution compelled him to flee. Finally he settled in Oldesloe in Holstein, where he was allowed to establish a printing press for the diffusion of his religious opinions. Here he died, Jan. 13, 1559. He was a man of earnest and spiritual nature, with no trace about him of the wild fanaticism of the earlier Anabaptists. His book of doctrine, *Elements of the True Christian Faith*, was published in Dutch in 1539. His works in English translation are published by the Mennonite Publishing Society at Elkhart, Ind. Consult his *Life* published in Dutch by F. C. Fleischer (1892); also, R. Barclay, *Inner Life of Religious Societies of the Commonwealth* (London, 1877).

MEN'OBRAN'CHUS. A genus of large newts, of the family Proteidæ, represented in the United States only by the mud puppy (q.v.).

MENOCAL, mā'nō-käl', Mario García (1867–). A president of Cuba. He was educated at Cornell University as a civil engineer, which profession he followed most of his life. During the war against Spain (1895–98) he served in the Patriot army with some distinction, but upon the conclusion of peace returned to his profession and was the managing director of the Cuban American Sugar Company, in charge of one of its large estates in Cuba. In 1912 he was elected president on the Conservative ticket, chiefly on the ground of the administrative ability which he had shown in business. His policy was to endeavor to cement better relations with the United States, to introduce economy in the administration, and to secure financial reforms for the country. He labored to give Cuba a clean, stable, and economical government, but experienced considerable opposition and criticism of his policy.

MENOMINEE, mē-nŏm'ĭ-nē, or Menomini (wild-rice men, so called because of their great use of the wild rice which grows abundantly in their country). A considerable Algonquian tribe, formerly ranging over northern Wisconsin and the adjacent upper Michigan, chiefly along the river of the same name, and now gathered upon a reservation near Green Bay, Wis. In their general characteristics they resemble the Ojibwa, but they speak a distinct language. French missionaries established a mission among them in 1670, and they remained faithful to the French interest until the end. They aided the English in the Revolution and in the War of 1812 and fought under Tecumseh during the latter struggle. In 1910 they numbered 1422. Consult W. J. Hoffman, "The Menomini," in *Bureau of American Ethnology, Fourteenth Annual Report*

(Washington, 1896), and Alanson Skinner, "Social Life and Ceremonial Bundles of the Menomini Indians," in *American Museum of American History, Anthropological Papers*, vol. xiii (New York, 1913).

MENOMINEE. A city and the county seat of Menominee Co., Mich., 165 miles north of Milwaukee, Wis., and opposite Marinette, Wis., with which it is connected by three bridges. It is situated on Green Bay, at the mouth of the Menominee River, and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Wisconsin and Michigan railroads (Map: Michigan, B 3). It is also the western terminus of the car ferries of the Ann Arbor Railroad. One of the greatest lumber-shipping ports in the State, Menominee has numerous saw and planing mills and a great variety of manufactures, including electrical appliances, telephones, shoes, paper, steam boilers, heavy machinery, boxes, beet sugar, automobile trucks, baby carriages, canned goods, packing-house products, etc. The city is the seat of Menominee County Agricultural College and contains a public library and museum, several fine schools, well-kept parks, and a public hospital. Menominee, first incorporated in 1883, is governed under a charter of 1905, which provides for a mayor, chosen biennially, and a unicameral council which elects most of the administrative officials, only the supervisor, city treasurer, and justice of the peace being chosen by popular election. Louis Chappieu, a trader, settled here in 1799; but the city really dates from 1883, when the first mill was built here. Pop., 1900, 12,818; 1910, 10,507.

MENOM'ONIE. A city and the county seat of Dunn Co., Wis., 69 miles by rail east of St. Paul, Minn., on the Red Cedar River and on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, B 4). It has a fine memorial library, the Stout Institute, a county normal school, and a county agricultural school. The Dunn County Asylum is near the city. Other noteworthy features are the courthouse, city hall, Federal building, and Lake Menomin. The industrial interests are represented by brickyards, foundries, and machine shops, carriage and wagon works, and manufactories of gasoline engines, cigars, dairy products, pianos, flour, etc.; and the commercial interests by a large trade in brick, live stock, flour, wheat, and fur. The city was formerly an important manufacturing and distributing centre for lumber. Menomonie adopted the commission form of government in 1912. Pop., 1900, 5655; 1910, 5036.

MEN'OPAUSE. See MENSTRUATION.

MEN'OPOME. The hellbender (q.v.).

MENORRHAZIA. See MENSTRUATION.

MENOU, *me-nōō'*, CHARLES DE. See CHARNISE, SEIGNEUR DAULNAY DE.

MENPES, *měn'pēs*, MORTIMER (1859–). An English painter, etcher, and draftsman. He was born at Adelaide, South Australia, was educated at Port Adelaide, and at 19 went to London. There he studied at South Kensington, and then went to Pont Aven in Brittany, where he remained three years. Yet he was largely self-taught in art. In 1900 he was artist for *Black and White* in the South African War. Of extraordinary versatility, he held more exhibitions in London than any contemporaneous artist. He traveled in many lands, including Japan, India, Mexico, Spain, Morocco, and Brittany, everywhere painting in oil and water color and drawing or etching scenes and objects of interest or beauty. His work shows a refined sense of color, and power and delicacy of draftsmanship. In his Japanese studies he invented a process of painting in water color by which he attained uncommon brilliancy of effect, and he also revived the art of printing in color from etched plates. In later years he turned his attention to portraiture on a small scale, where his mastery of many mediums and skill as a draftsman are effectively shown. He was elected a fellow of the Royal Geographical Society and in 1885 became a member of the Society of British Artists. He published, among other works: *World Pictures* (1902); *Whistler as I Knew him* (1904); *Rembrandt* (1905); *India* (1905), with Mrs. F. A. Steel; *Sir Henry Irving* (1906).

MENSES, *měn'sēz*. See MENSTRUATION.

MENSHIKOV, *měn'shĭ-kŏf*, ALEXANDER DANILOVITCH (1673–1729). A Russian field marshal and Minister of State. He was born near Moscow in 1673, in humble circumstances. His intelligent countenance attracted the notice of General Lefort, through whose patronage he was taken into the service of Peter the Great. He accompanied Peter in his travels to Holland and England, and on the death of Lefort became the Czar's chief adviser. Menshikov showed equal ability as a general and as a diplomatist, and although totally uneducated he did much to promote the education of the people and was a liberal patron of the arts and sciences. In 1702 he distinguished himself in the siege of Notemburg and was made commander of this fortress after it was taken by the Russians and renamed Schlisselbourg. During the same year Menshikov took Marienbourg; among the prisoners taken on this occasion was the girl Katherine Skavronsky, who later became the wife of Peter the Great and the Empress of Russia. In 1703 he was appointed Governor of Ingermanland, Coreles, and Eastland. On Oct. 30, 1706, he defeated the Swedes at Kalisz. He contributed to some of the Czar's other victories, was made a field marshal on the field of Poltava, 1709, and after the battle compelled Lewenhaupt to capitulate with a great part of the Swedish army. In 1710 he took Riga, in 1712 he led the Russian troops into Pomerania and Holstein, and in 1713 took Stettin, but gave it up to Prussia contrary to the will of the Czar. This and his avarice so displeased Peter that Menshikov was court-martialed and condemned to death, but he was pardoned on payment of a heavy fine. During the reign of Catharine I he regained his influence at court, and after her death governed Russia with almost absolute authority in the name of Peter II. His daughter was about to marry the young Czar when Menshikov lost his influence and was banished to Siberia, September, 1727. His estates and treasures were confiscated. He died Nov. 12, 1729.

MENSHIKOV, or **MENTCHIKOV,** ALEXANDER SERGEIEVICH, PRINCE (1787–1869). A Russian statesman and general, the great-grandson of Alexander Danilovich Menshikov. He participated in the campaigns of 1812 to 1815 against Napoleon. In 1820 he was appointed commander of the Black Sea fleet, but he resigned four years later because of insufficient acquaintance with naval matters. During the Russo-Turkish War of 1828–29 he took Anapa and was wounded at Varni. In 1831 he was made Governor-General of Finland. In 1836

he became Minister of Marine and did much to increase the effectiveness of the Russian navy. In 1853 he was sent as Envoy Extraordinary to Constantinople just before the rupture which resulted in the Crimean War, but he was not, as is frequently stated, responsible for the rupture. During this war he became prominent as defender of Sebastopol, where he showed the greatest energy until his retirement on account of ill health in March, 1855. He died at St. Petersburg.

MEN'STRUA'TION. The periodic discharge of sanguineous fluid which issues from the generative organs of the human female during the period in which she is capable of procreation.

The first appearance of this discharge, to which are applied the terms menses and catamenia, indicates the approach of sexual maturity, and is accompanied by enlargement of the mammary glands, a growth of the external genitals, an increase of hair upon the *mons Veneris*, and an accession of reserve, thoughtfulness, and maturity. Menstruation usually commences between the fourteenth and the sixteenth years and terminates between the fortieth and fiftieth years. The cessation of the menstrual flow is called the menopause. The interval between successive menstrual periods is about four weeks, although it is oftener shorter; and the duration of the flow is usually three or four days, but is liable to great variations even in health. The first appearance of the discharge is usually preceded and accompanied by pain in the loins and headache, malaise, depression, and restlessness, and in many women these symptoms invariably accompany the discharge. As a general rule there is no menstrual flow during pregnancy and lactation, and its cessation is one of the first signs that conception has taken place. In robust young girls who have lived an outdoor life there is no disturbance experienced at the appearance of the menses. In many others, however, there is considerable nervous excitement, consisting of irritability, emotion, depression, flushing, and throbbing of the head.

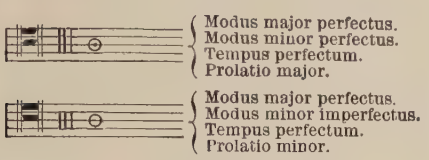
Difficult and painful menstruation is called dysmenorrhœa. During such nervous manifestations the girl should be treated as an invalid, and studies should not be persistently prosecuted. Avoidance of drains upon physical and mental powers should be enjoined, and abundant daily outdoor life should be secured. Other disorders of the menstrual function are amenorrhœa (q.v.), or lack of flow, and menorrhagia, or metrorrhagia, excessive flow. The latter is generally a sign of serious disease of the uterus or its appendages and demands prompt medical attention.

MEN'SURABLE MUSIC (Lat. *mensurabilis*, measurable, from *mensura*, measure). Strictly speaking, all music written in notes that have a definite time value. In a specific sense the term is applied to the music written between the beginning of the twelfth and the seventeenth centuries, before the invention of the line dividing a composition into bars. Before the twelfth century the choral note of the plain chant indicated only the pitch. The duration of each note was left to the individual singer and arbitrarily determined by the rhythm of the text. As long as music was sung in unison this system answered all practical purposes. But with the introduction of harmony and the development of polyphonic music, employing a number of independent voices, an imperative need made itself felt to fix the duration of the individual note. Mensurable music, therefore, borrowed the forms of the notes as used in the plain chant. These were: the large (*maxima* or *duplex longa*), ; the long (*longa*), ; the breve (*brevis*), ; and the semibreve (*semibrevis*), . To these were added the minim (*minima*), , and semiminim (*semiminima*), . For nearly 300 years the notes were written in this form. At the beginning of the fifteenth century the black notes were gradually supplanted by the white or open notes: , , , , . For the smaller notes both the black and white forms continued in use: semiminim, or ; croma or fusa, or ; semicroma or semifusa, or . Even as early as the sixteenth century rounded notes were substituted for the square ones in writing music. But it was not until 1700 that the round forms were generally adopted by music printers.

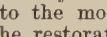
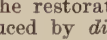
Out of reverence for the Trinity triple time was regarded as *perfect* time, whereas duple time was *imperfect*. A division of a note into three of the next smaller kind was *mensura perfecta;* into two of the smaller kind, *mensura imperfecta*. This division was indicated by certain signs, but a sharp distinction was made between the division of a long into breves, or of a breve into semibreves. These signs were placed at the beginning of a composition. The division of a large into longs or of a long into breves was known as *modus;* of a breve into semibreves as *tempus;* of a semibreve into minims as *prolatio*. The *modus* itself was further distinguished as *modus major* (division of a large into longs) and *modus minor* (division of a long into breves). A still further subdivision of both the *modus major* and *minor* was into *perfectus* (triple time) and *imperfectus* (duple). *Tempus* was thus also subdivided into *perfectum* and *imperfectum;* whereas in the case of *prolatio* this division was designated as *major* and *minor*. The following table gives a complete view of this system with the various signatures:

Modus major perfectus	1 = 3 ,	}
Modus major imperfectus . . .	1 = 2 ,	}
Modus minor perfectus	1 = 3 ,	,
Modus minor imperfectus	1 = 2 ,	,
Tempus perfectum	1 = 3 ◇ ,	○
Tempus imperfectum	1 = 2 ◇ ,	C
Prolatio major	1 ◇ = 3 ,	• within tempus sign.
Prolatio minor	1 ◇ = 2 ,	no dot.

The sign of the *modus major* was the same for the *perfectus* and *imperfectus*. The following sign for the *modus minor* determined the *modus major*. If the sign was followed by or , it was *modus major perfectus;* if followed by or , it was *modus major imperfectus*. The *length* of the vertical bars had reference to the *modus minor*, the long bars indicating the *perfectus*, the short ones the *imperfectus*. The *number* of vertical bars referred to the division of the large into two or three longs. The *prolatio* sign appeared only in connection with the *tempus* sign. Thus ⊙ meant *tempus perfectum, prolatio major;* ⊙ *tempus imperfectum, prolatio minor*. If the tempus sign appeared without a dot it always meant that *prolatio minor* was understood. The following table will make this clear:

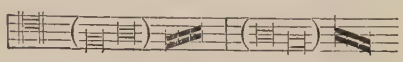


The time value of the different notes as fixed by these signs or signatures was known as the *integer valor notarum*. But these fundamental values could be changed by means of *augmentatio, diminutio*, and *proportio*. *Diminutio* reduced the value of the notes in triple time to one-third, in duple time to one-half of the original value. It was indicated by a vertical line through the signature, or by affixing a number to the tempus sign, ⊙ 2 or ⊙ 3. Time indicated thus always denoted a lively tempo, corresponding to the modern *allegro*. *Augmentatio* signified the restoration of the *integer valor* of notes reduced by *diminutio*. It was indicated by writing the ordinary sign of the *integer valor*, ○ C. A change of the *integer valor* by means of fractions was known as *proportio*. Thus $\frac{3}{1}$ meant that the time was to be accelerated, so that *three* breves now had the same duration as *one* breve of *integer valor*. But $\frac{1}{3}$ meant the opposite, viz., that the time was to be retarded, so that *one* breve now had the same duration as *three* breves of the *integer valor*. A special kind of *proportio* was that indicated by $\frac{3}{2}$, known as *hemiolia*.

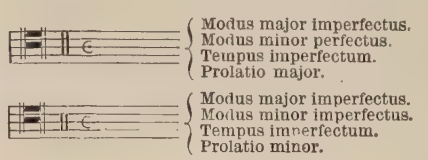
Alteratio was the doubling of the time value of the second of two notes of the same kind when a tripartite note of the next larger kind followed. Generally the two smaller notes stood between two of the larger kind, or were separated from the following notes of equal or smaller value by a *punctum divisionis*. Thus, in *tempus perfectum* (○, tripartite),  would be expressed in modern notation (values reduced one-half)  .

An important factor in the theory of mensurable music was the *color* of the notes. The ordinary note was black. In the fourteenth century a red note (notula rubra) was used. Originally this red note was used instead of signatures to denote a change from *perfectio* to *imperfectio*, or vice versa. Soon it was definitely used to indicate *imperfectio* only. For want of red color it was often left open or white (notula alba), and during the fifteenth century the white note had the same meaning as the red note of the fourteenth. When finally the white notes were generally adopted (during the sixteenth and seventeenth centuries), *imperfectio* was denoted by the black note (notula nigra).

A group of two or more notes to be sung on one syllable was called *ligatura*. When only two notes were given to one syllable, they were written as one and called *figura obliqua*.



In ligatures of more than two notes the time value of the individual notes was not determined from their actual shape but from their position. The value of the first note could be a breve or a long. In the former case the term *proprietas*, in the latter *improprietas*, was applied. If the second note was lower than the first, *proprietas* was indicated by a vertical line



(cauda) downward on the left side of the first note, ; if the second note was higher, the *cauda* was wanting, . In both cases the first note is breve. *Improprietas* was indicated by adding the *cauda* to the first note if the second was higher, and omitting it if the second was lower, , . Here both first notes are longs.

Out of this system of notation our modern system of notation has been gradually evolved. Consult: H. Müller, *Eine Abhandlung über Mensuralmusik* (Leipzig, 1886); J. Wolf, *Geschichte der Mensuralnotation von 1250–1460* (ib., 1904); H. Bellermann, *Die Mensuralnoten und Taktzeichen des 15. und 16. Jahrhunderts* (Berlin, 1906); H. Riemann, *Kompendium der Notenschriftkunde* (Ratisbon, 1910); J. Wolf, *Handbuch der Notationskunde* (Leipzig, 1913).

MENSURA'TION (Lat. *mensuratio*, from *mensurare*, to *measure*, from *mensura*, measure, from *metiri*, to measure). A branch of applied mathematics dealing with the calculation of lines, angles, surfaces, and volumes from measured data. The metrical relations between lines and angles are computed chiefly by the principles of trigonometry (q.v.). The mensuration of common surfaces and volumes, however, can generally be effected by the principles of geometry. For the purposes of either direct measurement or computation a unit is necessary. The straight line is measured by direct comparisons with some linear unit, as the inch, foot, yard, or meter. But in measuring a surface or volume it is unnecessary to apply an actual square or cubic unit, or even to divide the magnitudes into such squares or cubes. It is only necessary to measure certain of its boundary lines or *dimensions* and from these measurements to calculate the contents in terms of the appropriate unit, e.g., if a inches and b inches are the lengths of the adjacent sides of a rectangle, its area is $a \cdot b \cdot 1$ square inch $= ab$ square inches; i.e., the number of square units of area in a rectangle is equal to the product of two numbers which rep-

resent its base and altitude, measured by the same linear unit. The areas of other figures are found from this area by the aid of certain relations or properties of those figures; e.g., the area of a parallelogram is the same as the area of a rectangle having the same base and altitude, and is therefore equal to the base multiplied by the altitude. As a triangle is half of a parallelogram of the same base and the same altitude, its area is one-half the product of its base and altitude. Certain quadrilaterals and polygons are measured by dividing them into triangles, the area of each of which is separately calculated. (For the area of the circle, see CIRCLE.) By reasoning similar to that employed in the case of areas, it is shown that the volume of a rectangular parallelepiped or prism is found by multiplying together the length, breadth, and thickness; and of the oblique parallelepiped, prism, or cylinder, by multiplying the area of the base by the height.

As in case of the circle, so in the mensuration of the cylinder, cone, and sphere, the theory of limits (see LIMITS, THEORY OF) is applied in connection with the circumscribed and inscribed figures. The following formulas of mensuration will be found convenient:

Abbreviations: b, base; h, altitude; r, radius; a, area; c, circumference; p, perimeter; s, slant height; v, volume; m, mid section; α, the number of radians in an angle.

Parallelogram	$a = bh.$
Triangle	$a = \frac{1}{2}bh.$
Trapezoid	$a = \frac{1}{2}(b + b')h.$
Parallelepiped	$v = bh.$
Prism	$v = bh.$
Lateral area, right prism	$a = ph.$
Prismatoid	$v = \frac{1}{6}h(b + b' + 4m).$
Pyramid	$v = \frac{1}{3}bh.$
Lateral area, regular pyramid	$a = \frac{1}{2}ps.$
Frustum of pyramid	$v = \frac{1}{3}h(b + b' + \sqrt{bb'}).$
Lateral area, frustum of regular pyramid	$a = \frac{1}{2}(p + p')s.$
Right circular cylinder	$v = bh = \pi r^2 h.$
Lateral area	$a = ch = 2\pi rh.$
Right circular cone	$v = \frac{1}{3}bh = \frac{1}{3}\pi r^2 h.$
Lateral area	$a = \frac{1}{2}cs = \pi rs.$
Frustum of right circular cone	$v = \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2).$
Sphere	$v = \frac{4}{3}\pi r^3, \quad a = 4\pi r^2.$
Lune	$a = 2\alpha r^2.$
Spherical polygon	$a = \alpha r^2.$
Zone	$a = 2\pi rh.$
Spherical segment	$v = \frac{1}{6}\pi h[3(r_1^2 + r_2^2) + h^2].$
Spherical sector	$v = \frac{2}{3}\pi r^2 \quad h = \frac{1}{8}\ br.$
Circle	$c = 2\pi r, \quad a = \pi r^2, \quad arc = \alpha \cdot r.$

For the mensuration of geometric solids, consult Holzmüller, *Elemente der Stereometrie* (2 vols., Leipzig, 1900).

MENT. See MONT.

MENTAL CONSTITUTION. A somewhat popular term, used with a meaning analogous to "bodily constitution," "physical constitution," and the like, to denote the general make-up of individual minds. Language is rich in words for individual differences of ability, temperament, character, and general organization. For example, men are able or inefficient, talented or stupid, sympathetic or cold, emotional or phlegmatic, rash or cautious, steady or unreliable; they are weak-willed and strong-willed, broad-minded and narrow-minded, slow and quick. Differences of this kind, manifested in learning, acting, thinking, are referred to, loosely, as differences in mental constitution. Their analysis and classification are undertaken by individual psychology. (See INDIVIDUAL PSYCHOLOGY; MENTAL TESTS.) They are to be explained in terms of inherited and acquired tendencies or predispositions in the nervous system. See DETERMINING TENDENCY; DISPOSITION; HABIT.

MENTAL DEFECTIVES. Definition. The mentally deficient person is one who by reason of anatomical or pathological conditions occurring in the brain at or before birth is unable to compete successfully with his normal fellows in play, study, or work. Though an adult, he cannot gain a livelihood independently, but requires guidance and some one to take the initiative and assume responsibility. These persons are spoken of as *aments*, i.e., without mind, as distinguished from *dements*, who had minds but lost them.

Classification. A person having almost a normal mind, but not knowing more than a child of 12 years, is called a *moron*, from the Greek *μωρός*, a "fool"; one having the mind of a child of seven to 12 years is *feeble-minded;* one with the mentality of three to seven years is an *imbecile;* and the individual who remains at the state of development of two years is an *idiot.*

A normal child at two years of age will repeat rhymes, distinguish colors, obey simple commands, and imitate the acts of others. At seven years of age a child will count up to 20, knows the names of coins in common use, can tell time correctly, and can make readable copy of simple sentences. At 12 years of age the child can construct sentences containing three given words, can give rhymes rapidly to suggested words, and can define such words as "charity," "justice," and "goodness." The moron is likely to be nearly normal in feature, in expression, and in physical development. The defectiveness may not appear until it is found that he does not keep to a piece of work or study, or does not show normal resistance to unwise advice or immoral example. Such persons have little power of inhibition, but are like an engine without a balance wheel or governor. They are very subject to their environment. This is the group that becomes a large factor in the problems of criminality, truantism, pauperism, and prostitution. The feeble-minded person does not easily pass for normal; he is likely to be under normal size, have a head of peculiar shape, e.g., boat-shaped (scaphoid), or very round like a turned post, or high like a tower (oxycephalic). There is frequently asymmetry of the skull and face. The eyes may be of different colors and strabismus or other errors of action exist. The ears are often large and of unequal size, and may exhibit a Darwinian tubercle suggesting a lower animal. The palate is in many cases very high, easily earning the name "Gothic arch."

The imbecile is still farther from normal in appearance. He has little activity of the senses

and accordingly is without facial expression; the muscles of his face, like the others of his body, are flabby and without tone. His palate may be high and his teeth very irregular and subject to early decay. A normal head is 22 inches in circumference, but that of the imbecile, besides being very asymmetrical, may be microcephalic, very small; or hydrocephalic, very large; the imbecile is careless about his clothing, though he may be able to put it on.

The idiot is the lowest of the group. He may have no more stigmata than the imbecile, but is usually a more helpless-looking object. He is likely to be paralyzed and is often an epileptic. His mentality is so meagre that he cannot protect himself from harm and injury. His "mind is a negation." He must be clothed and fed by others, often requiring as much attention as an infant.

To this general classification must be added three other varieties: the *cretin*, *Mongolian idiot*, and the *amaurotic family idiot*. The cretin is a short, thickset little individual 3 or 4 feet high, having heavy features, broad nose, thick lips and tongue, thick, dry skin, and coarse, wiry hair. Upon the shoulders above the collar bone are pads of fat. The limbs and so-called long bones are very short. The hands are short and pudgy. The development of puberty is delayed, if indeed he reach that stage at all. Cretins are usually happy folks and capable of some instruction. The cause in these cases has been traced to absence of the thyroid gland, leading to perverted metabolism. The trouble may be overcome by administering thyroid-gland extract by mouth.

The Mongolian idiot is so called because he has an Oriental cast of countenance, due to obliquity of the eye slit. The eyes seem to be a bit on the bias. There is no asymmetry of the skull, but a round head with regular features. An idiot of this sort is usually the last born in a family and the only one mentally defective. As is well known, there are many families in which all the members are defective, but they belong to the feeble-minded or imbecile groups.

The amaurotic idiot is blind from degeneration of the optic nerve. Amaurosis in Latin and Greek means "to darken." Examination with the ophthalmoscope reveals a cherry-red spot in the fovea centralis of the macula lutea, which has now become not a yellow spot, but a white spot. The cherry spot is pathognomonic of this disease. There is a gradual lessening of strength until the child can no longer sit up and soon becomes wholly paralyzed. This is due to degeneration of the ganglion cells throughout the gray matter of the brain and cord. The disease is first discovered by the parents at about six months of age and progresses to a fatal termination in about a year. It is a singular fact that all cases reported thus far have been of Jewish parentage. Frequently there are two or more affected in the same family. There is neither cure nor likelihood of betterment.

Prevalence. Data collected in studying 10,000 school children in California, the same number in New Jersey and in Philadelphia, showed about 3 per cent to be feeble-minded. The British Royal Commission, in a study of a population of 3,873,151, found aments at the rate of 3.28 per thousand, i.e., one mental defective to 248 persons. Four aments per thousand is a very conservative estimate and will enable one to calculate the number in any community at any time. For example, in 1915 the United States population of 100,000,000 would contain 400,000 mental defectives. It is interesting to note that the insane, i.e., those who had minds and lost them, aggregate the same as the mentally deficient. Fifty per cent of the youths in reformatories are mentally defective, and 25 to 50 per cent of adult prisoners are the same. The Commission for the Investigation of the White Slave Traffic, so called, found more than half the number of prostitutes feeble-minded. Truants and paupers are largely feeble-minded, 80 per cent and 50 per cent respectively.

Cause. Mental deficiency is attributed to heredity, accidents at birth or in early life; to diseases such as meningitis, convulsions, and fevers; to traumatism; to the fact that the parents were alcoholic, tuberculous, syphilitic, or neurotic. Many of these conditions are concomitant, but proofs of cause and effect are wanting. There are multitudes of alcoholic parents without feeble-minded children; 66 per cent of the defectives come from alcoholic families most of which are physically and financially poor. Goddard studied thoroughly the family history of 300 cases and found that 54 per cent of them were undoubtedly hereditary. His studies showed many interesting alleged causes, and only 2.6 per cent unaccounted for. In former years only 25 per cent of patients having cerebrospinal meningitis recovered, and of these 97 per cent were mentally defective. Now that we have the serum treatment for meningitis this factor should be eliminated. Atwood found that 20 per cent of 200 defectives gave a positive Wassermann reaction, yet syphilis cannot be claimed as the sole cause of their condition.

Mendelian laws hold good in the heredity of man as elsewhere in nature, and according to Goddard the real cause of mental defect "is bad protoplasm." Tredgold holds that "primary amentia is a manifestation of a pathological germinal variation which has been produced by environment, and that the germinal change is of the nature of a vitiation." Consanguinity is not a causative factor in healthy families, nor in others unless they be neurotic. The hereditary character of the condition is recognized by individual students everywhere and also by the British Royal Commission as a body. The lawmakers and public officers of most countries have in recent years been giving careful consideration to the treatment of these unfortunate persons.

Segregation. All mentally defective children should be placed out of the family while young; first, because they cannot associate on equal terms with the normal members; secondly, because they require expert teaching and oversight to improve their condition. This may be done by the wealthy in private training schools, and should be insisted upon for others in public institutions. Only 24 States of the United States (1914) have institutions fit for the care of the mentally deficient. Although there are 30 such places, they can accommodate only 19,000 persons. Older persons should be in institutions in order that they may be under responsible direction and enabled to take part in useful work —at all events to be safe from bad moral influences and temptations if they be of high-grade mentality. It is the high-grade defectives that are a menace to society, especially the females, who so readily become mothers. At the New

York State Reformatory for Women a study was made of 2000 prostitutes, with the result that 29 per cent were decided to be subnormal. New York State also has an institution especially for women during the child-bearing age.

In connection with this phase of the subject there has been much discussion regarding asexualization. While all students are in favor of segregation, accommodations do not exist for one in twenty of those who need it. Sterilization as now performed is simply vasectomy in the male and ligation of the Fallopian tubes in the female. There being no removal of the glands peculiar to either sex, the individual retains general characteristics but loses the power to reproduce. Laws have been passed in several States legalizing the operation, but it has not become a popular procedure. Some idea of the expense to the public of feeble-minded families may be had by reading *The Jukes*, by Dugdale, or *The Kallikak Family*, by Goddard. The cost to the State for the care of criminals, paupers, and incompetent persons because of mental deficiency is counted literally in millions of dollars.

Instruction. Various attempts have been made to teach idiots, one of the earliest being that of Itard's wild boy found in the forest of Aveyron in 1799. The boy's ignorance was largely due to deprivation, so that some slight success was attained in the attempt to improve his condition. One of Itard's pupils was Edouard Seguin. In 1837 Seguin began to instruct idiots in the Hospital for Incurables in Paris. He regarded the idiot as an undeveloped infant and, proceeding upon a definite plan, instituted a course of physiological education. He insisted upon the value of food, air, and exercise, i.e., the need of a healthy body for a useful mind, and began then to train the senses. He visited America several times and made his home here from 1863, when he established in New York the Seguin Physiological School for Feeble-Minded Children. Before the Academy of Sciences in Paris it was declared that Seguin had solved the problem of the education of idiots. Not only are there special institutions, public and private, for the defectives, but special classes are formed in connection with the schools of most large cities. Such classes existed in Halle about 1863 and in Dresden in 1867. New York City had in 1914 200 ungraded classes with 3100 children.

In teaching the mentally defective, the games and exercises are designed especially to fix the attention and promote coördination. Music appeals to the feeble mind, and the children learn to march and play to the accompaniment of piano or other instrument. Reading, writing, and number work may be learned by the higher grade pupils, yet they always show a certain amount of childishness in composition. The exact degree of intelligence is standardized by various methods, notably the Binet test. (See MENTAL TESTS.) The boys are taught mat-making, weaving, basket making, shoe mending, tinsmithing, carpentering, gardening, and farming. The girls are taught the care of the house or wards, sweeping, dusting, making beds, setting table, and being useful in the kitchen. They learn to sew and do fancywork, the fineness of which depends upon their mentality. Farm colonies are operated by several States with great benefit to the inmates, both in body and mind. A feeble-minded person rarely grows much beyond the mental age that he stands the test for; therefore he should be given all the training possible in order that he may not drift below his station.

Treatment. There is no remedy for the majority. Cretins may be practically cured if the condition is recognized before they are six months of age and thyroid extract is given systematically. In 1890 and the following years craniectomy was practiced extensively in the hope that removing strips of bone would allow the brain more room for growth. The procedure was a failure. Drainage of hydrocephalus by either the external or the internal method has not helped conspicuously. The mentally defective may have diseases of the body which indirectly impair their minds. Such must be treated, especially if the infirmity is of the nervous system.

Results. The investigation of Dr. Caldecot indicates the result of training in 341 patients discharged from the institution because they were supposed to be suited to life outside. The time covered was 15 years. He says "3.25 per cent were earning wages, 3.81 per cent were at home very useful. 7.5 per cent were at home and useful, and the rest, i.e., 85.5 per cent, were no good and should have been taken care of for life."

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MENTAL HEALING. See FAITH CURE; HYPNOTISM; MESMERISM; PSYCHOTHERAPEUTICS; SUGGESTION.

MENTALITY OF INSECTS. See section on *Social Insects* under INSECT; also INSTINCT.

MENTAL PATHOL'OGY. The science of abnormal mental process. The intimate dependence of consciousness upon the functioning of the central nervous system enables us to approach the investigation of morbid mental conditions from the vantage ground of physiology. The brain, which is the substrate of mind, may, like any other organ of the body, exhibit (1) defects, i.e., lack of some structure, or (2) abnormality of function, whether it be (*a*) temporary, i.e., a disorder, or (*b*) permanent, i.e., a disease. "Defectives" are, then, persons who suffer, congenitally or from early childhood, from the absence of some group or groups of mental elements in consequence of some underlying defect of the nervous system; they are the blind, the deaf, the paralytic, etc. The cases of Laura Bridgman and Helen Keller, the blind deaf-mutes, are typical. From careful reports of their educational progress and from special psychological and neurological examination of their mental and physiological organization valuable data have been secured. Temporary mental derangements are found in the consciousness of dreams, hypnosis, and the intoxication of various drugs. Frequent attempts have been made to examine mind as specific phases of it are rendered anæsthetic or hyperæsthetic in these ways. Hashish (extract of *Cannabis indica*), e.g., greatly mag-

nifies our consciousness of duration and extent, and also induces visual hallucination. Chronic mental derangement is exemplified by the various forms of insanity, such as mania, melancholia, dementia, general paresis, etc.

Abnormal mental types are, as one writer puts it, "psychological experiments made for us by Nature herself." Especially is this true when the infirmity is isolated, when a single group of mental processes—e.g., a sense department—is either entirely lacking or extraordinarily emphasized. Such a state of affairs simplifies matters for the psychologist. He is able to find out the relative value of the group concerned in the normally organized mind, and, as a consequence, to proceed more successfully with the analysis of the adult human consciousness. (See PSYCHOLOGY.) Take, e.g., cases of the anæsthesia of particular internal organs which lie beyond that experimental control which is of supreme importance in the laboratory investigation of the external sense organs. Evidence of this sort has been of weight in referring the sensation of dizziness to the semicircular canals of the internal ear. (See STATIC SENSE.) From observations of senile dementia Hughlings Jackson has established the law that, in the gradual loss of memory with advancing age, the latest mental stuff, that acquired with most difficulty, first decays. The successive stages of dissolution, consequent upon the inroads of cerebral deterioration, retrace the steps of evolution. The various types of aphasia (q.v.) have been of great assistance in the solution of the problem of the cortical localization of function, as well as in the more strictly psychological problems of apperception (q.v.) and language. There are, in particular, two lines of recent work which appeal to the interest of students both of normal and of abnormal mental processes. The rapid development of mental tests (q.v.) and their application to the retarded and feeble-minded as well as to the mentally sound have led to discussion and cooperation and have raised important issues of psychophysical heredity; and the Freudian school, whose doctrines are based upon a fairly definite psychological system and whose specific method is that of psychoanalysis, has brought dreams and hysteria into the very forefront of psychological debate. It is probable that the immediate future will see a much closer *rapprochement* between psychology and mental pathology than has been realized hitherto; so that, on the one hand, mental disorders and diseases will be studied scientifically as well as handled therapeutically, and on the other hand systematic psychology will devote special chapters to a detailed consideration of typical abnormalities.

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MENTAL PROCESS. A phrase employed by modern psychology in two nearly related meanings. 1. In the first place, it is tending to replace the older static conception of mind (q.v.). Stout, e.g., defines psychology as "the positive science of mental process," in preference to speaking of it as the science of mind, and James declares that "the first fact for us as psychologists is [not that mind exists, but] that thinking of some sort goes on. . . . If we could say in English 'it thinks,' as we say 'it rains' or 'it blows,' we should be stating the fact most simply." 2. But not only is mind, as a whole, a stream of thought and feeling; each separate element of mind or mental formation that our analysis teases out of the total consciousness is itself a process. Every sensation rises, poises, falls, in its own characteristic way; even the idea, the mental thing par excellence, is termed by Wundt a "variable process," and such formations as emotion and volition bear the mark of process stamped upon them. Meaning (q.v.) and mode of connection (see FUSION; IMPULSE) are stable, but the stuff of which mind is made is essentially durative process and not stable being. Consult: *Philosophische Studien*, vols. vi, x (Leipzig, 1891, 1894); G. F. Stout, *Analytic Psychology* (London, 1896); William James, *Principles of Psychology*, vol. i (New York, 1909); E. B. Titchener, *Textbook of Psychology* (ib., 1910); *American Journal of Psychology*, vol. xxiii (Worcester, 1912).

MENTAL SCIENCE. The name given to a metaphysical system which aims to cure diseases without drugs. Its history goes back to the early Christian centuries and has sometimes been religious and sometimes philosophical. Eginhard, an intimate of Charlemagne, was the first to make recorded observations in any way analogous to modern medical cases of mental healing. In the time of Charles II and Queen Anne special powers were attributed to royalty in the laying on of hands for the healing of the sick. Parson Blumhardt emphasized the religious element in healing about a century ago, and P. P. Quimby was most conspicuous in the work in the middle of the nineteenth century in America. Since his day there has been a succession of mental healers, including the Dressers, Mary Baker Eddy (q.v.), John Alexander Dowie (q.v.), A. B. Simpson, of New York, Francis Schlatter (q.v.), Schrader, Bradley Newall, and Paul Dubois, professor of psychotherapy in the University of Bern, Switzerland. All of them endeavored to prevent disease whenever possible. All have tried to awaken in the individual the inherent but latent forces of health through the medium of literature, lecture courses, heterosuggestion and autosuggestion. Most of them encouraged the formation of reading circles and other social expedients for keeping the mind fixed on the subject of good health.

In the last half century there has been a differentiation of the groups of Mental Science healers, with the result that there are to-day Christian Scientists, adherents of New Thought, and other groups. The Christian Scientists, while in general holding to the Mental Science idea, have developed a metaphysics of their own based on the concept that matter has no real existence, and have turned the small circles of the older days of Christian Science into organized churches throughout the United States with special responsibility to the Mother Church in Boston. The New Thought group do not deny the reality of matter

and have not developed large circles of adherents, but follow in the main the teachings of men like Horatio W. Dresser, Stanton Davis Kirkham, Henry Wood, Ralph Waldo Trine, and Thomas Troward. Such men as Paul Dubois, who have perceptibly influenced the practice of medicine, have as their metaphysics some form of materialism rather than idealism, and emphasize what Dubois calls persuasion rather than suggestion. Those who regard themselves as Mental Scientists are largely individualists and have no general organization. They agree in looking upon all schemes of cure as mere expedients. They insist that man lives in a physical phase of consciousness rather than in a physical world, and that to rise out of this consciousness to what the New Thought group and Christian Scientists call a spiritual conception would involve the break-up of their conception of life and being. They urge that each individual must in a final analysis think for himself, and be content to be what he thinks he is because he thinks he is. Mental Science, therefore, while often materialistic is also individualistic, and it is in consequence impossible to determine the number of its adherents. See CHRISTIAN SCIENCE; FAITH CURE; HYPNOTISM; MESMERISM; NEW THOUGHT; PSYCHOTHERAPY; SUGGESTION.

MENTAL TESTS. Procedures whose purpose is the determination, in an individual, of the presence or absence of a particular mental content, or of the degree of a particular mental function or capacity. The term is also employed, somewhat loosely, in cases where the function upon which the procedure is directed is itself imperfectly known, or is measured only indirectly, or is (so far as we know) rather a psychophysical than a strictly mental function. We speak, e.g., of "tests" of color-blindness, of pitch discrimination, of intelligence, and of fatigue. (See these titles.) Less formally, mental tests are characterized by simplicity of technique, relatively short duration, and emphasis upon quantitative determination rather than upon qualitative analysis and direct description. They are usually, moreover, standardized procedures, applied to a number of individuals for the purpose of measuring the variation within groups, or to a single individual because of a practical interest in that person. Mental tests accordingly furnish data primarily for individual psychology (q.v.) or for applied psychology (see PSYCHOLOGY, APPLIED), and contribute only indirectly to the general science of psychology.

As early as 1877 Francis Galton suggested the use of the reaction experiment for the diagnosis of temperament. In connection with anthropological measurements of weight, height, eye color, and the like, he further developed a number of simple tests which he hoped would make it possible to "obtain a general knowledge of the capacities of a man by sinking shafts, as it were, at a few critical points."

In the early nineties of the past century mental tests came into prominence in America. Here interest centred in the question of the relation of mental to physical variations, in the determination of the range and the types of mental variation as a methodological prerequisite of general psychology, and in the problems of class and child psychology. For the most part the tests resembled experiments already employed by psychology in the investigation of the simpler mental processes. Experiments were chosen whose results could be quantitatively expressed, and which seemed likely to exhibit wide or practically significant differences; their technique was so simplified as to make practicable their application to large numbers of individuals. In Germany, a few years later, tests of a similar character were developed; the principal interest in this case was the diagnosis of insanity and the analysis of the abnormal mind. At about the same time, in France, interest in individual psychology led to the formation of tests of a somewhat different kind. In particular, Alfred Binet and his followers were of the opinion that the more specific functions (such as ability to discriminate tones or colors or to judge time intervals) not only varied less widely among individuals, but also were of less importance in the constitution of individuality, than the more general or higher functions, such as imagination, comprehension, intelligence, suggestibility, and sentiment. Here, then, since methods of investigation had not yet been devised, adaptation of already existing procedures was impossible, and the invention of new tests was a preliminary to further work.

The inventor of such a test necessarily starts with a conception (derived from theoretical or common-sense psychology) of the function to be tested, and proceeds to lay down a procedure to suit this conception. Intelligence, e.g., has been conceived as essentially an ability to combine impressions into a unified and related whole; and the test of intelligence then takes the form of filling in the gaps of a mutilated text. Tests of this sort, however, unlike the adapted tests, hardly ever measure the supposed function directly; they are merely diagnostic, or expressive of the degree of the given function; and, however valuable they may be for practical purposes, they contribute little to scientific knowledge. The single test, moreover, is inexact in that it almost certainly involves other functions than that upon which it is directed. The result of a selected series of tests, all intended to reflect a single function, is likely to give a truer measurement, and it is upon such series that the practice of the present time chiefly depends. Probably the most famous series of tests yet devised is the Binet-Simon series of graded tests. The primary purpose of these tests is the practical determination of the degree of intelligence of a child and his consequent classification as normal (i.e., as having an intelligence equal to that of the average child of his age), subnormal, or supernormal. The Binet-Simon series of 1908 comprises 56 single tests, a group of which is assigned to each age from three to twelve. A certain minimum of performance in every test constitutes a "pass"; and the subject is graded on the basis of number of tests passed, as having a degree of intelligence normal to such-and-such a year. A subject whose rank places him three years behind the normal for his age is considered mentally defective. The tests themselves are in reality simple tasks, so chosen that so far as possible their performance cannot be materially affected by formal coaching or school training. A normally intelligent three-year-old child, e.g., is required to repeat correctly after the experimenter three digits, to repeat a simple sentence containing six syllables, to tell his family name, etc.; a child of nine, to tell the day of the month, to give the days of the week in order in 10 seconds, to make change (returning 21

cents from a quarter dollar), and the like. Beside success and failure, however, peculiarities of performance in many of the tests are considered diagnostic, so that entirely satisfactory administration of the tests and the drawing of reliable conclusions therefrom seem to demand a very careful and practiced experimenter. Binet's insight into the nature of the child's mind and his ingenuity in devising not only the general scheme of the test series but also the details of method are amply attested by the fact that the series still remains essentially as he left it in 1908 in spite of severe practical trials in nearly every civilized country. Criticism has resulted, for the most part, only in modification and extension of the series.

It has been pointed out that tests which shall permit of more accurate quantitative results than are furnished by statements of mere success or failure, and also that more specific qualitative tests, are desirable; and series possessing these advantages are at present in process of development. A further recent tendency is towards the development of tests which shall determine the fitness of individuals to enter various trades or careers.

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MENTANA, mĕn-tä'nȧ. A village in Italy, 13 miles northeast of Rome, with 2379 inhabitants in 1911. It is noted as the place where, on Nov. 3, 1867, Garibaldi was defeated by papal and French troops while attempting to seize Rome and thus complete the unity of Italy. On Nov. 25, 1877, a monument was erected in honor of the adherents of Garibaldi, who was taken prisoner in this battle. See GARIBALDI.

MENTCHIKOV, ALEXANDER DANILOVITCH. See MENSHIKOV, A. D.

MEN'TEL (or MENTELIN), JOHANNES (c.1410–78). A German printer of the fifteenth century, the first to establish a press at Strassburg. To him the invention of printing was once attributed by many. The erroneous character of such an assertion was very clearly demonstrated by Von der Linde in the results of his investigation of the early history of printing in his *Gutenberg* (Stuttgart, 1878).

MEN'TER, SOPHIE (1848–1918). A German pianist, born at Munich, in which city she subsequently studied under Schönchen, Lebert, and Niest, making her début in 1863. She met with extraordinary success, particularly at Frankfort, where, in 1867, Tausig (q.v.) secured her as a pupil. Two years later she won the good will of Liszt, who became one of her stanchest friends. She made many tours and had many famous pupils, and finally retired to her home, Castle Itter, in the Tirol. Meanwhile she had become known as a remarkable virtuoso, and besides her appointments as court pianist to the Prince of Hohenzollern and the Emperor of Austria, she served for a time on the faculty of the St. Petersburg Conservatory. In 1872 she married the cellist Popper, from whom she was subsequently divorced (1886).

MENTEUR, mäN'tĕr', LE (Fr., The Liar). A comedy by Corneille (1644), modeled after Alarcón's *Verdad sospechosa*. The play is Corneille's best comedy, and the most important before the appearance of Molière.

MENTHA. See MINT.

MEN'THOL (from Lat. *mentha*, mint), or PARA-MENTHANOL (3), or PROPANOL (3), $C_{10}H_{19}OH$. A colorless crystalline substance obtained from official oil of peppermint, or from Japanese or Chinese oil of peppermint. The oil is subjected to fractional distillation, and the higher-boiling fractions are allowed to crystallize, the product being purified by recrystallization. It has the odor of peppermint and produces in the mouth a sensation of cold. It is but sparingly soluble in water, but dissolves in considerable quantities in alcohol, ether, chloroform, and other organic liquids. It is often used, especially in solution in oleic acid, as a remedy for neuralgic headache. In a solution of ten parts of alcohol to one of menthol, or in the solid form of a pencil it usually gives immediate, though not always complete, relief, when applied to the seat of pain. It has also been used to relieve itching and in asthma. Internally it has been used in small doses to relieve nausea. Finally, it is used in perfumery. Menthol melts at 43° C. (109.4° F.) and boils at 211–213° C. (412–415° F.). When dissolved in four times its weight of alcohol, in a tube 1 decimeter long, it turns the plane of polarized light 49.3° to the left per gram per cubic centimeter of solution.

The ordinary menthol just described has also been obtained synthetically. But synthesis has also produced three other varieties of menthol, having the same ultimate composition as natural menthol and differing from it only in the position occupied in the molecule by the OH group. These varieties, or "isomers," of menthol are known as *carvomenthol*, *tertiary menthol*, and *tertiary carvomenthol*.

MENTONE, mĕn-tō'nȧ, Fr. **MENTON,** mäN'-tôN'. A seaport town in the Department of Alpes-Maritimes, France, on the Mediterranean, 19 miles east-northeast of Nice (Map: France, S., M 5). It is situated on the Golfe de la Paix, which here breaks into two small bays. On the north is a sheltering range of lofty mountains, the lower slopes of which are covered with orange, lemon, and olive groves, and dotted with picturesque villas and gardens. The inclosed situation of the town, dry and equable climate, and other natural advantages make Mentone one of the most popular of invalid resorts on the Riviera. The town built along the shore as a resort is modern, while the old portion retains a mediæval aspect, with narrow, winding streets; the newer portion is regularly laid out and clean. The prominent buildings are the churches of St. Michel (seventeenth century) and of the Conception; the hôtel de ville has an interesting museum of prehistoric relics. On the west coast of the bay near Cap Martin is the villa of the former Empress Eugénie. Mentone has a number of fine boulevards, the Promenade du Midi skirting the bay, and several public gardens. The chief point of interest, however, is in certain grottoes near by, in Italian territory, where Rivière discovered relics of ancient human occupation. In one of these caves, now known as the

"Grotte des Enfants" two skeletons were found at great depth to which the name "Grimaldi" man has been given (see MAN, SCIENCE OF). Mentone's harbor accommodates vessels of 26 feet draft. Mentone produces annually 45,000,000 lemons, also figs, olives, and perfumes, and has an extensive trade in fruit and olive oil. Pop. (commune), 1911, 18,001. After belonging for 500 years to Monaco, the town revolted in 1848 and attached itself to Sardinia. With the cession of Nice to France in 1861 Mentone came under French rule, the Prince of Monaco ceding his rights to France for 4,000,000 francs. Consult *Bulletins de la Société d'Anthropologie de Paris*, series 4, vol. ix (Paris, 1898), and Mortillet, *Le préhistorique* (ib., 1900).

MEN'TOR (Lat., from Gk. Μέντωρ). The son of Alcimus of Ithaca, the trusted friend of Ulysses, who, on setting out for Troy, left to him the charge of his household and the education of Telemachus. His name has become proverbial for a wise guide and counselor; as such he figures especially in Fénelon's *Télémaque*.

MENTU. See MONT.

MENU VON MINUTOLI, HEINRICH, BARON. See MINUTOLI, HEINRICH, BARON MENU VON.

MENYANTHES, mĕn'ĭ-ăn'thēz. A genus of plants. See BUCK BEAN; Plate of BRAZIL NUT.

MENZALEH, mĕn-zä'le, LAKE. A lagoon on the northeast coast of Egypt, extending from the Damietta branch of the Nile to the Suez Canal, and separated from the Mediterranean by narrow sand bars (Map: Egypt, F 1). It is 30 miles in length by about 20 miles in average breadth, is very shallow, and studded with low islands, on one of which are the remains of the ancient city of Tennesus. The lagoon has valuable fisheries, besides producing much salt.

MENZEL, mĕn'tsel, ADOLF VON (1815–1905). A German historical and genre painter, one of the foremost of the nineteenth century; also an important illustrator and lithographer. He was born at Breslau, Dec. 8, 1815, and as a lad assisted his father, a lithographer, in his work. The family removed to Berlin in 1830, and in the summer of 1833 Menzel attended the Academy schools, but soon relinquished as unprofitable the ordinary routine of training, and may truly be called self-taught. His father's death in 1832 threw the support of the family upon his shoulders and he worked hard at lithographic commissions. In 1833 he executed for the publisher Sachse "The Artist's Earthly Pilgrimage," a series of 10 drawings in pen and ink illustrating Goethe's poem, "Künstler's Erdenwallen," which attracted immediate attention. The real beginning of Menzel's triumphs was the year 1839, when he began the illustration of Kugler's *History of Frederick the Great*, a task occupying three years. These 400 designs, drawn in pencil on wood and reproduced in facsimile, brought him royal and popular favor and gave a new impetus to the art of wood engraving in Germany. This work was followed by a commission for King Frederick William IV for 200 illustrations of the edition de luxe of Frederick the Great's *Works* (1843–49), intended as a royal present to German and other notables (new ed., 2 vols., Berlin, 1886). He designed also many vignettes and other illustrations, and he invented new methods in lithography and gouache. Menzel began to paint at the age of 20, without formal instruction.

Of his paintings the best known are the episodes from the history of the great Prussian monarch. The historical fidelity, clever characterization, droll humor, and sound naturalism displayed in these compositions, combined with his thorough mastery of technique, rank Menzel as one of the dominant painters of Germany during the nineteenth century. He was, moreover, the first German painter to become imbued with the spirit of modern realism, of which he was the earliest pioneer. But as none ventured to follow him he exercised but little influence on the development of German art. He appears as the painter-historian of the modern Hohenzollern in another series, of which the "Coronation of King William I at Königsberg," in the Royal Palace, Berlin, and "Departure of the King for the Seat of War in 1870" (1871), in the National Gallery, Berlin, are the most conspicuous examples. Among a great variety of genre pictures the "Modern Cyclops" (1875, National Gallery, Berlin), representing the interior of a rolling mill in Silesia, is a sterling piece of realistic characterization and of masterly light effects. Remarkable for this latter quality, as well as for its keen satire, is "The Ball Supper" (1879), and a later noteworthy example is the "Ash Wednesday Morning" (1885), in the National Gallery, Berlin. Besides receiving various other honors, Menzel was made a Privy Councilor in 1895, and received the Order of the Black Eagle, conferring hereditary nobility, in 1898. He died in Berlin Feb. 9, 1905.

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MENZEL, WOLFGANG (1798–1873). A German historian and critic, born at Waldenburg, Silesia. He studied at Jena and Bonn, became an ardent disciple of Jahn (q.v.) and the Turner movement, taught (1820–24) at Aarau, in Switzerland, and from 1825 lived as a man of letters at Stuttgart, where he edited the *Litteraturblatt* (1826–48; again in 1852). From 1830 to 1838 he belonged to the Württemberg Diet. Unsuccessful in politics, he gave himself up to literature, assailed Goethe, and was himself mercilessly attacked by Heine and others. His popular *Geschichte der Deutschen* came out in 1824–25; *Die Geschichte Europas 1789–1814*, in 1853. His strongly monarchical tendencies develop in other histories. He wrote the dramatic fairy tales *Rübezahl* (1829) and *Narcissus* (1830), and an historical novel, *Furore* (1851). *Die deutsche Dichtung von der ältesten bis auf die neueste Zeit* (Stuttgart, 1858–59; 2d ed., 1875) is worthy of mention. His *Deutsche Litteratur* (1828) can be studied in *Specimens of Foreign Literature* (Boston, 1840). Consult also his autobiographical *Denkwürdigkeiten* (Bielefeld, 1876) and R. M. Meyer in *Gestalten und Probleme* (Berlin, 1905).

MENZELINSK, mĕn'tsĕl-ĭnsk'. A town of east Russia in the Government of Ufa, situated on a branch of the Kama, 125 miles northwest of Ufa (Map: Russia, H 3). Important fairs

are held here annually, in which miscellaneous goods are sold approximating the value of $2,000,000. Pop., 1897, 7542; 1910, 8573.

MENZIES, mĕn'zĭz *or* mĕn'yĭz, ALLAN (1845–1916). A Scottish theologian, born in Edinburgh and educated at the universities of Edinburgh and St. Andrews. In 1873 he became minister of Abernyte, Perth, and in 1889 was chosen professor of divinity and biblical criticism in St. Mary's College, St. Andrews. Dr. Menzies, who had studied in Germany, translated into English Baur's *Paul* (1873–75) and *Church History of the First Three Centuries* (1878–79) and Pfleiderer's *Philosophy of Religion* (1886–88). He edited the supplementary series *Ante-Nicene Fathers* (10 vols., 1886–96) and wrote: *National Religion* (1888); *History of Religion* (1895); *The Earliest Gospel* (1901), a study of St. Mark; *Second Corinthians* (1912).

MEPH'ISTOPH'ELES (formerly also *Mephostophilus, Mephostophilis;* of uncertain derivation, perhaps from Gk. *μή, mē,* not + *φῶς, phōs,* light + *φίλος, philos,* loving). A term which appears first in the German *Faustbuch* (1587) as the name of the devil who tempts Faust. The name is perpetuated in Marlowe's play, *Dr. Faustus.* In Goethe's *Faust* he is developed into the scoffing "spirit that denies." The figure comes from the mediæval demonology, but the particular origin or meaning is now lost.

MEP'PEL. A town in the Province of Orenthe, Netherlands, situated on the Meppeler Diep, 16 miles northeast of Zwolle (Map: Netherlands, E 2). It is an important centre for butter, eggs, cattle, and hogs, has calico and canvas manufactures and shipbuilding yards. Pop., 1900, 10,154; 1910, 11,000.

MEQUINEZ, mĕk'ĭ-nĕz, or **MEK'NEZ.** A noted town of Morocco, Africa, situated in a mountainous region 37 miles southwest of Fez (Map: Africa, D 1). It is still one of the finest cities of Morocco, although it has greatly declined since the eighteenth century, when it had attained unusual magnificence under the Sultan Muley Ismail. It is inclosed by a wall, pierced by nine gates, some of which are remarkable for their Moorish tile decorations. It is surrounded by extensive olive groves and has a fine mosque, which is visited by pilgrims, and a palace of the Sultan. It is of little commercial or industrial importance, its chief manufactures being earthenware and leather goods. The population is estimated at from 25,000 to 50,000.

MERAN, mā-rän'. A famous health resort in Tirol, Austria, 1045 feet above the sea, situated on the Passer, about 40 miles south-southwest of Innsbruck (Map: Austria, B 3). It lies at the foot of the Küchelberg and is noted for its salubrious and moderate climate. The vicinity abounds in picturesque old castles, châteaux, and villas, and fine promenades extend along both banks of the Passer. The principal street, Unter den Lauben, flanked with arcades, contains the fifteenth-century burg—the residence (till 1490) of the counts of Tirol and now in its restored condition serving as a museum. The season lasts from the beginning of fall to the end of spring, and the annual number of patients exceeds 10,000. Meran is provided with several churches, schools, a municipal museum, and a theatre. Its institutions include a Benedictine's school and a boarding school for English girls. The château of Lebenberg, south of Meran, is also of no little interest. Meran is first mentioned as Mairania in 857. It manufactures furniture, breadstuffs, gold and silver ware, and does a thriving business in fruit and wine. It became a town at the end of the thirteenth century. Pop., 1900, 9284; 1910, 11,568.

MERAN, AGNES OF. See AGNES OF MERAN.

MERBECK, JOHN. See MARBECK, JOHN.

MERCADANTE, mĕr'kà-dän'tā, FRANCESCO SAVERIO (1797–1870). A celebrated Italian musician, born at Altamura. He studied the violin and the flute under Zingarelli at the Conservatory San Sebastiano at Naples, but soon turned his attention to compositions for the voice. In 1818 he produced a grand cantata, entitled *L'unione delle belli arti,* which was performed at the Teatro Fondo and which met with a very favorable reception. This led to an engagement at the Teatro San Carlo, where his first opera, *L'apoteosi d'Ercole* (1819), was well received. In 1833 he was appointed chapelmaster at the cathedral of Novara, and in 1836 his opera *I briganti* was performed in Paris with an extraordinary cast, which consisted of Rubini, Tamburino, Lablache, and Grisi. He was made director of the royal conservatory at Naples in 1840, but became totally blind in 1862. He composed about 60 operas, 20 masses, and much Church music. He died at Naples.

MERCALLI, mĕr-käl'lē, GIUSEPPE (1850–1914). An Italian geologist. He was born in Milan, entered the Roman Catholic priesthood, and taught natural science at Monzo and Domodossola and in the Milan seminary. He had liberal tendencies and was removed from his chair in Milan when he was so indiscreet as to subscribe publicly to a national monument for Rosmini-Serbati. He then became a teacher in the government's *licei*—first at Reggio di Calabria for three years, then for 23 years at Naples, where he also lectured in the university—and after 1911 was director of the Vesuvius Observatory. He was burned to death by an overturned lamp in his study on March 19, 1914. His early work in northern Italy was on glacial action. He devised a scale (called by his name) for measuring earthquake shocks. More important were his vulcanological studies, first at Etna and then at Vesuvius; his "Notizie Vesuviane" appeared in the *Bolletino* of the Società Sismologica Italiana (1892–1906). His book *I vulcani attivi della terra* (1907) is one of the most valuable general works on volcanoes.

MER'CANTILE AGENCY. "An institution which, for a subscription price, agrees to collect information as to the financial condition and responsibility of business men and to transmit the same to its subscribers." At times it also undertakes the collection of debts for its customers. It originated in the United States, during the period of depression following the panic of 1837, and its avowed object was to uphold, extend, and render safe and profitable to all concerned the great credit system which had grown up with the increase of commerce. The first mercantile agency was established in New York during the year 1841 by Lewis Tappan and was followed the next year by a similar agency under the control of Woodward and Dusenbury.

While originally established for the purpose of answering questions about the financial standing of particular persons, the scope of the agency has been extended, until its records contain the financial ratings of nearly every business man in the country. In addition to the general agencies, such as Dun & Co. and the Bradstreet Company, there are many special agencies which

confine themselves to particular lines of trade. By the general agencies the country is divided into districts, in each of which is a managing agent with various correspondents in the several localities. If a subscriber wishes more minute or more recent information than that contained in the agency's periodical reports, he asks for and receives a special report brought down to date.

While a mercantile agency is employed by its subscribers to do certain things for them, it is not in the strict sense their agent (q.v.) in these transactions; it is rather an independent contractor. It engages to accomplish a stipulated result, but is entirely free to accomplish this in its own way and with its own instrumentalities. If, in obtaining and publishing information, it does a legal wrong to third persons, it is responsible therefor, but its employers are not. A statement made to a subscriber asking for it is generally held to be conditionally privileged, but when made to other subscribers who have no interest in the information it is not privileged. In a case of the former kind the plaintiff would be obliged, therefore, to prove actual malice, or malice in fact, to sustain an action for libel, slander, or the like on the part of the agency; but in the latter case he would not.

A subscriber who is misled to his injury by acting upon false information supplied by the agency is generally entitled to damages against it. Most agencies, however, require their patrons to agree that the agency shall not be responsible for any loss caused by the neglect of any of its servants, clerks, attorneys, or employees in procuring, collecting, and communicating information. Such agreements have been upheld by several courts. If, however, after correct information has been received by the agency, a blunder is made by its managers in printing it, the agency should be held liable, and such a decision was made by the Supreme Court of Pennsylvania. When a business man makes false statements about his financial condition to a mercantile agency, and this is communicated to a third party who acts upon it to his injury, the third party has as good cause of action in deceit (q.v.) against the business man as though the statement had been made directly to him. Consult J. W. Errant, *The Law Relating to Mercantile Agencies* (Philadelphia, 1889), and Reinhard, *A Treatise on the Law of Agency* (Indianapolis, 1902).

MERCANTILE AGENT. In the absence of a statutory definition, specifically one who acts as agent for another in important commercial transactions. It does not include a mere servant, caretaker, or a merchant's clerk or salesman, or a common carrier. The present Factors Act in England (52 and 53 Vict., c. 45, § 1) defines the term as an "agent having in the customary course of his business as such agent authority either to sell goods, or to consign goods for the purpose of sale, or to buy goods, or to raise money in the security of goods." This is the signification in which the term is most frequently used in current law literature. The rights and obligations of such an agent, both with respect to his principal, or employer, and to third parties, are governed by the general law of agency. See AGENT; FACTOR; PRINCIPAL AND AGENT.

MERCANTILE LAW. A term which at present covers a rather indefinite domain in English law. It is ordinarily applied to a group of topics more or less closely related and having this element in common—that they have originated in, or been greatly modified by, the usages and customs of merchants. The legal rules governing these various topics do not form a separate and independent branch of jurisprudence: they cannot be called a distinct and homogeneous body of law. In the leading English treatises on this subject mercantile law is viewed as comprising the law of partnership, joint-stock companies, agency, negotiable paper, contracts with carriers, insurance, sale, bottomry and respondentia, debt, guaranty, stoppage in transitu, lien, and bankruptcy.

Much of the law upon these subjects is of ancient origin, coming to us from the Roman civil law and later codes. For a discussion of this early development, see LAW MERCHANT. For the law upon the various subjects included under the term "mercantile law," such as partnership, lien, etc., see those titles.

MER'CANTILISM. The system of economic policy evolved by the European states after the decay of the feudal system. In essence it represented a transition from local and territorial to national economy. In the earlier period each town had regulated industry in the exclusive interest of its own inhabitants, treating the citizens of other towns as aliens who could trade in the town only after submitting to such restrictions as the town government chose to impose. It was the purpose of the mercantilist statesmen to break down the barriers to internal intercourse and to unite the state in a single economic organism in rivalry with other states.

The practical measures by which the mercantilist statesmen sought to attain national power were: (1) the accumulation within the state of a large amount of the precious metals; (2) the encouragement of agriculture; (3) the development of manufactures; and (4) the creation of a mercantile marine. In the writings of the exponents of mercantilist doctrine especial emphasis was devoted to the acquisition of treasure. The European states were rapidly passing from an economic order in which payments in kind prevailed to an economy based upon money transactions, and as a consequence the great importance of a sufficient stock of the precious metals occupied a large share of the attention of statesmen. In the earlier mercantile period an effort had been made to prevent the exportation of bullion altogether. Later it came to be recognized that bullion sent abroad in the way of exchange might result in an ultimate increase in the stock of bullion at home. Statesmen then concentrated their attention upon securing a favorable balance of trade. It was believed that one way of attaining this end was to encourage the exportation of finished commodities and the importation of raw materials, since in this way, it appeared, a greater value would be exported than imported.

Manufactures were encouraged because they furnished materials for commerce, helping thereby to secure the so-called favorable balance of trade. Agriculture took a subordinate position, but it was held deserving of encouragement as a source of abundance of raw material. The growth of population was desired in order to have an ample supply of cheap labor power. Cheap agricultural products and cheap labor were regarded as objects to be striven for, and herein we see a difference between mercantilism and modern protectionism, the avowed claims of

which are high prices for agricultural as well as other products and high wages for labor. In England the earlier prohibition of exportation of grain, which had been calculated to favor the consumer, was succeeded by prohibition of importation when prices fell below a certain figure, in order that tillage might be uniformly profitable. Manufactures were stimulated by high duties, or even by prohibition of imports, and by numerous sumptuary laws favoring domestic manufactures. The aim here was twofold: to attain national economic independence and to prevent the export of bullion in payment for foreign goods. Finally, the encouragement of shipping was naturally regarded as of the greatest consequence at the time, since the new trade with America and the Orient rapidly enriched the nations which controlled it. For the mercantilist navigation policy, see NAVIGATION LAWS.

Mercantilism as a definite policy first appears in English history at the end of the fourteenth century; not much later it was also the settled policy of France. In England it reached its height under Elizabeth; in France under Colbert in the seventeenth century. From that time pure mercantilism rapidly decayed, degenerating into a complicated system of discriminating duties designed to favor private interests instead of those of the state as a whole. It was mercantilism of this kind against which Adam Smith directed his criticisms, which prejudiced economic writers for a century against the system. Recent historical investigations have, however, demonstrated that at its best mercantilism represented a great advance in economic policy and that it was effective in bringing about national unity and independence. See INTERNATIONAL TRADE; PROTECTION; BALANCE OF TRADE; PHYSIOCRATS; NAVIGATION LAWS.

Bibliography. Perhaps the best presentation of a moderate mercantilism by an advocate is that found in Sir James Steuart's *Inquiry into the Principles of Political Economy* (London, 1767). For the older critical attitude towards mercantilism, consult Adam Smith, *Wealth of Nations*, book iv (New York, 1904). By far the best statement of the modern view is G. Schmoller, *Mercantile System* (Eng. trans., New York, 1896); also F. K. Mann, *Der Marschall Vauban und die Volkswirtschaftslehre des Absolutismus: eine Kritik der Merkantilsystems* (Munich, 1914), containing a bibliography.

MER'CANTILISTS. See POLITICAL ECONOMY.

MERCAP'TANS (from Lat. *mercurius*, mercury, quicksilver + *captans*, pres. p. of *captare*, frequentative of *capere*, to take; so called as absorbing mercury), or THIOALCOHOLS. A class of carbon compounds analogous to the alcohols. The latter are defined as compounds containing one or more OH (hydroxyl) groups directly combined with hydrocarbon groups like methyl (CH_3), ethyl (C_2H_5), etc. Similarly, the mercaptans may be defined as compounds containing one or more SH (sulphur and hydrogen) groups directly combined with hydrocarbon groups. Thus, methyl alcohol has the constitution CH_3OH, methyl mercaptan the constitution CH_3SH; ethyl alcohol has the constitution C_2H_5OH, ethyl mercaptan the constitution C_2H_5SH; etc. The following are the principal methods used in the preparation of mercaptans: (1) by the action of an alcoholic solution of potassium sulphohydrate (KSH) upon halogen derivatives of the hydrocarbons (CH_3Cl, C_2H_5Cl, etc.); (2) by distilling an aqueous solution of potassium sulphohydrate with salts of acids like the well-known ethyl-sulphuric acid; (3) by heating alcohols (or phenols) with the pentasulphide of phosphorus, P_2S_5. Thus methyl mercaptan may be prepared according to either of the following reactions:

I. $CH_3Cl + KSH = CH_3SH + KCl$
Methyl chloride; Potassium sulphohydrate; Methyl mercaptan; Potassium chloride

II. $SO_2(OCH_3)(OK) + KSH = CH^3SH + K^2SO^4$
Potassium methyl sulphate; Potassium sulphate

III. $5CH_3OH + P_2S_5 = 5CH_3SH + P_2O_5$
Methyl alcohol; Phosphorus pentoxide

Most mercaptans are liquid, though some exist, at ordinary temperatures, in the solid state. The liquid mercaptans are much more volatile than the corresponding alcohols. They are only sparingly soluble in water, but mix freely with alcohol or ether. Their most characteristic property, however, is their exceedingly offensive odor, by which, according to Emil Fischer and Penzoldt, a quantity of ethyl mercaptan can be detected that is 250 times more minute than the smallest amount of sodium that can be revealed by the spectroscope. The hydrogen of the SH group of a mercaptan can be replaced by metals. The resulting substances, called mercaptides, are decomposed by acids, but—unlike the alcoholates (see ALCOHOLS)—they are unaffected by pure water. The ethyl mercaptide of mercury is formed according to the following equation:

$2C_2H_5SH + HgO = (C_2H_5S)_2Hg + H_2O$
Ethyl mercaptan; Mercuric oxide; Mercuric mercaptide; Water

How much more strongly acidic mercaptans are than alcohols may be seen from the fact that mercaptans, in alcoholic solution, are capable of taking metals away from their acetates and forming, of course, the corresponding mercaptides. The first mercaptan ever prepared was ethyl mercaptan, which was obtained by Zeise in 1833. It is now extensively used in the manufacture of sulphonal (q.v.), a well-known hypnotic.

MERCAP'TIDES. See MERCAPTANS.

MERCA'TOR, GERARDUS (Latinized form of GERHARD KREMER) (1512–94). A Flemish mathematician and geographer, born in Rupelmonde. He took his degree in philosophy at the University of Louvain and later made a profound study of the sciences of geography and mathematics. In 1534 he opened a geographical shop in Louvain and did much work for Emperor Charles V during his campaigns. In 1552 he moved to Duisburg, where in 1559 he was appointed cosmographer to the Duke of Jülich and Cleves. His name is perpetuated by the projection used in nautical maps, in which the meridians are represented by parallel lines, and parallels of latitude by straight lines intersecting the meridians at right angles. The projection, however, seems to have been applied to nautical maps by Edward Wright. Besides a large number of maps, Mercator compiled series of geographical tables, *Nova et Aucta Orbis Terræ Descriptio ad Usum Navigantium* (1569) and *Tabulæ Geographicæ ad Mentem Ptolemæi Restitutæ* (1578). He also wrote a *Harmonia*

Evangeliorum (1592), but his chief work is *Atlas, sive Cosmographicæ Meditationes de Fabrica Mundi et Fabricati Figura* (1594)—the maps were engraved by himself. This atlas was placed on the Index Expurgatorius.

MERCATOR (real name KAUFMANN), NICOLAUS (c.1620–87). A German mathematician, astronomer, and engineer, born at Cismar in the Duchy of Holstein. He was educated at the universities of Copenhagen and Rostock, and in 1660 or thereabouts went to London, where he became one of the first members of the Royal Society, then newly founded. Subsequently he proceeded to France, where he was appointed hydraulic engineer to direct the construction of the Versailles fountains. Owing to his refusal to accept the Roman Catholic faith, the sum agreed upon as payment for this work was withheld, and this fact is said to have hastened his death. He is credited with the discovery of several methods of calculation, in astronomy and higher mathematics. The most important one is the series for log $(1 + x)$. His publications include, besides contributions to the *Philosophical Transactions* of the Royal Society, *Cosmographia* (1651); *Astronomia Sphærica* (1651); *Rationes Mathematicæ Subductæ* (1653); *Logarithmotechnia* (1668–74); *Institutionum Astronomicarum, Libri Duo* (1876). Consult Kaestner, *Geschichte der Mathematik* (Göttingen, 1796–1800), and Montucla, *Histoire des mathématiques* (Paris, 1799–1802).

MERCATOR'S PROJECTION. See CHART; MAP; MERCATOR, GERARDUS; NAVIGATION; SAILINGS.

MERCED, mĕr-sĕd′. A city and the county seat of Merced Co., Cal., 151 miles by rail southeast of San Francisco, on the Southern Pacific, the Atchison, Topeka, and Santa Fe, and the Yosemite Valley railroads, and near the San Joaquin and Merced rivers (Map: California, E 5). It contains the county hospital, a public library, a sanitarium, and a fine courthouse. Fruit growing, stock raising, farming, and dairying constitute the chief industries. Pop., 1900, 1969; 1910, 3102.

MERCEDES, mĕr-sā′dâs. A town in the Province of Buenos Aires, Argentina, situated on the Pacific Railroad, 36 miles west of Buenos Aires (Map: Argentina, G 4). It is a flourishing town in a rich sheep-raising region, has a normal school, a public library, and several steam mills and soap factories. Pop. (est.), 50,000. It was founded as a military station in 1779 and has been settled largely by Irish immigrants.

MER′CENARIES (Lat. *mercenarius*, hireling, from *merces*, wages, from *merere*, to gain, deserve; connected with Gk. *μείρεσθαι, meiresthai*, to share, divide). Hired soldiers, usually foreigners in the country for which they fight. They have been employed from the earliest times. In the early Greek republics there was no standing army or mercenary force, but the citizens themselves formed a national militia. In Persia, however, there were large numbers of Greek mercenaries, and they appear to have played the same part which in later centuries the Swiss did in western Europe. The first Grecian state which used mercenaries in large numbers was Athens, and other Greek states soon followed this example, so that by the end of the Peloponnesian War there were a large number of men in Greece whose profession was war and who fought regardless of the cause. In Rome mercenary troops were long used merely as auxiliaries, but about the fourth century A.D. the army began to assume the characteristics of a mercenary force, being composed largely of Germans, who finally overthrew the Western Empire. In the Byzantine Empire nearly all the troops were mercenaries.

But the golden age of mercenaries was in western Europe during the Middle Ages and the beginning of the modern era. In the early Middle Ages armies were recruited by a feudal levy, but when wars came to be waged on a larger scale in the twelfth century, the 40 days per year which the vassal had to serve proved insufficient, and instead the King or feudal lord began to commute the service of the vassal for a money payment and hire soldiers. In England itself, mercenaries were rare, though they did form one of the grievances against John and Henry III. On the Continent circumstances were different, and kings with a wide and scattered empire, like Henry II of England, who possessed a large part of France, were compelled to employ mercenaries of all kinds. At first it was common to buy their services by a gift of land, but by the twelfth century money became more common, and Norman knights, Genoese bowmen, and Flemish pikemen were frequently hired for pay. A fuller development was reached in the thirteenth century by the appearance of the condottiere system, in which some noted chief collected an army of free companions and sold his force as a whole. The first of these was Roger de Flor, who waged war successfully against the Byzantine Emperor Andronicus II. (See CATALAN GRAND COMPANY.) It was to this type that the various noted Italian adventurers belonged. The character of Italian civilization was of a kind to give impetus to the rise of a mercenary force, for the inhabitants of the many commercial city-states were unwarlike and at the same time frequently engaged in warfare. At times, however, the mercenaries turned their arms against the city which had hired them, or aided in imposing a tyrant upon the city, who then rewarded the company from the spoils. Thus arose in Milan the rule of the Visconti, in Verona that of the Scala, in Ferrara that of the Este, in Rimini that of the Malatesta. At the end of the fourteenth century the Italian mercenary met a dangerous rival in the Swiss pikeman. Switzerland was too small and poor to support all of its hardy sons, and they were sold in large numbers, usually by the canton itself, to some warlike prince. After the battle of Melegnano in 1515 they formed a valuable contingent in the French armies until the French Revolution. All parties in the Thirty Years' War used mercenaries to the exclusion of nearly all other troops, and to this fact is partly due the terrible devastation which was caused. In the American Revolution Great Britain used Hessian mercenaries to fight against the colonists, it being common for some of the smaller princes to sell their subjects in this fashion. The use of mercenaries on the Continent ended with the French Revolution, their place being taken by national standing armies. See BRABANÇONS; CONDOTTIERI; FREE LANCE; SWISS GUARD.

MER′CER, FORT. See FORT MERCER.

MERCER, HENRY CHAPMAN (1856–). An American anthropologist and archæologist, born at Doylestown, Pa., and educated at Harvard, where he graduated in 1879. He made

special studies of the relations of extinct animals to primeval man in North America, especially in connection with the mylodon, peccary, and sloth; made valuable discoveries of fossil carnivora in the Port Kennedy (Pa.) bone cave; and explored the caverns of Yucatan. After research on the Pennsylvania Dutch pottery manufactures he perfected a preparation for mural tiles in 1899; invented in 1902 a new process for making mosaics; and patented a system of printing large designs on paper and fabrics in 1904. He wrote: *Lenape Stone* (1885); *Hill Caves of Yucatan* (1896); *Researches upon the Antiquity of Man in the Delaware Valley and the Eastern United States* (1897); *Tools of the Nation Maker* (1897).

MERCER, HUGH (1720–77). An American soldier. He was born at Aberdeen, Scotland; was educated at the university there; entered the medical profession and served as assistant surgeon under Prince Charles Edward in 1745; emigrated to America in 1747 and settled as a physician near the site of the present Mercersburg, Pa. He served as captain under Braddock in 1755 and was severely wounded in the battle near Fort Duquesne. In 1758 he was promoted to be lieutenant colonel, accompanied General Forbes to Fort Duquesne, now Pittsburgh, and commanded that post for some time. Afterward he settled at Fredericksburg, Va., and on the approach of the Revolution took sides with the Patriot party. He organized and drilled the militia of Virginia in 1775 and the minutemen in 1776, and at Washington's request on June 5, 1776, was made a brigadier general by Congress. He commanded a column in the attack on Trenton and led the advance in the night march on Princeton, which he had himself advised. While rallying his temporarily disorganized troops early in the engagement at Princeton he was mortally wounded, and on January 12 he died in a neighboring farmhouse. A monument to his memory was erected at Laurel Hill Cemetery, Philadelphia, in 1840.

MER'CERIZED COTTON. Cotton that has been treated by a chemical process which imparts a permanent silky lustre to the fabric, yarn, or thread. In 1844 John Mercer, an English chemist, discovered that caustic soda or caustic potash had a remarkable effect upon the cellulose structure of the cotton fibre, changing its physical and chemical nature, causing it to shrink and become thicker and softer, and increasing its affinity for dyes. Mercer took out patents in 1850, but no practical use was made of the discovery because the process shrunk the material so badly. In 1889 Lowe in Great Britain, and later in 1895 Thomas and Prevost, discovered that by treating the cloth under tension the shrinking was obviated and the material assumed, after being washed, a glossy appearance, like silk; but the former's patent was allowed to lapse, while that of the latter inventors was annulled. The lustring effect is, of course, now the most important object in the process. This effect is due to the changed structure of the fibres, which, under the action of the mercerizing treatment while under tension, become straight translucent tubes with a small round central opening instead of the spiral collapsed and flattened tube of the cotton fibre. The lustre is due to the fact that the surface becomes smooth and reflects light like the silk fibre. Mercerizing is now effected by machine processes. There are machines which treat the yarn in hanks, those that treat the cloth, and those that are adapted for either. There are many forms of these machines in which yarn or cloth are treated in the lye, then, if desired, stretched as in a stretching machine with adjoining means of washing. By treating with acids it is further possible to imitate the scroop or viscous hardness supposed to be an essential mark of true silk, but which in reality in the case of silk is due to an artificial process also. Consult Paul Gardner, *Die Mercerization der Baumwolle und die Appretur du Mercerisierten Gewehe* (2d ed., Berlin, 1912), and Murphy, *The Textile Industries*, vol. vii (London, 1912).

MER'CERSBURG. A borough in Franklin Co., Pa., 73 miles by rail southwest of Harrisburg, on a branch of the Cumberland Valley Railroad (Map: Pennsylvania, F 8). It was formerly a noted educational centre as the seat of institutions under the control of the Reformed church in the United States (German). Mercersburg Academy is located here. The principal interests are agriculture and leather manufacture. Mercersburg, originally called Black Town, was incorporated first in 1831. It was the birthplace of President James Buchanan. Pop., 1900, 956; 1910, 1410.

MERCERSBURG THEOLOGY. The name of a system of views emanating from the theological seminary of the German Reformed church formerly located at Mercersburg, Pa. (now at Lancaster), and chiefly defended by Prof. J. W. Nevin (q.v.). He insisted upon the true unity of the person of Christ and the genuinely human character of his life. The person of Christ was made central in the system. Christ is united with generic humanity, which develops itself by an inward force in the Church. Thus, the Church has a true theanthropic character. Emphasis was also laid upon the objective operation of the sacraments. Consult Nevin's principal work, *Mystical Presence* (Philadelphia, 1846), and his *Life* by Theodore Appel (ib., 1889).

MERCER UNIVERSITY. A Baptist university at Macon, Ga., founded in 1838. In 1914–15 it had a faculty of 21 and a student enrollment of 224 in the College of Liberal Arts, 85 in the Law Department, and 39 in Pharmacy. The library contained 20,000 volumes. Its endowment was $400,000 and its income $28,000. The grounds and buildings were valued at $265,000.

MER'CHANT, FRANCIS WALTER (1855–). A Canadian educator, born at Oil Springs, Ontario, and educated at Albert and Toronto universities, taking a degree in pedagogy at the latter institution in 1901. For several years he was a successful teacher in various high schools and collegiate institutes and was a lecturer in physics in Western University and College, London, Ontario. He was principal of the London (Ontario) Normal School (1900–08), chief inspector of public and separate schools and inspector of normal schools for Ontario (1908–11), and in 1911 was appointed Director of Industrial and Technical Education for Ontario. Several educational textbooks were prepared by him. He was appointed a senator of Knox College, Toronto, and was elected president of the Ontario Educational Association (1910).

MER'CHANT, LAW. See LAW MERCHANT.

MER'CHANTABLE ARTICLE. In the law of sale, an article that is salable in the market

under the name or description which it bears in the contract relating to it. Frequently a contract of sale expressly provides that the article to be delivered shall be merchantable; but even in the absence of such a statement a contract for the sale of goods by description, as for the sale of sugar or wheat or coal, implies an undertaking by the seller to supply an article which comes up to the merchantable standard. The buyer is not entitled to a perfect article, but he is entitled to one that is salable under its contract name. If the contract is for a quantity of Manila sugar, the buyer cannot insist upon absolutely pure sugar, but he can reject sugar that is adulterated to such an extent as not to pass in market as salable Manila sugar. Where the term "merchantable" is used in the contract, either party may show that it bears a peculiar meaning in the trade or in the locality in which the contract is made or to which it relates. See SALE.

MERCHANT MARINE, FOREIGN. See SHIP; SHIPPING.

MERCHANT MARINE OF THE UNITED STATES. The 13 Colonies which eventually became the United States lay along the seaboard, and the shipping interests constituted a large part of their commercial activities. In nearly all the Colonies, from the very first, shipbuilding had been encouraged, and in most of them it was a favored and protected industry. Notwithstanding the demand for men in their numerous wars with the Indians, French, and Spaniards, in many Colonies shipwrights were exempt from military service, and inducements were offered to ship carpenters in England to become colonists. A century before the Revolution shipbuilding in the northern Colonies had become one of the most important—in some the most important—of industrial occupations, and American-built ships were beginning to be sold in England. The unlimited supply and comparative cheapness of shipbuilding timber in the Colonies and its scarcity and higher cost in England caused the sales to British shipowners to increase so rapidly as to provoke resentment and protest from British shipbuilders as early as 1725. It is stated that in the seventeenth century the cost of American vessels ($20 to $40 per ton, depending upon the materials used) was 25 to 50 per cent less than that of similar ships built in England. In 1769, 389 were built of a total tonnage of 20,000. New Hampshire built 45, Massachusetts 137, Rhode Island 39, Connecticut 50, New York 19, New Jersey 4, Pennsylvania 22, Maryland 20, Virginia 27, North Carolina 12, South Carolina 12, Georgia 2. In each succeeding year the amount of new tonnage increased, reaching 26,544 in 1772. In 1775 it was estimated that one-third the ships flying the British flag were American-built.

The British Navigation Acts of 1651, 1660, 1661, and 1663 were chiefly designed to destroy the carrying trade of the Dutch between Great Britain and her Colonies and other countries. But, with the exception of the Act of 1651, they were also planned to curb the expansion of Colonial commerce and shipping, which were becoming so extensive as to excite the fears and opposition of British shipowners and politicians. The Act of 1661 enumerated the Colonial products which could not be lawfully transported in any except British ships bound to England, and the proclamation of 1663 declared that "no commodity of the growth, production, or manufacture of Europe shall be imported into the British plantations but such as are laden and put on board in England, Wales, or Berwick-on-Tweed, and in English-built shipping whereof the master and three-fourths the crew are English." This limited the Colonial commerce with Europe to direct trade with England. As this was chiefly in New England vessels, the other Colonies—especially those of the extreme south—were not greatly concerned. In 1733 an Act of Parliament was passed for the purpose of stopping, by means of prohibitory duties, the trade between the continental colonies and the West India colonies of the French and Dutch. The traffic was important and profitable, so that this Act, as well as those of 1660, 1661, and 1663, was largely evaded by false clearances, smuggling, and other means. For nearly 30 years little was done to check these evasions, but in 1761–63 stringent measures were taken to enforce all the navigation acts with unsparing rigor. The number of customs officers was increased, confiscation usually followed search, and appeal was even more costly than confiscation. These proceedings were strenuously opposed by the colonists and were among the most important causes of the discontent which led to the Revolution. Notwithstanding these and other restrictive acts, the ships and mariners of the Colonies increased in number until, at the breaking out of the Revolution, Massachusetts owned one seagoing vessel for every 100 of her inhabitants; while in New Hampshire, and what is now Maine, more people were engaged in shipbuilding and navigation than in agriculture.

During the War of the Revolution, though the poverty of the Colonies prevented them from building a large number of men-of-war, the extensive merchant fleet furnished a host of privateers, and these small craft captured or destroyed several times as many of the enemy's ships as did the war vessels. In none of the previous wars—with France or Spain—had the British merchant fleet suffered so greatly, the total captures (including vessels and cargoes destroyed) reaching £4,000,000. In 1781 the number of privateers was 449, mounting in all 6735 guns. They cruised in the Channel and in the Irish Sea and captured prizes almost in the entrance to the British ports, raising insurance and freight rates enormously and seriously interfering with all kinds of British commerce. On the other hand 900 American vessels, valued at £1,808,000, were captured previous to 1779.

The American merchant vessels of the pre-Revolutionary period were small, mostly of less than 100 tons. While somewhat slow and unhandy from a modern point of view, they were by no means the awkward, clumsy, and almost unseaworthy vessels of the *Mayflower's* day. The ridiculously high structures on the poop and forecastle of ships of her date had been cut down until the form was not unlike that of sailing vessels of the present time. Sixty years before the outbreak of the war Capt. Andrew Robinson, of Gloucester, built a vessel of two masts with fore-and-aft sails on gaffs and booms, fitted with a jib boom and carrying a jib. This was a schooner, the most useful sailing type ever devised and now the most numerous. At first schooners were very small—50 tons or less—and when they began to grow in size the larger ones were fitted with yards on the foremast to carry a square topsail, or a topsail and topgallant sail. These vessels were called top-

sail schooners and were the craft which served so successfully as privateers and in the navy.

At the close of the Revolution the commerce of the States was well-nigh destroyed, and the poverty of the people made recovery slow. Nevertheless the immediate increase in shipping was considerable. Before the war Great Britain had seriously hampered the trade with her West India colonies; now she interdicted it. But the islands themselves suffered even more. Between 1780 and 1787 it is said that 15,000 slaves died there of starvation because American ships no longer brought dried fish and corn, while several of their own crops were reduced or destroyed by hurricanes.

As already noted, the cost of ship construction in America was considerably less than in England, and the building of ships for English purchasers had been an important industry. This also was cut off as a result of the war by the Orders in Council of the British government, which forbade the purchase or importation of American-built ships. The loss of the West India business drove the hardy navigators further afield. Trade with England was difficult for several years. A lucrative one with the south of Europe sprang up and was growing rapidly when the Barbary Powers discovered that many ships were to be found within striking distance that belonged to a young country which had no navy to protect its merchantmen. In their attack upon it they were openly supported by the British government and British shipowners. Lord Sheffield said that the Barbary pirates, preying on the defenseless commerce of the United States, were a blessing to Great Britain, while Franklin wrote that London merchants had publicly declared that if no Algiers existed it would pay them to build one. Congress was unable to protect the shipping against any foes and the vessels were, for a time, diverted elsewhere. Of those which persisted in trading with the south of Europe several were seized by the Barbary pirates and their crews forced into slavery.

Some adventurous mariners sailed for China, others doubled Cape Horn, seeking the isles of the Pacific or the western coast of the North American continent. Two of these in 1787 were the *Columbia* and *Lady Washington*, which made the first voyage to Oregon.

British ships endeavored to control the trade with the United States, and the British government continued so hostile that many of the States retaliated, exacting double duty on goods imported in British vessels and improvising various taxes of other sorts. But other States did not do this, and they got the business, transshipping the goods in their own coasting craft. In addition to interfering with legitimate trade by exorbitant tonnage and taxation charges, seizing and confiscating ships and cargoes upon flimsy charges, and forbidding trade with its Colonies, the British government authorized and encouraged rigorous search of American vessels and impressment of seamen. Little attention was paid to evidence of nationality if the need for men was urgent. Thousands of American citizens were thus seized and compelled to serve in the British navy.

The lack of support by the government and the difficulties and enemies to be met had held down American commerce, so that in 1789 the entire merchant tonnage registered for foreign trade was but 123,893. Among the first Acts of the new Congress were several for the relief of shipping. This was largely brought about by urgent appeals from merchants and shipowners, especially those of Baltimore. Madison brought in the bill for the revenue tariff, and this provided for a reduction of 10 per cent of the duty on all goods imported in American ships. Specially heavy taxes were laid on tea imported in other than American bottoms, or even on tea imported in them if brought from any place in Europe. The tonnage bill laid a tax of six cents per ton on American-built ships if owned by Americans and 30 cents per ton if owned by foreigners, while foreign-built and foreign-owned ships paid 50 cents. All ships were in theory admitted to the coasting trade, but as foreign ships paid the tax every time they entered port, and American ships only paid it once a year, the prohibition was nearly absolute.

The effect of this protective legislation was instantaneous. The registered tonnage for foreign trade increased from 123,893 in 1789 to 346,254 in 1790; 363,110 in 1791; 411,438 in 1792; 367,734 in 1793; and 438,863 in 1794. The percentage of imports carried in American bottoms was: 1789, 17.5 per cent; 1790, 41; 1791, 58; 1792, 67; 1793, 82; 1794, 91. The drop in tonnage in 1793 was due in part to the depredations of the Dey of Algiers. To punish this pirate and prevent future aggressions of a similar nature Congress, upon Washington's urgent recommendation, authorized the building of six frigates and the establishment of a permanent naval force. But before these ships were completed a treaty was arranged with the Dey in which he was to receive about $1,000,000 and other presents, including a frigate superior to any vessel ever under the United States flag up to that time. Congress, with careful economy, at once reduced the number of frigates to three and sold the material gathered for the others.

And now a new enemy appeared. The Revolution in France drove the former friends of the United States from power. The semblance of government under the Reign of Terror permitted all things. When the government of the United States refused to allow itself to be embroiled with England by permitting its territory to be used for unfriendly purposes, the attitude of the French changed. In the West Indies their picaroons (privateers) frequently seized American vessels without cause. After the diplomatic disputes began, these actions were not only permitted, but encouraged. Jealousy of the active mercantile navy of the United States, hatred of England and of their trade with the English colonies, restricted though it was, all combined to bring what remained of American West India trade to ruin. In 1794, 38 American vessels were seized upon the high seas by French warships and privateers and carried into French ports for confiscation. In the following years the conditions were as bad or worse. Protests were of no avail. The government under which the seizures took place was usually out of office by the time the protests were made and the documents in the cases submitted. Acting upon Washington's suggestions, Congress authorized the building of additional warships and the purchase of merchant vessels suitable for carrying an armament. In April, 1798, the Navy Department was organized, and in July, United States cruisers were directed to

capture any French vessels which might be found interfering with American commerce. After three years of fighting without the declaration of war, the French were so severely punished as to be glad to negotiate on any terms, and their harassment of American shipping ceased.

While still at war with France the United States escaped hostilities with the Dey of Algiers by giving way to his pretensions and by fortunate diplomatic negotiations with Turkey. Lack of a naval force for so many years, and the consequent failure to defend American citizens and property, led to a whole crop of small wars with the Barbary states. Gifts to Algiers and failure to punish the Dey for the imprisonment of American citizens and for depredations upon American commerce led the other Barbary Powers to adopt similar tactics. The Pasha of Tripoli declared war in May, 1801, but before the merchant marine had suffered to any degree a strong American squadron appeared before Tripoli, Tunis, and Algiers. Tripoli continued to make war, but Tunis and Algiers were quieted. Eventually the Tripolitans were thoroughly beaten and punished, and the Bey of Tunis overawed and compelled to sign a satisfactory treaty.

American dealings with England and France were equally unsatisfactory. The former continued to oppress the merchant marine by unfair taxes, impressment of seamen, and interference with trade. The latter did all she could to punish American ships for submitting to English methods. At this time all Europe was at war. The United States was the only neutral of importance, and the carrying trade of Europe was in its hands. Had the government stood firmly for its rights, much trouble might have been avoided. But President Jefferson was for peace at any price and merely protested against the imprisonment and impressment of thousands of American citizens and the confiscation of millions of dollars' worth of American ships and cargoes. England repeatedly refused to negotiate concerning or consider the question of impressment, although proof was presented that, in 1806–07, 6000 American seamen were serving against their will in the British navy.

Great Britain declared blockades of the French and other coasts and of the West India islands of her foes. France replied with declarations of blockade of the British Isles and colonies. These were only "paper" blockades, but served as an excuse to seize and confiscate American vessels. A British Order in Council forbade neutral vessels from carrying any goods from any port in the possession of France or her allies to any other similar port. Napoleon replied by his Milan Decree, directing the confiscation of all neutral ships which accepted British protection and paid British duties. In addition a British royal proclamation required royal officers to enforce the "right" of impressment against neutral merchant ships. Nor was this arrogance confined to merchant ships. In 1807 the British 50-gun ship *Leopard* held up the United States frigate *Chesapeake* and forcibly removed several of her crew.

To resist these aggressions, President Jefferson and the congressional majority adopted the policy of embargo. This is estimated to have cost the country $100,000,000 in 15 months, nearly destroyed its commerce, and was an indirect cause of the War of 1812.

Notwithstanding all the dangers and difficulties that beset American commerce, it throve because the prizes of success were large, so that the year 1810 saw the high-water mark of the foreign trade, the registered tonnage reaching 981,019. Madison was now President, and he was less inclined than Jefferson to submit to the condition of affairs. The temper of the people had also become aroused, and as the British continued their policy towards neutrals, war was becoming inevitable. British frigates lay outside of Sandy Hook, searching each merchant ship as she came out, impressing members of the crew, and seizing the vessel and cargo if she were bound to French ports in Europe or her colonies or to ports of her allies. Madison sent Commodore John Rodgers in the frigate *President* to watch this blockade of a neutral port. During the evening of May 16, 1811, Rodgers spoke a ship of war which, in the darkness, he took to be the British frigate *Guerrière*. When hailed the stranger returned an evasive reply and a round shot which lodged in the *President's* mainmast. The *President* replied by a broadside, and the fighting continued until the fire of the British ship was silenced. The stranger was then found to be the sloop of war *Little Belt*.

British aggressions were not checked by this incident. Seeing that war was imminent, President Madison laid a new embargo upon American ships and sent a warning to those abroad. The war which ensued was forced upon the United States and only resorted to when the conditions became intolerable. But the country was wretchedly unprepared. The work of the navy, however, raised its prestige enormously, and the privateers were not far behind in the brilliance of their achievements. They numbered 517 and carried 2893 guns. During the period of hostilities they captured or destroyed 1300 prizes valued at $39,000,000. Being lightly gunned, heavily sparred, and of fine model, they were very fast and enormously efficient as commerce destroyers, but they were not simply vampires seeking dollars and safety. Many of them never refused combat on reasonably even terms either with privateers of the enemy or with his regular cruisers, and a number of the latter were among the prizes taken. As in the Revolution, they sought the coasts of England and made British commerce so precarious a business that marine insurance reached very high figures and British protests against the inefficiency of the navy in not preventing their operations were frequent and bitter. Their success, indeed, formed the principal reason why Great Britain was so willing the war should end.

In the Treaty of Ghent no mention was made of impressment, but it was never again attempted, so that the merchant service justly felt that it had fought for and won its own battle for sailors' rights.

During the war the registered tonnage in the foreign trade of course decreased very materially, and of the vessels registered many never went to sea. According to the Treasury reports the tonnage in 1815 was 854,295; in 1816, 800,760; in 1817, 804,851; in 1818, 589,954; in 1819, 581,230. The figures for 1815, 1816, and 1817 are incorrect and include many vessels missing since the war—lost, captured, sunk, broken up, or diverted to the coastwise trade; and the drop in each year, especially in 1818,

is due to their removal from the customhouse lists. The actual size of the mercantile fleet in these years is unknown, but there is every reason to believe that the tonnage of existing vessels was about 500,000 in 1815 and that it increased steadily up to the figures of 1818–19. The increase continued thereafter, though the total did not reach the high figures of 1810 until 30 years after the war closed. This was in no way discreditable to the energy of American merchants or sailors. Conditions had changed. The European wars were over, so that American ships were no longer harried, confiscated, or destroyed. On the other hand all maritime Europe was met in competition. Of course it took time for the foreign mercantile marines to rebuild their vessels and get possession of the trade they had lost. American statesmen, without duly considering the causes which had built up their great ocean fleet, or the reasons why it did not succumb when so bitterly assailed, firmly believed that the flourishing condition of the merchant carrying trade was due almost entirely to Yankee enterprise and ingenuity, so at the close of the war they offered to make treaties with all nations in which the preferential duties allowed upon goods imported in American ships would be given up provided similar import and export duties be not laid, or if laid be given up, by the other contracting Power. Great Britain seized the opportunity at once, but she was followed by Sweden and Algiers only. In the convention with Great Britain she stipulated that she should regulate the trade of her West Indian and Canadian colonies as she might desire. The removal of the discriminating duty was not immediately harmful. England was too busy readjusting and extending her trade in Europe, where she had less active opponents to contend with. The loss of Canadian and West Indian business was a blow and caused 80,000 tons of American shipping to be laid up. In a very short time Great Britain's purpose was evidently to exclude American vessels, in which she succeeded admirably, partly by direct and partly by indirect means. Congress soon realized the unfair conditions and passed an act forbidding the entrance of vessels of any nation from ports from which American vessels were excluded. This eventually brought Great Britain to improved terms, but in the meantime it caused enormous losses to all concerned. Another section of the Act of 1817 barred foreign vessels from the coasting trade. This was perhaps unnecessary, as tonnage duties had already effected this.

As the foreign carrying trade which did not enter American ports was reabsorbed by the vessels of the nations concerned, the American ships forced out of this traffic entered the coasting trade or the direct carriage between American and foreign ports. At the same time the total foreign commerce of the United States decreased quite steadily from 1816 to 1830, with a slight temporary rise in 1825. This decrease of business in the face of a growing tonnage gave an increasing surplus of American ships, so that the percentage of imports and exports carried in American bottoms naturally also increased until, in 1826, it reached 92.5. This high percentage of goods carried to and from the ports of the United States, and the apparent prosperity wrought by unusual and temporary conditions, blinded the eyes of American statesmen to the actual conditions. One of the causes of the maintenance of the high percentage was the establishment, immediately after the war, of numerous lines of sailing packets between the United States and Europe, especially England. The first and greatest of these was the celebrated Black Ball line, but the vessels in all the lines were of such excellence that, until the advent of steam in this trade, few foreign vessels were able to compete.

In 1828 the last vestige of protection was removed from the foreign trade. The Act of 1815 had offered the removal of tonnage duties in the direct trade with other countries. The Act of 1828 removed them also in the indirect trade. The reciprocity treaties, 30 or 40 in number, which were negotiated under these Acts are still in existence or their terms have been repeated in later conventions. The effect of the Act of 1828 was apparently instantaneous and reflected in the tonnage figures. In that year the registered tonnage was 757,998; in 1829, 592,859; in 1830, 537,563. But these figures are deceptive. In 1829 the sharp fall in registered tonnage was partly caused by the removal from registry of a considerable number of vessels no longer in existence, but whose names still appeared on the customhouse lists. Notwithstanding the removal of protection, the low cost of wooden shipbuilding in the United States and the high efficiency of operation gave the merchant fleet a fair degree of prosperity for some years longer. Probably 1836 may be regarded as the high-water mark, if registered tonnage, value of foreign commerce, and percentage carried in American bottoms are all considered. Foreign competition then began to make itself felt.

In the development of ocean trade and shipping a factor of the greatest importance had appeared some time before, and its effect was now rapidly increasing. This was steam. It received early and wide use on the coast and inland waters and diverted attention from deep-sea affairs. About 1830 railroads began operations. Steam on land and water was so profitably used in the internal development of the country, and the demand for capital for this purpose was so incessant, that each ocean-trade undertaking was dropped as soon as it became definitely unprofitable, no matter what its possibilities were thought to be.

Though the first steam vessel to cross the Atlantic, the *Savannah*, was an American ship, the first to undertake regular passages were the British steamers *Sirius* and *Great Western* in 1838. Up to this time the great American sailing-packet lines had a monopoly of the trade. Great Britain saw her opportunity, and when, late in 1838, Samuel Cunard made his final proposals to the British government they were accepted. The subsidy given to the Cunard Company was at first $425,000 per annum, and this was about 25 per cent of its gross operating expenses. It was paid to insure the establishment of transatlantic steam navigation firmly in English hands, and it succeeded. As the service (originally planned for Halifax and Boston) expanded and extended to New York the subsidy was increased at intervals until it reached $850,000. The American sailing packets continued to run, many of them until the Civil War, but in decreasing numbers and with diminishing profits. No American steamer line was started because Congress would grant no

subsidy, and a steamship line could not exist without it.

Mr. Wheelwright, American Consul at Guayaquil, realizing the importance of a steam line to the west coast of South America, endeavored to get a subsidy from Congress for it, but failed, although supported by American shipping merchants. He then went to England, met a cordial reception, secured an ample subsidy from the government, built a fleet of ships after the American model, and thus started the Pacific Steam Navigation Company, now one of the greatest of steamship companies and the greatest cause of the extension of British trade in South America. The trade of the West Indies, Spanish Main, and Brazil was such as to require a steamship line for its development. A subsidy was offered and the Royal Mail West India Company was organized. When its subsidy proved insufficient, the required service was reduced. Later increased service was called for and the subsidy augmented. France and other nations followed England's lead, the United States government alone standing out against subsidy.

Finally in 1845 Congress authorized the Postmaster-General to make contracts with the owners of American vessels for the regular transportation of the United States mails. The first contract was made with the Ocean Steamship Company for a service to Havre and Bremen. The company were to receive $200,000 for 20 trips—about half as much as the amount paid the Cunard line for a much shorter route. Two very fine ships were built in 1847, the *Washington* (1640 tons) and the *Hermann* (1734 tons), and in 1850 these were followed by two of 2400 and 2850 tons. In 1847 the Black Ball line built a 2000-ton steamer, the *United States*, and she made several voyages; but without a subsidy she was a losing venture and was soon withdrawn and sold.

About the same time contracts were made for steamer lines to the West Indies, Isthmus of Panama, and, on the Pacific coast, from Panama north. The first of these was the Law line (afterward the Pacific Mail Steamship Company), which sent steamers to the Pacific and connected with its Atlantic branch at the Isthmus of Panama. Owing to the discovery of gold in California and the consequent increase of trade, this company became very prosperous and its fleet grew with rapidity. The transpacific service was not established until 1867 and was never really profitable.

In 1847 the Collins line of five steamers was projected. The original subsidy offered was small, but for increased service, larger vessels (the number reduced to four), and a higher rate of speed the subsidy was increased to $33,000 per voyage or $858,000 yearly for 26 voyages. These vessels, which began service in 1850, were much the largest, finest, and fastest vessels on the Atlantic. Such characteristics made them popular, but the cost and speed rendered them so expensive to run that the company made no money. However, they broke the British steamship monopoly, cut down the time of passage from 12 to less than 10 days, and reduced the cost of steamship freight between New York and Liverpool from $37 to $20 per ton. The company was unfortunate. The *Arctic* was sunk in collision, and the *Pacific* was lost at sea. A new and larger steamer was built in 1855, but in the same year Congress repealed the Mail Subsidy Act, and the company necessarily suspended operations.

The famous clipper ship (q.v.) was the natural result of the introduction of steam into ocean navigation. It was the last expiring effort of the sailing ship to hold its own with the steamer on long voyages by nearly equaling its speed and at the same time affording a lower freight rate. The ship which has the reputation of being the first of the type was the *Rainbow*, built at Baltimore in 1843. The necessity for speed to compete with steam in the transatlantic trade; the desirability of speed as a saver of time in the long voyage to China; the discovery of gold in California, with the corresponding increase of trade between the east and west coasts of the country; and lastly the European demand for transportation during the Crimean War all combined to popularize the clipper, extend for the moment the career of the sailing ship, and also to sustain for several years (and even increase) the tonnage of American foreign trade.

As the various supporting factors of this tonnage were reduced or extinguished the direct opposition increased. Iron began to supersede wood for steam vessels, and the shipbuilding yards and ironworks of the country were not prepared to build hulls of that material at a rate to compete with British establishments. The iron-hulled freight steamer then began to supplant the wooden sailing ship. The Civil War was now imminent, and all that sectional hatred and bias could do to injure the property that was almost wholly Northern was done. Nevertheless the registered tonnage, including the deep-sea fisheries (182,106), whale fishery (145,734), and a large amount of small craft operating along the borders, reached 2,496,894 in 1861. This, on paper, was its culminating figure. The conditions already referred to, the operations of the Southern cruisers, and the interest of capital in other undertakings caused it to drop steadily until 1898, when it was only 726,213—of which less than 500,000 tons were effectively employed away from the coast, the remainder consisting of barges, small craft, superannuated vessels (mostly laid up), vessels sold or lost but not yet erased from the list, and others registered for foreign trade but chiefly engaged in coasting commerce. Since 1898 there has been a material gain, the tonnage on Jan. 1, 1915, being about 1,300,000, of which 300,000 to 400,000 tons were not effectively engaged. Of the total, at least 250,000 tons represented ships transferred to the American flag since the beginning of the great war.

The prospect for the increase of registered shipping (i.e., shipping in the foreign trade—coasting vessels are *enrolled*) and the maintenance of it in normal times is not bright. Even if subsidies are resorted to, they will affect only mail and passenger steamers. The great mass of freight will still be carried by foreign freighters until American vessels of the same class can be built more cheaply and operated more cheaply. The difference in cost of building is much less than it was a few years ago, and by adapting construction processes to American labor conditions (as has been done in locomotive building) the excess may disappear or even appear on the other side of the ledger. But the difference in operating cost is not only the most serious, but for much of it there is no cure in sight—at least for steam vessels. It is

due to higher wages, more officers, larger crews, and many restrictions (without compensation) laid upon operating by unfavorable legislation. A very serious factor is the insurance, which is chiefly effected through European societies, whose interests are bound up with rival shipowners and merchants. This alone, in some trades, would be sufficient to render business unprofitable, even were other things equal. Under present conditions the operation of a 5000-ton freight steamer costs about $15,000 a year more under the American flag than under the British, German, or Norwegian. This is about 5 per cent of the cost of the ship and easily measures the difference between prosperity and unprofitableness. The Seaman's Act, approved by the President on Feb. 28, 1915, will add, when in full effect, still further to the expenses and difficulties of operating American ships by requirements concerning the payment of the crew, their ability to speak English, their qualifications as to experience at sea, etc. Another clause removes all penalties for desertion except forfeiture of part of the wages. In view of this Act, the Pacific Mail Steamship Company has announced the discontinuance of its foreign service, and other shipowners in the foreign trade are preparing to transfer their vessels to other flags. Some of the provisions of this and similar acts are desirable and are in line with modern ideas as to health, comfort, and safety; but as few of them are required in foreign services, and as there are no compensatory features to reimburse the shipowner, they make foreign trade under the American flag more difficult than heretofore.

One of the means of gauging the adequacy of the registered shipping is to determine the proportion of foreign commerce carried in native bottoms. In 1826, 92.5 per cent of the imports and exports of the United States was carried in American ships; in 1913, 10.2 per cent; and it has been (1910) as low as 8.75. This of course takes no account of traffic between ports of foreign nations, if such trade exists, as it did prior to 1860 and especially in the early years of the nineteenth century, when a large part of the deep-sea tonnage was so engaged.

In the summer of 1914, soon after the outbreak of war, the lack of sufficient shipping in the transatlantic trade was severely felt and caused a sharp rise in freight rates. As one means of relieving the difficulty a bill was passed in August, 1914, modifying section 5 of the Panama Canal Act and permitting the registry of stanch and seaworthy foreign-built vessels of any age, providing they were wholly owned by American citizens or corporations. The vessels registered under this Act before Jan. 1, 1915, had a total tonnage of nearly 300,000 and formed a notable addition to the foreign trade fleet; but whether the gain would be permanent would depend upon future conditions.

A minor but still important factor in the development of freight traffic in American bottoms is the new banking law of the United States which permits branch banks abroad. The lack of suitable banking facilities in foreign ports has always militated against American interests, shipping or other.

While the foreign shipping trade has, in the course of years, deteriorated until it is almost negligible, the completely protected coasting fleet has grown to enormous proportions, and the opening of the Panama Canal is likely still further to stimulate it. In 1789, while the coasting trade was unprotected, it had a hard struggle with British vessels for existence. In that year, as already mentioned, a tax of 6 cents per ton was placed on American ships and 50 cents per ton on those of foreign nations. Moreover, the foreigner paid the tax each time he entered port; the American paid once a year. This was practical exclusion. Thus relieved from foreign competition, the coasting trade increased rapidly from 68,607 tons in 1789 to 103,775 in 1790; 164,796 in 1795; 245,295 in 1800; 301,366 in 1805; 371,114 in 1810; and 435,067 in 1815. The Navigation Act of 1817 prohibited foreign vessels from engaging in the coastwise trade, and this prohibition has never been removed.

The advent of steam changed conditions in the coastwise trade much faster than in the foreign, for the very obvious reason that the early forms of marine engines and propelling apparatus were unfit for application to seagoing ships. But steamboats in rivers and protected waters increased rapidly; by 1823 there were 300 of them on American rivers, bays, sounds, and lakes. About this time seagoing coasting steamers, fit to stand moderate weather at sea, were beginning to run on regular service.

Until quite recently the heavy coastwise traffic was largely carried in sailing vessels, and for this purpose the schooner was found most suitable. As the traffic increased in volume the schooners increased in size and number of masts, culminating in the seven masters of to-day, though schooners of three and four masts are and have been the most common. The advantages of the schooner are the ability to lie close to the wind and work through narrow channels, the ease of working the sails so that few men are necessary to handle them, and the reduced cost of rigging, sails, and equipment. Of late years sailing vessels of all kinds are falling into disuse. The larger craft are being displaced by steel or heavy wooden barges, which are towed in strings of two or more by powerful ocean-going tugs. Even small sailing craft and fishing boats are now generally fitted with auxiliary motor engines. The combination of sail and auxiliary, internal-combustion, heavy-oil engines of the Diesel type may be a stage in the development of ocean transportation, for it seems apparent that in slow freight vessels this is the cheapest form of propulsion and ocean freight carriage, and the speed ought to approximate that of the steam tramp.

The Civil War did not seriously interfere with the development of the coasting trade except in the South. After the war the trade was somewhat affected by the diversion of capital and freight to the railways, and the total tonnage decreased slowly until 1878, when it had fallen to 2,444,801 tons. From that time to the present the increase has been continuous and rapid, reaching 6,818,363 tons on June 30, 1914, the last date for which figures are yet available. Of this total 2,882,922 tons were in the Great Lakes and 141,436 tons on Western rivers.

The first vessel built above Niagara Falls was the *Griffin*, a little craft of 45 tons, launched by La Salle in 1679; but it was another hundred years before anything more than the canoes and boats of trappers and explorers were to be found there. As the fur trade grew in importance small brigs were built to carry furs and supplies. The first American vessel on the upper

lakes was the *Washington*, said to have been launched at Erie, Pa., in 1797. After the War of 1812 the development of the Northwest brought about a corresponding increase of shipping on these fresh-water seas. At first this large increase in freight tonnage. The competition of the railways checked this somewhat in later years, but their principal effect was in the lake passenger business, which was nearly destroyed and has only recently revived.

FISHERIES OF THE UNITED STATES

SECTIONS	Vessels employed		Persons employed *	Capital invested *	Value of products
	No.	Tons			
New England (1908)	1,623	44,219	22,157	$11,970,000	$15,139,630
Middle Atlantic States (1908)	3,165	45,208	54,163	11,105,000	16,302,000
South Atlantic States (1908)	534	5,029	17,961	2,324,000	4,034,000
Gulf States (1908)	915	13,665	15,387	3,901,000	4,824,000
Great Lakes (1908)	319	4,499	8,533	4,814,000	3,767,000
Mississippi River and tributaries	39	273	11,825	1,440,000	3,125,000
Pacific coast States (1908)	294	15,618	13,855	6,468,000	6,839,000
Alaska Territory (1913)	444	93,800	21,721	37,047,305	15,739,068
Total	7,333	222,311	165,602	$79,069,305	$69,769,698

* Exclusive of packing houses and canneries.

was largely for the transportation of passengers and supplies. The first steamer, *Walk-in-the-Water*, was completed in 1819. By 1830, regular steamer lines ran between Buffalo and Chicago and had gone as far as Detroit a few years before.

In 1833 the Welland Canal was completed, with locks 110 feet long, 22 feet wide, and 8½ feet deep. As small canals have always done, this tended to make all vessels using it take on the general shape of canal boats, to the detriment of their safety, speed, and other qualities.

In 1855 the first canal for large craft was built by the State of Michigan around the St. Mary's River rapids (Sault Ste. Marie) with a depth of 11.5 feet. In the succeeding year 106,296 tons of freight passed through it. The growth of traffic soon demanded new locks, which were finished in 1881; during the next year 2117 steamers of 2,092,757 tons used them. Minnesota iron ore now began to be of importance and added greatly to the tonnage. In 1895 a Canadian canal around the rapids was opened for traffic, and in 1896 the Poe lock on

TABLE OF TONNAGE OF THE MERCHANT SHIPPING

AND VALUE OF THE FOREIGN SEA-BORNE COMMERCE OF THE UNITED STATES, 1789–1915

YEAR	Tonnage in foreign trade	Foreign sea-borne commerce, exports and imports	Per cent carried in American ships	Tonnage in coasting trade*	Tonnage in whale fishery	Tonnage in deep-sea fishery	Tonnage on Great Lakes
1789 †	123,893	.....	23.6	68,607	.....	9,062	.....
1790 †	346,254	§ $45,000,000	40.5	103,775	.....	28,348	.....
1795 †	529,471	117,746,140	90.0	164,796	.....	24,887	.....
1800 †	667,107	162,224,548	89.0	245,295	3,466	22,307	.....
1805 †	744,224	216,166,021	91.0	301,366	6,015	48,479	.....
1810 †	981,019	152,157,970	91.5	371,114	3,589	26,251	.....
1815 †	‡ 854,295	165,599,027	74.0	435,067	1,230	26,510	.....
1820	583,657	144,141,669	89.5	539,080	36,445	60,843	.....
1825	665,409	180,927,643	92.3	587,273	35,379	70,626	.....
1830	537,563	134,391,691	89.8	496,640	39,705	94,014	.....
1835	788,173	251,980,097	84.5	769,795	97,649	136,817	.....
1840	762,438	221,927,638	82.9	1,144,664	136,927	96,196	.....
1845	904,476	219,224,433	81.7	1,190,898	190,903	91,240	.....
1850	1,439,694	317,885,252	72.5	1,755,797	146,017	143,758	.....
1855	2,348,358	476,718,211	75.6	2,491,108	186,848	124,553	.....
1860	2,379,396	687,192,176	66.5	2,599,319	166,841	153,619	.....
1865	1,518,350	404,774,883	27.7	3,353,657	84,233	100,436	.....
1870	1,448,846	828,730,176	35.6	2,595,328	67,954	82,612	.....
1875	1,515,598	1,046,448,147	26.2	3,169,687	38,229	68,703	.....
1880	1,314,402	1,503,593,404	17.6	2,584,418	38,408	64,935	605,102
1885	1,262,814	1,319,717,084	17.0	2,822,598	25,184	73,975	749,948
1890	928,062	1,647,139,093	12.8	3,330,377	18,633	61,507	1,063,063
1895	822,347	1,456,403,388	11.7	3,644,276	15,839	60,838	1,241,459
1900	816,795	2,089,528,616	9.3	4,195,875	9,899	43,694	1,565,587
1905	943,750	2,393,809,408	12.1	5,441,688	10,763	60,342	2,062,147
1910	782,517	2,982,799,622	8.7	6,668,966	9,308	47,291	2,895,102
1913	1,019,165	3,773,060,925	10.1	6,817,013	8,611	41,762	2,939,786

* Includes tonnage on Great Lakes and of inshore fisheries.
† Figures for these years doubtful; are probably not very far wrong.
‡ Correct figures never determined; these are at least 30 per cent too large. Explanation in text.
§ Estimated.

The shallows near Detroit caused the larger lake boats to be broad of beam and light of draft until the government improved the channel.

In 1842–43 the first grain elevator was built at Buffalo, and soon the grain traffic caused a

the American side was finished, and in 1914 the Davis lock, also on the American side, with virtually a separate canal, was opened to commerce. The depth through the canals, locks, and river channels is approximately 20 feet, but

is gradually being increased by dredging and other work, the new American lock having 24½ feet of water upon its mitre sill with a depth of 25 feet in the canal approaching it both above and below. In 1914, 23,795 vessels of 57,989,715 net tons' register passed through the American and Canadian canals. Owing to the Great European War the iron-ore trade fell off 16,695,888 tons in 1914, and the total trade through the canals was 31 per cent less in 1914 than in 1913. The net tonnage of vessels passing through the American and Canadian canals for 1913 was 57,989,715, and for the Suez Canal in the same year, 19,758,040.

Since 1900 the increase of tonnage of vessels plying on the Great Lakes has nearly doubled. The size of the vessels has steadily grown, many of them being over 7000 tons, and one is over 8000. A large amount of tonnage is in steel barges, several of which are hauled in a single tow by a large cargo carrier or tug. Much of the success of the Lake freight trade has been due to the high efficiency of the design and construction of the vessels and to the novel, cheap, and rapid methods of loading and discharging cargo, which effect the handling of heavy bulk freight such as grain, coal, and iron ore at hitherto unprecedented costs.

One of the important branches of the merchant marine was the whaling industry. Whaling in small boats was practiced by the Colonies as early as 1640, but it was not until near the close of the seventeenth century that whale ships were sent out. In 1775, 150 Nantucket whalers were at sea, but they were mostly of very small tonnage. Most of the records previous to 1800 are incomplete and not very reliable. In that year the reported tonnage was 3466, and the greatest in any year before the outbreak of war was in 1803, when it reached 12,390. In 1817 it was 5224; in 1818, 16,750; and in 1819, 32,386. From that time until 1858 it increased with more or less regularity. The British have always had a good many whaling ships, many of which were in the South Pacific in 1812. Most of the American whalers in that vicinity had been captured by the British letters of marque when Porter appeared in the *Essex*. Before his glorious defeat at Valparaiso, Porter had captured every letter of marque and British whale ship west of Cape Horn and had liberated most of their American prizes, and his success gave such a setback to the British whaling industry in the Pacific that it was long before it recovered. The whaling trade continued to furnish a large part of the deep-sea fleet until quite recent years, its eventual decadence being almost wholly due to the decrease in numbers of the whale. At the height of its success, from 1836 to 1861, whaling was almost exclusively an American industry. In 1842, out of the world's total of 882 whale ships, 652 were American. In 1858 the tonnage engaged was 198,594 and the number of men employed about 25,000.

The deep-sea fisheries have always been an important American occupation, although they have now dwindled to less than one-fourth their former size, measured in tonnage. In 1614 John Smith set up a fishing station at Pemaquid, Me., where his men caught and cured 1200 quintals of fish that sold in Spain for $5 a quintal. During all the early days of the New England Colonies their fisheries were most important to them, affording the products best susceptible of being turned into ready cash. They were therefore carefully fostered and their rights jealously guarded. To the deep-sea fisheries the country was indebted for a very large proportion of the sailors of the Revolution and even of the War of 1812.

These fisheries were almost destroyed by the Revolution. After its close the Treaty of 1783 gave to American fishermen the same rights of fishing and curing fish along the Canadian coast as when British subjects. But the industry was paralyzed. A bounty was offered and the fisheries revived. The War of 1812 again ruined them, but additional bounties were given in 1819 and, notwithstanding opposition and unfair treatment by both England and Canada, it increased more or less steadily until 1862 (tonnage in that year, 193,459), although the bounty laws were repealed in 1858. From 1862 to the present the tonnage engaged has slowly decreased, until in 1913 it was only 41,762, employing 1623 vessels and 22,157 men. The value of the catch was $15,100,000.

The other fisheries have had less to do with the merchant marine proper. The latest statistics in regard to all fisheries are given in the tables on page 428.

Bibliography. The best general survey of the early period is in A. T. Mahan, *Sea Power in its Relations to the War of 1812* (2 vols., Boston, 1905), and the most useful repository of facts for the entire period is Hans Keiler, *American Shipping: Its History and Economic Conditions* (Jena, 1913), which contains a bibliography. Consult also: David MacPherson, *Annals of Commerce* (4 vols., London, 1905); *Report of the Merchant Marine Commission* (Washington, 1905); G. W. Allen, *Our Navy and the Barbary Corsairs* (Boston, 1905); Royal Meeker, *History of Shipping Subsidies* (New York, 1905); Edward Channing, *The Jeffersonian System* (ib., 1906); G. L. Beer, *British Colonial Policy, 1754–1765* (ib., 1907); G. W. Allen, *Our Naval War with France* (Boston, 1909); A. H. Clark, *The Clipper Ship Era* (New York, 1910); W. L. Marvin, *The American Merchant Marine* (ib., 1910); W. D. Reninger, *Government Policy in Aid of American Shipbuilding* (Philadelphia, 1911); B. O. Hough, *Ocean Traffic and Trade* (Chicago, 1914); *Statistical Abstract of the United States Department of Commerce* (Washington, annually). See COMMERCE; NAVIGATION LAWS; SHIP; SHIPPING; SHIPPING SUBSIDIES; UNITED STATES.

MERCHANT OF VENICE, THE. A comedy by Shakespeare, produced probably in 1597, printed in 1600. The earliest version was probably that by Henslowe, in 1594, under the title *The Venesyon Comedy*. The incidents of the play are drawn from many sources. The story of the pound of flesh is very ancient; Shakespeare took the story of Bassanio no doubt from the counterpart, in the *Adventures of Gianetto* in Fiorentino's *Il Pecorone*, written in 1378, but printed in 1558; and possibly from a similar tale in the *Gesta Romanorum*, which contained as well the story of the choice of three caskets, a popular mediæval tale. He may have been indebted to the lost play, *The Jew*, mentioned by S. Gosson in his *School of Abuse*, 1579; but certainly was influenced by Marlowe's *Jew of Malta*. The character of Shylock was drawn in part at least from *The Orator*, by Silvayn; while the story of Antonio and Shylock was foreshadowed in *Three Ladies of London*, by Robert Wilson, 1584.

MERCHANTS, CUSTOM OF. See LAW MERCHANT.

MERCHANTS ADVENTURERS. An English company organized in late mediæval times for carrying on foreign trade. Its constitution was that of a regulated company (q.v.), any one having a right to join in the trade upon payment of a fine and agreement to submit to the regulations of the company. The date of its incorporation is not known, but privileges were granted to it by the Count of Flanders as early as the fourteenth century. The principal business of the company was the export of cloth; and it exacted regular contributions from all persons who exported cloth to countries covered by its privileges. In the sixteenth century the chief work in extending English foreign trade was performed by this company. When the Portuguese made Antwerp the depot for Oriental wares the Merchants Adventurers grew rapidly in wealth, since their goods could find a ready sale for the Eastern trade. In the same century the company began a long war with the traders of the Hanseatic League (q.v.), who were infringing upon their monopoly of the export of woolen goods. The Hanseatic traders were at first protected by the crown, but finally were driven from England by a decree of Queen Elizabeth. With the siege and capture of Antwerp by the Spaniards (1584–85) the Merchants Adventurers had to find new centres for carrying on their foreign trade, and finally settled in Hamburg, becoming known as the Hamburg Company. Much of the historical importance of the Merchants Adventurers lies in the fact that their organization served as a model for the great foreign trading companies of the sixteenth and seventeenth centuries. See REGULATED COMPANIES.

Consult, for a brief account, "Adventurers, Merchants," in R. H. I. Palgrave, *Dictionary of Political Economy*, vol. i (New York, 1910). A more extended discussion will be found in Lingelbach, *The Merchant Adventurers of England* (Philadelphia, 1902).

MERCHANTS' COURTS. Certain courts which arose out of the guild merchant, by the practice of the guild brethren assuming to do justice at their "morning speeches," or periodical meetings of the society. They first assumed to decide cases of inheritance and succession to membership in the guild, such membership being —as to-day a seat on a stock exchange—regarded as an object of ownership. Later they assumed jurisdiction over actions of debt, covenant, trespass, and such other matters as they could enforce by their decrees. These judicial functions of the guild merchant became well established, in some cases at least, as early as the twelfth or thirteenth century; and the merchants' courts exercised a large influence upon the economic and corporate growth of the municipalities where they existed both in England and on the Continent. These old courts disappeared with the disappearance of the guild merchant, which was superseded by the aggregate of the crafts, and their jurisdiction was taken over by the ordinary courts or by special merchants' courts in London and other trade centres, but the business customs that they recognized and helped to establish became the source of a large part of the mercantile law of to-day. See LAW MERCHANT, and consult the authorities there referred to.

MERCHANT'S TALE, THE. One of Chaucer's Canterbury tales. The story is the betrayal of an old husband by a young wife. Tyrwhitt thinks it was taken from a Latin fable by Adolphe of 1315, but the story with the incident of the pear tree is found in many sources. It forms the seventh of the "Fables of Alfonce," added by Caxton to his edition of Æsop, 1484, and is found in "Behar Damish," composed in 1650, though the story, evidently of Oriental origin, is far older. Boccaccio and Chaucer may have drawn it from the "Commedia Lydiæ." An account of these sources is found in the Chaucer Society publications under "Origins and Analogues" of the tales. Pope used the tale as a basis for his "January and May."

MERCIA, mēr'shȧ. An Anglo-Saxon kingdom which at first occupied the upper basin of the river Trent and later conquered most of the territory between the Humber and the Thames. It owed its origin to the fusion of many smaller states. The name Mercians signifies "men of the march," for they were settled along the moorlands, which for centuries remained the borderland between Angle and Welshman. The Kingdom was of little importance until the accession of Penda, c.626, who rapidly attained a supremacy over the other kingdoms after his victory over the powerful Edwin (q.v.), the Deiran King, at Hatfield (or Heathfield) in 633. Penda, however, was defeated c.655 and slain by the King of Northumberland at Winwaed, and for a time Mercian supremacy came to an end. It recovered gradually under Wulfhere (658–675), who was the first Christian King of Mercia, and attained its highest development in the eighth century, especially under Æthelbald (716–757) and Offa (757–796). After the death of the latter the Kingdom declined, and in 918 it was annexed to Wessex. Consult Green, *The Making of England* (New York, 1882). See HEPTARCHY.

MERCIÉ, mâr'syȧ', ANTONIN (1845–1916). A French sculptor and painter, born at Toulouse. He was a pupil of Jouffroy and Falguière and won the Prix de Rome in 1868. His "David Vainqueur" (1872) secured him admission to the Legion of Honor, and the fine patriotic group "Gloria Victis" (1874), now in the court of the Hôtel de Ville, Paris, established his reputation. Other celebrated works are the high-relief "The Genius of the Arts," for the so-called Guichet du Louvre; the group "Quand Même" (1882), at Belfort (replica in the Tuileries Gardens); the statues of Meissonier (Louvre Gardens) and William Tell (Lausanne); the tombs of Cabanel and Michelet in Père-Lachaise and of Louis Philippe in Dreux Cathedral; the figure "Remembrance" in the Luxembourg; the monument to Gounod for the Parc Monceau; Lee in Washington and Francis Scott Key in Baltimore. His best work combines technical skill, feeling, and a certain grandeur of conception, with rhythm, movement, and delicacy of sentiment. His busts are excellent, and he also achieved success as a painter in such canvases as "Venus" and "Sleeping Nymph" (Luxembourg). He was elected a member of the Institute in 1891.

MERCIER, mâr'syȧ', DESIRÉ JOSEPH, CARDINAL (1851–). A Belgian prelate of the Roman Catholic church. He was born at Braine-l'Alleud, Belgium; was educated at Malines and at Paris and Leipzig; became a priest in 1874; then taught philosophy at the lesser seminary in Malines from 1877 to 1882, when he was appointed to the chair in Aquinas' philosophy founded at Rome by Leo XIII. In 1906 he was

consecrated Archbishop of Malines and primate of Belgium, and in April, 1907, he was made Cardinal. He founded in 1894 and edited until 1906 the *Revue Néoscolastique*, and wrote in a scholastic manner on metaphysics, philosophy, and psychology, several of his works being translated into English, German, Italian, Polish, Spanish, etc. His most important book was *Les origines de la psychologie contemporaine* (1897). His position as Catholic primate of the country brought him into particular notice when Belgium was invaded in 1914 by the Germans. He was forbidden to leave the episcopal residence, and his Christmas pastoral letter, summing up Belgium's losses, preaching patriotism, praising England and blaming Germany, and advising his flock that they need not recognize German authority, was suppressed and the printer fined. For this letter consult the New York *Times*, Jan. 22, 1915.

MERCIER, HONORÉ (1840–94). A Canadian political leader. He was born at Ste. Athanase, Quebec; was educated at the Jesuit College, Montreal; studied law, and in 1865 was admitted to the Quebec bar. In 1862–64, as editor of *Le Courrier de Saint-Hyacinthe*, he for some time advocated Liberal principles, but he had no sympathy with the cause of Confederation, which in his opinion threatened the political security of French Canadians. He was in 1871 one of the founders of the Quebec Nationalists, organized for the aggressive assertion of French-Canadian racial and religious rights. He became Liberal member for Rouville in the House of Commons (1872–74); but in 1879 he entered Quebec politics, having been appointed Solicitor-General in the provincial administration. Though a Liberal, he later based his policy mainly upon an alliance with the Catholic hierarchy, and was ready to strengthen his party following by accessions from the Conservative and Nationalist ranks. The result was seen after he was elected in 1883 as Liberal leader in Quebec. In 1885 the execution of Louis Riel (q.v.), who had fomented a second rebellion in the Canadian Northwest, greatly excited the French Canadians, who looked upon Riel as a martyr; and Mercier gathered under his leadership all the disaffected sympathizers with the cause of the rebel leader. In 1886 he was successful in the provincial elections and in 1887 became Premier. For four years his administration was the storm centre of both Quebec and Dominion politics. In 1887 he passed a law incorporating the Jesuits, and in 1888 he enacted a measure compensating them for the confiscation of their estates. An agitation for the federal disallowance of this measure became widespread, but the vote in the House of Commons sustained Mercier as acting within provincial rights. In 1890 he was successful in the elections, in 1891 visited Europe, and the honor of Count of the Roman Empire was conferred upon him by Pope Leo XIII. After his return the same year charges of corruption in connection with the Baie de Chaleur Railway scandal were brought against him, and he was dismissed by the Lieutenant Governor. Brought to trial by the succeeding administration, he was found not guilty; but his political importance was lost and his health failed.

MERCIER, LOUIS CHARLES ANTOINE (1744–1812). A French engineer, born at Melun. He entered the French naval service about 1760, but at the outbreak of the American Revolution got permission to join the Patriot forces as a volunteer, and served under d'Estaing and Lafayette. At the close of the war he reëntered the French service, but during the Reign of Terror fled to Louisiana, where in 1803 Napoleon employed him to draw up plans for the protection of the Gulf coast. Later Mercier explored the country as far as Oregon and California. In 1808 he returned to France, where he published *Mémoire sur les vapeurs de l'atmosphère le long du cours du Mississippi* (1808); *Carte du bassin du Mississippi* (1808); *Système hydrographique de la Louisiane* (1809); *Carte du delta du Mississippi* (1810); *Etudes topographiques, géographiques, hydrographiques, géologiques et géodésiques sur la Louisiane* (1811); *Tableau du climat de la Louisiane, et de son influence sur les Européens et les Créoles* (1812).

MERCIER, LOUIS SÉBASTIEN (1740–1814). A French author, born in Paris. At first he wrote novels, some of which, especially *L'Homme sauvage* (1767), were widely read. After having written some dramas, which were severely criticized, he published an *Essai sur l'art dramatique* (1773), in which he contended that the dramas of Racine and Corneille had ceased to be of any interest to the French theatre. Mercier wished to see Diderot's theories realized on the boards; he wished to see life portrayed more faithfully. It was after a prolonged struggle that Mercier had the satisfaction of seeing his dramas, *L'Habitant de la Guadeloupe, La brouette du vinaigrier*, and *Le déserteur*, played on the Parisian stage, where they were enthusiastically received. In his essay *L'An 2440, rêve s'il fut jamais*, published in 1770, he sketches out a programme of political and social reforms. His *Tableau de Paris* (1781), in which the vices and lawlessness of the Parisian aristocracy are described, gave so much offense that he was compelled to leave France. His other books include: *Le nouveau Paris* (1800) and *Histoire de France depuis Clovis jusqu'au règne de Louis XVI* (1802). Mercier was a member of the Convention, in which he voted for the death of Louis XVI, and of the Council of Five Hundred.

MERCIER DE LA RIVIÈRE, mâr'syâ' de lâ rē'vyâr', PAUL PIERRE (1720–1794). A French economist. In 1758 he became Intendant of Martinique, where he incurred the hostility of the French trading and shipping interests through a liberal administration of the colonial commercial regulations. He returned to France in 1764 and published *L'Ordre naturel et essentiel des sociétés politiques*, pronounced by Adam Smith to be the best exposition of the doctrines of the Physiocrats. Economists of the present day see in this work little more than a loose, popular exposition of the doctrines of Quesnay and Mirabeau. At the time of its publication, however, it created a sensation and procured for its author an invitation to the court of Catharine II of Russia. Mercier's audience with Catharine proved a dismal failure; his pedantry and the abstract character of his political doctrines were utterly repellant to the Russian monarch. Upon his return to France Mercier collaborated with Quesnay, Du Pont, and other members of the school in an active propaganda for economic liberalism. He published numerous articles in the *Ephemerides du Citoyen*, and several books, none of which attracted popular attention or merited scientific consideration.

MERCK, mĕrk, JOHANN HEINRICH (1741–91). A German author and critic, born at Darmstadt and educated at Giessen. From 1768 he

lived in his native town as an army paymaster. His influence on German literature was the result of his critical ability, but chiefly through his early encouragement and intelligent criticism of Goethe, his intimate friendship with Herder, Wieland, Forster, and Lichtenberg, and the prominent part he took in Wieland's *Merkur*, the *Frankfurter gelehrte Anzeigen*, and Nicolai's *Allgemeine deutsche Bibliothek*. In business ventures and in his domestic relations he was unfortunate, his mind became affected, and in 1791 he committed suicide. His correspondence, printed at Darmstadt (1835–38) and at Leipzig (1848), and a selection from his critiques, edited by Stahr (1840), alone remain as evidences of his literary ability. Selections from his works and letters were published in two volumes (Leipzig, 1909). Consult Zimmermann, *Johann Heinrich Merck* (Frankfort, 1871), and Leo Grünstein, *Silhouetten aus der Goethezeit* (Vienna, 1909).

MERCŒUR, mĕr'kēr', Philippe Emmanuel de Lorraine, Duke de (1558–1602). A soldier and Roman Catholic leader in the French "wars of religion." He was the head of the younger branch of the house of Lorraine and cousin to the Guises. King Henry III and Mercœur married sisters, and the King made him Governor of Brittany (1582). The appointment was imprudent, for Mercœur's wife was descended from the ancient dukes of Brittany and Brittany was but newly attached to the French crown. After the murder of the Duke of Guise (1588) Mercœur passed into revolt, declared for the League, and soon proclaimed himself Governor of Brittany. The location and local patriotism of Brittany made it an important factor in the clash of international ambitions. The province was coveted by Philip II as a most valuable stopping place on the voyage from Spain to the Netherlands. For this and other reasons Henry IV was anxious to regain it, and Elizabeth of England was desirous of helping him. Hence, in the decade 1588–98, Spanish troops coöperated suspiciously and half-heartedly with Mercœur, while English troops aided Henry IV's commanders against the Duke and the Spaniards. Mercœur enjoyed the general support of the Bretons and clung to his place until Henry IV marched against him in person in 1598. Then, with the support of Gabrielle d'Estrées, Henry IV's mistress, he made most profitable terms, securing, according to Sully, an indemnity of 4,000,000 livres. His only daughter and heir was betrothed, and ultimately married, to the Duke of Vendôme, a son of Henry IV and Gabrielle, and to him was transferred the government of Brittany. Mercœur subsequently fought the Turks in Hungary, and died, on the way back, at Nuremberg. Consult: L. Grégoire, *La Ligue en Bretagne* (Nantes, 1856); Gaston de Carné, *Documents sur la Ligue en Bretagne: correspondance du duc de Mercœur* (2 vols., Rennes, 1900); Ernest Lavisse, *Histoire de France*, vol. vi, part i (Paris, 1904).

MER'CUR, James (1842–96). An American military engineer and writer. He was born at Towanda, Pa., and, after graduation at West Point, was promoted second lieutenant in the engineers' corps (1866) and first lieutenant (1867). He later became assistant engineer on the survey of the northern and northwestern lakes. In 1867–70 he was assistant professor of natural and experimental philosophy at West Point, and later was principal assistant in the same department (1870–72). He engaged in different river and harbor improvements, notably at Hell Gate (1876–81). He was promoted captain in 1875, was recorder of the board of engineers in connection with the works of Charleston harbor (1878–81), and supervised government engineering and survey work in North and South Carolina, Virginia, and New York (1881–84). In the latter year he was appointed professor of civil and military engineering at West Point, which position he held until his death. He revised and enlarged the treatise by Prof. Dennis Hart Mahan (q.v.) on *Permanent Fortification* (1887) and wrote *Elements of the Art of War* (1888); *Military Mines, Blasting, and Demolitions* (1892); *Attack of Fortified Places* (1895).

MERCU'RIC CHLORIDE, or Corrosive Sublimate, $HgCl_2$. One of the two known compounds of mercury and chlorine, the other, which contains a smaller proportion of chlorine, being described under Calomel. Mercuric chloride may be prepared by heating a mixture of mercuric sulphate (free from mercurous salt) and common salt with a small percentage of manganese dioxide, and collecting the sublimate in a suitable receiver. The manganese dioxide remains behind unchanged, its presence being desirable only in order to prevent the formation of calomel along with mercuric chloride. Pure mercuric chloride has a specific gravity of about 5.4; it melts at 288° C. (550° F.) and the liquid boils at 303° C. (577° F.). Corrosive sublimate is moderately and very slowly soluble in water, but is quite soluble in ordinary alcohol, which dissolves about one-third of its weight of the sublimate. With the chlorides of the alkali metals, with ammonium chloride, and with many other salts mercuric chloride forms double salts. With alcohols, ketones, aromatic nitro compounds, and especially with the alkaloids, it forms double compounds. Mercuric chloride is a violent poison, the symptoms of acute poisoning being painful gastrointestinal irritation, vomiting, and diarrhœa. A moderate amount of white of egg forms a good antidote. Besides, milk and flour should be given, and vomiting should be induced by mustard and lukewarm water, or by irritating the fauces. In small quantities mercuric chloride is administered internally, either by the mouth or hypodermatically, as a remedy for syphilis, mercury salts being especially valuable in the primary and secondary stages of the disease. Externally mercuric chloride is extensively used as an antiseptic and as an antiparasitic, the maximum strength of solutions thus employed being about one part of the sublimate to one thousand parts of water. It is one of the most powerful antiseptics known.

MERCURIC CYANIDE. See Hydrocyanic Acid.

MER'CUROUS CHLORIDE. See Calomel.

MER'CURY (Lat. *Mercurius*, Gk. Ἑρμείας, *Hermeias*, hence Ἑρμῆς, *Hermēs*, Doric Ἑρμᾶς, *Hermas*). The Latin name for one of the Olympian divinities of Greece and Rome, known to the Greeks as Hermes.

Greece. According to the common Greek legend Hermes was the son of Zeus and Maia, who bore him in a cave on Mount Cyllene in Arcadia. He was widely worshiped in Greece proper and on the Greek islands, in festivals known as *Hermœa*. Immediately after his birth he went forth and stole the cattle of Apollo (then serving King Admetus, q.v., on earth), dragging them backward to his cave. When accused he

stoutly denied the theft even before Zeus, and when convicted succeeded in pacifying his brother by the gift of the lyre, which he had been led to invent on the day of his birth from discovering outside his natal cave a tortoise shell in which only the dried sinews remained. In the *Odyssey* and later Hermes is the messenger of the gods—their herald (κῆρυξ), of supernatural swiftness, often with wings on his shoes and cap, and carrying a magic rod (the later caduceus, q.v.). With this rod he charms men to sleep and wakes them; he is thus able to conduct whom he will wherever he will, unseen of men. He also appears in the latest stages of epic poetry and throughout classical antiquity as Hermes Psychopompos, who conducts the souls of the dead to the lower world, where he intrusts them to Charon, who ferries them over the Styx. He was also the herdsman's god, being especially worshiped to secure increase of the flocks. And from this function perhaps arises connection with the ram and the calf, both of which are associated with him in cult and art. Travelers looked to him for guidance and help on their journeys, and traders venerated him as one who could increase their gains, for he was the god of good luck and "windfalls." He was also the patron of thieves; perhaps originally of cattle raiders. He was also honored in the palæstra and gymnasium, where his statues were erected, as the guardian and favorer of manly sports. In later times he appears frequently as a god of eloquence and persuasion.

Perhaps his most common appearance in the Greek world, certainly in Attica, was as the god of roads and boundaries. Square pillars, called *hermæ*, were common as guideposts and boundary marks. They usually bore the head of the god and a phallus, and on them, as a sacred place, food was sometimes left for needy wanderers. The pillar seems the essential and original sign of the god, and perhaps even earlier the god was present in cairns or heaps of stones, which were called *hermæa*. The worship of Hermes therefore shows a mixture of elements in which conceptions of a heavenly god are combined with worship of rude stones. The name has not been satisfactorily explained, for its etymological identity with *Sarameyas* or *Sarama*, the *dog* of the gods of Indian mythology, is by no means certain, and any other connection in the conceptions of Hermes and Sarameyas is hard to see. It is possible that ἕρμα, a "mound" or "cairn," is at the basis of the name, and that the pile of stones in the pasture or on the road is the dwelling place of the god who protects the herds and the wayfarer. Many of his functions, however, agree well with the theory of Roscher, that Hermes is a wind god. This explains his position as swift messenger of the gods, and as guide of the souls, for *wind* and *soul* are closely connected in the primitive conceptions. The variety and apparent lack of connection in his functions would find easy explanation in the union of divinities originally separate.

In art the types of Hermes show a marked change in the course of time. At first he is a bearded man, with the petasus, or broad-brimmed hat, winged shoes, and his herald's staff. Later the type becomes distinctly youthful and vigorous, sometimes with short-girded tunic and cloak, but with the figure often nude, or but lightly draped. The most famous extant statue of Hermes is the beautiful figure at Olympia, representing the god holding the infant Dionysus, the work of Praxiteles. See illustration 3 with POLYCLITUS. For Hermes Trismegistus, the Hermes identified with the Egyptian god Thoth, see the paragraph *Egypt*, below. Consult W. H. Roscher, *Hermes der Wind-Gott* (Leipzig, 1878); "Hermes," in W. H. Roscher, *Lexikon der grieschischen und römischen Mythologie*, vol. i (Leipzig, 1884–90); Gruppe, *Griechische Mythologie und Religionsgeschichte*, vol. ii (Munich, 1906); L. R. Farnell, *Cults of the Greek States*, vol. v (Oxford, 1909). See HERM.

Rome. Mercurius was brought to Rome from the Greeks of southern Italy, as the god of merchants and trade, and this always remained his character in the true Roman religion, as his attributes of the purse and caduceus plainly show. To him, in this respect, a temple was erected in Rome as early as 495 B.C. For Mercury as a god of trade (and its trickeries), consult especially Ovid, *Fasti*, v, 663–692. He was the god especially of the *mercatores*, or merchants engaged in transmarine commerce, and of the dealers in grain, but ultimately was patron of all who bought and sold. His main festival was celebrated annually on May 15, in the Circus Maximus, near the Aventine Hill. The literature of course presents him in all his varied Greek activities (consult, e.g., Horace, *Carmina*, i, 10), but these are absent for the most part from the inscriptions. As the Roman traders penetrated to the north they identified with their tutelary god the Celtic Esus, and even found grounds for regarding the Germanic Wotan as the same divinity. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and G. Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1909).

Egypt. Another divinity identified with Hermes was the Egyptian god Dhouti or Thoth—called Thout(h) or Thôt by Greek writers—and in this case the resemblance is more striking. Originally Thoth was the local god of Chmûnu, the Greek Hermopolis (q.v.), and is usually represented in the form of, or with the head of, an ibis. Before historic times, however, he had become a moon god, worshiped throughout Egypt, and he plays an important part in Egyptian mythology as the assistant of the sun god in his fight against hostile powers. (See HORUS.) He was the inventor of writing and the scribe of the gods. A euhemeristic Phœnician tale represents him as a man of ancient times, who invented letters and communicated his discovery to his King, Thamus. Thoth was the judge who decided between Osiris (or Horus) and Set, and he assisted as recorder at the judgment of the dead. (See DEAD, JUDGMENT OF THE.) He was the patron of learning and the inventor of all sciences, including especially astronomy and medicine. His sacred animals were the ibis and the cynocephalus. On Thoth as Hermes Trismegistus and on his writings, see HERMETIC.

Other Countries. According to Greek accounts, Taaut would seem to have been the Phœnician Hermes, the inventor of letters and sciences; but this is only a late importation of Egyptian ideas, as may be seen from the name of the deity and from the fact that he is called a son of Misor, or Egypt. Sumes, a name of obscure etymology, is given as the Punic name of Hermes. Among the Babylonians Nabû, the god of Borsippa, worshiped in the planet Mercury, corresponded to Hermes in many of his attributes. The later Arabs relate many fables

about Hermes, stating, e.g., that Hermes Trismegistus (see the paragraph *Egypt*, above) once lived at Calovaz in Chaldæa, but these stories are all worthless distortions of very late Greek traditions.

MERCURY. The planet nearest the sun. Its mean distance from the sun is 35,700,000 miles, its periodic time 88 days, its diameter 2770 miles, mass $\frac{1}{20}$ of the earth's; density 0.56, that of earth being unity. The eccentricity of its orbit is greater than that of any other major planet, being 0.20562, and consequently its greatest and least distances from the sun differ by nearly 15,000,000 miles; the inclination of the orbit to the ecliptic is 7° 0′ 1.4″. Since Mercury is an inferior planet it is seen alternately east and west of the sun, at an apparent angular distance never exceeding 29°, and its apparent motion in the orbit is at times retrograde. When a change in the apparent motion takes place it appears for a short time stationary. During the year Mercury is morning star in the east three times and evening star in the west three times. Owing to its nearness to the sun it is never above the horizon more than about two hours after sunset or the same time before sunrise. On this account, and from its small apparent size (5″ to 13″ angular diameter), it is seldom distinctly observable by the naked eye. It is said that Copernicus was never able to see it. It is very difficult to observe any markings on Mercury's surface, and there is consequently much doubt as to the period of revolution on its axis. In 1889 Schiaparelli (q.v.) announced that he had been able to fix this period at 88 days, in precise accord with the period of the planet's revolution around the sun. If this be correct (and it has received some confirmation from the observations of Lowell), Mercury always turns the same side towards the sun. This undecided question concerning the rotation time of Mercury is of much importance in theoretical astronomy. Like Venus, Mercury shows phases (q.v.) similar to those of the moon. On account of the great eccentricity of its orbit its longitudinal libration is much greater than that of the moon, amounting to 47°; consequently only three-eighths of the surface of the planet is always illuminated and three-eighths is always dark. See ASTRONOMY; PLANETS; SOLAR SYSTEM; TRANSIT OF VENUS.

MERCURY, or QUICKSILVER. A metallic element that has been known since ancient times. As early as 300 B.C. Theophrastus mentions "liquid silver," which he says is obtained by rubbing cinnabar with vinegar in a copper vessel. Dioscorides describes the production of mercury by subliming cinnabar with charcoal in an iron pot. Pliny gave it the name of *hydrargyrum* when so obtained, while native mercury he called *argentum vivum*. Mercury was extensively studied by the alchemists, who believed that it was one of the component parts of all metals, and they were familiar with the method of purifying it by distillation. Many of the alchemists and iatrochemists considered mercury a metal; but this was disputed, and even as late as 1735 some chemists contended that it was a semimetal. Not until 1759, when Braune found it possible to solidify it by exposure to a freezing mixture, was its metallic nature established beyond dispute.

Mercury is found in small quantities in the metallic state, but the sulphide *cinnabar* with 86.2 per cent mercury is the most common ore mineral. Silver and gold amalgam, *calomel* (HgCl), quicksilver oxide (*montroydite*), are found, and may be secondary minerals developed from the sulphide. Mercurial tetrahedrite is not uncommon, while primary minerals of rare occurrence include black telluride of quicksilver (*coloradoite*), the selenide (*tiemannite*), etc. Mercury ores are found in formations ranging from Ordovician to recent in age, and in many different kinds of rock, although igneous rocks are often more or less closely associated with the ore. The ores occur as veins, disseminations, or as irregular masses, with silica, calcite, and bitumen as commonly associated minerals. Although mercury ores are widely distributed, the main production comes from a few occurrences. In the United States the coast ranges of California contain a number of deposits, whose yield in the past has been considerable, while the more recently developed district of Terlingua, Texas, has contributed notably to the supply. In Europe long-productive deposits are known at Almaden, Spain, while the ore bodies of Tuscany and Vallalta-Sagron, Italy, and Idria, Austria, are also of importance. In 1913 the production of the different countries in metric tons was as follows: United States, 688; Spain, 1490; Austria-Hungary, 855; Italy, 988; Mexico and others, 150; total, 4171. Exports of quicksilver from the United States, which were one and a half million pounds in 1904, fell steadily to 1914 when they were 64,000 pounds.

Mercury (symbol, Hg; atomic weight, 200) is a silver-white liquid metal that solidifies at −39.5° C., and, while slightly volatile at ordinary temperatures, boils at 357° C. Its specific gravity at 0° C. (32° F.) is 13.59. Mercury is used chiefly in the manufacture of fulminate for explosive caps, of drugs, of electrical appliances and scientific apparatus, and to a lesser extent than formerly in the separation of gold and silver from their ores. A new use is the floating of lighthouse lights on a body of quicksilver. It dissolves and possibly combines chemically with nearly all of the metallic elements to form alloys termed "amalgams." (See AMALGAM.) With oxygen it forms two oxides. One of these, the *mercurous* oxide, is obtained by the action of caustic alkalies on mercurous salts. The other, the mercuric oxide, can be obtained either as a brick-red or a yellow substance. Careful heating of mercuric nitrate yields the red modification, while adding a solution of a mercuric salt to a solution of sodium or potassium hydroxide gives the yellow form. The mercuric oxide is used in medicine and as an oxidizing agent in chemical operations. Corresponding to the two oxides mercury forms two series of compounds, which are known as mercurous and mercuric salts. Among these one of the most important is the mercuric sulphide found native as cinnabar, and when prepared artificially is the red pigment known as vermilion (q.v.). The two chlorides are important commercial salts, and of these the mercurous chloride or *calomel* (q.v.) occurs native; the artificial product is used largely in medicine to correct torpidity of the liver. The mercuric chloride, or *corrosive sublimate*, finds extensive use in medicine as an antiseptic, and is extensively used for the preservation of skins and natural-history specimens. Mercuric ammonium chloride is a white powder that is extensively used in medicine, under the name of *white precipitate*, especially in the form of ointment. Metallic mercury and its salts are poisonous, and

chronic mercurial poisoning is common among those who habitually work with the metal. When taken internally, salivation, ulcers of the mucous membrane of the mouth, and ultimately paralysis, result. The usual antidotes are albumen, milk, and flour and water. See also Hydriodic Acid; Hydrocyanic Acid.

Metallurgy. Many mercury ores now worked may not contain more than 1 or 2 per cent of the metal. Practically the only ore which is regularly worked for mercury is cinnabar. Mercury may be extracted from cinnabar in several ways, but two methods only are used upon a large scale. They are (1) extraction by heating the ore in furnaces having a free supply of air, and (2) extraction by heating the ore with lime or iron in retorts, air being excluded. In both methods the chemical reactions take place at temperatures above the boiling point of mercury, so that the latter is volatilized and has to be condensed. Heating the cinnabar with access of air is a process performed in shaft, reverberatory, or shelf furnaces, and is preferred to methods using lime or iron, inasmuch as it is more economical and less dangerous to the workmen. The leading objection to this method is the dilution of the mercurial vapors by sulphur dioxide, oxygen, nitrogen, and the products of combustion. For these reasons it is rather difficult to condense the mercury, and therefore there are losses of the metal through incomplete condensation. On the other hand, where the mercury is extracted by heating the cinnabar with lime or iron in retorts, the mercurial vapors are in a condensed form because no air is allowed to enter the retorts. These vapors are condensed so that with a high grade of ore the output is somewhat greater than by the first process. On account of the greater expense of labor and fuel, and the unhealthfulness of the process, due to the escape of mercurial vapors in emptying the retorts, the process is less frequently employed.

Mercury is transported in wrought-iron flasks closed by a screw stopper, each flask holding about 76 pounds of metal. Sheepskin bags are also used for this purpose.

Bibliography. G. F. Becker, "Quicksilver Deposits of the Pacific Slope," in *United States Geological Survey, Monograph 13* (Washington, 1888); Egleston, *Metallurgy of Silver, Gold, and Mercury* (New York, 1890); C. Schnabel, *Handbook of Metallurgy* (ib., 1905–07); Heinrich Ries, *Economic Geology* (3d ed., ib., 1910); McCaskey, "Quicksilver," in *United States Geological Survey, Mineral Resources* (Washington, 1911); Waldemar Lindgren, *Mineral Deposits* (New York, 1913).

MERCURY, Dog's (*Mercurialis*). A small genus of plants of the family Euphorbiaceæ. The common dog's mercury (*Mercurialis perennis*), common in woods and shrubby places in Europe, has a simple stem about a foot high, rough ovate leaves, and axillary loose spikes of greenish flowers. It turns a glaucous black in drying. The root, which is very poisonous, contains two coloring substances, one blue and the other carmine. The mercury mentioned by some writers as a potherb is not this plant, but *Chenopodium bonus-henricus*. Annual dog's mercury (*Mercurialis annua*) is eaten in Germany as spinach. The three-seeded mercury is an allied plant, *Acalypha*, of which there are a number of species.

MERCURY, Medicinal Uses of. The 21 official preparations of hydrargyrum, or mercury, may be classified as follows: (1) *preparations of mercury*, including mercury with chalk, blue mass, mercurial ointment, and two plasters of mercury; (2) *the chlorides of mercury and their preparations*, including calomel, corrosive sublimate, and others; (3) *the oxides and their preparations*, including the red precipitate and others; (4) *the iodides and their preparations*, including the red iodide, the yellow iodide, and others; (5) *acid combinations and their preparations*, including the solution of mercuric nitrate and others; (6) *cyanide of mercury;* and (7) *the triturations.* Besides the official preparations the following unofficial preparations are well known: yellow solution of mercury (yellow wash), black lotion of mercury (black wash), and red ointment of mercuric nitrate (brown citrine ointment).

Mercury is purgative, alterative, and tonic, and promotes the flow of bile. Some of its preparations are corrosive, some are caustic, some are poisonous. In small quantities some of the mercurials are tonic, while in large or long-continued doses they cause poverty of the blood, diminishing the number of the red corpuscles, reducing nutrition, and impairing digestion, finally causing waste of tissue. Long-continued exhibition of mercury causes a cachectic condition termed hydrargyrism. Mercury stimulates glands to a production of an increased amount of secretion. Hydrargyrism, commonly called salivation from one of its symptoms, is recognized by a fœtid breath, swollen and spongy gums with a blue marginal line, sore mouth, swollen and tender tongue, excessive production of saliva, loss of appetite, diarrhœa, and fever.

Mercury is used in syphilis, tonsillitis, and other glandular affections, gastritis, dysentery, gastric ulcer, early cirrhosis of the liver, typhoid fever, diphtheria, Asiatic cholera, pneumonia, gastroenteric disturbances, conjunctivitis, enlarged thyroid, and enlarged spleen. Mercury, according to the modern view, is not curative of syphilis as is salvarsan (q.v.). In syphilis intensive medication has lately been tried by means of hypodermic injections, gray oil, salicylate of mercury as well as the benzoate and succinimide being used for this purpose.

Bichloride of mercury is very largely used as an antiseptic. It is irritant and corrosive, and in toxic doses causes severe gastrointestinal irritation, nausea, vomiting, suppression of urine, bloody diarrhœa, convulsions, and collapse. It is, however, a safe and valuable internal remedy in proper dosage. It is used locally as a parasiticide in a solution of 1 part in 250 parts of water, and as a general surgical antiseptic in a solution of 1 part to 1000 of water, or 1 to 2000, sometimes 1 part to 5000 of water. In these dilutions it is an efficient antiseptic for cleansing wounds, moistening gauze dressings, injecting into cavities, etc. See Antidote; Toxicology.

MERCURY, Wand of. See Divining Rod.

MERCURY FULMINATE. See Explosives.

MERCUTIO, mêr-kū′shĭō. A character in Shakespeare's *Romeo and Juliet*, the kinsman of the Prince of Verona and friend to Romeo. He is killed in a quarrel with Tybalt.

MERCY, Fathers of. A religious congregation of the Roman Catholic church founded by Jean-Baptiste Rauzan (1757–1847), a zealous French priest, at Lyons in 1808, later suppressed by Napoleon, and reëstablished in 1814. Its constitution was approved by the Pope in 1834, under the title of Society of the Priests of

Mercy. The members devoted themselves to mission preaching and works of charity. Monsignor De Forbin-Janson, Bishop of Nancy, brought two of them to America in 1839, and houses were established in New York and in St. Augustine, Fla. Shortly after they came to New York to take charge of the French Catholics, and still have charge of certain parishes in Manhattan and Brooklyn. In 1903 the mother house in Paris was closed by the government under the Associations Law, and the headquarters were accordingly transferred to Rome. Consult Delaporte, *Vie de Jean-Baptiste Rauzan* (Paris, 1857).

MERCY, Sisters of, or Order of Our Lady of Mercy. A Roman Catholic religious community founded in Dublin in 1827. They are of two classes, choir sisters and lay sisters, the choir sisters being occupied with the visitation of the sick and prisoners, the care of poor and virtuous girls, and other charities; the lay sisters being employed in the domestic occupations of the convent. Each community is independent of the rest of the order, being subject only to the bishops. The origin of the order was due to Miss Catherine McAuley, of Dublin, who, born of Roman Catholic parents and left an orphan, having been educated a Protestant, joined the Roman Catholic church and devoted her life and ample fortune to the service of the poor. The order has been introduced into many parts of Ireland, England, Scotland, and America. After a preliminary preparation of six months, candidates assume the white veil and become novices. The novitiate lasts two years. Their vows bind them to poverty, celibacy, obedience, and the care of the sick and poor. In the United States their first, now the mother, house was opened in Pittsburgh, Pa., in 1843, and they are now very widespread, numbering over 4700 sisters and having, in addition to schools, 53 hospitals and 67 orphanages. Consult Carroll, *Life of Catherine McAuley* (London, 1866), and *Leaves from the Annals of the Sisters of Mercy* (3 vols., New York, 1881).

MERCY SEAT. The ordinary translation of the Hebrew *Kapporeth* (Ex. xxv. 17 et seq.), signifying the "covering" of the Ark of the Covenant (q.v.).

MER DE GLACE, mâr de glâs (Fr., sea of ice). One of the largest and most interesting of the Alpine glaciers. It lies on the northern slope of Mont Blanc and is formed by the confluence of three branches known as the Glacier du Géant, the Glacier du Lechaud, and the Glacier du Talèfre. Its extreme length is about 9 miles, and in all it covers an area of 16 square miles. The rate of flow, compared with other glaciers of the Alps, is very rapid, the average advance during the summer and autumn months being about 2 feet per day. The Mer de Glace is noted for its beautiful scenery and is one of the favorite tourist resorts in the Alps. It is most easily reached from the village of Chamonix, near which it debouches into the valley as the Glacier des Blois and gives rise to the Arveyron River. See Glacier; Mont Blanc; and Illustration accompanying Chamonix.

MÉRÉ, Paul Louis. See Courier de Méré, P. L.

MER'EDITH, George (1828–1909). A distinguished English novelist and poet of mixed English, Irish, and Welsh descent. He was born in Portsmouth, Hampshire, the son of Augustus Armstrong Meredith, a naval outfitter, on Feb. 12, 1828. In his fourth year his mother died. He became a ward in chancery. He was educated at Portsmouth and Southsea, and at Neuheim on the Rhine; and he remained until he was sixteen in Germany—a land whose influence, especially through its poetry and music, is perceptible in his writings. On returning to England he studied law for a while, but soon abandoned it, as his literary genius began to make itself felt. His first published poem, "Chillian-Wallah," appeared when he was only 21, in *Chambers's Journal* (July, 1849), and he lived somewhat precariously for a number of years by journalistic work. He married, in 1849, Mrs. Nicholls, a daughter of Thomas Love Peacock (q.v.), and it was to Peacock that he dedicated his first volume, *Poems* (1851). From Mrs. Nicholls (died 1861) he separated, and in 1864 married Miss Vulliamy (died 1885). Original and unique as Meredith's novels are, it is possible to trace in them an inheritance from the dilettante, whimsical work of his father-in-law. After *The Shaving of Shagpat,* "an Arabian entertainment" (1855), and *Farina,* an imitation of a grotesque phase of German romanticism (1857), he published his first novel in 1859—strange as it now seems to associate the two dates, the year of the publication of George Eliot's first novel, *Adam Bede.* This book, *The Ordeal of Richard Feverel,* which many of his admirers think he has never surpassed, contains some of his most beautiful passages in its tender love episodes with their note of Celtic passion. *Evan Harrington* (1861) was a more purely humorous treatment of the psychological problems involved in the great question whether a tailor could be a gentleman. A year later appeared *Modern Love, and Poems of the English Roadside.* The splendid sonnet sequence, *Modern Love,* is now recognized as probably its author's highest and most durable achievement in the poetic form; but at the time it was severely criticized, especially by the *Spectator,* in which Swinburne replied with a fervid eulogy. Among the few accessible biographical data, the close association of three of the foremost writers of the century is worth mentioning; for a short time in 1863, after the first two had lost their wives, Meredith, Rossetti, and Swinburne shared a house in Cheyne Walk, Chelsea. *Emilia in England* (afterward called *Sandra Belloni*) came out in 1864, and the next year *Rhoda Fleming,* as a story the simplest and the best told from an artistic point of view—a savage onslaught on the idols of fatuous respectability, a digging down to the elemental and primitive passions. When the war between Austria and Italy broke out in 1866, Meredith, who had already done considerable work in journalism, went out as the correspondent of the *Morning Post.* He turned to good account the knowledge of Italy thus gained and his sympathy with Mazzini and the cause of Italian independence in his next book, *Vittoria,* a sequel to *Emilia in England* (1867). For some 30 years he acted as literary adviser to the publishing house of Chapman and Hall, and helped many a young author by his wise and kindly criticism. Thomas Hardy, in particular, has said that he would probably never have persevered in the path of literature without the encouragement which Meredith gave him when he submitted his first manuscript. Meanwhile Meredith was going on steadily with his own work. In 1871 he brought out *The Adventures of Harry Richmond,* a fascinating romantic

novel, which is recommended to beginners as easier reading than the metaphysical, subtle, enigmatic style of his later books. It had undoubtedly no small influence on younger writers, and the class of romantic stories at the head of which stands *Prince Otto* may be clearly derived from it. *Beauchamp's Career* (1876) is largely occupied with English politics. While standing aloof as usual from questions of actual detail, Meredith allowed his philosophic liberalism to be seen almost distinctly, though he did not declare for either side. *The Egoist* (1879) made a pitiless analysis of innate selfishness. In its central figure, Sir Willoughby Patterne, the complete egoist takes on final shape and becomes typical. In fact, it may be said of Meredith generally that, unlike most psychological novelists, he gives us a psychology of types, not of individuals. In 1880 came *The Tragic Comedians*, recounting in the guise of fiction a decisive episode in the life of Ferdinand Lassalle, the German Social Democrat; and in 1883 another volume of verse, *Poems and Lyrics of the Joy of Earth*. All this time, in spite of such a bulk of admirable work, and although recognized by an increasing number of cultivated people, Meredith had remained strangely unknown to the public at large—in this like Browning, with whom in many ways his genius had strong affinities. The publication of *Diana of the Crossways* (1885), partly, perhaps, because its central episode bore a strong resemblance to an actual occurrence in English political life of a generation earlier, made a general impression and drew attention to work Meredith had done a quarter of a century earlier. From this time he came more and more to be recognized as the head of the profession of letters in England. He was elected president of the British Society of Authors on the death of Tennyson in 1892; and his appearance as the guest of honor at the meeting of the Omar Khayyam Club (an organization including many of the best-known men of letters) in 1895 was an event of singular interest, from the universal homage paid to him, as well as from the fact that he then made what he called his first public speech. On his seventieth and eightieth birthdays he was presented with congratulatory addresses, signed by the most prominent English writers of the day, and in 1905 he received the Order of Merit from Edward VII. He died May 18, 1909. A memorial service for him was held in Westminster Abbey, but he was not buried there, despite a widespread desire and a petition sanctioned by the Prime Minister, Asquith. His body was cremated and the ashes placed beside his second wife's grave at Dorking. Four more novels remain to be mentioned: *One of Our Conquerors* (1891), *Lord Ormont and his Aminta* (1894), *The Amazing Marriage* (1895), and the early but unfinished and posthumously published *Celt and Saxon* (1910), as well as notable volumes of verse—*Ballads and Poems of Tragic Life* (1887), *A Reading of Earth* (1888), *The Empty Purse* (1892), *Odes in Contribution to the Song of French History* (1898), *A Reading of Life* (1901), and *Last Poems* (1910), published after his death. His poems, like his novels, will probably never be popular; and for the same reason, that they require too much thought on the part of the reader. Yet as a poet he has many remarkable achievements to his credit, and none more signal than the expression of a perfect understanding of nature—nature as she is in herself, not, as with Byron and so many others, the mere reflex of the poet's temperament and moods. A comedy, *The Sentimentalists*, which was presented in 1910, may also be mentioned here.

Meredith's fiction is characteristic of an age of analysis and introspection, when every art must take account of the results of psychology and metaphysics. He is before all things a student of life. His attitude, as illuminated by the *Essay on Comedy* (1877), is not unlike that of his own Adrian Harley in *Feverel;* with an amused but not unkindly cynicism he stands off and watches his characters act on each other as deliberately, as inevitably, and often through situations as apparently unimportant as in life. He shows us the progress from act to act of dramas subtly philosophical, in the manner of *Hamlet*. We are reminded of Shakespeare again as we think of one of Meredith's strongest points—his gallery of fair women, types of the best in their age, for parallels to which we are driven to recur to Beatrice and Rosalind and Portia.

His style is frequently obscure—not because he cannot write simply, for (like Browning again) he can give us "English as ripe and sound and unaffected as the heart could wish." His aim, however, is not simplicity; it is to pack as much thought as possible into a phrase, to say only what is worth saying, and to say it in terms charged to the fullest with significance. The final verdict of his contemporaries, slowly though it was reached, is justified by his unquestioned intellectual eminence.

Bibliography. The Memorial Edition (London, 1910) of Meredith's complete works is the best, for the Authorized Edition (London, 1897) contains only the works as revised—with excisions—by the author. The former, while giving the revised text, includes the excisions separately for those who desire them. To many good judges the novels in their earlier and unrevised forms are superior to the later revised versions. Not included in his collected works may be mentioned *Up to Midnight: A Series of Dialogues . . . now Reprinted for the First Time* (Boston, 1913), which may have its interest for Meredithians. Consult: Richard Le Gallienne, *George Meredith: Some Characteristics* (London, 1890), which contains a careful bibliography; essays by W. E. Henley, in *Views and Reviews* (ib., 1890), and by W. C. Brownell, in *Victorian Prose Masters* (New York, 1901); W. L. Cross, *The Development of the English Novel* (new ed., ib., 1905); M. W. Abbott, *Browning and Meredith: Some Points of Similarity* (Boston, 1904); P. E. More, "Novels of George Meredith," in *Shelburne Essays* (2d series, New York, 1905); M. S. Henderson, *George Meredith* (London, 1908), valuable; J. A. Hammerton, *George Meredith in Anecdote and Criticism* (ib., 1909); J. W. Beach, *The Comic Spirit in George Meredith: An Interpretation* (New York, 1911); A. M. Trevelyan, *Poetry and Philosophy of Meredith* (ib., 1912); William Sharp, in *Papers, Critical and Reminiscent* (ib., 1912); *Letters of Meredith* (2 vols., ib., 1912), edited by his son.

MEREDITH, Louisa Anne (née Twamley) (1812–95). An Australian writer, born at Birmingham, England. Chiefly educated by her accomplished mother, at an early age she wrote verse and practiced art with success. In 1833 she published an octavo volume of *Poems with Illustrations*. She continued to write, and in 1839 married her cousin, Charles Meredith, and accompanied him on his return to Australia.

Her *Notes and Sketches of New South Wales* was followed by *My Home in Tasmania* and many other notable works. In 1860 appeared *Some of my Bush Friends in Tasmania*, a large and elaborate work on the flora of the colony. Poems and novels followed. The Tasmanian government granted her a pension of £100 a year. She received numerous prize medals for botanical drawings of Tasmanian subjects, at the exhibitions of London, Melbourne, Sydney, and Calcutta. Her first volume of verse appeared in 1833, and her last, *Grandmama's Verse-Book for Young Australia*, in 1878.

MEREDITH, Owen. The pseudonym of Lord Lytton. See Lytton, Edward Robert Bulwer.

MEREDITH, Solomon (1810–75). An American soldier and politician, born in Guilford Co., N. C. He removed to Indiana in 1830, was sheriff of Wayne County (1834 and 1836) and member of the Legislature (1846–48 and 1854–56), and upon the outbreak of the Civil War he was made colonel of the Sixty-ninth Indiana Volunteers. He participated in many of the most desperate battles fought by the Army of the Potomac and became the commander of the famous Iron Brigade. He fought at Gainesville, Chancellorsville, and Gettysburg. At the close of the war he was retired with the brevet rank of major general of volunteers. He was deeply interested in scientific agriculture and introduced several improvements.

MEREDITH, Sir William Ralph (1840–). A Canadian jurist and politician, born in Middlesex Co., Ontario, of Irish descent. He was educated in London, Ontario, and at Toronto University, studied law, and was called to the bar in 1861. He practiced his profession for many years in London, and in 1888 removed to Toronto. In 1872 he was elected a Conservative member of the Ontario Legislature, and in 1878 became leader of the Conservative Opposition therein, a position which he retained until 1894, when he was appointed Chief Justice of the Court of Common Pleas. In 1895 he was made a senator, and in 1900 chancellor, of Toronto University; this office he held for more than 14 years. In 1912 he became Chief Justice of Ontario. He was knighted in 1896. He manifested remarkable ability both as a lawyer and parliamentarian and was identified with much useful and progressive legislation, especially in behalf of workingmen. He was a member of the commissions for the revision of the provincial statutes (1896 and 1906), for investigating the affairs of Toronto University (1905), and upon laws relating to the liability of employers (1910).

MERES, mērz, Francis (1565–1647). An English author and divine. He was educated at Pembroke College, Cambridge, graduating B.A. in 1587 and M.A. in 1591. By 1597 he was living in London, where he gained an intimate knowledge of contemporary literature. In 1602 he became rector of Wing in Rutland and subsequently opened a school. He died at Wing, Jan. 29, 1647. His *Palladis Tamia, Wits Treasury* (1598) gives an account of Marlowe's death and an estimate of Shakespeare. After mentioning 12 of Shakespeare's plays and the "sugred sonnets among his private friends," Meres says, "The muses would speak Shakespeare's fine filed phrase, if they could speak English." The important sections dealing with Elizabethan literature were reprinted in *Shakspere Allusion Books*, New Shakespere Society (London, 1874), and by Arber in the *English Garner*, vol. ii (London, 1879).

MERETRIX, mĕr'ĕ-trĭks. See Hetæræ.

MEREZHKOVSKY, mĕ'rĕsh-kôf'skĭ, Dmitry Sergeyevitch (1865–). A Russian poet, novelist, and critic. He was born and educated at St. Petersburg. He published his first volume of verse in 1888. This was followed by two other collections, after which the author forsook poetry for prose. He made his début as a literary critic with an essay entitled "The Causes of Decadence in Modern Russian Literature" (1893), which attracted considerable attention. When he published his scholarly and comprehensive studies, *Tolstoy and Dostoyevsky as Men and as Artists* (1901) and *The Religion of Tolstoy and Dostoyevsky* (1902), his reputation as a critic was firmly established. Then came his trilogy of historical novels dealing with the great conflict of Christianity and paganism. The series is entitled *Christ and Antichrist* and the separate volumes are variously known as *The Death of the Gods, or Julian the Apostate* (1901); *The Resurrection of the Gods, or Leonardo da Vinci* (1902); and *Peter and Alexis* (1905). Some idea of the nature and magnitude of this work may be had from the fact that its author spent 12 years in its preparation, which involved extensive travel. The entire series, as well as his studies of Tolstoy and Dostoyevsky, may be had in English and other languages. Mention should be made also of his dramas *Paul I* (1908) and *Alexander I* (2 vols., 1913). His other work includes much critical writing and translations of classic drama. His collected works, published at St. Petersburg in 1911–12, number 15 volumes. Consult Persky, *Contemporary Russian Novelists* (Boston, 1913).

MERGAN'SER (Neo-Lat., from Lat. *mergus*, diver + *anser*, goose). A small subfamily of ducks, Merginæ, having a slender, straight, much compressed bill, hooked at the tip and notched at the edges, almost as if furnished with teeth. Their other anatomical peculiarities are like those of the sea ducks. They feed largely upon fish, which they are said to pursue and capture under water. Most of the species have little food value, but the hooded merganser (*Lophodytes cucullatus*) is said to feed upon roots and seeds and is thus a palatable table duck. The males are black and white, with a large, circular crest, giving them a peculiar and striking appearance; the adult female also has a crest, but it is small, grayish brown, tinged with cinnamon. (See Plate of North American Wild Ducks in article Duck.) The hooded merganser is the smallest of the North American species, only 1½ feet in length. The other two species, the goosander (*Merganser*, or *Mergus, americanus*) and the red-breasted merganser or sheldrake (*Merganser*, or *Mergus, serrator*), are nearly or quite 2 feet long, and have no true crest, though the feathers of the crown may be somewhat lengthened. The hooded and red-breasted mergansers are found in nearly all parts of the Northern Hemisphere, while the goosander is replaced in Europe by a very closely allied species (*Merganser*, or *Mergus, merganser*). All of these species breed in the northern portions of their range and winter southward almost to the tropics. About half a dozen other mergansers are known, one or two of which are South American.

MER'GER. 1. In the law of real property, the union of a lesser with a greater estate in the

same property in the same person, with the result that the lesser estate is obliterated by the larger estate. Thus, if one is a tenant for years or for life of real estate, and the estate of his landlord or the reversioner in fee comes to him either by descent or purchase, the tenancy is merged in the larger estate and the tenant becomes owner in fee. If, however, there be an intermediate estate, merger is prevented. Thus, if one be in possession of property as tenant for years, with remainder to another for life, and remainder to a third in fee, there will be no merger if the fee remainderman convey his estate to the tenant for years; but if the owner of the life estate convey to the tenant for years, or vice versa, the tenancy for years will merge in the life estate. Courts of equity will in many cases, where justice requires it, in effect prevent merger by compelling the owner of the estate to hold the property as though the two estates were distinct. Thus, for example, if a tenant of real estate in his own right purchased the reversion as trustee for another, a court of equity would compel him to continue to collect the rents from himself as tenant and to account to the beneficiary for them as trustee of the reversion. In the same manner when the legal estate in property becomes vested in one having an equitable claim with reference to the property, or an equitable estate as it is sometimes called, the equitable becomes merged in the legal estate and so disappears, unless kept alive for the purpose of furthering justice, when equity will treat the two interests as distinct notwithstanding the merger. Consult the authorities referred to under TRUSTS; MORTGAGE.

2. In the law of contracts, the acceptance of a higher security or obligation in lieu of a lower extinguishes the lower. Thus, rights upon contract are merged in a judgment secured in an action upon the contract. A simple debt merges in a promissory note given in its stead, and both merge into a bond or obligation under seal given in their place.

3. In the criminal law, the inclusion of a lesser crime in a greater and the sinking of private wrongs in public wrongs or crimes. Many greater crimes include lesser crimes, as an assault in committing robbery or homicide. The state may prosecute and punish either the greater or the lesser offense, but of course not both, since that would be putting a man twice in jeopardy for the lesser offense. In England, where criminal prosecutions are usually conducted by private persons, whenever a tort, as an assault or a libel, is also a crime, the private wrong is postponed to or merged in the public wrong, so that the injured party has no private remedy until after the conviction and punishment of the criminal. This does not generally hold in the United States, however. Consult the authorities under TORT.

4. The consolidation of the control of two or more corporations in a single corporation by the device of issuing the stock of the new corporation, known as the holding company, in exchange for a majority of the stock of the several corporations to be controlled. The several corporations to be controlled are then said to be merged in the single corporation holding their stock. The United States Supreme Court decided that the Northern Securities Company formed to hold the stock of the Great Northern and Northern Pacific Railway companies was an illegal combination in restraint of interstate commerce. See RESTRAINT OF TRADE, CONTRACTS IN; SHERMAN ACT.

MERGUI, mĕr-gē'. The capital of the Mergui Archipelago (q.v.).

MERGUI ARCHIPELAGO. A group of islands in the Bay of Bengal, along the coast of the Tenasserim division of Lower Burma, of which they form a part (Map: Burma, C 4). The islands, numbering about 800, are rocky and mountainous, some of them rising to 3000 feet above sea level, and are noted for their varied and picturesque scenery. The largest, King Island, has permanent habitations, but the others are inhabited by a race called Salons, or sea gypsies, who rove from island to island and subsist mainly by pearl fishing and collecting and selling edible birds' nests. Tin mines are worked in the south. Area of district, 9789 square miles; pop., 1901, 88,744; 1911, 111,424. Mergui, the capital of the district, with a heterogeneous population of 11,987 in 1901 and 14,889 in 1911, is situated on an island at the chief outlet of the Tenasserim River in the Bay of Bengal. It has an average rainfall of 103 inches. It is the centre of a pearl-fishing industry of considerable importance.

MERIAN, mā'rē-ân, MARIA SIBYLLA (1647–1717). A German painter and naturalist, born in Frankfort-on-the-Main, daughter of the engraver Matthäus Merian. She studied under Mignon and in 1665 married Johann Andreas Graff, a painter, and removed to Nuremberg. Though she was skillful in painting fruits and flowers, her taste led her particularly to natural history. Her exquisite taste, as well as the great precision which characterized her artistic work in botany and entomology, gained for her a high reputation in the scientific world of the time. In 1679 she published an excellent work on caterpillars, entitled *Erucarum Ortus, Alimentum et Paradoxa Metamorphosis.* In 1698 she went to South America and devoted herself to research on the natural history of Dutch Guiana, the result of which appeared in her *Metamorphosis Insectorum Surinamensium* (1705). There are two volumes of her drawings in the British Museum, one of the insects of Europe, the other of those of Dutch Guiana. There are collections in St. Petersburg, Amsterdam, and Frankfort.

MERIAN, MATTHÄUS, called THE ELDER (1593–1650). A Swiss engraver. He was born at Basel, studied under Dietrich Meyer, of Zurich, and afterward lived in Paris and Frankfort. He began in 1640 the famous Zeiller's *Topographia,* presenting perspective views of European cities, towns, and castles which were drawn, engraved, and described by himself. The work, which is regarded as extremely valuable, was continued after his death. For his biography, consult Eckardt (Basel, 1887).

MERICI, SAINT ANGELA. See ANGELA MERICI, SAINT.

MÉRICOURT, THÉROIGNE DE. See THÉROIGNE DE MÉRICOURT.

MÉRIDA, mā'rē-dȧ. The capital of the State of Mérida, Venezuela, situated about 60 miles south of Lake Maracaibo, on a plateau 5500 feet above sea level (Map: Colombia, C 2). It has a cool, moist climate, with an average temperature of 64.5° F. It has a cathedral and is the seat of one of the two universities of the Republic. Its chief manufactures are carpets, cotton and woolen goods; it exports coffee and preserved

fruits. Pop., municipal, 1891, 13,366; 1913 (est.), 16,000. Mérida was founded in 1558 by Juan Rodriguez Saurez. It has suffered much from earthquakes, notably in 1812 and 1894.

MÉRIDA. The capital of Yucatan, Mexico, situated on a barren plain in the northwestern part of the peninsula, 25 miles from the Gulf of Mexico (Map: Mexico, O 7). The town is regularly built, with fine streets, squares, and parks, and has a university, a cathedral completed in 1598, a government palace, a museum, various secondary schools, and a hospital. Among its manufactures are straw hats, cotton goods, soap, and leather, while great quantities of sisal grass are exported from here to the United States, as well as brandy, sugar, hides, indigo, and salt. Pop., 1910, 62,447. Mérida was founded in 1542 by Francisco Montejo, who was the conqueror of Yucatan.

MÉRIDA. A small town of southwest Spain, in the Province of Badajoz, situated on the right bank of the Guadiana, 30 miles east of Badajoz (Map: Spain, B 3). It is now an insignificant town, but contains numerous evidences of its ancient greatness. Among these are the remains of the Roman walls with five gates still preserved, a triumphal arch erected by Trajan, the ruins of an amphitheatre and of a Roman circus built to accommodate 20,000 spectators, some remains of a temple of Diana, and parts of an old reservoir and of two Roman aqueducts, as well as numerous columns, statues, and minor ruins. There is also a magnificent Roman stone bridge crossing the Guadiana by 64 arches and nearly half a mile long. Mérida was founded as a colony for Roman veterans (*emeriti*), and called *Augusta Emerita*, whence the present name is derived. It was made the capital of the Province of Lusitania, and later became the seat of the Visigothic archbishops. It remained an important town during the time of the Moorish domination until it was captured by Alfonso IX in 1228. Pop., 1900, 9124; 1910, 14,633.

MER'IDEN. A city in New Haven Co., Conn., 19 miles north-northeast of New Haven and 18 miles south-southwest of Hartford, on the New York, New Haven, and Hartford Railroad (Map: Connecticut, D 3). It is picturesquely situated, overlooked by the Hanging Hills on the northwest, and is drained by Harbor Brook. Meriden is one of the most prosperous industrial centres in New England. Among its manufactures are silver and plated ware, hardware, cutlery, steel pens, bronzes, brass castings, firearms, organs, self-playing attachments for pianos and organs, glassware, cut glass, curtain fixtures, electrical goods, gas, electric, and kerosene fixtures, screws, vises, and machinery. The city has the Connecticut School for Boys (reform), Meriden Hospital, Curtis Home for Orphan Children and Aged Women, a fine armory, and the handsome Curtis Memorial Library. Hubbard Park is a beautiful natural reservation of 900 acres, within the limits of which are the Hanging Hills, the highest point rising 1000 feet above sea level. Other attractions are Lake Merimere and Castle Craig.

The government, under a charter of 1897, is vested in a mayor, elected every two years, a bicameral council, and administrative officials, appointed or elected as follows: by the mayor—boards of apportionment and taxation, public works, and police, fire, and park commissioners; by the council—tax collector, plumbing inspector, fire marshal, boiler inspector, health officer, and board of compensation; by the people—clerk, treasurer, auditor, and sheriffs. The city owns and operates its water works. Pop., 1900, 24,296; 1910, 27,265; 1914, 28,528; 1920, 29,842. The city is included in the township of Meriden, the population of which in 1920 was 34,739. From 1725 until incorporated in 1806 as a town under its present name Meriden was a parish of Wallingford. In 1867 it was chartered as a city. Consult Perkins, *Historical Sketches of Meriden* (West Meriden, 1849), and G. M. Curtiss, *Century of Meriden* (Meriden, 1906).

MERID'IAN (Lat. *meridianus*, relating to midday, from *meridies*, for **medidies*, midday, from *medius*, middle + *dies*, day). Any great circle of a sphere passing through its poles. A *terrestrial* meridian is the intersection of the earth's surface made by a plane passing through the poles. The *prime* meridian is the one from which longitude is measured. The *celestial* meridian of any place on the surface of the earth is the great circle of the celestial sphere passing through the zenith and the celestial poles. The *magnetic* meridian at any point is the horizontal direction at the point of a freely suspended compass needle undisturbed by influences other than the earth's magnetic force. To distinguish the terrestrial or geographical meridian from the magnetic, the former is called the *true* meridian, as its direction is that of true north or south. It is evident from the explanation given that the so-called *magnetic* meridian is not a great circle of the earth, but merely a *direction* at a particular point. The lines joining the points of equal variation are not therefore coincident with the magnetic meridian; they are called isogonic lines, and, owing to the nonuniform character of the earth's magnetic force, these lines are very irregular curves. See MERIDIAN CIRCLE; MERIDIAN MEASUREMENT.

MERIDIAN. A city and the county seat of Lauderdale Co., Miss., 96 miles east of Jackson, on the Alabama and Vicksburg, the Alabama Great Southern, the Meridian and Memphis, the New Orleans and Northeastern, the Southern, and the Mobile and Ohio railroads (Map: Mississippi, H 6). It is the seat of the Meridian Female College (Methodist Episcopal), opened in 1869, the Meridian Male College, the Meridian Academy (Methodist Episcopal South), and Lincoln School (Congregational), the last two for colored students, and has the East Mississippi Insane Hospital, a Carnegie library, and fine courthouse and high-school buildings. The city has an extensive trade and is the most important manufacturing centre in the State. Its industries, represented by railroad machine shops, cotton, cottonseed-oil, and hosiery mills, lumber mills, mattress, broom, fertilizer, and harness factories, wagon works, stave mills, foundries, etc., had, in 1909, a production valued at more than $4,000,000. The city adopted the commission form of government in 1912. The water works, owned by the municipality, are valued at $700,000. In March, 1906, a tornado destroyed a large portion of the business district. Meridian was an important Confederate railway centre during the Civil War, and in February, 1864, General Sherman was sent against it. Arriving on the 14th, he remained unmolested until the 20th, destroying the railroads in the vicinity, also the large storehouses and many residences. Pop., 1900, 14,050; 1910, 23,285; 1914 (U. S. est.), 21,806; 1920, 23,399.

MERIDIAN CIRCLE. An instrument used for determining the meridian altitude or zenith distance of a star. It consists of an astronomical telescope firmly fixed to a graduated circle, which moves about a horizontal axis, resting on a pair of very solid supports. In the common focus of the eyepiece and object glass of the telescope is a system of fixed cross wires (spider lines are generally used for the purpose), one being horizontal and five or more vertical, with equal spaces between. An imaginary line passing through the optical centre of the object glass and the intersection of the horizontal and middle vertical wires is called the line of collimation of the telescope, and, when the instrument is in perfect adjustment, this line moves in the plane of the meridian. Besides the above-mentioned fixed wires there is a movable one, called a micrometer wire, which is moved by means of a screw, remaining always parallel to the fixed horizontal wire. If the instrument is in perfect adjustment, and if the image of a star, while passing across the middle vertical wire in the field of view, is at the same time bisected by the fixed horizontal wire, the star is at that moment in the line of collimation of the telescope. It is therefore at that moment in the meridian, and its meridian zenith distance is the angle through which the circle would have been turned from the position it had when the line of collimation of the telescope pointed to the zenith. There is a fixed pointer, for the purpose of approximately reading the instrument. If the instrument was adjusted so that the pointer was opposite the zero point of the circle, when the line of collimation of the telescope pointed to the zenith, the arc measured on the circle between these two positions of the instrument is the meridian zenith distance of the star.

Great nicety is required in reading the instrument, i.e., in determining exactly the arc through which the circle has moved in bringing the telescope from the vertical to any other position. The rim is usually graduated at intervals of five minutes; and the eye could determine only the division nearest to the fixed index. But by means of a reading microscope or micrometer (q.v.), fixed opposite to the rim, the portion of the interval to the nearest division on the rim can be read to seconds. There are sometimes six such microscopes fixed opposite different points of the rim; and the reading of the instrument is the mean of the readings of all the microscopes. This tends to eliminate errors arising from imperfect graduation and errors of observation. If the instrument is properly adjusted, the zero point of the circle will be opposite the fixed pointer when the line of collimation of the telescope points to the zenith. In practice, however, this is not always accurately, or even approximately, the case, and is really of no consequence, as the final result of every observation is the difference between two readings. It is evident that the difference between any two readings of the instrument will represent the angle through which the line of collimation of the telescope moves in passing from one position to the other. It remains to show how a fixed point, viz., the nadir (q.v.), is observed, and then how an observation is taken of the star itself on its meridian passage. It must be explained here that the fixed horizontal wire in the eyepiece of the telescope, in the instrument as now used, is only an imaginary line which determines the line of collimation of the telescope. It coincides with the position of the micrometer wire when the screw head of the micrometer marks zero.

To observe the nadir, a trough of mercury is placed underneath the instrument and the telescope is turned so as to look vertically downward into it. An image of the system of cross wires which is in the common focus of the object glass and eyepiece will be reflected back again to nearly the same focus. Looking into the telescope, the observer now adjusts it by means of a slow-motion screw till the reflected image of the horizontal wire coincides with the real one. The final adjustment is perhaps most delicately effected by turning the screw head of the micrometer, which moves the wire itself. When they coincide the line joining the centre of the object glass of the telescope with the intersection between the middle vertical and horizontal micrometric wires will be vertical. For that position of the movable wire the circle now gives the exact nadir reading, which differs by 180° from the true zenith reading.

Again, to observe a star in the meridian, the instrument is previously adjusted so that the star, in passing the meridian, shall pass over the field of view of the telescope. As the image of the star approaches the centre of the field the observer adjusts the telescope by the slow-motion screw, so as to bring the image of the star very nearly to the horizontal wire. Finally, just as the star passes the middle vertical wire, he bisects the image of the star with the horizontal wire by a touch of the micrometer screw head. The circle being now clamped, the reading is determined as before by reading the pointer and microscopes and adding or subtracting, as the case may be, the reading of the micrometer. This reading now subtracted from the zenith reading gives the meridian zenith distance of the star; and this, again, subtracted from 90°, gives its meridian altitude above the horizon. See TRANSIT INSTRUMENT.

MERIDIAN MEASUREMENT. The determination of the form and size of the earth from the measurement of a meridional arc has been a favorite problem with mathematicians from the earliest times, but up to the middle of the eighteenth century their operations were not carried on with exactness sufficient to render their conclusions of much value. Since that time, however, geodesy has progressed so rapidly, owing to the invention of more accurate instruments and the discovery of new methods, that the measurement of the meridian can now be performed with very high precision. The modus operandi is as follows: two stations, having nearly the same longitude, are chosen; their latitude and longitude are accurately determined (the error of a single second in latitude introduces a considerable error into the result) and the direction of the meridian to be measured ascertained; then a base line is measured with the greatest accuracy, as an error here generally becomes increased at every subsequent step; and then, by the method known as triangulation (q.v.), the length of the arc of the meridian contained between the parallels of latitude of the two stations is ascertained. As the previously found latitudes of its two extremities give the number of degrees it contains, the average length of a degree of this arc can be at once determined and also, on certain assumptions as to the earth's form, the length of the whole meridional circumference of the earth. This operation of meridian measurement has been

performed at different times on a great many arcs lying between lat. 68° N. and lat. 38° S., and the results show a steady though irregular increase in the length of the degree of latitude as the latitude increases. On the supposition that the law of increase holds good to the poles the length of every tenth degree of latitude up to 70° is as follows:

DEGREE OF LATITUDE	Length of degree in English feet
0°	362,756
10°	362,868
20°	363,188
30°	363,679
40°	364,284
50°	364,929
60°	365,536
70°	366,033

This table is calculated on the theory that the earth is not spherical, as in that case the length of all degrees of latitude would be alike, but of a more or less spheroidal form, i.e., having its curvature becoming less and less as we go from the extremity of its greater or equatorial diameter to the lesser or polar axis. See EARTH; DEGREE OF LATITUDE.

Meridional Parts. In preparing a chart (q.v.) upon Mercator's projection, in order to preserve the relative proportion between the lengths of meridians and parallels at any point the former must be increased in length. The lengths of small portions of the meridians thus increased are called *meridional parts*, and tables giving the lengths at different latitudes are prepared for use in constructing charts.

MERIGI DA CARAVAGGIO. See CARAVAGGIO, MICHELANGELO MERISI DA.

MÉRIMÉE, mā'rē'mā', PROSPER (1803–70). A French novelist, historian, dramatist, and critic, born in Paris, Sept. 28, 1803. He studied law, which he never practiced; he held various offices in the civil service, became, in 1831, inspector of archæological and historical monuments of France, an Academician in 1844, and a Senator of the Empire in 1853. His reports of professional researches were the basis of four volumes: *Dans le midi de la France* (1835); *Dans l'Ouest* (1836); *En Auvergne et Limousin* (1838); *En Corse* (1840). To archæology he contributed also *Monuments historiques* (1843); *Peintures de l'Eglise Saint-Savin* (1844); and to history a monograph on *Don Pedro de Castille* (1843), *Les faux Démétrius* (1854), and a volume of miscellaneous *Essais* (1855). He is best known, however, for his fiction, narrative and dramatic, *Théâtre de Clara Gazul* (1825), a pretended translation from the Spanish and an ironical toying with romanticism; *La Guzla* (1827), a pretended translation of Illyrian songs; *La Jacquerie* (1828), dramatic scenes from the Peasants' War of 1358; a similar but far finer historic study, *La chronique du règne de Charles IX* (1829), of which the Massacre of St. Bartholomew forms the central scene; *Colomba* (1840), his most popular novel, a story of Corsica; *Carmen* (1847), a Spanish gypsy romance and subject of a popular opera by Bizet; and three volumes of short stories of remarkable polish and artistic effect, but hard, ironical, and sometimes cynically pessimistic. Mérimée was, before Maupassant, an unapproached master of stylistic restraint and concision. He chooses exotic scenes, a material and moral life alike foreign to his readers, but he never fails to produce the illusion of reality even when he crosses the border of the supernatural. Although impassive in his writing, Mérimée was in private life characterized by tender and devoted friendships, of which his *Lettres à une inconnue* (1873), translated in the "Bric à Brac Series," edited by Stoddard, vol. 111, New York, 1874; the *Lettres à une autre inconnue* (1875); the *Lettres à Panizzi* (1881); and *Une correspondance inédite* (1896), are most interesting and beautiful monuments. They show Mérimée gracious, affectionate, loyal, capable of even a romantic idealism. Mérimée died at Cannes, Sept. 23, 1870. Consult: *Writings of Prosper Mérimée, with Essay on the Genius and Achievement of the Author*, by George Saintsbury (8 vols., New York, 1905 et seq.); also Tourneux, *Prosper Mérimée, ses portraits, ses dessins, etc.* (Paris, 1879); Haussonville, *Mérimée* (ib., 1888); Augustin Filon, *Mérimée et ses amis* (ib., 1894); id., *Mérimée* (ib., 1898); F. Chambon, *Notes sur Mérimée* (ib., 1903); L. Pinvert, *Sur Mérimée* (ib., 1908); also W. H. Pater, in *Studies in European Literature* (Oxford, 1900).

MERINO, me-rē'nō. See SHEEP.

MER'ION'ETH. A county of Wales, bounded west by Cardigan Bay and north by the counties of Carnarvon and Denbigh (Map: Wales, C 4). Area, 660 square miles. Its coast line is generally rugged. Merioneth is the most mountainous county in Wales, with valley, cliff, and lake alternating. The highest point is less than 3000 feet. Large tracts are unfit for profitable cultivation. Slate and limestone are largely quarried, and lead, copper, and manganese are mined. Woolens and flannels are manufactured. Capital, Dolgelly (q.v.). Pop., 1901, 48,852; 1911, 45,565.

MER'ISTEM (irregular formation from Gk. *μεριστός, meristos*, divided, from *μερίζειν, merizein*, to divide, from *μέρος, meros*, part). A general name applied in the anatomy of plants to actively dividing tissue. For example, in most stems meristem occurs at the apex and gives rise to the stem tissues. In stems which increase annually in diameter there is a very characteristic meristem, called cambium (q.v.), that produces the wood elements. A young organ, such as a leaf which is developing, is usually completely meristematic. The contrasting term to "meristematic tissue" is "permanent tissue." See HISTOLOGY.

MERIT, ORDER OF. An order instituted in London, June 26, 1902, by King Edward VII, with the object of conferring distinction on persons who have gained prominence in military, scientific, artistic, and professional services. The order consists of the sovereign and the members and is not conferred as a reward for political services. Initials of the order are accorded precedence immediately after those of the Bath and before the other orders of knighthood. On Jan. 1, 1915, there were 15 members, comprising, as representative of the army, Earl Kitchener; of the navy, Admirals Seymour and Wilson and Lord Fisher; of science, Lord Raleigh, Sir William Crookes, Sir Archibald Geikie, and Sir Joseph J. Thomson; of literature and history, Viscount Bryce, Viscount Morley, Lord Cromer, Thomas Hardy, Sir George Trevelyan, and Prof. Henry Jackson; of music, Sir Edward Elgar. Honorary members of the order were

Marquis Yamagata, Marquis Oyama, and Admiral Count Togo.

MERIT SYSTEM, The. In the United States the merit system looks towards the appointment of men to office because of their competency and not because of their political opinions. The fitness of the candidate is determined by his ability to pass a written competitive examination given by a commission of examiners. The answers submitted by candidates must be unsigned, so as to obviate the possibility of favoritism on the part of the examiners. A list is made of the successful candidates, arranged in the order of their merit as shown by the results of the examination. Appointments must be made from this eligible list in the order of rank unless good cause can be shown why one of higher rank should be set aside for one standing lower on the list. A common objection to the merit system is that it does not give an adequate test of a man's real capacity to administer the office to which he seeks appointment. This is in a measure true, though more and more the civil-service examiners are coming to lay stress upon experience and practical knowledge. Inasmuch as the merit system makes it more difficult for the ordinary political heeler to secure lucrative offices because of his vote-getting ability, the system must be recognized as a power for good. Though it does not inevitably lead to the choice of the most competent, it does very effectually exclude the absolutely unfit. The existence of a merit system has exerted a considerable influence even upon what are still legally political appointments. Considerations of fitness play a far more important part than formerly in determining appointments to responsible positions, especially in the larger cities. See Civil-Service Reform.

MERIVALE, měr'ĭ-vāl, Charles (1808–93). An English historian, best known by his work on the Roman Empire. He was born March 8, 1808, the son of John Herman Merivale, a well-known minor poet. He was educated at Harrow, Haileybury College, and St. John's College, Cambridge. He took his degree at the latter place in 1830, and was successively scholar, fellow, and tutor. During all this time he was interested especially in Roman history, and between 1850 and 1864 wrote his well-known *History of the Romans under the Empire,* which deals with the period between the rise of the Gracchi and the death of Marcus Aurelius. The first part of the work was especially popular and was published in popular form under the title of *The Fall of the Roman Republic.* The merit of this history was great in its day, but more recent investigation, especially the study of epigraphy, has controverted many of Merivale's views. In 1869, after declining an appointment to the professorship of modern history at Cambridge, he became dean of Ely, though he had only a slight interest in strictly ecclesiastical questions and disputes. He continued to publish various studies on Roman history, among which may be noted *General History of Rome from the Foundation of the City to the Fall of Augustulus* (1875). In 1862 he very successfully translated Keats's *Hyperion* into Latin verse. He died Dec. 27, 1893. Consult *Autobiography and Letters,* edited by his daughter, Judith Anne Merivale (London, 1899).

MERIVALE, Herman (1806–74). An English economist and administrator, born at Dawlish, Devonshire. He was a brother of Charles Merivale, the historian, studied at Harrow, and graduated at Trinity College, Oxford, in 1827. In 1832 he was called to the bar of the Inner Temple. From 1837 to 1842 he was professor of political economy at Oxford, delivering while there a valuable series of *Lectures on Colonization and the Colonies* (2 vols., 1841–42). Appointed Assistant Undersecretary of State for the Colonies in 1847, he became permanent Undersecretary in 1848. He was transferred in 1859 to the undersecretaryship for India and continued in that office until his death. His further works—none of his books, it is said, well represents him—include *Historical Studies* (1865); *Memoirs of Sir Philip Francis* (1867); the second volume of a *Life of Sir Henry Lawrence* (1872).

MERIVALE, John Herman (1779–1844). An English scholar, translator, and poet. He was born in Exeter, studied at St. John's College, Cambridge, and was called to the bar in 1804. He contributed largely to Bland's *Collections from the Greek Anthology,* published in 1813, and himself brought out a second edition in 1833. From 1831 to his death he held the office of Commissioner of Bankruptcy. Among his further literary works may be mentioned *Poems, Original and Translated* (1841) and *Minor Poems of Schiller* (1844). He was the father of Charles and Herman Merivale.

MER'IWETH'ER, Lee (1862–). An American lawyer and author, born at Columbus, Miss. He was educated at Memphis, Tenn., studied law, and practiced his profession at St. Louis. The Secretary of the Interior appointed him, after he had taken a tramp trip across Europe in 1885–86, to write a report on the condition of the laboring classes in Europe. Subsequently, as a special agent of the Department of the Interior, he was active in collecting statistics regarding labor in the Hawaiian Islands and the United States. This post he resigned to accept that of Labor Commissioner of Missouri. He made himself known by his report on the corporation (or "truck") store system, by which miners in Missouri were provided with supplies, at exorbitant figures, as a substitute for the regular wages, and he introduced into the Legislature of the State a bill which put an end to this system. Later he studied European prisons, and upon his return to the United States resumed the practice of law in St. Louis. He was the candidate of the Public Ownership party for mayor of St. Louis in 1901 and 1905. His publications include: *A Tramp Trip: How to See Europe on Fifty Cents a Day* (1887), describing a pedestrian journey taken by him from Gibraltar to the Bosporus in 1885–86; *The Tramp at Home* (1889); *Afloat and Ashore on the Mediterranean* (1892); *Miss Chunk* (1899); *A Lord's Courtship* (1900); *Seeing Europe by Automobile* (1911).

MERKEL, měr'kel, Adolf (1836–96). A German jurist and criminologist, born in Mainz and educated at Giessen and Heidelberg. He became docent at Giessen in 1862 and professor in 1867, and was successively appointed professor at Graz (1868), at Vienna (1872), and at Strassburg (1874). He contributed largely to Holtzendorff's *Handbuch des deutschen Strafrechts* and *Encyklopädie der Rechtswissenschaft* and wrote *Zur Lehre vom fortgesetzten Verbrechen* (1862); *Kriminalistische Abhandlungen* (1867); *Juristische Encyklopädie* (1885; 3d ed., by R. Merkel, 1904); *Lehrbuch des deutschen Straf-*

rechts (1889); *Vergeltungsidee und Zweckgedanke im Strafrecht* (1892); and other essays on criminal law.

MERLE, mĕrl (OF., Fr. *merle*, from Lat. *merula*, blackbird). The common European blackbird (*Turdus merula*), a thrush closely allied to the American robin, the male of which is uniformly black, while the female is dusky olive brown above and reddish brown below. The species is migratory except on the borders of the Mediterranean, and is one of the most familiar of the summer birds of Europe, coming about all gardens and roadsides and making its rude nest in bushes and hedgerows. The eggs are bluish green freckled with brown. This is one of the finest of European songsters and is frequently kept in cages and aviaries. The genus is a large one, with numerous species in the Orient, Australia, and South America. Compare BLACKBIRD; THRUSH.

MERLE D'AUBIGNÉ, mârl dô'bē'nyā', JEAN HENRI (1794–1872). A Swiss historian. He was born at Eaux-Vives, a suburb of Geneva, in Switzerland, Aug. 16, 1794; studied there and at Berlin, and in 1818 became pastor of the French Protestant Church in Hamburg. Thence, after a residence of five years, he proceeded to Brussels. In 1831 he returned to Geneva and took part in the institution of a new college for the propagation of orthodox theology, in which he was appointed professor of Church history. His *Histoire de la réformation au seizième siècle* gave him a wide reputation and has been translated into many languages. It is, however, marred by partisanship and uncritical use of authorities. The first part, that on the Reformation in the time of Luther (4 vols., Paris, 1835–47; best ed. of the Eng. trans., 5 vols., Edinburgh, 1853, the last volume on the English Reformation), was vastly more popular than the second part, that on the Reformation in the time of Calvin (8 vols., 1862–78; Eng. trans., 8 vols., London, 1863–78). His other writings, mostly historical, are of less account. He died at Geneva, Oct. 21, 1872. Consult his *Life* by Bonnet (Paris, 1874).

MERLET, mâr'lā', LUCIEN VICTOR CLAUDE (1827–98). A French antiquary, born at Vannes. He studied paleography and in 1851 became head of the departmental archives of Eure-et-Loir. He edited many chartularies and ecclesiastical registers and published: *Histoire des relations des Hurons et des Abnaquis du Canada avec Notre-Dame de Chartres* (1858); *Robert de Gallardon: scènes de la vie féodale au XIIIème siècle* (1858); *Dictionnaire topographique du département d'Eure-et-Loir* (1861); *De l'instruction primaire en Eure-et-Loir avant 1789* (1878); *Dictionnaire des noms vulgaires des habitants de diverses localités de la France* (1883); *Poètes beaucerons antérieurs au XIXe siècle* (1894); *Inventaire sommaire des archives dèpartementales d'Eure-et-Loir* (1894); *Dalles tumulaires et pierres tombales du département d'Eure-et-Loir* (1895); *Cartulaire de l'abbaye de la Madeleine de Châteaudun* (1896); *Dignitaires de l'église Notre Dame de Chartres* (1901).

MER'LIN. An opera by Goldmark (q.v.), first produced in Vienna, Nov. 19, 1886; in the United States, Jan. 3, 1887 (New York).

MERLIN. The name of an ancient British prophet and magician who flourished, according to the romancers, during the decline of the native British power in its contest with the Saxon invaders. The earliest traces of him are found in the *Historia Britonum*, ascribed to a certain Nennius (about 800). He there appears as a prophetic child under the name Ambrosius, and is confounded with Aurelius Ambrosius, to whom Vortigern surrenders Mount Heremus (Snowdon). He next appears in Geoffrey of Monmouth's *Vita Merlini*, afterward incorporated in the *Historia Regum Britanniæ* (about 1139), where he is called Merlin Ambrosius, or simply Merlin. Geoffrey expanded the narrative of Nennius, evidently employing for the purpose traditions concerning a Cambrian or Welsh bard known in Welsh legend as Myrddin. According to Geoffrey, Merlin lived in the fifth century and was sprung from the intercourse of a demon and a Welsh princess. Merlin displayed miraculous powers from infancy. He is made to predict the history of Britain down to Geoffrey's own time. From Geoffrey and other sources was built up the French prose romance of Merlin (thirteenth century). Versions of this romance were made in Italian, Spanish, German, and English; and parts of it were embodied in Malory's *Morte d'Arthur* (1485). A collection of prophecies attributed to him appeared in French (Paris, 1498), in English (London, 1529 and 1533), and in Latin (Venice, 1554), and their existence is traceable as far back as the thirteenth century. Besides this Cambrian Merlin (Merlin Ambrosius) there is the Strathclyde Merlin, called Merlin the Wyllt, or Merlin Caledonius. He is supposed to have lived in the sixth century, a contemporary of St. Kentigern, Bishop of Glasgow. His grave is still shown at Drummelzier on the Tweed, where, in attempting to escape across the river from a band of hostile rustics, he was impaled on a hidden stake. A metrical life of him, extending to more than 1500 lines, professedly based on Armoric materials, and incorrectly ascribed to Geoffrey of Monmouth, was published by the Roxburghe Club in 1833. His prophecies, published at Edinburgh in 1615, contain those ascribed to the Cambrian Merlin.

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MERLIN (OF. *esmerillon, emerillon*, Fr. *émerillon*, merlin, augmentative form from ML. *smerillus, smerlus*, merlin, probably from Lat. *merula*, blackbird). The smallest of Old World falcons (*Falco æsalon*, or *regulus*), scarcely exceeding a blackbird in size, but very bold and powerful. It is bluish ash in color above, reddish yellow on the breast and belly, with longitudinal dark spots, the throat of the adult male white. It builds its nest on the ground and is fond of localities where large stones are plentiful, whence it is often called stone falcon. It is common in most parts of Europe, Asia, and

Africa, and was of great repute in the days of falconry. The merlin is represented in North America by the pigeon hawk (q.v.).

MERLIN, mĕr'lăn', ANTOINE CHRISTOPHE (1762–1833). A French revolutionist, born at Thionville. He studied theology and law and became an advocate at the parlement of Metz in 1788. He was sent as a deputy for Moselle to the Legislative Assembly of 1791, and in that body upheld the confiscation of the property of the émigrés and urged the execution of Louis XVI. He was elected to the National Convention in 1792, and, sent in the same year to defend Mainz, accomplished his task with notable success. He participated in the reaction against his former colleagues, the Jacobins; and under the Directory he sat in the Council of Five Hundred until 1798. He then became Director General of Posts, but lived in retirement under the Consulate and the Empire. He is often referred to in French history as Merlin of Thionville to distinguish him from Merlin de Douai (q.v.), with whom he was closely associated.

MERLIN COCCAI, mĕr-lēn' kō-kāy', pseudonym of TEOFILO FOLENGO (1491–1544). Greatest of Italian macaronic poets. At the age of 18 he became a member of the Benedictine Order, and while a monk he wrote Latin verses in the style of Vergil. About 1515 he forsook monastic life and wandered about the country with a young woman of good family, Girolama Dieda, often in great poverty, for he had no resource but his poetic talent. His first publication was the mock heroic *Baldus* (Venice, 1517 and 1521), written in macaronic verse (q.v.), which Folengo was the first to use with genius. Specimens of macaronic poetry are found in England in the thirteenth century (*Carmina Burana*), in the French *Roman de Renard* (thirteenth century), and in a German Goliardic poem of the fifteenth. It occurs frequently in the French farces of the fifteenth century (in parodies of church sermons), which, like the French epics, were popular in Italy. From Padua, in fact, in 1490, came the *Macaronea* of Tifi Odasi (Michele di Bartolomeo degli Odasi), a rippling satire of local types, which, giving this culinary name to poetry of the kind, had an immediate following. The anonymous *Nobile Vigonze Opus* (1494) is likewise of Padua and directly from the university. Of the same year is the *Virgiliana* of Fossa da Cremona, which was followed (1499) by the political invectives of Bassano da Mantua and Giovan Giorgio Alione d'Asti. In 1505 Serafino Buffone addressed a macaronic epistle to Isabella d'Este. Marin Sanudo cites some macaronic hexameters from as early as 1483. From this rich tradition Folengo drew the inspiration and the method for his famous *Baldus*, which probably influenced Rabelais in his creation of Pantagruel, and which, as a satire of the chivalric romance, is a predecessor of Cervantes' *Don Quixote*. A serious artistic and moral purpose guides Folengo not only here but in his following *Zanitonella, Orlandino,* and *Moschea*. He reduced his Latinization of a curious jargon composed of Venetian, Bergamasque, and Tuscan elements to rules in the *Normula Macaronica de Sillabis*. His *Chaos del triperuno* is, historically, more interesting still from its curious portrayal of the confused state of mind of the time in the midst of conflicting religious and scientific tendencies. Folengo issued from it about 1527 with a chastened spirit and, resuming monastic life, seems to have devoted the rest of his days to the production of religious works, such as the *Palermitana a umanità di Cristo* and the play *Atto della pinta*. Among the many imitators of Folengo the most important is Cesare Orsini of the following century (*Capriccia macaronica*, Venice, 1638). Consult *Works*, edited by Renier-Luzio (4 vols., Bari, 1911), and relative articles in *Giornale Storico della Letteratura Italiana* (Turin, 1911–12).

MERLIN DE DOUAI, mâr'lăn' de dōō'â', PHILLIPE ANTOINE, COUNT (1754–1838). A French politician and jurist. He was born at Arleux and studied at the College of Anchin. He began his career by practicing law at Douai. In 1775 he became advocate at the parlement of Flanders, where he soon acquired reputation as an able lawyer. His frequent contributions to the law dictionary, of which he finally became the editor (5th ed., 1827–30), then appearing under the title *Répertoire universel de jurisprudence*, increased his reputation and established his authority as a jurisconsult. After the outbreak of the Revolution he was elected a member of the National Assembly (1789), where he attracted much attention by his report on the bill of April 4, 1789, abolishing the feudal system. In 1795 he became Minister of Justice and kept this post till Jan. 18, 1799. After the coup d'état of the 18th Brumaire he took the office of procureur général at the Court of Cassation (1801), and Napoleon made him Councilor of State in 1808, and two years afterward created him Count and Grand Officer of the Legion of Honor. By a royal ordinance of July 24, 1815, he was expelled from France and resided in Belgium and Holland. On his return to France in 1830 he became a member of the Academy of Moral and Political Science. He is the author of *Recueil alphabétique des questions de droit qui se présentent le plus fréquemment dans les tribunaux* (4th ed., 1827–28).

MER'LON (Fr. *merlon*, It. *merlo;* perhaps connected with Lat. *mœrus, murus,* wall). In fortification, the portion of the parapet between two embrasures.

MER'MAID (from *mere,* AS. *mere,* Goth. *marei,* OHG. *mari,* Ger. *Meer,* OIr., Gael. *muir,* OChurch Slav. *morye,* Lat. *mare,* sea + *maid,* AS. *mægþ,* Goth. *magaþs,* OHG. *magad,* Ger. *Magd,* maid). An imaginary inhabitant of the sea. The upper parts of mermaids are represented as resembling those of beautiful women, while the body terminates in a tail like that of a fish. The *merman* is also heard of, but less frequently. The commonest representation of the mermaid pictures her as holding in her hand a mirror, while in the act of combing her hair. There is an evident affinity between the stories concerning mermaids and those concerning the sirens and tritons, perhaps also the nereids, of the ancients. All these stories may have had their origin in the play of the imagination about such sea creatures as seals and walruses dimly or distantly seen.

MERMAID, THE. A famous London club, the foundation of which is ascribed to Sir Walter Raleigh. Its members included Jonson, Beaumont, Fletcher, Selden, and Carew. Shakespeare also is said to have belonged to it. The meeting place was the old Mermaid Tavern on Bread Street.

MERMAID'S GLOVE. A local English name applied to a sponge (*Halichondria oculata*) often cast ashore on the coast of Great Britain

and northeastern America. Its branches are somewhat finger-shaped, giving to the entire animal a rude glovelike appearance. The name is also given to a social polyp, *Alcyonium digitatum*, more aptly and commonly called dead-man's-fingers.

MERMAID'S HEAD. The popular British name for a spatangoid sea urchin (*Amphidetus cordatus*).

MERMAID'S PURSE. A shark's egg case. See RAY.

MERMET, mĕr'mā', JOSEPH (?1783–1836). A Canadian poet. He was born in France, was educated to be a soldier, and in 1813 went to Canada as lieutenant and adjutant of the well-known De Watteville regiment, made up chiefly of Swiss officers and soldiers. This regiment did notable service on the British side in the War of 1812. Mermet was for a time stationed at Kingston, Upper Canada, and while there wrote a considerable part of his poetry. His chief themes were inspired by the war, and especially the exploits of Colonel de Salaberry, the victor of Châteauguay. He afterward traveled through Canada and wrote poetic descriptions of its scenery. He was the first Canadian poet to choose Niagara Falls as a subject. In 1816 he returned to France. Mermet, though not a poet of great distinction, had considerable influence in stimulating the ambitions of the French-Canadian writers in the early part of the nineteenth century. Much of his verse had a light, satirical vein. His poems were published in *Le Spectateur* of Montreal.

MERMILLOD, mĕr'mē'lō', GASPARD (1824–92). A Swiss Roman Catholic prelate, whose ecclesiastical history is largely the story of the quarrel between the radical government of Geneva in the seventies and the holy see. He was born in Carouge, studied in a Jesuit college at Freiburg, and took holy orders in 1847. He was an impassioned orator and a leader of the Ultramontanists, in whose behalf he founded *L'Observateur Catholique* and the *Annales Catholiques*. In 1857 he was appointed vicar-general of Geneva and in 1864 received full episcopal powers in the canton. In the struggle precipitated by this action the Genevan government exiled him in 1873. An attempt on the Pope's part in 1879 to restore him was unsuccessful, as the brief forming the Canton of Geneva into an apostolic vicarate was still in force; but in 1883 Mermillod was appointed Bishop of Lausanne and Geneva, and the distasteful title was thus abrogated and the decree of exile consequently withdrawn. He was made Cardinal in 1890. In 1885 he founded the Union Catholique d'Etudes Sociales et Economiques. His best-known work is *Lettres à un Protestant sur l'autorité de l'église et le schisme* (1860). His collected works, sermons, lives of the saints, and political pamphlets were published in Paris and Lyons in 1893. Consult Lesur and Bournand, *Le Cardinal Mermillod* (Abbeville, 1895).

MERNEPTAH. See MENEPTAH.

MERÖ, mā'rē, YOLANDA (1887–). A Hungarian pianist, born at Budapest. Her first instruction she received from her father, after which she completed her pianistic studies with Madame Rennebaum, a pupil of Liszt. Twice, in 1900 and 1902, she won musical scholarships from the Minister of Education. Her début occurred at Dresden in 1904, with gratifying success. She then made tours of Germany, France, Holland, and England. At her American début, in 1909, with the Russian Symphony Orchestra, she made such a decided impression that she was immediately engaged by the great symphony orchestras of the country. Her playing is characterized by warmth and brilliancy. In 1909 she was married to Herman Irion, of New York.

MERODACH, mē'rō-dăk. The Hebrew pronunciation of the name of Marduk, or Maruduk, the great Babylonian god. It occurs in Jer. 1. 2, in the proper names Merodach Baladan, which stands for Marduk apal iddin, and Evil Merodach, which represents Amil Marduk, and probably also in Mordecai in the Book of Esther. The same god is clearly intended in Isa. xlvi. 1, Jer. li. 44, where Bel is used, and also in the deuterocanonical fragment Bel and the Dragon (q.v.).

MÉRODE, mā'rōd', FRANÇOIS XAVIER MARIE FRÉDÉRIC GHISLAIN, COUNT DE (1820–74). A Roman Catholic prelate. He was born at Brussels, a grandnephew of Lafayette. He entered the Belgian army and took part in the Algerian campaign. In 1847 he began the study of theology at Rome, where he was ordained to the priesthood in 1850. Pius IX made him his chamberlain and canon of St. Peter's. In 1860 he was appointed temporary Minister of War and recruited, chiefly from foreigners, a Pontifical army. In 1865 he went out of office in consequence of a dispute with Cardinal Antonelli. The next year he was made Archbishop of Mytilene and Papal Almoner. In 1869 he resisted the declaration of the doctrine of papal infallibility, but he acquiesced in the final enunciation of it by the Ecumenical Council. Consult his *Life* by Lamy (Louvain, 1874) and by Besson (Paris, 1886).

MERO DE ALTO. See JEWFISH.

MEROË, mĕr'ō-ē (Lat., from Gk. Μερόη). The second capital of ancient Ethiopia (q.v.), dominant from the reign of King Ergamenes (c.250 B.C.), and the only residence of the kings after the downfall of Napata (q.v.). As Berua it is mentioned as early as 500 B.C.; the extensive ruins (described by Cailliaud, and finely illustrated in Lepsius, *Denkmäler*, part v) are situated at a place now called Begerawieh. Consult: Cailliaud, *Voyage à Méroé* (Paris, 1823–27); Lepsius, *Letters from Egypt, Ethiopia, and the Peninsula of Sinai* (London, 1853); Budge, *The Egyptian Sudan* (ib., 1907).

MEROM, WATERS OF. The scene of the great battle between the Hebrews under Joshua and the allied kings of Canaan (Josh. xi.). The Waters of Merom have been identified with the more northern of the two lakes through which the Jordan flows in its course to the Dead Sea. This lake is now called Huleh, or more fully Baheiret el Huleh (the little lake of Huleh). It is triangular in shape; at its base, towards the north, the Jordan enters and flows out again from its apex towards the south on its descent to the Sea of Galilee. The falling rains and melting snows periodically increase its size, but its average length is about 3½ miles and its width at the broadest point about 3; its depth is 10 to 16 feet. Schmidt supposes that we should read Merom for Darom in Deut. xxxiii. 23, since Naphtali had nothing to do with Darom (the south), while it seems to have possessed the places on Lake Merom. Josephus calls the lake Semechonitis (*Wars*, iii–x, 7), and the region about it Ulatha (*Ant.* xv, 10, 3).

The district, which is very fertile, is inhabited by Arabs. Consult: Macgregor, *The Rob Roy on the Jordan* (New York, 1870); G. A. Smith, *Historical Geography of the Holy Land* (London, 1895); Schmidt, *The Messages of the Poets* (New York, 1911).

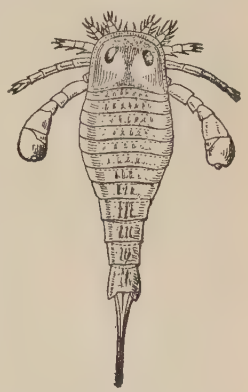
MEROPE, mĕr′ō-pē. 1. A sister of Phaëthon and one of the Heliades. 2. One of the Pleiades, the wife of Sisyphus and mother of Glaucus. She hid her light for shame because she had married a mortal. (See LOST PLEIAD, 1.) 3. The daughter of Cypselus and wife of the Messenian King Cresphontes. All her sons except Æpytus were killed when her brother-in-law, Polyphontes, seized the kingdom. Æpytus fled, and when he had grown up returned and put Polyphontes to death and regained the sovereignty.

MÉROPE, mā′rôp′. A tragedy by Voltaire (1743).

MEROP′ODA (Neo-Lat., from Gk. *μέρος, meros*, a part, a segment + *πούς, ποδός, pous, podos*, a foot). The name given by Packard to a phylum or general group of arthropodous animals comprising three classes, i.e., the diplopod Myriapoda (q.v.), or thousand legs, the Pauropoda, and the Symphyla. It is equivalent to the *Tracheata progoneata* of Pocock. In the typical forms (Diplopoda) the second pair of mouth appendages, corresponding to the mandibles of insects, are very different in structure and composed of three segments, since all the head and thoracic appendages are made up of several joints; hence the name *Meropoda*, or jointed legs. In this phylum all the forms agree in having the genital outlets situated a little behind the head; i.e., in diplopods and pauropods in the third segment behind the head, while in the Symphyla (*Scolopendrella*) the single opening is in the fourth segment from the head. The young on hatching differ from those of centipedes (Chilopoda) in having but three pairs of legs, but, unlike those of insects, either the third or the second trunk segment in diplopods is footless. See CENTIPEDE; MYRIAPODA.

MER′OSTOM′ATA (Neo-Lat. nom. pl., from Gk. *μέρος, meros*, part + *στόμα, stoma*, mouth). A class of Arthropoda, standing next above the Trilobita and immediately below the Arachnida, these three classes forming a series by themselves and distinct from the Crustacea. They are represented by the king crab (q.v.), or *Limulus*, the sole surviving member of the class. The merostomes are subdivided into three orders: the Eurypterida, represented by *Eurypterus;* the Synziphosura, of which three Paleozoic families are the types; and, third, the Xiphosura, type *Limulus*. The class chiefly differs from Trilobita in having appendages of two types, those of the head being single, those of the abdomen being biramous; in being provided with book gills, attached to the broad abdominal legs, which are fused together at the base, the head appendages often ending in a forceps, while they differ from the Arachnida in breathing by gills, all the forms being marine, in the nature of the appendages, the brain, the nervous cord enveloped by arteries, and by the reproductive organs. The earliest forms are the Eurypterida. The typical genus *Eurypterus*, unlike the king crab, probably swam actively nearer the surface of the sea. The species are found fossil in rocks of Cambrian to Permian age. The form of the body is somewhat like that of a scorpion, though flatter and of larger size. A quadrate headpiece or cephalothorax with rounded front corners bears two large reniform compound eyes, between which are two small eye spots or ocelli. The abdominal portion consists of 12 segments that taper posteriorly and are terminated by a strong, sharp spine or telson. The structure of the ventral surface of the body is quite similar to that of the horseshoe crab.

The eurypterids appeared first in the Potosi Cambrian limestones of Missouri. At the end of the Silurian period geographic conditions seem to have favored their development, for they expanded rapidly and became the dominant types of the fauna of the inclosed basins in which were deposited the shallow-water passage beds between the Silurian and Devonian formations. They appear in great numbers in the water limestones or cement rocks of New York State, and in beds of equivalent age and similar character in Great Britain and the Baltic Provinces; also in the coal measures of Carboniferous age in Pennsylvania, Nova Scotia, and in Europe, where they are associated with the fossil remains of a swamp fauna and flora. The last member of the genus is known from Permian freshwater beds of Portugal. The genus seems to have been first a marine shallow-water organism and to have changed its habitat through brackish and possibly to fresh water in succeeding geological periods. Several allied genera are found associated with the remains of *Eurypterus;* of these *Pterygotus, Slimonia*, and *Stylonurus* are the most important. See the articles KING CRAB; XIPHOSURA.



EURYPTERUS FISCHERI.

Consult: Woodward, *Monograph of the British Fossil Crustacea of the Order Merostomata* (Palæontological Society, London, 1866–78); A. S. Packard, "On the Carboniferous Xiphosurous Fauna of North America," in the *Memoirs of the National Academy of Sciences*, vol. iii (Washington, 1886); K. A. von Zittell, *Text-Book of Paleontology*, translated by C. R. Eastman (New York, 1900); with the writings of De Kay, Hall, Huxley, Salter, Peach, and Laurie.

MER′OVIN′GIANS. The first dynasty of the Frankish kings in Gaul. The name is derived from Merovæus, or Merovech, the reputed grandfather of the great Frankish King Clovis (q.v.), who in 486 put an end to the Roman dominion in Gaul. Clovis on his death divided his Kingdom among his four sons, one of whom, Clotaire I, reunited them under his own sway in 558. On his death in 561 the Kingdom was again divided into four parts—Aquitaine, Burgundy, Neustria, and Austrasia. His grandson, Clotaire II, again reunited them in 613. Later there were again three states, Neustria, Austrasia, and Burgundy, which were united in 687. The power of the Merovingian kings was finally reduced to a shadow, the real power having passed into the hands of the major domus (q.v.). The dynasty of the Merovingians terminated with the deposition of Childeric III by Pepin

the Short (q.v.) in 751 and gave place to that of the Carolingians (q.v.). (See FRANKS.) The chief authority of the earlier parts of the history of the Merovingians is Gregory of Tours. Consult: Thierry, *Récits des temps mérovingiens* (2d ed., Paris, 1887); Havet, *Questions Mérovingiennes* (2d ed., ib., 1896); Pron, *La Gaule Mérovingienne* (ib., 1897); Sergeant, *The Franks* (New York, 1898); Mariguan, *Etudes sur la civilisation Française*, vol. i (Paris, 1899).

MER'RIAM, AUGUSTUS CHAPMAN (1843–95). An American classical scholar, born at Locust Grove, N. Y. In 1866 he graduated with the highest honors from Columbia College, and from 1868 until his death he was connected with his alma mater as tutor, adjunct professor of Greek, and professor of Greek archæology and epigraphy. He was the pioneer in the study of classical archæology in the United States. In 1886 he served as president of the American Philological Association. He was director of the American School of Classical Studies at Athens in 1887–88, during which year important excavations were carried on at Icaria (q.v.). He died while on a visit to Athens and was buried there. His chief publications are: *The Phœacians of Homer* (New York, 1880); *The Greek and Latin Inscriptions on the Obelisk Crab in Central Park* (1883); *The Sixth and Seventh Books of Herodotus* (New York, 1885); *The Law Code of Gortyna in Crete* (ib., 1886); "Telegraphy among the Ancients," in *Papers of the Archæological Institute of America: Classical Series III* (Cambridge, 1890).

MERRIAM, CLINTON HART (1855–). An American biologist, born in New York City and educated at Sheffield Scientific School of Yale (1877) and at the College of Physicians and Surgeons (Columbia), where he graduated in 1879. He served as naturalist to the Hayden Survey in 1872, was appointed assistant of the United States Fish Commission in 1875, and acted as one of the Bering Sea commissioners in 1891 and as head of various expeditions. From 1885 to 1910 he was chief of the Biological Survey, which he developed as a bureau of the United States Department of Agriculture; and he edited a long and important series of publications relating to the fauna of North America, in the classification of which he became a leading authority. In 1910 he took charge of the biological and ethnological investigations carried on under the trust fund established by Mrs. E. H. Harriman. Among his published works are: *The Birds of Connecticut* (1877); *Mammals of the Adirondacks* (1882–84); *Biological Reconnaissance of Idaho* (1891); *Geographic Distribution of Life in North America* (1892); *Flora and Fauna of the Death Valley Expedition* (1893); *Temperature Control of Distribution of Animals and Plants* (1894); *Indian Population of California* (1905); *Totemism in California* (1908); *The Dawn of the World* (1910).

MERRIAM, FLORENCE. The maiden name of FLORENCE MERRIAM BAILEY (q.v.).

MERRIAM, HENRY CLAY (1837–1912). An American soldier, born at Houlton, Me. He graduated at Colby College, studied law, served in the Civil War in 1862 as captain in the Twentieth Maine Volunteer Infantry, resigned in 1863, and in the same year was appointed captain in the Eightieth United States colored troops. He served with colored troops from 1863 until the close of the war, was brevetted colonel of volunteers for faithful and meritorious services during the campaign against Mobile and its defenses, and in 1865 led the final attack on Fort Blakely, Ala., with the Seventy-third United States colored infantry. For this he was awarded the Congressional Medal of Honor (1894). In 1866 he became major in the Thirty-eighth Infantry of the regular army, in 1885 colonel of the Seventh Infantry, and in 1897 brigadier general. As commander of the departments of Columbia and California in 1898 he organized and forwarded troops for the Philippines expedition. In the same year Merriam was promoted major general of volunteers. He became commander of the Department of Colorado in 1900, was retired in 1901, and in 1903 was promoted major general (retired) of the regular army. The Merriam infantry pack was invented by him.

MERRIAM, JOHN CAMPBELL (1869–). An American paleontologist. He was born at Hopkinton, Iowa, and was educated (B.S., 1887) at the University of California, to which, after studying at Munich (Ph.D., 1893), he returned to be instructor in paleontology and historical geology (1894–99), assistant professor (1899–1905), associate professor (1905–12), and professor after 1912. His papers, which deal mainly with fossil reptiles and mammals of western North America and with the historical geology of the Pacific coast region, appeared for the most part in the University of California publications.

MER'RICK, FREDERICK (1810–94). An American educator, born at Wilbraham, Mass. He was educated at the Wesleyan Academy in his native town and at Wesleyan University. In his senior year he left college and became the principal of Amenia (N. Y.) Seminary, and from 1838 to 1843 he was professor of natural science in Ohio University at Athens, Ohio. Thereafter until his death 51 years later he was connected with Ohio Wesleyan University. He served the institution two years as financial agent, 15 years as professor, 13 years as president, and 21 years as emeritus professor and lecturer on natural and revealed religion. He was an Abolitionist and a contributor to the Underground Railway. Though never in charge of a parish, he was an ordained minister of the Methodist Episcopal church and a member of the Ohio conference, which he joined in 1841. He was a member of the General Conferences of 1860, 1864, and 1876. His entire property was bequeathed to Ohio Wesleyan University for the endowment of the Merrick lectureship. He was the author of *Formalism* (1865) and many fugitive poems and contributions to the religious press.

MER'RILL. A city and the county seat of Lincoln Co., Wis., 225 miles by rail northwest of Milwaukee, at the junction of the Wisconsin and Prairie rivers, and on the Chicago, Milwaukee, and St. Paul Railroad (Map: Wisconsin, D 3). It has broad and well-paved streets and contains the T. B. Scott Public Library, occupying a fine building, three parks, a well-equipped high school, and handsome courthouse and city hall buildings. The surrounding country possesses valuable hardwood timber, and there are important manufactories, producing sawed lumber, shingles, laths, sashes, doors and blinds, brooms, pails, hubs, shoes, knit goods, veneer, excelsior products, and pulp and paper. There are also some dairying interests. Excellent

water power is afforded by two large dams on the Wisconsin River. Settled in 1875, Merrill was incorporated five years later, being known as the village of Jenny until 1881, when it received its present name. The government is vested in a mayor, biennially elected, and a unicameral council. Pop., 1900, 8537; 1910, 8689; 1914 (U. S. est.), 8752.

MERRILL, Elmer Truesdell (1860–). An American Latin scholar, born at Millville, Mass. He graduated from Wesleyan in 1881 and pursued graduate studies at Yale, Berlin, Rome, and in England. He taught the classics at the Massachusetts State Normal School, Westfield (1882–83), and at Wesleyan (1883–86); after one year (1887–88) at the University of Southern California as professor of Latin, he returned to Wesleyan as professor of Latin language and literature (1888–1905); and for three years he held a similar chair at Trinity College, Hartford. In 1908 he became professor of Latin at the University of Chicago. He was active in the work of the American School of Classical Studies in Rome, of which he was professor (1898–99), acting chairman (1899–1900), and chairman (1900–01). After 1906 he was associate editor of *Classical Philology,* and in 1906–07 he served as president of the American Philological Association. Merrill was ordained a priest in the Protestant Episcopal church in 1895. In 1911 the University of St. Andrews gave him its LL.D. His publications include: *Poems of Catullus* (1893); *Fragments of Roman Satire* (1897); *Selected Letters of the Younger Pliny* (1903); *C. Plini Cœcili Secundi Epistularum Libri Novem* (1914). He contributed to the New International Encyclopædia.

MERRILL, Frederick James Hamilton (1861–1916). An American geologist, born in New York City. He graduated at the Columbia School of Mines in 1885, received his Ph.D. there five years afterward, held a fellowship in geology at Columbia College (1886–90), and was assistant in the New Jersey Geological Survey (1885–89). From 1890 to 1893 he was assistant geologist for New York State. He was assistant director (1890–94) and director (1894–1904) of the New York State Museum, and was in charge of the New York exhibit at the Columbian Exposition in Chicago in 1893, at the Buffalo Exposition in 1901, and at the St. Louis Exposition in 1904. He afterward established himself in Los Angeles as a consulting mining geologist. To the bulletin of the New York State Museum he contributed *Salt and Gypsum Industries in New York* (1893); *Mineral Resources of New York* (1896); *Road Materials and Road Building in New York* (1897); *Natural History Museums of the United States and Canada* (1903).

MERRILL, George Edmands (1846–1908). An American Baptist clergyman and educator, born at Charlestown, Mass. After graduating at Harvard University in 1869 and at Newton Theological Institution in 1872, he was pastor of Baptist churches in Massachusetts at Springfield (1872–77), Salem (1877–85), and Newton (1890–99). Two years (1885–87) he spent at Colorado Springs. From 1899 until his death he was president of Colgate University. His writings include: *The Story of the Manuscripts* (3d ed., 1881); *Crusaders and Captives* (1890); *The Reasonable Christ* (1893); *The Parchments of the Faith* (1895); "The Songs of Solomon," in the *American Commentary on the Old Testament* (1905). Merrill received the degree of D.D. from Colby College in 1895 and that of LL.D. from the University of Rochester in 1901.

MERRILL, George Perkins (1854–). An American geologist, born at Auburn, Me. He was educated at the University of Maine (B.S., 1879; Ph.D., 1889), was assistant in chemistry at Wesleyan University, Connecticut (1879–80), and studied at Johns Hopkins (1886–87). In 1881 he became assistant curator at the National Museum, Washington. He also served as professor of geology and mineralogy at the Corcoran Scientific School of Columbian (now George Washington) University after 1893, and was appointed head curator of the department of geology at the National Museum in 1897. His chief publications are: *Stones for Building and Decoration* (1891; 3d ed., 1903); *A Treatise on Rocks, Rock-Weathering, and Soils* (1897; 2d ed., 1906); *The Non-Metallic Minerals* (1904; 2d ed., 1910); *The Fossil Forests of Arizona* (1911); and many periodical contributions, especially on meteorites.

MERRILL, Lewis (1834–96). An American soldier, born at New Berlin, Pa. He studied at Lewisburg University, Pennsylvania, graduated at West Point in 1855, was assigned to duty as lieutenant with the First Dragoons, and served in Missouri, in Kansas Territory, and with the Utah expedition. In 1861, as colonel and first cavalry officer on the staff of John C. Frémont, he organized Merrill's Horse to oppose guerrillas in Missouri, and later commanded the Department of St. Louis and then that of Northern Missouri. In 1864 he was commander of the cavalry bureau at St. Louis and took part in the engagements at Franklin, Mo. The next year he was sent against guerrillas in northern Georgia and Alabama and was brevetted brigadier general. After various Western assignments he was placed in command of a military district in South Carolina with orders to break up the Ku-Klux Klan (q.v.). From 1871 to 1873 he succeeded in this so well that he received the thanks of the War Department. When similar conditions arose in the Red River district of Louisiana he was made commander there in 1875, remaining until the following year. As a consequence of his activities his nomination as lieutenant colonel in the regular army was held up for several years in the Senate by Southern sympathizers, but it was finally confirmed as from 1886. Merrill was retired in 1891.

MERRILL, Selah (1837–1909). An American Congregationalist clergyman and United States Consul, born at Canton Centre, Conn. After studying at Yale and at the New Haven Theological Seminary, he was ordained in 1864. During the last year of the Civil War he was chaplain of the Forty-ninth United States colored infantry and in 1868 went to Germany, where he studied two years. In 1874–77 he was in Palestine as archæologist of the American Palestine Exploration Society and was United States Consul at Jerusalem in 1882–85, 1891–93, and 1898–1907. While there he made important explorations and excavations to discover the second wall of Jerusalem and determine the site of Calvary. He taught at Andover Theological Seminary in 1872 and 1879 and became curator of the Biblical Museum there. In 1907 he became American Consul at Georgetown, Guiana. His works include: *East of the Jordan* (1881; 2d ed., 1883); *Galilee in the Time of Christ* (1881); *Greek Inscriptions Collected in the*

Years 1875–77 in the Country East of the Jordan (1885); *The Site of Calvary* (1885); *Ancient Jerusalem* (1906).

MERRILL, Stephen Mason (1825–1905). An American Methodist Episcopal bishop, born in Jefferson Co., Ohio. He entered the ministry of his church, joining the Ohio conference in 1846, was editor of the *Western Christian Advocate* (1868–72), and in 1872 was elected Bishop. He retired in 1904. He was a member of the General Conference of 1868 and 1872 and of the Ecumenical Methodist Conference of 1891. His chief works are: *Christian Baptism* (1876); *New Testament Idea of Hell* (1878); *Second Coming of Christ* (1879); *Aspects of Christian Experience* (1882); *A Digest of Methodist Law* (1885; rev. ed., 1913); *Organic Union of American Methodism* (1892); *Mary of Nazareth and her Family* (1895); *The Crisis of this World* (1896); *Atonement* (1901); *Sanctification* (1901); *Miracles* (1902).

MERRILL, Stuart (1863–1915). An American poet of French residence, born at Hempstead, Long Island. He went to Paris as a child and studied at the Lycée Condorcet, studied law at Columbia University from 1885 to 1889, and in 1890 returned definitely to France. He wrote a number of articles for the New York *Times* and the *Evening Post* on contemporaneous French writers. His verse shows a fastidious delicacy of phraseology but possesses an almost magic power. He wrote: *Les gammes* (1887); *Pastels in Prose* (1890), translations from Banville, Baudelaire, etc.; *Les fastes* (1891); *Petits poèmes, d'automne* (1895); *Poèmes, 1887–1897* (1897); *Les quatre saisons* (1900). After 1900 his work appeared in literary reviews.

MERRILL, William Emery (1837–91). An American soldier and military engineer. He was born at Fort Howard, Wis.; graduated first in his class at West Point in 1859, and from September, 1860, to July, 1861, was assistant professor of engineering there. In the Civil War he served as assistant engineer in the Army of the Potomac during the Peninsular campaign and in the northern Virginia campaign, and from July, 1864, to September, 1865, commanded, as colonel, a regiment of veteran volunteer engineers. During the war he received the successive brevets of captain, major, lieutenant colonel, and colonel for gallant services. In March, 1867, he was raised to the regular rank of major and in February, 1883, to that of lieutenant colonel. From 1867 to 1870 he was chief engineer on the staff of General Sherman, then commanding the Military Division of the Missouri, and thereafter until his death he was engaged on engineering work for the government. One of the most notable engineering works of its kind in America was the Chauvine wicket movable dam constructed by him at Davis's Island, 5½ miles below Pittsburgh. In 1889 he represented the United States Engineer Corps at the International Congress of Engineers at Paris. He published *Iron Truss Bridges for Railroads* (1870) and *Improvement of Non-Tidal Rivers* (1881).

MER'RIMAC, The. 1. A United States frigate, sunk with other vessels when the Federal government abandoned the Norfolk Navy Yard in 1861, and reconstructed as a Confederate ironclad. She was then renamed the *Virginia*. After destroying the *Congress* and the *Cumberland* at Newport News on March 8, 1862, she met the *Monitor* in Hampton Roads on March 9 and after a contest of four hours was obliged to withdraw. She was destroyed when the Norfolk yard was evacuated by the Confederates on May 11, 1862. See Hampton Roads; Monitor.

2. A collier accompanying the United States fleet investing Santiago de Cuba in 1898. In an effort to prevent the escape of the Spanish fleet she was sunk at the mouth of the harbor on June 3 by Lieut. Richmond P. Hobson, who, after accomplishing his perilous feat, was captured by the Spaniards and held prisoner until July 6.

MERRIMAC RIVER. A river of New Hampshire and Massachusetts. It is formed near Franklin by the union of the Winnepesaukee and Pemigewasset, the former being the short outlet of the lake of that name and the latter the outlet of Profile Lake, in Franconia, N. H., 50 miles north of Franklin and less than 10 miles from Mount Washington (Map: Massachusetts, E 2). From Franklin the river flows southward for about 60 miles, until it enters Massachusetts, when it turns eastward for about 40 miles and empties into the Atlantic Ocean at Newburyport. Its drainage area is about 5015 square miles, and its chief importance is the water power which it furnishes to the manufacturing cities of Lowell, Lawrence, and Manchester.

MER'RIMAN, Henry Seton. The pseudonym of the English novelist Hugh S. Scott (q.v.).

MERRIMAN, John Xavier (1841–). A South African statesman. He was born at Street, Somersetshire, the son of N. J. Merriman (1810–82), who was Bishop of Grahamstown. He first went to South Africa in 1849 and again, after studying in England, in 1861; and in 1869 entered politics in Cape Colony. He was Commissioner of Crownlands in 1875–78 (Molteno ministry) and 1881–84 (Scanlen ministry) and Treasurer General in 1890–93 (Rhodes ministry) and in 1898–1900 (Schreiner ministry). In 1896 he was a member of the committee on the Jameson Raid and drew up its report. He opposed Kruger's narrow policy in 1898. With J. W. Sauer in the summer of 1901 he represented the Cape Afrikanders in a mission to London which sought to continue the independent republics. In 1908, upon the victory of the Bond party, he succeeded Jameson as Premier of Cape Colony and for two difficult years held this post and that of Treasurer. He was a prominent member of the National Convention for Union in 1908–09; and in 1910 opposed the formation of a coalition cabinet for the Union and refused to serve in a cabinet under Botha.

MERRIMAN, Mansfield (1848–). An American civil engineer, born at Southington, Conn. He graduated at Sheffield Scientific School (Yale) in 1871, was assistant in the United States Corps of Engineers in 1872–73, and instructor in civil engineering at Sheffield from 1875 to 1878. He was professor of civil engineering in Lehigh University from 1878 to 1907 and thereafter a consulting civil and hydraulic engineer. From 1880 to 1885 he was also assistant on the United States Coast and Geodetic Survey. His researches in connection with hydraulics, bridges, strength of materials, and pure mathematics are important. His chief publications, widely used as standard textbooks, are: *Method of Least Squares* (1884; 8th ed., 1901); *Mechanics of Materials* (1885; 10th ed., 1910); with Jacoby, *A Text-Book on Roofs and*

Bridges (4 vols., 1888–98; 5th ed., 1912); *Treatise on Hydraulics* (1889; 9th ed., 1914); *Handbook for Surveyors* (1895; 3d ed., 1903); *Strength of Materials* (1897; 6th ed., 1913); *Precise Surveying and Geodesy* (1899); *Elements of Sanitary Engineering* (1898; 3d ed., 1906); *Elements of Hydraulics* (1912). In addition, he was editor in chief of the *American Civil Engineers' Pocket Book* (1911).

MER'RITT, Ernest George (1865–). An American physicist. He was born at Indianapolis, Ind.; attended Purdue University in 1881–82; graduated M.E. from Cornell in 1886; and studied at Berlin in 1893–94. At Cornell he was instructor in physics in 1888–91, assistant professor from 1892 to 1903, professor after 1903, and dean of the Graduate School after 1909. He served as vice president of the American Physical Society and contributed to periodicals various papers on physics.

MERRITT, Wesley (1836–1910). An American soldier, prominent in the Civil War and the Spanish-American War. He was born in New York City. After graduating at West Point in 1860 he was assigned to a cavalry regiment (1861), acted as aid to General Cooke (1862), participated in Stoneman's famous raid towards Richmond (April–May, 1863), and commanded the reserve cavalry brigade of the Army of the Potomac in the battle of Gettysburg and in the Richmond campaign of April–August, 1864. In the Shenandoah Valley campaign under Sheridan and in the final Richmond campaign he commanded cavalry divisions. By the end of the war he was major general of volunteers and brevet major general in the regular army. Afterward he saw varied service, first in the Southwest, on frontier duty at various stations. In 1876, the year that he was promoted colonel of the Fifth Cavalry, he served in the Big Horn and Yellowstone Indian campaigns in Wyoming and Dakota. From 1882 to 1887 he was superintendent of the United States Military Academy. Merritt was promoted brigadier general (1887) and major general (1895). He was in command of the Department of the East in 1897–98; was placed in command of the United States forces in the Philippine Islands in May, 1898; and later in the same year was summoned to Paris to assist the American peace commissioners. Thereafter until his retirement in June, 1900, he commanded the Department of the East.

MERRITT, William Hamilton (1793–1862). A Canadian statesman. He was born in Westchester Co., N. Y., and in 1796 was taken to Upper Canada by his parents, who were United Empire Loyalists. (See Loyalists.) He was educated at Ancaster, Upper Canada, and at King's College, Windsor, Nova Scotia. During the War of 1812–15 he took part in the capture of Detroit and the battles of Queenston Heights, Stoney Creek, and Lundy's Lane. He projected the Welland Canal (q.v.) and the Welland Railway, and it was mainly through his efforts that both were constructed. In 1845 he also projected the Niagara Falls suspension bridge. Merritt was a Liberal member of the Upper Canada Legislative Assembly in 1832–41. He was President of the Council in the Lafontaine-Baldwin administration (1848) and in 1850 Commissioner of Public Works, and in 1860 he was elected a member of the Canada Legislative Council. His writings include: *A Concise View of the Inland Navigation of the Canadian Provinces* (1832); *A Brief Review of the Revenue, Resources, and Expenditure of Canada* (1845); *A Journal of Events Principally on the Detroit and Niagara Frontier during the War of 1812* (1863).

MERRITT, William Hamilton (1855–). A Canadian mining engineer and soldier, grandson of the preceding. He was born at St. Catherines, Ontario, and was educated at Upper Canada College, the Royal Military School, and the Royal School of Mines, London, England, where he graduated in 1877. He practiced his profession in Toronto. In 1878 he served in connection with the Canadian commission at the Paris Exposition, and was later appointed lecturer in mining engineering in the School of Mining, Kingston. He was a member of the Royal Commission to inquire into the mineral resources of Ontario and was elected vice president of the Ontario Mining Institute. Merritt was gazetted a cornet in the Governor-General's bodyguard in 1884, served in the Northwest rebellion (1885), in the Boer War (1899–1902), taking part in many actions, and was promoted lieutenant colonel in 1903. He contributed papers to the *Proceedings* of the Geological Society, London, England; *Proceedings* of the American Institute of Mining Engineers; and *Proceedings* of the Canadian Institute. He published *Economic Minerals of Ontario* (1896) and *Field Testing for Gold and Silver* (1900).

MER'RY, Robert (1755–98). An English poet, born in London. He studied at Christ College, Cambridge, and began the study of law, but was never called to the bar. Merry traveled extensively throughout Europe, and in Florence was made a member of the so-called Della Cruscan Circle. He wrote much for the Florence *Miscellany,* and after his return to England published reams of affected and grandiloquent verse over the signature Della Crusca. He also wrote a number of incoherent dramas, including: *Lorenzo* (1791); *The Magician No Conjurer* (1792); *The Abbey of St. Augustine* (1797). From 1796 he resided in the United States, where his wife, Elizabeth Brunton, was an acceptable actress for many years.

MERRY, William Walter (1835–). An English classical scholar, clergyman, and educator. He was born in Worcestershire and was educated at Cheltenham College and Balliol College, Oxford, where he gained the chancellor's prize for a Latin essay in 1858. He was select preacher to the university in 1878–79 and in 1889–90, and Whitehall preacher in 1883–84; public orator at Oxford from 1880 to 1910; a member of the Hebdomadal Council (1896–1908); and vice chancellor (1904–05). For many years he was engaged in the preparation of editions of the classical authors, published by the Clarendon Press, Oxford. Of these may be mentioned Homer's *Odyssey* (books i to xii, with James Riddell; 2d ed., 1886); a school edition of the same books and another of books xiii to xxiv—of the former 66,000 copies were sold, of the latter 16,000; a series of editions of the plays of Aristophanes, begun in 1879. (Some of these have gone through several editions.) Other works in classical literature are *The Greek Dialects* (1875) and *Selected Fragments of Roman Poetry* (2d ed., 1901).

MERRY DEL VAL, Raphael, Cardinal (1865–). A Roman Catholic prelate, born in London (where his father was secretary of

the Spanish legation) and educated partly in England, partly in Rome. In 1888 he took orders, in 1892 was made papal chamberlain, and in 1897 became prelate of the papal household. He represented the Vatican at the jubilee of Queen Victoria and the coronation of Edward VII, and was sent on a special mission to Canada; in 1900 was consecrated Bishop of Nicæa in partibus; was secretary of the conclave which in August, 1903, elected Pius X pope; and in October succeeded Cardinal Rampolla as papal Secretary of State. In the conduct of this important office he was criticized for adopting an aggressive policy which helped to intensify the strained relations between the Curia and the French government. In November, 1903, he was created Cardinal. In September, 1914, upon the accession of Pope Benedict XV, Merry del Val was succeeded as Secretary of State by Cardinal Ferrata (q.v.). Although probably the most widely known representative of the Catholic hierarchy, it was not expected that he could be elected Pope, because of the antagonism he had aroused. While Pius was Pope Merry del Val had sought persistently to acquire more power for himself. In October, 1914, he was appointed secretary of the congregation of the Holy Office. He wrote *The Truth of the Papal Claims* (1909).—His brother, DON ALFONSO MERRY DEL VAL (born, 1864), after being long in the Spanish diplomatic service, was appointed Ambassador to Great Britain in 1913.

MERRY DEVIL OF EDMONTON, THE. An anonymous comedy acted in 1607 and printed in 1608. It has been attributed on slight evidence to Drayton by Coxeter, and also ascribed to Shakespeare. Fleay thinks the play, originally called *Sir John Oldcastle*, was written by Drayton for the Chamberlain's Men before 1597, and that the prose story of the same title by T. B., 1608, is not to be identified with the play. It was very popular; Jonson remarks that it was the "dear delight of the public." Allusions to it are found in *Grim, the Collier of Croyden*, and probably in *Merry Wives of Windsor* as well.

MERRY ENGLAND. An old popular name of England, in which the word merry has its early meaning of pleasant.

MERRY MONARCH, THE. A nickname of King Charles II of England.

MERRY MOUNT. The name of a settlement made by Thomas Morton within the limits of the present Quincy, Mass. See MORTON, THOMAS.

MERRY WIVES OF WINDSOR, THE. A comedy by Shakespeare, produced probably in 1597, printed complete in 1623. An imperfect copy, entitled *Sir John Falstaff and the Merry Wives of Windsor*, was printed by Thomas Creede in 1602, bearing evident marks of haste. The play was made for a court performance and is said to have been written at Queen Elizabeth's command, to show Falstaff in love. Some incidents of the plot are taken from two tales in Straparola's *Notti Piacevoli;* from Tarleton's *The Lovers of Pisa* in his *Newes Out of Purgatorie;* from Brainford's "Fishwife's Tale" in *Westward for Smelts.* The buck basket found in the tale of Buciolo in Fiorentino's *Pecorone* is in the comedy the basket of soiled linen in which Falstaff hides. It is notably a play of middle-class people and, like *Much Ado about Nothing*, is mostly prose. A version called *The Comical Gallant* was made in 1702 by John Dennis, who is one authority for Elizabeth's connection with the play. Another is Rowe in 1709.

MERSCHEID, mĕr'shīt. A town of Germany. See OHLIGS.

MERSEBURG, mĕr'ze-bŭrk. A town in the Province of Saxony, Prussia, situated on the Saale, about 20 miles west-northwest of Leipzig (Map: Germany, D 3). It consists of the city proper, the free ground of the cathedral, the new quarters, and the suburbs of Altenburg and Neumarkt. Its fine cathedral, begun in the eleventh and finished in the sixteenth century, contains the grave of Rudolf of Swabia, a fine chancel and organ. The Gothic castle, the former residence of the bishops, is now used as an administration building. There are also the Rathaus, the assembly house, and the chapter house. The Gymnasium, founded in 1575, is the chief educational institution. Merseburg manufactures machinery, leather, iron products, toys, textiles, motors, cellulose, cigars, dyes, and beer. It is considered one of the oldest towns of Germany. As early as the ninth century it was the residence of the counts of Merseburg. During the tenth, eleventh, and twelfth centuries it was the favorite residence of the German emperors and the seat of a bishop and many diets. Merseburg was the seat of an important bishopric in the Middle Ages. With the introduction of Protestantism the see passed to Saxony. Its fairs were also of great importance. Near Merseburg the German King, Henry the Fowler, won a great victory over the Hungarians in 933. Pop., 1900, 19,119; 1910, 21,226, chiefly Protestants.

MERSENNE, mâr'sĕn', MARIN (1588–1648). A French theologian and scholar, born at La Soultière (Maine). He studied at the college of La Flèche, where he had as a fellow pupil René Descartes, with whom he always maintained a close friendship. In 1611 he became a Minim friar. Afterward he taught philosophy at Nevers from 1614 to 1620, and subsequently lived principally in Paris. He was the Parisian representative of Descartes while the latter was in Holland. Later his studies grew more scientific and he published a number of treatises on astronomy and mathematics. He also wrote *Harmonie universelle, contenant la théorie et la pratique de la musique* (1636), and a Latin epitome of it, *Harmonicorum Libri XII* (1636). From these we learn much of the condition of music in the seventeenth century and his own discoveries in the phenomena of vibration.

MERSEY, mĕr'zĭ. A river of England, separating the counties of Chester and Lancaster (Map: England, D 3). It enters the Irish Sea by a wide estuary forming the Liverpool channel. This channel is deep and navigable for several miles above Liverpool. By means of a ship canal, which follows for some distance the course of the river and crosses it several times, navigation can be continued to Manchester and beyond. See LIVERPOOL.

MERSHON, mĕr'shon, RALPH DAVENPORT (1868–). An American electrical engineer and inventor, born at Zanesville, Ohio. He graduated M.E. from Ohio State University in 1890; was employed by the Westinghouse Electric and Manufacturing Company from 1891 to 1900; and thereafter was in practice as a consulting engineer. He installed the electric plant of the Colorado Electric Power Company at Cripple

Creek; reconstructed the transmitting and receiving apparatus of the Montreal and St. Lawrence Light and Power Company, and designed the plants of the Shawinigan Water and Power Company of Montreal and the Niagara, Lockport, and Ontario Power Company. In 1905 he was consulting engineer of the Victoria Falls Power Company (South Africa). He invented a six-phase rotary converter, a compounded rotary converter, and a system of lightning protection for electric apparatus for which he received the John Scott Legacy medal of the Franklin Institute. In 1912–13 he was president of the American Institute of Electrical Engineers.

MERSINA, mĕr'sē-nä'. A seaport town in the Vilayet of Adana, Asia Minor, situated on the south coast, 41½ miles by rail west-southwest of Adana (Map: Turkey in Asia, C 3). It is well built and surrounded by fine gardens. The harbor, an open roadstead, is not very deep, and steamers usually anchor a long distance from the town. It is the busiest port on the south coast of Asia Minor, being the outlet for a rich agricultural district. The United States is represented by a consular agent and it is the seat of an American mission. Mersina is of recent origin; its population is estimated at over 15,000, about one-half Christian, of whom the Armenians and the Greeks are in the majority.

MERSON, mâr'sôn', Luc Olivier (1846–1920). A French decorative and historical painter, born in Paris. He studied under Chassevent and Pils, was awarded the Prix de Rome in 1869, and obtained a gold medal at the Paris Exposition of 1889. His pictures, treating historical and religious subjects, are painted with peculiar, poetic charm, and his drawings have the same delicate, almost tender, quality. His most notable mural paintings are two episodes from the life of St. Louis, in the Palais de Justice, Paris, and decorations by him are in the Opéra Comique, the Hôtel de Ville, the Sorbonne, and the church of St. Thomas d'Aquin. Among his other paintings are "St. Isidore" and "The Annunciation" (1903). He illustrated Victor Hugo's *Notre Dame de Paris* and works by Gautier, Flaubert, and others.

MERTHYR TYDFIL, mĕr'thĕr tĭd'vĭl. A municipal, parliamentary, and county borough in Glamorganshire, south Wales, surrounded by lofty hills and built on the river Taff, about 500 feet above sea level, 22 miles northwest of Cardiff (Map: England, C 5). Merthyr Tydfil is the seat of the iron trade of south Wales, and contains large collieries, celebrated for the excellence of steam coal. The Dowlais Ironworks have 18 blast furnaces, and Cyfartha works produce steel. The town has greatly improved since 1850; it has modern churches, a town hall, public baths, a library, a good water supply, and two profitable sewage farms. It maintains two infectious-disease hospitals. Pop., 1901, 69,228; 1911, 80,990.

MERTON, mĕr'ton, Walter de (?–1277). An English prelate, founder of Merton College, Oxford. He was educated in the priory at Merton, Surrey, and was ordained to the priesthood. Henry III raised him in 1261 to the lord-chancellorship, from which office he was deposed in 1263 by the barons under Simon de Montfort. He returned to that office in 1272, but in 1274 resigned to accept an appointment to the see of Rochester. He founded at Basingstoke a hospital for superannuated clergymen and travelers in distress, but is best known as the founder of Merton College (q.v.), Oxford, which was completed in 1274. This was originally designed, it would appear, for the education of the secular clergy and offered courses in philosophy, the liberal arts, and theology—*in arte, dialectica, et theologia,* as the Rochester chronicles express it. It became the model of subsequent foundations at both Oxford and Cambridge, and was thus the basis of the collegiate system peculiar to these two English universities.

MERTON COLLEGE. The oldest college of its type in Oxford and the model of all later secular colleges in both Oxford and Cambridge. It was first founded as the House of the Scholars of Merton, in 1263 or 1264, by Walter de Merton (q.v.). The original endowment consisted of his manor house and estate at Malden, Surrey, the income from which was to go to the support of scholars in Oxford, the estate being managed by a resident warden and "brethren." By various changes between 1264 and 1274 the scholars were moved from a rented house to their own property, Merton Hall, acquired for them by the founder, and were put in charge first of a subwarden, then of the warden himself, who had come up from Surrey. The number of scholars, who had been originally confined to the members of the founder's family, was increased, and the collegiate idea of the foundation was crystallized in the Statutes of 1274. The addition of a system of ecclesiastical patronage, the arrangement of the buildings, and the plan, size, and beauty of the chapel, in addition to the scheme of the statutes, had great influence on later foundations. The college has suffered various changes since its establishment, the last of which was its absorption of St. Alban Hall in 1882. There were, in 1911–12, a warden, 19 fellows, 2 honorary fellows, 34 scholars and exhibitioners, 4 lecturers, 2 chaplains, college officers, and, in all, some 150 undergraduates. The buildings are among the most interesting in Oxford, being partly of the thirteenth century. Here Henrietta Maria occupied the warden's apartments, while Charles I's court was held at Oxford. Again, in 1665, the year of the plague, Charles II moved his court hither, and his Queen occupied the lodgings formerly used by Henrietta Maria. The chapel, though not completed, is of cathedral size, but has no transepts. Among the worthies of Merton may be mentioned Harvey, the demonstrator of the circulation of the blood, Bishops Patterson and Jewell, Anthony Wood, Sir Thomas Bodley, Sir Richard Steele, and Sir H. Savile. Consult Hastings Rashdall, *Universities of Europe in the Middle Ages,* vol. ii, part ii (Oxford, 1895), and Henderson, "Merton College," in *University of Oxford College Histories* (London, 1902). See Merton, Walter de; Oxford University.

MERU, mā'rōō. A fabulous mountain in Hindu mythology, the abode of the gods. It is supposed to stand at the centre of the world, and it towers to a height of 80,000 leagues; the sun, moon, and stars revolve about its summit. Regarded as a terrestrial mountain, it would seem to have been located somewhere to the north of the Himalayas.

MERULO, mĕr'ōō-lō, Claudio (1533–1604). An Italian organist and composer, born at Correggio. His real name was Merlotti. A pupil of Girolamo Donati, he began his career as organist at Brescia. In 1557 he came to Venice as second

organist at San Marco. He succeeded to the position of first organist in 1566, and this important post he held for 20 years, when the Duke of Parma offered him the post of court organist. He died at Parma. Not only was he one of the greatest masters of his instrument, but his compositions for organ are of permanent value, being among the earliest specimens of a distinct organ style, which a little later became a most important factor in the development of instrumental music. His vocal compositions consist of several books of madrigals, motets, and masses; his works for organ comprise three books of *Ricercari*, three of *Canzoni*, and two of *Toccate*. Consult G. Gasperini, *Claudio Merulo da Correggio* (Parma, 1904).

MERV, mĕrf. A region in Central Asia now forming a district in the Russian Transcaspian Province, a short distance from the northeast corner of Persia (Map: Asia, Central, J 4). Its area is estimated at about 49,000 square miles. The northern and larger part is a vast sandy plain with very little vegetation. The southern part is more elevated and watered by the Murghab and its tributaries. The summers are long and hot, and the annual average temperature is from about 57° F. to 60° F., ranging from —6° F. to 113° F. The precipitation is very meagre, especially in the northern part. The chief occupation of the inhabitants is agriculture, which is made possible only by irrigation. Unirrigated regions are utilized to some extent for stock raising by the nomadic tribes. The chief centre of agriculture is the oasis of Merv, to which the name was formerly confined. The area of the oasis is about 2000 square miles, and it contains a large share of the population of the district, though there is a considerable nomadic population outside the oasis. The water for irrigation is supplied by the Murghab and a few of its tributaries. Wheat, rye, millet, and barley are the chief cereals raised in the irrigated portions of the territory. The oasis is renowned throughout the East for its fertility. The carpets are regarded as superior to the Persian, and the manufactures of silver hold high rank. Transportation is effected principally by the use of pack animals, although the territory is crossed by the Transcaspian Railway line. Near the railway line are the Imperial estates of Murghab, with extensive irrigation works. The population of the district is variously estimated from 120,000 to 240,000; that of the oasis is about 120,000 and is composed, with the exception of a few Russian Jews and Persians, of Tekke Turkomans, divided into a number of clans. They all profess Islam.

The capital of the district, known as New Merv, is situated on the Murghab and the Transcaspian Railway. It has a number of schools, churches, a meteorological observatory, and some trade. The population is about 12,000, consisting of Russians, Turkomans, Armenians, Persians, and Jews. About 25 miles east of New Merv are the ruins of three cities, of which one, existing in the time of Strabo, was, according to that historian, of great extent and importance.

Merv is a very ancient settlement, its name (Mouru) being mentioned in the Zend-Avesta. In old traditions it is looked upon as the cradle of the human race. It once formed a satrapy of the Persian Empire. An archbishopric of the Nestorian church existed there as early as the fifth century. Occupied by the Arabs in the seventh century, the city of Merv became the capital of Khorasan and a great intellectual centre, rising to still greater importance in the eleventh century while under the rule of the Seljuks. The prosperity of Merv came to an end with the invasion of the Turkomans about the middle of the eleventh century. The district was almost entirely depopulated by the Monguls under Tulai in 1221. At the end of the fourteenth century it fell into the hands of Timur, and after a short occupation by the Uzbeks at the beginning of the sixteenth century was taken by the Persians, under whose rule it remained until 1787, when it was occupied and later entirely devastated by the Bokharians. About the middle of the nineteenth century it was invaded by the Tekke Turkomans, who became the ruling race (1556). In 1884 Merv was annexed by Russia. In 1898 a strategical railroad from Merv to the frontier of Afghanistan was opened up.

MERWARA. See AJMERE-MERWARA.

MERX, mĕrks, ADALBERT (1838–1909). A German theologian and Orientalist. He was born at Bleicherode, near Nordhausen, and studied at Jena, Marburg, Halle, and Berlin. From 1865 to 1875 he was professor of Semitic philology and theology at Jena, Tübingen, and Giessen. In the latter year he took the chair of theology at Heidelberg. He belongs to the school of liberal theologians, who fully acknowledge the right of unrestricted criticism of the Scriptures. Among his published works are: *Das Gedicht von Hiob* (1871); *Die saadjanische Uebersetzung des Hohenliedes ins Arabische* (1883); "Historia Artis Grammaticæ apud Syros," in *Abhandlungen für Kunde des Morgenlandes* (Leipzig, 1889); *Idee und Grundlinien einer allgemeinen Geschichte der Mystik* (1893); *Die vier kanonischen Evangelien nach ihrem ältesten bekannten Texte* (1897–1905).

MÉRY, mā'rē', JOSEPH (1798–1866). A French satirical poet, born Jan. 21, 1798, in Aygalades (Bouches-du-Rhône). In 1824 he went to Paris, where he aroused attention through a political satire, *La Villélaide, les Jésuites* (1826), by some Bonapartist poems, and by work on a satirical journal *Némésis*. Later he wrote dramas, romances, and novels remarkable for their exotic descriptions of lands Méry had never seen. Of his once very popular stories, *Héva* (1843) and *Nouvelles nouvelles* (1853) are sufficiently typical. Méry died in Paris, June 17, 1866. Consult Claudin, *Méry, sa vie intime* (Paris, 1866).

MERYON, mâr'yôn', CHARLES (1821–68). A French etcher, born in Paris. He was educated at the Naval School in Brest and afterward rose to the position of lieutenant in the navy. Failing health caused him to resign, and he took up etching, which he studied at Paris, achieving the highest success in this art. Though strong and precise, his execution is of rare delicacy and his art is highly imaginative. His fame is posthumous; he lived in poverty and discouragement and died in an insane asylum at Charenton. Of his etchings the best known are the series of 23 plates, *Eaux-fortes sur Paris* (1850–54), which fairly evoke the spirit of old Paris, then rapidly disappearing under the improvements of Haussmann. Consult: Wedmore, *Meryon and Meryon's Paris* (London, 1879); Burty, *L'Œuvre de Charles Meryon*, translated by Huish (ib., 1879); Bouvenne, *Notes et Souvenirs sur Charles Meryon* (Paris, 1883); Loys

Delteil, *Peintre-Graveur illustré*, vol. ii (ib., 1907).

MERZ, John Theodore (1840–1922). An English writer on philosophy, born in Manchester and educated in Germany—at Darmstadt, Giessen, Göttingen, Heidelberg, and Bonn. He lived in Newcastle-upon-Tyne, where he was director in chemical and electrical corporations and a member of the Armstrong College of Durham University. Merz received honorary degrees from Durham and Aberdeen for his book on Leibnitz (1884), in the "Philosophical Classics," and for his remarkable work entitled *A History of European Thought in the Nineteenth Century* (4 vols., 1896–1914; vol. i, 3d ed., 1907; vol. ii, 2d ed., 1912).

MERZIVAN. See Marsivan.

MESA, mā′sȧ. A Spanish word meaning "table" (cf. Latin *mensa*) and used especially in the southwestern United States to designate the small, isolated remnants of plateaus, usually rising abruptly from the surrounding plains, which are found scattered over the region traversed by the Colorado River (Map: Colorado, A 2). The mesas result from the dissection of a plateau, having horizontal strata, but with the upper layer of more resistant rock than the underlying. In many cases the capping stratum represents portions of an ancient lava flow which has been poured over the sedimentary rocks. In the process of denudation the underlying weaker strata crumble under the weathering process, the overlying resistant stratum is thus gradually undermined, and fragments of the latter fall down. Thus the face of the mesa is generally steep, called an escarpment face, and this is maintained during all the time of the process of denudation. The name "mesa" is generally applied to remnants of plateaus of considerable top area, and smaller areas of similar form are called buttes. The Enchanted Mesa and the Mesa Verde are frequently used as types.

The Enchanted Mesa, called by the Indians Katzimo, is situated near the village of Acoma in west central New Mexico. It is a perpendicular sandstone rock rising from a grassy plain. It is of elongated shape, 2050 feet long, and from 100 to 350 feet wide. Above a sloping talus, 100 to 200 feet in height, towers the perpendicular wall to a height of 430 feet above the plain. The summit is nearly level and consists of a hard rock very much weathered and supporting a few stunted cedars. The rock is held in superstitious awe by the neighboring Acoma Indians, and a tradition is current among them that their remote ancestors once inhabited the summit. This mesa has been described by F. W. Hodge in "The Enchanted Mesa," in *National Geographical Magazine*, vol. viii (1897), pp. 273–284, and here he writes of the evidences of a former occupation.

The Mesa Verde is situated in the extreme southwestern corner of Colorado, on the right bank of the Mancos River. It is a plateau 15 miles long and 8 miles wide. Its talus is 300 to 500 feet high, above which rises a precipitous wall of yellow sandstone 150 to 300 feet farther, the top of the mesa being 400 to 800 feet above the plain. The area has enough rainfall to support a covering of grass and a scattering of scrubby cedars and piñons, and from this the mesa derives its name (*Verde* = green). The summit is more accessible than that of the Enchanted Mesa, being intersected by the numerous ramifications of a cañon which opens into that of the Mancos River. The rock walls of the Mesa Verde are interrupted by numerous horizontal ledges occupied by the ruins of ancient cliff dwellings, some in a remarkable state of preservation. Large numbers of stone implements, potsherds, and some mummies have been found among the ruins. Consult Atwood, "A Geographic Study of Mesa Verde," in *Annals of the Association of American Geographers*, vol. i (1911), p. 95. See Cliff Dweller.

MESA. A town in Maricopa Co., Ariz., 18 miles by rail southeast of Phœnix, on the Arizona Eastern Railroad (Map: Arizona, D 4). Among the interesting features of the town are the public library, the Toltec ruins, government experimental farm, Granite Reef Dam, government power plant, and the splendid public-school buildings. Mesa is in a rich agricultural, fruit-growing, and stock-raising region. It has ample water power, derived mainly from the Roosevelt Dam (q.v.). The town was settled in 1879 by a colony of Mormons from Salt Lake City and other places in Utah, but is now composed mostly of non-Mormons. The water works are owned by the municipality. Pop., 1900, 722; 1910, 1692.

MESAGNE, mȧ-sä′nyȧ. A town in the Province of Lecce, south Italy, about 10 miles by rail southwest of Brindisi. It is an ancient town, picturesquely situated in a fertile region, producing oil, wine, grain, and fruit. Pop. (commune), 1901, 12,105; 1911, 13,740.

MESARCH, mēs′ärk. A term used in the vascular anatomy of plants. In the development of a xylem (wood) strand the first elements to appear are spiral vessels, and this first group of elements is called the protoxylem. If the later xylem elements (metaxylem) develop in every direction from the protoxylem, so that it becomes surrounded by metaxylem, the xylem strand is said to be mesarch. The coördinate terms are exarch and endarch, the former indicating that the metaxylem is developed centripetally from the protoxylem, and the latter that it is developed centrifugally. The result is that in an exarch strand the protoxylem is upon its outer edge; in an endarch strand the protoxylem is upon its inner edge (next to the pith); while in a mesarch strand the protoxylem is embedded in metaxylem. Exarch strands are the most primitive, occurring in all roots and in the stems of the more primitive pteridophytes (as club mosses); mesarch strands are characteristic of the ferns; while seed plants have endarch strands.

MESA VERDE. See Mesa.

MESCAL. See Agave.

MESCALA, mȧs-kä′lȧ, or **MEXCALA.** A river of Mexico, rising in the State of Tlaxcala, 60 miles east of Mexico City. It flows in a general westerly direction for 430 miles and empties into the Pacific near Zacatula. It is known in its upper course as the Atoyac, and in the lower, where it serves as the boundary line between the states of Guerrero and Michoacán, as the Río de la Balsas. The current is exceedingly swift, and the river is navigable for only a short distance, but it furnishes power to a number of textile and other mills.

MESCALERO, mȧ′skȧ-lā′rō. A small Athapascan tribe. They receive their name from their use of mescal bread prepared from the maguey root by roasting under cover until it softens into a white, sticky, and sweetish mass, which is said to be extremely nutritious. They

formerly ranged over the arid Pecos and Staked Plain region of Texas and New Mexico, and were constantly at war with the Ute and Navaho, while maintaining a precarious friendship with the Kiowa and Comanche. They lived entirely by hunting and depredation upon the frontier settlements of Texas and Mexico, in company with other roving tribes, and were distinguished for their warlike and cruel disposition. Their shelters were mere wikiup's of boughs; they planted nothing and went nearly naked. Since about 1865 they have been confined upon a reservation in southeastern New Mexico. In 1855 they were estimated at about 750. They number now 424. Consult P. E. Goddard, *Indians of the Southwest* (New York, 1913).

MESDAG, mĕs'dăg, HENDRIK WILLEM (1831–1915). An eminent Dutch marine painter. He was born in Groningen, the son of a banker, and until the age of 35 he followed his father's vocation. Encouraged by his wife, he then studied painting under Roelofs and Alma-Tadema in Brussels, and afterward lived at The Hague. He is one of the best of Dutch marine painters. His style is realistic and simple, and his work is characterized by breadth of treatment, fine atmospheric effects, sober color, and harmony of feeling. He is preëminently the painter of the North Sea. His services to modern Dutch painting are incalculable. Possessed of considerable wealth, he was a liberal patron of his less fortunate fellows and devoted his time and money to the organization of exhibitions and every other means of promoting Dutch art. His works include: "Return of the Fishing Boats" (1875), in The Hague Museum; "The Shore at Scheveningen," "A Calm Sea," and six other paintings, including two portraits, in the Rijks-Museum; "Summer Evening near Scheveningen," in the Berlin Gallery; "After the Storm," in the Brussels Gallery. He also painted an interesting panorama of Scheveningen, which, together with a collection of his own and his wife's work, forms a permanent exhibition at The Hague. In 1902 he presented to The Hague his admirable collection of paintings, including excellent specimens of the Barbizon school and modern Dutch painting, bronzes, porcelains, and rugs, together with the house especially built for it. Among many other honors Mesdag received the cross of the Legion of Honor in 1889.—His wife, SIENTJE MESDAG-VAN HOUTEN (1834–1909), was also a painter of impressionistic tendencies. Consult: Zilcken, *Hendrik Willem Mesdag* (Eng. ed., London, 1896); *Dutch Painters of the Nineteenth Century*, vol. ii, edited by Rooses (ib., 1898–1901); Marius, *Dutch Painting of the Nineteenth Century* (Eng. trans., ib., 1908).

MES'EMBRYA'CEÆ (Neo-Lat., from Gk. *μεσημβρία, mesēmbria,* midday, from *μέσος, mesos,* middle + *ἡμέρα, hēmera,* day; so called because the flowers of many species open only during midday). A family of dicotyledonous herbs or shrubs, now generally called Aizoaceæ. They are mostly natives of warm regions and include about 24 genera and 500 species. The family belongs to the Centrospermales, an order which begins with Chenopodiaceæ (goosefoot family) and culminates in the Caryophyllaceæ (pink family), an order characterized by its conspicuous perisperm. *Mesembryanthemum* is much the largest genus of the family, comprising about 300 species, which form a very characteristic feature of the flora of South Africa. Two genera are represented in the flora of North America, viz., *Sesuvium,* the sea purslane, two species of which occur on sandy beaches and alkaline plains; and *Mollugo,* the carpet weed, which occurs as a weed in waste places and cultivated grounds throughout North America. The leaves of some species, when burned, yield soda in great abundance. Large quantities of barilla are made from them in the Canary Islands, in Spain, and in Egypt. The seeds of some, as the ice plant (*Mesembryanthemum crystallinum*), and of *Mesembryanthemum geniculiflorum* are ground into flour to make bread. *Mesembryanthemum geniculiflorum* is used as a potherb in Africa. The fruit of *Mesembryanthemum edule* (known as Hottentot figs) is eaten in South Africa, and that of *Mesembryanthemum æquilaterale* (pig's-faces) in Australia. *Mesembryanthemum anatomicum* is called kou by the Hottentots, who beat and twist up the whole plant, allow it to ferment, and chew it like tobacco. When nearly fermented it is narcotic and intoxicating. Some species of *Mesembryanthemum* are common annuals in flower gardens.

MESEN, mā'zyĕn. A river in Russia. See MEZEN.

MESEN'TERON. See ALIMENTARY SYSTEM.

MES'ENTERY AND ITS DISEASES. The mesentery derives its name from being connected to the middle portion (Gk. *μέσον*) of the small intestine (*ἔντερον*). It is a broad fold of peritoneum (the great serous membrane of the abdomen) surrounding the jejunum and ileum and attached posteriorly to the vertebral column. Its breadth between the intestinal and vertebral borders is about 4 inches, its attachment to the vertebral column is about 6 inches in length, and its intestinal border extends from the duodenum to the end of the small intestine. It serves to retain the small intestines in their place, while at the same time it allows the necessary amount of movement, and it contains between its layers the mesenteric vessels, the lacteal vessels, and mesenteric glands. These lymph glands are 100 to 150 in number and are about the size of an almond. They elaborate the contents of the lacteals, the chyle being more abundant in fibrin and corpuscles after it has passed through them. The most important affection of these organs is their tubercular degeneration, which gives rise to *tabes mesenterica,* a disease most common in childhood, but confined to no period of life. It may be associated with tubercular infection of other parts of the body, such as pulmonary consumption, tubercular peritonitis, or caries of the spine; but sometimes the mesenteric glands are exclusively affected. The leading symptoms are loss of color and flesh, diarrhœa, and occasional vomiting, pain in the region of the navel, increased by pressure, tumefaction and hardness of the abdomen, with general emaciation. The enlarged glands can sometimes be detected by careful palpation, especially in advanced cases and when the peritoneum is also involved. The progress of the disease is generally slow.

The treatment mainly consists in the administration of cod-liver oil, tonics, and laxatives. When the disease has advanced to a considerable extent, medicines are of little use, except to palliate some of the more urgent symptoms.

Independently of the disease that has just been noticed, inflammation of these glands is by no means uncommon when the mucous membrane

of the small intestine is ulcerated, as, e.g., in typhoid or enteric fever.

The mesentery may be the site of hemorrhages, as in aneurism or some infectious diseases, as smallpox; of embolism or thrombosis; of cysts or of tumors. See also PERITONITIS.

MESGOUAT, TROÏLUS DE. See ROCHE, TROÏLUS DE MESGOUAT.

MESHA, mē′shȧ (Heb. *Mēsha‘*). King of Moab during the reigns of Ahab and his sons, Ahaziah and Jehoram, kings of Israel. (2 Kings iii. 4, 5.) According to his inscription, found at Dhiban, Mesha shook off the yoke of Israel and freed himself from the heavy tribute imposed upon him in the middle of the reign of Ahab, and this is regarded by many historians as more correct than the statement in 2 Kings iii. 5 that the revolt took place after the death of Ahab. Subsequently, however, Jehoram secured the aid of Jehoshaphat, King of Judah, his father's ally, or vassal, and the united armies of the two kings were joined by the forces of the King of Edom. The Moabites were defeated, and the King took refuge in Kir-hareseth, his last stronghold. (2 Kings iii. 6–25.) Having in vain attempted to force his way through the besieging army, he withdrew to the wall of the city, and in the sight of the allied host offered up his first-born son and successor as a propitiatory sacrifice to Chemosh, the national god of the Moabites. The biblical narrative suggests (ib., 26–27), though in a vague way, that Chemosh turned to the succor of Mesha; at all events the Moabites remained masters of the situation, and the attempt to reduce them to subjection failed, though their land suffered much in the struggle. The famous inscription of Mesha seems to come from the period after the death of Ahab (c.851 B.C.) and before the invasion of the allied kings (c.849 B.C.). See MOABITE STONE.

MESHHED, mĕsh′ĕd, or **MESHED.** Capital of the Province of Khorasan, Persia, situated 3800 feet above the sea, in the extreme northeastern part of the country, 460 miles east of Teheran (Map: Persia, J 4). The city is surrounded by a mud wall. It owes its chief importance to the fact that it contains the tomb of the Imam Riza, a descendant of Ali, the founder of the Shiites. The tomb is contained in a mosque which is one of the most magnificent buildings in the East, richly ornamented with gold, silver, and marble. It is visited annually by more than 100,000 pilgrims. The shrine with adjacent territory is sanctuary for criminals. The city is also the centre of several important caravan routes and had a very extensive transit trade with India and Central Asia, which, however, has greatly decreased since the completion of the Russian railroad from the Caspian Sea to Samarkand and the adoption of adverse customs regulations by the Russian authorities. The town still manufactures and exports fine silks, carpets, shawls, and sword blades. Pop., about 60,000.

MESHHED-HOSEIN, mĕ′shĕd hō-sān′. A town of Asiatic Turkey. See KERBELA.

MES′MER, FRANZ, or FRIEDRICH-ANTON (1733–1815). A physician and founder of the doctrine of animal magnetism, or mesmerism (q.v.), born at Iznang on Lake Constance. He studied theology at Ingolstadt and medicine at Vienna, where he took his degree in 1766. About 1772 he began, along with Father Hell, to investigate the curative powers of the magnet, and was led to adopt the opinion that there exists a power similar to magnetism, which exercises an extraordinary influence on the human body. This he called animal magnetism, and published an account of his discovery and of its medicinal value in 1775. Honors were conferred upon him in Germany. In 1778 he went to Paris, where he attracted much attention and made a fortune by his famous magnetic cures. His system obtained the support of members of the medical profession as well as of others, but he refused an offer of an annual pension of 20,000 livres (about $4000) to reveal his secret; and this, combined with other circumstances, gave rise to suspicion and induced the government to appoint a commission, composed of physicians and scientists, whose report was unfavorable to him. He now fell into disrepute, and after a visit to England retired to Meersburg, where he spent the rest of his life in obscurity.

MES′MERISM. The name of the process by which, towards the end of the eighteenth century, Franz Mesmer (q.v.), promulgator of the doctrine of animal magnetism, induced the so-called mesmeric trance or sleep. Since Mesmer's day the subject has been transferred from the domain of charlatanism to that of scientific research. The mesmeric trance is identical with the condition known to-day as induced somnambulism, or hypnotism, or the hypnotic state; it has presented to the observer many highly interesting phenomena. In persons who are favorably disposed for passing into the hypnotic state the condition is easily induced by weak, long-continued, and uniform stimulation of the nerves either of sight, of touch, or of hearing. This state is, on the contrary, almost always easily capable of being brought to a close by some strong or suddenly varying stimulation of the same nerves.

The scientific study of the phenomena presented by hypnotized persons is of great interest and has a definite though very limited sphere of usefulness in the cure of mental and functional disorders. Actual harm may result from the practice of hypnotism upon some nervous and impressionable persons. Moreover, the number of those susceptible to its influence is so small that its general use is impossible. For obvious reasons, women should never be hypnotized without reliable witnesses, and the public use of hypnotism can only appeal to the morbid. Hypnotism tends to destroy self-reliance and to make patients imaginative, weak-minded, and neurasthenic. Suggestion (q.v.) is a mighty aid to the physician, and without producing hypnosis, positive and intelligent assertion can accomplish all that is likely to be done by hypnotism short of the somnambulistic stage. A fair realization of the part suggestion plays in therapeutics is one of the recent achievements of the most progressive medical minds. See HYPNOTISM; MENTAL SCIENCE; PSYCHOTHERAPY; SOMNAMBULISM; SPIRITUALISM; SUGGESTION.

MESNE (mēn) **LORD.** In English law, a landlord of whom lands are held in fee who is himself tenant in fee to some superior lord. The lord of a manor containing freehold lands which are held of him in fee, and who in his turn holds his lands of the crown, answers that description at the present time; the superior lord, in this case the King, being the lord paramount. See FEE; FEUDALISM; TENURE.

MESNE PROCESS. All writs, process, or orders made or issued in an action between its commencement by original writ, summons, or

other primary process and the final process by which the judgment of the court is enforced. This term is not employed under modern practice acts in the United States, but is still employed in the "common-law States" and in England. In the "code states" such process is now included in that covered by the term "interlocutory order, judgment, or decree." See EXECUTION; JUDGMENT; SUMMONS; WRIT.

MESNE PROFITS. The reasonable value of the use and occupation of real property during the period in which a trespasser remains in possession, and which may be recovered by the true owner as an incident to his judgment in ejectment. The mesne profits cover the revenue derived by the trespasser from the land during the period of his wrongful possession, including the value of crops gathered, timber cut, etc., as well as the rent received by him. In the ordinary case the mesne profits are estimated by taking the fair and reasonable net rental value of the premises between the original entry by the trespasser and the restoration of the owner in possession and deducting therefrom all reasonable and necessary expenses for repairs and improvements incurred by the trespasser and the amount of any taxes or assessments paid by him. See DAMAGES; EJECTMENT.

MES'OHIP'PUS (Neo-Lat., from Gk. *μέσος, mesos*, middle + *ἵππος, hippos*, horse). A name sometimes applied to one of the fossil horses of Miocene age. See HORSE, FOSSIL.

MESOINOSITE. See INOSITE.

MES'OLITE (from Gk. *μέσος, mesos*, middle + *λίθος, lithos*, stone). A hydrated sodium-calcium-aluminium silicate that is intermediate in composition between natrolite and scolecite and apparently crystallizes in the triclinic system. It occurs crystallized, in fibrous masses, and sometimes massive, with a vitreous lustre, and in color is white or of light shades of gray or yellow. Mesolite is found in amygdaloid and other volcanic rocks, especially in Iceland, Scotland, in Pennsylvania and Colorado in the United States, and in Nova Scotia.

MESOLONGHI, mĕs'ō-lŏn'gē. A town of Greece. See MISSOLONGHI.

MESONERO Y ROMANOS, mā'sō-nā'rō ē rō-mā'nōs, RAMÓN DE (1803–82). A Spanish essayist, born at Madrid. He entered first upon a mercantile career and while thus engaged he collected the material for his *Manual de Madrid*. As a journalist, he collaborated on the *Cartas Españolas*, and in 1836 he established the *Semanario Pintoresco Español*, which he continued to direct until 1842. The best of his essays are to be found in the volumes entitled *Escenas matritenses* (2 vols., 1836) and *Memorias de un setentón* (1880). Those contained in the former collection give faithful pictures of older Madrid, and therefore have a decided antiquarian value; those included in the *Memorias* present much matter that is now very useful to an understanding of the political, social, and literary aspects of the time. Consult: the edition of his *Obras completas* (8 vols., Madrid, 1881); *Trabajos no coleccionados* (2 vols., ib., 1903, 1905); and a good bibliographical note in G. T. Northup, *Selections from Mesonero Romanos* (New York, 1913).

MES'ONYX (Neo-Lat., from Gk. *μέσος, mesos*, middle + *ὄνυξ, onyx*, nail). A fossil creodont mammal found in the fresh-water Eocene formations of Wyoming and New Mexico. A complete skeleton has been mounted in the museum of Princeton University. It shows the animal to have had a large head, with strong jaws and stout teeth which were able to crush bones. The body is more bulky in front and smaller and weaker behind, with a remarkably long and powerful tail. It resembled in some superficial respects the modern Tasmanian wolf.

MESOPH'ILOUS PLANT (from Gk. *μέσος, mesos*, middle + *φίλος, philos*, dear, from *φιλεῖν, philein*, to love). An objectionable term for plants which grow in intermediate conditions. "Mesophytic" is preferable. See MESOPHYTE.

MES'OPHYLL (from Gk. *μέσος, mesos*, middle + *φύλλον, phyllon*, leaf). The characteristic tissue of a foliage leaf, including all of the tissues of a leaf excepting the epidermis and the veins. The mesophyll cells contain chloroplasts, and therefore are the cells of the leaf engaged in the manufacture of carbohydrates. In leaves of ordinary exposure the mesophyll is differentiated into two regions: (1) palisade tissue, which develops on the upper side of the leaf and consists of elongated cells standing close together and with their long axes at right angles to the plan of the leaf; and (2) spongy tissue, which is developed on the lower side of the leaf and consists of cells loosely arranged, so as to leave a labyrinth of intercellular spaces. In some cases groups of mesophyll cells may become water-storage tissue, in which case they may lose the green pigment. A general term, applied to all green tissue, whether in the foliage leaf or elsewhere, is chlorenchyma (q.v.). In the foliage leaf chlorenchyma and mesophyll are usually synonymous, but the former is the name of a distinct tissue, while the latter is a name of position and may include more than one tissue. See LEAF.

MES'OPHYTE (from Gk. *μέσος, mesos*, middle + *φυτόν, phuton*, growth, plant). A name given to plants which grow naturally in conditions of intermediate soil moisture. The term is thus in contrast with hydrophyte and xerophyte (qq.v.). To this group belong the most common plants of the forest and grass lands of equable climates. Cultivated areas with very few exceptions are mesophytic. Hydrophytes and xerophytes, then, may thus be regarded as extremes, the one adapted to an extreme of moisture, the other of dryness. On account of the almost uniformly favorable conditions mesophytes are able to survive without any striking adaptations such as are to be found among xerophytes and hydrophytes. However, with the exception of a few remarkably plastic hydrophytes, they exhibit maximum plasticity. It is perhaps not surprising that plasticity is found developed to a high degree among them, the sequence of periods of extreme moisture or extreme dryness tending to rigidity of structures. The vegetation of mesophytic areas is much more dense than that in xerophytic or even in hydrophytic regions, and there is a far greater wealth of species. The struggle for existence is thus more keen, and fewer representatives of the various species may be found, while a xerophytic or hydrophytic plant society may often be characterized by the dominance of one or two species. The keen competition which exists in mesophytic regions may perhaps account for the survival of forms with a high degree of plasticity. The various mesophytic societies are treated under the following heads: FOREST; MEADOW; PASTURE; PRAIRIE.

MES'OPOTA'MIA (Lat., from Gk. *μεσοποταμία*, sc. *γῆ, gē*, country, country between the

rivers, from *μέσος, mesos,* middle + *ποταμός, potamos,* river). In the widest sense, all the country between the Tigris and Euphrates rivers from Armenia to the Persian Gulf; in a narrower and more proper usage, the northern part of this territory, called to-day by the Arab name El Jezirah (the island peninsula), the southern portion (Babylonia) being known as Irak Arabi. In the Old Testament this territory is called Aram Naharayim (the Aram of the two rivers) and Padan Aram (the plain of Aram). The name, in the form Nahrina, is found in Egyptian inscriptions and in the Amarna letters. Concerning the earliest history of Mesopotamia cuneiform descriptions have as yet given no information. If Uspia and Kikia of Asur were Hittites (see ASSYRIA), it is possible that this Asianic people invaded Mesopotamia before the Assyrians carried their arms through the country into Cappadocia in the twenty-third century B.C. The Hittites, who in 1932 B.C. overthrew the first dynasty of Babylon (see BABYLONIA), are likely to have established themselves in Mesopotamia. In the fifteenth and fourteenth centuries the ruling power was the Mitannians (q.v.). Samsi Adad II (c.1870–1840) had already built a temple to Dagan in Tirka, south of the Khabur. After the decline of the Mitannian power Shalmaneser I (c.1320–1290) conquered northern Mesopotamia, and in the treaty between the Hittite King Dudhalia and the Amorite Benteshina Assyria appears as suzerain in Mesopotamia. Soon after this Aramæan tribes seem to have settled in the land, and strong kingdoms like the Bit Adini established themselves until Shalmaneser III (860–825) and his successors made themselves masters of Mesopotamia. The most important city in the Assyrian period was Haran. In the division between Media and Chaldæa after the fall of Assyria in 606 Mesopotamia fell to the latter. In 538 it passed under Persian rule, and later belonged successively to the Seleucid and Arsacid empires. The chief cities of this period were Edessa and Harran. (See EDESSA; OSRHŒNE.) The Romans made it a province. In 363 Jovian surrendered most of it to Persia. In the seventh century it came into the hands of the caliphs. After 1055 much of the land was ruled by petty Seljukian sultans. These were in turn conquered by the Mongols, who captured Bagdad in 1258. The Osmanlis began their conquest early in the sixteenth century and in 1638 the land passed completely into their power. At present the population is mainly Arab; most of the tribes are as independent of the Turkish government as their brethren in central Arabia, though the country is nominally divided between several Turkish vilayets. There are a few Kurds in the north and a small number of Armenian and Syrian Christians. The land is hilly in the north, but low and sandy to the south. After the Euphrates and Tigris, the chief rivers are the Khabur, Jaghjagha, and Belikh. Bitumen is common and a few petroleum wells are found. The most important towns are Urfa, Mardin, Nesibin, Mosul, El Deir, and Rakka. In early times, when a good irrigation system was maintained, the land was fertile, populous, and the home of an advanced civilization. Owing to its situation, it was open to influences from both the east and the west, from Babylonia and Asia Minor. Perhaps its most prosperous time was under Assyrian and Babylonian rule, but in the early Christian centuries it contained important cities, such as Edessa and Nisibis. To-day it is desert except along the banks of the natural watercourses.

Bibliography. Oppert, *Expédition scientifique en Mésopotamie* (Paris, 1856–59); Lady Anne Blunt, *The Bedouin Tribes of the Euphrates* (London, 1880); Eduard Sachau, *Reise in Syrien und Mesopotamia* (Leipzig, 1883); Oppenheim, *Vom Mittelmeer zum persischen Golf* (Berlin, 1899); Guy Le Strange, *Lands of the Eastern Caliphate* (Cambridge, 1905); Louis Massignon, "Mission en Mesopotamie, 1907–08" in *Institut français d'archéologie orientale du Caire, Mémoires,* vols. xxviii, xxxi (Cairo, 1910–12); E. B. Soane, *To Mesopotamia and Kurdistan in Disguise* (London, 1912), containing a bibliography. See ASSYRIA; BABYLONIA, where the works dealing with the earlier history will be found.

MES'OZO'A (Neo-Lat. nom. pl., from Gk. *μέσος, mesos,* middle + *ζῷον, zōon,* animal). A group of animals regarded as intermediate between the Protozoa and Metazoa. The name was proposed in 1876 by E. van Beneden for a group of filiform bodies living in the liquid bathing the "spongy bodies" or venous appendages (kidneys) of cephalopods. They resemble Infusoria, but are two-layered and pass in their development through a gastrula stage. They were named Dicyema by Kölliker, who, with others, considered them as parasitic worms. Van Beneden regarded these forms as constituting the type of a distinct branch or phylum of the animal kingdom. These mesozoans are represented by two types of individuals, differing externally; one (nematogene) producing vermiform embryos, the other form (rhombogene) infusoriform (but many-celled) young. Packard suggested that Dicyema and allies may be degenerate parasitic platyhelminths derived originally from some low cestode or trematode worm. Parker and Haswell (1897) treat of them in an appendix to the Cœlenterata and state that it has been proposed to call them the Planuloidea, from the resemblance which they bear to the planula larva of the cœlenterates. Sedgwick (*Text-Book of Zoölogy,* 1898) is inclined to regard them as allied to the Trematoda, to the miracidium larva to which he asserts "they do present some considerable resemblance." Consult E. R. Lankester (ed.), *A Treatise on Zoölogy,* part iv (New York, 1903).

MES'OZO'IC ERA. One of the main divisions of geologic time, following the Paleozoic era and preceding the Cenozoic era. It is subdivided into the Triassic, Jurassic, and Cretaceous periods. See GEOLOGY.

MESPELBRONN, JULIUS ECHTER VON. See JULIUS ECHTER VON MESPELBRONN.

MESQUITE (mĕs-kē'tâ) **GRASS** (Sp. *mezquite;* probably of Mexican origin). A name applied to a number of low-growing tufted grasses that occur in greater or less abundance upon the extensive ranges of the western and southwestern parts of the United States. Species of Aristida and Boutelona are among the mesquite grasses, *Boutelona oligostachya* and *Boutelona curtipendula* being the best known. Curly mesquite is *Hilaria cenchroides.* It forms a dense sward with leafy stems a few inches to a foot high. It matures standing, as do the other species, and is excellent fodder until rotted by the winter rains. While valuable for grazing, it is too low growing to be cut for hay.

MESQUITE TREE (*Prosopis juliflora*). A shrub or tree belonging to the family Legumi-

nosæ, found from central Texas to eastern California, and southward through Mexico and Central America to Chile and Argentina, and also in Jamaica. It is also known as honey locust, honey pod, algaroba, and has been introduced in the Hawaiian Islands, where it is highly prized for its timber, shade, and for its pods, which are an important stock food. In the United States the tree attains its best development in the valleys of western Texas, New Mexico, and Arizona. In some places it is the only tree. According to some botanists the shrubby form is the species while to the larger tree of Arizona and Sonora the name *Prosopis juliflora velutina* is given. There is some doubt regarding the specific identity of the Hawaiian tree. According to its surroundings, the mesquite varies from a straggling, spiny shrub to a widely branched tree 50 feet high and 3 feet in diameter, the latter size being attained in rich valleys where water is available to the deeply penetrating roots. When once established it withstands extreme heat and drought. The wood is exceedingly durable and is much used for posts, house

MESQUITE TREE.

foundations, and similar structures, as well as for fuel. The leaves, which are eaten by stock, have about the same composition as alfalfa hay. The pods, which grow in clusters of from 2 to 10 and are from 4 to 8 inches long, are slender, white or yellow, contain a number of small hard seeds, and are rich in sugar, on which account they are eagerly eaten by cattle, horses, and mules. When eaten without preparation much of the nutritive value is lost, since the seeds are voided without being digested; but when gathered, dried, and ground their value is greatly increased, since the nitrogenous beans are saved. Two forms of gum are produced by the mesquite tree. One, resembling gum arabic, exudes as small clear or amber-colored drops from the trunks. It makes an excellent mucilage, and has been employed in laundries and for confectionery. The other, obtained from wounds in the trunks, occurs in black, brittle, larger masses. It contains as much as 20 per cent of tannin, and with some form of iron is used by the Mexicans as a black dyestuff. During the flowering period, which lasts for about two months, the trees are visited by bees for the abundant nectar, which makes a clear honey of very agreeable flavor. Mexicans make a cathartic by pounding the inner bark in water and adding salt to the mixture. A second species, *Prosopis pubescens*, is known as the screw bean or curly mesquite. It is a shrub or small tree growing in situations similar to the previous one. Its pods are spirally curled into close rigid cylinders. The uses of this species are very similar to those described above.

MESS (OF. *mes*, Fr. *mets*, dish (of food), It. *messo*, *messa*, course at table, from Lat. *missus*, p.p. of *mittere*, to send). A military and naval term originally signifying a dish or portion of food, but now used in the sense of a number or association of officers or men taking their meals together. The officers' mess or messes at an army post in the United States army are established and have quarters assigned for such purpose, under the supervision of the commanding officer. In campaign company officers usually mess with their organizations. Battalion officers mess with the companies or provide their own. The regimental commander and his staff form one mess or may mess with the band. To reduce transportation the superior commander may require all officers to mess with organizations. Whenever possible the enlisted men mess together by companies, under the supervision of the captain. An officer appointed by the post commander has charge of the "general mess" for enlisted men when such a mess is authorized and created by combining several companies. In campaign enlisted men mess by company when possible. Often it is necessary to mess in squads or have individual cooking.

The system of messing, as regards the soldier, is practically the same throughout Europe, varying in comfort and food according to the country and army organization.

On board ship the admiral messes alone or with the captain, if agreeable to both. The ward-room mess includes all ward-room officers. The junior officers (ensigns, if not in the ward room, naval cadets, pay clerks, etc.) have a separate mess room, as have also the warrant officers (boatswains, gunners, carpenters, warrant machinists, pharmacists). The enlisted force in most ships forms the "general mess." The men are divided into convenient units or messes, according to the size of the tables; the chief petty officers and those of the first class have their own tables, and when possible are granted special privileges in their messing arrangements. In ships on board which the "general mess" system has not been established the crew is divided into several messes, according to the number.

To each officers' mess in the navy are allotted a cook, steward, and servants, the number of the latter depending upon the number of officers in the mess. The servants (or mess attendants, as they are called) are not merely waiters and personal attendants, but in action they are ammunition passers.

MESSA DI VOCE, měs'sȧ dē vō'chȧ (It., setting of the voice). A term used in the art of singing, meaning the gradual swelling and again diminishing of the sound of the voice on a note of long duration.

MESSAGER, mĕ'sȧ'zhȧ', André Charles (1853–). A French composer and conductor, born at Montluçon. He began his musical studies at the Ecole Niedermeyer in Paris and completed his training under Saint-Saëns. In 1876 he won the prize offered by the Société des Compositeurs Français for the best symphony.

For a number of years he was organist at St. Paul's in Paris, until the success of some lighter operas secured him the position of conductor at the Opéra Comique in 1898. From 1901 to 1907 he was the artistic director at Covent Garden. In 1907 he was appointed first conductor at the Grand Opéra in Paris, and at the same time joint director with Broussan. He resigned the directorship in 1914, but continued as conductor. He directed the first Paris performance of *Parsifal*. In 1908 he succeeded Marty as conductor of the Concerts du Conservatoire. His compositions (almost exclusively operas) include *La fauvette du temple* (1885); *La basoche* (1890); *Mme. Chrysanthème* (1893); *Le Chevalier d'Harmental* (1896); *Les petites Michus* (1897); *Véronique* (1898); *Les dragons de l'impératrice* (1905); *Fortunio* (1907); *Béatrice* (1914).

MESSA'LA CORVI'NUS, Marcus Valerius (c.70 B.C.–c.1 B.C.). A Roman soldier, orator, and patron of letters. He was educated in part at Athens, and, having returned to Rome after Cæsar's assassination and previous to the formation of the second triumvirate, became a member of the Senatorial party. He was third in command of the Republican army at Philippi, and stormed the camp of Octavius, whom he almost captured. Having escaped, with a fairly well organized force, to the island of Thasos, he later accepted terms from Antony, against whom, however, at Actium, he brilliantly commanded the centre of Octavius' fleet, and whose abrogated consulship he filled (31 B.C.). Appointed proconsul of Aquitania, he completed the reduction of that province and received a triumph. He was also at one time a prefect in Asia Minor, and became a special member of the College of Augurs. He was reckoned, with Gaius Asinius Pollio, the last orator of the old school. He was a liberal patron of men of letters, of a group distinct from that which gathered under the auspices of Mæcenas. Consult Wiese, *De Corvini Vita et Studiis Doctrinæ* (Berlin, 1829), and the article "Valerius, 43," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MESSALIANS. See Massalians.

MES'SALI'NA, Valeria. The most infamous woman in the annals of the Roman Empire. She was the daughter of M. Valerius Messala Barbatus, and third wife of the Emperor Claudius, whom she married before his accession in 41 A.D. (See Claudius I.) Taking advantage of the weakness and stupidity of the Emperor, she indulged in the most wanton and flagrant atrocities, both moral and political. If we are to judge by the Roman historians, her character was unspeakably vile, and her boundless ambition could be satisfied only with the destruction of all who seemed to thwart her plans. The best blood of Rome flowed at her pleasure. She retained her influence over the Emperor, who remained unaware of her infidelities; but when, during a short absence of Claudius from Rome, she actually committed the folly of going through the forms of a public marriage with C. Silius, whom she had compelled to divorce his wife, the affair was brought to the Emperor's attention by the freedman Narcissus, and Claudius reluctantly gave orders for her death. She was killed by a tribune of the guards, 48 A.D. Consult: Stahr, *Römische Kaiserfrauen* (Berlin, 1865); Tacitus, *Annales*, xi, 1–38; *Juvenal*, vi, 115–135; x, 333; xiv, 331; J. B. Mayor on *Juvenal* at the places cited.

MESSANA. See Messina.

MESSA'PIA (Lat., from Gk. Μεσσαπία). The name applied by the Greeks to Calabria (in the classical sense), a peninsula in the southeastern part of Italy, extending from Tarentum to the Iapygian Promontory. The chief towns were Rudiæ, where Ennius (q.v.) was born, Brundisium (see Brindisi), Uria, and Uzentum. The Messapii, inhabitants of this part of the country, were known also as the Iapyges, or Iapygii. Their language survives in some inscriptions, about 50 or 60 in number, consisting mostly of proper names. On these consult: Theodor Mommsen, *Die Unteritalischen Dialekte* (1850); A. Torp, *Indogermanische Forschungen*, vol. v (1895); R. S. Conway, *The Italic Dialects* (2 vols., Cambridge, 1897); I. P. Droop, *Annual of the British School at Athens*, vol. xii (Athens, 1905–06).

MESSENE, mĕs-sē'nē (Lat., from Gk. Μεσσήνη). The capital of Messenia, in the Peloponnesus, founded by Epaminondas (369 B.C.) (Map: Greece, Ancient, B 3). It lay at the foot of Mount Ithome, surrounded by a stone wall 5½ miles long and of great strength. This wall is still well preserved in places, especially at the Arcadian Gate, which is an exceptionally fine example of Greek fortification. The stadium, theatre, and other ruins can be easily traced, and excavations in 1895 by the Greek Archæological Society brought to light a fine colonnade and other remains of the ancient agora.

The town was settled by the descendants of the ancient Messenians (see Messenia), whom Epaminondas invited to return, and was therefore the hereditary enemy of Sparta, contributing not a little to the continual internecine strife which marks the history of the Peloponnesus from the middle of the fourth century B.C. to the Roman conquest. The modern Messene, or Nisi, is some distance from the ancient site, which is partly occupied by the little village of Mavromati. Consult K. Baedeker, *Greece*, pp. 410–412, with plan (4th Eng. ed., Leipzig, 1909).

MESSE'NIA (Lat., from Gk. Μεσσηνία). A district in the southwest part of the Peloponnesus, bounded on the east by Laconia, on the north by Arcadia and Elis, and on the south and west by the sea (Map: Greece, Ancient, B 3). It consisted of extensive plains, watered by the Pamisus and other streams. These plains were famous for their fertility, and particularly for their wheat harvests. At an early period, after the Doric conquest (see Dorians), it rose to power and opulence. Its chief cities were Methone and Pylos. In late times Messene was the capital. Messenia is chiefly noted for its two wars with Sparta, known as the Messenian wars, the first of which seems to have occurred in the eighth century B.C., the second (of which Aristomenes is represented as the hero) in the second half of the seventh century B.C., though the authorities on which our accounts of both wars rest are far from satisfactory. In both instances the Messenians were defeated, and after the second war a part of the population emigrated to Sicily. The peopling of Messana (see Messina) was much later. The remainder of the inhabitants were reduced to the position of helots. A revolt of the latter, who fortified themselves on Mount Ithome and held out for 10 years, is known as the Third Messenian War (464–455 B.C.). The invasion of the Peloponnesus by Epaminondas in 370–369 led to the

return of the Messenians to their land (see MESSENE) and the revival of their old state, which continued independent, though in alliance at times with the Macedonians, until the Roman conquest (146 B.C.). Messenia is the name of one of the nomarchies of the modern Kingdom of Greece, with Kalamata as its capital. Consult: C. Bursian, *Die Geographie von Griechenland*, vol. ii (Berlin, 1868); A. Philippson, *Der Peloponnesus* (ib., 1892); J. G. Frazer, *Pausanias*, vol. iii (2d ed., New York, 1914).

MESSI'AH (transliterated in Gk. Μεσσίας, *Messias*, or Μεσίας, *Mesias*, from Aram. *Meshiha*, the *h* having been slurred over in pronunciation, the equivalent of Heb. *ha-Mashiah*, the anointed, translated into Gk. χριστός, *Christos*, Christ). A title given to the king or pontiff in ancient Israel and Judah because of his anointment as vicegerent of the deity and ruler of the people, and in later times a designation of the expected deliverer from foreign oppression and founder of a world-wide Jewish empire. Saul (1 Sam. xii. 3, 5, xxiv. 7, 11), David (2 Sam. xix. 21, xxiii. 1), and Zedekiah (Lam. iv. 20) are spoken of as Yahwe's anointed. In Isa. xlv. 1 the title seems to be applied to Cyrus; doubts, however, have been expressed, both on metrical and other grounds, as to whether the words "to Cyrus" formed a part of the original text. (See ISAIAH.) The anointed priest referred to in Lev. iv. 3, 5, 16 is clearly the high priest, who, during the Persian period, was the head of the state and therefore was spoken of as the Messiah, the anointed one, quite as naturally as the kings of preëxilic times. The same custom evidently continued in the Ptolemaic and Seleucid periods, as Joshua ben Jozadak is alluded to as the anointed prince in Dan. ix. 25, and the cessation of the legitimate high-priesthood is expressed by the phrase "the anointed is cut off" in Dan. ix. 26. (Cf. Wellhausen, *Israelitische und jüdische Geschichte*, 7th ed., p. 234, Berlin, 1914.) The priest kings of the Hasmonæan dynasty, as possessors both of the throne of David and the pontificate, naturally received this title. (See MACCABEES.) Ps. xviii. 50, xx. 6, xxviii. 8, lxxxiv. 10, lxxxix. 39, 52 are regarded by many scholars as referring to some of these rulers, though it is doubtful in some instances whether one of the actual kings, Aristobulus I and Alexander Jannæus, or a princely pontiff like Jonathan, Simon, or John Hyrcanus is meant. There appears to be no passage in the Old Testament in which the title is unmistakably used with reference to a future monarch. It has been thought, however, that this is only an accident, and that such an eschatological figure is alluded to here and there under other names. Thus, Shiloh (Gen. xlix. 10), the star (Num. xxiv. 17), the Prince of Peace (Isa. ix. 6), the branch (Isa. xi. 1), Immanuel (Isa. vii. 14), the righteous Shoot (Jer. xxiii. 5), my servant David, and the shepherd (Ezek. xxxiv. 23, xxxvii. 24) have been considered by some scholars as possibly designating the Messiah. They have sought a justification for expecting such veiled allusions in certain Babylonian and Egyptian prophecies that have recently come to light and seem to them to point to analogous eschatological speculations among the nations by which Israel and Judah were influenced. Thus, Zimmern has called attention to a cuneiform inscription describing a time of prosperity when a righteous king shall reign over the land. (*Zum Streit um die Christusmythe*, Leipzig, 1910.) A Petrograd papyrus, a wooden tablet at Cairo, and an ostracon at Liverpool contain a prophecy which is said to have been made by a priest in the time of Snefru, but probably belongs to the twelfth dynasty, predicting (ex eventu) the power and prosperity of the founder of this dynasty, Amenemhat I. The admonitions of the sage Ipuwer to a king of the nineteenth dynasty in a Leyden papyrus, published by Gardiner (*The Admonitions of an Egyptian Sage*, Leipzig, 1909) and interpreted also by Breasted (*Religion and Thought in Ancient Egypt*, New York, 1912), speak of a shepherd of men in whose heart there is no evil, and ask "Where is he to-day? Doth he sleep perchance? Behold his might is not seen." The text is obscure, and it is not clear whether the sun god Re, or a future king, or even the monarch addressed is intended. While these texts are fragmentary, of doubtful interpretation, and insufficient to prove a connection of prophetic speculation in general, and the Messianic idea in particular, with Babylonian and Egyptian thought, there is nothing strange in the expression of the hope for a good king, and it would not be remarkable if certain designations of a great and noble ruler should prove to have been used by different peoples, independently or through imitation. Nor can it be affirmed a priori that the Hebrews could not have associated with kingship, present or future, that divine character which is so clearly assigned to it in ancient Egypt at all times and in Babylonia in the earliest periods. But thus far the evidence adduced is quite inconclusive. It is by no means certain that Shiloh is a name; the star in Balaam's oracle seems to point to David; Immanuel appears very clearly to be the name which a woman in Isaiah's time, expecting soon to be a mother, will give to her child; a descendant of the old royal family living in the exile seems to be referred to in Isa. ix. 6, xi. 1; and the same is likely to be the case with the passages in Jeremiah and Ezekiel alluding to my servant David (a David redevivus), the righteous Shoot, and the shepherd. As ampler material for such comparative study of ancient eschatology is brought to light it is possible that one or the other of these terms may appear more likely than is the case to-day to be veiled allusions to the Messiah. Critical scholars find it extremely difficult to discover any passage in the Hebrew Bible that refers to the Messiah as a future deliverer. The Psalter of Solomon, however, can no longer be pointed out as containing the earliest distinct and unmistakable reference to this Messiah; for it is probable that the Documents of the Covenanters of Damascus, published by Schechter (*Fragments of a Zadokite Work*, Cambridge, 1910), in which the hope of a coming Messiah is expressed, were written as early as c.100 B.C., and the sect to whose tenets this belief no doubt belonged from the beginning was formed soon after the overthrow of the legitimate Zadokite pontificate by the Tobiads in the reign of Antiochus IV (175–164 B.C.). The Messiah expected by these Covenanters was to come in the future from Aaron and Israel, not from David and Judah. Unless it hides under some cryptic forms, the figure of the eschatological Messiah would, therefore, seem to appear in literature as a coming high priest somewhat earlier than as a coming king.

But the elements out of which the Messiah as

an eschatological magnitude was formed had long been in existence. There had been a tendency to attach much importance to the anointing of rulers. From Saul to Zedekiah, from Joshua to Aristobulus II, the leader of the state, whether king, pontiff, or priest king, had been consecrated with oil. Originally unction was an application of sacrificial fat. The pouring of oil upon the stone in which the divinity dwelt was a sacrifice. The King was a holy being to whom this offering was made. With the anointing a spirit entered into him (1 Sam. xvi. 13); he was sacrosanct, his body must not be touched (1 Sam. xxiv. 10); he was gradually removed from the gaze of the people and seen only by his officials (2 Kings xix. 15). The pontiff as ruler of Israel was Yahwe's anointed, a son of oil (Zech. iv. 14), having access to the celestial court (Zech. iii. 7). It is held by some scholars that in the Hasmonæan age the priest king by virtue of his anointment was regarded as Yahwe's Son and as a god sitting on his throne. (Ps. xlv, lvii, lxxxii.) It is not considered strange by those holding this view that a victorious king engaged, as it seemed to his admirers, in the conquest of the world should at that time have been addressed as god by a court poet. (Ps. xlv. 6.) There had also been a tendency to repose extraordinary faith in the dynasty founded by David. The reason for this may have been its remarkable longevity; perhaps also its promised prosperity. As long as princes of this family lived and received signal honors at the hands of Chaldæan and Persian kings, as was the case with Jehoiachin, Sheshbazzar, and Zerubbabel, the hope of national independence naturally connected itself with these shoots of the old stock. Thus, the elevation of Jehoiachin from his dungeon to royal dignity in 561 B.C., and the birth of his son, Sinapaluzur (Sheshbazzar), seem, according to some scholars, to have led a poet to express the hopes of Isa. ix. 1–6, xi. 1–6, and the presence of Jehoiachin's grandson, Zerubbabel (q.v.), as governor in Jerusalem at the beginning of the reign of Darius Hystaspis raised expectations of his restoring the old dynasty. (Hag. ii. 23; Zech. viii. 8, iv. 6 et seq., vi. 12.) The gradual disappearance of prominent members of the Davidic family no doubt gave room for independent aspirations. Sanballat (q.v.) may have been right when he declared that prophets in Jerusalem had announced Nehemiah as the coming King. (Neh. vi. 7.) Simon became Prince as well as high priest, and Aristobulus I King, without belonging to the Davidic family. But the strength of the legitimist feeling may be seen both in the fiction by which the occupant of David's throne was designated as his son, and in the indignant protest of the Pharisees against this fiction. This loyalty to the legitimate line, and the increasing difficulty of finding a leader who should also be a genuine descendant of David, necessarily removed into the future the Messianic King. Of great importance was also the tendency, always strong in Israel, to look beyond present conditions for better things to come. While the great prophets before the Exile announced impending judgment, there were always those who held up cheerful pictures of the future to the people. After the Exile it was especially the author of Isa. xl. et seq. who inspired hope and courage by his promises of good. He indeed did not look forward to a Messiah, but he did much to develop that apocalyptic mood out of which this figure was born. The same is true of the Book of Daniel, which seems to have been written in part in the third century and in part in the year 165 B.C. It reveals a marked growth of the apocalyptic imagery, but the Messiah holds as yet no place among its eschatological figures. The manlike being appearing on the cloud (chap. vii) is probably Michael, the celestial representative of Israel. The Maccabæan uprising and the establishment of a native dynasty encouraged this disposition to map out the future. But while Yahwe's anointed actually sat upon the throne of David and was conquering the neighboring nations, there was no reason for putting the Messiah in the future. The atmosphere of the Psalter is saturated with a desire for divine judgment upon the heathen nations and breathes a pathetic confidence in the dynasty occupying the Davidic throne. The enthusiasm seems to have been shared by the Egyptian Jews. In the *Sibylline Oracles* (iii, 652 et seq.) there seems to be a reference to Simon as a godsent king who will put an end to evil war. From the standpoint of the Erythræan Sibyl, Simon may be said to be a king sent from the sun, even as Cyrus is called a king from heaven (iii, 286). The passage was probably written in the time of Ptolemy IX, Euergetes II (145–117 B.C.). Ethiopic Enoch i–xxxvi, written in the reign of John Hyrcanus (135–104 B.C.), contains no allusion to a king, and Ethiopic Enoch xc, 37, 38 seems to be a late addition to the book lxxxiii–xc, which apparently was written c.106 B.C. An elaborate eschatology had thus been developed in which the Messiah, according to this view, held no place. On the other hand the overthrow of the Zadokite high-priesthood and the assumption of the pontificate by the illegitimate line of Tobiad and Hasmonæan rulers appear to have led the Zadokites to look hopefully for a Messiah from Aaron and Israel, i.e., a high priest of the old line, not a son of David and member of the tribe of Judah. But the way was prepared by veneration for the anointed ruler of the state, loyalty to the old dynasty, the Davidic or the Zadokite, and speculation about the world's future. Roman oppression caused a fusion of these elements. The anointed king that was needed must be a genuine son of David, and as no claimant to the throne of the legitimate line presented himself, he necessarily belonged to the future. The Roman yoke was all the more galling as the Jewish people had for a century indulged in a dream of empire and imagined itself in the midst of the actual conquest of the world. But even this cruel disenchantment could not quench the spark of ambition. The Pharisees saw the cause of the calamity in the Hasmonæan usurpation of the throne of David, as the *Psalter of Solomon* shows, and looked to God to provide the genuine Son of David, strengthening their faith by the prophetic word. They understood the Psalms of David to be songs indited by the great monarch, and naturally interpreted the language in which the actually reigning King had been referred to as prophecies of the coming Messiah. Similarly, the words of ancient prophets originally referring to their contemporaries of the Davidic family or to the dynasty itself were explained as divine announcements of the coming dēliverer. But in spite of this support in the popular exegesis of the Bible, the Messianic hope seems to have been cherished only in limited circles. Whether the idea was influenced at the outset by

Mazdayasnian thought is doubtful; in its later development it may have borrowed some features from the Saoshyant (q.v.). This Persian Messiah has no political character. He was expected to raise the dead and to renew the world. (*Yasht*, xix, 92 et seq.) The Messianic idea seems to have had little hold upon the Alexandrian Jews. It is not certain that the translators of Isa. ix. 5 and Ps. cx. 3 had the Messiah in mind; in Num. xxiv. 7 the Davidic house is meant, and the rendering of Gen. xlix. 10, "he is the expectation of the nations," is not likely to be original. It is doubtful whether *Sibylline Oracles*, iii, 46–62, 75–92 belongs to the time of the first triumvirate and Cleopatra or to the time of Galba, Otho, and Vitellius; in the latter case the widow is Rome, and the holy ruler may be none else than the immortal God and great king mentioned in the same connection. The Book of Wisdom contains no allusion to the Messiah. Philo declares that the Israelites shall return to Palestine "led by a divine or more than human apparition" (*De Execrationibus*, iii, 437), and that if the future kingdom of peace shall be disturbed a man will come, according to the promise, to subdue the nations, God granting to the pious auxiliaries in psychic power and physical strength (*De Præmiis et Pœnis*, ii, 421–428). But he seems to have thought of the divine glory and of deliverance through manly qualities rather than through a man. The Slavonic Enoch knows nothing of a Messiah. The same silence concerning this figure is found in such Palestinian works as Ecclesiastes; the *Assumption of Moses* (i–vi), written in the beginning of our era; the *Book of Jubilees;* and the original *Testaments of the Twelve Patriarchs*. It is held by many that, aside from the *Psalter of Solomon* there is no unmistakable reference to the Messiah in any literary production that can be dated with certainty as earlier than the time of Jesus. But the description given in this work (xvii, xviii) of the coming king shows with sufficient clearness that some men in Israel in the first century B.C. looked forward to the appearance of a descendant of David, who would be a conqueror of nations and a righteous ruler and whom they called the Messiah. And the recent discovery of the Zadokite work (see ZADOKITES) has shown that the term was applied in the second century B.C. to the expected high-priestly ruler, the Messiah from Aaron and Israel. According to Matt. xxii. 15, 16 (Mark xii. 13) there was a party of the Herodians. Tertullian declares that "the Herodians said Herod was the Christ." (*Præscr.* 45.) It is not improbable that the King who built the most splendid temple Jerusalem had ever had and restored the Davidic kingdom, even though it was by the favor of Rome, was thus looked upon as the promised Messiah by his courtiers. Judah of Gamala in Galilee seems to have been regarded as the Messiah by many and undertook an insurrection in 7 A.D. (See JUDAS OF GALILEE.) He was supported by Zadok, a disciple of Shammai. The immediate cause of the rebellion was the census of Quirinius on the accession of Archelaus. He was put to death, but his followers continued as a sect. (Josephus, *Wars*, ii, 118.)

Jesus of Nazareth was crucified under Pontius Pilate as a political criminal claiming, in defiance of the authority of Rome, to be King of the Jews. It is believed by some that he never claimed himself to be the Messiah. The Synoptic Evangelists believed, indeed, that he was the Messiah. But this belief may have been based on the conviction that he had been raised from the dead. For a time, at any rate, he avoided assuming any distinctive Messianic title, and on several occasions forbade his disciples to say that he was the Messiah. From their point of view they could explain this attitude only as a persistent attempt to keep his Messiahship a secret. This secret was known to God, who might in due time reveal it, and to the demons, who were punished for prematurely announcing it, but not to men. The disciples seem, however, to have regarded the term Son of Man as a self-designation of Jesus by which he intended to hint at his Messianic claims without directly disclosing them. But this belief, it is argued, may have been erroneous, and so indefinite a term as "man" cannot very well have been a Messianic title and is not found in Jewish literature as such. The life and teaching of Jesus offended all influential parties in the nation, while the enthusiasm and indiscretion of his disciples readily furnished immediate excuse for a false accusation. Pilate could scarcely avoid regarding him as a disturber of the peace and handed him over to be crucified on the ground of the loose charge preferred against him. Similarly, there is no evidence that John the Baptist regarded himself as the Messiah, though his disciples at a later time may have considered him as such.

According to the traditional view, still held by many Catholic and Protestant scholars, the Messianic belief was embedded in Hebrew history and interwoven with the deepest life of the people. The promises which formed and fed it are thought to reach back to the earliest Jewish annals, and the belief itself is regarded as resting upon traditions coeval with the origin of the human race. The Messianic idea is supposed to have been inseparably connected with the provision for the redemption of man after the fall and gradually unfolded through the history of the chosen people.

From this standpoint the evolution of the Messianic idea is traced through four distinct epochs, three within the limits of the Hebrew canon and the fourth outside it. The first of these ends with Moses. In the protevangelium there is the primal promise. The seed of the woman is to bruise the serpent's head. This promise takes shape in the family of Abraham, in whose seed all the nations of the earth are to be blessed. Paul argues in Gal. iii. 16 that the seed is a personal Messiah. His characteristics are gradually unfolded in the Shiloh of the dying Jacob (Gen. xlix. 10), in the star of Balaam (Num. xxiv. 17), and the prophet of Moses (Deut. xviii. 18, 19), as the lawgiver, teacher, and deliverer of Israel. The second period centres in the reigns of David and Solomon. The promise of a kingdom to David and his house forever is regarded as precluding a mere continuation of his dynasty on an earthly throne, but implying a superhuman royalty of which there is supposed to be a series of pictures in the Messianic psalms, which are believed to be pervaded with the expectation of a coming deliverer. In Ps. ii, xlv, lxxii, and cx, e.g., this traditional interpretation sees a picture not only of the Messiah's inheritance and the blessings and extent of his kingdom, but of the King himself reigning among men and bringing to his subjects righteous judgment, salvation, and redemption. He is both priest and king. He is David's Lord

as well as his son. His empire is spiritual. Its rule is world-wide and time-embracing. He is to reign until his enemies become his footstool. The third period extends to the close of the Hebrew canon and includes, according to tradition, the richest mine of Messianic prophecy in the Old Testament. Messiah as the servant of God is regarded as the central figure of Isaiah's prophecies. This expected king, this root of Jesse, will "stand for an ensign of the people." He will be the rallying point of the world's hopes, the true centre of its government. (Isa. xi. 10.) He is portrayed as the mighty God, the everlasting Father, the Prince of Peace. (Isa. ix.) The picture of the suffering servant of Yahwe in the fifty-third chapter is considered as a prophetic anticipation of the events in the judgment hall of Caiaphas and before Pilate's bar. Jeremiah is supposed to have depicted the future deliverer as a king executing judgment and justice in the earth (Jer. xxiii. 5) and Zechariah is thought to have painted him as an enthroned priest (Zech. vi. 13). Daniel vii, according to this view, applies to the coming Messiah the title Son of Man, whose dominion is "an everlasting dominion which shall not pass away." Finally Malachi is held to have referred to him as the angel of the covenant, whom Israel was seeking and who would "suddenly come to his temple." (Mal. iii. 1.) The fourth epoch extends from the close of the Hebrew canon to the beginning of the Gospel era. Among the Jews of Alexandria the Messianic hope at this time is supposed to have deteriorated, while among the Palestinian Jews it survived and flourished. The Hellenized peoples would naturally be absorbed in the current speculations regarding the Sophia and the Logos and long absence from Palestine, and a hesitancy to avow startling beliefs among unfriendly critics, would tend to quench all interest in the future of Jewish nationality. Nevertheless the expectation of a Messiah existed both among the common people and in more intellectual circles at the beginning of the Christian era. The Galilean peasantry and the Pharisees alike expected the fulfillment of the national hopes. An oppressed and suffering people naturally looked for a secular prince who would free them from the heathen yoke, and when Jesus entered upon his public ministry, Messiahship meant to the masses and the classes of Jewry simply emancipation from Roman rule. But Jesus did not lend himself to this type of Messiahship. He is supposed to have claimed to be the divine Messiah of David and Isaiah. The conversation between him and Peter at Cæsarea Philippi is understood as implying on his part an acceptance of the Messianic title, and Peter's confession is taken as the supernaturally imparted recognition of Jesus as the Messiah. In the Fourth Gospel the same designation of him is used by the Samaritan woman (John iv. 25, 26) and accepted by Jesus, and Andrew says to his brother Simon: "We have found the Messiah, which is, being interpreted, the Christ" (John i. 41 et seq.).

According to the traditional view, the title Son of Man was the Christ's self-chosen designation of himself. To Jewish ears it is supposed to have been a clear assertion of Messiahship. Some think that in consequence of the prophecy of Daniel it became a popular and official title of the Messiah. In one part of the Book of Enoch (q.v.), which, however, is of uncertain date, the judgment day of Messiah, identified with Daniel's son of man, stands in the forefront of the eschatological picture. Jesus, when standing at the tribunal of Caiaphas, is reported as having said to his judges: "Hereafter shall ye see the Son of Man sitting at the right hand of power and coming in the clouds of heaven" (Matt. xxvi. 64), and a similar prediction is found in his prophecy over Jerusalem (Matt. xxiv. 30). Those who accept the genuineness of these sayings think that it was no merely generic title, but the constant setting forth of his Messianic claims, and that it brought down upon him the wrath of the scribes and Pharisees. The Sanhedrin, the highest court of Jewry, is supposed to have condemned him because he claimed divinity. "We have a law and by our law he ought to die because he made himself the Son of God," said the members of this court to the Roman governor, according to John xix. 7. "He hath spoken blasphemy," cried the high priest, according to Matt. xxvi. 65.

It should also be stated that between the critical estimate first given and the traditional interpretation just outlined many scholars have assumed a mediating position, rejecting the bulk of supposed Messianic prophecy and the accuracy of the New Testament interpretation of it, while still maintaining that Jesus regarded himself as the Messiah and gave to the Messiahship as to the kingdom a more spiritual significance.

In 37 A.D. a Samaritan appeared as a leader of a rebellion in Tirathana. Precisely what claims he made for himself is not clear from the account of Josephus (*Ant.*, xviii, 85 et seq.). There are many indications that after this time a more transcendental character was given to the Messianic conception, not only among the Jews who looked forward to a return of Jesus as the Messiah, but also in other circles of Jewry. Theudas, who announced himself as the Messiah in the reign of Claudius, did not depend upon military strength or political diplomacy, but looked for a miraculous establishment by God of the Kingdom of Israel in place of the Roman Empire. He was beheaded by Cuspius Fadus in 46 A.D. (Josephus, *Ant.*, xx, 97 et seq.) The Egyptian (c.58 A.D.) mentioned by Josephus (*Ant.*, xx, 169 et seq.) probably claimed to be only what the historian calls him—a prophet. But Menahem, son of Judah, the Galilean, who appeared during the siege of Jerusalem, led the attack upon the Roman garrison clothed in royal garments and fell a victim of his Messianic pride and arbitrariness. An apocalyptic fragment of Jewish origin, preserved in Rev. xi. 1, 2, xii, sets forth figuratively how the Messiah has already been born, but is hidden secure against Roman persecution, to appear in due time. This idea that the Messiah has been born in the Jewish community, but has already as a child been translated, is similar to the conception found in the Babylonian Talmud (*Sanhedrin*, 98 b), where the Messiah is a deceased descendant of David who rises from the dead to accomplish the delivery of Israel. Both of these notions were due to the conviction that God would provide a genuine son of David. A translated hero would naturally return on the clouds of heaven. Thus, in the *Apocalypse of Baruch*, written after the fall of Jerusalem, the Messiah is "revealed" (xxix, 3, xxxix, 7) and "returns in glory" (xxx, 1) to rule until the world of corruption is at an end (xl, 3), sparing some and putting others to death (lxxii, 2–6). In the *Apocalypse of Ezra*, written c.97 A.D., the Mes-

siah is to be revealed during 400 years and then die together with all men, whereupon the present age will end and a new world begin, after seven days of silence, with the resurrection of the dead and the appearance of the Most High on the judgment seat (vii, 28 et seq.). The woman that brings forth a child, as in Rev. xii, loses him when she is about to give him a wife and flees into the wilderness (ix, 43 et seq.). The lion rebuking the eagle is said to be the Messiah, who has been preserved for the end from the seed of David (xii, 3 et seq.). Finally the manlike or angelic being that rises from the sea and flies with the clouds of heaven, destroying an army with the fire proceeding from his mouth, is declared to be the Messiah (xiii). In spite of the marked influence of Jewish-Christian thought, the emphasis is strongly put upon the assertion that God is not to judge His creation through any one (v, 56, vi, 6). It is possible, however, that even this step was taken by the Jewish interpolator of the parables of Enoch. (See ENOCH, *Books of.*) In the original vision God alone is the judge and there is no Messiah; but the book seems to have been annotated and expanded by a writer who looked forward to the revelation of a chosen instrument, not merely for the punishment of the nations, but for the judgment of the world—a man destined to sit upon a glorious throne to judge angels and men (xlv, 3, 4, xlv, li, liii, 6, lv, 4, lxi, 8, 9). This picture has finally been retouched by a Christian hand. The Aramaic original is lost, but even the Ethiopic translation renders it possible to distinguish between the early passages, where a *bar nasha* in the generic sense of man occurred, and the places where the Christian title has been subsequently introduced. The original work may have been written in the time of Caligula, and the Jewish expansion in the reign of Domitian. After this a reaction against the transcendental Messianic idea set in. This was developed in Christianity as it separated itself from Judaism. The Messianic idea became fused with metaphysical speculation of Greek origin to such an extent that ὁ χριστός, "the anointed one," the etymological equivalent of "the Messiah," finally conveyed a meaning absolutely foreign to the original conception.

The figure of Simon bar Kozeba (or Bar-Cochba) was probably as close a realization of the popular Jewish ideal of a Messiah as history ever produced. Of him alone can it be said that he was not only recognized by his people as the Messiah at a time when the Messianic idea had reached its full development and regarded himself as such, but also succeeded temporarily in redeeming Jerusalem from foreign oppression. In less than a year he conquered 50 fortified cities and 945 towns and villages. His army consisted of 200,000 men. For two years and a half he reigned as King. Only after 52 battles could Julius Severus vanquish him in 135 A.D. There is something sublime in this King of Zion bidding Imperial Rome defiance. The terrible persecutions that followed the Hadrianic insurrection did not quench the Messianic hope. This is shown by the "Eighteen Prayers"; by Trypho, who told Justin Martyr that all Jews believed the Messiah would come, a man born of men; and by Celsus, who in 178 A.D. no doubt correctly represented his Jew as cherishing this expectation. The Targums also indicate its continuance. The idea of a Messiah ben Joseph who is to rule until Messiah ben David comes may be an early Jewish concession to the Ebionitish Christians who believed that Jesus was the son of Joseph; or it may be another form of the belief, already met with in the Documents of the Damascus Covenanters, that the Messiah would come from Israel and not from Judah. Only in late writings is there any reference to a suffering Messiah, though the notion of sufferings of Israel previous to the establishment of the Messianic kingdom is common. The end of the Roman Empire and the victories of the Mohammedans naturally stirred afresh the hope of a return to Palestine and the coming of the Messiah. In 716–721 Serenus, a Galilean, appeared as a Messianic reformer, after the fashion of Mohammed, rejecting certain rabbinic regulations as to food and marriage and gaining many followers. But when he was brought to task by Yazid II, the Ommiad Caliph, he lacked the courage of his convictions and was handed over to the Jewish authorities for punishment. From 745 to 755 Abu Isa exercised a great influence as a reformer, abolishing the law of divorce and the sacrificial cult and maintaining himself with a large army against Merwan II and Abdallah. After his death he had followers into the tenth century. Yudghan, of Hamadan, on the other hand, pursued no political ends. He sought only to reform Judaism, being an ascetic and a believer in the transmigration of souls and the allegorical interpretation of the Bible. He died c.800 A.D., though his followers believed him to be still living and destined to return in the appointed time. In 1160 David Alrui, of Amadia, Persia, proclaimed himself to be the Messiah in Azerbaijan. His plan was to use the weakness of the Abbaside caliphate for the establishment of a free Jewish state, and he attracted to himself large masses of Jews; but he was murdered by his father-in-law before he could carry out his vast enterprise. A Messianic cult community, the Menahemites, cherished long his memory and ideal. Abraham ben Samuel Abulafia, of Saragossa, announced himself as the Messiah in 1280. He was a mystic and occupied himself much with cabbalistic speculations. The expulsion of the Jews from Spain drove many earnest minds to the prophetic writings. Even such a statesman as Isaac Abarbanel wrote works in which he announced that 1503 would be the year of redemption. In the sixteenth century David Reubeni and Solomon Molko appeared in the rôle of the Messiah. The former pretended to be the brother of a prince reigning in Arabia and was received with great honor by Pope Clement VII. The latter, born in 1500, was a Christian who became a convert to Judaism and seems to have sincerely believed in his mission. He is said to have prophesied accurately the inundation of Rome in 1530 and the earthquake in Portugal in 1531, and thereby gained a great reputation. He was saved from death in Rome by Clement VII substituting another man for him, but suffered martyrdom courageously in 1532. His followers long believed that he had escaped death this time also. The most important Messiah after Solomon Molko was Sabbathai Zewi (1626–76). He was born in Smyrna and belonged to a family of Spanish Jews. His brother was the agent in Smyrna of an English mercantile house, and through him Sabbathai became acquainted with the speculations of Christian Pietists who expected the second advent of Christ in 1666. He was an eager student of cabbalistic works. His personality was very attractive, and in all lands Jews were drawn to him and ac-

cepted him as their heaven-sent leader. The enthusiasm was boundless, and the hope of a return to Palestine filled thousands of hearts. Sabbathai intended to abrogate the law, establish a new code based on the Cabbala, introduce the doctrine of a Trinity consisting of three persons —the Ancient of Days, the Messiah, and the female Shechinah. In the year 1666, however, he was ordered to appear before the Turkish authorities at Constantinople. Here he finally abandoned the Jewish faith and became a Moslem. The disenchantment was great, but a sect of Sabbatians continued to honor him as the Messiah. It is obvious that the Messiahs of Judaism have sometimes been mystics, obeying what seemed to them a divine call, sometimes political leaders taking up a heroic struggle for liberty, sometimes men of personal ambition and unscrupulous methods. But Jews, Christians, and Mohammedans owe much moral vigor and spiritual uplift to the Messianic hope.

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MESSIAH, The. 1. A poem by Alexander Pope, which appeared in the *Spectator*, May 14, 1712. It is a sacred eclogue, imitating Vergil's *Pollio*. 2. An epic poem by Klopstock (q.v.). 3. An oratorio by Handel, composed in 1741 and given first in Dublin, April 13, 1742, in aid of charity, and in the United States (for the first time in its entirety) Dec. 25, 1818 (Boston).

MESSIDOR, mĕs'sĕ'dôr' (Fr., from Lat., *messis*, harvest + Gk. *δῶρον*, *dōron*, gift). The tenth month of the French Revolutionary Calendar, beginning on June 19 in years 1 to 7, and on June 20 in years 8 to 13.

MESSINA, mĕs-sē'nà (anciently *Messana*). The capital of the Province of Messina, Sicily. It is in the northeast corner of the island, on the Strait of Messina, 59 miles by rail northeast of Catania (Map: Italy, E 5). It is situated between a sickle-shaped harbor on the east and a chain of abrupt conical peaks on the west, rising to a height of 3700 feet. The climate is very even. The mean temperature is 66° F. The city suffered practically complete destruction on Dec. 28, 1908, by an earthquake, which, measured by destruction of life and property, was the severest ever recorded. Prior to that time Messina was, after Palermo, the most important city of Sicily. Messina was substantially built and had some fine lava-paved thoroughfares, affording views of the bay and of Calabria across the strait. The city itself had no very famous attractions for sightseers, having retained few of its striking antiquities, owing to a rather calamitous career; for prior to 1908, notably in 1783, it had suffered especially from earthquakes. The most interesting structure was the cathedral, dating from Norman times, having been begun in 1098 and finished by Roger II. It was a mixture of different architectural periods, and little of the original edifice remained to the building destroyed in 1908.

Among the leading secular edifices were the municipal palace, completed in 1829, and the villa Rocca Guelfonia, with Norman remains. The museum in the convent of San Gregorio contained a few paintings, some marbles and other antiquities, and a collection of majolica vases. The manufacturing interests were not extensive. The chief products were hardware, silk, muslin, and linen, and Messina had some fame for satins and damasks. The commerce was large and was facilitated by the excellent harbor, to which the importance of the city was chiefly due. Since the earthquake of 1908 the city has been reoccupied, and its rebuilding is in progress. The harbor is still busy with traffic in silk, oil, wine, oranges, lemons, fruit essences, coral, etc. Messina ranked seventh in 1911 among Italian ports in respect of the total tonnage entered and cleared (5402 vessels, of 4,166,367 tons net). There is direct steamship communication with Naples and Marseilles. The university, opened in 1538, had an enrollment of 574 students in 1907–08 and 238 in 1911–12. Messina is the seat of an archbishop. Pop. (commune), 1881, 126,497; 1901, 149,778; 1905, 158,812; 1911, 126,557.

The outskirts and environs are delightful, affording magnificent views of the sea as well as of Mount Etna. On the west rises the former fort of Castellaccio, and not far away to the south is Fort Gonzaga, on an historic spot. The new Campo Santo, before the earthquake, was beautiful, with its graceful Greek colonnades and wonderful views. The Telegrafo—the summit of a pass near Messina—is much visited for its scenery. Here was supposed to be the Charybdis of the familiar legend, opposite Scylla, on the Calabrian coast.

History. Messina is a town of great antiquity, its foundation being ascribed to pirates from Cumæ in the eighth century B.C., when it was known as Zancle (a sickle), in allusion to the shape of its harbor. At the end of the fifth

century B.C. the town was occupied by fugitives from Samos and Miletus, and it soon after passed to Anaxilas, the tyrant of Rhegium, who introduced there Messenians from the Peloponnesus, by whom the name of the city was changed to Messana. After the death of Anaxilas, Messana became a republic and maintained that status until its destruction by the Carthaginians during their wars with Dionysius of Syracuse at the beginning of the fourth century B.C. It was rebuilt by Dionysius, but soon fell again into the hands of the Carthaginians, who were finally expelled by Timoleon in 343 B.C. During the war between Agathocles (q.v.) of Syracuse and Carthage, Messana sided with the Carthaginians. After the death of Agathocles the town passed into the hands of the Mamertines (q.v.), whose appeal to Rome brought on the First Punic War. This war left Messana in the possession of Rome, and the town subsequently attained considerable commercial importance. It later gained Roman citizenship, perhaps from Julius Cæsar; Augustus established a colony there. In 831 A.D. the town was taken by the Saracens, and in 1061 was conquered by the Normans. In 1194 it became a part of the dominions of Henry VI (q.v.) of the German Empire, and had the same history as Sicily (q.v.) until 1282, when it passed to the Spaniard Peter I. Except for a few years it remained under Spanish rule till 1713. The town became a flourishing seat of trade in the Middle Ages and later received important privileges from Charles I of Spain, which added greatly to its prosperity. During the struggle between the aristocratic faction, or Merli, and the democratic faction, or Mavizzi (c.1672–78), the Senate appealed for aid to the French, who occupied the city, but soon abandoned it, after having defeated the combined fleet of Spain and Holland. Left in the hands of the Spaniards, the city was deprived of its political liberties, and soon lost its commercial importance. The plague of 1743 and the earthquake of 1783 carried off a considerable part of its population. On Dec. 28, 1908, the city was demolished by an earthquake, and about 96,000 persons were killed.

MESSINA, ANTONELLO DA. See ANTONELLO DA MESSINA.

MESSINA, STRAIT OF (It. *Faro di Messina*, Lat. *Mamertinum Fretum*). The channel separating Sicily from the southern point of Italy and connecting the Ionian with the Tyrrhenian Sea (Map: Italy, E 5). It is 24 miles in length and from 2 to 12 miles in breadth. Regular tidal currents run through the strait, which is of great depth, in some places exceeding 4000 feet. See SCYLLA AND CHARYBDIS.

MESS'MATES, ANIMAL. See COMMENSALISM.

MESS'MER, SEBASTIAN GEBHARD (1847–). An American Roman Catholic archbishop, born at Goldach, Switzerland. He was educated in St. George College at St. Gall, Switzerland (1861–66), and at the University of Innsbruck in Austria (1866–71). Ordained a priest in 1871, he was thenceforth until 1889 professor of theology at Seton Hall College, South Orange, N. J., and in 1890–92 was professor of canon law at the Catholic University of America, Washington, D. C. He was consecrated Bishop of Green Bay (Wis.) in 1892 and was appointed Archbishop of Milwaukee (Wis.) in 1903. He edited Devivier's *Christian Apologetics* (1903) and Bishop England's *Works* (7 vols., 1908) and is author of *Praxis Synodalis* (1883); *Canonical Procedure* (1886); *Spirago's Method* (1901); *Outlines of Bible Knowledge* (1910).

MESSUAGE, mĕs'wâj (OF. *masage*, a tenement, from *mas*, a house, manse). A legal term employed in conveyancing as substantially equivalent to the phrase "dwelling house and appurtenances," and most commonly construed as meaning the curtilage, courtyard, orchard, if there is one, etc. See APPURTENANCE; CURTILAGE.

MESSYS, or METSYS, QUINTEN. See MATSYS, QUINTEN.

MESTCHERSKY, mĕst-shĕr'skĕ, PRINCE VLADIMIR PETROVITCH (1845–1914). A Russian writer and editor. He became an intimate friend of both Alexander III and Nicholas II. In 1878 he founded and thereafter edited the *Grashdanin*, considered by some the most reactionary paper in Russia. He published some 12 novels, in which he portrayed the social conditions in St. Petersburg in a realistic and often coarse manner. His books include: *Women of St. Petersburg*, *The Nihilists*, and *Men of the Great World*. Mestchersky was sentenced to one week in prison in 1914 for publishing information regarding a mutiny in the Russian navy. Russians nicknamed him "the Knower" because of his intimate knowledge of court and cabinet matters. Throughout his life he fought strenuously every reform and progressive movement.

MESTIZO, mĕs-tē'zō (Sp., mongrel, from Lat. *mixtus*, p.p. of *miscere*, to mix). The ordinary term in use in Spanish-American countries to denote the offspring of white and Indian parentage, and usually understood to mean the offspring of a white father by an Indian mother. The equivalent term in French Canada is *metis* and in the United States half-breed. The offspring of an Indian and a *mestizo* is called *mestizo-claro*, of a negro and mestizo a *mulato-oscuro*, of a mulatto and mestizo a *chino*.

MES'TOME (from Gk. *μέστωμα*, *mestōma*, fullness, from *μεστός*, *mestos*, full). In botany the conducting portion (hadrome and leptome) of a vascular bundle, which means the tracheary vessels of the xylem and the sieve vessels of the phloem.

MESTRE, mĕs'trâ. A town in the Province of Venice, north Italy, 5 miles by rail northwest of the city of Venice, on the border of a lagoon (Map: Italy, D 2). The town has a sixteenth-century palace and a fourteenth-century clock tower. There is a considerable transit trade; also manufactures of machinery, silk goods, and bricks. Pop. (commune), 1901, 11,680; 1911, 17,306, including Malghera.

MESTU'RUS (Neo-Lat., from Gk. *μεστός*, *mestos*, full + *οὐρά*, *oura*, tail). A fossil actinopterygian fish of the family Pycnodontidæ, found in the Jurassic rocks of Europe. The body was flat and high and was covered with rhombic ganoid scales that are most peculiar in being united to each other by jagged sutures. The mouth is small and provided with powerful grinding teeth on the palate and sharp cutting teeth in the jaws. See GANOIDEI.

MESVINIAN. See PALEOLITHIC PERIOD.

MÉSZÁROS, mā'sä-rŏsh, LÁZÁR (1796–1858). A Hungarian patriot. He was born at Baja, studied theology and law, and in 1813 joined the Hungarian army in the campaign against Napoleon. He was colonel of a Hussar regiment in 1848, when Batthyányi called him to be Minister of War in his cabinet. In the same

year Mészáros took command of an expedition against the Rascians in his native county of Bács. This proved a complete failure, and in January, 1849, his army was defeated with great loss before Kaschau. For a brief time he was nominally commander in chief of the Hungarian forces and shared with Dembinski in the defeats at Szöreg and Temesvár. He then fled to Turkey. After residing for some years in England and France, Mészáros emigrated to the United States. He died at Eywood, Herefordshire, England, on his way to Switzerland.

META, mā'tà. One of the principal tributaries of the Orinoco. It rises in the Eastern Cordillera of the Colombian Andes, near Bogotá, and flows in a northeasterly direction to its junction with the Orinoco, on the boundary between Colombia and Venezuela (Map: Colombia, C 2). Its length is about 700 miles, for the greater part of which it is navigable for small steamers, though its channel is filled with numerous islands.

METABETCHOUAN, mĕt'à-bĕt-chōō-ăn'. The principal southern affluent of St. John Lake (q.v.), Canada (Map: Quebec, G 2). It is 90 miles long and near its mouth occur its fine falls, 236 feet high.

METAB'OLISM (from Gk. *μεταβολή, metabolē*, change, from *μεταβάλλειν, metaballein*, to change, from *μετά, meta*, beyond + *βάλλειν, ballein*, to throw). The total changes occurring within the plant or animal body in foods, inorganic nutrients, and even living substance during the life of the organism. The construction of more complex materials from simpler ones is spoken of as anabolism, and the breaking down of the complex substances to simpler ones as katabolism. It was once thought that the metabolic activity of an organism consisted mainly or exclusively in building complex labile living substance, followed by the decomposition of this substance. This conception really led to the use of the terms "anabolism" and "katabolism." It seems evident now that many synthetic and analytic processes occur in the organism without the protoplasm at the same time passing through corresponding changes. The function of the protoplasm in many of these changes is apparently that of the production and control of enzymes involved in the processes. There is much evidence for the extreme lability of living matter and of some of the compounds entering into it, so that it is not unlikely that synthetic and analytic changes are occurring in it also with various changes of conditions.

In plant physiology the term "metabolism" is used in essentially the same sense as in animal physiology. The first step in the anabolism of green plants is photosynthesis. The carbohydrates first formed are probably hexoses. These are in part condensed directly or by the intermediate formation of pentoses into the storage or frame-building carbohydrates—starch, inulins, cellulose, hemicellulose, and wood structures. The rest of the carbohydrates form the carbon source for the construction of a great variety of organic compounds of the cells, the more important of which are fats, lipoids, amino acids, amines and alkaloids, glucosides, and proteins. In the synthesis of fats the sugar is first transformed to glycerine and fatty acids, and these condensed into the fats. Lecithin is a lipoid always present in the living cell. It is really a fat in which one molecule of fatty acid is substituted by phosphoric acid bearing a nitrogen-containing radical, cholin. The synthesis of lecithin is a very complex process and seems to run parallel with that of amino acids. Amines and alkaloids, both nitrogen-containing compounds, seem to have their origin in amino acids. The proteins are synthesized by two general steps. The various amino acids entering into the proteins are first formed. These are then condensed into proteins. Several of these compounds bear nitrogen, phosphorus, or sulphur in addition to the elements found in carbohydrates. These elements are derived from the salts of nitric, phosphoric, and sulphuric acids. The step of perhaps greatest interest in anabolism or assimilation is the formation of protoplasm itself from various of these substances. Of this we know nothing except that living protoplasm always contains proteins, fats, lipoids, and carbohydrates, the first in very high percentage. Just how these substances are united or arranged to constitute living matter we do not know, for the act of analysis itself leads to their separation and rearrangement. In the formation of nonliving structures like cell walls and starch grains enzymes such as cytocoagulase and amylocoagulase seem to play a main rôle. It is possible that in the synthesis of protoplasm itself such condensing enzymes are active; if so, their great lability prevents their isolation and study.

There are autotrophs that synthesize their organic materials from carbon dioxide and water by means of chemical energy (chemosynthesis in contrast to photosynthesis), or energy gained from oxidizing simple substances like hydrogen sulphid, ammonia, hydrogen, methane, and carbon monoxide. We know almost nothing of the details of their assimilative processes, but they are likely similar in general outline to assimilation in green plants.

In heterotrophs either the carbon source or both the carbon and nitrogen sources must be organic substances such as sugar, alcohol, organic acids, amino acids, peptones, or even in same cases proteins. While the anabolic processes are in general reduction or endothermic processes, the katabolic changes involve in large part oxidation or exothermic changes. It must be mentioned, however, that purely condensative and digestive processes (condensation of glucose to starch, or amino acids to proteins, or the reverse digestions) are almost nil in energy consumption and production. The main katabolic processes of the plant are digestion, respiration, and fermentation, which are fully treated under these terms.

Metabolism, in Medicine. In medicine under metabolism are understood the process of, and the chemical and tissue changes produced in, the human body by the assimilation of food. Metabolism considers therefore not only the action of the living cell upon a substance and the change produced in the substance as well as in the cell, but also the change in the tissue of the body to which the cell belongs, i.e., the nutrition of the body. There are two kinds of metabolism: (1) *anabolism*, the constructive and assimilative changes by which matter becomes protoplasm (a substance of the lower order changed into one of the higher); (2) *katabolism*, the destructive or retrograde change by which protoplasm becomes finally waste product (a substance of the higher order changed into one of the lower).

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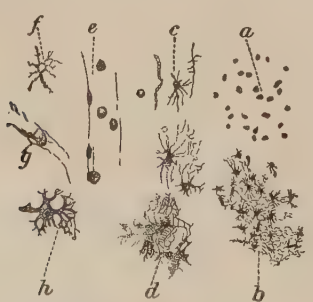
F. G. Benedict, *Influence of Inanition on Metabolism* (Washington, 1907); Jost, *Lectures in Plant Physiology* (Oxford, 1914).

For special discussions of metabolic processes, see ANIMAL HEAT; ASSIMILATION IN PLANTS; DIGESTION IN PLANTS; FERMENTATION; FOOD; NUTRITION; PHOTOSYNTHESIS; RESPIRATION IN PLANTS.

MET'ACEN'TRE (from Gk. *μετά, meta*, after + *κέντρον, kentron*, centre). It is shown in hydrostatics that a floating body is acted on by two equal forces in opposite directions—one vertically down through the centre of gravity of the body itself, the other vertically up through the centre of gravity of the volume which was occupied by the liquid now displaced by the body. If the body is at rest these two forces must lie in the same vertical line; but the question of the stability of this equilibrium depends upon what happens when the floating body is tipped slightly. If the forces bring it back to its former position the equilibrium is stable; if they make it tip still farther the equilibrium is unstable. Imagine a line drawn in the floating body so as to pass through the centres of gravity of the body and of the displaced liquid when the body is in equilibrium; this line is called the axis. Now imagine the body tipped slightly, thus making the axis inclined to the vertical; the line of action of the vertical upward force will intersect this line at a point called the metacentre. If the metacentre lies above the centre of gravity of the body the two forces will form a couple tending to restore the body to its former position, where the equilibrium was stable. If, on the other hand, the metacentre is below the centre of gravity of the body the forces form a couple tending to tip the body farther, and so the equilibrium was unstable. An elongated floating body like a ship has a *transverse* metacentre and a *longitudinal* metacentre. The former is the one most commonly considered. The metacentric height is the vertical distance between the centre of gravity and the metacentre. It is evident that this must always be a positive quantity; for if the centre of gravity were above the metacentre there would be no force tending to keep the vessel upright and it would capsize. See SHIPBUILDING.

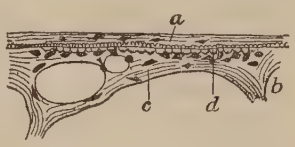
MET'ACHRO'SIS (from Gk. *μεταχρωννύναι, metachrōnnynai*, to change color, from *μετά, meta*, after + *χρωννύναι, chrōnnynai, χρώζειν, chrōzein*, to color, from *χρῶσις, chrōsis*, color, from *χροιά, chroia, χρόα, chroa*, skin, color). Color change, as that of the chameleon, in adaptation to surroundings, due to changes in the size of the pigment cells of the inner layer of the skin. These specialized pigment cells are called chromatophores, and the remarkable changes in the color of the skin of the chameleon, of the tree toad, the squid, etc., depend on the distribution of these pigment cells, which dilate (becoming highly ramified) and contract under certain kinds of irritation. The pigment (q.v.) varies in color in different species and in different parts of the body, being black, brown, yellow, and sometimes even red or green. In the goby Heincke found that the chromatophores which are yellow or greenish yellow when distended become orange colored when contracted, while the orange or red ones when shrunk become brown or even black; and he detected in the goby a special kind of chromatophores which were filled with iridescent crystals of marvelous delicacy, appearing when dilated as specks of metallic sheen.



CHROMATOPHORES OF A FROG.

a, wholly contracted; *b*, *c*, half relaxed; *d*, wholly relaxed; *e*, wholly contracted (a capillary vessel); *f*, *g*, *h*, expanded color cells.

These changes may be due to the direct influence of the stimulus of light, or indirectly through the eyesight. Semper says that Lister demonstrated as long ago as 1858 that the activity of the chromatophores depends solely on the healthy condition of the eye. As soon as the eyes are destroyed or the optic nerve is divided the chromatophores do not function. He was confirmed in this view by Pouchet's experiments on fishes and crabs, showing that the chromatophores lost their power of contraction if the two sympathetic nerves were destroyed at the root.



SECTION OF A FROG'S SKIN.

a, epidermis; *b*, cutis, with black, star-shaped, deep-seated cells; *c*, *d*, yellow pigment cells in a thick, single layer close under the epidermis.

Heincke's observations in some respects contradict those of Pouchet. Biedemann (1892), on the other hand, has claimed that the color cells change their shape owing to the direct action of the light and of temperature. He shows that the slightest change of temperature affects the mutual disposition of the pigment cells, and consequently the color, of the frog. It is enough to keep the animal in the hand to provoke a contraction of its black cells. The amount of blood supply also has a definite effect. Steinach also (1891) has proved that light acts as a direct stimulus. Biedemann therefore appears to have proved that the chief agency of changes of color is not in the sensations derived from the eyes, but in those derived from the skin. On the other hand, recent interesting experiments by Sumner seem to show that the color changes adapting the pattern of flounders to artificially patterned bottoms are due to stimuli received solely through the eyes.

It is well known that the underside of flatfish is white or colorless. This is due to absence there of pigment cells. These, however, are present in very young flounders, but as they grow unsymmetrical the fish turns the left side upward, and the chromatophores disappear from the right or under side. Cunningham experimented with young flounders by placing a mirror below the aquarium at an angle of 45° and cut off the light from above. In the larger number of specimens thus treated, after several months, more or less of the skin of the lower side was pigmented. He thus proved that the absence of

pigment on that side in the normal fish is due to its position in shadow. It thus appears that the absence of the pigment or of color is due to the absence of light—a mechanical or physical cause.

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MET'AGEN'ESIS. See ALTERNATION OF GENERATIONS; PARTHENOGENESIS.

MET'AKINE'SIS (Gk. *μετακίνησις*, transposition). A term in biology suggested by Jaekel to express the results of cenogenetic modification, since the process involves a thoroughgoing modification of a form in a way impossible in the adult and only possible in a larval or early stage, or in which the various organs are not yet specialized. Consult Jaekel, *Ueber verschiedene Wege phylogenetischer Entwickelung* (Jena, 1902; reviewed in *Science*, vol. xvii, New York, 1903). Compare PALINGENESIS.

METAL. See HERALDRY.

METAL, FUSIBLE. See FUSIBLE METAL.

METAL CASTING. See FOUNDING.

METAL'DEHYDE. See ALDEHYDE.

METAL LATH. See LATHS AND LATHWOOD.

METALLIC INK. See INK.

METALLIC PAINT. See PAINT, MINERAL.

MET'ALLOG'RAPHY. The study of the structure and constitution of metals and alloys and their relation to the physical properties. Sorby, who was the first to make rock sections, examined the structure of iron and steel for comparison with that of meteorites in 1863. Martens in 1878 took up the work. Osmond and Werth's "Structure cellulaire de l'acier fondu" (*Comptes Rendus*, vol. c, p. 450) and Wedding's paper on the microstructure of malleable iron appeared in 1885 (*Journal Iron and Steel Institute*, vol. i, p. 187). Since then metallography has grown until now it is a recognized method of testing and of research.

The Structure of Metals. The old idea of the structure of metals was based on an examination of fractures, and from this came the terms "crystalline," "granular," "fibrous," "amorphous," etc. The microscope has proved, however, that all metals are crystalline, that the appearance of the fracture may have no relation to the structure of the metal but depends not only on the method of breaking but also on the mechanical and thermal treatment the metal may have undergone. All metals which have cooled down from the liquid state are built up of crystalline grains with distinct orientation, the size and shape depending chiefly on the rate of solidification and the mass of the metal.

A section of a small ingot of pure zinc, after deeply etching with dilute nitric acid to bring out the grain structure, is shown on the accompanying plate. It shows the growth of crystals perpendicular to the cooling surface of the mold, also the central pipe or shrinkage cavity characteristic of most metals—for as most metals freeze they contract. When the metal is poured into the mold heat flows from the hot metal to the cold mold and a point is reached when the metal next the mold is at its freezing point. Crystals start to grow in all directions, but are soon restricted from growing laterally by adjacent crystals, which leaves only one direction in which they can grow, viz., towards the still liquid mass of metal, which is opposite to the direction of flow of heat, so that they grow perpendicularly to the isothermal lines of the metal. This method of growth is clearly shown at the bottom corners of the ingot in Fig. 1.

In a thin casting these crystals perpendicular to the surface of the mold soon meet at the centre and the fracture of such a metal would be columnar. In thicker castings, however, the process of freezing is slower, the thermal gradient between the centre and the outside becomes less and less, and a point is reached when the still liquid metal begins to crystallize at a number of independent centres. These crystals grow in all directions until they meet adjacent crystals, and in this way the centre of the metal is composed of equidimensional grains. Thus we get a difference in structure between the outside and the centre of the ingot or casting, the outside being columnar, the interior granular.

The method of growth of crystals is well shown by the skeleton crystals found in the interior of the pipe or shrinkage cavity of large castings. This is illustrated on the plate Fig. 2, a specimen of lead obtained by taking a crucible of molten metal, chilling the surface, and, when a crust of solid metal had formed, pouring out the still liquid interior. The crystals grow with definite axes, which are well shown on the surface of small ingots of most metals. Fig. 3, magnified 30 diameters, is the surface of a small ingot of the metal cadmium. It shows several skeleton crystals or dendrites. These form the framework of the grains and are left standing out in strong relief because they were the first to freeze, and as they froze the metal contracted until the whole mass was solid. A section, however, would show the metal to be built up of

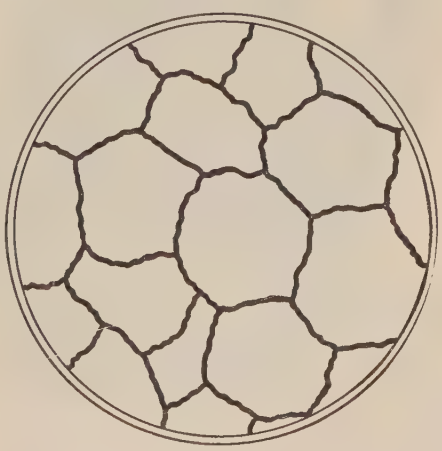

FIG. 15.

polygonal grains as in Figs. 5, 8, or 15. On deep etching each grain shows its own particular orientation, appearing light or dark according to the way it is cut, as seen in Fig. 1.

The structure of a metal shows no change when strained within the elastic limit, but when

once this is passed there is a permanent deformation. If a polished surface be examined after such straining, within the grains are seen a number of parallel lines and bands which change in direction as we pass from one grain to the next. As the strain increases these slip lines and slip bands increase in number and are found in more than one direction within each grain, and the grains themselves become elongated and drawn out as the strain becomes more severe. Figure 4, magnified 30 diameters, shows the slip bands produced in zinc. The orientation of the grains can be seen, while within the two largest grains the slip bands appear white and change in direction as we pass from one grain to the next. In some metals the grains appear capable of being elongated and drawn out indefinitely as, e.g., copper. Figure 5, magnified 200 diameters, shows the grain structure of pure copper. Figure 6, magnified 400 diameters, shows the structure of a cold-drawn copper rod, deeply etched, in which the grains are very much drawn out and show a crosshatched effect due to the slip lines. Some metals, like lead and tin, behave differently, for when the strain has been very severe, as in rolling, the grains are first distorted and then broken down and the structure becomes composed of a broken-up conglomerate. When a metal is strained by cold work, as in rolling or drawing, the elastic limit and tensile strength are greatly increased and the metal becomes much harder, but as a rule the ductility falls off proportionately.

On annealing such a strained metal recrystallization takes place and crystals or grains grow with distinct polygonal boundaries and generally show marked twinning (Fig. 16), the grain size

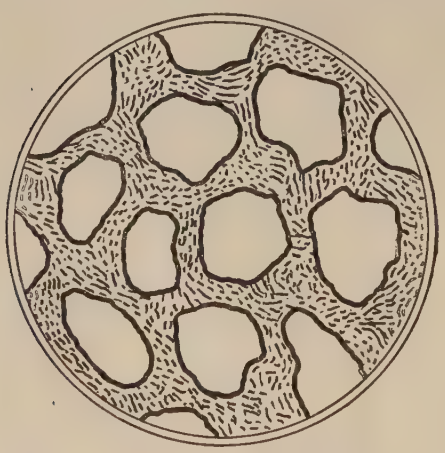

Fig. 16.

depending on the time and temperature of annealing, the amount of work the metal has undergone, and upon its cross section or mass. The strength falls off and the metal becomes comparatively soft and its ductility increases. Figure 7, magnified 400 diameters, shows the structure of a cold-drawn copper tube after annealing at a dull red heat. The original structure was the same as seen in Fig. 6. The deep etching reveals the twin structure more prominently than the grain structure. Both the twinning and the grain structure can be developed by annealing in hydrogen. Figure 8, magnified 400 diameters, shows this same cold-drawn copper, polished and then reheated to 1000° C. in an atmosphere of hydrogen. The polygonal grain boundaries show up distinctly, while the alternate light and dark bands show the twinning. The whole structure is in marked contrast with that of Fig. 6.

The recent researches of Beilby and others tend to confirm his theory that cold working of a metal produces an amorphous modification due to flow on the surfaces of the planes of slip, which modification is harder, stronger, and less ductile than the crystalline one. Reheating to temperatures around 300° C. causes the transformation from the amorphous to the crystalline state and restores the ductility.

The Constitution of Alloys. The constitution of binary alloys is shown by the thermal diagram, which in terms of temperature and composition shows the changes which occur when an alloy freezes and as it cools down in the solid state. Portevin and Bornemann have collected those so far published, while Guertler's textbook discusses them exhaustively. Under the microscope three distinct constituents—pure metals, chemical compounds, and solid solutions—are found. A chemical compound is one in which we get a complete merging of the constituent metals in definite atomic proportions, while in a solid solution we have a complete merging but in indefinite proportions.

Now, alloys are solutions and can be classified according to solubility. We have two main divisions as follows:

A. No compounds are formed.

Solubility in liquid state	Solubility in solid state
1. Complete	*a.* Complete *b.* Limited *c.* Zero
2. Limited	*b.* Limited *c.* Zero
3. Zero	*c.* Zero

B. Compounds are formed.

1. The compound occurs at a maximum on the freezing-point curve.
2. The compound forms by reaction between one of the metals and the liquid from which it has crystallized. In heating it dissociates before reaching its melting point.

We can further subdivide group B according to the solubility of the compounds in each of the metals, as under group A.

The Thermal Diagram. To construct the thermal diagram we use temperature time or cooling curves of individual alloys. Type cooling curves are shown in Fig. 17. They indicate the changes in the rate of cooling as the alloy changes from the liquid into the solid state. The first curve is that of a pure metal. Cooling down in the liquid condition is shown from *a* to *b*. The horizontal *bc* shows the arrest in cooling due to the latent heat of fusion as the metal freezes. At *c* the metal is completely frozen, while from *c* to *d* we have regular cooling in the solid state. The rest of the curves are those showing the freezing of type alloys.

Having obtained cooling curves of a suitable number of alloys of a pair of metals, and plotting the breaks of these curves on a temperature-composition diagram, curves can be drawn to indicate the beginning of freezing or the liquidus and the end of freezing or the beginning of melting, the solidus. Above the liquidus the alloy is completely liquid, and below the solidus all is solid, while between these two curves we

Fig. 1. VERTICAL SECTION OF ZINC INGOT

Fig. 2. CRYSTALS OF LEAD

Fig 3. SURFACE STRUCTURE OF CADMIUM
Magnified 30 Diameters

Fig. 4. STRAINED ZINC
Magnified 30 Diameters

For Explanation and Description See Text

Fig. 5. CAST COPPER
Magnified 200 diameters

Fig. 6. COLD DRAWN COPPER
Magnified 400 diameters

Fig. 7. COLD DRAWN COPPER
ANNEALED AND ETCHED
Magnified 400 diameters

Fig. 8. COLD DRAWN COPPER
ANNEALED IN HYDROGEN AT 1000° C
Magnified 400 diameters

For Description and Explanation See Text

have a mixture of liquid and solid. The changes in composition of the liquid and solid are also given by these two curves. The composition of a liquid at any particular temperature is given by the liquidus, while the composition of the solid freezing out at that temperature is shown by the solidus.

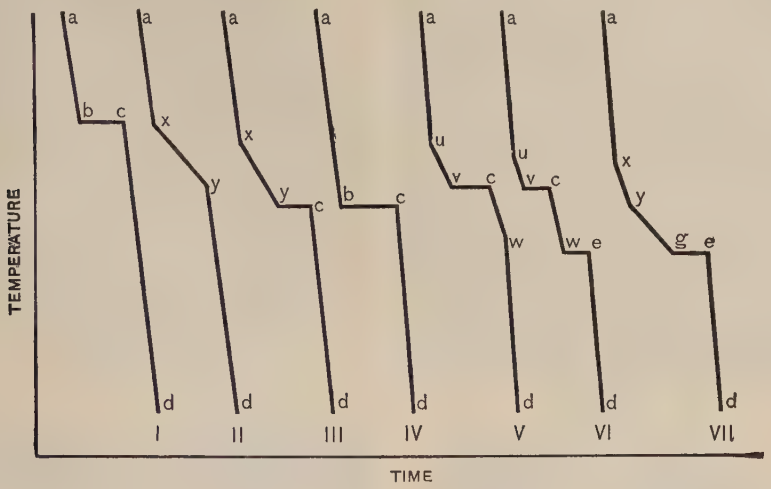

FIG. 17. TYPE COOLING CURVES.
Campbell, *Proceedings of the American Society for Testing Materials*, xiii, 1913.

Following the classification given above, the first type of thermal diagram is as follows:

Case A 1 (*a*). *Completely soluble in both the liquid and solid states.* This is shown in Diagram I, Fig. 18, in which the temperature is indicated in the vertical scale and percentage composition in the horizontal. The point *A* is of freezing is shown by the solidus *AmyB*. Each alloy of this series has a cooling curve similar to Diagram II, Fig. 17. The alloy begins to freeze at *x* and is completely solid at *y*. For example, take the alloy *xy*, shown in Diagram I, Fig. 18. It begins to solidify at the point *x*. The solid which begins to freeze out is not pure A, but a solid solution whose composition is given by the solidus at this temperature or *m*. Now, as the alloy freezes the composition of the solid solution freezing out changes from *m* to *y* and the composition of the liquid changes from *x* to *n*. The solid alloy consists of homogeneous grains of a solid solution of the metals A and B.

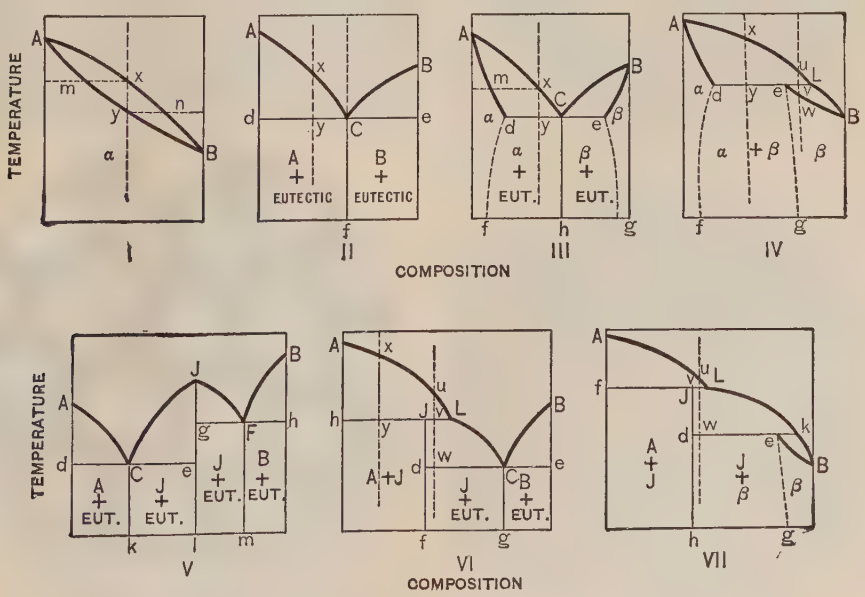

FIG. 18. TYPE THERMAL DIAGRAMS OF BINARY ALLOYS.

the freezing point of the pure metal A, while *B* is that of the pure metal B. Then the beginning of freezing of any alloy of A and B is shown by the curve *AxnB*, which is the liquidus. The end

So it is that all the alloys of A and B, when solid, consist of solid solutions of A and B, or alpha, which form a continuous series from pure A and pure B and vary uniformly in physical

properties. Their structure can be represented by Fig. 15. When strained beyond the elastic limit slip lines appear as in a pure metal. Cold work elongates the grains as in Fig. 6, while annealing such cold-worked material causes a recrystallization, as in Figs. 7 and 8, diagrammatically shown in Fig. 16, with more or less marked twinning. As examples of this type we have *Cu-Ni, Au-Ag, Au-Pt, Cu-Pt, Fe-Mn, Fe-Co, Ni-Co.*

Case A 1 (*c*). *The two metals are completely soluble in all proportions when liquid but insoluble when solid.* The diagram is II, Fig. 18. The addition of A to B lowers the freezing point, while the addition of B to A also lowers the freezing point, and two curves are produced which intersect at the point *C*. *ABC* is the liquidus, *dCe* the solidus. Any alloy from *d* to *C* begins to freeze on reaching the temperature *AC*,

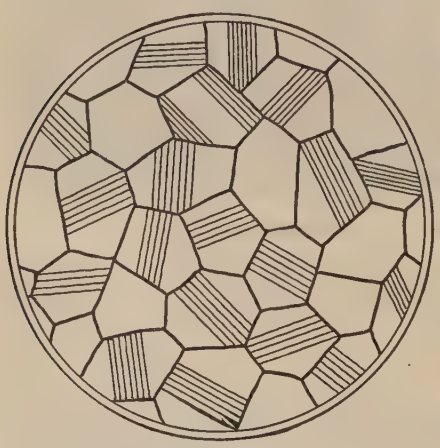

Fig. 19.

by separating out crystals of the pure metal A. In the alloy represented by *xy*, A freezes out from *x* to *y*. At *y* the composition of the liquid has reached *C* and it then freezes as a mechanical mixture of A and B and forms the ground mass for the crystals of A. Similarly any alloy between *C* and *e* begins to freeze by the formation of crystals of B. The alloy of the composition *C* is that with the lowest freezing point, which by definition is called the eutectic. As the ground mass of all alloys of this type is composed of *C* it consists of a mechanical mixture of A and B. The structure of any alloy between *d* and *C* is represented by Fig. 19, where the white grains of A are surrounded by a matrix of eutectic. Curve III, Fig. 17, shows the cooling curve of such an alloy. Cooling down uniformly in the liquid state is shown by *ax*. At *x* the metal A begins to freeze out and freezes from *x* to *y*. From *y* to *c* the eutectic freezes and at *c* the alloy is completely solid. The cooling curve of the eutectic alloy *C* is shown in Curve IV, Fig. 17. The horizontal *bc* shows the freezing out of the eutectic at constant temperature. As examples of this type we have *Pb-Ag, Bi-Ag, Bi-Au, Pb-Sb, Cd-Bi, Cd-Zn, Sn-Zn, Hg-Zn.*

Case A 1 (*b*). *The two metals are partially soluble in each other when in a solid state. A eutectic occurs.* The diagram is III, Fig. 18. The liquidus is similar to that of the last diagram, but the solidus is given by *AdCeB*. This is because the metal A will hold *d* per cent of B in solid solution, while the metal B will hold *e* per cent of A in solid solution and the eutectic only makes its appearance between *d* and *e*. Any alloy from pure A to *d* per cent of B is a solid solution of B in A, or alpha, while any alloy from pure B to *e* is a solid solution of A in B, or beta. This freezes in the same way as in Case A 1 (*a*). Alloys between these two limits consist of crystals of alpha or beta surrounded by the eutectic of composition *C*, which is a mechanical mixture of alpha and beta and not of A and B. The structure of any such alloy can be represented by Fig. 19. The method of freezing can be shown by following the alloy *xy* as in the last case. The alloy begins to freeze at *x* by separating out a solid of the composition *m*. As the temperature falls this solid changes from *m* to *d*, while the liquid changes from *x* to *C*. At *y* we have crystals of composition *d* surrounded by the liquid *C*, which is the eutectic. When completely frozen, therefore, the alloy consists of crystals of alpha surrounded by the eutectic. The curves *df* and *eg* show that the amount of B which A can hold in solid solution and the amount of A which B can hold in solid solution decrease with fall of temperature. In other words, the curves *df* and *eg* are the solubility curves of B in A and A in B in the solid state. As examples of these alloys we have *Cu-Ag, Bi-Sn, Bi-Pb, Sn-Pb, Sn-Al, Sn-Cd, Pb-Cd, Pb-Hg, Ni-Au.*

Case A 1 (*b*). *The two metals are partially soluble in each other when solid. No eutectic occurs.* The diagram is shown in IV, Fig. 18. Here the addition of B to A lowers the freezing point, but the addition of A to B raises it. The two curves forming the liquidus intersect at the point *L*. The solidus is shown by *AdeB*. As in the last case alloys from pure A to *d* and from pure B to *e* consist of solid solutions, alpha and beta. Between *d* and *e*, however, the alloys are composed of grains of alpha surrounded by beta, shown in Fig. 20, the alpha being white, the beta black. Taking the alloy *xy* as an example, freezing begins at *x* by the separation

Fig. 20.

of a solid solution as in the last case. At *y* we have crystals or grains of *d* in a liquid whose composition is *L*. Here a reaction occurs between the liquid L and the solid alpha of composition *d*, and a solid beta, of composition

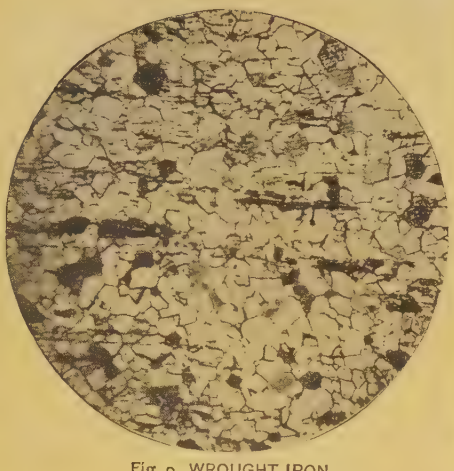

Fig. 9. WROUGHT IRON
Magnified 35 diameters

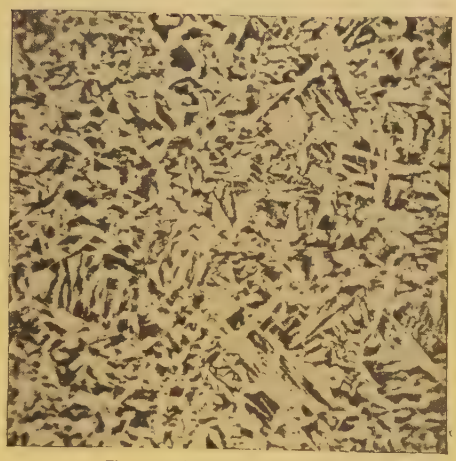

Fig. 10. LOW CARBON STEEL
Magnified 40 diameters

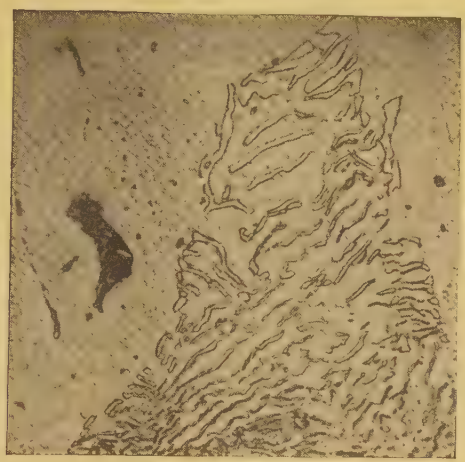

Fig. 11. PEARLITE
Magnified 1250 diameters

Fig. 12. MARTENSITE
Magnified 50 diameters

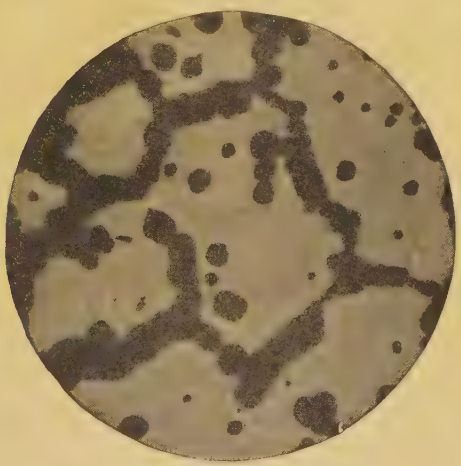

Fig. 13. TROOSTITE AND MARTENSITE
Magnified 40 diameters

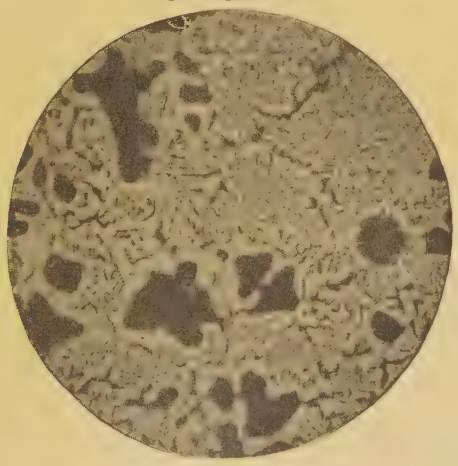

Fig. 14. WHITE CAST IRON
Magnified 40 diameters

For Description and Explanation See Text

e, is produced, forming a ground mass to the alpha grains. The cooling curve of such an alloy is given in III, Fig. 17, where *xy* indicates the freezing out of the alpha and *yc* the formation of beta by the reaction between this alpha and the liquid L. Alloys between *e* and *L* show no alpha when solid, because it is all used up through the reaction. This is illustrated by the alloy *uvw*, where solid alpha begins to freeze out on reaching *u* and continues to separate until the temperature *v* is reached. Here the reaction occurs between the alpha and the liquid L, and all of the alpha is used up. Then the temperature falls from *v* to *w*, and the composition of the solid beta changes from *e* to *w*, so that when frozen the alloy is composed entirely of beta. The cooling curve is shown in V, Fig. 17, where *uv* is the separation of alpha, the horizontal *vc* is the reaction, while the *cw* is the further separation of beta as the temperature falls. At *w* the whole mass is solid. As before, the lines *df* and *eg* are the solubility curves of B in A and A in B in a solid state. *Cd-Hg, Pt-Ag, Fe-Au, Cu-Co, Cu-Fe,* the brasses and bronzes (in part), are examples of this type.

Case B 1. *A compound occurs. Its freezing point is a maximum on the liquidus.* Take the simplest case where A and B form a compound, J, which is insoluble in either A or B in the solid state. The resulting diagram is shown in V, Fig. 18. This is really compounded of two simple curves of the type II, which represent the alloys of A and J and the alloys of B and J. At *C* we have the eutectic of A and J, at *F* we have the eutectic of B and J. The liquidus is *ACJFB* and the solidus is *dCegFh*, and freezing occurs as already described in Case A 1 (*c*), while the structures are similar to that of Fig. 19. As examples we have *Zn-Mg, Pb-Mg, Sn-Mg, Cu-Mg, Al-Mg, Al-Sb, Cd-Sb, Cu-P, Cu-As,* etc.

Case B 2. *The compound forms by reaction between one of the solid metals and the liquid from which it crystallizes.* Diagram VI, Fig. 18, shows this case. *ALCB* is the liquidus, *eCdJh* is the solidus. The point *C* is the eutectic of the compound J and B. When solid, alloys from B to *g* are composed of crystals of B in the eutectic. Alloys from *g* to *f* show the compound J surrounded by the eutectic, which is a mechanical mixture of J and B. Alloys from A to *f* are composed of grains of A in a ground mass of J. Taking the alloy *xy*, it freezes out pure A from *x* to *y*, and at this temperature the liquid has the composition L, and reacts with the solid A to form the compound J. When all of the liquid is used up the alloy consists of cores of A in a ground mass of the compound J. In Fig. 20 the white areas represent A, the black ground is J. The cooling curve of such an alloy can be represented by III, Fig. 17, *xy* representing the freezing out of A and *yc* the reaction which forms J. The alloy *uvw* begins to freeze out pure A. At *v* this pure A reacts with the liquid L and is all used up. As the temperature falls the liquid continues to freeze out more J and the composition of the liquid changes from L to C, as the temperature falls from *v* to *w*, when the eutectic freezes and the resulting alloy is composed of J surrounded by the eutectic of J and B. The cooling curve of this alloy is shown in VI, Fig. 17, where *uv* shows the freezing out of A, *vc* the reaction between the liquid L and the solid A to form J, whereby all of the A is used up. *cw* shows the further freezing of the compound J, and *we* is the freezing of the eutectic of J and B. This type diagram can be modified by showing partial solubility of the metals in the compound. The freezing will take place as already described, except that instead of pure A we would have alpha, etc. As examples of this type we have *Ag-Sn, Ag-Sb, Au-Sb, Au-Pb, Fe-Zn, Al-Zn, Al-Ni, Al-Co, Mn-Sn, Pt-Pb.*

The last case is where J and B do not form a eutectic and is shown in Diagram VII, Fig. 18. Alloys from pure A to *h* freeze as in the last case. Alloys from *h* to B resemble those in Diagram IV. For example the alloy *uvw* begins to freeze with the separation of pure A. At *v* this A reacts with the liquid L to form the compound J. As the temperature falls from *v* to *w* more J freezes out and the liquid changes from L to K. At *w* we get the reaction between J and the liquid K to form beta of the composition *e*, so that when solid the alloy consists of J surrounded by beta, as in Fig. 20. The cooling curve of such an alloy is given in VI, Fig. 17, where *uv* shows the separation of pure A, *vc* the reaction to form the compound J, *cw* the continued freezing out of J, while *we* is the reaction between the liquid K and the compound J to form beta. Tin and antimony are alloys of this type, the compound of *Sb-Sn* being formed.

TERNARY ALLOYS

If we wish to show variation in composition of three metals we have to use the triaxial diagram. In Fig. 21 the corners of the equi-

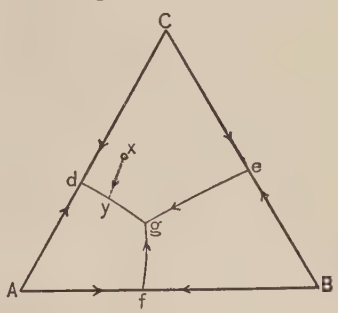

FIG. 21.

lateral triangle represent the pure metals A, B, and C. The composition of any alloy within the triangle is given by the perpendicular distances to the sides. For example, in the alloy *g* the per cent of A is represented by the perpendicular from *g* to *BC*, the per cent of B is represented by the perpendicular from *g* to *AC*, while the per cent of C is represented by the perpendicular from *g* to *AB*. The binary alloys of A and B are represented by the line *AB*. The binary alloys of B and C and A and C are represented by the sides *BC* and *AC* respectively, and these three sides are projections of such binary diagrams as are shown in Fig. 18. Temperature must be indicated perpendicular to the plane of the triangle and a solid figure results. Only one case will be shown, that in which the pairs of metals are completely soluble in the liquid state and insoluble in the solid. Each pair therefore can be represented by Curve II, Fig. 18. In Fig. 21 the side AB being a projection of Fig. 18, II, the point *f* is the projection of the eutectic C. Now if we use arrows to indicate fall of temperature we should show a

fall of temperature from *A* to *f* and from *B* to *f*, representing the curves *AC* and *BC* in Diagram II, Fig. 18. In the same way *d* and *e* represent the binary eutectics of AC and BC, the ternary eutectic being the alloy with the lowest freezing point, represented by point *g*, as shown by curves from the points *d*, *e*, and *f*, and this divides the triangle into three areas. The metal A freezes out of any alloy within the area *Adgf*, B freezes out in the area *Begf*, while C is the first to freeze within the area *Cdge*. The method of freezing of all the alloys is similar. Take the alloy *x*, which begins to freeze by separating out crystals of C, and the composition of the liquid changes from *x* to *y*, a projection through *C*. From *y* to *g* A and C freeze out side by side, forming, as it were, a binary matrix to the crystals of C. When the composition of the liquid reaches *g* the ternary eutectic freezes as a mechanical mixture of A, B, and C. Thus the line *dg* represents the binary A and C, the line *fg* the binary A and B, while the line *eg* shows the simultaneous freezing of B and C. The cooling curve of a ternary alloy is given in Fig. 17, VII, where *xy* denotes the freezing of the metal C, *yg* the simultaneous freezing of C and A, while *ge* is the arrest denoting the freezing of the ternary eutectic of A, B, and C. As examples of this type we have the series *lead-tin-bismuth*, which was worked out by Charpy, *lead-tin-cadmium* and *bismuth-tin-cadmium*, given by Stoeffel. By taking pairs of metals shown in the different diagrams of Fig. 15 the ternary diagram is greatly modified, and examples of this have been worked out by Geer, by Sahmen and Vegesack, and by Campbell.

Partial Solubility in the Liquid State. In the cases we have discussed so far the solubility in the liquid state was complete, for when the component metals were melted together a homogeneous liquid resulted. Certain pairs of metals, however, have only a limited solubility in the liquid state, and, when melted together within certain limits, separate out into two liquid layers. Each liquid is saturated with the other metal, but as the temperature is raised the amount which each metal can dissolve of the other increases so that at a certain temperature (the critical temperature) each liquid has the same composition and one homogeneous liquid results. Now by determining the variation in composition of each layer with variation in temperature we can construct a pair of solubility curves which show the amount of A dissolved in B and the amount of B in A for each particular temperature. These two curves meet at the critical temperature, and we get the completed solubility curve.

Now according to the way in which this solubility curve cuts the freezing point curves shown in Fig. 18, so will the constitution of the alloys vary, and any alloy whose composition lies within the points where the solubility curves cut the liquids will be found when solid to consist of two layers.

As examples we have *lead-zinc, bismuth-zinc, copper-lead, chromium-copper, chromium-silver, chromium-aluminium, chromium-tin, chromium-lead, manganese-lead, cobalt-lead, nickel-lead,* also *copper and copper oxide, copper and copper sulphide, iron and iron sulphide.*

In the case where the two metals are insoluble in each other at the beginning of freezing we have two liquid layers, each consisting of the *pure* metal. Each layer freezes at its own particular temperature, that of the freezing point of the pure metal. As examples we have *aluminium-cadmium, aluminium-lead, iron-lead, iron-silver, cobalt-silver.*

Changes in the Solid State. So far the changes which an alloy undergoes when it changes from the state of a *liquid solution* to a solid have been considered. *Solid solutions* may undergo very similar changes as they cool down, which changes may be represented by diagrams similar to those in Fig. 18. For example, in Fig. 18, Curve II, suppose the alloys above *ACB* exist as homogeneous *solid* solutions. The same explanation of the diagram holds good except that the pure metals are precipitated from the solid instead of freezing out of the liquid as before. Thus, the alloy *xy* on reaching *x* begins to precipitate pure A from each grain of the solid solution and this continues down to the temperature *y*, when the residual grain has the composition C. Here it splits up into a mechanical mixture of A and B very similar to a eutectic. The alloy C is not the alloy with the lowest *freezing* point, but the one with the lowest *transformation* point, hence we call it the eutectoid.

Such changes in solid solutions are found in brass and in bronze, where the beta solid solution breaks down into a mechanical mixture of alpha and the compound Cu_4Sn at about 500° C. For example, a bell metal of 20 per cent tin and 80 per cent copper if quenched from just above 500° C. would have the appearance of Fig. 20. If slowly cooled, however, this structure of alpha surrounded by beta would change at 500° C., because the beta breaks down into a mechanical mixture of alpha and Cu_4Sn at this temperature and its structure would then resemble Fig. 19. Each grain of alpha contains about 12 per cent of tin in solid solution, while the groundmass or eutectoid contains about 26½ per cent of tin, partly as alpha, partly as the compound Cu_4Sn (with 32 per cent tin).

In the aluminium bronzes a similar eutectoid occurs. The alpha is saturated with aluminium at 7½ per cent. The eutectoid contains 12 per cent aluminium; thus alloys between 7½ and 12 per cent resemble Fig. 19. The eutectoid transformation occurs at 550° C. The most important eutectoid change, however, occurs in the iron-carbon series, and to this change steel owes most of its well-known properties.

The Iron-Carbon Diagram. We now recognize that wrought iron, soft, medium, and hard steel, cast iron, both white and gray, belong to a continuous series of alloys and consist of the following constituents in varying proportions: *ferrite* or pure iron, soft and malleable; *cementite* or carbide of iron, Fe_3C, hard and brittle, 6.67 per cent carbon; *pearlite*, the eutectoid of ferrite and cementite, 0.9 per cent carbon. The above are found in steel, while in addition we find graphite in cast iron. Now, on heating, the eutectoid, pearlite, changes at about 700° C. from a mechanical mixture of ferrite and cementite into a solid solution called austenite, which, as the temperature is raised, is capable of dissolving more and more ferrite or cementite as the case may be. Austenite is a solid solution of carbon in iron, which is capable of hardening on quenching.

The occurrence and the temperature limits of the above constituents are shown in Fig. 22, which is the diagram for iron-iron carbide or cementite.

The freezing-point curve or liquidus is *ADL*, while the solidus is the curve *AEDF*, the end of freezing or, in heating, the beginning of melting. The alloy DT is the eutectic and consists of a mechanical mixture of austenite and cementite. On freezing, alloys from 0 to 2 per cent carbon consist of austenite and are steels, alloys with over 2 per cent of carbon are cast irons and consist of grains of austenite set in the eutectic (DT) if less than 4.2 per cent carbon, or of crystals of cementite surrounded by the eutectic if more than 4.2 per cent carbon.

An alloy between 2 and 4.2 per cent carbon can be well represented by Fig. 19, the grains being the excess austenite, the matrix the eutectic of austenite and cementite. The white cast iron in Fig. 14 shows the eutectic structure typically.

The diagram also shows the changes which take place in the solid solution austenite. Iron exists in three modifications: above 900° C. it is in the gamma condition, is nonmagnetic, and can dissolve carbon up to about 2 per cent; below 900° C. it cannot dissolve carbon, being in the beta condition down to 780° C. and nonmagnetic (i.e., *G* to *M*); below 780° C. it is in the alpha or magnetic condition. Therefore austenite is a solid solution of carbon in gamma iron and at 1125° C. is saturated at about 2 per cent carbon. However, the amount of carbon in solution falls with the temperature and cementite precipitates, as shown by the curve *ES*, which is the solubility of cementite in gamma iron. Again, the curve *GOS* indicates the precipitation of ferrite from the solid solution austenite. *GO* yields beta ferrite, *OS* the magnetic or alpha variety. At 700° C., or temperature *PSK*, we have the formation of the eutectoid pearlite from austenite of 0.9 per cent carbon. From 0 to 0.9 per cent carbon steels consist of ferrite and pearlite, while with more than 0.9 per cent carbon they are composed of cementite and pearlite.

The iron carbon diagram is not yet definitely settled and its development has been the source of much controversy on account of the difficulties encountered. Osmond determined the three forms of iron—alpha, which exists up to 780° C. and is magnetic; beta, which exists from 780° to 900° C. and is nonmagnetic; gamma, also nonmagnetic, exists above 900° C. and has the property of dissolving a maximum of 2 per cent of carbon. The first comprehensive temperature-composition diagram was given by Roberts-Austen (*Fourth Report to Alloys Research Committee*, plate ii, 1897. Institution of Mechanical Engineers, London; *Fifth Report*, 1899), and this consisted of the lines shown in Fig. 22, *ABC*: *aBf*, the graphite-austenite eutectic; *GOS*; *MO*; *PSK*; *SE* in part.

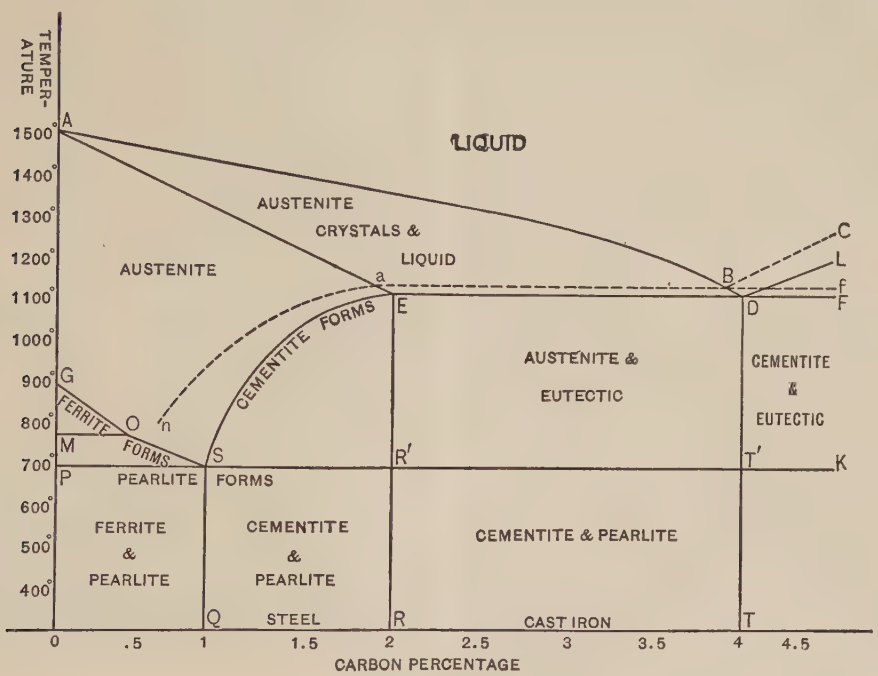

FIG. 22.

Rooseboom applied the phase rule to Roberts-Austen's work and modified the diagram by adding the line *Aa*, joining the point *a* by a line to the summit of the curve denoting separation of cementite at 1.8 per cent carbon and 1000° C. A horizontal line was drawn from this point, indicating a reaction between austenite and graphite to form cementite. Above 1000° C. we are dealing with austenite and graphite and *aBf* is the austenite-graphite eutectic. Below 1000° C. we have no graphite in a state of equilibrium, all the carbon occurring as cementite. (*Journal Iron and Steel Institute*, 1900, ii, p. 311.)

Stansfield in a paper on the "Present Position of the Solution Theory of Carburized Iron" (*Journal Iron and Steel Institute*, 1900, ii, 317) suggested a radical change. Instead of the line from *a* (denoting the further separation of graphite) cutting the cementite line *SE*, a line *an* is drawn to the left of and parallel to *ES* so as to cut *GOS*. This new line *an* shows the

solubility of graphite in austenite, which is much less than that of cementite in austenite. In other words, if cooled slow enough the 2 per cent of carbon which iron holds in solid solution ought to be rejected as graphite and not as cementite. According to the phase rule only two constituents can be present in equilibrium, and as graphite is the more stable, these two constituents must be ferrite and graphite.

Benedicks sums up the previous work and shows (*Metallurgie*, 1908, part ii) that we are dealing with two distinct and separate systems:

1. *White cast iron. Metastable.* Alloys of *austenite* and *cementite.* Produced by rapid cooling, low silicon, high manganese, etc. The solidus is shown in Fig. 16 by the curved line *AEDF*, the eutectic freezing at about 1125° C.

2. *Gray cast iron. Stable.* Alloys of *austenite* and *graphite.* Produced by slow cooling, high silicon, low manganese, low sulphur, etc., and more liable to occur in iron of high carbon content. The liquidus is *ABC*, the solidus *AaBf*, and the eutectic freezes at 1135° C. Mottled cast iron consists of grains of gray surrounded by a network of white. The gray appears to have solidified a little ahead of the white, giving us a grained structure, diagrammatically shown in Fig. 19. Thus we have two systems, graphite-austenite or cementite-austenite, on freezing. The austenite, however, is not stable, but changes over with fall of temperature. This it can do by separating out cementite along the curve *ES* or graphite along the curve *an*.

Goerens and Gutowsky concluded from their experiments that graphite is always the product of the decomposition of cementite, for cast iron freezes as austenite-cementite, but just below the freezing point may be changed over into austenite-graphite wholly or in part. (*Metallurgie*, vol. v, p. 45.)

Upton holds that white cast iron is the product of undercooling, and that Rooseboom was correct in stating that the stable constituents on freezing were graphite and austenite. (*Journal of Physical Chemistry*, vol. xii (1908), p. 507.) At a lower temperature these react to form a carbide of iron resembling cementite. The main points of his diagram are: graphite + austenite = Fe_6C at 1095° C.; at 800° Fe_6C changes over into Fe_3C and austenite; at 615° Fe_3C breaks up into Fe_2C and alpha iron (ferrite). A later research is Wittorf's (*Revue de Métallurgie*, 1912, p. 600), whose diagram shows a stable eutectic of austenite and Fe_4C at 1180° C. and 4.1 per cent carbon. Below 1130° C. Fe_4C decomposes into austenite and graphite.

The whole subject has been thoroughly discussed by Guertler (*Text-Book of Metallography*, vol. ii), who concludes that the stable system is as according to Wittorf, and that we have two metastable systems. The first shows the eutectic of graphite and austenite at 1150° C. with a eutectoid of alpha and graphite at 750° C. The second is our ordinary white cast iron with the eutectic of cementite (Fe_3C) and austenite at 1135° C. and the eutectoid of Fe_3C and alpha ferrite at 710° C. as already described. (Figs. 11 and 14.) However, at present the most satisfactory working diagram is the double one showing the two systems, stable and metastable.

The diagram explains in a very satisfactory manner the changes which take place from 0 to 2 per cent in the steel division, as in Fig. 22.

Starting with 0 per cent C or wrought iron, Fig. 9 is a section of a piece of pipe skelp (magnified 35 diameters) etched with 10 per cent nitric acid. It consists of grains of pure iron or ferrite with more or less regular polygonal boundaries and some dark patches of slag, which are elongated in the direction of the rolling. Ingot iron shows the same structure, but without the included slag, because the metal was cast from the liquid state and is steel with only a trace of carbon and other impurities. In pipe steel of say 0.07 per cent carbon we find the same grain of ferrite, but in addition there are small dark-etching areas of pearlite containing 0.9 per cent carbon. As we pass from this low-carbon steel to that containing 0.9 per cent we find the amount of pearlite increases until it finally composes the whole grain. Figure 10, magnified 40 diameters, shows a piece of medium carbon steel cut from a 3½-inch shaft. The white areas are ferrite, the dark are pearlite. Under very high magnification pearlite is seen to be a mechanical mixture of ferrite and cementite, as shown in Fig. 11, where the fine hard white plates are cementite set in a groundmass of softer ferrite. The black patch is a particle of manganese sulphide. Now when the carbon reaches 0.9 per cent the whole steel is composed of pearlite, and in any steel up to this point the changes which take place on cooling from high temperatures are the same. Above the line *GOS* (Fig. 22) the metal is composed of homogeneous grains of austenite. The higher the temperature to which it is heated the coarser the grain. On cooling down no change occurs until the curve *GOS* is reached. The steel shown in Fig. 10 after forging cooled down normally until it reached the temperature *GOS*, when ferrite began to separate out and continued until at 700° (*PS*) the residual austenite grain changed over into pearlite.

With increase in carbon the pearlite increases and the temperature at which ferrite precipitates decreases, following *GOS*.

Above 0.9 per cent carbon a new constituent, cementite, appears as hard, bright envelopes around the grain. This cementite separates out in high-carbon steels when they cool down to the line *ES*, just as ferrite separated out of the low-carbon steel. The change in the residual austenite grain into pearlite occurs at 700° C., or *SR'*, as before.

HEAT TREATMENT

As a general rule a coarse structure means weakness. When a metal or alloy freezes, dendrites or pine-tree crystals generally form. Figure 1 shows typically the normal ingotism. In an ingot or casting of steel similar dendrites form and we have to break them up either by mechanical work or by heat treatment. Rolling or forging at a high temperature breaks them up, and the greater the amount of reduction of section brought about by the mechanical work, the finer the grain, as in the hot working of any metal or alloy. In the case of a casting we produce a fine grain by annealing or, more correctly, refining. When the temperature reaches the curve *AD* the metal begins to freeze and is completely frozen on reaching *AE*, Fig. 22. The rate at which the metal passes through this freezing range determines the grain size. When solid the casting consists of dendrites, or grains of austenite. No further change takes place on cooling until *GOS* is reached. Then ferrite begins to separate out around and in each grain

until on reaching *PS* pearlite forms. To obtain a very fine structure we have to reheat the casting to just above the line *GOS* in order to take the coarse ferrite into solution, for this gives us the finest grain. Heating to temperatures below *PS* causes no change of structure. On passing this temperature the coarse pearlite changes over into very fine-grained austenite. To complete the refining, however, we must get rid of the coarse ferrite, which we do by heating just above *GOS*. Thus the lower the carbon in the steel the higher the refining temperature. The changes which take place on heating are at a slightly higher temperature than on cooling, which is due to lag, so that in practice we have to heat say 25° C. above the line *GOS* for complete refining. Manganese, etc., make the lag more pronounced.

Occasionally such heat treatment fails to give complete refining. This is due partly to the fact that a steel casting may contain films of manganese sulphide and silicate, which act as nuclei on which the ferrite precipitated on cooling from *GOS* down to *PS*, and partly due to segregation of phosphorus.

In the heat treatment of high-carbon steel we have to heat just above *SE* to refine the casting, but such heat treatment, as a rule, gives a coarse grain, especially with very high-carbon content. But most high-carbon steel for tools, etc., comes in the form of forged or rolled bars and rods which have a comparatively fine grain. With very high carbon heating to just above *SE* causes overheating and often breaks down the carbide of iron, with the production of graphite. But on account of the fact that the envelopes of cementite tend to break down and form globules, heating to just above *PSK* generally refines the steel.

Hardening and Tempering. Hardening is heating to the austenitic condition and suddenly cooling, as by quenching in water, oil, etc. The more rapid the cooling the harder the steel; the greater the content of carbon the harder the material. The higher the temperature above *GOSK* to which the steel is heated the coarser the grain and therefore the more brittle. Hence the correct temperature to heat the steel for hardening is that point where it has just completely transformed into austenite, which is just above *GOSK*. It is not necessary to heat above *SE*, for cementite is already very hard.

Theoretically we ought to be able to prevent any change in the solid-solution austenite by extremely rapid cooling. In practice, however, this is impossible, and we find more or less decomposition in the quenched material. This decomposition is of two kinds. The outside of the grain of austenite may be changed over into a dark etching constituent called troostite; the nearer the centre of the bar, the more troostite occurs. In Fig. 13 is shown a steel with 1.4 per cent carbon quenched from a white heat. The section is taken from near the outside and the troostite occurs as dark-etching irregular envelopes to the grains of austenite and rounded patches within the grain. The centre of the bar showed comparatively little of the austenite, most of the grain having decomposed into troostite, for in the centre the cooling is much slower. Hence with very large sections it is impossible fully to harden the interior, for the heat is not conducted away rapidly enough to suppress the change of austenite towards pearlite completely. The second method of decomposition occurs within the grain itself. Curious chevrons and needles appear, with some semblance of octahedral symmetry. This is martensite. Figure 12 shows it in a steel with 2 per cent of C, $\frac{5}{16}$ inch square, quenched from 1100° C. The thin envelope to the very coarse grain is cementite. The grain itself shows the typical chevron structure of martensite. Martensite is extremely hard, austenite (found pure in nickel or manganese steel) is comparatively soft. Troostite is less hard and less brittle than martensite. Troostite itself changes over into submicroscopic pearlite, called sorbite, which is extremely strong and ductile. There is a whole range of structures between typical austenite, troostite and martensite, and sorbite, depending on the size of the section, the rate of quenching, and the temperature of quenching. The temperature from which the material was quenched determines the grain size.

Material as quenched is usually hard and brittle. By reheating to over 200° C. to 300° C. we "temper" the material, which causes a further decomposition of the austenite within the grain, but does not alter the grain size. The brittleness is decreased, with some loss of hardness. Within the grain the martensitic structure becomes more pronounced through the formation of troostite and sorbite and then becomes hazy, and finally sorbite and pearlite, and then pearlite alone, result, and the material is then dead soft.

Casehardening and Cementation. This is accomplished by heating wrought iron or low-carbon steel into the gamma range, packed in carbonaceous material, such as charcoal, bone meal, lampblack, etc., or by means of carbonaceous gases. According to Giolitti (*The Cementation Process of Iron and Steel*, 1915) the gamma iron absorbs carbon mainly through the agency of carbon monoxide gas.

The process of casehardening can be readily followed under the microscope. When the specimen has not been quenched a cross section can be cut and the changes in structure followed as they pass from the outside of cementite plus pearlite, or pearlite alone, through a zone of pearlite into ferrite plus pearlite, which gradually decreases in amount until finally the normal material is reached, which shows the limit of carbon penetration.

Alloy Steels. The metallography of alloy steels forms a subject in itself. They may be classified into three groups according to the predominant constituent: (1) pearlitic, (2) martensitic, (3) austenitic, of the air-cooled specimens. The presence of the alloy profoundly affects the critical temperatures, especially *GOSK*, and the ease with which the transformations occur. As an example of group 7 we have nickel steel with 3.5 per cent nickel. This closely resembles ordinary carbon steel in structure, although the grain size is usually finer, and when quenched the martensite is very much more pronounced. Chrome-steel, nickel-chrome, chrome-vanadium, nickel-chrome-vanadium, silico-manganese, etc., are all pearlitic. When quenched and tempered, however, martensite is very predominant and there are marked differences both in properties and structure. Manganese steel (Mn 12 per cent), when slowly cooled or cast, is composed of austenite with more or less carbide in and between the grains,

as in Fig. 12; for the manganese present has suppressed the *GOSK* change (Fig. 22) entirely and we have only the curve *ES* left. Quenching from 1050° C. prevents the separation of the carbide and the material is composed of polygonal grains of austenite. (See Fig. 8.) As examples of the third group we have air-hardening and high-speed steel, but their structure is by no means typical martensite. Small white grains of carbide usually occur in a more or less complex groundmass which may be at times austenite, at others martensite, at others pearlite. The differences, however, run parallel with the difference in hardness and physical properties.

Functions of Metallography. In conclusion, metallography does not compete with chemical analysis or physical testing. It supplements them. Chemistry tells us what elements are present; metallography shows us how they occur in regard to grain size, segregation, inclusion of impurities, etc. It is a method of determining cause of failure as well as of distinguishing material. In some cases this is easily done, as, e.g., distinguishing between wrought iron and steel, properly and improperly refined castings, segregated rail steel, etc. Some problems are more difficult, as the study of hardened alloy steels, especially high-speed, the corrosion of tubes, both of iron and steel, and of brass, etc. As in all scientific work, the answer comes sooner or later, and subjects at present unsolved may in time be unraveled by metallographic means.

Bibliography. Several publications available for consultation have devoted considerable space to metallography, viz., the *Zeitschrift für anorganische Chemie* (Leipzig); *Zeitschrift für physikalische Chemie* (ib.); the *Journal of the Iron and Steel Institute* (London); the *Revue de Métallurgie* (Paris); *Metallurgie* (Aachen), now divided into "Ferrum" and "Metal und Erz"; the *Journal of the Institute of Metals* (London); while the *International Journal of Metallography* (Berlin) is devoted to it exclusively. Several introductory textbooks have appeared, notably C. H. Desch, *Metallography* (New York, 1910); G. H. Gulliver, *Metallic Alloys* (Philadelphia, 1913); Rosenhain, *Introduction to Physical Metallurgy* (New York, 1914). The theoretical side is most ably dealt with in William Guertler, *Metallographie* (Berlin, 1912 et seq.), of which two volumes had been published in 1915.

Special papers of importance as dealing with the beginnings of the science are H. C. Sorby, in *Report of the British Association for the Advancement of Science*, vol. ii, p. 189 (London, 1864), *Journal of the Iron and Steel Institute*, vol. i, p. 140 (1886), and Martens, in *Zeitschrift des Verein deutscher Ingenieure*, vol. xxi (Berlin); also his papers in *Stahl und Eisen*, vol. ii (Düsseldorf, 1882), and *Verhandlungen des Vereins zur Beförderung des Gewiebfleisses* (Berlin, 1882).

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MET'ALLUR'GY (from Gk. *μεταλλουργός, metallourgos*, metal working, from *μέταλλον, metallon*, metal, mine + *ἔργον, ergon*, work). The art of extracting metals from their ores and adapting them to the various purposes of manufacture. As the oldest written records of the world's history contain references to metals and their uses, the indications are that metallurgy is an art that was practiced in very early times. The ancient Egyptians and Hebrews were skilled in the working of metals, and the art must have been known and practiced before the dawn of history. Metallurgy may be divided generally into two grand divisions, mechanical metallurgy and chemical metallurgy. Mechanical metallurgy is that procedure usually included under the head of ore dressing (q.v.) and means the mechanical separation of a metal from its ores without recourse to chemical assistance. When the metals occur in a native state this procedure is possible, but, since such occurrence is comparatively rare, purely mechanical metallurgy is not widely adopted. There are a few cases in which it is applicable, such as when native gold occurs in coarse form. In such cases the rock may be broken fine enough to liberate the particles of gold, which then may be separated from the rock by water concentration. Chemical metallurgy includes all processes in which chemical changes are essential. This branch includes by far the greater part of the systems actually in use. The recovery of metals from all ores in which they occur in other than free and native condition involves chemical changes and is therefore within the realm of chemical metallurgy.

Most systems of ore treatment are a combination of mechanical and chemical metallurgy. In a broad way there are five systems under which all metallurgical processes may be classified. These are *concentration, amalgamation, leaching, roasting*, and *smelting*. Concentration is the removal of the gangue or barren part of an ore from the rich or mineral-bearing part, or, in other words, concentrating the metal into much smaller bulk than it occupied in the original ore mass. There are two methods of accomplishing this result. The first is by *gravity separation*, in which either water or air is used as a suspending medium, allowing the heavier metal-bearing portion to settle and thus separate itself from the siliceous gangue. *Flotation*, the second system, separates mineral from gangue by virtue of causing the former to float on the surface of water, either by the use of oil, oil and acid, or by utilizing the principle of surface tension. Flotation is a comparatively new process, the field of which is constantly widening. It is being largely applied at the present time in the wet treatment of copper.

Amalgamation is that system of metallurgy which makes use of the property which mercury possesses of amalgamating readily with gold and silver. Ores are crushed and mixed with mercury, the resulting amalgam being then separated by washing out the remaining gangue. The amalgam is then subjected to a distillation

process in which the mercury is volatilized, leaving the pure metal behind. The amalgamation treatment is usually limited to those ores in which gold occurs free and uncombined, since the metal in chemical combination is not amalgamable. Occasionally silver ores may be amalgamated, an example being the rich ores of the Cobalt district, in Canada, but silver rarely occurs native and is therefore not often amalgamable. See GOLD.

Leaching is the system of extraction in which the ore is treated with aqueous solutions of a solvent which acts upon the metal to be recovered. Three classes of solutions are used under special circumstances—acid, saline, and alkaline. As an example of the first may be mentioned the leaching of copper ores with sulphuric-acid solutions. Use of saline solutions may be typified by the leaching of precious-metal ores with cyanide solutions or the leaching of silver ores with sodium hyposulphite. Among alkaline treatments are the ammonia solutions often used for dissolving copper oxide from ores. Leaching may be accomplished by grinding the ore to a granular form consisting of particles varying in size from 0.5 inch to 0.002 inch, placing it in tanks equipped with false filter bottoms, and applying the solvent solution at the top, allowing it to percolate through the ore bed; or the rock may be ground to an exceedingly fine condition and mixed with the solvent solution, being maintained in suspension by mechanical means and separated after the treatment period by filtration or settlement. Other methods which have been well known are included in leaching—chlorination for example. The class includes all the wet metal-dissolving processes.

The roasting system of treatment includes those in which the ore is heated with access of air, but short of the point of fusion. In this way carbonates, such as those of zinc ($ZnCO_3$) and lime ($CaCO_3$), are brought down to the oxide form, the mineral losing carbonic-acid gas. The process also serves to drive off elements which occur in combination with some minerals, as, e.g., the roasting of sulphides, driving off the sulphur as sulphur dioxide and leaving usually an oxide of the metal. Roasting is widely practiced, but can only rarely form a complete cycle of metal production from ore.

Smelting is the final great class of metallurgical processes and may be called the most important of all of them, since it produces by far the greatest quantities of metal. The process consists of the application of heat together with the addition of materials which induce chemical reactions, the result being molten metal and a melted slag composed of the ore gangue and materials which have been added as flux. The process is one which is applied in special ways to a wide variety of metal ores. It may, and often does, account for the entire cycle between crude ore and metal in the form of raw material for manufacture. Smelting is accomplished usually in furnaces of one of two types—the reverberatory furnace, in which the material to be treated is placed on a bed separate from the fuel or heating agent; and the shaft or blast furnace, in which fuel for generating the required heat is mixed with the ore and flux charge.

Smelting is an extremely ancient process, since the extracting of iron from its ores in blast furnaces was practiced among the hill tribes of India at least 3000 years ago. Iron ore and charcoal are put into a small blast furnace, worked with a goatskin bellows, and several hours are required to produce the small quantity of iron a man might carry in one hand. Smelting is utilized in the recovery of iron, copper, lead, zinc, gold, silver, antimony, nickel, and many other metals. In the recovery of many of these metals it is not the only process which may be used, but in the cases of iron, copper, lead, and some others it is practically the only system in commercial use. Gold and silver are recovered by practically all the classes of metallurgical treatment, but a great quantity is produced directly through smelting.

Electricity has become largely used in metallurgy in recent years, and its application has given rise to the coining of the term "electrometallurgy." It is not, however, a division of the metallurgical art, since the basic principles have not been changed in its use. Electrical action is employed to provide, either more conveniently or more cheaply, means for generating heat or inducing chemical changes that were formerly obtained in some other way. For example, electric furnaces have been built for smelting iron by the heat of the electric arc. Here electricity has supplied heat in a convenient way, but the process of smelting has been in no way changed. In a like way many metals are precipitated from their solutions by the use of the electric current, promoting economy and convenience, but acting essentially as auxiliaries to the formerly known processes. It seems, therefore, that the creation of a metallurgical division under the heading of electrometallurgy is hardly justified at this time. An ore can often be treated entirely by systems that come under but one of the general metallurgical methods, but often a combination of two or more of them is required to effect the recovery of a single metal, and at times all of them are used upon one ore. Thus, a gold ore might be subjected to amalgamation, concentration, and leaching with cyanide solutions, and the concentrates produced might be roasted and finally smelted, thus combining in the treatment of a single ore some process under each of the general divisions of metallurgy. Some of the mechanical operations of metallurgy pertaining to treatment of ores are described under ORE DRESSING; other mechanical operations, referring to the working of metals, as well as the chemical treatment, which differs in detail for each metal, are described in the articles on the various metals. See ALUMINIUM; COPPER; GOLD; IRON AND STEEL; LEAD; MERCURY; NICKEL; PLATINUM; SILVER; TIN; ZINC; ETC.

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METALS AND METALLOIDS. See PERIODIC LAW.

METAL WORK. A term applied to decorative objects made of metal. The metals and alloys most often used are iron, bronze, brass, gold, silver, copper, tin, and lead, and the principal methods of treatment employed are casting, hammering, spinning, drawing, and stamping. (For description of these processes, see

FOUNDING; REPOUSSÉ.) Because of its scarcity and value the use of gold has generally been confined to small objects of personal luxury and adornment, although the Greeks frequently used it, in connection with ivory, for statues of the gods. (See CHRYSELEPHANTINE; PLATE; JEWELRY.) The use of silver is also thus limited, though to a less extent. Although copper in a pure state was employed for ecclesiastical ornaments from the twelfth to the fifteenth century, its chief use has always been as an alloy with tin in the form of bronze. In this form it is the metal most used by sculptors for both statues and reliefs. This is due to the fact that its high fluidity when melted, its slight contraction upon cooling, and its hardness render it peculiarly adapted for casting. (See BRONZE; and on bronze doors, see DOOR.) Brass, an alloy of copper and zinc, was used during the Middle Ages for sepulchral slabs, the design and lettering being engraved. (See BRASSES, SEPULCHRAL.) Modern lamps and lighting fixtures are usually made of brass, but sometimes of bronze; andirons and other fireplace furniture, of iron, sometimes with brass ornaments. Brass plate lends itself to spinning just as naturally as tin plate (iron or steel plate coated with tin) does to stamping. The domestic dishes and utensils that formerly in Europe and America were made of copper, brass, or pewter, are to-day, except in the Orient, stamped inexpensively by automatic machines out of tin plate. By reason of its great contraction upon cooling iron is less adapted to casting; but its extreme malleability and adhesive qualities when heated only to redness render it easy to forge under the stroke of the hammer. From the thirteenth century to the eighteenth it was extensively used with high artistic success for screens, gates, and the like, though the attempted revival in our day cannot be pronounced equally successful. (See IRON AND STEEL.) Steel is also extensively used in the beautiful inlay work of Oriental nations. During the Gothic centuries iron was the favorite metal of the locksmith; among the Greeks and Romans, and since the beginning of the Renaissance, brass and bronze. See LOCK; DAMASKEENING; INLAY; INDIAN ART.

Architecture. The metals chiefly used in architecture are iron and steel, bronze, copper, lead, and zinc. Their uses may be broadly divided into the structural and the decorative.

Iron and Steel.—It is only within the past century that these have come into extensive use for structural purposes. Their applications in modern fire-resisting structures are treated in the articles FIREPROOF CONSTRUCTION and SKYSCRAPER (qq.v.). Another important field of use —and, indeed, that for which they are peculiarly adapted and to which they were applied long before the development of modern fireproof construction—is the roofing of wide spans by means of trusses. The earliest example of this use, which the French inaugurated and have developed with consummate artistic skill, was the iron dome which replaced the earlier wooden dome of the Halle au Blé, Paris (now the Bourse du Commerce), after the fire of 1811, and which is still in perfect condition. In 1839 an iron-framed roof was built over the vaults of Chartres Cathedral. In both of these the main members were of cast iron. The great Halles Centrales in Paris by Baltard (1846–52) and the Crystal Palace at London (1851) employed cast-iron columns with trusses chiefly of wrought iron. In all modern work wrought iron and steel have almost completely displaced cast iron. Very notable French examples of artistic construction in iron were the exhibition buildings of 1878, 1889, and 1900; the roof of the "Salle des Machines" (1889) had a span of over 360 feet, with pointed-arched trusses of great beauty. In the vaulted ceilings of the Bibliothèque Nationale, Bibliothèque Ste. Geneviève, and church of St. Augustin the French in 1850–72 made interesting experiments in combining a decorative iron framework with brick, terra-cotta, or plaster fillings. The earliest iron structure in the United States was the beautiful Crystal Palace of the World's Fair at New York in 1858, in Bryant Park; it was unfortunately destroyed by fire the same year. The iron and glass roof of the train shed of the first Grand Central Depot in New York (1871) was an unusually elegant work; but, in general, American examples lack the elegance of the French. The widest span ever roofed with iron (or steel) and glass was that of the Liberal Arts Building of the Chicago World's Fair (1893); the arched trusses had a clear span of 387 feet and a height of 211. Many very beautiful bridges have been built with spans of steel arches; e.g., the Eads Bridge at St. Louis, the Washington Bridge over the Harlem at New York, the Alexander III Bridge at Paris, etc. It was the great cost and scarcity of iron that prevented its wide use for construction previous to the nineteenth century; but an iron beam bedded in cement was found among the ruins of the Baths of Caracalla (Rome, 202 A.D.), proving that the Romans used it in exceptional cases. In the Middle Ages its chief use was for gates, grilles, decorative hinges, and (in Italy) tie-rods; in the Renaissance it appears also in balconies and balustrades.

Bronze.—For decorative work in architecture bronze holds the place of honor. It was early hammered into reliefs by the Assyrians (Balawat Gates) and the Mycenæans; cast in large masses by the Phœnicians, as in the columns "Jachin" and "Boaz" for the Temple of Solomon (c.1000 B.C.), and the great laver for the court of the same temple; employed by the Romans for the roof of the Pantheon portico (c.120 A.D.) and for its superb doors; in the Middle Ages for bronze-plated and solid-bronze doors of great splendor; in the Renaissance and in modern times for sculptural adornments of all kinds—for doors, grilles, railings, candelabra, and such objects as mast bases (e.g., those at Venice in front of St. Mark's); and also for the minor adornments and details of furniture, tombs, etc.

Copper, zinc, and *lead* in sheet form are used for covering roofs in place of slates or tiles, and for gutters and spouts, on account of their resistance to the weather. Copper and lead, beaten or cast into decorative forms, are used also for the finishing and adornment of roofs, in the forms of hip rolls, crestings, finials, and the like; and copper and galvanized iron for gutters, *chéneaux,* or high gutter fronts, and even cornices. The use of sheet metal for hollow counterfeits of stone is a reprehensible modern device for cheap pretentiousness which, though widely practiced as an organized trade, deserves no mention as a fine art. The use of bronze in sculpture does not belong in the scope of this article. See SCULPTURE.

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nique and history of the different kinds of metal work will be found under the titles cited above. Among the special manuals on the subject which have been written at different periods are: the treatise of the Monk Theophilus, "Diversarum Artium Schedula" (twelfth century), published in *Quellenschriften für Kunstgeschichte, VII.* (Vienna, 1877); Cellini, *Trattati dell' oreficeria e della scultura*, edited by Milanesi (Florence, 1856); Vasari, *Tre arti del disegno*, part ii, edited by Milanesi (ib., 1882); Garnier, *Manuel du ciseleur* (Paris, 1859); Hefner-Altenach, *Serrurerie du moyen âge* (ib., 1869); W. W. Kent, *Architectural Wrought-Iron* (New York, 1888); F. S. Meyer, *Handbook of Art Smithing* (ib., 1896); *Lexicon der Metaltechnik* (Vienna, 1900); Codron, *Travail des métaux dans les ateliers de construction mécanique* (London, 1901); Haas, *Der Metallarbeiter* (1902); J. S. Gardner, *English Ironwork of the XVII and XVIII centuries* (ib., 1911).

METAL-WORKING MACHINERY. The purpose or function of both of the two general classes into which metal-working machinery is divided is to apply power to the forming or shaping of metallic raw material into the desired finished or wrought forms as required by commerce, industry, or the engineer's designs. In one class are the power-driven machines which are designed to produce one article only in great numbers (and possibly in varying sizes) and usually with some degree of automatic action so far as human supervision is concerned. These are properly styled *special machines.* Such are screw-making machines, bolt threaders, nut tappers, gear cutters, spring-making machines, and the like. They usually turn out a product complete, or a process complete, with little or no requirement for subsequent finishing. The other class of power-driven forming or shaping machines includes those which are not special but general in their function and operation, adaptable for doing all kinds of work in their classes on all shapes of stock or raw material. These are properly called *machine tools* and are controlled by the intelligence of the workman and are not to be designated as automatic in any sense. They can of course be made to produce large numbers of duplicate articles, but this is not their normal use. They usually perform a process, or one of several processes, on an article in the course of its production, but they are not machines of production or manufacture in the sense that the special machinery is which turns out a finished product in one completed continuous operation.

It is obvious that the special-machine class of metal-working machinery is as large and as diversified as the mechanical ingenuity of designers and the needs of economic manufacture. Such machines have found their greatest development in the construction of parts for sewing machines, typewriters, arms, cartridge work, motor vehicles, and metallic articles in general.

Metal-working machinery in both classes operates to form or shape the stock or raw material, first by bending or pressure, which creates no chips or leavings; second, by shearing, which separates the blank or work from the general mass or stock, again without chips when dies are used; third, by a paring process, in which the metal which is superfluous is reduced to chips by a cutting tool acting upon the surface or by abrading machines or grinders which comminute the material attacked. Machine tools will include in the first class hammers, presses, and riveting machines; in the second class punches and shears; and in the third class drills, lathes, and boring machines,

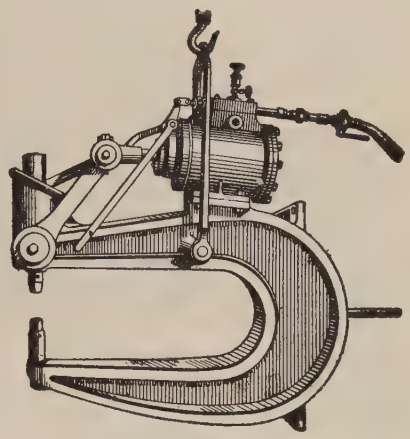


FIG. 1. RIVETER.

planers, surfacers, and milling machines for producing plane surfaces, and emery wheels for sharpening and for producing true surfaces.

Tools of Pressure or Impact. The important tools in this class are hammers and riveting machines. These, however, usually act on metal which has been softened and made plastic by heat, and are therefore more properly forging machines. See FORGE, FORGING.

Riveters are employed for driving and heading hot rivets in making riveted connections in boiler work, in bridge work, structural work, etc. They are built in a great variety of forms, but the most usual portable form derived from the larger stationary types has a U-shaped frame or yoke having at the ends of the arms interiorly projecting dies, one of which is stationary while the other has a reciprocating motion. The rivet after being inserted in the hole is squeezed endwise between these two dies until it clamps the work together and a head is formed. Figure 1 shows a common form of such portable riveter.

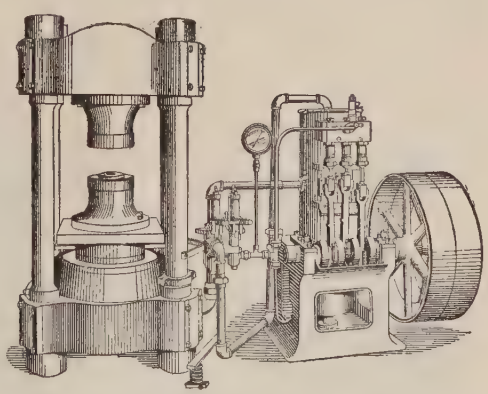


FIG. 2. HYDRAULIC PRESS.

The moving die is operated by means of a steam or compressed-air cylinder. The more massive stationary machines are designed for boiler shells and flues, and the work is presented to

them by cranes. Such riveters are often operated by hydraulic pressure.

Presses are used for forming sheet metal into desired useful forms by means of pressure between dies. Figure 2 shows a hydraulic press for such work as watchcase making which is operated by a belt-driven pump. The same type of machine of larger capacity will be used for flanging boiler plate or shaping armor plate for vessels. The operation of presses of this style is described in the article on the hydraulic press (q.v.). Presses are made for both the hot and cold working of metals. A form of hot-working press, generally horizontal in action, used in bending axles and frame members for motor vehicles, rails, and other structural shapes, is called a bulldozer. The illustration Figure 3 shows a familiar form of bulldozer press. The cold sheet-metal-forming presses for lighter shapes are usually vertical and can produce quite complicated forms in several successive processes. The drop press is also in this class.

Bending rolls are used for bending metal plates to suitable curves for boiler and tank work. They usually consist of three rolls, arranged in the form of a triangle, between which the plate is drawn by the rotation of the rolls.

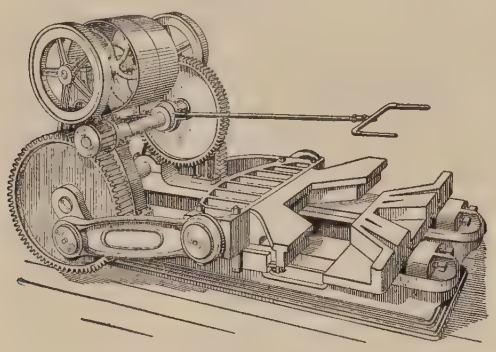


FIG. 3. BULLDOZER PRESS.

The relative adjustment of the rolls determines the curve to which the plate is bent. The accompanying plate shows a horizontal bending roll operated by a special steam engine. These rolls will take in plates 24 feet wide. Vertical rolls of similar construction are also made.

Tools for Shearing or Punching. The tools in this group operate by cutting metal of relatively thin stock, so as to separate a desired shape from a larger mass of stock or to cut holes in the latter by a punching process. The metal is sheared along the parting line, and the tool must have power to overcome this considerable and massive resistance along an area of some magnitude and extent. Punches operate by the thrust of a cylindrical or spirally ended cylinder plunger or tool forced through the metal, while the edges of the desired hole are held up and limited by a die below it. Single and multiple punches are built capable of punching one or several holes at once. For light work punches are usually driven by belts, but for heavy work individual steam engines or hydraulic cylinders are the motive powers used. Where holes are to be punched at regular intervals automatic spacing tables are often used in connection with punches. Figure 4 shows a single punch of familiar construction. Horizontally acting punches are also constructed.

Shears are used for cutting off or shearing metal plates and shapes, and resemble punches in construction and operation except that the punching tool and die are replaced by cutting edges which slide past each other like the blades of scissors. Figure 5 shows a type of plate

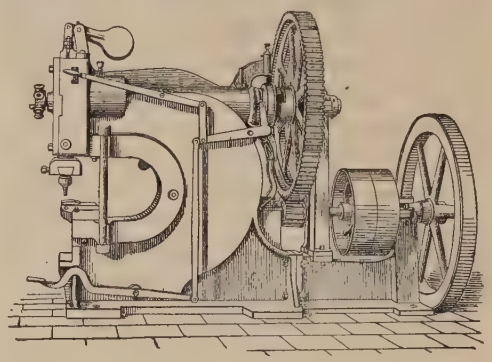


FIG. 4. PUNCH.

shears. Machines of this kind are built wide enough to shear plates 10 feet wide. For shearing angle-iron and other shapes special forms of shears are often made.

Tools for Paring Chips from the Stock. Tools in this class are historically the oldest, since they are developed from the hand-operated devices of the earliest industries. The principal tool in this group is the lathe, sometimes called the "king of machine tools." Here the work is revolved by power, and the point of the cutting tool held rigidly against undesired motion and fed parallel to the axis or at right angles thereto will cut away by a wedging action the metal which is outside of the surface of revolution to an extent determined by the position of such cutting point. Lathes turn cylinders, cones, and surface of revolution. They can also bore or generate hollow surfaces of revolution. They are driven either by belts or electric motors self-contained in their structure, with or without gearing. They have capacities from the smallest machine used by dentists and jewelers up to

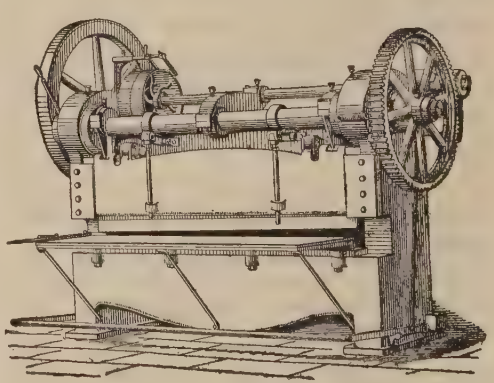
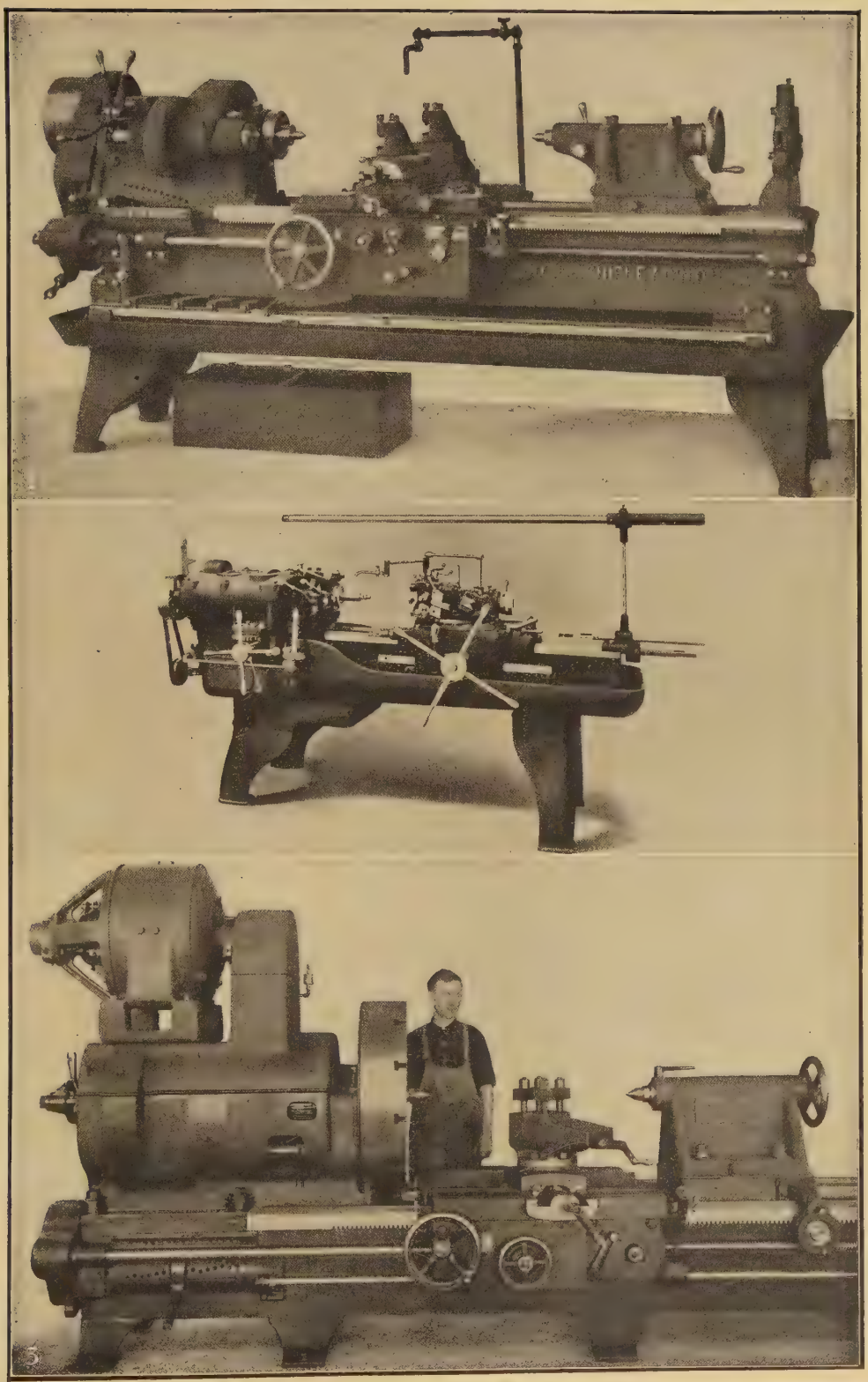


FIG. 5. SHEARS.

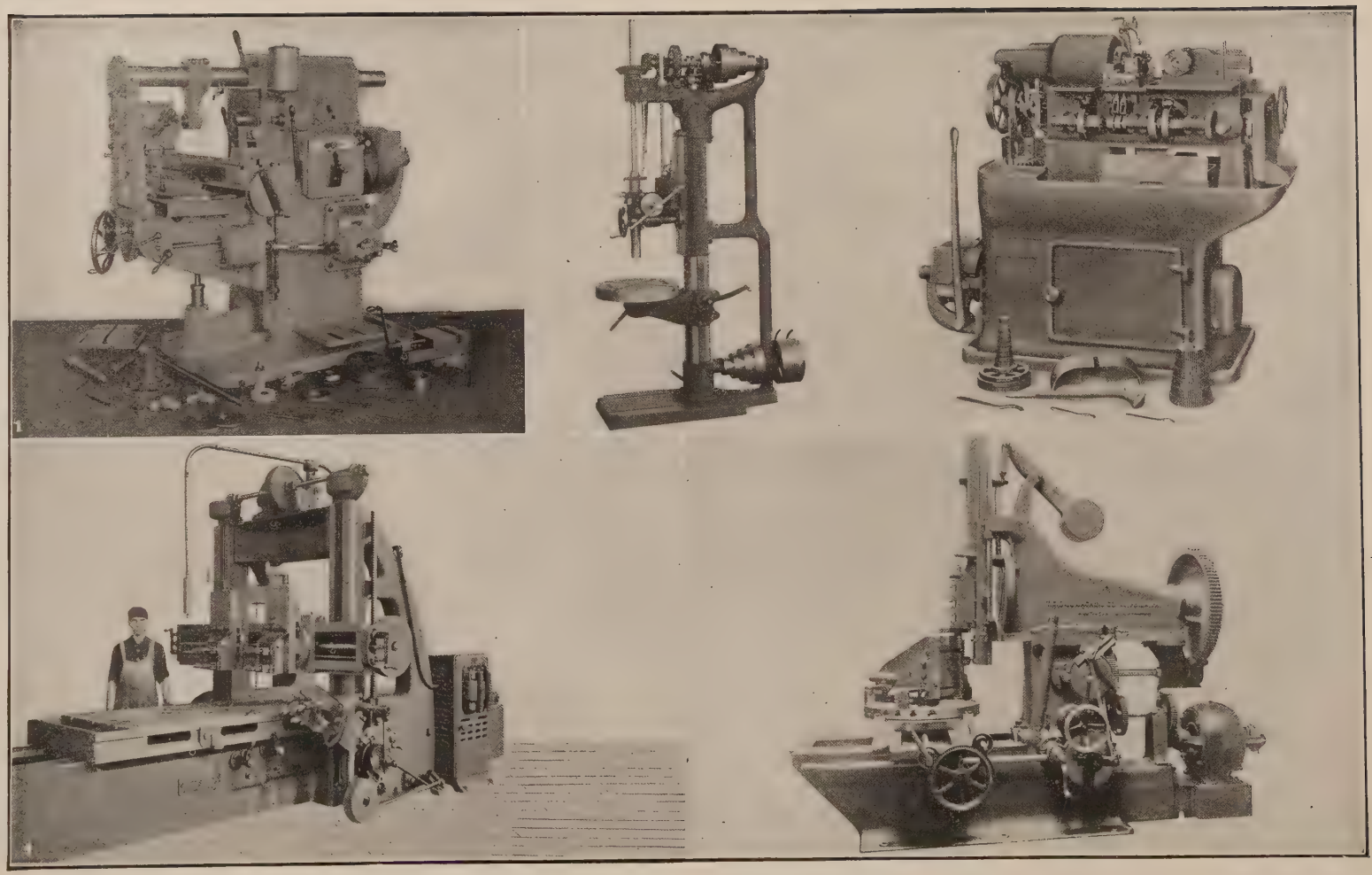
the massive ingot lathes or those for machining the driving wheels of locomotive engines or the flywheels of steam engines. The work, firmly held in a chuck, revolves in the lathe, and the tool is rigid except for the feed motions im-



TYPICAL AMERICAN LATHES

1. SELECTIVE HEAD LATHE
2. TYPICAL TURRET LATHE
3. TRIPLE-GEARED ENGINE LATHE WITH QUICK CHANGE GEARS, MOTOR DRIVEN

METAL WORKING MACHINERY



1. HEAVY UNIVERSAL MILLING MACHINE WITH CONSTANT SPEED DRIVE
2. A 21-INCH SLIDING HEAD HEAVY PATTERN UPRIGHT DRILL
3. AUTOMATIC SCREW MACHINE
4. A 42-INCH PLANER WITH TWO HEADS ON CROSS RAIL AND ONE SIDE HEAD AND WITH REVERSING MOTOR DRIVE
5. A SLOTTER DRIVEN BY ELECTRIC MOTOR

parted to it. The axis of revolution may be either horizontal or vertical. The lathe passes into the boring machine when the work is held rigidly on a chuck or faceplate and the tool is driven by power and fed to its work. Boring machines are used in boring and rifling guns and gun tubes and sleeves and in making true cylinders for engines and motor vehicles.

The boring machine is differentiated from the drill or drill press only by the diameter of the hole it cuts or forms. The drill usually forms its hole by cutting into the solid; the boring machine cuts on the sides of a hole already formed and does not cut at the bottom or end of such hole. A drill does not cut holes over 2 inches in diameter; a drill cuts on its end and not its sides. The lathe as a general machine tool can be transformed into a special machine for rapid production by the expedient of mounting special cutting elements or tools in a head of proper construction and feeding these tools in succession against the revolving stock. As these carrying heads resemble a turret of a warship in form and movements, such lathes are called turret lathes. The turret is usually on a vertical axis and is borne on a bed carriage; horizontal turrets are used in certain designs. The use of stops eliminates the necessity of pauses to caliper or measure the work in progress, and the entire product will be of the same dimensions until the tools wear.

Drill presses similarly become special tools when multiple spindles in determined relations to each other bore several holes at once at standard distances and positions. The plates illustrate standard drills and boring machines. The universal form of the drill press is the radial drill, in which the drilling spindle has adjustments for position both laterally and in and out and the work is held rigidly upon a faceplate or table or on a floor plate which is truly at a right angle to the drill spindle in all the positions of the latter.

The second group of tools which shape by cutting chips from the surface are the planers and shapers, which have linear motion only. In the planer the tool is held rigidly except for feed motions and the work moves against the tool; in the shaper the work is held in a chuck or on a table and the tool reciprocates back and forth over it. The planer will develop a surface as nearly plane as are the ways which control the motion of the bed; the shaper will develop a surface as plane as the springing of the tool carrier will admit. The latter machine is limited to work on smaller flat or curved surfaces. The slotter is a shaper with the stroke vertical instead of horizontal, and is used for working and finishing locomotive frames, for key-seating and similar work where it is convenient to have the work lie in a horizontal plane and be formed by paring metal at right angles to its greatest dimension.

The planer rarely or never becomes a special machine; the shaper becomes one when its principle is used to form the teeth of gears by having a reciprocating cutter develop the elements of a tooth profile by following the outline of a former having the desired shape, while the gear blank is held continually in the line of the axis of its proposed revolution. Planers and shapers usually cut in one direction or traverse only; to save time the idle traverse is made at higher speed. Such tools are said to have quick return.

The fourth group of machine tools acting to form metals by cutting or paring the surface is that in which the work is rigidly held except for feed motions and the cutting tool revolves against or over the work. The cutters have multiple cutting edges like a circular saw. Hence they last a long time before regrinding makes a readjustment necessary, and duplicate shapes and dimensions can be cheaply and exactly reproduced in manufacture. Such machines are called milling machines, and the revolving cutters are called mills. The mill may have a desired profile to produce a desired shape on the stock over which it moves as it revolves. Milling machines may have vertical or horizontal axes for the cutters. A special form of edge miller is called a profiling machine. Millers may generate and cut spirals or helices, and are much used for cutting the teeth of gear wheels. They then become special machines, but can easily be made automatic as respects the dividing of the circumference of the wheel into equal parts and cutting the tooth space of the required shape. Figure 6 illustrates the so-called plain milling machine and Figure 7 the range in types of cutters which may be used.

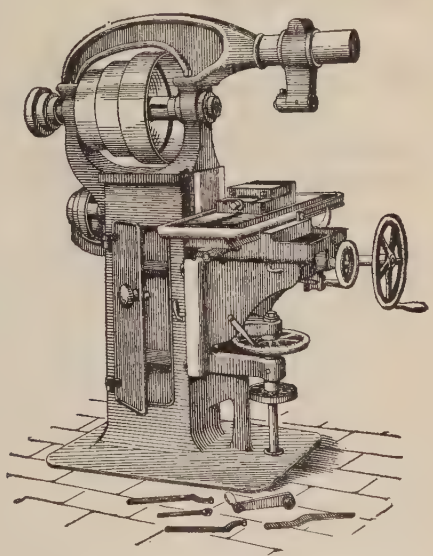


FIG. 6. PLAIN MILLING MACHINE.

The milling machine is the highest development of the machine tool in its class and with the turret lathe lies at the bottom of American supremacy in rapid and cheap production. It will work to a dimension varying only one-half of one-thousandth of an inch from a desired standard size.

The metal saw is in the class of the milling machine for cutting beams and other metallic masses, like armor plate, to shape. The saw may have inserted "bits" of hardened steel in a softer plate, or diamond facets may be similarly used, or the teeth may be made in the saw disk itself. In Figure 8 is shown the beam saw where the beams are clamped in place and the revolving saw traverses at right angles. Less usual is the toothless saw, a disk of soft steel, about three-sixteenths of an inch thick and perhaps 42 inches in diameter. This disk is made to revolve with a speed at the circumference of

15,000 feet per minute, and grinds its way through the metal. If the speed is increased to about 25,000 feet per minute, it becomes a fusing disk and melts the abraded particles. The work should be slowly revolved as fed to

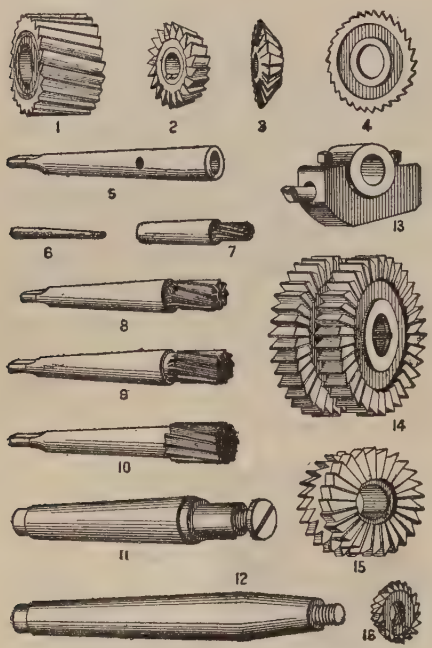


FIG. 7. MILLING CUTTERS AND TOOLS.

the fusing disk to prevent excessive local heat and change of shape in the work.

The United States is a large manufacturer of metal-working machinery, the exports under this specific title having increased from $3,716,709 in 1904 to $14,011,359 in 1914.

Bibliography. A large number of books dealing with machine shops and tools are available, but in most cases the most recent practice will best be described in the current files of such journals as the *American Machinist* (New York), *Power* (ib.), *Machinery* (ib.), and *Journal of the American Society of Mechanical Engineers* (ib.); while the catalogues of the more important machine-tool makers can be studied with considerable profit. Also: L. E. Brookes,

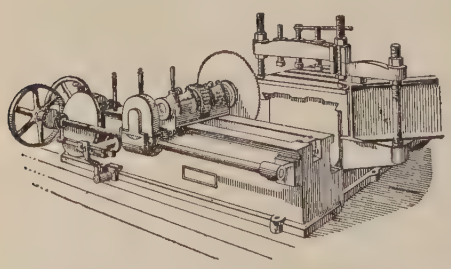


FIG. 8. COLD-METAL-SAWING MACHINE.

Twentieth Century Machine Shop Practice (Chicago, 1906); J. G. Horner, *Modern Milling Machines* (New York, 1906); id., *Practical Metal Turning* (ib., 1906); C. H. Benjamin, *Modern American Machine Tools* (ib., 1907); J. F. Hobart, *The Screw-Cutting Lathe* (ib., 1907); C. O. E. Perrigo, *Modern American Lathe Practice* (ib., 1907); Goodrich and Stanley, *Accurate Tool Work* (Chicago, 1908); S. H. Moore, *Mechanical Engineering and Machine Shop Practice* (ib., 1908); F. H. Colvin, *Engine Lathe Work* (New York, 1909); R. E. Flanders, *Gear Cutting Machinery* (ib., 1909); Goodrich and Stanley, *Automatic Screw Machines and their Tools* (Chicago, 1909); D. F. Nedden, *Engineering Workshop and Engineering Work and Processes* (New York, 1910); F. H. Colvin, *Machine Shop Mechanics* (ib., 1911); J. V. Woodworth, *American Tool Making and Interchangeable Manufacturing* (2d ed., ib., 1911); id., *Drop Forging, Die Sinking, and Machine Forming of Steel* (ib., 1911); Colvin and Stanley, *American Machinists' Handbook and Dictionary of Shop Terms* (ib., 1914).

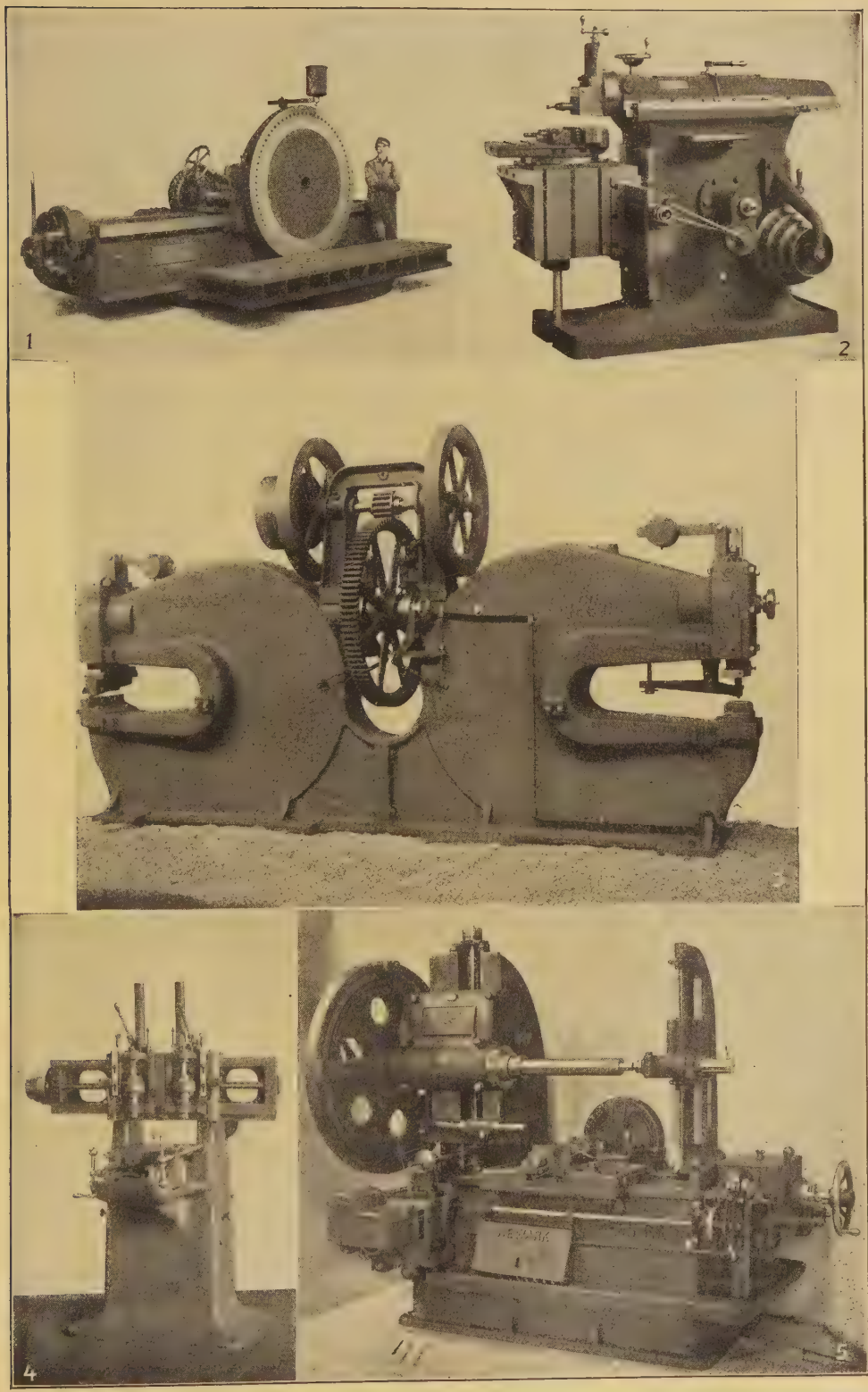
METAM'ERISM (from Gk. *μετά, meta*, after + *μέρος, meros*, part). In zoölogy a term equivalent to segmentation, as seen in the worms whose body is divided along the primary or longitudinal axis into segments, homologous with each other, which are technically called somites or metameres. Each metamere or segment contains a chamber or compartment of the body cavity and a section of the alimentary canal and other organs. The external appendages, or the so-called segmental organs, are said to be segmentally or metamerically arranged. Metamerism is most obviously exhibited in worms and arthropods, as the lobster, myriapods, and insects. Vertebrate animals, also, in the nervous system and some of the other organs, show a tendency to a repetition of segments, i.e., to metamerism.

METAM'NEH. A town of Galabat (q.v.).

METAMOR'PHIC ROCKS. One of the three great divisions of the rocks (see ROCK) characterized generally by a foliated or schistose structure and including: (1) rocks which have been shown to be altered (metamorphosed) igneous rocks (q.v.); (2) rocks which have been shown to be altered sedimentary rocks (q.v.); and (3) rocks which, while resembling one or both of these types, do not allow of a definite determination of their origin. This implies that the product of metamorphism acting upon a sedimentary rock may be indistinguishable from the result of the same agencies acting upon an igneous rock. There are, however, certain limits of composition fixed by the laws of consolidation of rock magmas that restrict somewhat the composition of metamorphic rocks which can have had an igneous origin, the processes of metamorphism having been shown in the great majority of instances not to have altered in an important way the ultimate composition of the rock as a whole. The metamorphic rocks are as a class those of which the processes involved in their alteration have been active within the crust of the earth, and are exclusive of those formed through the chemical action of the atmospheric agencies, the latter class being generally designated residual rocks (q.v.). See METAMORPHISM.

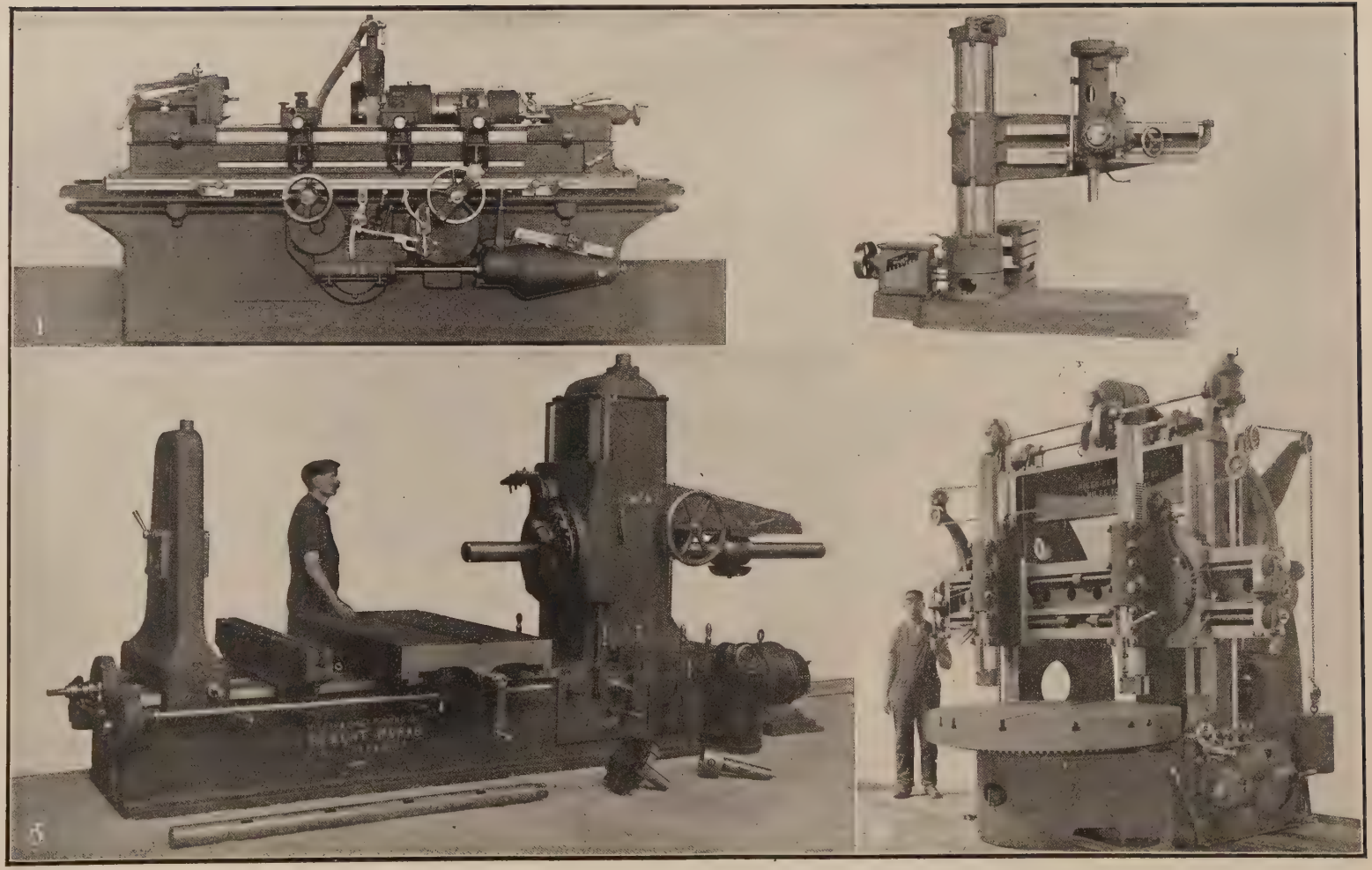
Metamorphic Sedimentary Rocks. The principal metamorphic sedimentary rocks are definitely related to the unaltered sedimentary rocks, principally, however, in respect to composition. Thus marble (q.v.) and crystalline limestone (q.v.) are metamorphosed limestone, and dolomitic marble is the product of metamorphism of dolomite. Quartzite (q.v.) and quartz schist result from the metamorphosis of arenaceous rocks, and by the recrystallization of

METAL WORKING MACHINERY



1. ROTARY PLANER OR END MILLING MACHINE
2. HEAVY DUTY 24-INCH BACK-GEARED PILLAR SHAPER
3. DOUBLE PUNCHING AND SHEARING MACHINE
4. TWO-SPINDLE PROFILING MACHINE
5. AUTOMATIC HEAVY PINION CUTTING MACHINE

METAL WORKING MACHINERY



1. A 14 X 50-INCH PLAIN GRINDING MACHINE
2. RADIAL DRILLING MACHINE
3. A 60-INCH MOTOR-DRIVEN DUPLEX BORER, DRILLER, AND MILLER
4. A 73-INCH BORING AND TURNING MILL, MOTOR-DRIVEN

contained iron ore or by the impregnation by ferruginous material they become jaspilite (q.v.) or hematite rock. The argillaceous rocks produced by the same processes are slate, phyllite, mica schist, hornblende or actinolite schist, garnetiferous schist, staurolitic schist, and the rarer types of hornfels or hornstones (q.v.), albite schist and chiastolite schist.

Metamorphic Igneous Rocks. The types included under this head may generally be recognized by the partial preservation of the peculiar textures of igneous rocks; such, e.g., as the granitic, porphyritic, vitreous or glassy, spherulitic, pearlitic, etc. (See IGNEOUS ROCKS.) These structures are, however, almost always obscured by the presence of parallel or approximately parallel sets of fissile planes which are collectively referred to as the schistosity of the rock. (See METAMORPHISM.) There may be several sets of these fissile planes, but when two or more are present it is generally impossible to determine whether the rock had an igneous or a sedimentary origin, and it would be relegated to the third class of metamorphic rocks. It has been found that igneous rocks which were originally glassy in texture are liable to devitrification, the product of which process is a rock of microcrystalline or cryptocrystalline texture. Metamorphic rocks of this derivation are named in terms of the rocks from which they have been derived with the addition of the prefix *apo;* as, e.g., aporhyolite, from rhyolite (q.v.). If, however, the induced texture is that of schistosity or foliation alone, a structure which must be referred to the processes known as dynamic metamorphism, the original name of the igneous type is joined to the textural term "gneiss"; as, e.g., *granite-gneiss* from metamorphism of granite (q.v.). *Granitoid gneiss* is the equivalent of granite-gneiss. The third class of metamorphic igneous rocks owe their origin chiefly to the chemical alteration (recrystallization) of igneous rock types with the abundant development of new minerals out of old ones. Such rocks are steatite or soapstone (q.v.), from the development of talc, and serpentine rock (q.v.), from the development of serpentine, in rocks of dominant magnesian composition.

Consult: Zirkel, *Lehrbuch der Petrographie,* vol. iii (Leipzig, 1894); Diller, "The Educational Series of Rock Specimens Collected and Distributed by the United States Geological Survey," in *United States Geological Survey, Bulletin 150* (Washington, 1898); Pirsson, *Rocks and Rock Minerals* (New York, 1908); Rosenbusch, *Elemente der Gesteinslehre* (Stuttgart, 1910).

MET'AMOR'PHISM. A term commonly used by geologists to indicate the profound changes which some rocks have undergone. It is particularly applicable to those modifications that are usually accompanied by an increase in hardness and degree of crystallization from the original conditions. Metamorphism may lead also to the mineralogical reconstruction of rocks. The changes which occur in the outer zone of the earth's crust as the result of weathering and hydration are embraced under the term "katamorphism." The metamorphic processes are characteristic of the deeper zone under the influences of heat and pressure. The phenomena of metamorphism are commonly met with in nature, particularly in the regions underlain by ancient rocks, where the processes of upheaval and subsidence and volcanic forces have operated through long periods of time. The degree to which rocks have been changed varies from mere hardening in some cases to an extreme marked by complete alteration in structure and composition.

Kinds of Metamorphism. Strata in the vicinity of igneous intrusions, as dikes and bosses of granite, are more or less metamorphosed and show an increase in hardness and crystallization. In this kind of metamorphism, called *contact metamorphism,* the amount of change effected depends upon the character of the invading rock and the rock that has been invaded, and also upon the proximity to the contact. Deep-seated igneous masses exert greater influence than surface flows of lava, doubtless because of the greater heat and longer period of cooling; while those of acid composition in which there are large quantities of occluded gases and vapors are more effective than basic types. The character of the strata invaded by the igneous rock largely determines the extent to which new minerals are formed; sandstone usually shows no change beyond a hardening or recrystallization of the quartz particles, but clay rocks, such as shales and slates, exhibit a complete rearrangement of the chemical constituents with the formation of new minerals. Limestones are also greatly changed along the contacts with igneous rocks, undergoing a crystallization so as to form marbles and developing new minerals by combination of the materials in the limestones with those given off by the igneous intrusions. In such contact zones valuable ore deposits may be present, especially deposits of copper, lead, and silver ores.

A second form of metamorphism by which rocks have been influenced over wide areas depends upon the energy developed by the great stresses and movements within the earth's crust; this is called *regional* or *dynamic metamorphism.* The first stages of regional metamorphism are indicated by hardening and the loss of volatile substances; but, as the strains of compression and shearing increase, the rock assumes a schistose structure and its constituent minerals are more or less completely recrystallized. The change effected may amount to a thorough transformation, as from an unaltered sediment to a homogeneous crystalline mass resembling an igneous rock. In most cases the influence of pressure in producing such metamorphism is manifest in the foliated or schistose structure which the rocks exhibit.

Causes of Metamorphism. Heat, pressure, and moisture are the most effective agencies in producing the changes known as metamorphism. The influence of heat is shown in igneous contacts, but it is also an accessory in regional metamorphism, although pressure is here the dominant factor. Moisture, which is present in all classes of rocks, assists in decomposing minerals and in the formation of new compounds. The phenomena of metamorphism have been imitated in an experimental way by subjecting specimens of various rocks to the influence of heat and pressure. Consult Archibald Geikie, *Text-Book of Geology* (London, 1903), and Johnston and Niggli, "The General Principles Underlying Metamorphic Processes," in *Journal of Geology,* vol. xxi (Chicago, 1914). See GEOLOGY; METAMORPHIC ROCKS.

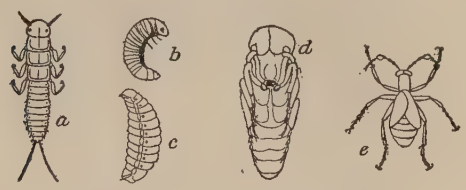
METAMORPHO'SES. The name of two famous Latin works, one in verse, by Ovid (q.v.), the other in prose, by Apuleius (q.v.).

MET'AMOR'PHOSIS (Lat., from Gk. *μετα-*

μόρφωσις, from *μεταμορφοῦσθαι*, *metamorphousthai*, to be transformed, from *μετά*, *meta*, a prepositional prefix often suggesting the idea of change, + *μορφή*, *morphē*, form). In the mythology of the ancients, those transformations of human beings into beasts, stones, trees, and even into fire, water, etc., in fables with which that mythology abounded. Writings dealing with such transformations were called metamorphoses (q.v.). See APULEIUS; OVID; FOLKLORE; WEREWOLF.

METAMORPHOSIS, IN ANIMALS. A change of form in the postembryonic life of an individual animal. The term is also applied to the change in form of homologous parts in different species.

The young of many animals pass through a series of changes of form, in each of which the animal is adapted to changes in its surroundings, involving alterations in its mode of life,



HYPERMETAMORPHOSIS OF OIL BEETLE.

a, first larva; *b*, second larva; *c*, third larva; *d*, pupa; *e*, mature beetle.

slight if the change of body form is slight, thoroughgoing and radical if its body becomes profoundly modified. As examples of a complete metamorphosis may be cited the life histories of the jellyfish (q.v.), the starfish, mollusks, crustaceans, insects, and also the salamanders, toads, and frogs. The result of this change of habits and form undoubtedly is to prevent the extinction of the species, since if at a given moment the parents were swept out of existence, the young, living under very different circumstances, would survive, develop, and represent the species. Again, in the marine species of worms, crustacea, etc., the free-swimming young (larvæ) are borne about by oceanic and tidal currents, and in this way what in adult life are the most sedentary forms become widely distributed from one part of the world to another. On the other hand, the larval forms of fixed marine animals serve as food for fishes, especially young fishes, and numerous invertebrates. Thus, were it not for the metamorphoses of animals, many species would become extinct sooner than they do, while the great overplus of larval forms gives to many other species of animals a secure hold on existence.

As an example of metamorphosis we may cite that of a butterfly. Its life is divided into four stages—the embryo passed within the egg, the larva, pupa or chrysalis, and imago. Such an insect after hatching lives, so to speak, three different lives, having distinct bodily structures and existing under very different conditions as regards food, enemies, etc. The caterpillar, e.g., has big jaws, which in the winged or adult state are entirely wanting or so modified that the mouth is a suctorial one. Other radical changes are observable in the body and appendages and also in the internal organs. The term "larva" (q.v.), as applied to the first stage of animals, is a very variable and indefinite one, that of insects in general being a much more highly organized animal than the larva of a worm, starfish, or crustacean. Primitive wingless insects (Synaptera) do not pass through a metamorphosis. The metamorphosis of higher insects, whether winged or wingless, is of two sorts—complete and incomplete. The butterfly furnishes an example of complete metamorphosis. An example of incomplete metamorphosis is that of locusts or grasshoppers. In these insects the freshly hatched young differs from the adult only in being without wings. The different stages of metamorphosis are not primitive, inherited from some early form, but are acquired characters; the nauplius stage of most crustacea, and the caterpillar, maggot, or grub of insects, are forms which were adaptations to changed modes of life, inducing use or disuse of certain organs. At first insects were ametabolous and it was not until perhaps the middle of the Paleozoic era that insects with a metamorphosis began to exist.

Hypermetamorphosis. A condition in insects wherein they pass through more than the three normal stages. The best-known examples are the supernumerary stages of *Meloë*, *Stylops*, etc. In the oil beetle (*Meloë*) the freshly hatched young is an active, minute campodia-like larva, which is found on flowers. It crawls from these to the bodies of bees and is carried by them to their nests, where it feeds upon the bee eggs. This sedentary mode of life reacts upon the organism, and after molting in the second larval stage it is grublike, the body thick, soft, and fleshy (carabidoid stage), and it feeds on honey. At the next molt the insect is motionless and nearly footless (semipupal stage). It then changes to a third larval form, when it resembles the maggot or larva of a bee. It then transforms into a genuine pupa, and finally into the beetle.

Suppressed Metamorphosis. This phenomenon, or direct development, is a curtailment or absolute loss of primitive larval characters, or a forcing back of larval features or structures, until they are either passed through in the embryo before hatching or entirely lost, due to the lapse of heredity. This abbreviated metamorphosis is seen in the Crustacea, as the lobster (q.v.), and more especially in certain shrimps and crabs, which, owing to changed conditions, hatch in the adult form, passing through the nauplius and zoëa stages in the embryo. It is also seen in the frogs (see FROG), where the different degrees of metamorphosis are quite plainly due to great differences in the conditions of life. See NIDIFICATION.

Causes of Metamorphosis. These are obscure, but it is plain that the different stages are exaggerated or pronounced periods in the growth of the animal, and that the fundamental causes are the same as those which have initiated and controlled the origin of species. This is plainly seen in aquatic larvæ, the young of forms whose larvæ were originally terrestrial. The numberless contrivances and temporary larval organs, especially seen in dipterous larvæ, are evidently adaptations to the needs of the insect during its temporary aquatic life, these being cast aside when the animals pass to a different medium.

Bibliography. Sir John Lubbock, *The Metamorphoses of Insects* (London, 1874); Balfour, *Treatise on Comparative Embryology* (ib., 1880–81); Korschelt and Heider, *Text-Book of the Embryology of Invertebrates* (ib., 1895–1900); Packard, *Text-Book of Entomology* (New York,

1898); J. W. Folsom, *Entomology* (Philadelphia, 1906); Parker and Haswell, *Text-Book of Zoölogy* (new ed., London, 1910).

METAMORPHOSIS, IN PLANTS. Goethe's doctrine which seeks to establish a relationship between the different organs of a plant by assuming an ideal fundamental organ from which the different leaf organs could be derived. The stem came into consideration only as carrying leaves, and the root was almost entirely disregarded. In its application this ideal leaf form came to mean to most botanists an ordinary foliage leaf, and foliar structures have been in the main presented from this standpoint. For example, the parts of the flower are commonly spoken of as modified or metamorphosed leaves; and when petals or stamens are abnormally replaced by foliage-like structures, they are said to revert to the primitive condition and to prove derivation from leaves by modification. Morphology long ago disproved this idealistic metamorphosis, and it does not regard the occasional replacement of a usual organ by an unusual one as any argument in favor of such a view. Consult Sachs, *History of Botany, 1530–1860*, translated by Garnsey and revised by Balfour (Oxford, 1906).

METAPH'ONY. See ETYMOLOGY, FIGURES OF.

MET'APHOR (Gk. *μεταφορά, metaphora*, a transference). A figure of speech by means of which one thing is put for another which it only resembles. Thus, the Psalmist speaks of God's law as being "a lamp unto his feet and a light unto his path." The metaphor is a kind of comparison in which the speaker or writer, casting aside the circumlocution of the ordinary similitude, seeks to attain his end at once by boldly identifying his illustration with the thing illustrated.

MET'APHYS'ICS (Lat. *metaphysica*, from Gk. *μετὰ τὰ φυσικά, meta ta physika*, following the physics, because of the position this subject occupied in Aristotle's collected works). The name given to the science which deals with ultimate reality. Metaphysics or ontology is a term used to designate a branch of philosophy, but much difference of opinion prevails as to the precise character and function of this philosophic discipline and even as to its possibility. Before Kant's time there was a very general tendency to build up theories of the nature of things on the basis of a priori reasoning. Certain metaphysical principles were assumed to be necessary, and the acceptance of these principles led to the deduction of various propositions which were held true of reality as it is in itself, i.e., of reality as it exists without relation to the conditions of our experience. This method of procedure is called dogmatism (q.v.), and the metaphysics thus developed is dogmatic or rationalistic metaphysics. This may be dualistic, as in the case of Descartes, who maintained the radical difference between mind and body as two disparate substances; or it may be qualitatively monistic, as in the case of Leibnitz, who resolved all reality into spiritual monads (spiritualistic or idealistic monadism), and in the case of Hobbes, who supposed that all reality consisted in matter and motion (materialism). Others held that knowledge of reality is not derived from a priori principles, but is obtained only from experience, and that this experience gives us a true view of reality. The type of metaphysics thus developed is called empiricism (q.v.). Still others maintained that, while there is an ultimate reality, it is inaccessible to human knowledge, which is conditioned by human faculties; these faculties do not present us with the real as it is in itself, but with the results of their own elaboration. Our sensations are not revelatory, but transformative, and the results they give us vary with the varying individuals and their varying pathological conditions. Knowledge is thus only seeming; it is illusory. This view is called skepticism. Kant (q.v.) combined and compromised these different motives, and as a result developed a philosophy which he called criticism and transcendentalism. This was skeptical in that it held that there can be no knowledge of ultimate reality. It was empiristic in that it maintained that all knowledge arises with experience and is true of objects of actual and possible experience. It is dogmatic in that it maintained the a priori character of the principles of this empirical knowledge. These principles are necessary and universal in their application to experience; the reason for this is that there are forms supplied by the mind to its sensations, and these forms are logically prior to experience. This logical priority is their transcendentality, because these principles transcend experience in the same way in which any condition transcends what it conditions; the transcendental reaches beyond any actual experience and extends to all possible experience. But while controlling all experience, both actual and possible, these principles are powerless with regard to things in themselves. They are not, therefore, to be treated as if the necessary knowledge they confer were a revelation of things as they are in themselves. This knowledge concerns things only "in so far as they appear to us." The argument whereby Kant tried to establish this limitation of knowledge to experience, actual and possible, and to demonstrate its inability to penetrate beyond experience to the realm of the ultimately real, constitutes the critical feature of his philosophy, giving the key word to the title of his three leading treatises, which are all *Critiques* (*Kritiken*).

These types of metaphysics found in modern philosophy up to and including Kant are therefore dogmatism (in its monistic and dualistic varieties and spiritualistic and materialistic subvarieties of the former), empiricism, skepticism, and critical transcendentalism. Some of Kant's most distinguished followers (Fichte, Schelling, and Hegel) developed his transcendentalism and dropped his criticism. This they were enabled to do by their denial of any meaning to the Kantian conception of things in themselves. We have thus a dogmatic transcendentalism in opposition to critical transcendentalism. Since the great period of this dogmatic transcendentalism, extending for about 40 years, to the end of the third decade of the nineteenth century, the development of metaphysics has resulted in as many types as were presented in pre-Kantian philosophy, in spite of Kant's assurance that he had forever determined the limits of philosophical speculation. Materialism revived about the middle of the century; empiricism reasserted itself and in recent years has advanced to the position designated radical empiricism. (See EMPIRICISM and JAMES, WILLIAM.) Dogmatism has challenged Kant's veto. Skepticism, especially in the form of phenomenalism, has had active supporters. (See COMTE and SPENCER.) Both critical and dogmatic transcendentalism have been vigorously upheld

in the Neo-Kantian and Neo-Hegelian movements. In addition some new forms of metaphysics have appeared on the scene. The new realism has combined various motives more or less allied to those actuating other schools. In voluntarism (q.v.) there has been a significant modification of the older idealism in that for this metaphysics ultimate reality is given the character of will rather than that of intellect. See SCHOPENHAUER; BERGSON; MÜNSTERBERG.

Bibliography. The bibliography of metaphysics is almost coextensive with that of philosophy itself. Consult, for the modern period, the works of Descartes, Spinoza, Leibnitz, Hobbes, Locke, Berkeley, Hume, Kant, Fichte, Schelling, Hegel, Büchner, Comte, Schopenhauer, Lotze, Green, J. and E. Caird, Harris, Royce, Taylor, James, Dewey, Bergson, Russell. Systematic treatises: Paul Deussen, *Elemente der Metaphysik* (Aix-la-Chapelle, 1877; 3d ed., Leipzig, 1902; Eng. trans., London, 1894); R. H. Lotze, "Metaphysik," in his *System der Philosophie*, part ii (Leipzig, 1879; Eng. trans., 2d ed., 2 vols., Oxford, 1884–87); Karl Dietrich, *Grundzüge der Metaphysik* (Freiburg, 1885); B. P. Bowne, *Metaphysics* (2d ed., New York, 1895); G. T. Ladd, *A Theory of Reality* (ib., 1899); F. H. Bradley, *Appearance and Reality* (2d ed., ib., 1902). For a general survey of the field, consult: Friedrich Paulsen, *Introduction to Philosophy*, translated by Frank Thilly (2d Amer. from 3d Ger. ed., New York, 1895); Arnold Külpe, *Introduction to Philosophy* (Eng. trans., London, 1897); Rerouvier, *Histoire et solution des problèmes Métaphysique* (Paris, 1901); J. S. MacKenzie, *Outlines of Metaphysics* (London, 1902); G. S. Fullerton, *A System of Metaphysics* (New York, 1904); Harald Höffding, *Problem of Philosophy* (Eng. trans., ib., 1905); James Lindsay, *Fundamental Problems* (Edinburgh, 1910); William Jerusalem, *Introduction to Philosophy* (Eng. trans., New York, 1910); M. W. Calkins, *Persistent Problems of Philosophy* (3d ed., ib., 1912). See also PHILOSOPHY and the references there given.

MET'APON'TUM, or **METAPONTIUM** (Lat., from Gk. Μεταπόντιον, *Metapontion*). An ancient city of Magna Græcia, Italy, 24 miles from Tarentum and 14 from Heraclea. It was founded at the instigation of the Sybarites, who wished to check the advance of Tarentum, by Achæan and probably Messenian emigrants, early in the seventh century B.C. To this place the philosopher Pythagoras was said to have retired, and here his tomb was shown. In 415 B.C. we find the inhabitants allies of the Athenians in their invasion of Sicily, and for some time previous the town had evidently been in a condition of constantly increasing prosperity. In the wars waged against Rome by Pyrrhus and Hannibal the Metapontines were hostile to the Imperial city. At the end of the war of Pyrrhus they were subjugated completely by the Romans, but in 212 B.C. succeeded in throwing off the yoke by admitting the Carthaginians. After the withdrawal of the Carthaginians the city was deserted and soon fell into ruin. In the neighborhood of the modern railway station are some remains of ancient temples, and excavation has brought to light some inscriptions and architectural fragments. Consult Lacava, *Topografia e storia di Metaponto* (Naples, 1891).

METASOMATISM, mĕt'ă-sō'mă-tĭz'm. A term used in geology for those processes of chemical reaction that lead to the replacement of one mineral by another of different composition. The chemical reaction is incident usually to a change of environment whereby the mineral becomes less stable than under its original surroundings. A chemical rearrangement then takes place, or an entirely new compound may be introduced, the nature of which is determined by the special conditions. In any case the process seems to be one of molecular interchange, the old being replaced molecule for molecule by the new compound. The latter may contain some of the elements of the earlier mineral, as in the change of tremolite (an anhydrous silicate of lime and magnesia) to talc (hydrous silicate of magnesia), or it may be wholly different, as is shown in the replacement of calcite by metallic sulphides. The underground waters and the heated waters and vapors given off by igneous rocks during the process of consolidation are effective agencies in metasomatism, which is of great importance in the formation of ore deposits.

METASTASIO, mă'tà-stä'zê-ô (originally TRAPASSI), PIETRO (1698–1782). A great Italian poet and dramatist. He was born at Rome, Jan. 13, 1698, of humble parents, and gave early evidence of his genius by his boyish improvisations. Gravina, a famous jurisconsult of the day, believing in the youth's genius, took charge of his education and gave his paternal name of Trapassi the Greek form Metastasio. He forbade his wasting his powers in improvisations, gave him severe training in the Greek and Latin classics, and left him an inheritance which Metastasio soon dissipated. In Naples, where he had gone in hopes of a livelihood, he wrote the *Orti Esperidi* (1721), the performance of which aroused the general enthusiasm, particularly that of the famous singer Marianna Bulgarelli, who had the pleasing youth come to live in her house. His frequent meetings there with the composer Porpora gave him the intimate knowledge of musical composition for which his subsequent dramas, all written to be sung, are remarkable. In 1724 appeared one of his most celebrated dramas, *Didone abbandonata*, which, with *Catone* and *Siroe*, gave the poet a European name. In 1730 Metastasio accepted the post of court poet at Vienna. While there he composed 11 plays, among which are his *Ciro*, *Demofoonte*, and *Temistocle*. Among the best of his melodramas are *Clemenza di Tito* (1734) and *Attilio Regolo*, this latter being usually considered his masterpiece. He died at Vienna, April 12, 1782, having continued Zeno's work in raising melodrama from the low state to which it had fallen and given it in many respects its most perfect expression. His themes have a humorous color under a varnish of nobility and his characters possess a recognizable psychology; his expression is simple and harmonious and the skill with which he balanced words and music is unsurpassed. Some of his airs have become part of the permanent stock of Italian folk songs. The sentimentality and artificiality with which he was vigorously charged, especially by the more serious writers of the following generation, are characteristic of the Arcadian atmosphere in which he wrote. His works have been translated into many languages and set to music by celebrated composers, among them Vinci and Caldara, Pergolese and Scarlatti. The best edition of Metastasio is that of Paris (12 vols., 1780), with useful supplements in the *Opere postume* (Vienna, 1795), and in the Florentine

editions of 1820 and 1826. The latest critical edition is that published at Bari, 1914. Consult: Mussafia, *Pietro Metastasio* (Vienna, 1882); Giuseppe Carducci, *Lettere disperse e inedite di Pietro Metastasio* (Bologna, 1883); Masi, "Pietro Metastasio," in his *Parrucche e Sanculotti nel secolo XVIII* (Milan, 1886); Antona-Traversi, *Lettere inedite e disperse di Pietro Metastasio, con un' appendice* (Rome, 1886); O. Tommasini, "Pietro Metastasio e lo svolgimento del melodramma italiano," in his *Scritti di storia e critica* (ib., 1891); Vernon Lee, *Studies of the Eighteenth Century in Italy* (new ed., Chicago, 1908).

METAS'TASIS (Neo-Lat., from Gk. *μετάστασις*, removal, change, from *μεθιστάναι*, *methistanai* to remove, change place, from *μετά*, *meta*, after + *ἱστάναι*, *histanai*, to place, stand). A change in the seat of a disease from one part of the body to another. Acute infections of the venous channels are most likely to result in metastatic processes in other parts of the body. In thrombosis of the lateral sinuses following mastoiditis, portions of the clot may break off and be carried by the blood stream to the brain, heart, lungs or joints, ending respectively in abscesses, endocarditis or pericarditis, infarction and arthritis. The same series of events may attend septic infection of the uterus. When the blood stream becomes loaded with pus-producing organisms and multiple foci of infection are scattered throughout the body, the condition is known as *pyæmia* (q.v.). The wandering propensity of acute articular rheumatism and its tendency to involve the serous lining of the heart and pericardium are sometimes considered as an illustration of metastasis. This would lend support to the infectious theory of rheumatism and to the belief held by many that there is a focus of infection in the tonsils from which bacteria are carried to the joints and the heart. In mumps (q.v.) metastasis may take place in the ovaries in girls or in the testicles in boys, with resulting ovaritis or orchitis respectively. In cancer metastasis takes place principally through the lymphatics, but it is probable that the blood stream may also be implicated, since the foci are often widely distributed.

ME'TA SU'DANS (Lat., dripping cone). A great fountain facing the Coliseum at Rome, said to have been erected by Domitian and completed in 97 A.D. Representations on medals and references in literature, however, seem to indicate that Domitian enlarged a fountain already in existence. Its name was given from its shape, which represented the conical turning post of a Roman circus, and from the way the water flowed out through openings over the cone. Only the partially restored brick interior of the fountain remains.

METATARSALGIA, mĕt'ȧ-tär-săl'jĭ-ȧ (Morton's Disease). A severe neuralgic pain beginning in the ball of the foot and extending up into the foot and leg. It is caused by pressure upon the nerves running between the distal ends of the metatarsal bones, usually the third and fourth, and is set up either by tight shoes, bony hypertrophy of the distal end of the bones, or weakness of the external arch of the foot. The treatment in extreme cases may require resection of the head of the bone or excision of the superficial branch of the external plantar nerve; but relief may generally be obtained from the wearing of properly fitting shoes and appropriate flat-foot braces. Temporary relief may be had by injecting the nerve concerned with cocaine or normal saline solution.

MET'ATHE'RIA (Neo-Lat. nom. pl., from Gk. *μετά*, *meta*, after + *θηρίον*, *thērion*, dim. of *θήρ*, *thēr*, wild beast). The order Marsupialia, or marsupial mammals. In the classification of the Mammalia prepared by Huxley (*Proceedings of the Zoölogical Society of London*, 1880) the marsupials were placed in a class Metatheria (compare Didelphia), between the Prototheria, or monotremes, below them, and the Eutheria, or ordinary mammals, above them, and equivalent to both in rank. He enumerated 11 characters in distinguishing the Metatheria and giving it the rank he proposed. Subsequent investigations, however, have shown the invalidity of some of the supposed facts relied upon, and the preponderance of evidence that the marsupials cannot be separated from the higher mammals by any such gap as separates them from the Prototheria. The term "Metatheria" is now retained by several authors as the designation of a section of the subclass Eutheria embracing the marsupials. Gregory employs it as the first of two infraclasses (the second being Eutheria), forming the subclass Theria. Consult Beddard, *Mammalia* (London, 1902), and W. K. Gregory, "The Orders of Mammals," in *Bulletin, American Museum of Natural History*, vol. xxvii (New York, 1910).

METATH'ESIS. See Etymology, Figures of.

METAURUS, mē-tą'rŭs (It. *Metauro*). A small river of central Italy, emptying into the Adriatic, 4 miles south of Fano. It was the scene of the defeat of Hasdrubal, brother of Hannibal, by Caius Nero and Marcus Livius in 207 B.C.

METAXYLEM, mĕt'ȧ-zī'lĕm. A term used in the vascular anatomy of plants. In the development of a xylem strand the group of elements which first appears is called the protoxylem (q.v.), while those which appear later constitute the metaxylem. Protoxylem and metaxylem together constitute the "primary wood," while the xylem produced by the cambium (q.v.) is "secondary wood."

MÉTAYER, mȧ'tȧ'yȧ' (Fr. *métayer*, farmer who tills the land for half the produce). An agricultural tenant who works the land with capital owned by the landlord and pays as rental a fixed proportion of the crop. It may in general be said to be the resource of a community where cultivators are without capital. In the United States such a system of renting land on shares prevails mainly in the South, but as time progresses money rents are substituted more and more for share rents, and this seems to be the natural tendency where the economic position of the tenants improves. The system of métayage is still very common in Italy, parts of Austria and Russia, and in Portugal and the West Indies. Métayage is a system which possesses marked social advantages but equally marked economic disadvantages. The métayer cannot be rack-rented; bad seasons cannot drive him into bankruptcy; the increase in value of produce due to improved means of transportation redound to his advantage as well as to that of the landlord. Métayage, therefore, tends to create a class of peasantry who are in large measure independent of the price movements which are so great a source of anxiety to the small farmer who is compelled to make periodic money payments for rent. But, on the other

hand, there is slight inducement for either métayer or landowner to make improvements, since one-half of the resulting increase in product goes to the other party on the division of the crop. Métayage has for this reason tended to perpetuate primitive conditions of agriculture. This evil is, however, not necessarily inherent in the system, since it would be quite possible for landowner and métayer to unite in making improvements, and this practice is not uncommon in France. It is also possible to make an agreement as to a separate return for the capital invested. The economic disadvantages of divided responsibility would still remain, and for this reason métayage can hardly survive in highly advanced economic conditions. Its existence in so large a part of Europe is probably to be explained by the persistency of custom among the agricultural population. See Cruveilhier, *Etude sur le métayage* (Paris, 1894). An excellent account of the system in practice is to be found in Higgs, "Métayage in Western France," in *Economic Journal* (March, 1894). See also articles on "Métayage" in Palgrave, *Dictionary of Political Economy*. The standard works on political economy usually devote some attention to the merits of métayage. Consult Adam Smith, *Wealth of Nations* (London, 1776; new ed., New York, 1904), and J. S. Mill, *Principles of Political Economy* (London, 1848; new ed., New York, 1909).

MET'AZO'A (Neo-Lat. nom. pl., from Gk. *μετά, meta,* after + *ζῷον, zōon,* animal). The name applied to all the animals above the Protozoa. The animal kingdom is thus subdivided into two divisions, viz., the Protozoa, or one-celled animals, and the Metazoa, or many-celled animals. The latter include all the branches or phyla of the animal kingdom from the sponges (Porifera) to the Vertebrata. Each metazoan, however, develops from a single cell, the egg.

The Metazoa have been defined as "animals in which the ordinary (so-called adult) form of the species has always more than one nucleus, and in which the nuclei are for the most part arranged regularly and with a definite relation to the functional tissues of the animal (so-called 'cellular arrangement'). Special conjugating individuals of the form of ova and spermatozoa are always formed." Metazoa reproduce by ova and spermatozoa. These reproductive products originate by a process of unequal fission from their parent, and may be produced by one or different individuals. When they are both produced by the same individual that individual is said to be *hermaphrodite.* When they are produced by different individuals, that parent giving rise to the egg is called *female* and that producing sperm cells or spermatozoa is called the *male,* and the individuals are said to be unisexual and the species dicœcious. In certain forms, probably under given conditions of food or temperature, the ova may develop without being fertilized by a sperm cell, the process being called parthenogenesis (q.v.). Reproduction by ova and spermatozoa is called sexual reproduction, and that by parthenogenesis asexual reproduction. Consult Bourne, *The Cœlomate Metazoa* (New York, 1901). See Classification of Animals.

MET'CALF, Willard Leroy (1858–). An American landscape painter. He was born in Lowell, Mass., and was at first apprenticed to a wood engraver. He studied painting under George L. Brown (1876–77), at the Boston Art School, and in Paris (1883) under Boulanger and Lefebvre. On his return to the United States he established himself in New York. Metcalf came to be recognized as one of the foremost American landscape painters of his day. He was elected a member of the National Institute of Arts and Letters, became one of the "Ten American Painters," and received many medals and prizes. His art is characterized by a delicate restraint and a fine feeling for values and tone. His landscapes have a lyric quality, and though seldom brilliant in execution, are nevertheless satisfying in their quiet appeal. He is represented by "May Pastoral" in the Boston Museum of Fine Arts; "The Family of Birches," National Gallery, Washington; "Twin Birches," Pennsylvania Academy of Fine Arts, Philadelphia; "May Night," Corcoran Gallery, Washington; "Icebound," Art Institute, Chicago; "On the River," Cincinnati Museum; "The Prelude," Worcester Museum; "Unfolding Buds," Detroit Museum.

METCALF, William (1838–1909). An American steel manufacturer. Born at Pittsburgh, Pa., he graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1858. In 1860–65 he had charge of the manufacture of the heavy Rodman and Dahlgren guns at Fort Pitt foundry, Pittsburgh, where most of the heavy artillery used by the Federal government during the Civil War was made. After 1868 he was engaged continuously in steel manufacturing, and in 1897 he organized the Braeburn Steel Company, of which he was the head until his death. He is credited with having made the first crucible steel in America. In 1881 he served as president of the American Institute of Mining Engineers and in 1893 he held the presidency of the American Society of Civil Engineers. He published *Steel—A Manual for Steel-Users* (1896).

METCALFE, Charles Theophilus, Baron (1785–1846). A British statesman, born in Calcutta, India. At an early age he was sent to England, where he was educated in a preparatory school at Bromley, and then at Eton. After holding various other positions he became a member of the Supreme Council of India in 1827, and from 1835 to 1836 was provisional Governor-General. During his short term of office he made certain the freedom of the Indian press. He was next made Lieutenant Governor of the Northwest Provinces, but resigned in 1838 and returned to England. The next year he was sent out as Governor of Jamaica, where he succeeded in bringing about better relations between the planters and the emancipated blacks. In 1842 he returned to England, and the next year was made Governor-General of Canada, where he soon came into conflict with the Executive Council and the Representative Assembly. This Council (or cabinet) had been elected to carry into effect the principles of responsible or parliamentary government. In consequence of his refusal to admit their right to be consulted about official appointments—a cardinal feature of the new system—all the members of the Council save one resigned, and for some time he was without a full Council. His refusal occasioned a prolonged and bitter controversy between the Reform and Conservative leaders. The books and pamphlets published for and against him and his attitude were notably strong and brilliant. In the election of November, 1844, the government received a small majority, and

he was able to fill the vacancies with men of his own views. In 1845 he was created Baron Metcalfe of Fern Hill, but in the same year an incurable disease forced him to return to England, where he died. Metcalfe, who had many admirable personal qualities, had been trained in a political school ill adapted to the demands of Canadian politics. In India and Jamaica his point of view had been that of a benevolent autocrat. He lacked both the temper and the knowledge necessary to apply to a vigorous democracy a principle newly vindicated by long and severe party struggle. Consult Sir J. W. Kaye, *Life and Correspondence of Charles, Lord Metcalfe* (rev. ed., London, 1858).

METCALFE, Frederick (1815–85). An English scholar and educator. He graduated at St. John's College, Cambridge, in 1838, and was elected fellow of Lincoln College, Oxford. In 1848 he became head master of Brighton College, and then he returned to Lincoln College, where he became bursar in 1849, subrector in 1851, and Greek lecturer in 1853. In 1844 he published a translation of Prof. W. A. Bekker's *Gallus*, with notes and excursus, considered of great historical value (2d ed., 1853). In 1845 followed his translation of Bekker's *Charicles*, a story similarly illustrative of private life among the ancient Greeks, also with notes and excursus. He published: *The Oxonian in Norway* (1856); *History of German Literature* (1858); *The Oxonian in Iceland* (1861); *The Englishman and the Scandinavian* (1880).

METCALFE, Samuel L. (1798–1856). An American physician and scientist. He was born near Winchester, Va., graduated M.D. at Transylvania University in 1823, practiced in New Albany, Ind., and in 1831 went to England. Returning to the United States, he made a geological trip through eastern Tennessee, North Carolina, and Virginia, and then settled in New York City, where he devoted himself to scientific work and contributed to the *Knickerbocker Magazine* over the initial M. In 1835 he again visited England. He is the author of *Narratives of Indian Warfare in the West* (1821); *A New Theory of Terrestrial Magnetism* (1833); *Caloric: Its Mechanical, Chemical, and Vital Agencies in the Phenomena of Nature* (2 vols., 1843; 2d ed., 1859).

METCHNIKOFF, mĕch'nĭ-kôf, Elie (Iliya) (1845–1916). A biologist, born in the Province of Kharkov, Russia, May 15, 1845. He was educated at Kharkov and afterward studied at Giessen, at Göttingen, and at Munich. He was appointed to the chair of zoölogy at Odessa in 1870, but resigned in 1882 to devote himself to private researches. He traveled extensively, especially through the northern Balkan kingdoms and the Volga steppe. In 1884, as the result of work on sponges and polyps, he published an epoch-making memoir on the intracellular digestion of invertebrates, *Untersuchungen über die intracelluläre Verdauung bei wirbellosen Thieren* (1883). He found that the individual cells of sponges took in solid particles of food and digested them in order to provide material for the growth of the young; and he saw the amœba-like eggs of a polyp (*Tubularia*) eat and digest the neighboring follicular cells. He also established the fact that certain wandering amœboid cells attack, ingest, or absorb parts of the body which become either useless or septic and thus harmful to the organism, and even hard objects, as also microbes or disease germs and the bacteria which have entered a wound. He called these microbe eaters "phagocytes" (q.v.). (*Ueber die Beziehung der Phagocyten zu Milzbrandbacillen*, 1884.) He boldly (1884) threw out the remarkable theory (phagocytosis) that inflammation in the vertebrates is due to the struggle between the white or amœboid corpuscles of the blood and the disease germs within it. This theory, in the hands of Sir Almroth Wright (q.v.) and others, led to vaccinotherapy (q.v.). Metchnikoff went to Paris, becoming a French citizen, and was appointed chef de service in the Pasteur Institute in 1892, and later became subdirector, under Roux. In 1895 he demonstrated that bacteriolysis (Pfeiffer's phenomenon) can take place *in vitro*. (See Pfeiffer, Richard.) He paid special attention to the microscopy of syphilis (with Roux and others) and proved that the higher apes can be inoculated with this disease. Attributing many ailments of man and especially the decadence of old age to intestinal putrefaction, he made experiments with the intestinal flora and published *La vieillesse* (1904). He based his theory upon his observation of the therapeutic value of lactic ferments (*Bacillus bulgaricus*), not only as a preventive of, but also as a remedy in, intestinal putrefaction and autointoxication, thus bringing bacteriology to the assistance of therapeutics. In this connection he wrote *Quelques remarques sur le lait aigri* (1906). Later he took up the study of typhoid fever. Metchnikoff demonstrated the value of, and the close relation between, studies in the development of the lower animals and physiological and medical studies and practice. In 1908 he was awarded, with Paul Ehrlich, the Nobel prize for medicine. His chief writings, besides those mentioned, include: *Leçons sur la pathologie comparée de l'inflammation* (1892; Eng. trans., *Lectures on the Comparative Pathology of Inflammation*, London, 1893); *L'Immunité dans les maladies infectieuses* (1901; Eng. trans., *Immunity in Infective Diseases*, New York, 1905); *Etude sur la nature humaine: essai de philosophie optimiste* (1903). Three of his lectures were published in English as *The New Hygiene* (Chicago, 1907); and of his *Essais optimistes*, collected in 1907, two have appeared in translation as *The Nature of Man* (New York, 1903, 1908, 1910) and *The Prolongation of Life* (New York, 1908, 1910). Many of his essays which have not been included in this list appeared in *Annales de l'Institut Pasteur* (Paris). He also edited with Sacquépée and others *Médicaments microbiens, etc.* (1909). Consult E. E. Slosson, *Major Prophets of Today* (Boston, 1914).

METEL'LUS. The name of a Roman family of the plebeian gens Cæcilia, which rose to be one of the first families of the Roman nobility. 1. Lucius Cæcilius Metellus, consul in 251 B.C., victor, at Panormus, over Hasdrubal, 1 (q.v.). A tradition, questioned now, said that, in 241, when the temple of Vesta was burned, he brought out the Palladium safely, though he was himself blinded by the flames. Consult J. B. Mayor on Juvenal, 3, 139.—2. One of the most distinguished members of the family was Quintus Cæcilius Metellus Macedonicus, who received his surname from his victory over Andriscus, a claimant to the throne of Macedonia (148 B.C.). His life was considered by ancient writers an example of the greatest felicity. He died 115 B.C.—3. Quintus Cæ-

CILIUS METELLUS NUMIDICUS twice defeated Jugurtha in Numidia (108 B.C.), but was superseded in his command by Marius. When Saturninus caused a law to be passed requiring all senators to swear within five days to uphold his agrarian law, Metellus refused and went to Asia into exile. He returned later and died in Rome (c.91 B.C.). He was celebrated for his integrity. 4. His son, QUINTUS CÆCILIUS METELLUS, surnamed PIUS for his efforts to effect the recall of his father from exile, joined Sulla in 83 B.C., but sought to moderate the severity of his proscriptions. He fought with success for Sulla against Marius and served acceptably in Spain. He, too, bore a distinguished character for virtue.—5. QUINTUS CÆCILIUS METELLUS CRETICUS conquered Crete and reduced it to a Roman province (67 B.C.).—6. QUINTUS CÆCILIUS METELLUS PIUS SCIPIO, sometimes called QUINTUS SCIPIO and sometimes SCIPIO METELLUS, was a son of Publius Cornelius Scipio, who was adopted by one of the Metelli and became the father-in-law of Pompey (52 B.C.) and his zealous partisan. He commanded under him at Pharsalus, maintained war on his behalf for some time in Africa, and after the battle of Thapsus (46 B.C.) died by his own hand. Consult: M. Wende, *De Cæciliis Metellis* (Bonn, 1875); the article "Cæcilius," by F. Münzer, in Pauly-Wissowa, *Real-Encyclopädie der klassischen Altertumswissenschaft*, vol. iii (Stuttgart, 1897); and the article "Cæcilius" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

METEM'PSYCHO'SIS (Lat., from Gk. *μετεμψύχωσις*, from *μετεμψυχοῦν*, *metempsychoun*, to make the soul pass from one body to another, from *μέτα*, *meta*, over + *ἐμψυχοῦν*, *empsychoun*, to animate, from *ἔμψυχος*, *empsychos*, animate, from *ἐν*, *en*, in + *ψυχή*, *psychē*, soul). Transmigration of souls, or, more accurately, the reincorporation of a soul. In a crude form this is a frequent belief of primitive forms of religion, and is not a religious but a philosophical opinion. That is to say, it is not believed that any religious factors, such as the state of the soul or the will of the deity, decide the soul's fate, but that every soul necessarily finds another habitation after death. Dreams showed that souls might leave their bodies and travel to distant places, and also that souls of the dead still lived. Moreover, if men had souls, so had animals and even trees, for they also possessed life; and the next step was a belief in the transference of souls from one to another. This helped to answer the questions whence came souls at birth and whither do they go after death? As any soul during a man's life may enter at will the body of a beast, so after death the soul of the departed may find shelter either in a man's body or in the frame of a beast. Some savages believe that at the instant when one dies one's soul enters a new body. Others believe that the spirit can remain for some time disembodied, and that it seeks reincarnation, not from necessity, but for pleasure. The Australians believe that souls lurk beside the paths and select their future mothers from the women who pass. In some of the tribes of American Indians resemblances of children to persons recently dead, or even to animals, are used as proofs of the identity of their souls. Sometimes this animistic belief appears sporadically in a much more developed environment and is evidently a reversion. Thus, in the midst of the nature gods of the Teutons we find once in legend and often in folklore a reversion to the belief that men are often liable to be reborn on earth either in human or in animal bodies. Sometimes no rebirth is necessary, but the soul leaps from one body and drives out the soul of the animal whose body it enters. All these beliefs, more or less confused and vague, but persistent through various stages of social development, are found in Europe, India, Asia, and America, while in Africa and in Polynesia, where very little social change has taken place, it may be said to be in its crudest form the usual faith of the people.

While common in primitive, animistic religions, metempsychosis has also been a part of certain advanced religious systems. It was formerly supposed, on the basis of statements of Herodotus, to be found in Egypt, but a more complete knowledge of the Egyptian religion fails to reveal it. The Indian and Greek religions took it up into philosophical systems. Of these the Hindu makes far the most of it. In the earliest Vedic hymns there is no mention of it. In the Upanishads it appears, perhaps borrowed from the aboriginal inhabitants of India. From then on it became a part of the moral structure of Hinduism, as the great means by which Karma (q.v.) operates. It is the way of final salvation. The soul, which is blind and ignorant, will be reborn again and again until at last, after innumerable incarnations, it shall arrive at truth. Then it will know itself to be the absolute, Karma will cease, and rebirth will be ended. It is also used to punish evil and reward good. The soul is doomed to expiate by future rebirths in low forms of life the sins committed in this life. On the other hand, a highly moral life results in one being reborn in a higher caste, as an aristocrat, a king, or a priest, or even as a godling. In this system the length of the series of rebirths depends wholly upon the individual, who works out his own salvation by his own acts. As Buddhism denies the existence of a soul, metempsychosis in India, strictly speaking, is confined to Hinduism. But Buddhism had an analogous belief in the transmigration of character entities, also conditioned by acts, ending in Nirvana, unconscious existence or extinction of personality resulting from extinction of desire and volition. The system was one of transmigration, without any souls to transmigrate. The new personality was the result of the Karma of the old, and all the moral values of the Hindu doctrine were preserved. In Mahayana, or Northern Buddhism, much stress is laid upon the incarnation of the Bodhisattvas, or future Buddhas. The first known appearance of the belief in Greece is in the system of Pythagoras. Herodotus says that he borrowed it from the Egyptians (ii, 123), but there is no present evidence that the Egyptians had such a belief. It has often been surmised that in his travels Pythagoras came in contact with the Indian belief, but there is no need for such a supposition. Indirect influence of Indian thought would not be impossible, but with the widespread ideas of the soul in primitive religion it is not necessary to go far from Greece itself in search of the suggestions on which he built. The belief may be connected with Orphic conceptions of the guilt of the soul. Pythagoras held that the soul was a being cast down to earth because of sin and imprisoned in various bodies till, by means partly magical and partly

ethical, it has worked out its purification, when it returns to its former happy abode. Tradition ascribes to Pythagoras the claim to remember former states. Plato, in the *Republic*, the *Phædrus*, and the *Phædo*, has the same idea of the soul as a fallen spirit, which must work out its own redemption by three times, in three millenniums, making choice of the philosophic life, after which it ascends to its home with the gods. Whether this picture presents Plato's serious belief, or is used as poetic allegory, it is difficult to say. In Neoplatonism, however, it is a part of the philosophical system, and, as in the Hindu system, the soul is a part of the absolute itself. Some of the Gnostics (q.v.) were said to hold to transmigration of souls. The Christian Church almost universally repudiated it, even Origen, who believed in the preëxistence of the soul, rejecting it. It has appeared in the Jewish Cabbala, in the Shiite sect of the Moslems, in the religion of the Druses, and in Babism. In Europe it has occurred sporadically. Leibnitz held a theory akin to the Buddhist Karma, and Lessing consciously adopted metempsychosis. In the present day theosophy is attempting to introduce it into the West, along with other elements of Indian thought. See KARMA.

Bibliography. Rhys Davids, Hibbert Lectures, 1881 (see Appendix V for Origen's opinion) (New York, 1882); Zeller, *Grundriss der Geschichte der griechischen Philosophie* (4th ed., Leipzig, 1893); Hopkins, *Religions of India* (Boston, 1895); Wiedermann, *The Ancient Egyptian Doctrine of the Immortality of the Soul* (London, 1895); F. B. Jevons, *Introduction to the History of Religion* (ib., 1896); Alfred Berthalet, *Transmigration of Souls*, translated by H. C. Chaytor (New York, 1909); G. F. Moore, *Metempsychosis* (Cambridge, Mass., 1914). See HINDUISM.

METENTERON, mĕt-ĕn'tĕr-ŏn. See ALIMENTARY SYSTEM.

ME'TEOR (OF. *meteore*, Fr. *météore*, from Gk. *μετέωρον*, *meteōron*, meteor, from *μετέωρος*, *meteōros*, on high, from *μετά*, *meta*, beyond + *ἀείρειν*, *aeirein*, to lift), FIREBALL, BOLIDE, or SHOOTING STAR. A term applied to those swift-moving points of light which flash out suddenly and dart across the sky along paths which are usually straight and often many miles in length. At one time it was believed that their luminosity was excited by terrestrial magnetism, but it is now generally accepted that they are small solid bodies which enter our atmosphere from outside space and are raised to incandescence by the friction caused by their rapid motion through the air. They frequently rival Venus, and even the moon, in brightness. It is difficult to determine their exact size, but, from the light which they emit, it has been estimated that ordinary shooting stars are extremely small, weighing only a few ounces at most, while Humboldt was of opinion that the diameters of the largest fireballs varied from 500 to 2800 feet. In many cases a long comet-like train of light is left behind. One or two instances are on record where the train of a fireball continued shining for half an hour after the body had disappeared. The cause of this remarkable phenomenon is still obscure, though Professor Trowbridge, of Columbia University, has advanced the interesting theory that it is due to the phosphorescence of the rarefied air along the path of the meteor. The heights at which meteors appear average about 75 miles, and their velocities range from 10 to 40 miles per second. In a narrow sense meteors are those shooting stars which flash into view without detonation or explosion and appear to be completely consumed during their flight through the atmosphere; they are sometimes called bolides. As thus characterized they form a class of bodies distinct from the meteorites (see METEORITE).

One of the most remarkable facts connected with shooting stars is that certain appearances of them are *periodic*. On most occasions they are *sporadic*, i.e., they appear singly, and traverse the sky in all directions. At other times they appear in swarms of thousands, and these swarms are periodic, or recur on the same days of the year. Attention was first directed to this fact on occasion of the prodigious swarm which appeared in North America between Nov. 12 and 13, 1833, described by Professor Olmsted, of New Haven. The stars fell on this occasion like flakes of snow, to the number, as was estimated, of 240,000, in the space of nine hours, varying in size from a moving point or phosphorescent line to globes of the moon's diameter. The most important observation made was that they all appeared to proceed from the same quarter of the heavens, the vicinity, viz., of the star γ, in the constellation Leo; and although that star had changed greatly its height and direction during the time that the phenomenon lasted, they continued to issue from the same point. It was afterward computed by Encke that this point was the very point towards which the earth was moving in her orbit at the time. Attention being directed to recorded appearances of the same kind, it was observed with surprise that several of the most remarkable had occurred on the same day of November, especially that seen by Humboldt and Bonpland at Cumana in 1799 and by other observers over a great extent of the earth. The November stream was again observed in the United States in 1834, between November 13 and 14, though less intense.

Olmsted showed that the emanation of the shower of meteors from a fixed point, or "radiant," as it is called, could be explained by supposing them to have been derived from a cloud of particles moving round the sun in an elliptic orbit which intersects that of the earth at the point at which the latter finds itself in November. Those which are rendered visible when they strike our atmosphere travel along lines which are practically parallel, and the apparent divergence of their paths is due to the fact that what the eye notes is the projection of the true path on the face of the sky. The variable character of the shower at its annual appearances was later elucidated by Olbers, who substituted for Olmsted's cosmical cloud a closed ring of irregularly distributed particles revolving round the sun in such a way that the densest part of the swarm crosses the earth's orbit once in 33 or 34 years, and he even went so far as to predict that the next notable display would occur in 1867. In 1864 Professor Newton, of Yale, took up the investigation of the recurrence of the November meteors, or Leonids, as they are now called from the position of their radiant, and he concluded that there were five possible periods for the meteor ring—33¼ years, 376 days, 354 days, 188 days, and 177 days. In consequence, he was able to predict the occurrence of another striking display of

meteors on Nov. 13–14, 1866, a prediction which was fulfilled with remarkable punctuality. His work was supplemented by the English astronomer Adams, who showed that, of the periods suggested by Newton, the 33¼-year period was the only one consistent with known facts.

There are many other periodic showers. One of particular interest is the shower of Perseids, which occurs between August 10 and 12 and has its radiant in the constellation Perseus. It is noticed in ancient legends as the "fiery tears" of St. Lawrence, whose festival falls on August 10. The principal meteor showers, with the dates of their occurrence, are given below:

Quadrantids	January 2–3
Lyrids	April 20–22
ηAquariids	May 1–6
δAquariids	July 28
Perseids	August 10–12
Orionids	October 18–20
Leonids	November 14–16
Andromedids	November 17–23
Geminids	December 10–12

It is now generally accepted that the periodic meteors are the débris of comets which have been captured by the members of the solar system. It is supposed that the matter composing the tail has been driven off into space, while that of the nucleus has been scattered along the orbit by the disintegrating forces to which it has been subjected. In some cases this disintegration is apparently complete, while in others it is still going on. This view was first definitely propounded by Schiaparelli in 1866, though the division of Biela's comet (q.v.) into two parts had led Kirkwood to practically the same conclusion in 1861. Schiaparelli drew attention to the fact that the Perseids move in the same orbit as Tuttle's comet of 1862, while early in 1867 Leverrier identified the orbit of the Leonids with that of Tempel's comet of 1866 and even assigned 126 A.D. as the year in which this comet was brought into its present orbit by the attraction of Uranus, and Weiss proved that the Andromedid meteors of November 28 were all that remained of Biela's lost comet, which was last seen in 1852. In all about 80 meteor streams have been assigned more or less certainly to known cometary orbits.

METEOR'IC DUST. See DUST.

METEORIC HYPOTHESIS. See COSMOGONY.

METEORIC STONE. See METEORITE.

ME'TEORITE, AËROLITE, METEORIC STONE, URANOLITE, or SIDERITE. A solid body reaching the earth from unknown points beyond the earth's atmosphere. When seen at night meteorites usually consist of a luminous head or fireball, followed by a bright train of incandescent matter. Sometimes there are visible explosions, and even loud detonations are occasionally heard. In the daytime the light of both fireball and train is largely lost against the sky background; it is said, however, that visible clouds at all times replace the luminous train.

There are numerous records and stories in all ages and countries of the fall of stones from the sky, but until comparatively recent times they were treated by scientific men as instances of popular credulity and superstition. It was not till the beginning of the nineteenth century that the fact was established beyond a doubt. According to Livy, a shower of stones fell on the Alban mount, not far from Rome, about 654 B.C. The fall of a great stone at Ægospotami, about 467 B.C., is recorded in the *Parian Chronicle* (see ARUNDEL MARBLES) and by Plutarch and Pliny. It was still shown in the days of Pliny (died 79 A.D.), who describes it as the size of a wagon and of a burned color. In the year 1492 A.D. a ponderous stone weighing 260 pounds fell from the sky near the village of Ensisheim in Alsace; part of it is still to be seen in the village church. An extraordinary shower of stones fell near Laigle in Normandy, on April 26, 1803. The celebrated French physicist, M. Biot, was deputed by the government to repair to the spot and collect the authentic facts, and since the date of his report the reality of such occurrences has no longer been questioned. Nearly all the inhabitants of a large district had seen the cloud, heard the noises, and observed the stones fall. Within an elliptical area of 7 miles by 3 the number of stones that had fallen could not be less than two or three thousand; the largest were 17 pounds in weight. These are only a few out of hundreds of instances on record.

As is natural with objects of such mysterious origin, meteoric stones have always been regarded with religious veneration. At Emesa in Syria the sun was worshiped under the form of a black stone, reported to have fallen from heaven. The holy Kaaba of Mecca and the great stone of the pyramid of Cholula in Mexico both have a similar history. The existence of such bodies once admitted led to assigning a meteoric character to strange ferruginous masses found in different countries, which had no history or were only adverted to in vague tradition. Of this kind is the immense mass seen by Pallas in Siberia, now in the Imperial Museum in St. Petersburg. The largest aërolite known is probably the immense mass called Ahnighito (the Tent), which was discovered by Lieutenant Peary, in 1894, near Melville Bay, 30 miles east of Cape York in northern Greenland. With it were two smaller ones, known respectively as "the Woman" and "the Dog." The three masses had long been used by the Eskimo as a source of iron for the manufacture of knives and other weapons, and were supposed to have been hurled from the heavens by the evil spirits. The dimensions of Ahnighito are as follows: length, 11½ feet; width, 7½ feet; thickness, 3½ feet. Its weight is 37½ tons. It was brought to New York with its two companions in 1897, and since 1904 has rested under the entrance arch of the Museum of Natural History. Its nearest rival is Bacubirito, a huge mass discovered half buried in the ground near the old mining town of Bacubirito in the State of Sinaloa, Mexico. Its weight is said to be 51 tons, but as the mass has never been raised from the place where it originally fell, no correct measurements of its dimensions have been possible, and its weight has doubtless been overestimated.

One constant characteristic of meteoric stones is the fused black crust, like varnish, with which the surface is coated. This coat is very thin and is separated from the inner mass by a sharply defined line. It is due to the action of heat generated by the rapid motion of the meteor through the atmosphere. The specific gravity of meteoric stones ranges from two to seven or eight times that of water. Chemically they have the same composition as our earth, the chief constituent being nickel iron, which

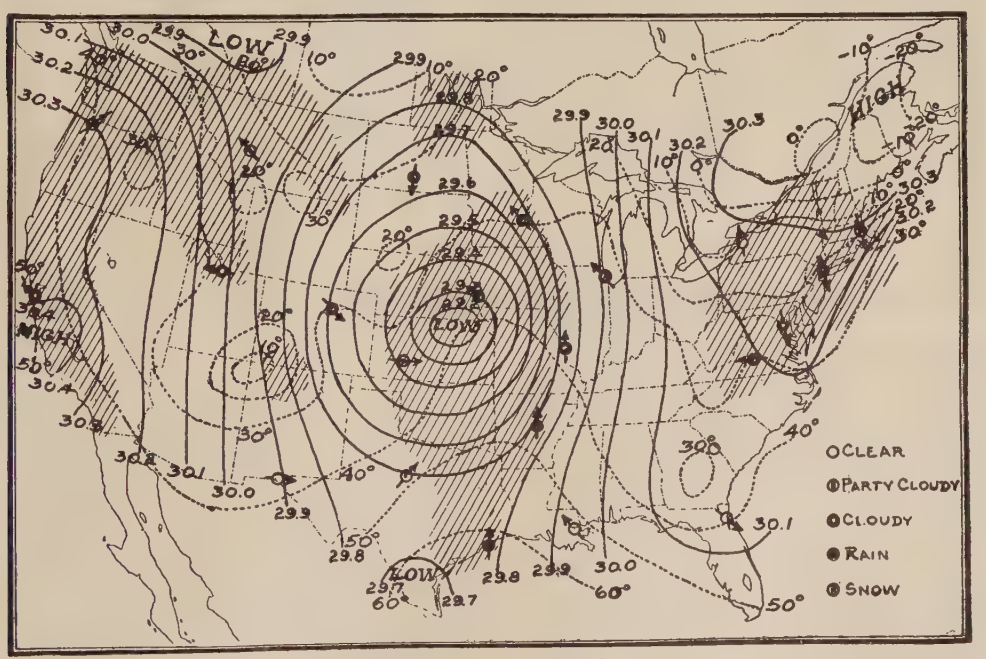
occurs in variable proportions. No new element has been found in them, and only about 30 of those already known. But these old elements are often combined in the form of minerals not yet known on the earth.

Besides these solid masses of considerable size numerous instances are on record of showers of meteoric dust over large tracts of land. See DUST.

It remains to notice briefly the various opinions that have been advanced as to the origin of meteorites. It might be supposed that they are simply meteors which are so large that they are not completely consumed in their rapid passage through the atmosphere, but they differ from meteors in one important respect. They are invariably sporadic; no meteorite is known with certainty to have been a member of any meteoric shower, though there are at least two instances on record where a meteorite fell during such a shower. The hypotheses that have been formed in answer to the question, Whence come those solid masses that fall upon the earth? are of two kinds, some ascribing to them a telluric origin and others making them alien to the earth. Of the first kind is the conjecture that they may be stones ejected from terrestrial volcanoes, revolving for a time along with the earth and at last returning to it. It is difficult, however, to imagine that the velocity requisite to carry them beyond the limits of the earth's atmosphere and prevent their immediate return could have been imparted by any terrestrial eruption, for there is no reason to suppose that the eruptions of the past have differed in violence to any great degree from those of the meteoric stones the original velocity of projection must be no less than 40 or 50 times that of a cannon ball, which makes the hypothesis improbable. Another and perhaps more plausible hypothesis is that which considers them to be minute members of the solar system, similar to the planetoids, which are captured from time to time by the earth. Consult: S. Mennier, "Les météorites," in *Encyclopédie chimique*, vol. ii (Paris, 1884); E. W. Cohen, *Meteoritenkunde* (Stuttgart, 1894–1905); Lazarus Fletcher, *Introduction to the Study of Meteorites* (London, 1904).

ME'TEOROLOG'ICAL SOCIETY, THE ROYAL. A learned association, established in 1850, incorporated in 1866, and allowed to adopt the prefix "Royal" in 1883. The society has its headquarters in London. The objects are the promotion of meteorology in all its branches and the recording of data and theories relating to the subject. Its membership consists of fellows and honorary members, the latter being foreigners of distinction. The publication of the society is the *Quarterly Journal*. During the session 1913–14, 18 papers were read and were afterward printed in the *Quarterly Journal*. The society meets on the third Wednesday in each month from November to April, and the annual meeting takes place in January. The president in 1914 was C. J. P. Carl, and the secretaries Francis Campbell Bayard and W. F. Caborne.

ME'TEOROL'OGY (Gk. μετεωρολογία, *meteōrologia*, treatise on celestial phenomena, from μετεωρολόγος, *meteōrologos*, discussing celestial phenomena, from μετέωρον, *meteōron*, meteor + λέγειν, *legein*, to say). The study of the atmosphere and its phenomena. Efforts are being made by every civilized nation to apply to the benefit of mankind the knowledge we possess of meteorology, especially to foretell the winds and weather from day to day and the general

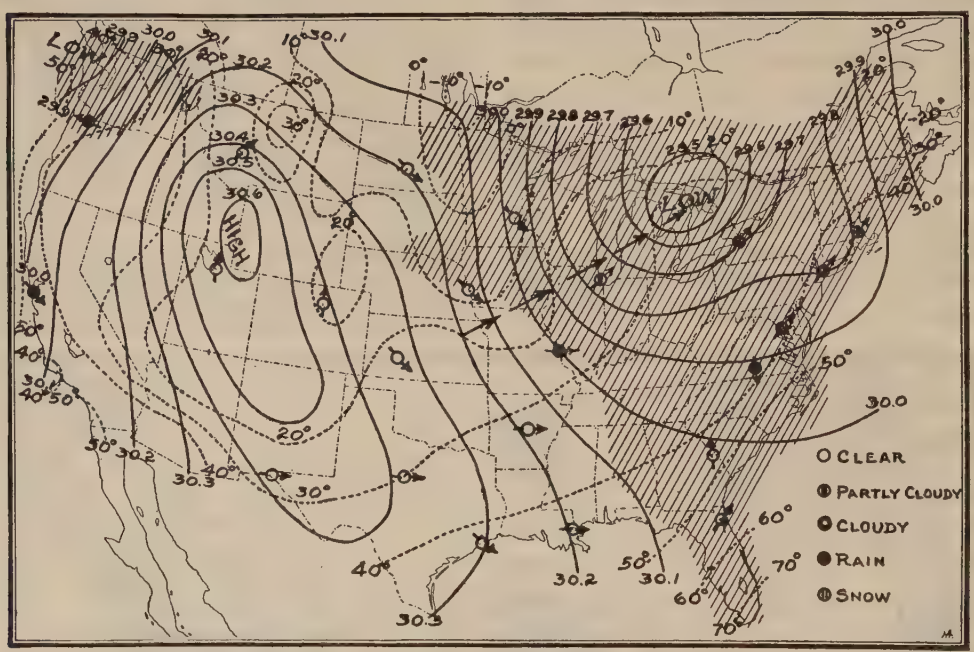


WEATHER MAP, FEB. 5, 1915, 8 A.M.

present day. In seeking a source beyond the earth the moon readily presents itself. Olbers was the first to investigate (1795) the initial velocity necessary to bring to the earth masses projected from the moon. He showed that to account for the actual measured velocity of

character of the seasons from season to season. About 50 official governmental weather bureaus receive reports from their stations by telegraph daily, compile weather maps, issue forecasts, and publish weekly, monthly, or annual climatological summaries, together with frequent special meteorological memoirs. Among the most prominent of these, on account of the extent of their territory and the value of their publications, are those of Austria-Hungary, Great Britain, France, Germany, Italy, Russia, India, Argentine Republic, Canada, and the United States. The total annual expenditure by all government services on meteorological work is not less than $3,000,000, to which should be added an equal sum to represent the great amount of work that is done without pay by voluntary observers. Several private meteorological establishments have been founded by wealthy lovers of science, most prominent among which are those

In addition to its material progress in observers and apparatus, theoretical meteorology has especially profited by the labors of eminent physicists. Those who have, since 1850, contributed most to our knowledge of the mechanics and physics of the atmosphere may be enumerated as follows: Adolph Erman, who published in 1868 a memoir on the distribution of winds and pressure over the globe; J. C. Redfield, who showed the mechanism of extended hurricanes; James P. Espy, who published several reports and a volume on the philosophy of storms, explaining in general how atmospheric moisture, by its condensation into cloud and rain, disturbs the equilibrium of the atmosphere and produces both local and general storms; William Ferrel, who published numerous papers developing the laws of the motions of the earth's atmosphere and its general and local phenomena as resulting from the rotation of the earth on its axis,



WEATHER MAP, FEB. 6, 1915, 8 A.M.

of Vallot, on Mont Blanc; A. Lawrence Rotch at Blue Hill, near Boston (since his death (1912) the property of Harvard University); L. Teisserenc de Bort at Trappes, near Paris. There are also numerous municipal observatories, prominent among which are that of the New York City Central Park, Dr. Daniel Draper, director, and those of Montsouris and the Tour St. Jacques in Paris, of which Dr. J. Joubert is director. Observatories are also maintained by special associations, such as those on the Santis, Austria, the Jesuit observatories of St. Hélier, Havana, Zikawei, and Manila. Special mention should be made of Symons's British Rainfall System, to the development of which his life was devoted and the perpetuity of which is now assured by the terms of his will. Over 300 stations are maintained in the British Isles. Organized systems of rainfall stations have also been maintained in Mauritius, Jamaica, Barbados, Antigua, and St. Kitts.

the evaporation and condensation of aqueous vapor, and the general influence of the solar heat; Lord Kelvin, who first gave the laws of thermal convective equilibrium for dry air; Peslin, who gave the laws of thermal equilibrium for moist air; Von Helmholtz, Willy Wien, Oberbeck, Guldberg and Mohn, Margules, Diro Kitao, Rayleigh, Pockels, Sprung, V. Bjerknes, and J. W. Sandström have made important contributions to the hydrodynamic problems of the atmosphere; Prof. H. Hertz, W. von Bezold, and Marcel Brillouin have contributed greatly to the perfection of our knowledge of the thermodynamic problems. Noteworthy contributions in this field include that of Pockels, on the theory of the formation of rain in slowly ascending currents of moist air (see *Wiedemann's Annalen*, January, 1901); Prof. F. H. Bigelow's tables in his reports on international cloud work (Washington, 1900); his report on barometry (Washington, 1902); Neuhoff's memoir on adiabatic changes in the atmosphere (Ber-

lin, 1900); Berson and Assmann's *Scientific Balloon Ascensions* (3 vols., 4to, Berlin, 1900); Bjerknes and Sandström, *Dynamic Meteorology and Hydrology* (2 vols., 4to, so far, Washington, D. C., 1910, 1913).

Our knowledge of meteorological conditions has been obtained for the most part by observation of the clouds or by stations on mountain tops. More recently it has been found desirable to study conditions at considerable altitudes above stations and places. In order to obtain better data for the lower atmosphere, at least partially to meet the needs of the case, Americans and Europeans have developed the art of obtaining meteorographic records by sending up meteorographs on kites to heights of 1 or 2 miles; on the other hand, Europeans have given special attention to the development of the balloon and especially the small sounding balloon which can carry a meteorograph to an elevation of 7 or 15 miles above sea level, where man cannot live. The exposure of meteorological apparatus so that the records from different stations on the earth's surface and from vessels on the ocean and from kites or balloons in the atmosphere shall be comparable with each other offers many difficult problems, but the progress towards uniformity throughout the world has been appreciable during the past 40 years. Every first-class weather service now keeps close watch of the condition of its apparatus and the correctness of the methods in vogue at its stations. Although much remains to be done, yet the contrast between the condition of affairs in 1850 and that in 1915 is very great.

In some cases the larger portion of the funds and forces of a weather service is spent upon observations and climatological work, but in most cases the daily forecast work takes precedence, since that promises immediate results in saving life and property. In order to carry on this work properly numerous stations must be connected by telegraph with the central bureau, at which several simultaneous observations must be received daily from the observers, and weather charts must be promptly made out showing the isobars, isotherms, state of the wind and weather, moisture, and clouds over a large region of country. The accompanying charts, for February 5, 8 A.M., and February 6, 8 A.M., 1915, show the general character of such daily weather maps; they will easily be understood by studying the respective legends. On these charts the reader will see the development of a storm that began with an area of low pressure in Kansas and rapidly developed into the great storm centre shown on the second chart; the storm then passed northeastward over the Lake Region and the Gulf of St. Lawrence and was followed by an extensive area of clear cool weather on February 7. The movements and changes of storms and weather will undoubtedly be fully understood only in proportion as we have better knowledge of the facts and of the mechanical and physical laws that govern the atmosphere, but their approximate prediction from day to day is expected and demanded by reason of the many interests that depend upon the wind, temperature, and weather. At present such forecasts are generally based on the evident trend of events, as shown by comparing the two or three latest weather maps, and in part also on empirical rules or generalizations, based on the study of similar types of maps in preceding years; but in some cases also one may be guided in part by general physical principles that must apply to the case in hand. The generalizations relative to storm movements for the United States, i.e., the statistics of storms, have been presented in three memoirs by Prof. Elias Loomis and printed in the *Memoirs of the National Academy of Sciences*. These were supplemented in 1914 by E. A. Bowie in *Monthly Weather Review, Supplement No. 1*. Similar data for the Northern Hemisphere as a whole were published in 1893 in *Bulletin A* of the United States Weather Bureau; this compilation is mostly the work of Prof. E. B. Garriott and is based upon 10 years of daily maps (1878 to 1887), originally published in the *Bulletin of International Simultaneous Observations*. In this volume the paths of the storm centres are classified by different types and displayed on charts that show the frequency with which storm centres pass over each square of latitude and longitude.

Charts of storm paths for Europe, Asia, and Japan have been published by Germany, Russia, and Japan respectively, and monthly charts for the United States have been published regularly since January, 1873. By means of these charts one may, in a general way, anticipate the path and velocity of a storm centre when once it has appeared in any part of the Northern Hemisphere. In the Northern Hemisphere such centres move westward when they lie between the equator and the parallels of 25° or 30° N.; they then curve poleward and move northeastward with increasing rapidity towards the parallel of 60° or 70°. The variations from this general rule can best be understood by studying the charts of storm frequency. A similar rule holds good for the Southern Hemisphere, substituting only south for north. But little is known about the tracks of storms within the Arctic circle. The known region of greatest storm frequency extends in a narrow belt east and west from Lake Superior to Newfoundland and its prolongation eastward ends in the interior of northern Russia. The region of next greatest storm frequency covers the islands of Japan. The north polar region of cold air, whose tendency is to flow outward towards the equator, is inclosed within an oval curve extending from Luzon over Japan, southern Alaska, British Columbia, the region of the Great Lakes, Newfoundland, the Hebrides, northern Norway and Sweden, and ending in Siberia at lat. 60° and long. 90° east of Greenwich. South of this oval the prevailing winds are west and southwest; north of it they are north and east in the stormy season of the year.

The great whirls that we call general storms occur in connection with these polar and equatorial currents, but not necessarily between them. The whirls are explained as partially due to mechanical reactions between the northern and southern currents, but they are not merely hydrodynamic phenomena, since they have also an additional thermodynamic relationship which is quite as important. The warm, moist southerly winds are underrun by the colder and drier northerly winds. This enforced elevation of the southerly winds is accompanied by a corresponding expansion and cooling of the air that is thus elevated, and generally it is soon cooled to its dew point or below. This is followed by condensation of aqueous vapor and the formation of cloud, rain, hail, or snow with a great liberation of latent heat. Consequently

the cloudy region will be warmer, but especially will it have a much smaller specific gravity than before.

In very small storms, such as tornadoes, waterspouts, etc., this process gives rise to very rapid uprising currents, a very rapid whirl around the central axis, and a very low barometric pressure at the centre, but in extensive storms the vertical current is not so conspicuous, although the buoyancy of the central air tends very strongly to maintain the disturbance. The storm centre undoubtedly has a tendency to move towards the region in which the temperature and buoyancy are most disturbed; but as this region is always moving in advance, the storm centre will remain in the rear and its path will advance somewhat to the left of the direction of the greatest disturbance. But the uplifting of the lower moist air may be greatly intensified if the southerly winds on the eastern half of the storm area are being pushed up over high lands, or it may be almost wholly annulled if these winds must necessarily descend from the high lands to the ocean level. Therefore the relation of the storm's motion to the continents must be carefully worked out.

As regards weather prediction, it is evident at once that the descending winds and those that are coming from the north southward are being warmed up, and therefore in their presence the storm disappears and the weather clears away. For the Atlantic coast of North America rain is to be forecast only when a south and east wind prevails, and especially when it is blowing on the coast. The actual effect of mountains, plateaus, continents, and the underflow of cold air varies so much on every occasion that the best one can do in forecasting is to familiarize himself thoroughly with the illustrations and exceptions that appear on every daily weather map.

The atmosphere would be at rest on the earth's surface and whirl about with the globe were it not for the sun's heat. All the important meteorological phenomena may be considered as resulting from the interaction of the solar heat, the moisture in the air, the varying temperature, and the centrifugal reaction due to the rapid diurnal rotation of the earth on its axis. The solar radiation maintains the temperature of the equatorial regions. The cold air of the polar region is both by gravity and by centrifugal force driven towards the equator. Thus the general currents are maintained moving from the poles towards the tropics and return. They are most intense in the Northern Hemisphere in January, when the sun is farthest south or over the tropic of Capricorn, because at that time and subsequently the difference of temperature between the equator and the North Pole is greatest, and the reverse holds good in June, when the sun is north of the equator. The general circulation is greatly modified by the difference in temperature and moisture of the air over the land and the ocean, so that in summer time the tendency of the air to flow inward towards a continent or mountain is very decided. The general circulation is also greatly modified by the presence of snow, ice, mountains, plateaus, clouds, forest, etc. The winds, when once formed by differences of temperature and moisture, are themselves affected by the rotation of the earth. No matter in what direction they may be moving they are at once deflected from their polar path; in the Northern Hemisphere they turn to the right; in the Southern Hemisphere to the left. Therefore those flowing towards the equator become the northeast and southeast trade winds and those flowing towards the poles, or the upper return trade winds, become the westerly winds of the north and south temperate zones.

The differences in temperature between the continents and the ocean give rise to the so-called monsoon winds. The general centrifugal action of the winds produces a low pressure in the regions about which the winds rotate, viz., a low pressure in the Arctic and Antarctic regions; a low pressure on the left of the winds blowing around a storm centre and on the right-hand side of these same winds considered as blowing around an adjacent region of high pressure; a low pressure at the equator between the northeast and southeast trades. The reaction of the easterly winds near the equator and the westerly winds farther north also produces a similar area of high pressure between these two systems of wind corresponding to the high pressure under the tropics of Cancer and Capricorn.

A full exposition on these and other theorems by Prof. William Ferrel will be found in his *Treatise on the Winds* (New York, 1893). The results of later researches are presented in Prof. F. H. Bigelow's report on international cloud observations (Washington, 1900) and his report on barometry (Washington, 1902), but these are written for purely technical and mathematical readers. A general résumé of the laws of atmospheric motion is given in the appendix to Hann, *Lehrbuch der Meteorologie* (3d ed., Leipzig, 1914). An elementary presentation of the subject will be found in Davis, *Elementary Meteorology* (Boston, 1894); in Ward, *Practical Exercises in Elementary Meteorology* (Boston, 1899); Moore, *Descriptive Meteorology* (New York, 1910); and in Milham, *Meteorology* (New York, 1912). Consult Flammarion, *Thunder and Lightning* (Boston, 1906). For history of practical meteorology in the United States, see WEATHER BUREAU.

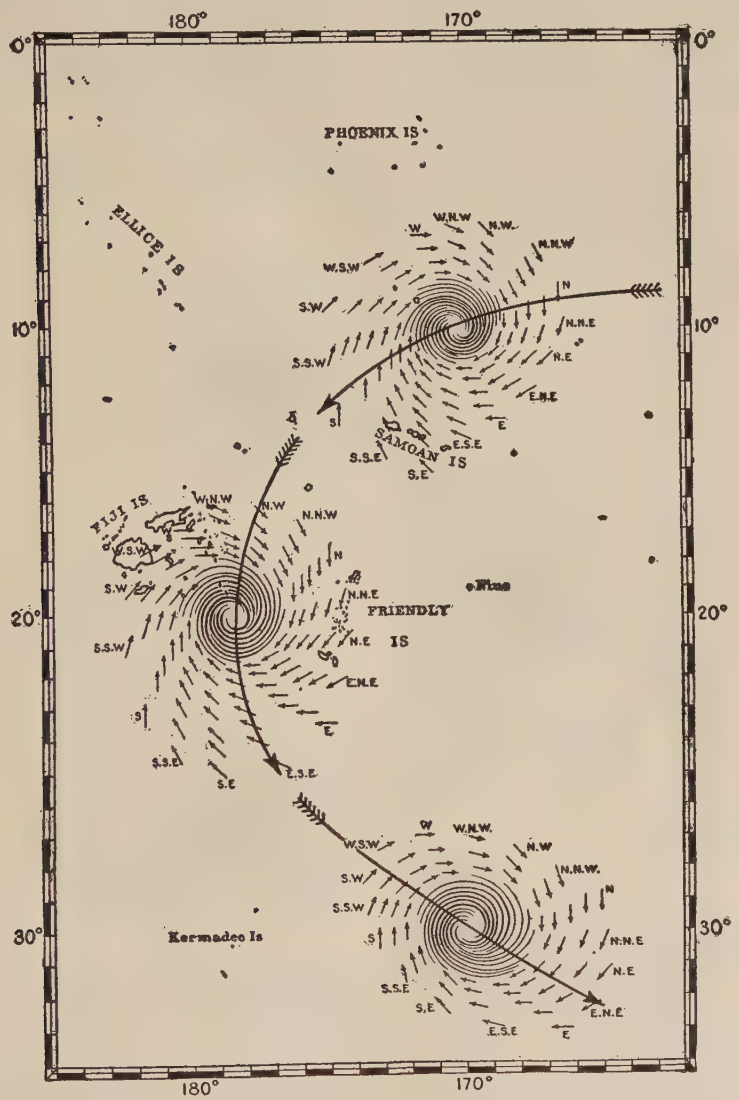
Some details as to the instruments used in meteorology will be found under the topics: ACTINOMETER; ANEMOMETER; BAROMETER; PYRHELIOMETER; NEPHOSCOPE; RAIN GAUGE; THERMOMETER. Some of the results of observation will be found treated under the topics: ATMOSPHERE; ATMOSPHERIC ELECTRICITY; AURORA BOREALIS; BLIZZARD; CLIMATE; CLOUD; DARK DAY; DEW; DOLDRUMS; DUST; EQUINOCTIAL STORM; FOG; FROST; HAIL; HALO; HUMIDITY; INDIAN SUMMER; ISOBAROMETRIC LINES; ISOTHERMAL LINES; LIGHTNING; MONSOON; POLARIZATION OF SKYLIGHT; SCINTILLATION; SIMOOM; SNOW; SNOW LINE; STORM; HEAT; TERRESTRIAL ELECTRICITY; TYPHOON; WEATHER; WHIRLWIND; WIND.

METEOROLOGY, MARINE. Information as to the kind of weather which may be expected at sea at different times and in different localities and a knowledge of the best means of avoiding or minimizing the effect of unfavorable conditions are of the utmost importance to the maritime world in order that ships may be able to navigate more safely and economically and with the greatest possible ease and comfort. The subject has attracted more or less attention for thousands of years, for storms on the water are greatly to be feared by all who traverse the sea in any except the very large vessels of recent times and are to be avoided if practicable

even by these. The first systematic and practical attempts to collect, consider, and publish definite, correct, and useful meteorological and oceanographic information were made by Lieutenant (afterward Commander) Matthew F. Maury (q.v.) of the United States navy; and the United States Naval Hydrographic Office, which Maury founded, to-day supplies to the mariner more information of this character than he can obtain from any other source, possibly from all other sources combined. The general subject of meteorology is so fully treated in the foregoing pages and elsewhere under its various branches (see references at the end of this article and the preceding) that only the general nautical features will be considered under this head.

Practical marine meteorology may be divided into a study of (*a*) air conditions, (*b*) air movements, (*c*) instruments used aboard ships for ascertaining air conditions and the methods of taking and recording observations and developing the results for use.

Air conditions include temperature, pressure, hygrometric state, and their results, such as freezing, rain, snow, hail, fog, mist, air movements, and calms. The tendency of air conditions at sea is the same as on land, but the results are somewhat different, owing to comparatively stable (i.e., slowly changing and through moderate ranges of temperature) water temperatures and the unobstructed sweep of air movements, while on land the temperature of the surface may change rapidly and the irregular character of its elevations greatly modifies the force and direction of air currents. Aside from air movements the most important results of air conditions are fog and thick weather of all kinds in which seeing is difficult. Thick fog is very serious and is always to be avoided if practicable. Freezing weather, in which the rigging becomes clogged with ice and



AVERAGE STORM TRACK IN SOUTHERN HEMISPHERE (SOUTH PACIFIC).

the sails cannot be handled, is becoming less important as the number of sailing ships is reduced. Calms, which bereft the sailing ship of its motive power, are a blessing to steamers by insuring smooth water.

Air movements include: (1) trade winds (q.v.) and other winds (see WIND) of a permanent or semipermanent character; (2) periodical winds such as monsoons (see MONSOON), land and sea breezes, etc.; (3) variable winds of moderate force; and (4) storms (see STORM). As regards sailing ships the first three kinds of winds may be regarded as beneficent, as they furnish the means for locomotion, and as regards steamers they are either unimportant or storms of wide and great severity have their birth in the tropics. The cyclonic storms which have their origins in the temperate zones mostly start from points in the eastern parts of the various oceans and move easterly across a continent before they reach the ocean again, so that usually their force is by that time greatly reduced. In many cases their tracks are curved so far to the northward at the eastern end as to be beyond the vicinity of much shipping. With the tropical cyclones the case is different. Their tracks are along populous coasts and over seas filled with ships and frequently extend beyond the fiftieth parallel of latitude. Their occurrence is confined almost wholly to the summer

AVERAGE STORM TRACK IN NORTHERN HEMISPHERE (WEST INDIES AND UNITED STATES).

only moderately objectionable. Storms, however, are to be shunned by all classes of vessels. They vary in character. Some are violent winds that are nearly constant in direction when blowing at maximum force. Such are the northers of the gulfs of Mexico and Tehuantepec, the pamperos of Uruguay and Argentina, and the mistral, bora, and levanter of the Mediterranean. The most important storms from a nautical standpoint are the cyclones, because they are of frequent occurrence, of large area, the winds are stronger than in most other sea storms, and their movements are responsible for the development of many of the local linear gales and heavy winds. See STORM.

A large percentage of the well-defined cyclonic and autumn months and to the western side of the several oceans—the North Atlantic, North Pacific, South Pacific, and Indian oceans; they are unknown in the South Atlantic. The Arabian Sea and the Bay of Bengal are also visited by cyclonic storms which occur most frequently in May and October. A tabulation of West India hurricanes for the decade 1890–1900 showed that they occurred as follows: in June, 1; July, 2; August, 8; September, 19; October, 22; November, 4.

The four great centres of cyclonic activity are: the West Indies and the east coast of the United States; the Philippine Islands and China Sea; Samoa, Fiji, and Tonga Islands; Mauritius. On account of the volume of its seaborne trade the

first-named region is the most important, but the area which includes the Philippines, China Sea, and coasts of China and Japan is certainly a close second. From the number of vessels which traverse these seas our knowledge of the behavior of the storms in them is fairly complete.

It is noted that all tropical cyclones are born in regions of comparative calm about 10 degrees of latitude from the equator. The centre moves first to the westward and then its path curves gradually away from the equator and finally reaches northeast in the Northern Hemisphere and southeast in the Southern. The tracks are not always the same. The average path is different for each month and there are occasional marked exceptions to the general rules, owing usually to local meteorological conditions which modify those of the storm. The speed of movement of the centre of the cyclone along its track is variable. In the tropics it is from 5 to 20 miles per hour, always decreasing as the storm track turns away from the equator and recurves and then increasing until a rate of 50 miles an hour is sometimes reached in temperate regions. Within the tropics the storm area is comparatively small, the violent winds seldom being found more than 150 miles from the centre. The barometric pressure falls rapidly, however, as the centre is approached, a difference of two inches having been observed within the distance mentioned. The winds therefore blow with greater violence, and their directions are more symmetrical with respect to the centre than is the case in higher latitudes. After recurving, the area usually increases and the winds become less severe. The centre is no longer a small, well-defined area over which the sky is nearly clear and near which the winds blow with the greatest violence, but broadens until it is not easily recognizable, and the strongest winds are often found at some distance from it.

The approach of a tropical cyclone is almost invariably preceded by a nearly cloudless sky and marked clearness of the atmosphere—islands, mountains, and distant vessels are seen with great distinctness, while the temperature is abnormally high and made more oppressive by a cessation or reduction of the ordinary breezes. All this is commonly accompanied by an unusually high barometer which becomes unsteady as the air disturbance approaches. The sky then begins to be covered by a light cirrus haze which becomes more and more dense until the true hurricane cloud appears on the horizon in the approximate direction from which the centre is approaching. Portions of this begin to be detached and drift across the sky, accompanied by rain squalls and wind of increasing force. The rain along the edges of the storm area is mistlike, with occasional showers which increase in frequency and heaviness towards the centre, where the rain falls in torrents. One of the indications of an approaching cyclone is a heavy swell coming from the direction of the centre, and this frequently sets in before any other indication becomes marked.

By the time the hurricane cloud appears on the horizon the barometer will be unmistakably falling. If the centre passes far away, the fall will not be great, but the weather will be unsettled and showers frequent; ordinary trades will be increased in force and squally north of the centre (in the Northern Hemisphere), while variable winds will be found south of the centre, usually from a southeasterly direction.

If the observer is within the real storm area the barometer continues to fall and, unless he is in the path of the centre, the wind will begin to shift, the changes usually being accompanied by heavy squalls. These changes afford a means of determining the direction of the centre and the path of the storm, so that it may be avoided. The wind does not blow exactly towards the centre, but around it in a manner to develop a sort of spiral in which the direction of the wind is opposite to that of the movement of the hands of a watch in the Northern Hemisphere and in the same direction as the hands of a watch in the Southern. This spiral effect and the storm tracks are shown in the accompanying plates. If an observer within the storm area faces the wind, the centre bears about 10 points (112.5°) to the right, if in the Northern Hemisphere, and 10 points to the left, if in the Southern. By noting the direction of the wind at frequent intervals the direction of the centre can be obtained a sufficient number of times to determine its approximate path and probable distance. If the barometer falls without a change in the direction of the wind, the observer is in the path of the centre.

Having determined the path of the centre, it can be avoided unless the sea is too rough to lay a proper course for the purpose, in which case vessels must heave to and let the storm pass by. Rules for the handling of vessels in cyclones are given in the article on navigation.

The instruments used on board ship for making weather observations are the thermometer, barometer, hygrometer, compass, rain gauge, wind gauge, or anemometer, and the barocyclonometer. With the exception of the last named these are of ordinary type and are adequately described under their own heads. The barocyclonometer is an instrument invented by Father José Algue, S. J., director of the Philippine Weather Observatory. It consists of a special form of aneroid barometer that is not absolutely essential to the operation of the instrument and a disk which is a graphic representation of the cyclonic wind swirl about the storm centre. Two pointers, which may be set at any angle, are pivoted at the centre of the disk, and one of these carries a secondary pointer pivoted about two-thirds the length from its own axis. By setting these in accordance with certain tabular data, with the corrected barometer readings and with the observed directions of the wind, the approximate distance and direction of the storm centre may be obtained as well as the speed along its path. The tables and storm disk were originally prepared for the typhoons of the East, but the instrument is now being adapted for use in the West Indies and along the United States coast. See METEOROLOGY; WEATHER; WIND; STORM; NAVIGATION; HYDROGRAPHIC OFFICE; CHART; PILOT CHART; also bibliography under METEOROLOGY, STORM, ETC.

ME'TER. See METRIC SYSTEM.

METER, ELECTRIC. See ELECTRIC METERS.

METER, GAS. See GAS, ILLUMINATING.

METH'ANE (from *methyl*), MARSH GAS, FIRE DAMP (Ger. *Sumpfgas*), CH_4. The simplest of the compounds of carbon and hydrogen, usually prepared by strongly heating a mixture of sodium acetate and soda lime. It is one of the gaseous products of the decay of vegetable matter (especially cellulose) under water and is therefore a constituent of the gases bubbling up in the stagnant water of marshes; it is also one

of the gases evolved in petroleum wells, and natural gas contains about 90 per cent of methane. Considerable quantities of methane occur also in coal mines, where the gas, mixed with air, has often caused disastrous explosions. Methane is a colorless and odorless gas burning with a nonluminous flame. It is formed in the destructive distillation of organic matter, such as wood, coal, etc., and is, therefore, one of the principal constituents of ordinary illuminating gas, which contains 30–40 per cent of methane. A very large number of organic compounds can be derived from methane; and since the gradual building up of these compounds from the elements is a matter of great importance in organic chemistry, the synthesis of methane itself, as the first step in innumerable processes employed in producing organic compounds, formed a valuable contribution to chemical science. The synthesis of methane was first effected by Berthelot, who showed that the gas is produced when a mixture of carbon disulphide and water vapor is passed over red-hot copper. The reaction taking place is represented by the following chemical equation:

$$CS_2 + 2H_2O + 6Cu = CH_4 + 2Cu_2S + 2CuO.$$

Carbon disulphide — Water — Copper — Methane — Cuprous sulphide — Cupric oxide

In this manner methane can be obtained by using nothing but elementary substances as starting material, for carbon disulphide and water can be prepared by the direct union of their elements. Another synthesis of methane results when the silent electric discharge is caused to act upon a mixture of carbon monoxide and hydrogen. Still another synthetic method consists in the action of water upon the carbide of aluminium. But the most direct synthesis of methane was carried out by Bone and Jerdan, who succeeded in obtaining methane by heating its elements, carbon and hydrogen, to 1200° C. (2192°F.). Very pure methane may be prepared by decomposing zinc methyl with water or by the GRIGNARD REACTION (q.v.).

METHANE SERIES. See HYDROCARBONS.

METH'ODISM. The name given to the religious movement in England led by John Wesley, appropriated by the numerous churches which have sprung from that movement and by others which, though not bearing the name, are both historically and spiritually in the Methodist succession. Wesley himself was impatient of sectarian names and called the people whom he enrolled in classes for religious culture simply the United Societies and proudly appealed to the fact that to join the Societies there was needed no dogmatic or ecclesiastical test, all Christians from Anglicans to Quakers being alike welcome. His definition of a Methodist (abridged) was as follows: "A Methodist is one who has the love of God shed abroad in his heart by the Holy Ghost given unto him; one who loves the Lord his God with all his heart, and soul, and mind, and strength. He rejoices evermore, prays without ceasing, and in everything gives thanks. His heart is full of love to all mankind, and is purified from envy, malice, wrath, and every unkind affection. His one desire, and the one design of his life, is not to do his own will, but the will of Him that sent him. He keeps all God's commandments, from the least to the greatest. He follows not the customs of the world; for vice does not lose its nature through its becoming fashionable. He fares not sumptuously every day. He cannot lay up treasure upon the earth; nor can he adorn himself with gold or costly apparel. He cannot join in any diversion that has the least tendency to vice. He cannot speak evil of his neighbor any more than he can tell a lie. He cannot utter unkind or evil words. No corrupt communication ever comes out of his mouth. He does good unto all men; unto neighbors, strangers, friends, and enemies. These are the principles and practices of our sect. These are the marks of a true Methodist. By these alone do Methodists desire to be distinguished from other men." Wesley's catholicity was so broad that he was not greatly concerned whether the books he reprinted for his people were by Roman Catholics or Unitarians so long as they were to religious edification. It was his hope that his movement would be the nucleus of a reunited Christendom, and it was with sorrow he saw forces which he could not control carrying his people into permanent separation. The title Methodist was not a word of his own choosing—it was given by Oxford students because of the strict life of Charles Wesley and his band in the university—but he took it up as a matter of course and it became an ecclesiastical watchword.

It must be remembered that the churches which go under the name of Methodism were not the largest part of the results of the movement. It stimulated tremendously every Protestant church, besides sending thousands of converts into those churches. It imparted new life and hope to Christendom. It was one of the forces which led to the abolition of slavery. Wesley initiated several charitable schemes, and his work overflowed into permanent forms of benevolence. The common people of England and America received such a stimulus to intellectual religious life and expression that they began to take an interest in education and political and social reforms. Laymen who were leaders in the meetings (class leaders, exhorters, local preachers) became protagonists in progressive propaganda. Political and social legislation of the nineteenth century rested back on a revived consciousness of the masses which was born of Methodism. Though Wesleyan Methodism itself was excessively conservative in the first half of the nineteenth century, partly because as a reaction to criticism and persecution it wanted to commend itself to the authorities and to the higher classes, and partly through an overtimid deference to the Established church, its members were thoroughly alive to popular rights—so much so that almost every important advance in political liberalism and social amelioration went hand in hand with an exodus of eager reformers out of Wesleyanism to form a new Methodist church or reënforce other churches or devote themselves solely to secular betterment. On the surface the secessions were ecclesiastical; deeper they were also political and economic—the cry of men awakened by the Gospel for the liberty of the sons of God. Before the Methodist movement did its work the sodden condition of the English peasantry was fearful. After its work was done the formation of political, agricultural, social, and literary societies was possible. The mass of the peasants could not have been moved at all, says Prof. J. Thorold Rogers, nor would the formation of agricultural unions have been possible, had it not been for the previous work of the Methodist preachers. (*Six Centuries of Work and Wages*, 6th ed., p. 516.) Wesley struck the first note of the temperance reform, and with terrific power. The religious

and moral interests of the movement were so engrossing that the people of England were saved from the extreme doctrines of the French Revolution and from a violent application of its healthful doctrines. Modern mission work at home and abroad, the institutional church, the cheap press, universal appeal by tract and pamphlet to the reason of the common man, were congenial to Wesley's large-minded insight into the needs of men and, with other modern methods, were anticipated by him.

Polity. The polity of early Methodism was suggested by exigencies in the growth of the revival of which it was the outcome. Methodism as an organization dates from 1739, the loosest possible in form. A few Christians met together weekly in classes (the class meeting) to pray and to talk concerning the things of God, over whom a leader (a layman) was appointed, whose duty it was to watch over their souls and to give spiritual counsel. The societies were independent of each other, except as they were held together by the itinerating Wesley, who appointed their leaders and to whom these leaders were responsible. In 1743 Wesley drew up the rules for the United Societies, which have remained the ethical standard of teaching and practice from that day to this. As the work extended, preachers were appointed. They were of two kinds: clergymen of the Church of England who affiliated with the movement and who were permanent pastors; and laymen, who were itinerants, moving at first every six months and then every year. In its inception Methodism was preëminently an episcopal movement, oversight, as in the Society of Jesus, being reduced to an exact science. Over the classes were the leaders; over both were the preachers, assisted in out-appointments by local preachers, who were laymen with the gift of public address and from whom the itinerants were recruited. Each preacher had his circuit, and several circuit preachers were under a head (whence arose the district and, in North America, the presiding elder). There were quarterly and district conferences and, after 1744, the annual conference, composed of both clergymen and lay preachers. Finally, over the whole movement was Wesley himself, giving it vitality, depth of impression, and breadth of view, saving it from fanaticism on the one hand and laxity on the other, ever guiding and really, though not officially and narrowly, dominating it. A general conference, meeting every four years, arose in the United States after 1792, owing to the great extent of the country.

The relation of the movement to the Church of England is not hard to define. Wesley was a sincere lover of the church of his fathers and hoped that the bishops would ordain his preachers and in some way articulate his results into the normal ecclesiastical life of the country. In this he was disappointed; but, nothing daunted, he went on his way independently, holding that he was justified in this by the unique position he occupied as the providential leader of the movement and consolidating what became a vast ecclesiasticism. Wesley tried to be a loyal churchman as far as circumstances allowed. As a rule he did not hold services in Church hours, nor would he allow lay preachers to administer sacraments. But England's call always sounded louder than the Church's, so that he came to feel that he was serving the Church best when disregarding her most. He invaded parishes constantly and was all the time building a church that had no legal relation to Anglicanism whatever and almost no moral relation. Some of the state clergy persecuted his ministers and members bitterly, others favored them. By the study of the New Testament and early Church history he became convinced that, though only a presbyter in form, he was a real bishop, and therefore ordained clergy whenever he thought best.

After Wesley's death in 1791 the people called Methodists were governed by the Annual Conference, composed of the Legal Hundred, as the lawmaking body, and all the itinerant preachers as advisory and coöperative. The new denomination—as it has been legally since 1784, when Wesley entered a deed into the Court of Chancery constituting the Conference, and as it has been practically since 1740, when the movement separated from both Moravianism and Calvinism—came to be called the Wesleyan Methodist Connection or church. The territory was divided into districts for more efficient supervision, whose interests were looked after by the district meeting, and subdivided into circuits whose affairs were governed by a quarterly meeting composed of ministers, local preachers, and stewards, of whom the two last were appointed by the superintending pastor. Various efforts were made to tone down the hierarchical spirit and constitution of the church by introducing laymen into the annual conference and by giving the local church the right to elect its own officers, but these efforts were successful only at the cost of numerous divisions. Finally, in 1878, the Wesleyan Methodist church introduced the principle of lay representation thus far: that it allowed laymen to sit in the annual conference and deliberate with the ministers on all financial and benevolent causes, those of a pastoral nature being reserved to the clergy. In all the Methodist churches of Great Britain and her colonies there is only one order of ministers.

In 1784 Wesley ordained Thomas Coke (q.v.) superintendent for America, and at the Christmas conference of 1784–85, held in Baltimore, Md., the Methodist Episcopal church was constituted by the ordination of Francis Asbury as superintendent and the drawing up of an episcopal Church constitution. The new overseers assumed the title of Bishop, much to Wesley's disgust, who, out of deference to the Church of England, desired them to be called simply superintendents. But that he considered them to be bishops in the full sense there can be no doubt. In his letter to the conference stating and defending his position he says: "Lord King's account of the Primitive Church convinced me many years ago that bishops and presbyters are of the same order, and consequently have the same right to ordain. For many years I have been importuned to exercise this right"; but he refused out of deference to the established order. In America the case was different. There there were no bishops, so that for hundreds of miles there was no one to administer the sacraments. "Here, therefore, my scruples are at an end, and I conceive myself at full liberty, as I violate no order and invade no man's right by appointing and sending laborers into the harvest." Of course it is understood that the American Methodist episcopacy is in order presbyterial purely, though it is certainly sufficiently Catholic in its powers of supervision, especially in its absolute control over pastoral appointments—a control that is, however, limited in practice when dealing with popular preachers and wealthy

churches. The other of the two orders is that of deacons, who are strictly differentiated from elders. It is, however, a principle of Methodism that no one type of Church order is of exclusive authority, that the Scripture lays down no model, and that therefore a church may exercise liberty in matters of polity if she is true to the spirit and general complexion of the apostolic church. The nonepiscopal Methodist churches are true to Wesley's idea of oversight through their conferences and districts, but presbyterian in ministry and congregational in some features of their administration. A peculiar feature of all Methodist polity is the itinerancy, or the removal of preachers from one charge to another, which is done by the bishops with the advice of the presiding elders in the Methodist Episcopal churches, and by a stationing committee in the other churches. In the Methodist Episcopal church the pastoral limit was placed at two years in 1804, at three in 1864, at five in 1888, and in 1900 the limit was removed entirely. Preachers are now reappointed from year to year by the bishops.

Theology. Few churches have had less doctrinal disturbances than the Methodist. No one has expressed more briefly and admirably the doctrines received by all Methodists than Bishop John H. Vincent: "I. I believe all men are sinners. II. I believe that God the Father loves all men and hates all sin. III. I believe that Jesus Christ died for all men to make possible their salvation from sin, and to make sure the salvation of all who believe in Him. IV. I believe the Holy Spirit is given to all men to enlighten and to incline them to repent of their sins and to believe on the Lord Jesus Christ. V. I believe that all who repent of their sins and believe on the Lord Jesus Christ receive the forgiveness of sin. This is justification. VI. I believe that all who receive the forgiveness of sin are at the same time made new creatures in Christ Jesus. This is regeneration. VII. I believe that all who are made new creatures in Christ Jesus are adopted as the children of God. This is adoption. VIII. I believe that all who are accepted as the children of God may receive the inward assurance of the Holy Spirit to that fact. This is the witness of the Spirit. IX. I believe that all who truly desire and seek it may love God with all their heart and soul, mind and strength, and their neighbors as themselves. This is entire sanctification. X. I believe that all who persevere to the end, and only those, shall be saved in heaven forever." As to the sacraments, Methodism holds that the Lord's Supper is a memorial of Christ's death for the spiritual feeding on him, that he is really present only in the hearts of those who receive him, and that baptism is a sign of a regeneration already accomplished by faith, and as to adults should be given only to believers. Infant baptism is administered to children whose parents desire, if they promise to bring them up in religion, on the ground that the child is already a member of the Kingdom of God. As to atonement, Methodists universally hold to the fact, but are not agreed as to theory. In England the penal substitutionary theory has been held, at least until recently, and that was the common view in America until Professor Miley, of Drew Theological Seminary, published his book on the atonement in 1879, advocating the governmental theory. But it has been the universal conviction of Methodists that a real atonement was paid to God for the sins of the world, though in 1900 Professor Bowne, of Boston, advocated the view that it was an act of love to influence men, holding, however, that the sufferings of Christ bear a "vital and unparalleled relation to the forgiveness of sins." Christ as an object of faith, i.e., his absolute divinity, is held as fundamental, and in fact was one of the driving springs of the movement. Ritschlian views have filtered in among some of the younger ministers, but they are at the farthest pole from historic Methodist testimony. As to depravity, Methodists hold that it is total in the sense that no man is saved except through God's inciting and enabling grace, but not total in the sense of the Reformation creeds. In eschatology opinions differ. Unlike the older Methodists, some hold now to processes of salvation in an intermediate state for those who never heard of Christ. Dr. Pope presented this view in his *Theology* (1875–76), and his book was placed on the course of study for preachers. The natural immortality of the soul has always been maintained, the first dissentient being Professor Beet in his *The Last Things* (1897; 3d ed., enlarged, 1899) and more explicitly in his *Immortality of the Soul: A Protest* (1901). His views were not acceptable to the church, and he was not continued in his professorship. Eternal punishment in some sense is a cardinal tenet. The general view of the final state of the heathen is that all who conscientiously live according to the light which they have received will be saved. It must be remembered that Methodism arose as a religious, not doctrinal, movement, and a narrow orthodoxy is both historically and theologically inconsistent with her genius. She has therefore generally been patient of diverging views, if they have not struck at the vitals of the gospel. For all that, Methodism has had doctrinal standards. In 1769 Wesley, who was legally himself the conference, proposed this test for his preachers: "To preach the Old Methodist Doctrines, and no other, contained in the Minutes of Conference." After 1798 new preachers in England were to be examined in the eight volumes of Wesley's sermons, and later a rigid catechetical examination on the candidate's orthodoxy on such doctrines as the eternal Sonship of Christ was instituted, quite contrary to the spirit of Wesley. Wesley's sermons and notes in the New Testament remain a legal standard in England, though liberally interpreted, and a moral one in America. On theological changes in Methodism, consult Sheldon in *American Journal of Theology*, 1906, pp. 31–52, and Faulkner in *Andover Review*, vol. xviii, pp. 487 ff., and in *New History of Methodism*, 1909, vol. ii, pp. 150 f.

Ethics. Wesley always retained some of the ascetic fervor of his High Church days, and set forth in his "General Rules for the United Societies" (1743) a standard of conduct of a strict and self-denying type. These rules forbade softness and needless self-indulgence, the using of many words in buying or selling, the use of intoxicants as a beverage, and the reading of books or the taking of diversions that could not be indulged in in the name of Jesus. The early Methodists were accordingly noted for their Quaker-like strictness of life, this even showing itself in regard to dress and jewelry; and they resembled the Puritans in their abhorrence of sports and amusements.

Worship. Wesley was attached to the liturgy of the Church of England and drew up for the societies at home and in America a service based on the Prayer Book, which he abridged and changed extensively. This was not adapted to American needs and was never used in America to any extent until recently. It was republished by the Rev. Charles S. Harrower in 1891, and the responsive parts have been widely adopted. But the spirit of Methodism seems opposed to the reading of prayers, and though a modest liturgical service was suggested by the General Conference of the Methodist Episcopal church in 1896, it goes no further than a responsive reading, the Gloria, and the recitation of the Apostle's Creed, and even this is too ritualistic for some churches. In special rites, however, like baptism, marriage, and burial, all Methodists use a prepared service.

HISTORY AND METHODIST DENOMINATIONALISM

England. (For the so-called Calvinistic Methodists, see CALVINISTIC METHODISTS; and for the "Calvinistic Methodist Church" of Wales, see PRESBYTERIANISM. See also METHODIST EPISCOPAL CHURCH, SOUTH; METHODIST PROTESTANT CHURCH.) The paternal absolutism which Wesley exercised and which he left to his legal successors—the Hundred Ministers—could not endure. It was inevitable that the societies would assert their liberties. These liberties had reference to (1) holding service in church hours, which Wesley had opposed out of regard for the Established church; (2) receiving the sacraments in their own chapels from their own ministers; (3) lay representation in the conferences; and (4) the right of the local church to have a voice in the reception and expulsion of members, in the choice of local officers, and in the calling out of candidates for the ministry. All these principles except the last have been incorporated into all types of Methodism, but the honor of being the first to found a society upon them belongs to Alexander Kilham (1762–98). In 1795 Kilham published a pamphlet, *The Progress of Liberty*, which is a landmark in Methodism, as it is the first systematic presentation of the rights of ministers and laymen. For this book and for statements which were interpreted as reflecting on the conference he was expelled in 1796. Three ministers joined themselves to him immediately, and soon 5000 members were enrolled, the body taking the name of the *Methodist New Connection* at the date of its organization in 1797. In theology and polity it is similar to Wesleyan Methodism, except in the principle of representation. It was the first effective effort to adjust Methodism to the nonconformist principle and thus bring it to its logical conclusion.

With the building of chapels there had been a decline in the aggressive zeal of the field-preaching days of original Methodism. In the early part of the nineteenth century news was borne across the Atlantic of the marvelous success of camp meetings as a revival agency, and desire was felt by some to revive open-air meetings in England. Accordingly Hugh Bourne (1772–1852), assisted by William Clowes and other zealous Wesleyan local preachers and exhorters, held a camp meeting at Mow Cap, a hill between Staffordshire and Cheshire, May 13, 1807, and with such favorable results that several similar meetings followed. The parent conference in 1807 passed a resolution severely condemning such meetings, but Bourne persisted in his use of an evangelism so congenial to early Methodism. For this he and his companions were expelled, and in 1810 they organized an independent church, which in 1812 took the title of the *Primitive Methodist Connection.* In polity this body is similar to the New Connection church, except that it has two laymen instead of one to every minister in their conference, and is especially noted for its large use of laymen both in church government and in evangelism. It publishes an able review, the *Holborn Review* and sustains numerous schools and missions and all the appliances of a strong church.

A zealous young Wesleyan, William O'Bryan, felt called to carry the gospel to destitute villages of east Cornwall and west Devon in the early years of the nineteenth century, and had great success in these tours. As this necessarily carried him beyond the bounds of Wesleyan circuits, and as he could not limit his work to their harness, he was expelled for his zealous following of Wesley. In 1815 O'Bryan organized his first society, the work developed, other preachers were received, rules were drawn up in 1818, and in 1819 the first conference was held. His societies came to be called *Bible Christians*, although that was not adopted as the official name until 1828. In 1850 they sent Way and Rowe to Australia, where a strong cause has been built up. They also have missions in China. The polity of the Bible Christians is similar to that of the other bodies of reformed Methodists.

The forcing of an organ on the Brunswick Wesleyan Methodist Chapel in Leeds in 1828 against the wishes of the leaders and stewards caused the withdrawal of more than a thousand members and the formation of the *Wesleyan Protestant Methodists.* The dominating influence of Jabez Bunting (minister 1799–1858), who exercised an autocratic power over the conference, was the indirect cause of the next schism—that over the formation of a theological institution. The opposition to this scheme was led by Dr. Samuel Warren, who was then minister at Manchester and who was expelled in 1835. He was the father of the famous novelist of the same name. Thousands of members sympathized with him and left the church, forming the *Wesleyan Methodist Association,* which in 10 years numbered 21,176 members. Independent speech and action in the conference being impossible under Bunting, an outlet for criticism was found in anonymous publications and periodicals. To find out the authors of these articles strong measures were adopted, and every member of the Wesleyan Methodist conference was subject to a system of rigid questioning. For failure to answer these and other questions James Everett and other ministers of standing were expelled in 1849. The revulsion against these proceedings was equal to that against state control in Scotland six years before. One hundred and twenty thousand members left within three years and the contributions fell off £100,000. This separation helped to swell the nonconformist churches, but many kept up a Methodist organization—generally called the *Wesleyan Reformers*—until 1857, when they united with the *Protestant* (Leeds) and *Association* (Warren) Methodists to form the *United Methodist Free Churches.* This body carries on large missionary and educational work. Its polity is thoroughly representative, and is congre-

gational as to the supremacy of the local church in purely local affairs.

In 1907 the Methodist new connection, the Bible Christians, and the United Methodist Free churches united in one church—the United Methodist church. No substantial change had to be made in the polity. The creed in 12 short articles, though general and liberal, is evangelical and orthodox. The church's headquarters are at 12 Farringdon Avenue, London, E. C., and its publications include the *United Methodist*, the *United Methodist Magazine*, and other literature. It has extensive missions in China, and some in Africa.

Under the charge of English Wesleyan Methodism in 1854 the connectional relief and extension fund was inaugurated, in the same year that the Wesley Chapel fund was established on a new basis, and in 1861 the metropolitan chapel-building fund for the building of 50 new churches in and near London was founded by the gift of £50,000 by Sir Francis Lycett. The Children's Home was established in 1873 by the Rev. Thomas Bowman Stephenson, which has developed into a magnificent charity, with branches in several cities and a house in Canada. In 1873 the Sunday School Union was founded for the extension of that cause. But the most important change is the introduction of laymen into the annual conference since 1878. There are now two sections of the conference—a ministerial for the consideration of matters relating to the clergymen and a mixed section for the financial and other matters in which all are interested. This tardy and partial recognition of laymen has given an impetus to the parent church, seen especially in the munificent gifts for the million-guinea century fund in 1899–1902.

Ireland. In Ireland, Wesley had been preceded by Thomas Williams, who in 1747 gathered a society in Dublin. Wesley came in that same year and was greatly encouraged, and all through the second half of the eighteenth century both English and native itinerants traveled through the country, establishing societies in some towns, but being frequently mobbed, fined, and imprisoned. In the Irish rebellion of 1798 the Methodists were the special objects of Irish wrath and suffered numerous tortures. It was they who saved Dublin from being sacked by timely communication of the intentions of the rebels. The first Irish conference was held in 1752. But Methodism was unable to affect Irish life deeply. The membership has never reached 30,000, and the highest number was, as far back as 1814, 29,388. The Irish were even more insistent on receiving the sacrament at the hands of their own ministers (rather than from the Episcopal church) than the English were, and in this they were favored by Dr. Coke, who frequently presided over the conferences. In January, 1818, the *Primitive Wesleyan Methodist Society* was formed under the leadership of the apostolic Adam Averell, whose banner was "The sacrament from the Established church." The regular Methodist church in Ireland declared for independence. In 1878 the two united.

Scotland. Wesley found Scotland stony ground. He received an attentive hearing, but not much response. Whitefield told him plainly that he had "no business in Scotland." But he persevered and established his societies. The Rev. D. Butler has shown in two interesting studies the influence of Wesley on Scotland and the debt which Wesley himself owed to Scougal's *Life of God in the Soul of Man* (1671), a book that he had reprinted in 1744. Consult Butler, *Wesley and Whitefield in Scotland* (Edinburgh, 1898), and *Henry Scougal and the Oxford Methodists* (Edinburgh, 1899).

France. English soldiers carried Methodism to Jersey in the Channel Islands as early as 1779, and Robert Carr Brackenbury, a wealthy layman, who could speak French, was sent there in response to their converts. Wesley himself spent a fortnight in the islands in 1787, preaching and exhorting from house to house. In 1790 the mainland was invaded, and from that day to this Methodism has always had a foothold in France. In 1818 Charles Cook began his ministry there. Cook died in 1858 and left his two sons to carry on his work. In 1852 France was made a separate conference and the full supervision of the mission was left in her own hands. Some notable men have wrought their lives into French evangelization—Cook and his two sons, Emile F. and Jean Paul, Gallienne, Hocart, and Gibson. One of the best lives of Wesley ever written we owe to this mission, that by J. W. Lelièvre (1868; trans., 1871; new ed., 1900). In 1907 the Methodist Episcopal church started a flourishing work in the Savoy, with centre at Grenoble.

Germany. A young Württemberger, C. G. Müller, went to London in 1805 on business, was converted, became a local preacher, in 1830 returned to south Germany, became a missionary of the Wesleyan conference, and when he died in 1853 left 67 preaching places, 20 local preachers, and 1100 members, chiefly in Württemberg. In 1849 Ludwig S. Jacoby went out from America, and for 50 years English and American Methodism labored in different sections of the German Empire. In 1898 England handed over to the Methodist Episcopal church her missions in Germany and a union was effected.

Italy. In 1852 the French Methodists sent M. Rostan to the Piedmont valleys, who established several stations. In 1861 the Wesleyan Methodist conference in England sent Green and Piggott to Florence, and they soon had flourishing missions in north Italy. In 1872 Leroy M. Vernon began his work in Bologna as representing the Methodist Episcopal church. Further particulars as to European Methodism will be found under *Missions*.

America. The first Methodist society in the New World was recruited from the German refugees to Ireland driven out of the Palatinate by Louis XIV. Two of these, Philip Embury and Barbara Heck, had been converted in Ireland, and upon arriving in New York, in 1760, they began preaching. Thomas Webb, an army captain and local preacher, also preached in New York and elsewhere, and about the same time (1766) Robert Strawbridge, another Irishman, started the work in Maryland, where he was assisted by Robert Williams, who was the apostle of Virginia. In 1769 Wesley sent out Richard Broadman and Joseph Pilmoor, and two years later Francis Asbury and Richard Wright. In 1773 their first conference was held—10 ministers with 1160 members. In spite of the disastrous influence of the Revolutionary War, at its end they had 80 preachers and nearly 15,000 members. Most of the Episcopal clergy had fled, and Wesley tried to get a bishop in England to ordain one of his preachers for America. Failing in this, he concluded that he himself had authority. The societies in America, Wesley said,

"are now at full liberty to follow the Scriptures and the primitive Church, and we judge it best that they should stand fast in that liberty wherewith God has so strangely made them free." He accordingly ordained, Sept. 1, 1784, Whatcoat and Vasey as deacons, on the next day elders, and Coke superintendent. He furnished them with a liturgy and collection of psalms and hymns, articles of religion abridged from the Thirty-nine Articles of the Church of England, and told them to organize the American societies into a church. This was done at the celebrated Christmas conference in Lovely Lane Chapel, Baltimore, Dec. 24, 1784 to Jan. 2, 1785, where Asbury was ordained deacon, elder, and superintendent, the societies taking the name of the *Methodist Episcopal church.*

The catholicity of the new church was shown by Wesley's method in regard to both doctrine and discipline. Everything of a sectarian nature was stricken out of the Thirty-nine Articles, so that as they left Wesley's hands they could be subscribed to by almost any evangelical Christian. Nor did he insert any of his own teachings. His design was to provide a generous platform on which all who loved the Lord could rally. As to discipline, no one mode of baptism was made obligatory, and even rebaptism of such as had scruples of their baptism in infancy was permitted, and although kneeling was recommended on the reception of the Lord's Supper, it was distinctly conceded that it might be received standing or sitting. Nor were people required at first to give up membership in their own church in order to become Methodist; so long as they "complied with our rules" they were to have full liberty of attending their own churches. On the other hand, no one could be admitted to communion but members of the society, or such as had received tickets from the preacher. Members who neglected their class meetings were liable to expulsion, and also members who married "unawakened persons"—rules that have gone by the board long since.

During the national period the growth of Methodism has been extraordinary. Its polity is vigorous yet elastic, and provides for close supervision of all parts of the field. This it does by reviving the apostolate or apostolic episcopate and adapting it to present-day needs. Itineracy has given it the opportunity to meet the immigrant face to face while establishing his family in their new home, and it has thus been able to proclaim the gospel everywhere on American soil. But this would have been impossible without a band of preachers alert, brave, consecrated, self-sacrificing, ready to go anywhere with the message of salvation. Perhaps history has never seen a truer type of home missionary than the itinerant preachers of Methodism. Ready to obey orders like the Jesuits, strong to preach like the Dominicans, they have gone everywhere, threading forests, fording and swimming rivers, making friends with Indians or with chance settlers, traveling through parishes a hundred miles or more in extent, meeting their appointments with the regularity of a machine, running the gauntlet of all kinds of dangers. These men of the first generations of Methodists revived the earliest traditions of Christianity. The emphasis put on preaching has been another cause of success. Necessarily deficient in learning, the preachers made up for that by study (a course of study was early prescribed), reading, and contact with men. But they learned above all to be preachers—ready, powerful, interesting extemporaneous preachers. Emphasis on religious experience, personal knowledge of Christ, and victory over all sin gave both preachers and people a buoyant, triumphant life, and this sense of reality and power invested the pulpit with authority and fascination and its people with a vitalizing influence over others. At a time when the prevailing type of Christianity was Calvinistic the Methodists came with the gospel of a free, full, and present salvation, which they preached with tremendous earnestness and without philosophical refinements. Methodism has therefore been a revival church.

The government of the Methodist Episcopal church was completely in the hands of the preachers, who received their appointments annually from the superintendents, who were thus invested with large legal and indefinite moral power. This excessive clericalism was the occasion of the first two schisms. James O'Kelly, an earnest Irishman of warm piety and strong personality, tried to have the right of appeal to the conference recognized in the case of a preacher who felt oppressed by an appointment by the Bishop, and, failing in this, led a schism in Virginia in 1792. He organized the *Republican Methodist church*, which was finally absorbed by other movements. Of greater significance was the agitation to admit laymen into the church councils, which, being refused by the General Conference of 1824, led to a new church, in 1828. See METHODIST PROTESTANT CHURCH.

To many minds at one time slavery seemed the article of a standing or falling church. At the beginning Methodism had taken strong ground against slavery, but exigencies of the work in the Southern States led to an abandonment of the old ground. The antislavery men of the North would not yield, however, and in 1843 organized the *Wesleyan Methodist Connection* at Utica, N. Y. In government they are similar to the Methodist Protestant church. They hold stricter ground in regard to secret societies, intemperance, and dress, than the old church. This church has its headquarters in Syracuse, N. Y., where it publishes the *Wesleyan Methodist.* It supports missions in Sierra Leone, Kunso, and other unhealthy parts of West Africa. The great division on slavery was that in 1844–45, in connection with the case of Bishop James O. Andrew, who had married a slaveholding wife. (See METHODIST EPISCOPAL CHURCH, SOUTH.) The latest division of consequence was that in western New York in 1860, when the *Free Methodist church* was organized, a reaction towards the strenuous ideals of primitive Methodism in regard to secret societies, plainness of dress, the use of tobacco, and in the interests of positive Christian teaching and practice. It has its headquarters in Chicago, Ill., and North Chili, N. Y., publishes the *Free Methodist,* and supports missions in Africa, India, Japan, and China. It put two new articles in its creed—sanctification and eternal punishment. Other and smaller separations have taken place, prompted by a desire either for a more democratic or for a purer Christianity, or both, the latest being the organization of the *Independent Methodist church* at Newark, N. J., in 1900.

Colored Methodism has had free course in the United States. Housed at first in the parent church, the colored people came out in Philadelphia under Richard Allen in 1816 and organized the *African Methodist Episcopal church.* Four

years later the *African Methodist Episcopal Zion church* was organized in New York. The *Colored Methodist Episcopal church of America* was organized by action of the Methodist Episcopal church, South, Dec. 16, 1870. The Methodist Episcopal church has colored conferences in the South, but she had never elected a colored bishop since the death of Francis Burns in 1863, until 1904, when Scott was elected Missionary Bishop of Africa.

The struggle for the rights of laymen in America has been similar to that in England. The Methodist Episcopal church, South, not only (since 1869) admits laymen to the General Conference in equal numbers, but admits four laymen from every district in the annual conference. The African churches do the same. After the organization of the Methodist Protestant church, 1828–30, the agitation rested in the Methodist Episcopal church until 1852, but it was not until 1872 that that church granted place to laymen in her supreme council, and then only to the extent of two laymen from each annual conference, which gave the preponderance to the ministers three to one. In 1900 the ratio of representation was made equal. In 1912 this church in its General Conference voted down a resolution to admit laymen into the annual conference.

Canada. The Palatines, who did so much for Irish Methodism and who founded the church in the New World, were also the organizers of the first class in Canada—at Augusta, Ontario, in 1778. In fact, it was the same Paul and Barbara Heck, their sons and relatives, and the widow and son of Philip Embury, who constituted that class. George Neal, a school-teacher in the Niagara district, preached to the people on Sunday and on week evenings after 1786, and gathered his converts into classes. He kept up this work for years, but was not ordained until 1810. William Losee was the first itinerant minister. He preached in and around Kingston in 1790 and following years, and in 1791 and thereafter Canada was regularly supplied with ministers from the United States. In 1800 there were one district, four circuits, seven preachers, and 936 members. Relations with the Episcopalians were not always friendly. Canada was a part of the Genesee conference of the Methodist Episcopal church until 1824, when the Canada conference was organized. In 1828 the church was made independent and became the Methodist Episcopal church in Canada. The English Methodists began work in Montreal in 1814, extended it into Ontario in 1818, and took over the Methodist Episcopal church in 1832, though the latter resumed an independent existence in 1834. Methodism in the eastern provinces was founded by the apostolic William Black, a notable figure, who began his work in Nova Scotia in 1782. Other branches of English Methodism were likewise planted in Canada. In 1874 the Wesleyan Methodist church of the Dominion united with the New Connection church, and in 1883 these united with the Methodist Episcopal, Primitive Methodist, and Bible Christian—making one Methodism in Canada. The union has been very successful. A bold attempt was made between 1905 and 1913 to unite in one church the Presbyterians, Congregationalists, and Methodists of Canada, and all doctrinal, ecclesiastical, and legal matters were arranged satisfactorily; but on account of a strong minority of Presbyterians holding out, the union is being held in abeyance as inexpedient for the present. There are also colored churches.

Australia. Two schoolmasters and farmers, who were sent out from England to take charge of the convict schools, established the first class, in Sydney, March 6, 1812. They soon applied for a missionary and in 1815 Samuel Leigh, "the apostle of Australia," landed and took up the work. Others followed, and wonderful success attended their labors, often wrought with heroic self-sacrifice and bravery. In 1820 Methodism went to Tasmania, 1822 to the Friendly Islands, 1823 to New Zealand, 1835 to the Fiji Islands, 1838 to South Australia, and 1839 to Western Australia. In 1854 all the Wesleyan Methodist churches were united in one conference (including New Zealand), and in 1873 those of Tasmania and the South Sea Islands were united with these, making the Australasian church. The Primitive Methodist and other English Methodist denominations were also established in Australia, but in 1900–02 these all united with the Wesleyans, making one Methodism in the South Pacific.

Missions. All the Methodist churches sustain extended missionary operations, but it is impossible here to do justice to their work. A society was gathered in Sierra Leone in 1792, and in 1811 the Wesleyan conference sent George Warren as the first missionary to Africa. Churches have been established among both natives and Europeans, and in 1884 William Taylor opened up the Congo country. Bishop Hartzell has done much towards coördinating the work over a vast territory with the progress of civilization. In 1814 Thomas Coke, with six missionaries, founded the first Methodist missions in Asia, which have realized great results. The American church sent Melville B. Cox to Africa in 1833, and William Butler founded missions in India in 1856, which have recently achieved notable results among the peasants of north India—the natives coming into Christianity faster than they can be cared for. In 1873 Butler also began work in Mexico, where hospitals, schools, and churches have been established. William Taylor also did a great work in India and Bishop James M. Thoburn ranks with William Butler and William Taylor for efficiency, enthusiasm, and influence in India. Numerous missions exist in South America. Scandinavia has proved a good soil for Methodism; even Finland has been entered, and Switzerland has several societies. In 1900 the Methodist Episcopal church made John H. Vincent resident Bishop in Europe, where there are already five conferences. Mission work in China has had marvelous success, considering the circumstances, and various Methodist bodies are working there in harmony. In Japan, efforts have been made to merge the Methodist denominations into a single Japanese church, and in 1906 a union of the Methodist Episcopal church, of the same, South, and of the Methodist church of Canada was effected. In 1900 missionaries were sent to the Philippine Islands. Russia was entered in 1907.

Education. It was not till 1834 that it was decided to open institutions for the training of ministers, and even then amid much opposition, partly on account of fear of loss of the old spirituality, freshness, and independence, and partly on account of the preponderating influence of Bunting. In 1834 an institution was opened at Hoxton, London, removed to Richmond, Surrey, in 1843; another was opened in

Stoke Newington in 1839, merged in the Richmond school in 1843. The Didsbury institution, near Manchester, received students in 1842; that at Headingly, near Leeds, in 1868; that at Handsworth, near Birmingham, in 1891. These schools are both academic and theological, and not on the grade of American theological seminaries. These, as well as Wesley College for boys at Sheffield, the Leys School in Cambridge, and Trinity College, Taunton, are in connection with the Wesleyan Methodist church, which also supports a system of day schools having 159,000 scholars and an annual expenditure of £259,000, with training colleges for teachers in Westminster and Southlands. In Ireland there are Wesley College, Dublin, and the Belfast Methodist College. In Australia and New Zealand there are three theological institutions and ten colleges. The Primitive Methodists have a college for ministers at Manchester, and colleges for youths in York and Birmingham. The United Methodist church has a theological institution at Ranmoor, near Sheffield, opened in 1864, Shebbear College at Highampton, Devon, Ashville College and a girls' school at Edgehill.

In America Cokesbury College was opened at Abingdon, Md., in 1787. After eight years of vicissitudes it was burned. It was rebuilt, but was burned again in 1797. In 1817 an academy was built at Newmarket, N. H., closed Dec. 30, 1823, but opened again at Wilbraham, Mass., Nov. 5, 1825. The oldest academy having a continuous existence is at Kent's Hill, Me., founded in 1821. Cazenovia Seminary, at Cazenovia, N. Y., was founded in 1825. The oldest college is Wesleyan University (1831), at Middletown, Conn. Between 1820 and 1847 academies and colleges furnished all the education received in school in theological branches by candidates for the ministry, and that was meagre, as classical and scientific studies necessarily predominated. There was in fact a deep-seated prejudice against theological schools, lest they should become centres of heresy, as well as deprive men of that spirituality, earnestness, and self-sacrifice which characterized early Methodist preachers. It was not till 1840 that the first theological institution was opened, that at Newbury, Vt., removed to Concord, N. H., in 1847, to Boston in 1867, and incorporated in Boston University in 1871. Garrett Biblical Institute at Evanston, Ill., now in connection with Northwestern University (the largest university in Methodism), began in 1856, and Drew Theological Seminary at Madison, N. J., in 1867. Gammon Theological Seminary, for colored preachers, was founded in South Atlanta, Ga., in 1883. The Methodist Episcopal church has 10 theological institutions, 32 colleges and universities, 34 classical seminaries, besides numerous women's schools, 18 institutions for colored, and 240 of all kinds in foreign fields. A postgraduate university was begun in Washington, D. C., in 1892 by Bishop Hurst, but was not opened for instruction till 1914. (See AMERICAN UNIVERSITY.) There are important schools for classical and theological instruction at Frankfort-on-the-Main and Bareilly, India, and smaller schools in other mis-

FOREIGN COUNTRIES (1914)

DENOMINATION	Ministers	Lay preachers	Church members and probationers	Sunday schools	Officers and teachers	Sunday scholars	Churches, etc.
Wesleyan Methodists:							
Great Britain	2,513	19,463	508,563	7,552	130,167	939,619	8,479
Ireland	250	646	28,116	340	2,448	24,889	606
Foreign missions	681	5,524	166,851	2,050	8,486	116,278	3,844
French conference	41	82	1,715	35	155	2,074	124
South African conference	280	4,300	131,474	818	2,922	40,322	4,022
Primitive Methodists	1,157	15,718	207,356	4,239	57,713	453,430	4,907
United Methodist church	851	6,224	185,486	2,264	41,428	300,075	3,038
Wesleyan Reform Union	26	490	8,519	187	2,694	22,992	207
Independent Methodist churches	411	.....	8,905	159	3,084	26,518	162
Australasian Methodist church	985	8,634	149,878	3,849	21,964	203,365	5,147
New Zealand Methodist church	199	949	23,181	437	3,020	29,141	455
Japan Methodist church	215	.....	14,569	283	1,131	25,980	1,100
Totals	7,609	62,032	1,434,613	22,213	275,212	2,184,683	31,091

UNITED STATES (1914)[1]

NOT INCLUDING EVANGELICAL ASSOCIATION, UNITED EVANGELICAL CHURCH, AND UNITED BRETHREN

DENOMINATION	Ministers	Churches	Communicants
African Methodist Episcopal	5,000	6,000	620,000
African Methodist Episcopal Zion	3,552	3,180	568,608
African Union Methodist Protestant	200	125	4,000
Colored Methodist Episcopal	3,072	3,196	240,798
Congregational Methodist	337	333	15,529
Free Methodist	1,199	1,179	33,828
Independent Methodist	2	2	1,161
Methodist Episcopal	18,881	28,245	3,603,265
Methodist Episcopal, South	7,099	16,691	2,005,707
Methodist Protestant	1,371	2,348	180,382
New Congregational Methodist (1906)	59	35	1,782
Primitive Methodist	70	92	8,210
Reformed Methodist Union Episcopal	40	58	4,000
Union American Methodist Episcopal	170	212	19,000
Wesleyan Methodist	840	675	19,500
Zion Union Apostolic (1906)	33	45	3,059
Total	41,925	62,416	7,328,829

sion fields. The Methodist Episcopal church, South, reports 147 schools and colleges, one of the largest being Vanderbilt University at Nashville, Tenn., with a theological school, organized in 1875. On account of a decision of the courts that Vanderbilt University could not be controlled by the bishops, Asa G. Chandler established the beginnings of a university in Atlanta, Ga., in 1914, to be in more direct relation to the church, of which the theological department is organized. The Methodist Protestant church has colleges at Adrian, Mich. (1859; theological department, 1882); Westminster, Md. (1868; theological department, 1882); and Kansas City, Kans. (1896). The Free Methodists have a college at Greenville, Ill., and seminaries at North Chili, N. Y.; Spring Arbor, Mich.; Orleans, Neb.; Seattle, Wash.; Wessington Springs, S. Dak.; Los Angeles, Cal.; and Evansville, Wis. Canada established an academy at Cobourg, Ontario, in 1836, which was made a college in 1841, the first degree-conferring body in Ontario; a medical faculty was added in 1854, law in 1860, theology in 1871, and the whole (Victoria University) removed to Toronto in 1892. The Wesleyan Theological College, Montreal, was established in 1873, and the Mount Allison College, Sackville, N. B., in 1859. There are several academies and female colleges.

Journalism and Publishing Interests. There are many weekly and monthly periodicals. The *Wesleyan Methodist Mazagine*, London, was established under the name of the *Arminian Magazine* in 1778, the *London Quarterly Review* in 1853, the *Primitive Methodist Quarterly* (now *Holborn Review*) in 1858, the *Methodist Review*, New York, in 1818 (quarterly, 1830; bimonthly, 1885), the *Methodist Review*, Nashville, 1847, and the *Canadian Methodist Quarterly* in 1889 (merged in the *Methodist Magazine*, Toronto, in 1896). The oldest official weekly in American Methodism is the *Christian Advocate* of New York, founded in 1826.

Statistics. According to the latest figures obtainable the statistics of Methodist communicants in Great Britain, Ireland, Australasia, and Canada in 1914 and in the United States in 1914 were as tabulated on page 511.

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METHODIST CHURCH, FREE. See METHODISM.

METHODIST EPISCOPAL CHURCH. See METHODISM.

METHODIST EPISCOPAL CHURCH, SOUTH. The history of the Methodist Episcopal church, South, as an organization separate and distinct from the Methodist Episcopal church, began in 1844, when the church was divided into two branches. For history up to that time, see METHODISM.

The three largest churches of this country (Methodist, Baptist, and Presbyterian) have long been divided into Northern and Southern branches, and it is quite impossible to understand these divisions without a reference to

American slavery. The question the answer to which divided the church and the nation was how to abolish slavery and how to handle the situation while public sentiment was being brought to the point of demanding that the slaves be freed. More and more leading Methodists in the North came to feel that the only way for the church to free itself from responsibility for this evil was to forbid its ministers and members from owning slaves on penalty of excommunication. Southern Methodists were equally sure that if the church took this action it would result in destroying the influence and perhaps the very existence of the church in the slaveholding States, and would certainly bring to a speedy end the great work that was being done by the Methodist church in the South among both slaveholders and their slaves. By 1844 the differences of opinion had become so radical and so irreconcilable that the General Conference authorized a division of the church.

In pursuance of the plan of separation adopted at the General Conference of 1844 representatives of the church chosen by the various annual conferences located in the Southern States met in a convention in Louisville in May, 1845, and with great unanimity organized the Methodist Episcopal church, South. The first quadrennial General Conference of the Methodist Episcopal church, South, convened in Petersburg, Va., in May, 1846, being presided over by Bishop Joshua Soule and Bishop James Osgood Andrew, who had cast in their lot with the Southern church at the time of the division. Rev. William Capers and Rev. Robert Paine were elected to the episcopacy at this conference. This conference took all the steps necessary to put the machinery of the church in running order. About 20 annual conferences and 450,000 communicants fell to the Southern church under the plan of division.

The Articles of Religion, 25 in number, which constitute the basis of Methodist theology in so far as it is in common with that of other Protestant churches, were taken from the Thirty-nine Articles of the Church of England. Among the doctrines peculiarly characteristic of Methodist faith and most emphasized in Methodist preaching may be mentioned the Fatherhood of God, the unlimited atonement of Jesus Christ, the moral free agency and accountability of man, the witness of the Holy Spirit testifying to the regenerate believer of his acceptance with God, the possibility of apostasy, and the attainability by grace of entire holiness. These doctrines are in the published sermons of John Wesley, which are recognized as doctrinal standards, legal or moral, in all branches of Methodism. The preaching of this evangelical type of theology has made Methodism intensely evangelistic, and no branch of world-wide Methodism has shown happier results from the preaching of these doctrines than the Methodist Episcopal church, South.

The most characteristic feature of the polity of the Methodist Episcopal church, South, is the "conference." The work of the church is done largely through its various conferences, of which there are five, as follows: 1. *The Church Conference*, composed of all the members of any local church. 2. *The Quarterly Conference*, which meets four times a year and is composed of the pastor in charge of the church and all the male members of the church holding an official position, such as stewards, trustees, class leaders, superintendents of Sunday school, etc. It attends to all the business affairs of the pastoral charge. The presiding elder is ex-officio chairman of the quarterly conference. 3. *The District Conference*, which meets but once a year and is composed of all pastors having charges in the district and residing within the district and of all local preachers and certain lay delegates elected by each quarterly conference. The district conferences have on an average some 20 or more pastoral charges in them. 4. *The Annual Conference* meets once a year, as the name indicates, is composed of all traveling preachers living and working in its bounds and of certain lay delegates elected annually by the district conferences, and is presided over by a bishop. The bishops meet in May of each year and distribute the annual conferences among themselves, each bishop as a rule having from three to six conferences to preside over. 5. *The General Conference* meets quadrennially and is composed of an equal number of clerical and lay delegates elected by the various annual conferences, the number of delegates which each annual conference is entitled to being determined by its size. The General Conference is the one and only lawmaking body of the church. It is presided over by the bishops in turn. It elects quadrennially the general agents, secretaries, editors, etc., and also elects from time to time as many bishops as may be needed for the general superintendency of the church.

The second most characteristic feature of Methodist church polity is its itinerant ministry. Preachers are distinguished as local and itinerant or traveling. Every traveling preacher must belong to an annual conference and receive his appointment from the presiding bishop annually. A traveling preacher is supposed to give his whole time to the work of the Christian ministry and to receive his support from the church in return for his labor. A local preacher, on the other hand, chooses his own vocation and supports himself, but is supposed to preach only so often as opportunity offers and as he may find it convenient to do so. A traveling preacher cannot be returned to the same pastoral charge more than four successive years. The itinerant system gives every effective traveling preacher a pastoral charge every year and supplies every pastoral charge with a preacher. Bishops hold office for life. They choose their own places of residence, but each bishop receives from his colleagues annually his assignment of annual conferences over which he is to preside for the year.

The general direction of the more important interests of the church is committed to certain "connectional boards," the members and executive officers of which are elected quadrennially by the General Conference. The interests committed to these connectional boards are as follows: (1) Sunday schools; (2) home and foreign missions; (3) education; (4) church extension; (5) young people's organization known as the Epworth League; (6) the board having charge of the publishing interests is known as the Book Committee. The leading publishing house of the church is located in Nashville, Tenn., with branch houses in Dallas, Tex., and Richmond, Va. It is the largest publishing house in the Southern States. All the connectional boards have their headquarters in the publishing house at Nashville, Tenn., except the Church Extension Board, which is located in

Louisville, Ky. The one official volume of the church called *The Doctrines and Discipline of the Methodist Episcopal Church, South*, is published quadrennially, immediately following the General Conference, which body alone has power to alter it. Among the important and influential periodicals issued by the publishing house may be mentioned the *Methodist Review*, published quarterly, and the *Christian Advocate*, issued weekly, while each of the above boards issues a publication devoted mainly to its own interests. The literature of the Sunday-school department is very widely circulated. Most of the annual conferences have well-equipped colleges both for men and for women. The church has recently established theological seminaries at Atlanta, Ga., and Dallas, Tex. There are successful missions in Mexico, Cuba, Brazil, Japan, China, and Korea, with a total membership in all these fields of over 30,000. For figures, see METHODISM.

Organic Union. In 1915 negotiations were under way between the Methodist Episcopal church, the Methodist Episcopal church, South, and the Methodist Protestant church, looking towards the organic union of all three of these churches in one organization which will probably bear the name of the Methodist Church of America.

METHODIST NEW CONNECTION. See METHODISM.

METHODIST PROTESTANT CHURCH. Instituted in 1828 and organized under its present title in 1830, this church traces its origin through the Methodist Episcopal church, back to the Evangelical Reformation begun in England by John and Charles Wesley, of Oxford University, and presbyters of the Church of England. The separation from the mother church grew out of the controversy for the rights of the laity in the lawmaking councils of the church. After years of desultory discussion William S. Stockton began the publication of the *Wesleyan Repository*, which was intended to provide a medium for the more formal examination of what came to be called "the mutual rights of the ministry and laity" and to spread abroad the views of leading ministers and laymen on the subject. This publication was followed in 1824 by a publication called *The Mutual Rights of Ministers and Members of the Methodist Episcopal Church*, with the same general object in view. The views of the reformers were embodied in a formal petition to the General Conference of 1824, but in a curt reply the bishops denied this right of petition. This was followed by the organization of union societies, whose object was to unite the reformers and present to the ensuing General Conference a petition that would obviate the objection made at the previous conference that the reformers were merely scattered agitators with conflicting aims and uncertain objects. In 1827 a general convention of reformers was held in Baltimore, composed of 100 delegates from seven different States, who prepared a memorial to be presented to the next General Conference, praying for the admission of laymen into the legislative councils of the church. After three weeks of deliberation the memorial was denied. This seemed to put an end to the resources of peaceable reform. The protestants again and again professed their loyalty to the church and their strong desire to remain in its communion, but they were soon threatened with expulsion. They were charged with breaking the General Rules of Wesley which forbid "speaking evil of magistrates and ministers." One of the leaders of that day voiced the sentiment of those who opposed the contention of the reformers. "You publish," he said, "the Mutual Rights, and say you will not discontinue that publication. You also say you will not withdraw from the Methodist Episcopal church. Now we are reduced to one of two alternatives, either to let you continue to agitate the church or to expel you." At no time was there a charge of heresy or immorality brought against the reformers. On the other hand, they had been the cherished friends of many of the foremost men in the church, including Bishop Asbury himself.

Those who were expelled were left no alternative but to organize another branch of Methodism. They had no contention with Methodism, but they could not consent to the suppression of their convictions and the privilege of expressing them. They did not object to the episcopacy, but they did protest against the exercise of arbitrary episcopal authority. They sorrowfully took up the task of organizing a Methodist church in conformity with the fundamental principles which Protestantism had bequeathed to the world, and they sought to express these ideas in the name they gave the church. The church was organized without the change of a single word in the doctrines of Methodism. In polity a presbyterial form of government was chosen. The itinerant system for stationing ministers was retained, but ministers were given the right of appeal from the stationing authority if for any reason they thought themselves afflicted by their appointment. There is only one order of ministers recognized in the church. The presiding officers of the conferences are elected every year, though they may be reëlected. It has often been said that there is now little difference between the two Methodisms. The fact is that the real difference is just as great as it ever was, though it is pleasant to note that the differences are no longer a cause of bitterness and bad feeling. The real difference is this: in the Methodist Episcopal church the unit of power is in the bishops; in the Methodist Protestant church the unit of power is in the laity. The laymen, in equal numbers, share in every legislative action and in every election of the church. The church was formally organized in 1830. It now has 32 conferences, 16 mission conferences, 1551 ministers, 648 local preachers, 191,300 members, and church property valued at $7,589,576. It has a well-organized conference in Japan and some mission work in China. It has five colleges and one theological seminary, and has organized boards of missions, education, church extension, and preachers' aid. See METHODISM.

METHO'DIUS (also called EUBULIUS) (?–c. 311). A Greek theologian of the third century, a martyr and Church father. He was Bishop of Olympus in Lycia and perhaps of Tyre. He was a contemporary of Porphyry and suffered martyrdom about 311. Epiphanius calls him "a very learned man and a strenuous asserter of the truth," but he is not mentioned by Eusebius. He vigorously opposed Origen. Of his numerous works, which are mostly dialogues, several exist complete either in Greek or Syriac, the most important being the *Symposium*, a Christian counterpart to Plato's *Symposium*. It is in Migne, *Patrol. Græca*, xviii, and has been edited by Bonwetsch (Leip-

zig, 1891); there is an English translation in the *Ante-Nicene Fathers* (vol. vi). Consult Adolf Harnack, *Geschichte der altchristlichen Litteratur* (Leipzig, 1893), and Bonwetsch, *Die Theologie des Methodius von Olympus* (Berlin, 1903).

METHODIUS. The apostle to the Slavs. See CYRIL AND METHODIUS.

METHOD OF AGREEMENT, OF CONCOMITANT VARIATIONS, OF DIFFERENCE, AND OF RESIDUES, IN LOGIC. See INDUCTION.

METHOD OF CHARACTERISTICS. See CHARACTERISTIC.

METHOD OF EXHAUSTIONS. See EXHAUSTIONS.

METHOD OF LEAST SQUARES. See LEAST SQUARES, METHOD OF.

METHOW. See SALISHAN STOCK.

METHUEN, mē-thū'*e*n. A town in Essex Co., Mass., 30 miles north of Boston, on the Spicket and Merrimac rivers and on the Boston and Maine Railroad (Map: Massachusetts, E 2). It is a beautiful residential town, and has the Nevins Memorial Library, a fine high-school building, and the Nevins Home for Aged and Incurables. There are manufactures of cotton and woolen goods, yarns, etc. The government is administered by town meetings. There are municipal water works. First settled about 1641, Methuen was part of Haverhill until 1725, when it was incorporated as a separate town. Pop., 1900, 7512; 1910, 11,448; 1914 (U. S. est.), 13,123; 1920, 15,189.

METHUEN, měth'ŭ-*e*n, PAUL SANFORD, third BARON (1845–). An English field-marshal, born at Nynehead, Somersetshire, and educated at Eton. He entered the army in 1864 as lieutenant of the Scots Guards; served in the second campaign of the Ashanti War in 1874, and after four years as attaché in Berlin became assistant adjutant general for the Home District in 1881. In the Egyptian War (1882) he was staff officer and quartermaster-general, and in Bechuanaland in 1884–85 he won a C.M.G. From 1892 to 1897 he was commander of the Home District, and on the outbreak of the Boer War was put at the head of the first of Buller's three divisions, to relieve Kimberley. He was entirely unsuccessful in this attempt, being severely checked and wounded at Modder River, and, a week after, Nov. 30, 1899, losing in a frontal attack on Magersfontein nearly 1000 men. He retired to Modder River. Methuen, together with Hunter, formed the left in Lord Roberts's victorious movement on Pretoria in May and June, 1900. In March, 1902, he was captured by De la Rey and Kemp on the way from Vryburg to Lichtenburg. The troops were almost immediately released, and with them Lord Methuen, who had been wounded in the brief engagement. He was commander in chief of the Eastern Command in 1903–08, was general officer commanding in chief in South Africa in 1907–09, and in 1909 was Governor of Natal. In 1910 he was made G.C.V.O., and in 1911 field marshal.

METHUEN TREATY. A treaty concluded May 16, 1703, between England and Portugal. Soon after the outbreak of the War of the Spanish Succession Portugal agreed to support England against France, and hence a formal treaty was negotiated by Sir Paul Methuen, the English Ambassador at Lisbon, by which Portugal was to furnish 28,000 troops; but of these the maritime Powers were to provide maintenance and payment for 13,000, and a force of 12,000 Dutch and English was to protect the Portuguese harbors. Politically this treaty had the effect of making Portugal the devoted political adherent of England for more than a century. In its commercial aspects the treaty is almost still more interesting. The wines of Portugal were to be admitted into England upon the payment of a duty 33½ per cent less than the duty paid upon French wines. For this England received proportionate advantages. The result was that for generations the English gentry were addicted to the drinking of port, the Portuguese wine.

METHU'SELAH. According to Gen. v. 21 ff., son of Enoch, grandson of Jared, and father of Lamech, of the line of the Sethites, who attained to the age of 969 years. In Gen. iv. 18 the name of Lamech's father appears as Methushael, and he is represented as the grandson of Irad, and great-grandson of Enoch, who is here son of Cain. The similarities are so striking that many scholars regard the two lists as only variants of one original genealogy. Methuselah is composed of two elements, *Methu*, 'man,' and *Shelaḥ*, probably the name of a deity; Methushael seems to mean 'man of God.' Two Babylonian lists of antediluvian kings are known to exist. One of them is quoted from Berosus by Eusebius (ed. Schoene, pp. 7 ff., 31 f.). It gives 10 names. The eighth is *Ἀμέμψινος, Amempsinos*, which probably corresponds to an Akkadian *Amel Sin*, 'man of Sin.' This name actually occurs as that of an ancient sage or king in cuneiform inscriptions cited by Zimmern. *Mutu-sha-ili Sin*, 'man of the god Sin,' would be a variant of this name, corresponding exactly with Methushael, if the proper name of the Babylonian god is dropped, as it naturally would be by the Hebrew writer. Shelaḥ, which also occurs in Gen. x. 24, may have been another name for the moon god Sin. Of the other Babylonian list, written in the Sumerian language, we have as yet only a preliminary account by Langdon. It apparently begins with a creation story, gives the names of 10 antediluvian patriarchs, or kings, and then narrates the coming of the deluge whose hero is Tagtug, a name corresponding in meaning to Noah, according to Langdon and Sayce. Consult Hommel in *Proceedings of the Society of Biblical Archæology*, vol. xv (London, 1892–93); Zimmern in Schrader, *Die Keilinschriften und das Alte Testament* (Berlin, 1902); Stephen Langdon, also A. H. Sayce, in *Proceedings of the Society of Biblical Archæology*, vol. xxvii (London, 1914).

METH'Y. The burbot (q.v.).

METH'YL (from Gk. *μέθυ, methy*, mead + *ὕλη, hylē*, wood), CH_3. The simplest univalent radicle found in carbon compounds. See CARBON COMPOUNDS; CHEMISTRY (historical section); TRIPHENYL-METHYL; VALENCY.

METHYL ALCOHOL, WOOD ALCOHOL, or PYROXYLIC SPIRIT, CH_3OH. A colorless liquid having a peculiar aromatic odor. It boils at 64.96° C. (148.93° F.) and mixes with water in all proportions. It is largely used in the manufacture of varnishes and for the preparation of "methylated spirit" (q.v.). Methyl alcohol is one of the products obtained when wood is heated in retorts, out of contact with the air. It is contained in the aqueous portion of the distillate, mixed with pyroligneous (crude acetic) acid, ammonia, acetone, etc. To separate the acid, the mixture is neutralized with slaked lime

and distilled, the acid then remaining fixed as calcium acetate. Ammonia may be eliminated in a similar manner, by adding sulphuric acid and distilling. Further, to separate the alcohol from acetone (which is especially objectionable if the alcohol is to be used in the manufacture of aniline dyes), oxalic acid may be added to the mixture and a gentle heat applied. Methyl alcohol, when brought in contact with oxalic acid, forms the crystalline solid substance called methyl oxalate, while acetone does not react with oxalic acid, and remains in solution. After separating the solid methyl oxalate from the remaining liquid, methyl alcohol may be re-obtained from it by dissolving in potash and distilling. Finally, the alcohol may be freed from water and any remaining impurity by rectification over quicklime. Pure methyl alcohol may also be distilled from commercial wood spirit after the addition of one-tenth of its weight of iodine and just enough caustic soda to decolorize the solution: all the ordinary impurities of wood spirit are thus converted into iodoform. Methyl alcohol forms double compounds with a number of inorganic salts, such as the chlorides of lithium, calcium, and magnesium, and, as Loeb has shown, with the iodide of sodium. When taken into the stomach, wood alcohol acts as a violent poison. A peculiar feature of its toxic action is that a dose insufficient to cause death may cause complete blindness. Methyl alcohol was discovered by Boyle in 1661.

METHYLATED SPIRIT. Ethyl alcohol, or spirit of wine, to which methyl (wood) alcohol has been added to render it unfit for use in beverages. It is used as a cheap substitute for ethyl alcohol, since the manufacture of ordinary alcohol is heavily taxed by most governments. In 1907 the United States, following the example of other countries, removed the tax from alcohol properly denatured or made unfit for drinking, and as the tax of $1.10 per proof gallon (alcohol ½ gal., water ½ gal.) was 10 times the cost of production, a great saving to users and a great extension of the use of alcohol resulted (see Fuel). The formula for the legally denatured or methylated alcohol is 100 parts ethyl alcohol, not less than 90 per cent pure, 10 parts of wood spirits, and ½ part of benzine. This mixture is almost as suitable for general use as a solvent or fuel in burners or engines as pure ethyl alcohol. In cases where this mixture is not suitable, such as the manufacture of certain chemicals and drugs, the law allows the manufacturer to obtain permission to use special denaturants.

METH'YLENE BLUE. An aniline dye, occurring in the form of a bluish, finely crystalline powder with a bronzelike lustre. It is slightly soluble in water, and much more freely upon the addition of alcohol. It is largely used as a stain for pathological and normal tissues and for specimens of blood. It has proved of some value in the treatment of gonorrhœa, and claims are made for it as a substitute for quinine in malaria. See Coal-Tar Colors.

METHYLENE (from *methyl*) **DICHLORIDE**, or Dichloromethane, CH_2Cl_2. A chemical compound of carbon, hydrogen, and chlorine. It can be obtained by the direct action of chlorine gas on methane (marsh gas), or by the action of nascent hydrogen on chloroform. It is a colorless heavy liquid, having a chloroform-like odor and boiling at 40° C. (104° F.). It is a powerful anæsthetic, and has been used as a substitute for chloroform. Its effect on the organism is more even than that of similar anæsthetics. When treated with a methyl-alcoholic solution of ammonia, it is converted into hexamethylene tetramine.

METHYL PYROCATECHIN. See Coal-Tar Colors; Guaiacol.

ME'TIS (Lat., from Gk. *Μῆτις*, counsel). The daughter of Oceanus and Tethys and first wife of Zeus, who devoured her in the fear that the son whom she should bear would be more powerful than himself; from the head of Zeus then sprang the goddess Athena.

METIUS, mā'tē-ụs, Adriaan (1571–1635). A Dutch geometer, born at Alkmaar. The name Metius seems to have been a nickname which he received as a student, but which he kept and which, on account of his prominence, was adopted by his brothers and his father. The latter's name was Adriaan, and hence Metius is also known as Adriaan Adriaanszoon. He studied law and medicine, but later devoted his attention to astronomy, and from 1598 until his death was professor of mathematics at the University of Franeker. His mathematical works include: *Doctrinæ Sphæricæ Libri* (1598); *Astronomiæ Universæ Institutiones* (1605; 2d ed., 1630); *Praxis Nova Geometrica* (1623); *Problemata Astronomica* (1625); *Calendarium Perpetuum* (1627); *Opera Astronomica* (1633); *Arithmeticæ Libri 2, et Geometriæ Libri 6 . . . Trigonometriæ Planorum Methodus* (1626); *De Genuino Utriusque Globi Tractatus* (1624); *Primum Mobile Astronomice, etc.* (1631; 2d ed., 1632–33).

METLAKAHTLA, mĕt'lȧ-kȧ'tlȧ (properly *Matlakhatla*). A mission settlement of Chimesyân or Tsimshiân Indians, on Annette Island, southern Alaska, made a reservation by Act of Congress, March 3, 1896 (Map: Alaska, O 8). The original settlement was some 70 miles farther south, below Port Simpson, on the mainland of British Columbia. Here the Episcopal missionary William Duncan in 1862 established a mission, which within a few months was joined by the whole body of Indians residing near Port Simpson, and prospered so rapidly that in 1886 it had developed into a town of 1500 civilized Indians, with two-story houses, regular streets, a salmon cannery, saw mill, etc., and one of the largest churches in British Columbia. An extensive shawl-weaving industry was also carried on. Unfortunately the British government permitted the imposition of religious and other unacceptable restrictions on the mission, with the result that almost the entire settlement, led by Duncan, abandoned the place and established themselves in 1887 at the present location in United States territory, where they continue to maintain their advanced civilization. Although many of the natives established independent homes outside of the reservation, the colony numbered 602 souls in 1910. In 1913 the United States Bureau of Education, at the request of many of the Indians, opened a government school, which is in part supported by the natives. Consult H. S. Welcome, *Story of Metlakahtla* (New York, 1887), and K. J. Arctander, *Apostle of Alaska* (ib., 1909).

METON'IC CYCLE (so called from its inventor, Meton, who flourished at Athens about 432 B.C.). A cycle of 19 years of 235 lunar months, or 6940 days, at the end of which time the new moon falls on the same day of

the year as it did at the beginning of the cycle, and eclipses recur in nearly the same order. This arises from the circumstance that 19 solar years are nearly equal to 235 lunations, their average values being 6939.68835 and 6939.60249 days respectively. As the Greek states reckoned by lunar months, and on this reckoning depended the recurrence of many religious festivals, while on the other hand certain other rites were connected with the recurrence of the seasons, there was a constant effort to bring the solar year (365 days, 5 hours, 48 minutes, 46 seconds) into accord with the period of 12 lunar months (354 days, 8 hours, 48 minutes, 33.6 seconds). Before Meton the favorite cycle was the Octaëteris (or, as it was sometimes called, Enneateris), of eight years with three intercalary months of 30 days. The inaccuracy thus arising was removed by Meton, who in the period of 19 years inserted seven intercalary months, of which five had 30 and two had 29 days. They were inserted in the 3d, 6th, 8th, 11th, 14th, 17th, and 19th years. The slight inaccuracy that remained was reduced by Callippus about a century later, by combining four Metonic periods into a "great year" of 76 calendar years and omitting one day in the intercalation, obtaining 27,759 days. The details of Meton's cycle are not very clear and there is considerable difference of opinion among scholars in regard to them. Unger places the beginning of Meton's cycle on July 16, 432 B.C.; Oppert on July 28, 433 B.C. It is agreed that the Callippic cycle began June 29, 330 B.C. The Attic calendar, as laid down by Unger, is as follows:

YEAR OF THE CYCLE

MONTHS	I	II	III	IV	V	VI	VII	VIII	IX	X
Hecatombeon	30	29	30	30	29	29	29	30	29	30
Metageitnion	30	30	29	29	30	30	30	29	30	30
Boedromion	29	29	30	30	29	29	29	30	30	29
Pyanepsion	30	30	29	29	30	30	30	29	29	30
Memacterion	29	30	30	30	29	30	29	30	30	29
Poseideon	30	29	29	29	30	29	30	29	29	30
Poseideon II (in leap years)	..	..	30	..	..	30	..	30	..	..
Gamelion	29	30	29	30	29	29	30	29	30	29
Anthesterion	30	29	30	29	30	30	29	30	29	30
Elaphebolion	29	30	30	30	29	29	30	29	30	29
Munychion	30	29	29	29	30	30	29	30	29	30
Thargelion	29	30	30	30	29	29	30	29	30	29
Scirophorion	30	29	29	30	30	30	29	30	29	30
Number of days in a year	355	354	384	355	354	384	354	384	354	355

MONTHS	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX
Hecatombeon	29	29	30	30	30	29	30	30	30
Metageitnion	30	30	29	30	29	30	29	29	29
Boedromion	29	29	30	29	30	29	30	30	30
Pyanepsion	30	30	29	30	30	30	29	29	30
Memacterion	29	29	30	29	29	29	30	30	29
Poseideon	30	30	29	30	30	30	29	29	30
Poseideon II (in leap years)	30	..	..	29	..	..	30	..	29
Gamelion	29	29	30	30	29	29	29	30	30
Anthesterion	30	30	29	29	30	30	30	29	29
Elaphebolion	29	30	30	30	30	30	29	30	30
Munychion	30	29	29	30	30	29	30	29	29
Thargelion	29	30	30	29	29	30	30	30	30
Scirophorion	30	29	29	29	30	29	29	29	29
Number of days in a year	384	354	354	384	355	354	384	354	384

Bibliography. Ideler, *Handbuch der Chronologie* (Berlin, 1825–26); Boeckh, *Zur Geschichte der Mondcyclen der Hellenen* (Leipzig, 1855); id., *Ueber die vierjährigen Sonnenkreise der Alten* (Berlin, 1863); A. Mommsen, *Chronologie* (Leipzig, 1883); A. Schmidt, *Handbuch der griechischen Chronologie* (ib., 1888); Unger, "Zeitrechnung der Griechen und Römer," in Müller's *Handbuch der klassischen Altertumswissenschaft*, vol. i (Munich, 1892); Oppert, in *Compte rendu de l'Académie des Inscriptions et Belles-Lettres* (Paris, 1898). See CALENDAR, first paragraph, at end; GOLDEN NUMBER.

METON'YMY (Gk. *μετωνυμία, metōnumia*, change of name). A figure of rhetoric by which one thing is put for another to which it bears an important relation, as a part for the whole, the effect for the cause, the abstract for the concrete, etc. For example, "*Lying lips* are an abomination to the Lord."

METOPE, mĕt'ō-pē (Lat. *metopa*, from Gk. *μετόπη, metopē*, space between beam ends, from *μετά, meta*, between + *ὀπή, opē*, aperture). The space between the triglyphs (see TRIGLYPH) in the frieze (q.v.) of the Doric order. As this space in the developed Greek architecture is always filled by a slab, usually relatively thin, the name is generally applied to the slab. This was often decorated with sculpture in high relief, as in the Parthenon (q.v.), at Olympia (q.v.), and at Selinus (q.v.), or with painting. Even where sculpture was used, the background and the relief seem to have been painted in contrasting colors. Consult E. A. Gardner, *A Handbook of Greek Sculpture* (London, 1911), and P. Gardner, *The Principles of Greek Art* (ib., 1914).

ME'TRE. In music, the division of a composition into parts whose rhythm is similar and whose time is equal. The smallest element in metre is the *measure* (q.v.); a *section* comprises two measures, and two sections make a *phrase*. The largest division is the *period*, which consists of two phrases. Theoretically metre differs from rhythm in that the latter deals with accents and

with actual and typical patterns which metre arranges in groups in accordance with their time-value. But this definition is not universally accepted, and exactly *opposite* significations are often given to the two terms.

METRE. A designation applied without great precision to measured or rhythmic language called verse; also the rhythmical measure of verse. In those languages whose versification depends not only on the number of feet in a line, but also on the length of the syllable or syllables in each foot, metre designates both the character of the line as a whole and that of the feet composing the line. This is true, e.g., of Latin and of Greek. In such languages as do not depend on the length of individual syllables for their verse systems, metre applies to the number of stresses or beats in a line, or on the number of counted syllables. This is true, e.g., of the Germanic and the Romance languages, although attempts have been made to employ long and short syllables as in the ancient languages. See VERSIFICATION.

MET'RICAL FOOT. In versification, the designation of the rhythmical unit in a verse. In Greek or Latin poetry this unit may be composed of one or more syllables, all long, or short and long, in various arrangements, as the *spondee, dactyl, anapœst,* etc. In the Germanic and Romance languages the unit may be a single stressed syllable, or a combination of a stressed and one or more unstressed syllables. The metrical foot is marked here not by quantity of individual syllables, but simply by this accentuation or stressing, which corresponds with the regular accentual system of the language, and not necessarily, as in Greek or Roman poetry, with a long syllable. See VERSIFICATION.

MET'RIC SYSTEM (from Lat. *metrum,* from Gk. *μέτρον, metron,* measure, from *μετρεῖν, metrein,* to measure). A system of weights and measures invented by the French in the latter part of the eighteenth century. From earliest times, civilized people have possessed two ideas concerning their standards of weights and measures: that they should be invariable, and that their prototype should be found in nature. From the earliest times great diversity in the kinds of units and in the size of the same units has always characterized systems of measures. As early as 1558 Henry II tried to correct the standard units of France, and a Gabriel Mouton, vicar of St. Paul at Lyons, proposed in 1670 a comprehensive decimal system remarkably similar to the metric system of to-day, while other propositions were made for scientific and natural weights and measures in France. But not until 1790 did the French government undertake the making of a new system. For this purpose a committee of the Academy of Sciences was appointed under the authority of the National Assembly and sanctioned by Louis XVI, and an interesting feature of the plan was that Great Britain also should concur in the determination of a natural unit of weights and measures. The committee consisted of Borda, Lagrange, Laplace, Monge, and Condorcet. Of the three linear bases proposed, the length of a seconds pendulum, a quadrant of the terrestrial equator, and a quadrant of a terrestrial meridian, the committee reported in favor of the last, one ten-millionth of which should be the standard unit of linear measure. Delambre and Méchain were appointed to measure the meridional distance from Dunkirk to Barcelona, the same task which Cassini had undertaken in 1669. This work, difficult in itself, was made the more so by the political revolutions of the times, and required seven years for its completion. The finally computed length of the terrestrial quadrant was in part verified by a comparison with a similar result found by Bouguer and La Condamine in Peru (1736). The length, expressed in English measure, is 32,808,992 feet. Sir John Herschel later estimated the quadrant to be 32,813,000 feet, which made the meter $\frac{1}{208}$ of an inch shorter than one ten-millionth of a meridional quadrant. In 1793 a temporary commission of 12 was appointed, with Borda as president, to make a comparison of all the units then used in France, and to determine the kinds and composition of the metals to be used in constructing the new standard units, their forms of construction, and finally the place and means of their preservation. In 1798 the European states were invited to send representatives to a conference at Paris, the object being to examine the work executed during the preceding eight years by the various commissions. Nine states responded. Their delegates, together with the 10 French commissioners, were divided into committees, which reviewed the work so far accomplished.

On June 22, 1799, the standard units, the meter and kilogram, duly made by expert scientists and instrument makers, were presented to the Council of Five Hundred, and deposited in the archives at Paris. In December of the same year the Council adopted these standards. The use of the new system, however, was not made obligatory in all departments until 1837.

The hope of the inventors of the metric system, that it would become the universal system of all civilized nations, seems likely to be realized, for its use has been made obligatory in Germany, Austria-Hungary, Belgium, Brazil, Chile, Argentina, Spain, France, Greece, Italy, Mexico, the Netherlands, Peru, Portugal, Rumania, Servia, Norway and Sweden, Switzerland, Bulgaria, Siam, and Uruguay; its use has been legalized in Egypt, the United States, Great Britain, Japan, Russia, Turkey, Bolivia, Canada, China, Paraguay, and Venezuela. Several attempts have been made to introduce the metric system in the United States or to adopt a similar system. On Jan. 15, 1790, Congress ordered the Secretary of State, Thomas Jefferson, to prepare a uniform system of weights and measures. Jefferson, who had been Minister to France, reported, on July 14, a system founded on the length of a seconds pendulum in the mean latitude of the United States (38°), or in the latitude of 45°. But the English system was not disturbed. Again, in 1821, Congress sought to revise the system of weights and measures, and John Quincy Adams, Secretary of State, recommended in the strongest terms the adoption of the metric system.

In 1866 the law which made the metric system legal in the United States was passed, and the meter was legally and officially defined as equivalent to 39.37 inches, from which conversely by reference to the international standard of length the customary units of length in the United States are now derived. The same legislation directed that the 5-cent piece should weigh five grams and have a diameter of two centimeters; that the unit for weighing letters in post offices should be the gram. But these

details were imperfectly carried out. The use of units in electrical engineering, based on the metric system, was determined by the law of 1894. Bills have been introduced to the House of Representatives several times, proposing to make the metric system obligatory. Although compulsory legislation may not be immediate in the United States, the adoption of the metric system is constantly extending, as shown by its use in weighing foreign mail matter, in weighing at the mints, in certain government publications, in the Pharmacopœia and the Dispensatory, in base measurements and the computations of the Coast and Geodetic Survey, and in much of the work of the arts and sciences, especially in electrical engineering.

The basal units of the metric system are: for length the meter, for small surfaces the square meter, for area of land the square dekameter (or are), for volume the cubic meter, for capacity the liter, and for weight the gram. The scale selected for the multiples and subdivisions of the various units is 10. The prefixes used to designate the multiples of the measuring unit are deka (10), hekto (100), kilo (1000), and myria (10,000), all from the Greek, and those used to designate subdivisions are deci (0.1), centi (0.01), and milli (0.001), from the Latin.

The ratio between the successive denominations in the system of linear measure, of weight, of capacity, and of money is 10, the ratio between the successive denominations of surface measure is 100, and that of cubic measure is 1000. The unit of capacity, the liter, is equal to a cubic decimeter, and approximately so to the volume of a kilogram of water at the maximum density. Its equivalent is 1.05671 liquid quarts (United States) or 0.8799 liquid quart (British). The unit of weight, the gram, is the mass weight of one cubic centimeter of water, standard pure, at the maximum density. Its equivalent in the English system is 15.432356 grains.

Note should be taken that in the following tables where equivalents are given the United States customary measures are stated, not the Imperial measures of Great Britain, which in the case of the gallon, bushel, etc., differ considerably.

TABLE OF LINEAR MEASURE

A myriameter	= 10,000	meters
A kilometer (km)	= 1,000	"
A hektometer	= 100	"
A dekameter	= 10	"
Meter (m)		
A decimeter (dm)	= 0.1	meter
A centimeter (cm)	= 0.01	"
A millimeter (mm)	= 0.001	"
A micron (μ)	= 0.000001	"

TABLE OF SQUARE MEASURE

A square myriameter	= 100,000,000 square meters
" kilometer (km².)	= 1,000,000 "
" hektometer or hektare	= 10,000 "
" dekameter or are (a)	= 100 "
Square meter (m²)	
A square decimeter (dm²)	= 0.01 of a square meter
" centimeter (cm²)	= 0.0001 "
" millimeter (mm²)	= 0.000001 "

TABLE OF CUBIC MEASURE

A cubic myriameter	= 10^{12} cubic meters
" kilometer	= 10^{9} "
" hektometer	= 1,000,000 "
" dekameter	= 1,000 "
Cubic meter (m³).	
A cubic decimeter (dm³)	=0.001 of a cubic meter
" centimeter (cm³)	=0.000001 "
" millimeter (mm³)	=0.000000001 "

A cubic meter is also called a *stere*, a unit used in measuring wood.

TABLE OF WEIGHTS

A metric ton (t)	= 1,000,000	grams	= 1,000 kilograms
A quintal (q)	= 100,000	"	= 100 "
A myriagram	= 10,000	"	= 10 "
A kilogram (kg)	= 1,000	"	
A hektogram	= 100	"	
A dekagram	= 10	"	
Gram (g)			
A decigram (dg)	= 0.1	gram	
A centigram (cg)	= 0.01	"	
A milligram (mg)	= 0.001	"	
A mikrogram (γ)	= 0.000001	"	

A metric or international *carat*, used in weighing diamonds, is 200 milligrams, and this international unit was adopted in the United States in 1913.

TABLE OF CAPACITY

A hektoliter (hl)	= 100	liters
A dekaliter (dkl)	= 10	"
Liter (l)		
A deciliter (dl)	= 0.1	liter
A centiliter (cl)	= 0.01	"
A milliliter (ml)	= 0.001	"
A mikroliter (λ)	= 0.000001	"

APPROXIMATE EQUIVALENTS

A meter	= 39.37 inches = 3¼ feet
A kilometer	= ⅝ of a mile
A liter	= 1 United States liquid quart
A kilogram	= 2⅕ pounds avoirdupois
A gram	= 15½ grains
A hectare	= 2½ acres
A square meter	= 10¾ square feet

MORE NEARLY ACCURATE EQUIVALENTS

LENGTH

	Inches	Feet	Yards	Fath's	Miles
Millimeter	0.03937	0.003	0.001		
Centimeter	0.39370	0.033	0.011	0.005	
Decimeter	3.93700	0.328	0.109	0.055	
Meter	39.37000	3.281	1.093	0.547	
Kilometer	39370.00000	3280.833	1093.611	546.817	0.621

CAPACITY

	Cubic in.	Cubic ft.	Dry quarts	U. S. gallons	U. S. bush.
Milliliter	0.06103		0.001		
Centiliter	0.61025		0.009	0.003	
Deciliter	6.10250	0.003	0.091	0.0264	0.003
Liter	61.0250	0.035	0.908	0.26418	0.028
Hektoliter	6102.5000	3.531	90.8102	26.4178	2.83774

MASS

	Grains	Troy oz.	Avoir. lb.
Gram	15.432 36	0.032	0.002
Kilogram	15432.356	32.1501	2.205

SQUARE MEASURE

	Square feet	Sq. yards	Acres
Centare	10.76387	1.196	
Are	1076.38	119.599	0.025
Hektare	107,638.7	11,959.85	2.471

TABLE FOR REDUCING FROM ONE SYSTEM TO THE OTHER

(The figures in heavier type represent either of the two columns beside them, as the case may be, viz., with hektares and acres in the first set of columns, 1 acre = 0.405 hektare, and vice versa 1 hektare = 2.471 acres, and so on.)

Meter		Yard	Kilogr.		Lb. avoir.	Liter		U. S. galls.
0.914	**1**	1.094	0.454	**1**	2.20	3.785	**1**	0.264
1.829	**2**	2.187	0.907	**2**	4.41	7.571	**2**	0.528
2.743	**3**	3.281	1.361	**3**	6.61	11.356	**3**	0.793
3.658	**4**	4.374	1.814	**4**	8.82	15.141	**4**	1.057
4.572	**5**	5.465	2.268	**5**	11.02	18.927	**5**	1.321
5.486	**6**	6.562	2.722	**6**	13.23	22.712	**6**	1.585
6.401	**7**	7.655	3.175	**7**	15.43	26.497	**7**	1.849
7.315	**8**	8.749	3.629	**8**	17.64	30.283	**8**	2.113
8.230	**9**	9.843	4.082	**9**	19.84	34.068	**9**	2.378
9.144	**10**	10.936	4.536	**10**	22.05	37.853	**10**	2.642

Hektare		Acre	Kilometer		Eng. miles	Square Kilometer		Eng. miles
0.405	**1**	2.471	1.609	**1**	0.621	2.590	**1**	0.386
0.809	**2**	4.942	3.219	**2**	1.243	5.180	**2**	0.772
1.214	**3**	7.413	4.828	**3**	1.864	7.770	**3**	1.158
1.619	**4**	9.884	6.437	**4**	2.485	10.360	**4**	1.544
2.023	**5**	12.355	8.047	**5**	3.107	12.949	**5**	1.931
2.428	**6**	14.826	9.656	**6**	3.728	15.539	**6**	2.317
2.833	**7**	17.297	11.265	**7**	4.350	18.129	**7**	2.703
3.238	**8**	19.768	12.875	**8**	4.971	20.719	**8**	3.089
3.642	**9**	22.239	14.484	**9**	5.592	23.309	**9**	3.475
4.047	**10**	24.710	16.093	**10**	6.214	25.899	**10**	3.861

The advantages of the metric system over the English-American system are numerous. Although, in both systems, the standard units of volume, capacity, and weight are directly connected with the standard unit of measure, the relation in the metric system is far more simple. Thus, in the usual system one United States liquid quart has a volume of 57¾ cubic inches, while in the metric system one liter has the volume of one cubic decimeter; in the English system the pound has the weight of about 0.0156 of a cubic foot of water at the standard temperature, while in the metric system one gram has the weight of one cubic centimeter. Although the names used in the metric system are generally longer than the names used in the English-American system, the nomenclature of the former has several advantages. Thus, the prefixes deci, centi, milli, deka, hekto, kilo have in point of derivation a numerical significance and have other applications in the language, while the names inch, foot, yard, rod, and mile are devoid of numerical significance and are distinctive in their use. But the greatest advantage of all results from the use of a uniform scale of relation. In the English-American system seldom do more than two units in succession have the same scale. Thus, in the metric system, 10 centimeters = 1 decimeter, 10 decimeters = 1 meter, . . . , the ratio being always 10; while in the English system, 12 inches = 1 foot, 3 feet = 1 yard, 5½ yards = 1 rod, . . . , the ratio changing between every pair of units. The French Commission of 1790 reported in favor of the decimal scale for reasons of expediency, although admitting that the uniform scale of 12 possessed many advantages.

The metric system was once thought to be superior to all other systems of weights and measures in being founded on an invariable magnitude, one ten-millionth of a terrestrial quadrant. But science dispelled this illusion by showing that this magnitude is not a constant and that the distance originally taken as the basis of the meter was inaccurately measured. The unit distance is now defined as equivalent to the distance between terminal lines on the international prototype meter, a bar of platinum iridium at the International Bureau of Weights and Measures near Sèvres and measured when at the temperature of melting ice (0° C.). Through the researches of Professor A. A. Michelson (q.v.) its length is now known in the terms of the wave length of light, thus making the standard distance replaceable and independent of the prototype standard.

In 1840 the French government conceived the idea of exchanging sets of the metric units for sets of the units of other nations in order to promote an international interest in the metric system. The international expositions at London (1851) and at Paris (1855) were, on account of the immense variety and confusion of metrical units, the first practical demonstrations of the need of a universal decimal system of weights and measures. At the Paris Exposition of 1867 a committee, representing several different nations, was appointed to consider the question of uniformity, and was called the Committee of Weights, Measures, and Moneys. Mathieu was the president of this commission. The committee recommended instruction in the metric system in the public schools and its use in governmental departments and in scientific publications. The Geodetic Association, which met at Berlin in 1867, was also representative of several nations, and likewise favored the general adoption of the metric system. In the year 1869 a committee of the Academy of Sciences at Paris and one of the St. Petersburg Academy recommended the convocation of an international commission, which should consider the means of providing all nations with sets of standard metric units. Such a commission was invited by the French government, and assembled at Paris in 1870. Twenty-four countries responded by sending delegates, Joseph Henry and Julius E. Hilgard representing the United States. This body was divided into committees, the most active one being the French section, during the interval of suspended operations during the Franco-Prussian War. This committee deliberated and consulted for the purpose of devising means for copying the standards preserved in the archives. Some of the questions which concerned the committee were the composition of the metal to be used in constructing the new unit of length, the most desirable form of cross section, ways of expressing the length, as the distance between the ends, or between two fine lines made on the bar, means of comparing the new unit with the standard of the Archives, means for determining its variation due to changes in temperature, and other considerations. The International Committee reassembled in 1872 and it was duly proposed that an international bureau of weights and measures be located at Paris, the definite conception of the International Bureau being later decided upon at the diplomatic conference of 1875. At the second meeting of the International Commission in 1872 it was decided to make the standard meter and the standard kilogram of the Archives the actual bases for the new standards. In order to give the work of the commission the character of an international act, its members so far being simply citizens of their respective countries, the French government invited plenipotentiaries and delegates from all the nations interested. Representatives

from 20 states assembled at Paris (1875) to constitute the Diplomatic Conference of the Meter. E. B. Washburne acted as plenipotentiary and H. Vignaud as delegate for the United States. The Observatory of the International Bureau, decided upon by this conference, was completed in 1878. It stands at the entrance of the park of St. Cloud, near Sèvres, on a reservation presented by the French government. The management of the Bureau reposes in the International Committee under the authority of the General Conference. In the Observatory are kept the instruments used in the determination of the international standards, the chief of which are the comparators, balances, and thermometers. The extent of the demands upon this Bureau may be inferred from the fact that, by 1913, 25 different countries had formally sanctioned the national prototype standards received from the International Bureau and known in terms of the international prototype. The meters are highly polished metal bars made of an alloy of platinum and iridium, and the kilograms are cylinders of the same material.

Bibliography. For an outline history of the metric system, with its present status, its equivalents, and particularly for a full bibliography bearing on its development, consult Hallock and Wade, *Evolution of Weights and Measures and the Metric System* (New York, 1906); a complete history in which the founding of the International Bureau of Weights and Measures is discussed is Bigourdan, *Le système métrique des poids et mesures* (Paris, 1901); an excellent work in small compass is Ch. Ed. Guillaume, *Unités et Etalons* (ib., 1893); as is also his *La Convention du mètre et le Bureau International des Poids et Mesures* (ib., 1902); id., *Les récents progrès du Système Metrique*, various reports, notably those of 1907 and 1913 (ib., 1907–13); also Fonvielle, *Le mètre international définitif* (Paris, 1875); Barnard, *Metric System* (3d ed., Boston, 1879); Potts, *Elementary Arithmetic* (London, 1886); Bassot, *School of Mines Quarterly* (New York, 1901), and various publications of the International Bureau of Weights and Measures and the United States Bureau of Standards (Washington), particularly for equivalents *Circular No. 47* (Washington, 1914). In opposition to the introduction of the Metric System into the United States and Great Britain much has been written, among which might be mentioned Halsey and Dale, *The Metric Fallacy* (New York, 1903), and various papers in the *Transactions* of the American Society of Mechanical Engineers (ib., annually). See WEIGHTS AND MEASURES.

MET'RONOME (from Gk. *μέτρον, metron*, measure + *νόμος, nomos*, law). A small machine for indicating the correct time or speed at which a musical composition should be played. It was invented in 1816, and consists of a pendulum, actuated by clockwork, which swings in front of a graduated scale. To the upper part of the pendulum-rod is attached a movable weight which can be set at any figure indicated by the scale. The figure 60 means that when the weight is set there the pendulum swings 60 times a minute. Thus it beats exact seconds. When set at 120 it beats half seconds. The metronome indication appears always at the beginning of a composition. M. M. (Mälzel's metronome, from its reputed inventor, Mälzel) ♩ = 80 means that the tempo must be taken so that 80 half notes fill the space of one minute. The indications differ with the tempo and time of each composition. A work written as allegro in common time might be indicated: M. M. ♩ = 100; allegro in alla breve: M. M. 𝅗𝅥 = 100; adagio in 𝄢: M. M. ♪ = 66; scherzo (Presto $\frac{3}{4}$): M. M. 𝅗𝅥. = 120. By means of the metronome the composer is enabled to give the minutest directions in respect to the tempo, for the old terms allegro, andante, presto, etc., can only serve as *approximate* indications, leaving much to the temperament of the individual performer. The metronome is of the greatest value and is much used to-day in training beginners to play strictly in time.

METROP'OLIS. A city and the county seat of Massac Co., Ill., 38 miles by river east by north of Cairo, on the Ohio River and on the Illinois Central and the Chicago, Burlington, and Quincy railroads (Map: Illinois, G 11). It is built on a high bluff which slopes gradually towards the river. A fine railroad bridge has been erected recently at this point. There are three city parks, a Carnegie library, hospital, the beautiful Fort Massac State Park, sanatorium, and fine Odd Fellows' Temple, courthouse, music hall, and city hall buildings. There are potteries, saw and planing mills, flour mills, veneer, box, stave, heading, spoke, automobile parts, and basket factories, a fluorspar separating and refining plant, tie-treating plant, bottling works, and large lumber interests. There are extensive deposits of potters' clay in the vicinity. The government is administered by a mayor, elected every two years, and a unicameral council. The city owns and operates the water works and electric-light plant. Metropolis is built on the site of old Fort Massac, which was settled about 1700 by French and Indians, but was not permanently inhabited until 1838; five years later it was incorporated. Pop., 1900, 4069; 1910, 4655.

MET'ROPOL'ITAN (Lat. *metropolitanus*, MGk. *μητροπολίτες, mētropolites*, from *μητρόπολις, mētropolis*, a capital city, from *μήτηρ, mētēr*, mother + *πόλις, polis*, city). An ecclesiastical title, in modern times practically equivalent to archbishop (q.v.). It arose from the early custom of giving precedence to the bishop of the chief city or metropolis of a province. In some of the English colonies where the title of archbishop is not used by the Anglican church, that of metropolitan is applied to the chief bishop of a province. For the prerogatives of metropolitans in canon law, consult Owen, *Institutes of Canon Law* (London, 1884).

METROPOLITAN MUSEUM OF ART. The principal art museum of New York and the largest and most important in the United States. At a public meeting held Nov. 23, 1869, a committee of 50 was appointed to organize the project and raise an endowment of $250,000. On Jan. 31, 1870, the first trustees and officers were elected with John Taylor Johnson as president. A charter was secured on April 13 of the same year. On April 5, 1871, a legislature, dominated by William H. Tweed, appropriated $500,000 for a building in Central Park and defined the relation of the museum to the city. The earliest home of the museum (1871–73) was the Dodworth building, 681 Fifth Avenue, then the Douglas mansion, until the completion of the building in Central Park in 1879. The central portion of the Fifth Avenue front, after the designs of Richard Morris Hunt, was completed in 1902 at the cost of $1,200,000 to the city. In

1904 a further appropriation of $1,250,000 was made for the north part of the Fifth Avenue front, after the designs of McKim, Mead, and White. Further extensions were made under the law of 1907, authorizing the expenditure of $750,000 a year for ten years. The new buildings are of classical design in light gray stone, and their total cost when completed is estimated at $20,000,000. The museum is governed by a board of trustees, selected from certain of its fellows. The corporation is composed of fellows and members of various degrees, according to the amount of their yearly contribution, the total membership for 1914 being 3169. It is administered by a regular staff, composed of a director, secretary, treasurer, curators of the different departments and their assistants, and the librarian with staff. The cost of its administration in 1914 was $461,555.39, to which the city contributed its yearly quota of $200,000. The long administration of General di Cesnola (q.v.), as director (1879–1904), was conservative in character; but with the presidency of J. Pierpont Morgan (q.v.) (1904–13), a broad policy of expansion and popularization of the museum's activities began.

The art treasures of the museum, which are classified in different departments, form, with the loans exhibited, a collection of the first rank. The department of paintings is especially rich in Flemish, Dutch, Old English, French, and American masters. Its nucleus, a collection, chiefly of Dutch and Flemish masters, was acquired in 1871 for $116,180.27. It was enriched by the Catherine Lorillard Wolfe Collection bequest of modern European paintings, with an endowment of $200,000 for further purchases; the small but exceedingly valuable collections of old masters donated by Henry G. Marquand, second president of the museum; the Vanderbilt loan of 135 paintings of the last half of the nineteenth century, chiefly French (Barbizon) masters, made in 1902 but indefinitely renewed; the Hearn collection (1905), rich in American pictures, with funds aggregating $250,000 for further purchases of American paintings; the Altman collection (see below); and the pictures bequeathed in 1915 by Mrs. Morris K. Jesup, with $50,000 for maintenance and $150,000 for the encouragement of American painting.

The most important feature of the department of classical art is the Cesnola collection of Cypriote antiquities, the largest and most important of its kind in the world, purchased in 1874 for the nominal sum of $60,000. Among the other treasures of this department is an Etruscan bronze chariot of the sixth century B.C.; many Greek and Roman marbles and bronzes, including a remarkable statue of an Imperial prince of the Julio-Claudian family, a Greek work of the first century A.D., purchased in 1915; excellent collections of Greek terra cottas, vases, and ancient glass; and a splendid collection of Rodin's sculptures, donated chiefly by Thomas F. Ryan. The department includes also an important representative collection of Chinese paintings. The department of Egyptian antiquities, organized in 1906, has conducted many excavations at Lisht, Kharga, and Thebes, the results of which form a representative collection, especially rich in the art of the Middle Kingdom. The department of decorative arts, founded in 1910, is housed in a wing built especially for the purpose, in rooms chronologically arranged, with the remarkable Hoentschel collection, donated and in part loaned by J. P. Morgan as its nucleus. It includes fine examples of sculpture, particularly of the French Gothic and the Italian Renaissance periods. The department of arms and armor was made one of the most important in the world by the acquisition of the William H. Riggs collection of mediæval armor in 1914. The library, which occupies a wing especially built for this purpose, is one of the best art libraries in the United States, and contains 30,000 volumes and nearly 40,000 photographs and other reproductions, including 600 Japanese prints.

Besides the above, the museum has received other important legacies; including the John Crosby Brown collection of musical instruments in 1899; the Jacob H. Rogers bequest of about $7,000,000 in 1901, for the purchase of art objects and books; the Heber Bishop collection of jade in 1902; an unconditional bequest of $1,000,000 by Francis L. Leland in 1912; the Benjamin J. Altman (q.v.) collection, small, exceedingly good in quality, and especially rich in Dutch paintings, Italian sculpture, and Chinese porcelains. The museum also possesses an important collection of plaster casts of architectural and sculptural subjects. The museum organizes temporary exhibitions of importance, such as the Hudson-Fulton Memorial Exhibition of Dutch painting and early American art in 1909. It coöperates with the universities and public schools, offers lectures, and seeks in every way to promote the diffusion of art. After Mr. Morgan's death, Robert W. De Forest (q.v.) was elected president. The directors since General di Cesnola have been Sir Caspar Purdon Clarke (1905–10) and Edward Robinson (1910–) (qq.v.). Consult: W. E. Howe, *A History of the Metropolitan Museum* (New York, 1913); the monthly *Bulletin;* and the various catalogues and handbooks of the different departments and collections published by the museum.

METRORRHAGIA. See MENSTRUATION.

METSU, mĕt'sụ, or **METZU,** GABRIEL (c.1630–67). A leading Dutch genre painter. He was born in Leyden in 1630, or possibly 1629, and is thought to have been a pupil of Gerard Dou. In 1648 he had acquired sufficient reputation to become one of the first members of the Painters' Guild of his native place, and between 1654 and 1657 he removed to Amsterdam, where he died in October, 1667. He painted scenes from the life of the burgher classes, although occasionally, in his market scenes and kitchen maids, he deals with humbler life. He also occasionally treated mythological and religious subjects, but with less success. In refinement of drawing and grace of expression he ranks among the best of the Dutch school. His pictures are characterized by smooth and polished technique, delicate treatment, and picturesque composition; they rarely contain more than three figures and have none of the boisterous action of Jan Steen; but the heads are animated and express cheerfulness and good humor; the color is clear and harmonious, with a tendency to coolness in his later work. Though often reminding us of one or another of his great contemporaries, Metsu's style always remained distinctly individual. His principal paintings include: "The Lady at the Harpsichord," in the Petit Palais, Paris; "The Music Lesson" and "Amsterdam Market," in the Louvre; "Music Lovers" and "The Mother with the Sick Child," in the Stiengracht collection at The Hague; "The Duet," in the National Gallery,

London; "The Sleeping Sportsman," in the Wallace collection, London; "The Music Lesson" (1659) and "A Visit to the Nursery," both in the Metropolitan Museum, New York; "Feast of the King of Beans," in which there is a touch of Jan Steen's humor, in the Pinakothek at Munich; "Old Poultry Peddler" (1662) and the "Young Woman Selling Poultry," both in the Dresden Gallery; "The Hay Barn," in the Johnson collection, Philadelphia. Consult: *Masters in Art*, vol. vii (Boston, 1906), containing an exhaustive bibliography; Hofstede de Groot, *Catalogue of Dutch Painters*, vol. i (London, 1908); Wilhelm Bode, *Great Masters of Dutch and Flemish Painting* (ib., 1909).

METSYS, QUINTEN. See MATSYS, QUINTEN.

METTERNICH, mĕt'tĕr-nĭk, CLEMENS WENZEL NEPOMUK LOTHAR, PRINCE (1773–1859). An Austrian statesman. He was born at Coblenz, May 15, 1773, being the son of Franz Georg Karl, Count von Metternich, an Austrian diplomat and an associate of Kaunitz. Young Metternich was educated at the University of Strassburg, and afterward studied law at Mainz and traveled in England. In 1795 he married the granddaughter of Kaunitz, by whom he acquired large estates. His diplomatic career commenced at the Congress of Rastadt (1797–99), which he attended as representative of the Westphalian lordly houses. In 1801 he became Austrian Ambassador at Dresden, and two years later was appointed Ambassador to the Prussian court, where he negotiated the treaty of alliance between Austria, Prussia, and Russia against France in 1805. In 1806 he went as Ambassador to Paris. In 1809 he succeeded Count Stadion as Minister of Foreign Affairs, concluded the Treaty of Schönbrunn with France, and was instrumental in bringing about the marriage of the Archduchess Maria Louisa to Napoleon. He guided the course of Austria amid the difficulties of 1812–13. He maintained at first a temporizing policy and a scheme of armed mediation by Austria; but the arrogance of Napoleon's demands and the personal humiliations to which he was subjected at his famous interview with the French Emperor in Dresden in June, 1813, led him to resolve upon the declaration of war by Austria against France, and he subsequently conducted with great ability the negotiations which ended in the completion of the Quadruple Alliance. He was afterward employed in almost all the chief diplomatic affairs of that eventful time. With little concern for the cause of German nationality, which animated so largely the Prussians during the War of Liberation, Metternich during the last two years of Napoleon's power pursued a policy aiming at the advancement solely of Austrian interests. Fearing lest the defeat of France should raise up powerful rivals for Austria in Russia and Prussia, he exerted himself to preserve for France its ancient boundaries, pursuing that end ostensibly in order to preserve the balance of power in Europe. With masterly diplomacy he succeeded in imposing his policy on the allies, represented Austria in the Congress of Châtillon in February and March, 1814, and participated in the deliberations leading to the Treaty of Paris. In June he visited England and formed a new Quadruple Alliance for the preservation of the peace of Europe. As presiding officer of the Congress of Vienna he exercised a preponderating influence on the deliberations of that body, and succeeded in gaining for Austria a dominant position among the Powers of Europe, with her interests supreme in Germany and Italy. After the Congress of Vienna he became the leading statesman of Europe, and the period 1815–48 is sometimes called the "Age of Metternich." He was the inspiring genius of the reactionary policy of the Restoration period. Crafty and cynical, having no sympathy with the aspirations of the people, his schemes were all directed to restoring the old order as far as possible. In 1821 he was made Austrian Chancellor. With his customary astuteness he made use of the Holy Alliance (q.v.), organized by Alexander of Russia to further the cause of Christian peace, as an instrument for the repression of all liberal or national movements. Under his inspiration congresses were held at Karlsbad (1819), Troppau (1820), Laibach (1821), and Verona (1822), at which action was taken against the Burschenschaft and the freedom of the press in Germany, the national movement in Italy, and the struggle for constitutionalism in Spain. He consistently opposed the Greek movement for independence, but there Russia refused to follow him. With time his influence over the French and Russian courts disappeared, but in Germany and Italy the reactionary policy of Metternich remained unabated until 1848. The revolutionary movement of that year, however, breaking forth with sudden violence, ended Metternich's system and caused the aged minister to flee from Austria (March, 1848) and to seek refuge in England and Belgium; nor did he return to Vienna till the end of 1851, when he received great marks of honor and favor from the Emperor; but, although sometimes consulted, he was never again asked to undertake the cares of office. He died at Vienna, June 11, 1859. His writings, under the title *Aus Metternichs nachgelassenen Papieren*, were published by his son, Prince Richard (8 vols., Vienna, 1880–84; in English translation under the title of *Memoirs*).

Bibliography. Albert Sorel, in *L'Europe et la révolution française*, gives a good sketch of Metternich and his political system. Consult also: writings by Friedrich von Gentz (q.v.); Gross-Hoffinger, *Fürst Metternich und das österreichische Staatssystem* (Leipzig, 1846); Beer, "Fürst Clemens Metternich," in *Der Neue Plutarch*, vol. v (ib., 1877); Wilhelm Oncken, *Oesterreich und Preussen im Befreiungskriege* (2 vols., Berlin, 1876–79); A. Prokesch-Osten, *Aus dem Nachlass van Prokesch-Osten* (Vienna, 1881); Malleson, *Life of Prince Metternich* (New York, 1888); Mazade, *Un chancelier d'ancien régime: le règne diplomatique de M. de Metternich* (Paris, 1889); Demelitsch, *Metternich und seine auswärtige Politik* (Stuttgart, 1898); *Cambridge Modern History*, vol. xi (New York, 1909); G. A. C. Sandeman, *Metternich, Life and Career* (ib., 1911); Oscar Browning, *History of the Modern World*, vol. i (London, 1912). See AUSTRIA-HUNGARY; VIENNA, CONGRESS OF; CARLSBAD DECREES.

METTEYA. See MAITREYA.

METTRAY, mĕ'trâ'. A great agricultural and industrial colony (reformatory) at Mettray, near Tours, France, which has for years been looked upon as the model of all such institutions. It was founded in 1839 by Mettray Demetz and Bretignières de Courteilles, who had gotten their inspiration from America. The object was to keep young boys out of the regular prisons and to teach them, in addition to common school branches, trades and agriculture. Boys of the

better classes who are sent by their parents to the school are kept separately in the "maison paternelle" and spend their time in study. In 1899 the colony contained 450 boys. After the boys leave the institution a supervision is maintained over them. See *Bulletin de la commission pénitentiaire internationale* (Brussels and Bern, 1900).

METZ, mĕts. A town and first-class fortress in Alsace-Lorraine, Germany, capital of the District of Lorraine, situated at the confluence of the Seille with the Moselle, about 11 miles east of the French frontier and 66 miles by rail south-southwest of Treves (Map: Germany, B 4). It is built partly between the two rivers and partly on islands of the Moselle. The streets bear both German and French names. The older section is irregularly constructed and is ancient in appearance. In the southwestern portion of the town is a splendid esplanade with statues of Marshal Ney, Prince Frederick Charles, Emperor William I, and Emperor Frederick (1909), and a fine fountain. The magnificent Gothic cathedral, the finest structure in the town, was begun in the thirteenth century. It was consecrated in 1546 and is now being restored. It has numerous fine specimens of stained glass and is surmounted by a tower 387 feet high. The church of St. Vincent, a fine Gothic structure of the thirteenth century, the garrison church, and the church of St. Constance, with frescoes, are also of architectural interest. Among the secular buildings may be mentioned the palace of justice, the town hall, the theatre, the barracks, and the Central Railway Station, completed in 1908.

The educational institutions include a Gymnasium, a Realschule, a seminary for priests and for teachers, schools of art and music, and a military school. The municipal library of 100,950 volumes in 1913 is rich in works relating to the history of Metz, and the municipal museum contains collections of coins and paintings and of antiquities found in the vicinity. Metz has lost somewhat in industrial importance since its occupation by the Germans, the French having withdrawn a large amount of capital. The chief manufactured products are leather and leather goods, arms, hats, artificial flowers, coarse cloth, preserves, etc. The trade is chiefly in the agricultural products of the surrounding country.

The city is regarded as one of the best-fortified places in Europe. Its fortifications, extending along the Moselle and the Seille, consist of works begun by the French and completed by the Germans, and of works built entirely by the conquerors. Some portions of the old fortifications have also been retained. Pop., 1890, 60,186; 1900, 58,424, part of the troops having been withdrawn; 1910, 68,598, including the garrison of nearly 25,000 men. The civil population is almost entirely Roman Catholic.

Metz was known to the Gauls as Divodurum and in mediæval times as Metac. By the Treaty of Mersen (870) the city fell to East Francia (later Germany) and rapidly attained importance, so that in the thirteenth century it became a free Imperial city. It was here that Charles IV in 1356 proclaimed the Golden Bull. Metz became involved in many conflicts with Lorraine, and in the period of the Reformation the city was a centre of disturbance. In 1552 it was handed over to Henry II of France, together with Toul and Verdun, by the Protestant lords in order to gain French aid against Charles V. (See MAURICE OF SAXONY.) The latter besieged the city in vain, and the Peace of Westphalia (1648) confirmed France in possession of the city. Metz was henceforth chiefly important as a strong fortress, and played a prominent rôle in the campaigns of 1814 and 1815 against Napoleon and again in the Franco-German War. As a result of the battles of Colombey-Nouilly, Mars-la-Tour, and Gravelotte (see FRANCO-GERMAN WAR), the German army occupied the city on Oct. 29, 1870, and the Peace of Frankfort gave Metz to Germany. In the European War which broke out in 1914 the German communications with Metz were the objective of several French offensive movements. It was also attacked by the allied aërial fleets. See WAR IN EUROPE. Consult: F. D. H. Klipffel, *Metz, cité épiscopale et impériale* (Brussels, 1867); G. T. Robinson, *The Fall of Metz* (London, 1871); Westphale, *Geschichte der Stadt Metz* (3 vols., Metz, 1875–78); F. Du Val des Bois, *Au pays de Metz* (Paris, 1886); Gustave Marchel, *La France moderne, le drame de Metz* (ib., 1890); E. F. Biskamp, *Das mainzer Domkapitel bis zum Ausgang des 13. Jahrhunderts* (Marburg, 1909).

METZINGER, LÉON (1842–1914). A French general, born at Dijon. He graduated from the military school of St. Cyr in 1863. From 1898 to 1903 he was commander of the Fifteenth Army Corps and then until his retirement in 1907 he served as general of division and member of the Superior Council of War. He received the grand cross of the Legion of Honor. During his 50 years of service he took part in 15 campaigns and was at the sieges of Hué and Tananarive. To *L'Echo de Paris* he contributed a number of articles on the reorganization of the army.

MET'ZU. See METSU.

MEUDON, mē'dôn'. A town in the Department of Seine-et-Oise, France, in the southwestern outskirts of Paris (Map: France, N., A 2). Its château, fitted up by Napoleon for Maria Louisa in 1812, was almost destroyed during the bombardment by the Germans in 1871; it has been partly restored. The church contains a statue of Rabelais, who was curé of Meudon. It has an observatory, a splendid orphan asylum, founded by the Duchess Galliera, and a school of military aviation. The forest near by is a favorite holiday resort. Meudon's manufactures comprise glass, chalk, linen, whiting, buttons, and ammunition. Rodin the sculptor located his studio here, and here was finished some of his most famous work. Pop. (commune), 1901, 9702; 1911, 12,292.

MEULEN, mē'len, ADAM FRANS VAN DER (1632–90). A Flemish battle painter, born at Brussels. He was a pupil of Peter Snayers, but afterward went to France on the invitation of Lebrun and was made Louis XIV's court painter (1666). During the war in Flanders he accompanied the King and painted pictures of the battles and sieges in which he was engaged. These are remarkable for the care bestowed upon historical detail and the numerous portraits of contemporaries contained in them. There are a number of them in the Louvre and at Versailles and two in the Metropolitan Museum, New York. He also designed cartoons for the Gobelins.

MEUMANN, moi'män, ERNST (1862–1915). A German psychologist and educator. He was privat docent in philosophy at Leipzig (1894), associate professor (1897) and professor of

psychology and pedagogy at Zurich (1900), professor of philosophy at Königsberg (1905), at Münster (1907), at Halle (1909), at Leipzig (1910), and professor of philosophy and pedagogy at the Kolonialinstitut in Hamburg (1911). He was early known for his investigations in psychology, especially in the fields of rhythm and the perception of time; but his greatest reputation is as the founder and systematizer of modern experimental pedagogy. He became editor of the *Zeitschrift für experimentelle Pädagogik*, of *Pädagogische Monographien*, and of *Die Psychologie in Einzeldarstellungen* and coeditor of the *Archiv für die gesamte Psychologie*. Besides numerous articles he wrote: *Die Oekonomie und Technik des Lernens* (1903; 3d ed., 1912; Eng. trans., *The Psychology of Learning*, 1913); *Vorlesungen zur Einführung in die experimentelle Pädagogik* (2 vols., 1907; vol. iii, 1914); *Intelligenz und Wille* (1908; 2d ed., 1913); *Einführung in die Aesthetik der Gegenwart* (1908); *System der Aesthetik* (1914); *Abriss der experimentellen Pädagogik* (1914).

MEUNG, mēn, JEAN DE (c.1250–?). A French poet, also called Jean Clopinel. He was born at Meung-sur-Loire and died at the beginning of the fourteenth century. Not much is known about his early life, but it is assumed that he studied at the University of Paris. His literary fame rests chiefly on his addition to the *Roman de la rose* (q.v.) of Guillaume de Lorris (q.v.). The poem, as Guillaume de Lorris left it, comprised about 4000 verses. Jean de Meung added about 18,000, of which 12,000 can be found in the authors of whom he was especially fond—notably 2000 from Ovid alone. Ostensibly continuing the allegory of his predecessor, who intended to make it a poem of chivalry, Jean de Meung in reality introduced quite a different spirit and made the allegory a mere cloak for telling stories and indulging in political and moral satire. At the request of King Philippe he translated the *Consolatio* of Boëthius into prose and verse. Towards the end of his life he wrote his *Testament*, in which, although praising sincere piety, he pours bitter sarcasm on monks. Consult: Paris, "Jean de Meung," in the *Histoire littéraire de la France*, vol. xxviii (Paris, 1840); Quicherat, "Jean de Meung et sa maison à Paris," in the *Bibliothèque de l'Ecole des Chartres* (ib., 1880); Langlois, *Origines et sources du Roman de la rose* (ib., 1890).

MEUNIER, mē'nyā', CONSTANTIN (1831–1905). The foremost among modern Belgian sculptors; also a painter of note. He was born April 12, 1831, at Etterbeek, near Brussels, studied sculpture at the Brussels Academy and later under Fraikin, and then took up painting under Navez. He first devoted himself to religious and historical subjects, such as "The Burial of a Trappist" (Courtrai Museum), "The Stoning of St. Stephen" (Ghent Museum), and "The Peasants' War" (1875, Modern Gallery, Brussels), which he rendered with almost brutal realism. From these he turned to the study of the workers in the mining and industrial regions of Belgium, the first fruits of which were "The Broken Crucible" (1880) and "The Descent of the Miners." Thereafter his life was dedicated to what others have called the "æsthetics of work," interrupted only by a trip to Spain in 1882–83 and by his duties as professor of painting at the Louvain Academy (1886–94). It was above all the monumental plastic qualities of the laborer which appealed to him; therefore it came about that when past 50 he turned again to sculpture and attained in this medium his greatest results. His works have been termed "hymns to labor." They are full of lyric power and vigorous rhythmic movement; the execution is sincere and forceful, though often neglectful of detail. Meunier depicts the struggle of man with the earth, the tragedy rather more than the grandeur and beauty of labor; his art is deep and intensely human. The first of his great typical figures of laborers were "The Hammerman" (1884) and "Puddler Resting" (1885). Other celebrated ones are "The Dock Hand" (Luxembourg), "The Sower" (Botanical Garden, Brussels), and "The Mine Girl." The statuette "Old Mine Horse," the group "Mine Damp" (Brussels Gallery), the equestrian group "At the Watering Place" (Square Ambiorix, Brussels), the relief "Puddlers" (Luxembourg), and the monument to Father Damien, at Louvain, are also fine examples of his work. On the death of his two sons he had returned for a time to religious subjects, producing the "Prodigal Son" (1895, Berlin Gallery), "Ecce Homo," and "Pietà." His crowning achievement, however, is the splendid unfinished "Monument to Labor," purchased by the state for the Brussels Gallery. Four reliefs, entitled "Industry," "The Harvest," "The Port," and "The Mine," are inserted in the sides; the whole is surmounted by the figure "The Sower"; and other figures are about the base. Exhibitions of Meunier's works have been frequently held throughout Europe, and in 1913–14 in America. Meunier died April 4, 1905, at Brussels, where he had lived since leaving Louvain in 1894. Consult: Camille Lemonnier, *Constantin Meunier, sculpteur et peintre* (Paris, 1904); Walther Gensel, *Constantin Meunier* (Bielefeld, 1905); Christian Brinton, *Catalogue* of the American exhibition (New York, 1914); W. O. Partridge, "Meunier the Belgian Sculptor," in *Homiletic Review*, vol. lxviii (ib., 1914).

MEUNIER, (ETIENNE) STANISLAS (1843–). A French geologist, born in Paris and educated there in the Faculty of Sciences. He became a doctor of science in 1869, was made laureate of the Academy of Sciences in 1878, and in 1892 was appointed professor of geology at the National Museum of Natural History. He was created a Knight of the Legion of Honor and served as vice president of the Geological Society of France. His writings include: *Etude descriptive sur les météorites* (1867); *Lithologie terrestre et comparée* (1870); *Le ciel géologique* (1871); *Géologie des environs de Paris* (1875; new rev. ed., 1912); *Les causes actuelles en géologie* (1879); *Excursions géologiques à travers la France* (1882); *Météorites* (1884); *Géologie régionale de France* (1889); *La géologie comparée* (1895); *Nos terrains: géologie populaire* (1898); *La géologie générale* (1903); *La géologie expérimentale* (1904); *Catalogue de la collection de géologie expérimentale du muséum* (1907); *Les convulsions de l'écorce terrestre* (1910).

MEURICE, mē'rēs', FRANÇOIS PAUL (1820–1905). A French dramatist, born in Paris and educated at the Collège Charlemagne. In 1842 he prepared a version of *Falstaff* for the Odéon with Vacquerie, presented at the same theatre in 1843. With the same collaborator he produced *Le capitaine Paroles* and an imitation of *Antigone* (1844), and he assisted Dumas in a

metrical translation of *Hamlet*, which was given at the Théâtre Historique in 1847. The following year he became chief editor of Victor Hugo's *L'Evénement*, to whose cause Meurice was so devoted that he suffered nine months' imprisonment (1851), but in 1869 he aided in starting a new journal with the same motive, *Le Rappel*, and he was intrusted by Hugo himself with the publication of his complete works (46 vols., 1880–85). Meurice dramatized several of them, as well as a number of George Sand's novels, and his other plays include: *Benvenuto Cellini* (1852; new ed., 1891); *Schamyl* (1854); *L'Avocat des pauvres* (1856); *Fanfan la tulipe* (1858); *La vie nouvelle* (1867); *Cadio* (1868); an adaptation of the *Midsummer Night's Dream* (1886); *Struensée* (1898), crowned by the Academy. Meurice also wrote romances, such as *La famille Aubry* (1854), *Césara* (1869), and *Le songe de l'amour* (1869).

MEURSIUS, mēr'sĭ-ŭs (Van Meurs), Johannes (1579–1639). A Dutch classical scholar and historian, born at Loosduinen, near The Hague. At the age of 16 he finished a commentary on the *Cassandra* of Lycophron. He traveled much and in 1610 was appointed professor of Greek and history at Leyden. Later the political disturbances in his country and the execution of Jan Barneveldt, to whose sons he had once been tutor, exposed him to considerable persecution and cost him the high favor which he had once enjoyed. Hence he left Holland and in 1625 accepted a position at the Academy of Sorö in Denmark, where he spent the remainder of his life. His published works include many editions of Greek authors, Lycophron, Apollonius Dyscolos, Philostratus, Procopius, and others. His numerous treatises on Greek literature are mostly reprinted in J. F. Gronovius' *Thesaurus Antiquitatum Græcarum*. His *Glossarium Græco-Barbarum* (1614) and *Athenæ Batavæ* (1625) also deserve mention. His complete works were edited in 12 volumes by Lami (Florence, 1741–63). Consult Van der Aa, *Biographisch Woordenboek der Nederlanden* (Amsterdam, 1869), and J. E. Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

MEURTHE-ET-MOSELLE, mērt'-ā-mō'zĕl'. A frontier department in the northeast of France, part of the old Province of Lorraine, and composed of the remnants of the departments of Meurthe and Moselle which remained to France after the Treaty of Frankfort, 1871 (Map: France, N., M 4). Area, 2039 square miles. Pop., 1911, 564,730. It is named from the principal rivers which traverse the department. The surface is diversified and picturesque, the east border being marked by the wooded Vosges Mountains, which attain a maximum altitude of 2041 feet. Iron, copper, lead, rock salt, gypsum, and building stone are the chief mineral products; and the fertile soil yields abundant crops of cereals, hops, tobacco, beetroot, and a variety of fruits. There are manufactures of steel, iron, railway materials, hats, soap, matches, textiles, pottery, glass, paper, chemicals, wine, and beer. Capital, Nancy. Chief towns, Lunéville, Toul, and Longwy. The Department of Meurthe-et-Moselle was the scene of almost continuous fighting during the European War which began in 1914. See War in Europe.

MEUSE, mēz. A frontier department in the northeast of France, part of the ancient Province of Lorraine, bordered on the north by Belgium (Map: France, N., L 4). Area, 2409 square miles. Pop., 1911, 277,955. It is traversed from southeast to northwest by the valley of the Meuse, flanked by the wooded Argonne hills and the Côtes de Meuse, also the rivers Orne and Chiers. The entire department is a highland, well forested, with fertile valleys producing wheat, oats, rye, barley, potatoes, and hemp; grapes are grown for wine, and the beetroot for sugar. It has minor manufactures of iron and steel instruments, textiles, lumber, leather, glass, and paper. Meuse was the scene of heavy fighting during the European War, which began in 1914 (see War in Europe). Capital, Bar-le-Duc.

MEUSE, or **MAAS,** mäs. One of the principal rivers of western Europe. It rises on the Plateau of Langres in the Department of Haute-Marne, northeast France, and flows at first north through a narrow, winding valley with high and steep sides, sometimes becoming cañon-like with rocky cliffs, and through the wild forest region of Ardennes (Map: France, N., L 4). It then flows northeast through Belgium into Holland, the land becoming gradually lower, changing through the heath lands of north Belgium to the extensive peat bogs known as De Peel in southeast Holland. Finally the river turns westward, joins the Waal, one of the arms of the Rhine, opposite Gurkum, and empties into the North Sea through the great delta common to the two rivers, a large, compound estuary consisting of broad, sandy, and shallow channels inclosing a number of low, flat islands. The united Meuse and Waal first divide into two arms, one of which, the Hollandsch Diep, flows southwest and, after communicating southward with the delta of the Scheldt (q.v.), enters the sea through the broad Haringvliet. The other arm flows west and again divides into the Old and the New Meuse, which, uniting at several points, flow parallel to the sea. The Old Meuse communicates by side channels with the Haringvliet, and the New Meuse receives the Lek, an arm of the Rhine. The New Meuse, which passes Rotterdam, is the main channel for navigation. The total length of the Meuse is 498 miles and it is navigable for 355 miles. Its upper reaches are connected by canal with the Saône, forming the Canal de l'Est, which gives France a waterway north and south along the east frontier. Its principal tributaries are the Sambre from the left and the Semoy, Ourthe, and Roer from the right. It connects with extensive canal systems in Belgium and in Holland. Above Neufchâteau, in the Department of Vosges, the river loses itself underground for some miles. The chief cities on its banks are Verdun (the head of navigation), Sedan, and Charleville in France; Namur and Liége in Belgium; and Maastricht, Dordrecht, and Rotterdam in Holland. The line of this valley was followed by part of the German army, the Army of the Meuse, in its invasion of Belgium and France in 1914. This valley is not only the shortest route from Berlin to Paris, but also the easiest as far as natural conditions are concerned. The region between the Meuse and the Moselle was almost completely devastated during the struggle between the Germans and the allies in 1914. See War in Europe. Consult W. M. Davis, "The Seine, the Meuse, and the Moselle," in *Geographical Essays* (Boston, 1909).

MEW, or Sea Mew. In Great Britain, a gull (q.v.).

MEWAR. See UDAIPUR.

MEWS, PETER (1619–1706). An English bishop and royalist. He was born near Sherborne, Dorsetshire, and was educated at the Merchant Taylors' School and at St. John's College, Oxford. When the Civil War broke out he joined the King's forces in 1642; was promoted to captain; was captured at Naseby; and upon his release retired to Holland in 1648. During the Protectorate he undertook two different missions to Scotland in behalf of the royalists. After the Restoration he resumed his fellowship at Oxford; became chaplain to the King; and was president of St. John's College, Oxford, in 1667–73, and vice chancellor of the university in 1669–73. He was appointed Bishop of Bath and Wells in 1672, and was elected Bishop of Winchester in 1684. He upheld the opposition of the fellows of Magdalen College to James II in 1688, and in 1689 swore allegiance to William and Mary.

MEXBOROUGH, měks'bŭr-ō. A town and urban district in the West Riding of Yorkshire, England, on the Don, 5 miles northeast of Rotherham. It has large iron, glass, and pottery industries. The markets are municipal property. Pop., 1901, 10,430; 1911, 14,401.

MEXCALA, měs-kä'lä. A river of Mexico. See MESCALA.

MEXIA. A city in Limestone Co., Texas, 40 miles northeast of Waco, on the Houston and Texas Central and the Trinity and Brazos Valley railroads (Map: Texas, D 4). It is in a natural-gas and oil region and has oil mills, ice plant, cotton mills, and a broom factory. Cotton, corn, and oats are raised extensively. The city contains a city hall and a public library, and shops of the Houston and Texas Central System. Mexia has adopted the commission form of government. Pop., 1900, 2393; 1910, 2694.

MEX'ICAN ARCHÆOLOGY. Among the many tribes which occupied Mexico in former times six may be said to have attained a considerable degree of culture. The Nahuas, whose chief seat at the time of the Spanish Conquest was in the valley of Mexico, had come from the north, and their influence extended, by reason of conquest and migration, southward as far as Costa Rica. It is impossible to state the exact limits of Nahua remains in Mexico, owing to our meagre knowledge of the antiquities of certain parts of the country and the confused traditions of the migrations of the people. The Tarascans were settled in what is now Michoacan, the Mixtecs and Zapotecs in Oaxaca, and the Huaxtecs, linguistically a branch of the great Maya-Quiché family, in northern Vera Cruz. The Totonacs, whose territory lay between that of the Huaxtecs and Nahuas, had a distinct culture, although undoubtedly influenced by both of the former peoples. To the east of the Isthmus of Tehuantepec, and extending eastward over the states of Chiapas, Tabasco, and Yucatan, and southward through Guatemala to northern Honduras, are the remains of the Maya-Quiché family, whose civilization was in many respects the most advanced in ancient America. This region is geographically as well as culturally a part of Central America.

The remains found in Chihuahua show an ancient culture similar to that which existed in the valleys of the Gila and Salt rivers in Arizona, but of a slightly higher grade. The people seem to have reached an intermediate stage between the Nahuas on the south and the Pueblo peoples on the north, but nearer the latter than the former. In this region the ruins of Casas Grandes (q.v.) are the only noteworthy group. The pottery from the vicinity of this ruin is of an advanced type and somewhat resembles the ceramics of Arizona and New Mexico, but it has distinct peculiarities and bears the marks of contact with the people of the south. In the dense forests of the State of Tamaulipas, on the coast of the Gulf of Mexico, ruins have been reported which are related to the culture of the south, and probably belong to the Huaxtec or Totonac peoples. The northernmost great ruin belonging to the high culture of central Mexico is La Quemada in Zacatecas, an immense structure that has been but little studied. The ceramic art of these and other neighboring sites is peculiar and represents a number of superimposed styles. In Michoacan the Tarascan ruins of Tzintzuntzan bear some resemblance to those of La Quemada. This region of the Tarascos has been little explored. The great ruins of the Nahuas include Tula, Teotihuacan, Xochicalco, Tepoztlan, Cholula, and Tenochtitlan, now the city of Mexico. The last named was the capital of the Aztecs, the predominant branch of the Nahuas, at the time of the Conquest. It was founded in 1325 and was leveled to the ground by Cortés in 1521. Underground in the city of Mexico are buried a vast number of objects that excavations constantly bring to light. The famous sacrificial stone and calendar stone were uncovered in 1790 by accident near the site where they had formerly been placed in the ceremonial centre of the Aztec capital. In the Huaxtecan and Totonacan districts are the ruins of Papantla, Misantla, Centla, Tusapan, and Cempoalla; while in the State of Oaxaca, Monte Alban, the ancient capital of the Zapotecs, is one of the most stupendous ruins in Mexico. Mitla, in the same district, belongs to a different style and a later period. In the Maya region are the remains of hundreds of cities, the most important of which are Palenque, Naranjo, Piedras Negras, Menché, Seibal, Tikal, Labna, Kabah, Uxmal, Chichén-Itzá, Quirigua, and Copan.

In the arts the ancient Mexicans show a surprising progress. For the architecture of ancient Mexico, see ARCHÆOLOGY, AMERICAN; MITLA; PALENQUE.

Sculptures in stone are found, ranging in size from the small amulets, representing deities, and designed as personal ornaments, to monuments of colossal size, such as the so-called Mexican calendar stone and the great stelæ of the ruins of Quirigua. In wood carving the Mexicans displayed even greater skill than in the working of stone. The famous zapote-wood lintels of Tikal, the wooden drums, and the atlatls, or throwing sticks, splendidly carved and in some instances covered with gold leaf, attest their proficiency in this branch of art. Carving, whether in stone, wood, bone, or shell, was done with stone or copper tools. Jadeite, emerald, rock crystal, turquoise, and serpentine were carved into numberless varieties of personal ornaments, chiefly in the territory of the Mixtecs and Zapotecs of Oaxaca, and by the Mayas in the mountainous parts of Chiapas. The Nahuas and Zapotecs fashioned mosaics on wood, shell, and clay, using bits of shell, jadeite, turquoise, obsidian, mother-of-pearl, and hematite to form the designs

In the ceramic art the products of the several civilized nations are distinct, and we may determine their provenance with a certain amount of exactness. We must take account of the historical succession of different styles in any one locality, as will be explained presently. The terra-cotta figures of the Jalisco district, the ware from the vicinity of Cholula, the funeral urns from the Oaxaca valley, and the pottery from the Maya region are characteristics of each centre. In metallurgy we find the ancient Tarascos, the Aztecs, Totonacs, Mixtecs, and Zapotecs were very skillful in the manipulation of copper into axes, tweezers, rings, rattles, and bells. Beautiful objects of gold have been found in the Matlaltzinca region near Toluca and in the Mixtecan and Zapotecan areas, which are the very highest achievement of the ancient American goldsmiths. Ear, nose, and lip ornaments, beautiful bells, some representing symbolic faces and animals' heads, beads, circular breastplates, the copilli or crown of rulers, and even remains of armor made of the precious metal have been found in ancient graves during recent years. Unfortunately the greater part of these finds go to the melting pot.

The ancient Mexicans believed in a future life which was graded according to the manner of death, and among the Zapotecs they had elaborate funeral ceremonies and sacrificed slaves to assist the shades of important persons on their journey to paradise. They had greater and lesser deities. The principal god of the Aztecs was Teotl, who was worshiped as a supreme being. Next to Teotl, Tezcatlipoca, a wizard god, was venerated as the soul of the world, who rewarded the righteous and punished the unrighteous. The great beneficent god was Quetzalcoatl among the Nahuas, called Kukulcan by the Mayas, the great feathered serpent deity. He seems to have been an early Maya god taken over by the Nahua at a time when they were profoundly influenced by the ascendant Maya civilization. He invented the arts and taught the people wisdom by his laws. According to his various attributes he appears under different names, as do many other gods of the Mexican pantheon. Tlaloc was the god of rain, and among the Aztecs, Huitzilopochtli, the terrible war god, was patron and protector. There were gods of the hunt and chase, of play, flowers, wine, merchants, trickery, lust, and so forth, while each trade and occupation had its own patron deity. The religious rites were elaborate and prescribed with minuteness. The multiplicity of gods required a great number of priests and priestesses, who were almost as highly venerated as the deities they served. There were degrees of priesthood and religious orders and fixed and movable festivals. The great teocallis, or god houses, were commanding edifices of stone, built on high truncated pyramids with annexed buildings. Their idols were many and hideous, smeared with the blood of human and animal sacrifices.

Among certain of these civilized tribes we find artificial flattening of the head; also trepanation, and decoration of the teeth by filing and interlaying with certain stones, such as jadeite, turquoise, obsidian, hematite, and rock crystal. Labrets, or lip ornaments, made of obsidian and gold, were inserted in holes in the lower lip; U-shaped ornaments of obsidian and shell were hung from the nose, and large ornaments were inserted in incisions in the ears. Many of the musical instruments are still extant, and we find in various museums examples of the teponoztli, the horizontal drum, made from a log of wood hollowed out on the under surface and having two tongues cut on the upper one, which were beaten with rubber-tipped sticks. Among the instruments were the upright drum, of a hollowed log of wood, with skin-covered top, beaten with the hands; flageolets, whistles, and rattles of clay; trumpets; and rattles of shell and notched human bones from the arm or leg, rasped with a bone or shell. Painting was another art in which the ancient Mexicans had made remarkable progress. This is shown by the mural paintings of Teotihuacan, Mitla, Chichén-Itzá, and Santo Rita. One of the most important sources of information for the study of ancient Mexico is found in the existing pictorial and hieroglyphic codices, or books. As is well known, several of the tribes of Mexico had attained a degree of culture at the time of the Spanish Conquest that led to the recording of events, not only on stone bas-reliefs and sculptures, but on material of a more perishable nature. These codices were on strips of deerskin, the surface of which was covered with a thin coating of stucco. They were folded screen fashion, and the paintings were on both sides. The Mexicans had furthermore invented a kind of paper. In Mexico proper, in addition to bark paper, a paper was made from the leaves of the maguey plant, *Agave americana;* this paper they also sized with a coating of lime.

One of the things which impressed Cortés, when he first came in contact with the messengers sent out by Montezuma, was that some of them were busily employed in making paintings of the Spaniards; their costumes, arms, and different objects of interest giving to each its appropriate color. These paintings were to convey to Montezuma an idea of the conquerors in picture writing, and are the first notice we have of its existence in ancient America. In symbolic and picture writing the Mayas approached very closely to phoneticism, and recent progress has been made in an interpretation of the codices of the Nahua and Mixtec group, as well as signal success in the decipherment of the hieroglyphics of the Mayas, preserved in codices, tablets, and stelæ. Of the latter class of inscriptions certain dates and methods of counting have been worked out, and in some instances about 40 per cent of the inscriptions have been successfully deciphered. Besides the two known systems of pictographic and hieroglyphic writing explorations in Oaxaca have recently revealed a third and distinct form of inscription among the Zapotecs.

The complex calendar system of the Tarascos, Nahuas, Mixtecs, Zapotecs, Totonacs, and Mayas is the same and is a remarkable evidence of the high culture which they had attained, but the Mayas had more extended measures for the computation of time than the Nahuas. Recent investigation of the Maya calendar revealed various periods and elaborate computations and a knowledge of the movements of certain planets. The year was divided into 18 months of 20 days each plus 5 days added after the last month to round out the true solar year. Each of the 20-day periods had its own name and symbol, but the days were not numbered from 1 to 20, but from 1 to 13. By this method of numeration the day bearing the same name and number did not recur until the 13 months had elapsed; this made a period of 260 days, which, among the

Aztecs, was called Tonalamatl; it was a year within a year and was used for divinatory or religious purposes. There were, also, many other intricacies in the Mexican calendar, some of which have not yet been explained.

Pre-Columbian history has been restored in the rough over most of Mexico and Central America, and in some regions, particularly among the Maya, the dating of sculptures and structures seems to be upon a very exact basis. The style of sculpture in the monolithic monuments and the mechanics of masonry in the stone temples pass through a natural development in which successive improvements give a test of age. The native dates inscribed on many of the ancient monuments of Yucatan, Guatemala, and Honduras agree with the positions of the monuments according to the tests of age given above. It was long thought impossible to correlate these dates with the European calendar because the fashion of counting time had changed somewhat before the coming of the Spaniards and the cities where the old-style dates occurred were not mentioned in extant traditions, although the history in the Maya Chronicles, or Books of Chilan Balam, extended back to almost the time of Christ. But an old-style date was found at Chichén-Itzá, a city prominent in these chronicles, and this date had to be placed in one of the known occupations of the site. There was only one date that fitted the conditions and this fortunately fitted very nicely the mass of traditions, the other inscriptions, and the theoretic arrangements according to style.

The earliest Maya cities were in the southern part of the area. Copan and Tikal show many archaic monuments as well as others that run the gamut of change towards the higher products. Quirigua, Seibal, Yaxchilan, and Piedras Negras offer examples of more finished work of what we may call the Great period. Architecture did not begin to develop as soon as sculpture and it was many centuries before some of the best features were accomplished. In fact the finest buildings date from a sort of renaissance that took place in northern Yucatan after all the early cities of the south had been abandoned. Labna, Kabah, Uxmal, and Chichén-Itzá afford many beautiful examples of late architecture. Finally, there was a short period when conquerors from the highlands of Mexico held Chichén-Itzá and after this a complete breaking down of the Maya political structure. Mayapan was the last great Maya city to be abandoned, in 1442. Learning was still maintained by means of books when the Spaniards arrived. The historical periods as determined by the monuments and chronicles are as follows:

Protohistoric period, before 160 A.D.
Archaic period, 160 A.D. to 455 A.D.
Great period, 455 A.D. to 600 A.D.
Transition period, 600 A.D. to 960 A.D.
League period, 960 A.D. to 1195 A.D.
Nahua period, 1195 A.D. to 1442 A.D.
Modern period, after 1442 A.D.

Traditional history on the highlands of Mexico is very complete for a short time before the coming of the Spaniards, but does not go back nearly so far as in Yucatan. The system of keeping time records brought confusion if the count ran into many of the 52 year cycles. Fairly accurate history extends back to 1200 A.D. and more or less legendary history for several centuries earlier.

In 1910 an actual stratification of archæological remains, mostly ceramic, was located in the valley of Mexico, the depth of the deposit arguing great age. At the bottom in a thick layer were many examples of a peculiar type of figurine that has since been found to have a very wide distribution over Mexico and Central America. It occurs over the greater part of central Mexico and reappears in parts of Guatemala and Salvador in identical form. Somewhat modified, this type of figurines may be traced through Nicaragua into Costa Rica. Since the Nahua tribes are the only ones common to all these regions there is little doubt that they were the originators and carriers of this art. In some regions, at least, this crude ceramic art is earlier than the known beginnings of Maya sculpture in stone. In the stratifications referred to above the archaic layer is topped by a thick stratum showing finely modeled figurines and richly painted vases. This second layer might perhaps be called Toltec, although this term has fallen into disrepute. Maya influence is strong in this second layer, which may extend in time from about 400 A.D. forward for six or eight centuries. There is reason to believe that the period of greatest extension of high culture towards the north, seen at La Quemada, etc., came near the end of this Toltec period, or from 1000 to 1200 A.D., which also boasted such Imperial centres as Teotihuacan, Tula, and Cholula. On the surface is a shallow layer that corresponds to the post-Toltec or Aztec culture. Although the Aztec capital was not itself founded till 1325 it is reasonable to suppose that the civilization of which it was the supreme example was already established. This late Mexican culture was doubtless a direct outgrowth of the more brilliant one of the Toltecs, who were possibly of the Nahua stock. In Zapotecan ruins we can likewise discern a chronological sequence. Monte Alban belongs to an earlier era than Mitla. This important question of primitive history is now engrossing the attention of Mexican and Central American archæologists.

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MEXICAN HAIRLESS DOG. See HAIRLESS DOG.

MEXICAN JUMPING BEAN. See JUMPING BEAN.

MEXICAN LITERATURE. Modern Mexico, despite the surprising advance of the past quarter century, has been so far outstripped in the material elements of civilization that the people of more progressive nations are apt to forget the time when its capital was the intellectual and artistic centre of the New World. The intellectual life of Mexico, therefore, is not of modern creation, but dates back to the third decade of the sixteenth century, which the early *conquistadores* marked by the introduction by Viceroy Antonio de Mendoza, in 1535, of the first printing press, to be followed shortly, late in 1551, by the establishment of the second university upon the American continent. That neither of these establishments was a matter of mere formal enactment is shown by the creditable list of the writers of that century who were connected as teachers or pupils with the early educational institutions and whose works bear the imprint of the native Mexican press, whose list of extant works printed before 1600 embraces some 116 titles. (J. García Icazbalceta, *Bibliografía mexicana del siglo XVI*, Mexico, 1886.)

Any study of Mexican literature naturally begins with the few survivals of primitive picture writing. These hieroglyphs so far approached writing as to give clearly names, places, and the date of events—some of which are accurate—as far as the twelfth century, while more vague traditions extend several centuries further back. Most of these records belong to that aboriginal branch of Nahua stock known as the Toltecs, but the famous *Popul-Vuh*, of Quiché origin, also mentions names and places of Mexican legendary history. The meagre details of these records were supplemented, within a century after the Spanish Conquest, by so-called histories, written by educated natives from the above sources, aided by oral tradition. These works consist of songs, ordinances, memoirs of the native kings, and accounts of the Spanish conquerors. Without them it would now be impossible to read the few extant sources; and if some of the early Church fathers are to be blamed for their fanaticism in destroying hieroglyphs, others deserve equal credit for their care in preserving the remaining few and in training natives who could still unravel their meaning.

Most writers of the early colonial period were natives of the Old World, whom matters of church or state called to the New. Among those works of the sixteenth century which relate to early native history we may mention Motolinía's *Historia de los Yndios de la Nueva España* (1541), Sahagún's *Historia de las cosas antiguas de los Indios* (1566), and Molina's *Vocabulario* (1555), a Castilian-Mexican work of 249 pages, one of the products of Juan Pablo's first printing press. The work of these men was largely utilized by Torquemada in his *Monarquía Indiana* (1615), a work for which Alamán bestows upon him the title "the Livy of New Spain." Above the names of the adopted European chroniclers stand those of Tezozomoc, son of the last Mexican Emperor, Cuitlahuac, whose *Crónica Mexicana* (c.1600) is an admirable companion volume to Friar Diego Durán's *Historia de los Indios de Nueva España y islas de tierra firme* (1581), up to that time the most complete chronicle of the ancient Mexicans, and Fernando de Alva-Ixtlilxochitl (1568–1648), the original chronicler of the Texcuco royal line, whose work, though not rigorously correct in chronology, in volume and importance surpasses all his predecessors. It is to these two native writers that we owe the interpretation of the early Mexican hieroglyphs then in existence.

The chroniclers who treated merely of the Conquest did so from a European standpoint, and for this reason do not greatly concern us here. Still, mention must be made, at this point, of the *Crónica de la Nueva España*, written by Francisco Cervantes de Salazar, in Mexico City, from 1560 to 1567, utilized in manuscript by Herrera for his own *Historia general*, and published for the first time by M. Magallón, under the auspices of The Hispanic Society of America (Madrid, 1914). It is important both as history and as literature.

Among the Creole population of the sixteenth century, however, there were some poets of note. Prominent among these were Francisco de Terrazas, who was eulogized by Cervantes, but only a few of whose poems have been preserved (consult Gallardo, *Ensayo de una biblioteca española*, vol. i, columns 1003–1007, and García Icazbalceta, "Literatura mexicana: Francisco de Terrazas y otros poetas del siglo XVI," in the *Memorias de la Academia Mexicana*, vol. ii, pp. 357–425); Saavedra Guzmán, whose most famous poem, *El peregrino indiano* (Madrid, 1599), adds rather to his reputation as chronicler than as poet; González de Eslava, whose *Coloquios espirituales y sacramentales y canciones divinas* (Mexico, 1610) are a most interesting example of the primitive Mexican drama; and Bernardo de Valbuena, whose *Grandeza mexicana* appeared in Mexico, 1604.

Though the modest literary product of the seventeenth century may to some extent exemplify the intellectual decadence of New Spain during that period, yet it illustrates in one phase the aptitude of the *mestizo* caste for music and for poetry—an aptitude which displayed itself in both Castilian and Latin verse. Easily the leader of this period stands the poetess Juana Inés de la Cruz (1651–1695), a leading personage at the viceregal court, and later a nun, who dazzled her contemporaries by her learning, and whose subtle and suggestive verse gained for her the title "the tenth Muse." Another easy and correct versifier of the period was the Pueblan Matias Bocanegra, whose popularity lasted well into the succeeding century.

The making of verse at that time was simply a pastime, so a comparatively small output has survived until our own day. The man of letters par excellence of the century was the diligent and versatile Carlos de Sigüenza y Góngora (1645–1700), whose writings, poetical and prose, embraced a wide variety of literary and scientific subjects. He held the post of Cosmographer of New Spain, and for many years filled the chair of mathematics in the University of Mexico. The most noted colonial dramatist of the century was Eusebio Vela, who, if not equal to the leaders of the Spanish stage, surpassed many of those of the second rank. Juan Ruíz de Alarcón y Mendoza, the dramatist, was of Mexican birth and education, though his mature work was produced in Spain. The theological works of the time bore the names of many native Church fathers; likewise the best work on the early compiling of the laws of the Indies was that of Rodrigo Aguiar y Acuña (died 1629). In the realm of scientific literature the work of Enrico Martínez, *Reportorio de los tiempos y historia natural desta Nueva España* (1606), and that of Friar Agustín de Vetancourt, *Teatro mexicano* (1698), fittingly open and close the century.

The eighteenth century in New Spain was marked by a more extensive if less notable literary culture. This was especially true of the reign of Carlos IV, when public functions were the scenes of notable contests of poets and orators, many of whose productions were favorably mentioned in Europe. The book trade with Madrid and other Spanish cities was very flourishing and some especially fine editions of classical authors were printed in the Creole capital. Large and well-selected private libraries were common, both here and in the provincial towns. It was the period for the collection of archives and the writing of local history—a work in which the names of Veytia (1718–1779) and Morfí (died 1793) hold a prominent position. Spanish-American journalism is represented by the monthly gazette (1728–39) of Francisco Sahagún de Arevalo; by the *Gaceta de Literatura* (begun 1768) of José Antonio de Alzate (1729–90), whose periodical did much to stimulate intellectual effort and develop a correct literary sentiment; by the *Mercurio Volante* (begun 1772) of José Ignacio Bartolache, largely a medical journal; by the *Gaceta de México*, a fortnightly publication from 1784 to 1806, devoted to general news and literary and scientific discussions, and after that date a biweekly; and the *Diario de Méjico* (1805) and the *Diario de Vera Cruz* (1805), the former devoted to literary and statistical matters and the latter a commercial sheet. Despite the strict censorship of all these periodicals they exercised a most beneficial effect upon public opinion at the close of the century.

In the literary production of the nineteenth century the work of the Mexican historians easily leads at home and occupies a prominent place in the world at large. An important work as collector of historical documents was done by José Fernando Ramírez. Among historians of lesser note may be mentioned Mora and Zamacois. Of unusual excellence is the work of Bustamante (died 1848), whose volumes treat of the revolutionary period and of the beginnings of the American war. The leader of his age, and still easily the foremost Mexican historian, was Lucas Alamán (died 1853), whose work as statesman during a trying period has been eclipsed by his greater work as the historian of that period. His *Disertaciones sobre la historia de Méjico* (3 vols., 1844–49) cover the viceregal period, and these are supplemented by his *Historia de Méjico* (5 vols., 1849–52), continuing the narrative to the middle of the century. Among the more recent historians the greatest figure is that of Manuel Orozco y Berra (1816–81), who crowned a life of public service and valuable archæological research by devoting his last 20 years to his *Historia antigua de México*. Closely allied with these is the work of Antonio García Cubas, whose *Diccionario geográfico, histórico, y biográfico de los Estados Unidos Mexicanos* (1889) is a model of its kind.

In the realm of pure literature the physician-poet Manuel Carpio (1791–1860) was well known for his vigorous descriptive verse, of which the most important example is *La cena de Baltasar*. His firmness and moderation in political life and the erudition and charm of his poems easily render him the most popular Mexican poet of the century. Ignacio Manuel Altamirano (born 1834), a noted liberal orator, is famous both as a poet and as a novelist. His poems are less vigorous in description than those of Carpio; the best known of his novels, *Clemencia*, is of considerable merit. To Rodríguez Galván is given the credit of the first national drama, but his work has been surpassed by Fernando Calderón (1819–45), whose *Reinaldo y Elena*, *Zadig*, and others gave promise of much better work had he lived to complete it. In comedy the name of Manuel E. Gorostiza (1789–1851) stands supreme. His comedies, of which the most famous are *Indulgencia para todos* and *Contigo pan y cebolla*, still hold popular favor. In addition to an active military and diplomatic career he organized the present *Biblioteca Nacional* and greatly advanced popular education throughout the Republic.

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MEXICAN POPPY. See ARGEMONE.

MEXICAN SISAL. See HENEQUEN.

MEXICAN SUBREGION. In zoögeography, a subdivision of the Neotropical region which embraces Central America and the low, hot coast regions of Mexico to the mouth of the Rio Grande on the east and about to the border of the plains of Durango on the west. Between

these the northern fauna and flora are continued along the summit of the Cordillera as an entering wedge reaching south to Nicaragua. It has many species peculiar to itself, but no large groups. Many northern as well as southern forms extend their range into this middle region, as might be expected; and views differ as to where its boundaries should be drawn. (See SONORAN REGION.) On the whole, its affinities are South American. See DISTRIBUTION OF ANIMALS; NEOGÆA; NOTOGÆA.

MEXICAN WAR. The war between the United States and Mexico in 1846–48. It was the result of a series of outrages upon American citizens, giving rise to claims of the United States citizens on the government of Mexico, the recognition of the independence of Texas by the United States (1837), the annexation (1845) of Texas to the United States, in the face of bitter opposition on the part of Mexico, herself torn with revolution and contending factions, and finally of a dispute regarding the boundary of Texas, the United States claiming the Rio Grande as the boundary, while Mexico held that Texas did not extend farther south than the Nueces. Mexican hostility towards the United States had been further stimulated by a violation of the Territory of Mexico due to the indiscreet precipitation of Commodore Jones of the American navy, which occurred in October, 1842. Another cause of friction was the sympathy of the people of the United States for the Texans, which manifested itself in material assistance at critical moments. The war was essentially a popular movement both in Mexico and in the United States. The utterances of contemporaneous journals reveal the gross misconceptions entertained by the two peoples of each other, as well as the bitter feeling which existed in consequence of the causes enumerated above. So far as the Texas-Mexican question is concerned one cannot but feel the justifiableness of Mexican suspicion and resentment against the United States. The immediate occasion of the breach of diplomatic relations in 1845 was the annexation of Texas. During the fall of 1845 a large part of the small regular army of the United States was assembled under Gen. Zachary Taylor at Corpus Christi, near the mouth of the Nueces in Texas, and on March 12, 1846, under orders from the United States government, Taylor advanced into the territory the possession of which was then in dispute. After a march of 16 days he reached the Rio Grande at a point opposite to the Mexican city of Matamoros. A week earlier, on the twenty-first, the United States Minister to Mexico, Slidell, unable to negotiate a treaty in accordance with President Polk's directions, or even to secure official recognition, received his passports and started on his return to the United States. The Mexican army at this time numbered at least 30,000 of all arms and comprised, besides troops of the line, the active battalions of the states and the local national guards of the cities. The cavalry (lancers) were excellent horsemen, fairly disciplined, but indifferently mounted and poorly armed; the artillery, officered partly by foreigners, were good gunners, but the arm lacked mobility; the infantry were well drilled, but were armed with muskets of ancient pattern. An undue number of general officers (politicians rather than soldiers) and an inefficient general staff completed the Mexican resources for war. The effective power of the Mexicans, however, was enhanced by the fact that they represented the defense, that they served among friends, and that they often fought behind strong fortifications. The American army was inferior in numerical strength to the enemy. At the close of 1845 the maximum strength was 7883. What it lacked in numbers, however, was made up in fighting quality. It consisted of two regiments of dragoons, four of artillery, and eight of infantry, with the usual staff corps. The dragoons were well disciplined, drilled as light cavalry, and armed with carbines and sabres; the artillery garrisoned the fortifications, but had little instruction in gunnery, excepting one company in each regiment organized as light artillery, which had reached a high standard of efficiency; the infantry, well disciplined and familiar with the use of arms, were distributed among a number of small frontier posts and never in large bodies; the officers, a majority graduates of West Point, were generally of superior ability, with the experience and self-reliance gained in Indian service and independent command. The navy of the United States, although small, was exceedingly efficient. The Mexican Republic had only a few small steamers and sailing vessels, and these principally on paper. Taylor's command hardly comprised 3000 effectives upon its arrival opposite Matamoros on March 28, 1846. Taylor immediately fortified his position and established a base of supply at Point Isabel. The mouth of the Rio Grande was blockaded by the small naval force accompanying the American army, and two vessels with supplies for the Mexican army were warned off and returned to sea. General Ampudia, who was in command at Matamoros from April 11 to April 24, protested vigorously against the occupation of disputed territory by General Taylor and insisted that, pending a settlement of the boundary dispute, the American army should be withdrawn to the Nueces. On April 24 General Arista superseded Ampudia and at once decided to take the offensive and cross the Rio Grande, notifying Taylor that he considered hostilities already to have begun on the part of the United States. On the twenty-fifth General Taylor learned that a large force of cavalry had crossed the Rio Grande some miles above his position, and sent a small squadron of the Second Dragoons under Captain Thornton to obtain definite information. While endeavoring to execute the order, Thornton, whose guide had deserted, found his command surrounded by a Mexican cavalry force of more than 500, and in an attempt to cut his way out lost one officer and eight men killed and two men wounded, and, with the remainder (46), was captured. Taylor notified his government that the first blow had been struck and called upon the governors of Louisiana and Texas for 5000 volunteers. On the thirtieth General Taylor, leaving a regiment of infantry and two companies of artillery to garrison an earthwork known as Fort Brown (see BROWNSVILLE, TEX.), in front of Matamoros, proceeded with the remainder of his command to Point Isabel in order to complete his communications. During his absence the Mexicans attacked the fort vigorously, but to no avail. As he was returning (May 8) he encountered Arista, who with 6000 men and 10 guns barred the road at a place 9 miles from Matamoros, known as Palo Alto. Taylor's force numbered 2300 officers and men

and 10 guns. After an indecisive fight of four hours (see PALO ALTO) Arista fell back to Resaca de la Palma, with a loss of over 600 in killed and wounded. General Arista's report put his loss at 252, dispersed, wounded, and missing. The American casualties comprised 7 killed and 47 wounded. On the following day Taylor continued his march. Arriving in front of the Mexican position, a low ridge commanding the road to Matamoros, the Americans paused to reconnoitre. On account of the dense chaparral, movements en masse were impracticable, and the infantry were deployed as skirmishers, with the artillery, supported by the dragoons, remaining on the road. Arista had been reënforced during the night by 2000 infantry. As on the day before, an artillery duel ensued, and the Mexican batteries held the Americans at bay for some time, until Taylor sent a squadron of dragoons under Captain May, who gallantly charged, taking the guns, together with the Mexican General La Vega, at the cost, however, of 1 officer and 7 men killed and 10 men wounded. Upon this the enemy gave way and fled from the field, pursued by the Americans, who made many captures, including 14 officers, 8 pieces of artillery, and several standards. The Mexicans, in confusion, retired to Matamoros, many being drowned in crossing the river. Taylor estimated the enemy's loss in this at about 400; that of the Americans as 36 killed and 70 wounded. On May 17 Arista evacuated Matamoros, and on the following day Taylor crossed the Rio Grande and took possession. Previously, on May 11, President Polk had sent to Congress his famous war message, in which he enumerated the wrongs committed by Mexico against the United States and, ignoring Mexico's reasonable claim to the country between the Nueces and the Rio Grande, asserted that "Mexico has passed the boundary of the United States, has invaded our territory, and shed American blood upon American soil. War exists and, notwithstanding all our efforts to avoid it, exists by the act of Mexico herself." Two days later Congress issued a formal declaration of war and threw the onus of striking the first blow upon Mexico. The ensuing three months were utilized by both sides in raising additional troops. Congress authorized a call for 50,000 volunteers, and the regular army was increased to 30,000. On August 19 Taylor marched with 6700 men (including volunteers) upon Monterey, which was held by Ampudia with some 9000 men, of whom 3000 were regulars, and 40 pieces of cannon. Previous to his arrival before Monterey, however, Santa Anna (q.v.) had subverted the government of Paredes and had established himself in power. Orders had been issued to Commodore Conner to place the Mexican coast under blockade, but not to obstruct the return of Santa Anna, who was believed to be in favor of peace with the United States. The American army arrived in front of the town September 19, attacked on the twenty-first, and after three days of severe fighting the defenses were taken by assault and the Mexican general capitulated, being permitted to march out "with the honors of war" and an armistice of eight weeks being agreed upon. (See MONTEREY, BATTLE OF.) The Mexican losses were estimated at nearly 1000; the American at 488. General Scott withdrew from Taylor the greater part of his army and instructed Taylor to establish his headquarters at Monterey and refrain from further offensive operations. Through captured dispatches Santa Anna learned of Taylor's depleted force and quietly advanced upon the American position near Saltillo with 20,000 effectives. Taylor's scouts informed him of this in time for him to complete his dispositions for battle. With 4691 men, only 453 of whom were regulars, he awaited Santa Anna at Angostura, near Saltillo and on the road to San Luis Potosí. The engagement which followed, known as the battle of Buena Vista (q.v.), lasted two days (Feb. 22–23, 1847), and more than once the result seemed doubtful, the panic which seized certain regiments of Taylor's volunteers being counterbalanced by the steadiness of the regulars, the effective work of the light batteries, and the gallantry of the Mississippi regiment under Col. Jefferson Davis, afterward President of the Southern Confederacy. Notwithstanding the numerical superiority of the Mexican army, the obstinacy of the defense eventually won, and Santa Anna was forced to withdraw with 4000 killed and wounded. The American casualties comprised 264 killed and 450 wounded. These estimates are only approximate, as the number of killed and wounded in the battle of Buena Vista is uncertain. Soon afterward General Taylor returned home on leave of absence.

While the campaign in northern Mexico was thus progressing, the United States sent expeditions into New Mexico and California. Within three months the American flag had been hoisted at Santa Fe, the navy had planted the flag at San Francisco, and seaports on the west coast of Mexico were blockaded.

About a week before the engagement at Buena Vista, Scott had landed at the Lobos Islands, some 60 miles beyond Tampico and 7 miles from the mainland. He had at his disposal a force of 12,000 men, of whom two brigades were regulars. From Lobos the force proceeded to Anton Lizardo, where it lay inactive for a few days. A sandy beach lying 3 miles south of Vera Cruz was selected as a safe landing place on the mainland. By March 22 the investment of the city was complete, and a formal demand for surrender was made, which met with prompt refusal. For four days the besiegers bombarded the city and the castle of San Juan de Ulua, their fire being replied to with spirit; but on the twenty-fifth the foreign consuls used their influence in the interests of noncombatants and to secure the burial of the dead, and a suspension of hostilities ensued. On the twenty-ninth the city surrendered. (See VERA CRUZ.) After a brief interval the Americans pushed on towards their goal. At the same time Santa Anna, having reorganized his army, marched with more than 12,000 men from the city of Mexico. At Cerro Gordo (q.v.), a pass in the mountains, 60 miles from Vera Cruz, he awaited the invaders, about 8500 strong. On April 14 Scott arrived and on the eighteenth attacked. Although stoutly resisted, by noon the Americans had swept over Cerro Gordo and driven the Mexicans down the road for 10 miles. The spoils comprised 3000 prisoners, including 5 generals, and 40 bronze cannon. The casualties on the Mexican side were fully 1000; on the American side 431. The advance to Puebla was only slightly opposed, and on May 15 Worth's division of 4000 men encamped in the Grand Plaza of this "City of the Angels," in the midst of at least 60,000 hostile citizens, 75 miles from

the Mexican capital. On the seventeenth Scott made a final appeal to the Mexicans in the interest of peace, but in the embittered state of popular feeling it failed. On the contrary, Santa Anna strained every means for the defense of his capital; he appealed to the patriotism of the people, money was freely contributed, and almost every able-bodied man was enrolled for the common defense, until 36,000 men and 100 pieces of artillery were in readiness. Sickness and the discharge of seven regiments of volunteers had reduced Scott's army, but the arrival of 2400 men under General Pierce (afterward President of the United States) brought the total strength of the American forces to 10,738, nearly one-half of whom were recruits. Leaving a detachment of 500 men at Puebla, where 2300 wounded were in hospitals, Scott advanced upon the "Halls of the Montezumas." The city was entered by three roads, each guarded by rocky hills strongly fortified, the most prominent being that of El Peñon, mounting 51 guns, behind which were long and narrow causeways, flanked on one side by fields covered with broken lava and on the other by ponds and marshes. On the east and southeast large lakes added to the military protection of the city; an inner line of fortifications, made doubly impregnable by nature and art, completed the obstacles to a further advance on the part of the Americans. Undismayed by these, however, General Scott summoned his engineers, among whom were Captains George B. McClellan and Robert E. Lee, and a new road was cut, skirting Lake Chalco and by a circuitous route of 27 miles leading to the most vulnerable side of the town. After careful reconnoissance the first impediment, the hill of Contreras (q.v.), was taken (August 20) by an unexpected and desperate assault, with 813 prisoners (including 4 generals), 22 cannon, and thousands of small arms. The attacking force numbered 4500, the defense at least 7000 men, of whom 700 were killed, while the Americans lost about 60 in killed and wounded. Within easy supporting distance, moreover, was Santa Anna's reserve of 12,000 of the finest troops of Mexico. On the same day the strong positions of San Antonio and Churubusco (q.v.) were carried by the divisions of Worth and Twiggs, with further captures of 1800 prisoners, including 4 general officers, and 35 pieces of artillery; the Mexicans losing more than 3000 and the Americans about 1100 killed and wounded. After the "outer walls" had thus been gained, the American advance was again halted, and on August 23 an armistice was agreed upon pending the possibility that the demands of the United States might be acceded to without further bloodshed. This expectation proved futile, and on September 7 the final movement began. After severe hand-to-hand fighting, the defenses of Molino del Rey were carried by the Americans on September 8, and on the thirteenth the castle of Chapultepec was stormed. On the fourteenth the Mexican army evacuated the capital, and General Scott made his entry into the city. The total American losses during the operations in the valley of Mexico were 2703, including 383 officers; that of the Mexicans 7000 killed and wounded and 3730 prisoners of war. The spoils of war comprised 20 standards, 132 cannon, and 20,000 small arms. General Scott established his headquarters in the city of Mexico, was reënforced to an aggregate of 20,000 men, and levied a tax of $150,000 upon the municipal government, to be largely expended for the comfort of the sick and wounded. On Feb. 2, 1848, a treaty of peace between the United States and Mexico was signed at Guadalupe Hidalgo. (See GUADALUPE HIDALGO, TREATY OF.) The total number of American regulars who served in Mexico and its borders during the war was 21,509; of volunteers, 22,027.

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MEX'ICO (Sp. *Méjico*, mā'hĭ-kō). The most southern country of North America, bounded on the north by the United States and the Gulf of Mexico, east by the United States, the Gulf of Mexico, and the Caribbean Sea, south by British Honduras, Guatemala, and the Pacific Ocean, and west by the Pacific Ocean. It extends through 18 degrees of latitude, between the parallels of 15° and 33° N., and through 30 degrees of longitude, between the meridians of 87° and 117° W., and has an area of 767,055 square miles, including the islands. Though usually considered a tropical country, it lies in the temperate and torrid zones, the tropic of Cancer crossing it nearly midway between its northern and southern boundaries. The boundary between Mexico and the United States is 1833 miles in length, the northern extremity of the country being its widest portion. The Isthmus of Tehuantepec, a little more than 100 miles across, is the narrowest part. The country has 1727 miles of coast line on the Gulf of Mexico and the Caribbean Sea and 4574 miles on the Pacific Ocean. In form Mexico is not unlike a cornucopia with its narrow end tapering towards the southeast; and the country is concave on its eastern and convex on its western coast lines. In the southeast is the low, wide peninsula of Yucatan, projecting northward; and in the northwest is the long narrow peninsula of Lower California, paralleling the mainland through 9 degrees of latitude and separated from it by the Gulf of California.

CALIFORNIA
ARIZONA
NEW MEXICO
LOWER CALIFORNIA
SONORA
CHIHUAHUA
SINALOA
DURANGO
NAYARIT
ZACATECAS
COAHUILA
GULF OF CALIFORNIA
PACIFIC OCEAN
Colorado R.
Rio Grande
Pecos
Gila R.
San Diego
Yuma
Phœnix
Tucson
El Paso
Ciudad Juarez
Chihuahua
Hermosillo
Guaymas
Culiacan
Mazatlan
Durango
Zacatecas
Tepic
Guadalajara
La Paz
C.S.Lucas
Santiago
S.Jose
Todos Santos
Topolobampo
San Blas
Colima
Manzanillo
Bolson de Mapimi
Llano del Chilicote
MEXICO and Vicinity
SCALE OF MILES
Longitude 99° West from Greenwich
Sierra Guadalupe
Tlalnepantla
Guadalupe
Lake Tezcoco
Tezcoco
Mexico
Tacubaya
Piedad
Iztapalapan
Tlalpam
Xochimilco
L. Xochimilco
L. Chalco
Chalco
Monte Cruces

MEXICO.
SCALE OF STATUTE MILES.
50
100
200
300
400
157 MILES TO THE INCH.
Capital of Country:
Capitals of States:
Railroads: Finished Proposed
COPYRIGHT, 1899, BY THE MATTHEWS-NORTHRUP CO., BUFFALO, N. Y.
Longitude 99° West from 97° Greenwich
95°
93°
91°
89°
87°
West from 99° Greenwich
97°
J
K
L
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Q
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10
34°
32°
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28°
26°
24°
22°
20°
18°
16°
G U L F O F M E X I C O
Gulf of Campeche
Gulf of Tehuantepec
G. of Honduras
Delta of the Mississippi R.
ARKANSAS
LOUISIANA
MISSISSIPPI
ALABAMA
X A S
NUEVO LEON
TAMAULIPAS
SAN LUIS POTOSI
HIDALGO
MEXICO
PUEBLA
VERA CRUZ
OAXACA
GUERRERO
TABASCO
CHIAPAS
CAMPECHE
YUCATAN
QUINTANA ROO
GUATEMALA
HONDURAS
BRITISH HONDURAS
Hot Springs
Pine Bluff
Birmingham
Grenada
Columbus
Tuscaloosa
Selma
Montgomery
Durant
Meridian
Vicksburg
Jackson
Natchez
Flomaton
Mobile
Pensacola
Biloxi
Baton Rouge
New Orleans
Texarkana
Camden
Greenville
Magnolia
Minden
Monroe
Shreveport
Natchitoches
Alexandria
Lake Charles
La Fayette
New Iberia
Beaumont
Port Arthur
Wichita Falls
Henrietta
Denison
Sherman
Paris
Greenville
Pittsburg
Ft. Worth
Weatherford
Dallas
Abilene
Cisco
Cleburne
Tyler
Corsicana
Palestine
Logansport
Jacksonville
Morgan
Waco
Lufkin
Temple
Bremond
Trinity
Navasota
Liberty
Austin
Bastrop
Kerrville
San Marcos
Columbus
Houston
San Antonio
Gonzales
Cuero
Richmond
Alvin
Galveston
Nottingham
Uvalde
Victoria
Eagle Pass
Beeville
Port Lavaca
Ocean View
Corpus Christi
Santa Tomas
Laredo
Pena
Guerrero
Mier
Camargo
Isabel
Brownsville
Bagdad
Matamoros
Monterey
Linares
Sta. Teresa
Mendez
Cruillas
S. Nicolas
S. Carlos
Garza Valdes
Hidalgo
Jimenez
Abasola
Soto la Marina
Padilla
Ciudad Victoria
Tula
Gonzales
Tampico
Tamos
Ozuluama
Tancanhuitz
Aztla
I. Blanquilla
I. de Lobos
Tantoyuca
Tamiahua
Tuxpan
Tihuatlan
Papantla
Misantla
Pachuca
Jalapa
Vera Cruz
Medellin
Alvarado
Tlacotalpan
Orizaba
Cordoba
Puebla
Mexico
Toluca
Cuernavaca
Popocatepetl
Chilpancingo
Acapulco
Ayutla
Oaxaca
Tehuantepec
Juchitan
Salina Cruz
Puerto Mexico
Frontera
Comalcalco
San Juan Bautista
Laguna de Terminos
Carmen
Campeche
Champoton
Merida
Progreso
Izamal
Valladolid
Sotuta
Tekax
C. Catoche
Cozumel I.
Bacalar
Corozal
Belize
Tuxtla
San Cristobal
Comitan
Tonala
Tapachula
Guatemala
Coban
Salama
Zacapa
Amatitlan
Totonicapan
Puerto Cortes
San Pedro
Comayagua
L. Peten
Usumacinta
Minatitlan
Acayucan
Tuxtla
Tlacotalpan
Santa Cruz de Bravo
C. Ambergris
Hermanos
Frontera

Topography. The surface of the main portion of Mexico rises steeply from the narrow coast lands and more gently from the great depression of the lower Rio Grande to the broad table-land of the interior. This central plateau is dominated by mountains whose great height is masked by the elevated lands above which they rise. The peninsula of Yucatan, on the other hand, has nothing in common with the main mass of Mexico in its conformation or geological structure, being a very low, level region.

The east coast is of monotonous aspect, low, flat, and sandy; but in the State of Vera Cruz, where the lofty mountain edge of the plateau most nearly approaches the coast, the inconspicuous shore line is forgotten by all who approach it from the gulf, for the majestic summits of the interior are visible far out to sea and dominate the view. Long reaches of sand banks stretch in front of the shore nearly as far south as Vera Cruz, shielding the shallow waters between the mainland and the banks from the sea waves. The Pacific shore is also generally low, though here and there relieved by spurs from the cordillera that extend to the ocean. Most of the many small islands near the coasts are uninhabited, though some of them are very fertile. The most important islands are El Carmen, the largest Mexican island in the Gulf of Mexico; San Juan de Ulua and Sacrificios, at Vera Cruz; Mujeres and Cozumel, in the Caribbean Sea; Guadalupe and Cedros, in the Pacific off the coast of Lower California; the Tres Marías group, near the entrance to the Gulf of California; and the Revilla Gigedo group, far off the coast of the State of Colima, to which it is assigned.

There are no good natural harbors on the Gulf of Mexico coast, but this impediment to commerce has been partly relieved by the expenditure of large sums. Jetties at the entrance to the port of Tampico have increased the depth from 9 to 24 feet; similar improvements have given Puerto Mexico a depth of 30 feet at the entrance to the Coatzacoalcos River; and breakwaters at Vera Cruz have turned that dangerous roadstead into a safe and commodious harbor. The best natural harbors are on the Pacific coast, those of Acapulco, Manzanillo, Guaymas, and La Paz, the chief town of Lower California, being most conspicuous. That of Acapulco is one of the finest natural harbors in the world. These excellent Pacific coast ports have, however, the disadvantage that they are shut off by mountains from the busiest parts of the Republic, and therefore do not have a large share of the country's trade.

The east and west edges of the great central table-land are bordered by two cordilleras or high mountain ranges. The Sierra Madre Oriental, on the east, runs nearly parallel to the Gulf of Mexico, at distances of 10 to 100 miles from the coast, the land gently sloping from the foot of the mountains to the sea. The Sierra Madre Occidental, on the Pacific side, is on the whole nearer the coast. In the south the main western cordillera trends towards the east, and in the states of Michoacan and Guerrero there is a coastal range, with a broad fertile valley stretching between it and the main chain. The most continuous range is the Sierra Madre Occidental, which extends from Arizona to Oaxaca with a mean elevation of over 10,000 feet. The inland faces of the two border ranges descend somewhat gently to the central table-land, while their seaward sides are more precipitous, presenting many scarps and cliffs and furrowed with deep chasms or gorges. The border ranges gradually approach one another towards the south, and the narrowing plain between them terminates, south of the city of Mexico, in a labyrinth of mountains culminating in giant peaks, such as Popocatepetl and Orizaba. They include an irregular line of mountains, known to the Mexicans as the Cordillera de Anahuac, extending east and west across the country without forming a continuous chain, but embracing most of the active volcanoes.

The numerous mountain peaks, mostly volcanic in origin, between the twenty-second parallel and the Isthmus of Tehuantepec, are the most elevated features of the topography. The volcanoes are of recent formation and most of them are either extinct or quiescent, the exhalations of the latter consisting only of aqueous and sulphurous vapors. The loftiest of these mountains is the volcano Orizaba (Citlaltepetl, Star Mountain, 18,250 feet in height), situated to the north of the line of the railroad between Vera Cruz and the city of Mexico. It has not been in violent eruption since the middle of the sixteenth century, and has been nearly quiescent since the middle of the nineteenth century, though vapors and sulphurous jets are still ejected from its crater, which, however, is usually filled with snow. Popocatepetl (Smoking Mountain, 17,520 feet), the most widely known of the Mexican volcanoes, is comparatively easy of ascent. Its yawning crater is over half a mile in circumference and 250 feet deep, and through the melted snow around the orifice frequent jets of gas emerge. Orizaba and Popocatepetl are among the most perfectly formed of volcanic mountains. Ixtaccihuatl (White Woman, 16,960 feet), which rises to the north of Popocatepetl, is not of volcanic origin, though there are many legends regarding its ancient activity. The extinct Nevada de Toluca (14,950 feet) rises to the south of the town whose name it bears, a lake from melting snows partly filling its crater with pure cold water in which fish of a peculiar species are found. Malinche (13,460 feet) rises in isolated majesty from the middle of the Tlaxcala plateau. On the verge of the central plateau bordering the Sierra Madre Oriental is Cofre de Perote (13,400 feet), another great eruptive summit now extinct, which owes its name "coffer" to the quadrilateral form of its summit, and is famous for the Chinacamote cavern on its western side, said to be over 30 miles in length, but difficult of access because its floor is strewn with large rocks. Colima (12,970 feet), not far from the Pacific and the most active volcano in Mexico, is in an almost incessant state of ebullition. The view from its summit, during its periods of quietude, is unrivaled, embracing the ocean, widespread plains, and the glittering snow crown of Popocatepetl far to the east. The forested Tancitaro, nonvolcanic (12,650 feet), is in the same latitude as Colima, but nearer to the Sierra Madre. As the limit of perpetual snow is a little under 15,000 feet above the sea, only three of these lofty summits, Orizaba, Popocatepetl, and Ixtaccihuatl, have an enduring crown of snow; and considerable glaciers develop only on Ixtaccihuatl. The small volcano of Jorullo (4330 feet) is said by the natives to have suddenly risen above the cultivated plain in a single night near the end of 1759, though its period of construction did not end till 1763. Humboldt made

it famous by the description he received from the natives of its terrific energy. Columns of superheated air still rise from its crater.

The wide table-land or plateau of Anahuac (q.v.), lying between the two cordilleras, slopes from south to north, being from 5000 to 9000 feet high in the states of Mexico and Puebla and falling to 3600 feet at El Paso, on the United States border. Its surface is covered with long-continued outpourings from the volcanoes and the detritus worn away from the mountain slopes, which, according to Heilprin, filled the original depressions, the valleys of to-day having been imposed upon this new surface. The mountains of the plateau, nearly buried by the accumulations of past ages, still rear their heads above the general level, and here and there are continuous ridges or ranges which divide the surface into well-defined basins such as the valley of Mexico, nearly 8000 feet above the sea and completely inclosed by mountains. The rivers of the plateau have cut deep valleys and cañons, some of which are 1000 feet below the general level, extending the warmer influence of the coast lands into the plain. These barrancas, as they are called, are watered by small streams and contrast, by the luxuriance of their vegetation, with the dry and often barren plateau above them. The most famous of the barrancas extend from the neighborhood of Guadalajara through the western mountains to Colima and Tepic. On the whole, the surface of the plateau is so level that there was little difficulty, even before there were wagon roads, in traveling by carriage between the city of Mexico and Santa Fe.

The dry and sandy peninsula of Lower California is traversed by the Sierra de la Giganta, broken in two places and culminating in Mount Calamahue (10,126 feet), in the northern part of the peninsula. Owing to its excessively dry climate and scanty population, this peninsula is still little known. The huge quadrilateral peninsula of Yucatan is projected beyond the continental coast line towards Cuba, has no mountain ranges, and its mean altitude is scarcely above 100 feet.

Hydrography. The form of the central plateau, hemmed in by border ranges parallel with the sea and preventing wet winds from reaching the interior, is not favorable to the development of large fluvial systems. No Mexican river is important for its volume or is valuable for commerce excepting to a very limited extent. All rivers tributary both to the Gulf of Mexico and the Pacific are obstructed by sand bars at their mouth. The longest river is the Rio Grande, which rises in Colorado and for 750 miles forms the boundary line between the United States and Mexico. The waters of its upper course are so far diverted for irrigation purposes that the lower river is almost entirely dry during the dry season. While the Mexican part of its basin comprises 94,000 square miles, the river receives scarcely any perennial stream. Its largest affluent in Mexico is the Río Conchos, which is fed for 200 miles north and south by the east slope of the Sierra Madre Occidental. The Salado tributary comes from the Sierra Madre Oriental, and its name, Salt River, indicates that its waters are rendered saline by their very slow passage through shallow basins. Other tributaries have the same peculiarity, so that they give a brackish taste to the waters of the Rio Grande itself. The Pánuco, the most considerable river of the south tributary to the Gulf of Mexico, rises north of the Mexican valley and empties at the port of Tampico. The Coatzacoalcos, or Snake River, drains the alluvial plain and low mountain district, forming the north slope of the Isthmus of Tehuantepec; small boats ascend it for over 60 miles from its mouth. The most important rivers on the Pacific coast are the Mexcala, or Río de las Balsas (river of the rafts), which, as its name indicates, is navigable to a limited extent in its lower reaches, and the Lerma or Santiago, which rises a little west of the city of Mexico, and about 15 miles from Guadalajara is precipitated over the great falls of Juanacatlan, one of the finest waterfalls in the Western world.

The Lake of Chapala, which receives and discharges the Lerma River, is the largest lake in Mexico; many fine country houses have been built on its shores. Mexico has no really large lakes, though some of the sheets of water, as Cuitzeo and Pátzcuaro, in the State of Michoacan, are famous for their beauty. A considerable part of the valley of Mexico is occupied by six very shallow lacustrine basins, four of the lakes salt. They are the relics of much larger lakes which existed when the Spaniards invaded the country.

Climate. As a whole, Mexico is a hot country, but its climate, if not one of the most salubrious, is among the most delightful in the world; the normal warm temperature is modified by great contrasts in elevations and by the position and trend of the mountain ranges, which influence the force and direction of the winds and the distribution and amount of the rainfall. The climatic differences depending upon the differing altitudes are so great that the vegetable products include almost all that grow between the equator and the Arctic regions. In some large areas, however, uniformity of climate prevails; thus, the great plains of the northern states, hemmed in by mountains from sea influences, have the extremes of temperature characteristic of the continental climate in the United States. On the other hand, the Isthmus of Tehuantepec is entirely included in the wet tropical zone.

Three zones of climate are distinctly marked. The tierra caliente, or hot land, lies along the low maritime zone of the Gulf and the Pacific and includes swampy and sandy coast lands and well-watered plains and slopes leading up to the mountains. The growth of luxuriant tropical vegetation is promoted by a mean annual temperature of 77° F. to 82° F., the mercury seldom falling below 60° F., but often rising to 100° F., and in the sultry districts of Vera Cruz and Acapulco to 104° F. Some places, as the port of La Paz, are among the hottest in the world. The seacoasts are unhealthful, fevers prevail, and in some localities yellow fever and black vomit are endemic. The health conditions may be greatly improved by draining the swamps, as has already been shown at Vera Cruz.

Above the Gulf and Pacific hot zones are the tierras templadas, or temperate lands, from 3000 to 6000 feet above the sea, embracing the higher terraces and parts of the central plateau. The temperate lands rise to a higher elevation in the southern than in the northern states. The mean temperature is from 62° F. to 70° F. and does not vary more than four to five degrees during the year. Thus, extremes of heat and cold are unknown; semitropical products, like those

of southwest Europe, are abundant and to some extent, also, products both of the tropical and cold regions. Around the city of Oaxaca wheat and sugar cane may be seen growing on the same piece of ground.

Above the temperate lands are the tierras frias, or cold lands, 7000 feet or more above sea level, with a mean temperature of from 59° F. to 63° F. Most of the central plateau, with its girdle of mountains, is included in this region, but in great depressions of the surface a warmer temperature and tropical products are found. The less elevated parts of this region produce cereals and apples, while the higher grounds, some of which extend above the snow line, have a sparse vegetation. The lower cold lands are the most thickly inhabited regions in Mexico.

Owing to the differences of temperature and the effect of the mountain ranges upon the direction of the winds, the rainfall is very unequally distributed. During the rainy season, from the middle of May to October, many torrential storms occur in the southern half of the Republic. Little or no rain falls in the winter or dry season. The cold lands receive only about one-fifth as much rain as the temperate lands, except in some of the mountain districts, where the precipitation is heavy. The city of Mexico has a mean rainfall of 30 inches a year, which is somewhat in excess of the general supply of the plateau to the north of it, though the precipitation on the mountain coast lands is two to four times as great. The extreme northern part of the plateau is semiarid, reproducing the conditions that prevail in Arizona and New Mexico. The country lies in the zone of trade winds blowing from northeast to southwest, but, as mentioned above, the trend of the ranges modifies their normal direction. Both the Gulf and Pacific coasts are exposed to violent gales, which often do great damage to shipping.

Geology and Mineral Resources. The mountain ranges are formed chiefly of plutonic and volcanic rocks, such as granites, gneiss, syenites, mineral-bearing trachytes, basalts, porphyries, obsidian, sulphur, pumice, lavas, and tufa. Sedimentary formations are also represented, especially by a carboniferous limestone interspersed with deposits of anthracite. The land consists mainly of metamorphic formations largely penetrated and overlaid by volcanic outpourings and the débris resulting from mountain denudation. The most valuable rocks thus far known are the argentiferous porphyries and schists of Sinaloa and the central plateau. It has not yet been revealed whether the auriferous deposits of Sonora are destined to equal them in economic value. The sandstones of the northern states have produced the sandy plains of north Mexico, but none of the horizontal layers is rich in ores, which are found chiefly in metamorphic rocks of Durango, Chihuahua, and the south.

Mexico is one of the richest mining countries in the world. It produces annually about 6 per cent of the world's output of gold, 30 per cent of silver, 5 per cent of copper, and 12 per cent of lead. Excepting Sinaloa and Sonora, which contain vast stores of the precious metals, nearly all the historic mines lie on the south-central plateau at elevations of from 5500 to 9500 feet. Silver is found in all the states, but the principal mines are in Sonora, Chihuahua, Sinaloa, Zacatecas, San Luis Potosí, Guanajuato, Hidalgo, and Mexico. A line drawn from Guadalupe y Calvo, Chihuahua, through Guanajuato and Mexico City, to Oaxaca will intersect perhaps the richest silver-yielding zone of the world. The central group of mines in the districts of Guanajuato, Zacatecas, and Catorce in the states of Guanajuato, Zacatecas, and San Luis Potosí have thus far yielded over half of the silver mined in Mexico. The Veta Madre lode of Guanajuato alone produced $252,000,000 between 1556 and 1803. Eighteen states of Mexico have gold-bearing districts; the metal, however, is found chiefly on the slopes facing the Pacific. Owing to the greater difficulty and expense in mining and reducing gold, it was formerly only produced when found in connection with silver ores. More recently gold-bearing quartz lodes have been worked. The rise of the gold production has been rapid during the last 20 years. In 1893 its value was less than 4 per cent of the silver output, in 1902 it was 20 per cent, and, in 1912–13, 48 per cent. Copper in a pure state is found near the city of Guanajuato and associated with gold in several states. Iron is in vast abundance in Michoacan, Jalisco, and Durango, but until the coal fields found at various points are developed there is little prospect that iron mining will become very important. The famous Cerro de Mercado, just outside the city of Durango, which was discovered in 1562, is a hill about 400 feet high, 1½ miles long, and ⅓ to ½ mile wide, consisting of a solid mass of iron ore 65 to 75 per cent pure iron. Mining experts have estimated the amount of ore above the surface at 500,000,000 tons, while no one knows how much may exist below the plain. Fuel is one of the most pressing needs of Mexico. Firewood costs in the city of Mexico $14 a cord. Coal ranges from $16 to $22 a ton and is brought from England and the United States. The difficulty is that most of the coal is remote from lines of transportation, and the fields cannot be developed till means of cheap carriage are provided. Sonora has a carboniferous area with veins from 5 to 16 feet in thickness of hard clean anthracite carrying as high a percentage of fixed carbon as the best coal of Wales. When it can be transported the anthracite of this field will supply the Pacific coast of North America with anthracite of the first quality for years to come. The coal deposits of Michoacan and Oaxaca are also undeveloped. Many of the inhabitants of the northern state of Coahuila burn mesquite bush, straw, and cotton bushes because they cannot procure the coal mined at Salinas in their state, which now supplies fuel for the International Railroad Company, a part of the Southern Pacific Railroad, and the factories in Monterey. Much lead is associated with silver, and tin, sulphur, salt, marble, and the building stones are in abundance. All other mining enterprises, however, are dwarfed by the colossal development of silver production. Most of the mines yield silver either alone or in combination with other ores. The mining industry, as well as all others, was seriously affected during the revolutionary movements from 1910 onward. In 1912–13 the silver production amounted, in Mexican silver, to $81,481,102 (in 1911–12, $88,839,747; in 1877–78, $24,837,000), and the gold production, $39,591,686 (in 1911–12, $49,905,115; in 1877–78, $747,000). In 1913 the production of copper was 116,402,880 pounds. The production of the other principal metals, in 1907, was as follows, in metric tons: Lead, 70,241,558; antimony, 3,070,230; iron, 1,363,-

290; coal, 1,024,579; mercury, 25,887. In 1907 the total number of mines of all kinds was 7296, of which 1032 were in operation, employing 95,991 men, 524 women, and 3130 children. In 1914 it was estimated that the foreign and Mexican capital invested in the mining industry amounted to $647,000,000.

One mint and ten government assay offices are maintained. The total coinage of Mexican silver from 1537 (when the city of Mexico mint was founded) to 1905 amounted to $3,546,393,617—more than one-third of the world's production of silver since 1493. As a large amount of silver is not coined, but is used in the arts, it is estimated that Mexico has produced nearly one-half of the world's silver mined in the past four centuries. From April 16, 1905, the mints and assay offices have ceased to accept bullion from private persons for free coinage. Most of the gold and silver is exported, the bulk going to the United States.

Petroleum. The presence of deposits of oil and asphalt was always recognized, but it is only within the past few years that this industry has been developed. Oil is found throughout the Gulf coastal plain, from Tamaulipas to Campeche; the principal centres of production are the Tampico region and the Isthmus of Tehuantepec. Most of the oils are heavy and are more especially adapted for use as fuel, although many contain valuable refining products. Many companies have been formed for exploiting the oil fields, refineries and pipe lines have been established, and in the Tampico district alone about 5,000,000 acres are held for oil purposes. The chief oil ports are Tampico, Tuxpam, and Puerto Mexico. The following table from the *Mexican Year Book* of 1914 shows the remarkable growth of the petroleum production in Mexico:

YEAR	Barrels	Percentage of world's production
1900–06	1,000,000	...
1907	1,000,000	0.38
1908	3,481,410	1.22
1909	2,488,742	0.84
1910	4,531,826	1.38
1911	14,051,693	3.70
1912	16,558,215	4.71
1913 (estimated)	26,000,000	...

Flora and Agricultural Resources. The sharp differences in climate produce rapid transitions in forms of vegetation; in a few hours' travel great differences not only in the kinds of plants but also in the stages of growth of the same plant are observed. The Mexican Southern Railroad from Puebla to Oaxaca descends by fertile terraces from 7000 feet to 1750 feet above the sea. In March the green wheat is just peering above the ground in Puebla, while lower down along this railroad fields of wheat are ripe for harvest and still lower the grain is being threshed. The varied conditions of temperature and moisture result in the greatest contrasts, desert areas lying contiguous to grassy steppes, which are succeeded by cultivated fields, and in the lowlands by forests with an inextricable tangle of tropical undergrowths. Gray, thorny plants characterize the northern region, where rain seldom falls, though even this region is brightened in the spring by many flowers. Owing to the undeveloped state of coal mining and the great need of fuel and timber for the mines, the forests that once covered the mountains have been largely destroyed, and thus the conditions of rainfall have been considerably modified. But many varieties of oak and also pines and firs are found on the mountain slopes; and the hot lands have about 100 varieties of building and cabinet woods, including mahogany and rosewood, besides dyewoods, gum trees, the fig, and oil-bearing trees and plants, such as the olive, coco palm, sesame, and almond. Fifty-nine species of medicinal plants have been classified.

Few countries equal Mexico in the variety of its economic vegetable products. Coffee is extensively cultivated in the temperate lands of Vera Cruz, Oaxaca, Chiapas, Morelos, Jalisco, and Tepic. It is of an excellent quality and about 40,000,000 pounds are exported annually. About 90 per cent of the cotton is grown upon the irrigated lands in the "laguna district" of the states of Coahuila and Durango, and the remainder is produced in the districts of Tuxpam and Vera Cruz and along the Pacific coast. The entire production of the staple yields about one-half the amount needed for the Mexican mills. Sugar cane is extensively cultivated in the lowlands of the southern states, but as yet the amount produced is insufficient to supply the home market. Tobacco is grown all over the Republic and that produced on the warm lands south of Tampico and San Blas is almost equal to Cuban leaf in aroma. Its improved cultivation was introduced by Cuban planters about 40 years ago. Maize, the chief crop throughout the temperate region, thrives best south of Durango. Another great food staple is the frijol, or brown bean, cultivated with peas and lentils and daily eaten by most Mexicans. The wheat crop in the cold zone is worth only about one-fourth as much as the maize crop.

A great variety of tropical fruits are raised in the hot zones, including oranges (up to 2500 feet), lemons, bananas (up to 5000 feet), easy to cultivate and affording a large profit, pineapples (from sea level to 3000 feet), and cocoanuts along the hot coasts. Many species of the agave grow on the central plateau. One of them, the maguey, yields large quantities of a white juice which, when fermented, produces the intoxicating liquor called pulque, the national beverage of Mexico. Other species of the agave yield henequen, or sisal hemp, whose cultivation and preparation for market are by far the most important of the fibre industries and have made the prosperity of the State of Yucatan, in the northern part of which it is produced. Enormous quantities are exported to the United States for sacking, cordage, and binder twine. The *Castilloa elastica* is the predominant species of rubber tree, and, though rubber collecting is as yet little developed, it is destined to be very profitable. The cacao tree thrives chiefly in Chiapas and Tabasco, but not enough cocoa is produced for home consumption. The vanilla bean grows luxuriantly on the Gulf coast and brings a high price on account of its excellent quality. Rice on the coasts is usually grown without irrigation, depending entirely upon the rainfall. The soils of Mexico excepting in the sandy north and some areas of sand along the coasts are excellent. The agricultural resources are capable of far larger development as soon as irrigation is applied to the naturally productive lands. Much of the plateau is semiarid, but the neighboring mountains have inexhaustible supplies of water, which by the construction

of reservoirs and other modern appliances may be conserved for agricultural uses. Farming methods are crude and modern machinery has been introduced only on the large plantations. The chief agricultural products of 1907 were (a kilogram = 2.2 pounds; a hectoliter = 2.8375 bushels):

	Kilograms		Kilograms
Sugar cane	2,762,089,370	Chile seco	13,312,964
Wheat	312,109,551	Cacao	3,108,960
Henequen	113,089,629	Oats	406,925
Ixtle	62,767,916		Hectoliters
Coffee	50,113,450	Corn	72,501,217
Cotton	33,631,842	Barley	3,819,876
Rice	32,885,335	Frijoles	2,113,472
Sweet potatoes	27,277,367		
Tobacco	19,445,564		

Fauna. In the plateau regions the fauna is that of the North American continent, while it is more closely associated with that of the West Indies in the coast lands of the gulf; that of the Pacific seaboard partakes of the character of the California and South American fauna. Wolves and coyotes are common in the northern states, and bears, peccary, the puma, jaguar, and ocelot are found among the mountain forests. In the tropical forests are five varieties of monkeys and a species of sloth. Among the other animals are the hare, rabbit, squirrel, beaver, mole, marten, otter, and several species of deer. A few boas in the south and several other species of snakes, some of them very venomous, as the rattle and coral snakes, represent the ophidians. Noxious insects infest the hot regions in myriads. The coast waters and estuaries of the rivers teem with fish, and turtle shell is an article of some trade importance. Bees are numerous and their wax is exported. Vultures are the scavengers of every town, and parrots, humming birds, and other tropical birds vie in brilliancy of plumage with those of Brazil. The Mexican mocking bird and other songsters are unsurpassed. Only the turkey and a species of duck have been domesticated, all the farm animals having been introduced by the Spaniards into Mexico, where they have multiplied prodigiously.

Animal Industries. Stock raising is one of the leading industries. In the low-lying coast regions, particularly in Vera Cruz and Tabasco, are moist savannas, covered with nutritious grasses, where cattle may be reared and fattened at small expense; and on the comparatively arid plateau of the north there is sufficient herbage to support enormous numbers of cattle. On some of the haciendas 10,000 to 30,000 head are in charge of vaqueros, who are very skillful in throwing the lasso and in all the other arts of the cowboy. Mexican cattle are of inferior quality (long-horned type) and small size, weighing only 900 to 1000 pounds. Stock raisers have begun to improve their herds by the importation of better breeds from the United States. Hides are an important export to the United States, and hundreds of thousands of undeveloped steers are sold in Texas. The horses are small but hardy animals. Sheep produce only 1 to 2½ pounds of coarse and inferior wool to the fleece, all of which is consumed in the home mills, which import much wool of finer grades, while well-to-do Mexicans wear imported clothes. The tendency towards the improvement of all the native domestic animals and of the methods of stock raising has given rise to a large expansion in these industries.

Manufactures. The manufacturing industries have progressed slowly, though with the advent of much foreign capital during the long period of peace under the Díaz régime there was a large development of many industries. The first cotton mill was erected in 1834. In 1911–12 there were 148 cotton spinning and weaving mills (126 in operation) with 762,149 spindles, 27,019 looms, and 50 printing machines, consuming 33,153,636 kilograms of cotton, producing 14,128,366 pieces of cloth (27 meters long) and 3,020,569 kilograms of yarn, and employing 32,209 hands. There were 44 factories in Puebla, 14 in Vera Cruz, 12 in the federal district, 10 in Coahuila, and from 1 to 8 in 18 other states. The 440 tobacco factories used 10,137,789 kilograms of tobacco and produced 570,352,851 packages of cigarettes, 42,461,139 cigars, 36,818,213 cheroots, besides pipe tobacco and snuff. The largest number of factories were in Guanajuato (62), Vera Cruz (55), Michoacan (45), Tamaulipas (34), Jalisco (28), and San Luis Potosí (25). In 1907 over 2000 establishments engaged in the manufacture of sugar products produced 116,774,165 kilograms of sugar, 96,238,319 kilograms of molasses, and 84,241,728 kilograms of panocha. The distilleries manufactured 1,769,397 hectoliters (1 hectoliter = 26.417 gallons) of rum and 4,629,818 hectoliters of pulque. The other important industries are woolen and linen spinning and weaving, the manufacture of glass, drugs, chocolate, paper, guayule, matches, soap, brick and tile, porcelain, flour, iron and steel, candles, furniture, and beer brewing. The artisans of the plateau are skilled in making the broad-brimmed Mexican hats, silver ornaments, jewelry, saddlery, leather work, and embroidery, and in other arts that contribute to the distinctive finery of Mexican attire and equipment. The feather work and other products of the Indians are still highly prized. The government encourages the development of home industries by imposing a tariff amounting on an average to about 38 per cent on the declared value of nearly all imported goods.

Commerce. The value of the foreign trade of Mexico has for years been rapidly increasing. The exports have steadily increased and have been larger than the imports, which have fluctuated considerably since 1907. The following table shows the value, in Mexican silver dollars or pesos (the peso = $0.46 United States currency), for the several fiscal years:

YEAR	Imports	Exports
1894–95	$66,200,000	$95,000,000
1899–1900	128,700,000	158,200,000
1904–05	178,204,962	208,520,451
1909–10	194,866,000	260,046,000
1912–13	195,772,000	300,405,000

The trade with the leading countries and the percentages of the total trade were as shown on page 540 for the several fiscal years.

The leading articles of export in 1912–13 were valued (in pesos) as follows: Silver, 91,293,652; gold, 39,591,427; copper, 36,522,115; henequen, 30,133,754; dry hides, 11,170,432; coffee, 11,263,700; rubber, 8,376,350; cattle, 7,555,585; guayule, 7,234,576; chick peas, 4,930,361; lead, 4,907,334; textiles, 3,646,441; woods, 3,365,131; and vanilla, 3,315,471.

IMPORTS FROM	Amount in millions of pesos			Percentage of total trade		
	1904–05	1909–10	1912–13	1904–05	1909–10	1912–13
United States	99.97	112.84	97.28	56.66	57.90	49.69
Great Britain	21.64	22.25	25.90	12.13	11.41	13.22
Germany	20.45	20.26	25.22	11.47	10.41	12.89
France	17.71	17.43	18.33	9.94	8.94	9.37
Spain	7.73	5.28	10.53	4.34	2.71	5.38
Other countries	10.67	16.78	18.49	5.26	8.63	9.45

EXPORTS TO	Amount in millions of pesos			Percentage of total trade		
	1904–05	1909–10	1912–13	1904–05	1909–10	1912–13
United States	152.93	196.97	232.03	73.34	75.74	77.24
Great Britain	17.08	28.53	31.14	8.19	10.97	10.37
Germany	16.17	8.44	16.43	7.75	3.24	5.47
France	5.92	12.28	7.15	2.84	4.72	2.38
Spain	1.93	1.93	2.18	0.92	0.74	0.73
Other countries	14.45	11.88	11.45	9.96	4.59	3.81

The principal classifications of imports and exports were valued as in the tables below.

Shipping and Communications. Most of the foreign trade of Mexico is carried either by railroad or in foreign bottoms. The mercantile marine of the country comprised, in 1911, 32 steamers of 16,648 net tons and 52 sailing vessels of 8712 net tons. In 1911–12 over 9000 vessels engaged in foreign and coastal trade entered the Mexican ports. The table on page 541 shows the increase in the number of vessels and tonnage.

IMPORTS	1904–05	1909–10	1912–13
	Pesos	Pesos	Pesos
Mineral substances	52,758,614	27,929,814	46,711,978
Vegetable substances	30,426,903	21,355,726	31,285,563
Machinery and apparatus	22,442,984	10,470,848	23,383,811
Textiles	23,282,549	10,110,462	21,281,571
Animal substances	.....	7,506,442	16,466,311

EXPORTS	1904–05	1909–10	1912–13
	Pesos	Pesos	Pesos
Mineral products	130,303,978	78,260,037	189,648,610
Vegetable products	59,076,270	38,857,899	85,942,954
Animal products	10,505,119	10,052,092	19,837,832
Manufactured products	7,896,959	1,768,326	3,345,264

In 1911–12, 1107 steam and 6 sailing vessels visited more than one port, bringing the total tonnage of vessels entering up to 7,256,210 and of those departing to 6,611,921. In this same year 4169 steam and 2982 sailing vessels, most of them very small and owned by Mexicans, which were engaged in coastwise trade, entered the various ports of the Republic.

The first railroad, only 3 miles in length, connecting the city of Mexico with Guadalupe, was completed in 1854. Since 1870 railroad construction has been carried on rapidly. The railroad between Vera Cruz and the city of Mexico was completed in 1873. Mexico is now covered with a network of railways, which reach all the important cities and mining districts. In 1910 the railway mileage was 15,260 (1914, about 16,000), of which 8612 miles were under the control of the National Railways of Mexico, a corporation in which the government owns a controlling interest by holding 50.3 per cent of the shares. The National Railways System, formed in 1909 by the consolidation of various lines, extends from the United States border, at two points, to Guatemala and from the gulf to the Pacific in two places. Of this system, the National Railroad (1218 miles) begins at Laredo and traverses the eastern portion of the central plateau to Mexico City, with a branch to Matamoros; the Mexican Central (3516 miles), starting from Ciudad Juárez, runs across the central uplands to the capital and beyond to the Balsas River, with numerous branches, one to Tampico on the gulf and one to Manzanillo on the Pacific; and the International Railway (917 miles) from Piedras Negras (Ciudad Porfirio Díaz) crosses the states of Coahuila and Durango. South and east of the capital the National Railway controls the Interoceanic Railway (736 miles), Mexico City to Vera Cruz; the Vera Cruz and Isthmus line (264 miles), from Vera Cruz to the Tehuantepec line; the Tehuantepec Railroad (220 miles), from Puerto México (Coatzacoalos) on the gulf to Salina Cruz on the Pacific; and the Pan-American Railway (297 miles), from San Gerónimo on the Tehuantepec line to the Guatemalan border. The principal independent lines are the Mexican Railway (520 miles), from Mexico City to Vera Cruz; the Kansas City, Mexico, and Orient (276

miles), building across central Chihuahua; the Mexico Northwestern (472 miles), from Ciudad Juárez through western Chihuahua; the Southern Pacific (1195) from Nogales southward along the Gulf of California and the Pacific to Mazatlan and Tepic; and the United Railways of Yucatan (503 miles). Most of the railroads of Mexico have been constructed with foreign capital, together with liberal government subsidies, under concessions providing for the ultimate reversion to the government, and are operated according to the Mexican Railway laws, under the supervision of the Railway Commission.

YEARS	ENTERING				YEARS	DEPARTING			
	Steam		Sailing			Steam		Sailing	
	Number	Net tonnage	Number	Net tonnage		Number	Net tonnage	Number	Net tonnage
1900–01....	906	2,256,220	553	191,589	1901–01...	883	2,216,546	540	194,100
1905–06....	1094	2,879,626	426	172,248	1905–06...	1016	2,627,111	408	164,074
1911–12....	1407	3,434,293	683	170,234	1911–12...	1418	3,521,544	641	183,198

In 1912 the federal government, which has a monopoly of the commercial telegraph business, had in operation 530 telegraph offices, 25 telephone stations, and 8 wireless telegraph (Telefunken system) stations. It had 46,037 miles of telegraph wires and transmitted 4,531,683 messages, which produced a revenue of 2,357,000 pesos. The railways also have telegraph lines for handling their own business. In 1912 there were 2911 post offices (1972 in 1900), which handled 101,920,217 letters, post cards, and packets. The postal revenue was 4,700,297 pesos in 1912–13. Mexico is a member of the Universal Postal Union, has both national and international money-order systems, and has parcel-post conventions with a number of countries.

Banking. The present banking system of Mexico dates from 1897. The law of that year provided for three classes of banks, viz.: banks of issue, issuing notes payable to bearer on demand; banks for mortgage loans, issuing mortgage bonds to cover loans on real estate; and banks of encouragement, issuing treasury bonds to cover loans to industry and agriculture. By the new law the National Bank of Mexico, which with the Bank of London and Mexico and the International and Mortgage Bank had been established previous to the passage of the law and enjoyed a monopoly of the issuance of bank notes, was restricted and the establishment of other banks of issue was permitted in the states under conditions practically limiting the number to one in each state. The purpose of the law was to extend banking privileges to all parts of the Republic, but the granting of charters was surrounded by careful restrictions. A bank of issue could not be founded with less than 500,000 pesos capital (increased to 1,000,000 pesos in 1908); no bank could be organized till the capital was fully subscribed and 50 per cent paid in; bonds equal to 20 per cent of the capital were to be deposited with the government or the National Bank; and the duration of the charter was not to exceed 30 years. Numerous special privileges, mostly in the form of exemptions from taxation, were conferred upon the banks chartered under the Law of 1897. Banks multiplied so rapidly after this date that in 1905 it was decided, in order to check further extension, that no further charter for a bank of issue should be granted until after Dec. 31, 1909. Subsequently this time limit was extended to March 19, 1922, the date of the expiration of the first charters granted under the law, which is tantamount to the concession of a monopoly to the now existing banks. All banks are under the direct supervision of the government and are obliged to publish detailed monthly statements of their condition.

In 1897 there were altogether 10 banks, with a capital of 41,500,000 pesos, cash holdings of 43,915,000, and reserve funds of 2,983,000. At the close of the fiscal year 1912–13 there were 33 chartered banks, with a capital (stated in pesos) of 164,600,000, cash holdings of 86,517,284, reserve funds of 37,140,595, and note circulation of 130,228,259. The capital of the National Bank is 32,000,000; of the Mexican Central Bank, 30,000,000; of the Bank of London and Mexico, 21,500,000; of the International and Mortgage Bank, 5,000,000; and of the other banks from 10,000,000 to 200,000. After the above date banking conditions were seriously disturbed by the revolution. The banking system in 1915 comprised 25 banks of issue, including the National Bank (founded in 1882), the fiscal agent of the government, with its 60 branches, the Bank of London and Mexico (established in 1864), and 23 state banks, two mortgage banks, and six banks of encouragement, one of which, the Mexican Central, organized in 1898 at Mexico City, serves as a clearing house. There are also a number of independent banks in the capital. Banking in Mexico is very profitable and the existing banks are in a flourishing condition. During the decade ending 1912 the National Bank paid annual dividends ranging from 15 to 20 per cent and the Bank of London and Mexico from 12 to 14 per cent. In 1912 the reports of 27 banks paying dividends showed an average of 7.1 per cent.

Finance. Mexico still needs capital to develop her resources and give employment to labor. A great deal of foreign capital is invested in the country, but much more will be required before the natural resources are adequately developed. Upon the achievement of independence it was seen that the colonial financial system was inadequate and unadaptable to the new Republic, and the inexperienced government had to improvise and try new methods, with the result that the finances fell into a chaotic state. Lack of railways and other internal developments and continually disturbed political conditions served to continue this state and caused Mexico's credit to fall very low in the money markets of the world. On account of her finan-

cial difficulties and under pretext of protecting the interests of European bondholders, France, England, and Spain intervened in Mexico with an armed force in 1861. After the withdrawal of England and Spain, the Emperor Napoleon III proceeded to carry out his plan, formed beforehand, of setting up an empire under Maximilian in 1864. It was not till peace and order were established, after 1877, that Mexico's credit began to revive and that the revenues finally reached an amount sufficient to pay the public expenses.

At the close of the fiscal year June 30, 1896, Mexico was able for the first time since achieving independence to show a surplus of $6,000,000. The obnoxious tax called *alcabalas*, or interstate duties on domestic and foreign commerce, was a great drawback to internal trade and was finally abolished on July 1, 1896. The country was then in such a condition that radical financial and other reforms might be introduced without danger of serious disturbances.

The per capita expenses are necessarily large, as the population is small in proportion to the vast extent of coast line and the large area requiring army, revenue, lighthouse, and police services; and only a small part of the inhabitants are wealth producers, the burden of taxation falling chiefly upon a fourth or a third of the people. It is only since 1888 that the reorganization of the federal treasury has enabled that office to keep correct and complete accounts of the public expenses. The following is a statement of the national receipts and expenditures, in Mexican silver pesos, for several fiscal years:

FISCAL YEARS	Revenues	Expenditures
	Pesos	Pesos
1891–92	64,653,630	64,624,084
1900–01	62,998,805	59,423,006
1904–05	132,997,000	109,132,000
1908–09	98,775,510	92,967,393
1910–11	111,142,401	100,913,923
1912–13	120,958,902	110,781,871

A large portion of the annual surpluses has been expended on public improvements, with a view to developing the country. Financial conditions were considerably disturbed, on account of the revolutionary movements, from 1910 to 1915. The budget for 1914–15 estimated the expenditures at 152,204,898 pesos.

The federal revenue is derived chiefly from the import and export duties, the stamp tax, the direct taxes payable in the federal district and the territories, the federal contribution (a surcharge of 20 per cent on all state taxes), excises on gold and silver, tobacco, alcoholic beverages, cotton yarn and textiles, and petroleum, and the earnings of the posts and telegraphs. The duties levied on foreign trade are highly protective and yielded in 1912–13 about 41 per cent of the revenue. Export duties are levied upon some of the largest exports, such as henequen, cabinet and dye woods, and vanilla. In 1912–13 the internal taxes collected through the use of stamps supplied about 24 per cent of the receipts, and the direct taxes levied upon the real estate, scientific professions, and industrial establishments of the federal district, together with other items, made up the remainder. Taxes on the professions vary from 50 cents to $20 a month. In the above year about 33 per cent of the revenues was expended by the Department of Finance and Public Credit, 25 per cent by that of War and Marine, 6 per cent by that of Public Instruction, and lesser amounts by the other departments. On June 30, 1913, the public obligations comprised a foreign debt of 310,105,945 pesos and an internal debt of 134,197,810 pesos.

The revenues of the Mexican states, derived chiefly from taxes on real estate, amounted in pesos in 1907 to 29,002,497, varying from 264,855 in Colima to 3,504,391 in Yucatan. The municipalities had an income of 19,073,620 in this same year.

Population. Mexico consists of 27 states, 3 territories, and the federal district, and had a population of 15,112,608, or 19.7 per square mile, in 1910; 1920, 15,115,612. It is difficult to take a correct census because many people, especially the Indians, fear that they will be taxed if they are enrolled in the census returns. The table on page 543, compiled from the *Mexican Year Book* for 1914, gives the names of the states and territories, named in order from north to south in each group, area, population, density of population as given in 1910, the capitals and their populations.

About 19 per cent of the population are pure white, 43 per cent mixed bloods, and 38 per cent Indians. The cold lands, being the most healthful, have the densest population, about 75 per cent of the total population; a relatively small part of the people, from 15 to 18 per cent, live in the temperate zone, and only 7 to 10 per cent in the torrid zone. The first census in 1795 showed a population of 5,200,000. Thus in a little over a century the population has nearly trebled. The increase of the Indian population is comparatively slow because, though the Indians have large families, they are subject to many epidemics. The foreign population numbers over 100,000, Americans, Spaniards, English, and Germans being the most numerous. Many branches of business are monopolized by the English, Germans, and French. The country is to some extent being Americanized as far as means of transportation, electric lighting, improved hotels, and other modern conveniences are concerned. The tendency of the people, however, is to cling to the old habits which grew out of their Spanish ancestry and climatic environment. They still desire their midday siesta, their religious feast days and holidays, but they are unwilling to live abstemiously, spending their money freely and dressing poorly. This is especially true of the Indians.

Immigration and Public Lands. Immigration has been left largely to itself, the government having made little official effort to encourage it, other than to enact laws providing favorable conditions for immigrants. With respect to colonies more has been done. Numerous French, Italian, German, Mormon, and Boer colonies have been formed, under special privileges from the government, and on the whole have done well. The new Immigration and Colonization Law of March 1, 1909, provided for the exclusion and deportation of undesirable persons, including those likely to become public charges, fugitives from justice, except for political offenses, and anarchists. Special regulations were also made for the admission of immigrant laborers and the supervision of transportation lines carrying them, with a view to preventing the entry of those who are physically

unsound. The movement of passengers at the sea and land ports of the Republic in 1907 gave a net increase to the population of 13,364, most of whom were from the United States. The low rate of wages, the fact that a large portion of the public lands is already disposed of, the lack of adequate surveys, the inability to secure lands in small tracts, and the unwillingness of the large landholders to divide their estates are the obstacles to a large immigration. The Land Law (March 26, 1894) divided the public lands into four classes, provided regulations for the denouncement and acquisition by Mexicans and for the lease by others, and exempted from alienation the seashore, banks of navigable rivers, and lands having monumental ruins. Under this law 3,553,732 hectares were granted by the government from 1901 to 1907. Owing to vagueness and inaccuracy of the data which the government possessed regarding public lands, the law was suspended by Congress in 1909. The surveying of public lands was placed under the direction of the Agrarian Commission at this date. The land question was one of the important factors in the revolutionary movements following the downfall of Díaz.

STATES AND TERRITORIES	Area in square miles	Population 1895	Population 1900	Population 1910	Density per sq. mile	Capital	Population
ATLANTIC STATES							
Tamaulipas	30,826	203,342	218,948	249,641	8.10	Victoria	12,103
Vera Cruz	27,875	853,892	981,030	1,124,368	40.32	Jalapa	24,816
Tabasco	10,372	133,926	159,834	187,574	18.07	San Juan Bautista	12,327
Campeche	18,086	87,264	86,542	86,661	4.79	Campeche	16,775
Yucatan	15,937	*297,088	*309,652	339,613	21.31	Merida	62,447
Quintana Roo (territory)	19,267			9,109	0.46	Santa Cruz de Bravo	2,000
Total	122,363	1,575,512	1,756,006	1,996,966			
INLAND STATES							
Chihuahua	90,021	260,008	327,784	405,707	4.50	Chihuahua	39,709
Coahuila	63,775	237,815	296,938	362,092	5.67	Saltillo	35,414
Nuevo León	25,027	307,856	327,937	356,150	14.58	Monterey	18,528
Durango	42,265	292,549	370,294	483,175	11.43	Durango	31,763
Zacatecas	24,467	447,265	462,190	447,556	19.50	Zacatecas	25,900
San Luis Potosí	24,000	562,195	575,432	627,800	26.15	San Luis Potosí	68,022
Aguascalientes	2,969	102,378	102,416	120,511	40.58	Aguascalientes	45,198
Guanajuato	10,948	1,047,817	1,061,724	1,081,651	90.65	Guanajuato	35,682
Querétaro	4,492	224,848	322,389	244,663	12.95	Querétaro	33,062
Hidalgo	8,635	552,817	605,051	646,551	75.38	Pachuca	39,009
Mexico	9,228	837,981	934,463	989,510	110.58	Toluca	31,247
Federal district	578	468,705	541,516	720,753	1245.32	Mexico City	471,066
Morelos	1,896	156,786	160,115	179,594	65.68	Cuernavaca	12,776
Tlaxcala	1,534	163,244	172,315	184,171	120.04	Tlaxcala	2,812
Puebla	12,990	973,876	1,021,133	1,101,600	84.77	Puebla	96,121
Total	322,825	6,635,140	7,191,697	7,951,484			
PACIFIC STATES							
Lower California (territory)	58,328	41,838	47,624	52,272	0.80	Ensenada (No. dist.)	2,170
						La Paz (So. dist.)	5,536
Sonora	76,619	189,158	221,682	265,383	3.47	Hermosillo	14,578
Sinaloa	27,553	256,858	296,701	323,642	11.73	Culiacan	13,527
Tepic (territory)	10,951	146,805	150,098	171,173	15.61	Tepic	16,778
Jalisco	33,486	1,094,569	1,153,891	1,208,855	36.09	Guadalajara	119,468
Colima	2,272	55,264	65,115	77,704	34.28	Colima	25,148
Michoacan	22,617	887,008	935,808	991,880	43.40	Morelia	40,042
Guerrero	25,275	417,886	479,205	594,278	23.76	Chilpancingo	7,994
Oaxaca	35,683	872,902	948,633	1,040,398	29.13	Oaxaca	33,011
Chiapas	27,523	318,730	360,799	438,843	15.92	Tuxtla Gutierrez	10,239
Total	320,307	4,281,018	4,659,556	5,164,158			
Islands	1,560						
Grand total	767,055	12,491,670	13,607,259	15,112,608			

* Includes Quintana Roo.

Education. In all the states education is free and compulsory in the primary grades; illiteracy, however, is very prevalent, and little has been done to educate the Indians. The table opposite shows the status of the educational establishments of the Republic in 1907.

There were 18,617 supervisors and teachers in the primary and secondary schools. The professional schools include law, normal, agricultural, commercial, medical, fine arts, arts and trades, engineering, military, and naval schools. The Mexican University, founded in 1553 and dissolved in 1862, was reorganized in 1910 with the various faculties, and is now at the head of the educational system of the country. There were also, in 1907, 2561 private and clerical schools, with 174,880 pupils, giving all grades of instruction from primary to professional. The public and private libraries are notable, the largest of them, the National Library, containing 200,000 volumes; there are 186 other public libraries, 38 museums for scientific and educational purposes, 11 meteorological observatories, 56 scientific and literary societies, and 1571 periodical publications, including 53 in

	NUMBER OF SCHOOLS SUPPORTED BY		Number of pupils
	Federal and state governments	Municipalities	
Kindergarten	69	10	8,880
Primary	6,397	3,144	657,522
Secondary	42	....	5,782
Professional	74	....	9,984

English, 6 in Spanish and English, 3 in Spanish and Latin, 3 in French, and 1 in German. Mexico is one of the first countries of Latin America in artistic, literary, and scientific advancement.

Religion. One of the motives of Spanish colonization was the conversion of the natives to the Christian faith. Upon the site of the heathen temple of Tenochtitlan arose the cathedral of Mexico. The Franciscan Order was the first to begin work in Mexico (1524), and was soon followed by the Dominicans and other orders. In 1527 Fray Juan Zumarraga was made the first Bishop and in 1545 the archbishopric of Mexico was created. The Inquisition was established in 1571, but the Indians were exempt from its jurisdiction. The following years the Jesuits came. There were many able churchmen as well as many who were corrupt, and during the colonial régime the church wielded a powerful influence. It was occupied with the conversion of the natives and the care of the religious life of the Spaniards, and had charge of the schools, hospitals, and asylums of the viceroyalty. In 1767 the Jesuits were expelled from Mexico as well as from all the other Spanish American colonies. During the wars of the independence a number of priests, such as Hidalgo, Morelos, etc., were active leaders in the movement, and in the establishment of the Empire of Itúrbide the church played a large part. The Inquisition was abolished in 1820. Since the independence the church has sided with the conservative element and has always been an active factor in the disturbances which have torn the country. During the colonial times and after it amassed great wealth and in the middle of the nineteenth century was said to possess about one-third of the real and personal property of the Republic. These conditions created no little antagonism to the church and as a consequence the constitution of 1857 provided for freedom of religious opinion. Two years later, the Laws of the Reform, issued by Juárez, brought about the complete separation of the church and state and the confiscation and nationalization of the property of the church. Since that date the Roman Catholic church has continued to exercise much influence in the affairs of the nation, as the majority of the people are still under its teachings. Nevertheless a considerable portion of the Mexicans have drifted away from or become antagonistic to the Roman Catholic church. It had, however, in 1910, 3 archbishops, 18 bishops, over 9000 churches and chapels, and 12,664,182 adherents. The Protestants began work in Mexico in 1867 and now have churches in all parts of the Republic. In 1910 they had 294 foreign missionaries, 529 native workers, 563 stations and substations, 24,771 communicants, 92,156 adherents, 139 day schools with 7640 pupils, 30 higher institutions with 4108 pupils, and 8 hospitals and dispensaries.

Government. The present constitution of Mexico was adopted by a constituent assembly on Feb. 5, 1857, and has undergone various amendments extending down to the year 1908. It is a written instrument of great length and is closely modeled after the Constitution of the United States. The declaration of the "rights of man" is the most complete document of its kind. Its 29 articles include personal freedom, freedom of speech and of the press, right of assembly and petition, right of bearing arms, guaranty of the rights of accused persons on trial for the commission of crime, including fair and speedy trial and exemption from special tribunals, and immunity from the operation of retroactive laws, laws which impose excessive fines or inflict unusual punishments and which take private property without compensation. In case, however, of great public danger from insurrection or invasion the President of the Republic, in concurrence with the Council of Ministers and with the approval of Congress, may suspend these guaranties for a limited period.

The government of Mexico is a democratic, federal, representative republic, composed of 27 states, 3 territories, and a federal district. The constitution provides for a distribution of the powers of government among legislative, executive, and judicial branches. The legislative power is vested in a Congress consisting of a Chamber of Deputies and a Senate. The Chamber of Deputies is composed of members elected by indirect secret ballot for a term of two years on the basis of one Representative for every 40,000, or fraction over 20,000, of the population and by an electorate which consists practically of all male adults. The qualifications for a deputy are citizenship and the full enjoyment of all the rights incident thereto, the attainment of the twenty-fifth year, and residence in the state from which he is chosen. Ecclesiastics are disqualified. The Senate is composed of two Senators from each state and two from the federal district, chosen in the same manner as the Representatives and possessing the same qualifications, except that the Senators must have attained the thirtieth year of age. The terms of one-half the Senators expire every second year. Both Senators and Representatives receive annual salaries of $3000 (which cannot be renounced) and are privileged from arrest for opinions expressed in the discharge of their duties. Each House is the judge of the election and qualifications of its own members. Two ordinary sessions of Congress are held annually, beginning respectively in April and September. The two Houses enjoy substantial equality of powers in legislation, except that financial and revenue measures and bills for the recruiting of troops must be first discussed in the Chamber of Deputies. Legislative measures may be initiated by the President of the Republic, the state legislatures, and by individual Senators and Representatives. Bills vetoed by the President, but subsequently passed by an absolute majority of each House, become law in spite of the executive veto.

The powers of Congress are enumerated with great specification in the constitution. They include the admission of new states to the Union, the erection of new states within the limits of old states, legislation regarding the federal district and territories, the levying of taxes, the issuing of mining and commercial codes, the maintenance of the army and navy, the declaration of war, the enactment of laws in regard to citizenship, naturalization, colonization, emigration, immigration, and general health of the country, the coinage of money, the regulation of weights and measures, the granting of pardons, and the enactment of all laws necessary and proper to the execution of the enumerated powers. The exclusive powers of the Chamber of Deputies include the exercising of the powers prescribed by law regarding the election of the President and Vice President of the Republic,

the judges of the Supreme Court, and the Senators from the federal district, the consideration and decision upon resignation and leave of absence of the President and Vice President, and the resignation of judges of the Supreme Court, supervision of the General Auditing Department, the approval of the annual estimates of expenses, and the impeachment of the President, secretaries of the departments, Senators, Representatives, judges of the Supreme Court, and governors of states for the commission of crimes during their terms of office. The exclusive powers of the Senate include the approval of treaties with foreign Powers, the ratification of nominations made by the President to important offices, the decision as to whether the status of a state government is such as to require the appointment of a provisional Governor, the decision of political conflicts within a state, and the trial of impeachments preferred by the House of Representatives. During the recess of Congress some of its important functions are discharged by a Permanent Deputation, composed of 15 Deputies and 14 Senators.

The executive power is vested in a President, or upon his default or absence on leave in a Vice President, who also is ex-officio President of the Senate. The President and Vice President are chosen indirectly by electors, who are themselves popularly elected, for a term of six years. Their qualifications are citizenship by birth, the full enjoyment of civil rights, the attainment of the thirty-fifth year, and residence in the country at the time of the election. In case of the default of both President and Vice President, either at the beginning or during the presidential term, the Secretary of Foreign Relations becomes the acting President and Congress calls for a new election, except when the default occurs during the last year of the presidential period. The office of President cannot be resigned except for grave cause, and then only with the approval of Congress. His chief powers are: to promulgate and execute the laws; to appoint and remove freely the Secretaries of State and all federal officials not otherwise provided for in the constitution or laws; to appoint with the approval of Congress ministers, diplomatic agents, consuls general, and the higher officials of the army, navy, and treasury; to declare war with the consent of Congress; to dispose of the army and naval forces; to grant letters of marque and reprisal; to negotiate treaties with foreign countries; to receive ambassadors and ministers; to call special sessions of Congress with the consent of the Permanent Deputation; to grant pardons; and to grant exclusive privileges to discoverers and inventors. In carrying out the work of administration the President acts through a cabinet composed of eight secretaries, who serve as heads of the departments of Foreign Relations, Interior, Justice, Public Instruction and Fine Arts, Promotion, Communication and Public Works, Finance, Public Credit and Commerce, and War and Marine. Every order, decree, or regulation of the President must be signed by one of the cabinet secretaries in order to be valid. The members of the cabinet do not occupy seats in Congress and their responsibility to that body extends only to criminal acts.

The judicial power of the Republic is vested in a Supreme Court and in district and circuit courts. At present the Supreme Court consists of 15 judges chosen by electors for a term of six years. They must be native-born citizens 35 years of age and learned in jurisprudence. They are required to take an oath to administer justice loyally and patriotically, and may resign only with the approval of Congress. The organization of the district and circuit courts is determined by statute. The jurisdiction of the federal courts extends to cases involving the application of federal law; to maritime cases; to cases in which the Republic is a party; to cases in which a state is a party; to cases arising under treaties with foreign Powers; and to cases concerning diplomatic agents. In those cases in which the Republic or a state is a party, and in those cases in which the question of jurisdiction arising between the state and federal courts is involved, the Supreme Court has original jurisdiction. In all other cases it has appellate jurisdiction.

The individual states of the Mexican Republic have a large degree of local autonomy, although the federal constitution requires that they shall adopt the popular, representative, republican form of government. They have their own constitutions and codes of laws, their own governors and unicameral legislatures, and local officials. They are allowed to regulate with one another their own boundaries subject to the approval of Congress. They may not form alliances or treaties with one another, grant letters of marque and reprisal, coin money or issue paper currency, tax the transit of persons or goods crossing their territory, lay duties on interstate commerce, or without the consent of Congress levy tonnage duties, keep troops or ships of war, or wage war except in case of invasion or peril so imminent as to admit of no delay. Each state is under an obligation to deliver without delay criminal refugees from other states and to give full faith and credit to the public acts, records, and judicial proceedings of every other state. It is made the duty of the state executives to publish the federal laws and cause them to be obeyed. On the other hand, it is made the constitutional duty of the federal government to protect the states against invasion or domestic insurrection upon request of the Legislature of the state concerned or of the executive if the Legislature be not in session. As in the United States, all powers not expressly conferred upon the federal authorities are reserved to the individual states. Similarly the federal constitution, the laws of Congress, and all treaties made in pursuance thereof are declared to be the supreme law of the whole Union, and the judges are bound thereby, anything in the constitutions or laws of the states to the contrary notwithstanding.

Amendments to the federal constitution may be proposed by Congress, two-thirds of all members present concurring. If approved by a majority of the state legislatures, they shall be a valid part of the constitution.

Money, Weights, and Measures. The currency law of 1905 placed Mexico on a practically gold basis. The theoretical unit is the gold peso, equal to $0.4984 United States currency. The silver peso has the same legal value as the gold peso and is of unlimited legal tender. The metric system of weights and measures was introduced in 1856 and was made compulsory in 1905. Before this latter date the old Spanish denominations were in current use.

Army. Since the resignation of General Porfirio Díaz as President, in May, 1911, the

country has been torn by revolution and counter-revolution, accompanied by a gradual disintegration of the federal army organized and maintained by him. The armed forces of opposing revolutionary leaders include individuals and units formerly belonging to the federal Mexican army. Notwithstanding these conditions, however, it may be assumed that the details of organization and conditions of service are, in the case of organized armed bodies, somewhat similar to those in existence under the régime of Díaz in 1911, as described below. *Higher Organization.*—In time of peace the regiment is the highest unit. Divisions are formed in war. General officers in peace: 7 generals of divisions, 41 generals of brigades, 55 brigadier generals. During the revolutions the number of generals enormously increases. *Infantry.*—All organization in Mexico is peculiar. The underlying principle is to arrange for the maximum expansion in war. The battalion has 4 companies. In peace the battalion is commanded by a colonel, with staff, which is expanded to a regiment by the addition of a battalion in war. In peace there were 34 battalions. Peace strength of company is 9 officers and 145 men. Total infantry, 1182 officers and 19,144 men. War strength of regiments, 47 officers and 1745 men. Total infantry strength in war, 3100 officers and 53,706 men. *Field Artillery.*—The artillery has 2 batteries to the battalion and 2 battalions to the regiment. There are in peace 1 regiment (4 batteries) of mountain artillery, 1 regiment (4 batteries) of horse artillery, 2 regiments (8 batteries) of light artillery, and in addition a so-called "squadron" of rapid-fire guns. Total peace batteries, 16, plus 1 skeleton mountain artillery regiment. Batteries have 6 guns, except horse batteries, which have 4. Peace strength of batteries varies between 6 officers and 79 men and 8 officers and 120 men, except the mountain batteries, which have 10 officers and 88 men. Total peace strength, 1912 officers and men. Upon mobilization the mountain artillery doubles, other regiments form 2 additional batteries. Total war strength, 3147 with 176 guns. *Cavalry.*—In peace 4 troops form a regiment at full peace strength, and 2 troops form a regiment at skeleton strength. Peace footing of troops, 6 officers and 72 men or 8 officers and 105 men. There are 14 regiments and 4 skeleton regiments. Total peace strength, 496 officers and 6822 men. In war each regiment is expanded to 6 troops. War strength of a troop, 5 officers and 140 men. *Coast Artillery.*—Unimportant detachments. *Technical Troops.*—War strength, 100 officers and 1000 men. *Train.*—Peace, 9 officers and 206 men; war strength, not known. *Sanitary Troops.*—No data. In addition to the regular troops there are 12 regiments of rurales, or military police, of 250 men each. Total peace strength, between 31,000 and 32,000. Total war strength, 100,000 officers and men. *Conditions of Service.*—In theory service is compulsory. Actually conscription is made to apply only to some of the lower and criminal classes. Upon mobilization conscription could be resorted to. *Arms.*—Infantry, the Mauser magazine rifle. Cavalry, Mauser carbine. Reserves, Remington rifle of 1893. Field and horse artillery use quick-fire guns of the Schneider-Canet system. Budget for 1910–11, 10,890,000 pesos.

Peoples of Mexico. The population of Mexico at the present day is largely Indian, and in many parts of the country ancient customs, superstitions, and languages hold sway. It is impossible to estimate the exact proportion of pure Indian blood, mestizo, or mixed blood, and white; probably there are about 5,000,000 pure-blooded Indians and a somewhat larger number of mestizos. Dr. León divided them into 17 families and 180 dialects, and was of the opinion that future studies would reduce this number of families to three mother tongues—the Otomí, Maya-Quiché, and the Nahua. Recent work has so far not justified this opinion. A number of stocks are totally extinct and little material is available for the study of them. In many parts of the Republic where certain languages are spoken over extended areas we find dialectal differences in every village. In some parts of Mexico the tribes occur in masses, while in other parts people speaking different languages are strangely intermingled. In the same town, separated by a single street, we may find two different languages spoken, while in one town Starr reports Aztecs, Otomí, Tepehuas, and Totonacs, each group keeping its independence in language, dress, customs, and beliefs, and occupying its own distinct quarter of the town.

Most of the Mexican Indians have been converted to Christianity; some are still idolaters, but have lost much of their knowledge of ancient traditions and religion. These are superstitious to a degree and believe in omens, witchcraft, and divination. Among the Huicholes, whose habits, customs, religion, and symbolism have been studied by Lumholtz, among the Mixes, who have been investigated by Starr and Belmar, and among the Lacandones, known through the field work of Tozzer, we find greater adherence to primitive ideas than among other Mexican peoples.

All over Mexico the commerce is carried on in very much the same manner as before the Spanish Conquest. Each town has its market place where a fair is held at regular intervals. The natives carry merchandise for long distances, to attend annual festivals of certain saints, whose modern shrines are built on the sites of ancient temples. The Indians are principally agriculturists, though certain aboriginal trades still prevail, such as weaving, basket and mat making, and the manufacture of pottery; and the products of these industries, for which certain villages are noted, are distributed throughout extended areas. Their mode of living, habitations, and clothing have changed but little under white influence. Their food consists mainly of corn, beans, and chili peppers; the corn is made into cakes, or tortillas, or a thin mush called posole; their food is prepared as before the Conquest, although to a certain extent cooking vessels of tin and iron are used as well as those of clay. Their great vice lies in the use of alcoholic stimulants; they make many native drinks as in former times, and on every possible occasion they indulge in their use.

History. The events of prehistoric Mexico are confused in a mass of myth. Legend carries the story of the Toltecs, the first historic race, back to the early centuries of the Christian era, when they began their migration, which finally led them, about the year 754, to the valley of Mexico. Here they founded the cities of Tulan and Tulantzinco, of which vast ruins still exist some 50 miles north and northeast of Mexico City. In the year 1064 the Toltec power was overthrown and they were eventually

driven from the country, going off towards the south, where they are supposed to have erected some at least of the immense buildings now in ruins in Yucatan, Honduras, and Guatemala. Their conquerors, the Chichimecas, first appeared in the vicinity of the two great volcanoes, Popocatepetl and Ixtaccihuatl, where the ruins of Amecameca show the centre of their power. After they succeeded the Toltecs as the dominant power, the Chichimecas settled at Texcoco, on the east side of the lake of that name, where they were living in a flourishing condition when, late in the twelfth century A.D., seven allied Nahuatlaca families or tribes entered the valley from the north, having started on their wanderings, quite possibly, in the cliff-dweller region of the modern New Mexico and Arizona. The Aztecs, the principal of these tribes, finally made a settlement at Tenochtitlan, on some marshy islets in Lake Texcoco, probably in the year 1325. It is said that this location was pointed out by a sign from the gods, an eagle perched upon a prickly-pear cactus, the nopal, strangling a serpent. This sign is now the national seal of Mexico. Tenochtitlan grew stronger, the islands were enlarged, and causeways were built to connect them with the mainland. By the time of the election of the first king or war chief, in 1376—the earliest authentic date in Mexican history—the Aztecs had won a position of influence in the valley. Huitzilihuitl, who was chosen chieftain or king in 1404, and his brother Chimalpopoca (1417–27), who succeeded him, greatly increased their power by intermarrying with the rival tribes and establishing trade relations, as well as by their successful battles. Itzcoatl (1427–40) (q.v.) rendered the dominant position of the tribe more secure by the formation of a confederacy with the Chichimecs and Tepanecs, for the purpose of conquering their outlying neighbors and forcing them to pay tribute. Montezuma I (1440–69) (q.v.) was perhaps the first chief to combine the war and priestly functions, and prepared for the downfall of the tribal power by allowing the latter to interfere with the former. His successors, Axayacatl, Tizoc, and Ahuizotl, considerably extended the influence of the tribe by conquering the tribes beyond the mountains, to the two seas on the east and west, and far towards the south, and forcing them to render tribute of slaves for the sacrifices which were becoming the established and popular religious practice of the Aztecs.

In 1502 Montezuma II was elected to the chief position in the tribe. (For an account of Montezuma's career and the invasion of Mexico by Cortés, see MONTEZUMA II; HERNANDO CORTÉS.) In November, 1519, Cortés entered Tenochtitlan—Mexico—and before the end of the month he had secured the person of the Mexican "Emperor," whose subjects soon fully realized that the white men would have to be expelled by force, and quickly commenced hostilities under the leadership of Montezuma's younger brother, Cuitlahuatzin (q.v.), and the Emperor's nephew, Guatemotzin (q.v.), or Cuahtemoc. On the *Noche Triste*, or "dreadful night," June 30, 1520, Cortés withdrew from the city of Mexico, and for a time his position was desperate, but the indomitable valor of the Spaniards enabled them to return to the attack. Cuitlahuatzin, Montezuma's successor, died in November, 1520, and was succeeded by Guatemotzin, whose heroic defense of the city of Mexico during the following year remains one of the noblest episodes in American history. Cortés began his siege of Mexico in May, 1521, and after the capture of Guatemotzin in August he set promptly to work at rebuilding the city. The dead bodies were burned and the city roughly cleansed, the canals filled up, streets, market places, and the sites for a church, fort, official residence, and other necessary buildings located. As an administrator Cortés was less successful than as a military leader, and the repeated complaints and threats against his rule led him to go to Spain to present his case at court. Military governors failed to control the affairs of New Spain, as Mexico was officially called, and the first Audiencia (1528) had no better success. The second Audiencia (1529) managed the government until 1535. In this latter year the Spanish colonial government reached its definitive form by the appointment of the first Viceroy of New Spain. The first incumbent, Antonio de Mendoza, "the good Viceroy," was intrusted with extensive powers and did much to advance the country and assure its permanent strength and welfare. Luís de Velasco succeeded to the viceroyalty in 1550, and during his administration the University of Mexico was founded (1553) and the mineral and other sources of wealth developed. Then followed a series of 61 viceroys who ruled the destinies of New Spain. Most of the viceroys were of noble family, some were able and wise, many were of the mediocre type of colonial officials, and not a few were corrupt and oppressive in their administration. On the whole New Spain enjoyed such prosperity as was possible under the monopolistic policy pursued by Spain in her colonial government. During the viceregal period the conversion of the natives was carried on, Indian revolts, which occurred from time to time, were suppressed, the exploration and settlement of New Mexico, Texas, and California were carried out, peaceful progress was made in agriculture and mining, commerce was developed as much as was possible under the restrictive system of Spain, conflicts of jurisdiction were settled, the disputes of the secular and ecclesiastical officials were adjusted, and the periodical inundations of the capital made necessary plans for draining the valley, which were formed by the Viceroy Velasco and completed by President Díaz at the opening of the twentieth century. In the eighteenth century many of the restrictions on trade were removed, the office of Intendant was established, and the second Count of Revilla Gigedo (1789) introduced many beneficent reforms in Mexico City. While carrying on these embellishments the ancient Mexican calendar stone and sacrificial block, which had been buried at the time of the Conquest, were discovered.

The gradual increase of education among all classes, the spread of liberal and revolutionary ideas, introduced from the United States, France, and England, the introduction of the liberal administrative reforms by Charles III, the chaotic conditions existing in Spain and the decline in the power of the home government, and finally the establishment of the supremacy of Napoleon in Spain, were the causes which contributed to the independence of Mexico. On Sept. 16, 1810, Miguel Hidalgo y Costilla (q.v.), the parish priest at Dolores, near Guanajuato, learning that the conspiracy in which he was

involved had been discovered, rang the church bell and called upon his people to follow him and free Mexico from foreign tyranny. His *Grito de Dolores*, the cry of "Long live religion! Long live our Holy Mother of Guadalupe! Long live America, and death to bad government!" marked the beginning of the struggle for Mexican independence. Hidalgo, after a series of successful fights with scattered Royalist forces, was defeated, driven north, and finally caught and shot at Chihuahua (July 30, 1811). His pupil, Morelos (q.v.), took up the leadership and became known as the "hero of a hundred battles." He assembled a congress at Chilpanzingo (Sept. 15, 1813), which abolished slavery and religious tithes, and issued a declaration of independence from Spain. Later he was defeated by the Royalist army under Augustín de Itúrbide (q.v.), betrayed by one of his followers, and shot in December, 1815. In 1817 Javier Mina invaded Mexico from Tamaulipas and maintained the fight for independence with the usual temporary success, until defeated, captured, and shot (November 11). Meanwhile Vicente Guerrero (q.v.) had gradually been establishing his claim to be the natural and most able leader of the Independents in the field, while among all classes in Mexico the feeling was growing more and more strong that the Spanish power must be done away with. Itúrbide determined to unite the two parties, and by the Plan of Iguala (Feb. 24, 1821) in which Guerrero and the Spanish Viceroy, Juan O'Donojú, joined, proposed an independent monarchy with a ruler from the Spanish royal family. The plan failed; no ruler could be secured from Europe, but independence had been practically and peacefully assured. Itúrbide arranged a popular demonstration, and the Congress ratified his choice of himself as Emperor (May 19, 1822). The older Independents soon refused to acknowledge his Empire, and on March 20, 1823, the opposition forced his resignation. An executive council of four revolutionary leaders, Nicolas Bravo, Guadalupe Victoria, Pedro Negrete, and Vicente Guerrero, managed affairs during the next year, calling for the election of a congress, which, on Oct. 4, 1824, proclaimed the first constitution of the Republic of Mexico. Guadalupe Victoria, the first President, gave the country a popular administration and a large measure of prosperity and was allowed to serve out his full term. In 1828 the election was bitterly contested by the Federalists or Liberals and the Centralists, aided by the Moderates and Conservatives. The Centralist candidate, Manuel Gómez Pedraza, was elected President, but a revolt under Antonio López de Santa Anna (q.v.) prevented his accession and his opponent, Vicente Guerrero, was installed in the presidency (April, 1829). Before the end of the year Guerrero was forced out and his Vice President, Anastasio Bustamante, was placed in control of the government.

Then followed a half century of internal disorder; revolution followed revolution; plans and pronunciamientos were issued by every political leader; Conservative and Liberal, Centralist and Federalist, Imperialist and Republican, carried on a seemingly endless struggle for power. For more than 20 years Santa Anna was the central figure in Mexican politics. At will he openly controlled the government as President or Dictator, or managed affairs while ostensibly in retirement. He sided with the Conservatives and Centralists and in 1843 dissolved Congress and assembled a Council of Notables, which formulated the Bases Organicas de 1843, a new reactionary conservative constitution. In 1836 Texas achieved her independence and 10 years later the war between Mexico and the United States broke out. The invasion of Mexico was rendered relatively easy by the repeated internal dissensions which absorbed most of the attention of the Mexican commanders. Twelve changes in the chief executive during the two years of the war prevented the Mexicans from offering any effective resistance, notwithstanding their admirable fighting qualities. The city of Mexico was occupied (Sept. 13, 1847), and in the Treaty of Guadalupe Hidalgo (q.v.) Mexico suffered heavy loss of territory. Santa Anna was the leading factor in affairs until August, 1855. General Ignacio Comonfort (q.v.) was installed as President in December and in June, 1856, issued the decree ordering the sale of all unimproved church lands, which precipitated the struggle between church and state. On Feb. 5, 1857, a new constitution, which, with its various amendments, is still in force, was adopted by Congress. Comonfort swore to defend the constitution, but, coming under the influence of the Reactionary party, he set it aside in January, 1858, and endeavored to govern the country under the Bases of 1843. A revolt under Gen. Félix Zuluoga drove him into exile. Benito Juárez (q.v.), the legitimate successor of Comonfort, assumed the presidency and proceeded to reëstablish constitutional government. The War of the Reform (of the church) broke out with all the fury of a religious warfare and in the midst of it Juárez issued his decree nationalizing all church property and separating the church and the state (July 12, 1859). The Constitutionalists, under General Ortega, decisively defeated the Reactionaries under Miramón, at Calpulalpam (Dec. 22, 1860), and a few days later Juárez entered the capital. Juárez proceeded to reorganize the internal administration of the country, but brought foreign war on the country by decreeing the suspension for two years of the payments on the foreign loan. The act, wise and perhaps necessary in itself, was not managed with diplomacy, and on Oct. 31, 1861, England, France, and Spain entered into the Convention of London, by which they agreed upon joint action for the protection of their interests in Mexico. An expedition was dispatched and Vera Cruz was occupied, but in February, 1862, when it became evident that Napoleon was scheming to establish an empire, supported by France, in America, England and Spain withdrew their forces. Thereupon the French came out openly against the Mexican government and were joined by the Reactionists and Monarchists, who were naturally hostile to Juárez. On May 5, 1862, a French army of 6000 men under General Lorencez was defeated before Puebla (the famous Cinco de Mayo) and was compelled to retreat to Orizaba. In September the arrival of reenforcements raised the French strength to 12,000 men. In May, 1863, a combined force of French and Mexicans, under the French General Elias Forey, captured Puebla and marched upon the capital, which fell into their hands on June 10 after Juárez and his cabinet had fled. Forey selected 35 citizens to act as a Supreme Council of the Nation. This body at once formed a

regency composed of Gen. Juan Nepomuceno Almonte (q.v.), Gen. Mariano Salas, and Archbishop Labastida, which was intrusted with supreme authority. On July 10 an Assembly of Notables at Mexico proclaimed Mexico an empire and tendered the crown to Maximilian, Archduke of Austria, brother of the Emperor Francis Joseph. (See MAXIMILIAN, FERDINAND JOSEPH.) Maximilian accepted the crown on condition that the action of the Assembly of Notables be ratified by a vote of the Mexican people. As a French army of 35,000 was present in the country, there was little difficulty in obtaining this. On May 29, 1864, Maximilian and his wife landed at Vera Cruz and on June 12 the sovereigns entered the capital, taking up their residence at Chapultepec, where they established a court with all the regalia and forms of a European dynasty. In the field the French troops under Bazaine, who had assumed command in October, 1863, gained a number of successes over the Patriot forces, and drove Juárez from place to place until he finally established his capital at El Paso del Norte on the United States border. In the desperate guerrilla warfare which the Nationalist forces waged against the invaders a large part of the country was devastated. Maximilian seriously undertook the task of governing the country and tried to reconcile the various parties, but in this he failed and by the end of 1865 he found himself, despite his efforts to win the good will of his subjects, with no real support except that of the French soldiers. Meanwhile the United States had convinced Napoleon III that French troops would not be suffered to interfere in American affairs. On May 31, 1866, Maximilian received word that the French army was to be withdrawn. He at once decided to abdicate, then changed his mind, at the instigation of the Empress Carlotta, who hastened back to Europe, where her failure to secure any help caused her to become insane. Maximilian again considered withdrawing, but the clericals urged him to remain and a council of leading Imperialists advised against the step, and eventually he determined to stay by his Empire and the supporters who remained true to him. As fast as the French troops were withdrawn from the northern part of the country, Juárez occupied the territory, re-formed his army, and awaited the final departure of the French (March, 1867). Maximilian removed the Imperial government to Querétaro, where the troops under Márquez, Miramón, and Mejía were assembled. The city was immediately surrounded by the Republicans and a siege begun on March 12, 1867. Márquez broke through the enemy to bring assistance from Mexico, but instead undertook to establish a power for himself at Puebla, where he was defeated by Porfirio Díaz, who drove him back to Mexico and then captured that city. On May 15 Maximilian was betrayed by one of his most favored officers, Col. Miguel López, who arranged the admittance of the enemy into the Imperial camp. The Emperor was forced to surrender, was tried by court-martial, and was shot, with Generals Mejía and Miramón, on June 19, 1867.

After four years Juárez entered the city of Mexico, on July 15, 1867, and began the reorganization of the Republic. A presidential election having resulted in no choice, Congress confirmed Juárez in that office, which he held till his death in 1872.

Sebastian Lerdo de Tejada (q.v.), the president of the Supreme Court, then succeeded to the presidency amidst great popularity. He pursued a policy of absorption of the states' rights and usurpation of power and prepared for his own reëlection in 1876 by having dictatorial powers granted. This was the signal for a new revolution and Gen. Fidencio Hernández issued the Plan of Tuxtepec (Jan. 15, 1876), which was adopted in a modified form by Gen. Porfirio Díaz, as the Plan of Palo Blanco (March 21). This latter plan included declarations in favor of the maintenance of the constitution of 1857 and the reform decrees of 1873, the nonreëlection of President and state governors, a new presidential election, and the repudiation of Lerdo de Tejada. Díaz defeated Lerdo de Tejada in the battle of Tecoac (November 16), entered the capital, and on November 28 assumed control of the executive power. The following year he was elected President for the unexpired term and began his long career as the ruler of the Mexican people. He ushered in a new epoch in Mexican history. He at once set about to insure a stable government, suppressing all opposition, and endeavored to extend the foreign relations of the country. In 1880 Díaz secured the election of his friend Manuel González as President and continued to exercise a power in the administration. The era of peace and prosperity inaugurated in the first term of Díaz continued, but many charges of corruption were made against González, and Díaz was considered as the only man who could properly govern the nation. He was reëlected in 1884, and before the end of this term the constitution was changed to allow the reëlection of the President and Díaz was chosen for and served out the five succeeding terms. During this period of 26 years, in which Díaz ruled practically as a benevolent despot, Mexico underwent a marvelous development, especially in economic and industrial lines. The public debt was funded and credit abroad was assured; the public revenues were regulated; foreign relations were improved and treaties of amity and commerce were negotiated; educational facilities were extended; the natural resources were developed and exploited; railways were extended; manufacturing plants were established; interstate taxes were abolished; the finances were put on a sound basis and the gold standard was adopted; a new banking law was enacted; and public works, harbor improvements, and public buildings were constructed.

Along with this material prosperity, however, came the development of oligarchical and autocratic tendencies in the government. Under the Díaz régime, both in the national and state governments, there sprang up many abuses, which caused uneasiness and silent protest. As the election of 1910 approached the administration party laid plans for the continuance of Díaz for another term of six years. Rumors of dissent from this arrangement became current, but it was scarcely thought probable that any one would have the daring to become a candidate in opposition to Díaz. No little surprise was occasioned at the publication of a book entitled *La sucesion presidencial en 1910* by Francisco Madero (q.v.), in which he openly attacked the Díaz régime, pointing out its corruption and abuses and declaring that he would wage a political campaign against it. He became the candidate of the opposition and ac-

tively carried on a political campaign of education, using American methods. He was not taken seriously at first by the followers of Díaz, and was repudiated by most of the other members of his own family, the wealthy Maderos of Coahuila. Finally concluding that Madero was an element of danger to the régime, the government caused his arrest upon a minor charge and thus eliminated him from the presidential canvass. On July 26, 1910, Díaz was reëlected for his eighth term, with Ramon Corral, one of his ardent supporters, as Vice President. Soon after the election (September 15–25) the centenary of the independence of Mexico was celebrated amidst the most brilliant festivities.

This was the last blaze of glory of the Díaz régime before its collapse. The suppression of Madero was the fact which, added to abuses and oligarchical tendencies of the Científico party, brought on a successful revolution. Madero, having been released from prison and warned from the country, began an active revolutionary propaganda. On October 15 he issued the Plan of San Luis Potosí, which proclaimed the principles of effective suffrage and no reelection, advocated certain land reforms, repudiated the Díaz régime and the election of 1910, and provided for open revolt and the organization of a provisional government. At the time of the actual outbreak in Chihuahua, on November 18, Madero was in the United States, but he at once returned to Mexico and took charge of the movement, which rapidly spread to the other northern states. The year 1911 opened with reverses for the federal government, though it continued to insist that the revolt was of little consequence and would soon be suppressed. The revolutionists demanded the immediate resignation of Díaz. As a reply Díaz, in his message of April 1, 1911, advocated reforms to safeguard the suffrage, reform of the federal judiciary, removal of abuses of the local officials, division of the large estates, and no reelection of the President. Because the fighting was carried on so near the border the United States government early in the year sent a warning to both parties and mobilized troops along the frontiers to guarantee neutrality and protect her interests.

On May 10, 1911, the city of Juárez was captured by the rebels and thereupon the federal government consented to negotiate for peace. The treaty provided for the resignation of Díaz and Corral and the holding of new elections within six months. Madero entered the capital on June 7, was chosen President, and inaugurated on November 6. With the best of desires to remedy the conditions of the country, he proved himself to be unable to cope with the situation. He had no sooner taken his seat as President than revolts broke out. Zapata (q.v.), a guerrilla leader in Morelos, who had led a movement against Díaz, now refused to submit to Madero and continued in arms against the government. Gen. Bernardo Reyes, a defeated candidate for the presidency, also attempted to start a revolt, but failed. A more serious outbreak occurred in February, 1912, in the north. Juárez was captured by the rebels and Gen. Pascual Orozco joined the movement and became its leader. The nearness of the disturbance to the United States frontier and the danger of violations of neutrality caused Congress to authorize and the President to issue an embargo on the shipment of arms to Mexico. This was later modified to allow shipments to the Madero government. Warning was sent, also, to both Madero and Orozco that they should protect the lives and interests of foreigners. The Federals gained victories in the north during the summer and seemed in a fair way to suppress the revolt, when a new movement took place in the south under the leadership of Felix Díaz, a nephew of Porfirio, who captured Vera Cruz. He was defeated, captured, and sentenced to death, but Madero suspended the sentence and removed Díaz to Mexico City for imprisonment.

Madero endeavored to carry out his programme of governmental reform, but in this he was unsuccessful, largely on account of his own character. Besides, his recognition of the old Congress left to the opposition a very effective weapon and the Científico press waged a relentless campaign against him. On Feb. 9, 1913, revolt broke out in Mexico City under the leadership of Felix Díaz and General Reyes. Sanguinary street fighting and the bombardment of public buildings continued for 10 days, until Gen. Victoriano Huerta (q.v.), the head of the federal army, deserted to the rebels. Madero and his Vice President, Pino Suárez, were arrested and forced to resign (February 19) and four days later they were murdered while being transferred from one prison to another. Huerta then assumed the provisional presidency. He and his followers justified their actions by accusing Madero of corruption, and promised reform in the administration.

Huerta experienced difficulties from the first. A counter-revolution was started in the north, led by Venustiano Carranza, the Governor of Coahuila. Governor Carranza was born in Coahuila in 1859 and was educated for the law. On account of weakness of the eyesight he took up farming, to which he has devoted most of his life. In 1893 he led a revolt against the Díaz Governor of Coahuila and succeeded in escaping with his life. He joined the Madero revolt in 1910 and upon its success became Governor of his native state.

Opposed to the course of events in the capital, Carranza secured extraordinary powers from the state legislature in order to defend the constitution. His scheme called for the establishment of a Constitutionalist army, and for the institution of several long-needed reforms. The revolt spread rapidly to Chihuahua, Sonora, and Sinaloa, and a Constitutionalist government was organized with Carranza as provisional president. Huerta's difficulties were further augmented by the attitude of the United States government. President Wilson continued President Taft's policy of non-intervention and non-recognition. The American Ambassador to Mexico, Henry Lane Wilson, advocated recognition, but as his ideas differed so widely from those of the President he felt compelled to resign. The President then sent John Lind (q.v.) as his personal representative, to undertake an adjustment of the Mexican situation. Promise of recognition of a new government in Mexico was given on the following conditions: The cessation of hostilities, the guarantee of an early and free election, the promise of Huerta not to become a candidate, and an agreement of all parties to abide by the result of the election. Huerta refused to agree to his own elimination, which was insisted upon and President Wilson adopted a policy of "watchful waiting." By a

coup d'état of Oct. 10–11, 1913, Huerta dissolved congress and assumed dictatorial power. He held an election, which he himself controlled, and was chosen President. President Wilson protested against the character of the election, but Huerta paid no attention to the protest.

In the meantime the Constitutionalists, under Carranza, had carried on an increasingly active campaign and by the middle of 1914 was in a position to threaten seriously Mexico City itself. Both factions were considerably hampered by the attitude of the United States. Protests were lodged with both sides against the disregard for the life and property of foreigners. An embargo was also placed again on the shipment of arms from the United States. Huerta was troubled also by the financial situation. The United States induced the financial world to boycott him and a threatened run on the banks of the country forced him to declare a bank holiday. He was compelled to resort to all means to secure funds.

On April 10, 1914, occurred the Tampico incident which gave a grave international aspect to the Mexican situation. A number of marines of the U.S.S. *Dolphin* were arrested, while landing from a launch flying the United States flag. Although the men were released and an apology made, Admiral Mayo deemed this insufficient and demanded a salute to the flag. President Wilson supported the demand and ordered the fleet to Mexican waters. In the diplomatic exchanges Huerta agreed in principle to grant satisfaction and hoped to secure recognition in the negotiations. Huerta's conditions were unacceptable and President Wilson appeared before Congress on April 20 and asked for authority to use the armed forces of the United States to secure reparation for the insult to the flag. War seemed imminent. The situation was further complicated by the seizure of Vera Cruz by American forces on April 21 to prevent the landing of a cargo of arms from Germany. At this juncture the A. B. C. powers (Argentine, Brazil, and Chile) offered their services as mediators. These were accepted and a conference was held at Niagara Falls, Canada (May 20–June 24). A protocol was drawn up, but it provided no practical solution for either the international or internal difficulties of Mexico.

During the summer months of 1914 the military successes of the Constitutionalists continued. The fall of San Luis Potosí and Manzanillo (July 17 and 24) gave the Constitutionalists control of the last remaining strongholds on the way to Mexico City. Huerta reorganized his cabinet in July and held a presidential election in the territory under his control. He was returned in this by a small majority. On July 15, he resigned the provisional presidency and was succeeded by Francisco Carbajol, Chief Justice of the Supreme Court. The latter at once made overtures for the surrender of the government to Carranza, asking for the assurance of an amnesty. At the suggestion of the United States Carranza finally agreed to the demands of Carbajol and the latter resigned having made Carranza Minister of Foreign Relations so that he might assume control of the provisional government. On August 15, General Obregon occupied the capital and on August 20, Carranza made his triumphal entry.

Factional strife almost immediately broke out. Followers of Carranza and Villa were in open conflict. Zapata, the southern leader, refused to follow Carranza because the latter failed to adopt his plans for agrarian reform. A convention of the Constitutionalist generals was called for October 1, in Mexico City, in order to decide on a plan of action and to choose a provisional President. The convention, after some delay, accepted Carranza's resignation. This action was later repudiated by Carranza and then the Convention declared itself supreme, chose Eulalio Gutierrez provisional President for 20 days, and placed Villa in command of its forces. Carranza was now openly hostile to the convention as was Zapata. The latter seized Mexico City on November 24, but held it only a short time. President Gutierrez continued in power more than his 20 days, but in January, 1915, he was repudiated by the Convention, which assumed control of the government in its own name. Gutierrez still maintained his right to the provisional presidency and Zapata continued to act independently, so that in reality Mexico had four factions, each pretending to control the government. In March the capital was occupied by each of the factions but held for a very short time. On June 2, President Wilson sent a warning to all factions that they adjust their differences and "act promptly for the relief and redemption of their prostrate country" or the United States would be "constrained to decide what means should be employed to help Mexico save herself."

On August 5, the representatives of Argentina, Brazil, Chile, Bolivia, Uruguay, Guatemala and the United States met at Washington to decide upon the course to be pursued in relation to the warring Mexican factions. The conference immediately resolved to send an appeal (August 11) to the leaders of the rival parties, in order to bring to an end the civil war and establish a provisional government. Villa accepted the offer, but after some delay it was rejected by Carranza. The Pan-American Conference met in New York on September 18, and decided that recognition should be given to the Mexican faction which possessed "the material and moral capacity necessary to protect the lines and property of natives and foreigners." The unanimous choice of the conference was Carranza and the Constitutionalists. Before granting recognition certain promises were secured from Carranza. These were: (1) protection of lives and property of natives and foreigners; (2) members of religious orders to be permitted to return and to be secure in life and property on condition that they did not enter politics; (3) that general amnesty be granted to Mexicans, except the real leaders of the opposing factions; (4) that the *de facto* government take steps to restore law and order, to provide for general elections, and the restoration of the Constitutionalist order in Mexico. On Oct. 18, 1915, Carranza was recognized as the Chief Executive of the Republic of Mexico. President Wilson ordered an embargo on all arms going into Mexico with the exception of those sent to the Constitutionalists. Foreign powers rapidly followed the lead of the American republics in recognizing Carranza. The new leader soon overpowered Zapata and Gutierrez and drove Villa back into his mountain fastness.

Early in 1916, Villa emerged from his retreat and involved the Carranza government in serious difficulties with the United States. On January 11, he seized 19 Americans from a train at Santa Ysabel, Chihuahua, and shot them. Upon the demand of the United States Carranza started a vigorous pursuit of Villa and his followers and succeeded in capturing some of his leaders, but Villa, himself, escaped. On March 9, at the head of 1500 bandits he raided the American town of Columbus, New Mexico, burned and looted it, and killed 15 civilians and 9 troopers. He then made his escape. After some negotiations, with Carranza, in which he did not show a very friendly attitude, a punitive force of American soldiers was sent into Mexico in pursuit of Villa. It was under command of General John J. Pershing. The expedition penetrated more than 300 miles into Mexican territory, but was unsuccessful as far as capturing Villa was concerned. The only serious engagement fought was at Parral where the American forces were attacked by Constitutionalists. While this expedition was seeking Villa he raided the town of Glenn Springs, Arizona. Another punitive expedition chased the bandits more than 150 miles into Mexican territory.

Carranza's attitude throughout these disturbances had been anything but friendly. He continually demanded the withdrawal of the American troops and on May 22, 1916, practically threatened to fire on any American troops in Mexican territory. President Wilson's reply to this was the calling out of the entire National Guard of the country and the strengthening of the forces on the Mexican border. Carranza's hostile attitude left General Pershing's forces in a very precarious position. A new position was taken by his troops much nearer to the border, where he could be easily reinforced by the thousands of militiamen that continued to come to the border. During the last three months of 1916 a joint American-Mexican commission was in session in the United States attempting to settle the difficulties in Mexico as well as to smooth out the international entanglement. Very little was accomplished, largely because the Mexican delegation insisted upon the withdrawal of the American forces and were reluctant to talk about Mexico's internal affairs. Nevertheless, the American troops were gradually withdrawn from Mexico, the last of them leaving in February, 1917.

On Dec. 1, 1916, a constitutional convention convened and drafted a constitution which was promulgated on Feb. 5, 1917. It was very liberal in form, with the exception of the provisions relating to the clergy which were very harsh. The provisions which drew the most attention from abroad, and aroused protests, were those regulating foreign capital. The government was empowered to expel any foreigner whose activities were considered dangerous or embarrassing, and new safeguards were taken against the concession of great oil and mining properties to foreigners, all natural resources being declared public property. Under this provision of the constitution a new tax was levied on oil lands and on oil contracts preceding May 1, 1917. The American government protested against this on the grounds that "the seizure of property at the will of the sovereign without legal process equitably administered, and without provision for just compensation has always been regarded as a denial of justice."

During October and November, 1919, relations between the United States and Mexico again became very strained. This was due to the seizing and holding for ransom of an American consular agent named Jenkins. The American government demanded his immediate release. The Mexican government at first refused, but after a second note was sent Jenkins was suddenly released and the tension relieved.

The Carranza government came to a sudden end in 1920. In April of that year a revolution broke out in Sonora and soon spread over the entire country. Generals Obregon and Gonzales, two of Carranza's strongest supporters, joined the new movement. Carranza fled from the capital, but was pursued by revolutionists and murdered on May 21. General Obregon was elected as his successor. The question of the recognition of the new ruler was intimately connected with the oil question (mentioned above). On Nov. 17, 1920, the American State Department announced that recognition must be withheld if the Mexican government made the provision of the constitution of 1917 relating to natural resources and the laws enacted under it retroactive. On June 7, 1921, Secretary of State, Hughes, proposed that a treaty of amity and commerce be signed with Mexico whereby Mexico should agree to safeguard property rights that had existed before the constitution of 1917 was adopted. Obregon refused this proposal declaring that the two countries should negotiate on an equal basis. The oil question was partially solved by agreements between the producers and the Mexican government (May 3, 1922), and the situation was considerably relieved by the decision of the Mexican Supreme Court, which said that the famous provision of the constitution of 1917 could not be considered retroactive. The settlement of the oil question seemed to smooth away many of the difficulties between the United States and Mexico and although the Harding administration withheld recognition, the relations between the two countries appeared to grow more cordial.

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MEXICO. An inland state of Mexico, bounded by the State of Hidalgo on the north, Tlaxcala, Puebla, and Morelos on the east, Morelos and Guerrero on the south, and Michoacan and Querétaro on the west (Map: Mexico, J 8). A part of this territory, adjacent to the State of Morelos and bounded on three sides by the State of Mexico, is occupied by the federal district, which is outside the jurisdiction of the state. Area, 9228 square miles. The surface is very diversified. In the north it is generally flat, with a few low hills and a number of lakes. The eastern part is taken up by the Popocatepetl Range with its two great volcanoes rising to an altitude of 17,000 feet. In the south rises the Ajusgo Range with its highest peak of over 13,500 feet, while the centre is occupied by the Sierra de las Cruces, exceeding 14,000 feet in its highest peak. The rivers are few in number, the chief among them being the Lerma, which rises in this state. There are a number of lakes in the eastern portion, the largest of which is Lake Texcoco. The climate is generally cold, owing to the mountainous character of the surface. In the valleys, however, it is temperate and healthful and even favorable to the cultivation of tropical fruits. The chief products are cereals, maguey, sugar cane, coffee, tobacco, and rice. The warmer regions produce tropical fruits. Stock raising is also an important and profitable industry. Mining is a growing industry; the chief metals are gold, silver, lead, copper, antimony, and iron. The great El Oro district is one of the leading gold-producing regions of the country. The state is also an important manufacturing centre; its products include cotton and woolen goods, flour, dairy produce, glassware, pottery, bricks, wines, and pulque. The state is traversed by several railway lines, all centring in Mexico City. Pop., 1900, 934,463; 1910, 989,510. The capital is Toluca (q.v.).

MEXICO. The largest and finest city in Latin North America and the capital of the Republic of Mexico. It is situated in the federal district on the west side of the valley of Mexico on the Anahuac plateau, 7350 feet above the sea, in lat. 19° 26′ N. and long. 99° 8′ W. (Map: Mexico, J 8). Its area is about 15 square miles. The city is 263 miles by rail from Vera Cruz on the Gulf of Mexico, 290 miles from Acapulco on the Pacific, 839 miles from Nuevo Laredo, the nearest railroad town on the United States frontier, and 1224 miles from El Paso, Tex. Its population by the census of 1900 was 368,898, and in 1910, 471,066. It is one of the most ancient cities of the continent and has been successively the capital of the Aztecs, of the Spanish viceroyalty of New Spain, and of the Republic of Mexico. It is the political, financial, and commercial centre of the Republic and is growing in importance as a manufacturing centre.

The valley in which it stands is an immense basin, approximately circular in shape, embracing some 2220 square miles, and completely encircled by high mountains, through which only two or three quite elevated passes afford an entrance. The view of the valley and of its girdling mountains and snow-capped volcanoes from elevations such as the towers of the cathedral or Chapultepec Hill, 3 miles west of the city, is superlatively beautiful. There is no natural exit for the waters which pour down the inner sides of the mountains, and they collect in six lakes scattered over the surface of the plain—Chalco and Xochimilco (fresh water), and Texcoco, Xaltocan, San Cristóbal, and Zumpango (salt water). In an early age nearly the entire surface of the valley was a lake bed, but for many centuries desiccation has been very gradually progressing until the waters are collected entirely in the six shallow basins whose extent

CITY OF MEXICO

THE CATHEDRAL

has been still further reduced by the drainage work recently completed. The waters of Xochimilco, however, were practically absorbed by the network of canals that irrigate the surrounding region.

Owing to the inadequate drainage and sewage systems and a soil permeated with the refuse of centuries, the city long had an annual death rate of 40 to every 1000 inhabitants, a larger proportion of mortality than in any other civilized city of the world. The conditions which promoted this high death rate have largely been remedied, and the city compares favorably with others in salubrity and is decreasing its death rate, though the unhygienic manner of life of the poorer classes swells the mortality. The city is naturally healthful, and in its climatic conditions is a delightful place of residence. The temperature is extremely equable, with an annual range of only 12 to 15 degrees. The mean temperature of the summer months is 60° to 65°, and the mean temperature in midwinter is about 53°. The prevailing winds, coming from the northwest, are damp; while the south winds, which blow only a sixth of the time, are very dry. The total rainfall is about 20 inches, or about half of that at New York.

From its three centuries of Spanish domination Mexico still preserves many characteristics of the great cities of Spain, and from a certain Oriental suggestion in its appearance far surpasses them in novelty and interest. Along with the wonderful commercial development that has characterized the last quarter of a century are to be found evidences of an artistic plan to preserve more beautiful forms of architecture than are usually associated with a modern industrial city, with the result that here may be found an artistic centre for local color not equaled elsewhere on the American continent. Seen from a distance the city, prevailingly white in color, is an imposing spectacle. Spreading widely over the plain, overtopped by domes and pinnacles, and hemmed around by majestic mountains, few cities of the world are more charming and impressive.

Most of the houses have terraced roofs and inner courts, are solidly built of sandstone or lava, and are only one to two stories in height, a precaution against the frequent though usually slight earthquakes; but many of the business and public buildings, supported on solid foundations of piling, are three and even more stories in elevation, and some of them reach an altitude of five stories. The walls of many of the poorer buildings are not quite perpendicular, owing to earthquake shocks and the insecure foundation soil of the city, thus giving to some of the street fronts a rather rickety appearance. The later buildings along the business streets are making greater use of steel in their construction, a practice serving to avoid the above difficulties.

Buildings. The cathedral, situated on the north side of the Plaza de la Constitución and built on the site of the great temple of Huitzilopochtli, the titular god of the Aztecs, is one of the largest and most sumptuous churches in America. It was commenced in 1573, dedicated in 1667, and completed in the nineteenth century, at a cost of over $2,000,000. It is rectangular in form, 426 feet long and 203 feet wide. The interior is in Doric style with traces of Gothic and has a single nave and transept, forming a Latin cross, two aisles, and 13 side chapels. The massive and tasteless high altar is surrounded by a tombac (copper and zinc alloy) railing which is surmounted by 52 statuettes. The huge quadrilateral choir is closed in front by a magnificent tombac grill and is connected with the high altar by two railings of the same material. To the rear of the high altar is the chapel of the kings, in Churriguueresque style and the finest in the cathedral. The façade is an attractive example of the architecture of the Spanish Renaissance, blending the Ionic, Doric, and Corinthian orders. Flanking the façade are two open towers, 218 feet high, which were completed in 1791. Facing the plaza on the east side of the cathedral and forming an integral part of it is the Sagrario Metropolitano, one of the parish churches of the city. In addition to the cathedral, Mexico contains some 60 churches, among which the finest are La Profesa, Loreto, Santa Teresa, Santo Domingo, and San Hipólito. A number of Protestant denominations also have houses of worship in the city.

The National Palace, of poor and monotonous architecture, occupies the east side of the plaza. It has a frontage of 675 feet, and with its associated buildings covers an area of 14,000 square meters. It contains the offices of the President, the Senate Chamber, the ministries of Finance and of War, the federal treasury, and the public archives. On its walls are some remarkable paintings by Miranda and other native artists. North of the National Palace and forming a part of it is the National Museum, with its sections of archæology, natural history, anthropology and ethnography, and Mexican history. It contains priceless collections of Aztec relics, remains of large animals of the Quaternary epoch, and an extensive collection of paintings. The National Observatory and the Meteorological Bureau are also located here. The Monte de Piedad, the famous national pawnshop of Mexico, with nearly 10,000,000 pesos of accumulated funds, stands close to the cathedral, and with its liberal management is really a beneficent charity. Facing the cathedral is the Palacio Municipal, or city hall, containing the city and federal district offices.

In recent years many imposing edifices have been constructed. The Legislative Palace, facing the Plaza de la República, is one of the finest structures of Latin America and was built at a cost of 10,000,000 pesos. The Central Post Office, just back of the National Theatre, is a fine example of the Plateresque style and was completed in 1907 at a cost of 2,921,000 pesos. The National Penitentiary, at the eastern edge of the city, is a large and perfectly equipped institution, which was opened in 1900. Other notable buildings, all of them old and of historic interest, are the School of Medicine on the Plaza Santo Domingo, occupying the quarters in which the Inquisition made its infamous history; the church of the Jesuits; the School of Arts, where many branches of industry are taught; the National Picture Gallery of San Carlos, in which the Florentine and Flemish schools are especially well represented; the National Library, formerly the church of San Agustín, with over 200,000 volumes, numerous manuscripts, and rare old Spanish books; the Mint, in which silver and gold have been coined since 1690, to the value of nearly $3,000,000,000; the Itúrbide Hotel; and the School of Mines, designed by the artist Tolsa, one of the finest

structures in Mexico, with rich mineralogical and geological collections and containing also the School of Engineering with its observatory. There are 19 hospitals, many of them dating from colonial times and occupying old buildings; the General Hospital and the Insane Asylum, however, are of the most modern type.

One of the curiosities of the city is the little old building in which the first printing in America was done. There are over 200 periodical publications registered in the capital, including about a score of dailies. They administer to every phase of the intellectual and artistic life, a number being printed in English, German, and French. The Geographical and Statistical Society, which issues many maps and charts, is the principal scientific institution of the country. The educational system of the city comprises the university, with its various faculties; technical and professional schools, including two normal schools, an engineering school, a school of fine arts, a conservatory of music, and a school of commerce; numerous public schools of primary and secondary grade; and many private institutions.

Streets and Parks. Mexico is said to be the finest-built city on the American continent. Some of its thoroughfares, paved with asphalt and lined with houses whose height bears a strict architectural relation to the width of the streets, certainly bear out this assertion. Its 2500 streets and lanes are laid out with great regularity, running generally from north to south and from east to west, except in some of the newer sections, and intersecting at right angles. The monotony of this arrangement is broken by an occasional public square or garden, while in the suburbs there are numerous diagonal streets and avenues. Many of the streets are very narrow, especially in the older portion of the city lying within the line of the old walls. Even where the streets are wider the sidewalks are usually too narrow to accommodate the passers-by. Formerly the system of street names was a bewildering puzzle, the same street changing its name many times. This condition has been remedied somewhat by the readjustment of the nomenclature made in 1908 and 1909. Starting from the Plaza de la Constitución, the electric tramway system reaches all parts of the city and the suburbs. The principal streets are electrically lighted and are clean and well kept.

San Francisco Avenue, the leading business thoroughfare, connects the Plaza Mayor with the Alameda and reminds the visitor strongly of the fashionable shopping districts of European centres. Here shops, with their costly displays of all sorts of merchandise, the best hotels, cafés, and restaurants, the business offices and clubs, pour forth during the later afternoon hours their elegantly attired throngs that overflow the narrow sidewalks and fill the costly equipages and hackney coaches moving in a double line along the crowded street. San Francisco Avenue is interesting any day, but it is doubly so when processions of flower-bedecked carriages, columns of troops in showy uniform, and the gayly decorated fronts of the buildings proclaim the celebration of the fiestas of September or of the Cinco de Mayo (Fifth of May). The avenue Cinco de Mayo, a rival of San Francisco Avenue and running parallel to it, extends from the cathedral to the new National Theatre. The Paseo de la Reforma is the finest avenue and drive in the Republic and is the highway of Mexican social life. It was constructed by the order of Emperor Maximilian and extends a distance of 2 miles from the Alameda to the hill of Chapultepec. It has a double avenue of fine trees, shading well-constructed stone sidewalks, which are lined with beautiful residences. There are six glorietas (circular parked expansions), each 400 feet in diameter, every one exhibiting a wealth of flowers and shrubbery and some surmounted with fine monuments of historic interest. Its terminal parks are of rare beauty and are in the midst of an architectural setting that each year becomes more imposing. It is no wonder that every afternoon from five to seven o'clock the paseo is the favorite parade ground for every Mexican who owns or can afford to hire an equipage. Along the line of handsome vehicles one occasionally detects a touch of domestic color in the person of some caballero in native costume, but such appear with less frequency as the years pass on, and the Mexican Vanity Fair approximates more closely to the ordinary park processions of the great world centres.

A spot hardly second to the paseo in interest is the beautiful park and promenade known as the Alameda. With its 40 acres well shaded with poplar and beech trees and variegated with a most profuse collection of semitropical plants and shrubs, it has long been the favorite stamping ground of Mexican aristocracy, whose weekly parade on Sunday from eleven to one exhibits the fashionable life of the capital at its best. Here a fountain now stands on the site of the Quemadero, or burning place of the Inquisition, where many a heretic expiated his heresy at the behest of the then all-powerful church and had his ashes thrown into the ditch flowing behind the neighboring sanctuary of San Diego. The central Plaza de la Constitución, or Plaza de Armas, or Plaza Mayor, surrounded by the magnificent cathedral, the National Palace, the municipal buildings, and some of the finest retail stores, seems more truly than any other spot the real centre of the city. It covers 14 acres and is beautified by trees, flower plots, statuary, and marble fountains, while in the centre is the charming band stand which gives to it its popular name of Zócalo. Formerly the centre of the commercial life of the metropolis and still that of the political life, it is the scene of the patriotic celebrations so dear to the heart of its populace. It is here, during the fiestas of September, that one can view the floral parade of the fourteenth; can listen to the charming military concerts of the fifteenth and behold the gorgeous electric and pyrotechnic display that follows the commemorative ring of the grito of Hidalgo; and on the sixteenth can see the parade of column after column of Mexico's well-drilled troops.

Monuments. The city, which contained the first academy of fine arts erected upon the American continent, still affords many examples of the artistic instinct of its people in its well-built public and private residences and in important groups of statuary. Among the most important of these is the equestrian statue of Carlos IV, begun in 1794 and finished in 1803, the work of a native artist, Manuel Tolsa. Originally placed on the Plaza Mayor, it is now situated at the city terminus of the paseo. In the first glorieta of the paseo is the monument to Christopher Columbus; in the second, that to

Cuauhtemoc, the last of the Aztec rulers, one of the most impressive structures on the American continent; and in the fourth, the monument to the national independence, an imposing structure combining modern and classic styles and completed in 1910. The striking Benito Juárez Monument, facing Juárez Avenue midway along the Alameda, was constructed in commemoration of the hundredth anniversary of the independence. The tomb of Juárez in the pantheon of San Fernando is a noteworthy piece of Mexican art.

Clubs and Theatres. As may be imagined, the social life of Mexico City, from a Latin-American point of view, is exceedingly attractive. In addition to many native organizations, all of the principal foreign colonies have a social centre, the British and the Americans being especially well housed. The Jockey Club, a native organization, has as its headquarters one of the finest buildings in the city, formerly the palace of the Count del Valle. The new National Theatre, a government undertaking, located at the eastern end of the Alameda, is the largest and finest theatre in the Republic. Among the other playhouses are the old Teatro Nacional, the Teatro Colón, the Teatro Arbeu, and others of lesser note. In no other country except Spain is bullfighting so popular, and although the administration of Díaz made quiet efforts to bring the sport into disrepute, the two bull rings are well thronged on festal days and at the Sunday performances.

Suburbs, etc. Extension of the tramway system resulted in a great expansion of the older city and a development of the suburban towns. One of the earliest additions to the old city was the Colonia Juárez, which was laid out in 1890 and lies just south of the Paseo de la Reforma. Here American ideas of architecture and hygiene were developed and have exerted a great influence upon the city. This handsome colonia is the centre of the American, English, French, and German wealth and fashion of the metropolis. To the south of the Colonia Juárez are the colonias Roma, Condesa, and Hidalgo, and to the north are the colonias Cuauhtemoc, San Rafael, and Santa María, all patterned after the original colonia and forming the chief residential sections of the city. Just to the west of the Colonia Juárez and at the far end of the paseo is Chapultepec, a mass of rock rising some 200 feet from the midst of magnificent cypress groves and topped by the splendid structure containing the National Military Academy and the President's summer palace, from which may be obtained the finest view of the valley. The older suburban towns, while not so desirable as places of residence, are full of historic interest. To the southwest of the city is Tacubaya, the most fashionable resort of Mexico, situated in the most fertile portion of the federal district. Here is located one of the national observatories, occupying a former palace of the Archbishop of Mexico. To the north of the city lies Guadalupe Hidalgo, whose beautiful and rich church is the Lourdes of Mexico and whose traditional Virgin has become the tutelar divinity of the modern Republic. To the south is the Viga Canal, lined with the so-called floating gardens, the region which furnishes the flowers, fruits, and vegetables for the city markets and whose inhabitants present some of the most interesting pictures of contemporary native life. Upon this canal are the towns of Santa Anita and Iztacalco, interesting pleasure resorts frequented by the lower classes. Also to the south is Tlalpam, a resort second only to Tacubaya in importance. To the west, Popolta contains the Noche Triste tree, under which tradition says that Cortés wept on the night of his expulsion from Mexico. By rail it is possible to extend one's excursions beyond the mountain valley to the most interesting points of ancient and modern Mexican history, all of which are within easy distance of the capital.

Industries and Commerce. The high price of fuel long hampered the industrial development of the city. The use of electric power, however, has produced a great increase in the industries. In 1914 there were 153 manufacturing establishments in the city, producing cotton, linen, and silk textiles, leather, boots and shoes, alcohol, beer, flour, cigars and cigarettes, chocolate, hats, ice, furniture, pianos, matches, glass, soap, bricks, carriages, etc. The textile and cigarette enterprises are the most important. In the suburban towns also there are numerous factories. A large part of the trade interests is in the hands of French, German, and English merchants. (For communications with the United States and other countries, see MEXICO.) The city is the wholesale centre for the nation, and its banks, of which the most important are the National Bank of Mexico, capitalized at 32,000,000 pesos, the Mexican Central Bank, capitalized at 30,000,000, and the Bank of London and Mexico, capitalized at 21,500,000, control its financial conditions. Its 15 markets are large and well ordered and a perpetual convenience to its inhabitants.

Drainage and Water Supply. The city derives its water supply from the western mountains, the greater portion coming from the vicinity of Tacubaya. For the transportation of the water there has been constructed a series of aqueducts, the first of which was completed in 1576 and the last was opened in 1910. Upon the inauguration of the new system, in this latter year, there was available an average of 400 liters per day for each inhabitant of a population of 545,000. New plans were made to secure a more even distribution of the water supply, especially in the poorer sections, where the lack of water had contributed greatly to the unsanitary conditions.

The drainage works, which have vastly improved the sanitary conditions, were completed in 1900 after three centuries of more or less spasmodic effort and at the cost of the lives of many thousands of men and many millions of dollars. The great evils from which the city of Mexico suffered for many generations were inundations from Lake Texcoco and disease promoted by the fact that the city stood in the bottom of an undrained natural sink. The lake, suddenly filled by downpours from the mountains, sometimes buried the streets in water for weeks. Thirty thousand persons were drowned by the sudden submergence of the city in 1629, and similar catastrophes were caused by other floods. It was to rescue the city from inundations that the drainage works were begun three centuries ago, but it was not till 1789 that the city ceased to be menaced by deluges. Up to 1830 the total expenditure on the drainage works had been $8,000,000, but the menace of malaria and epidemics had not yet been removed. The canal was not deep enough, the lake was still very little below the mean level of the city,

and the fall was not sufficient to carry off the sewage. The gigantic works, which were not seriously undertaken till 1885 and completed in 1900, now rank among the great engineering achievements of modern times. The works consist of sewers carrying the waste of the city to a canal starting from the San Lázaro gates and extending for 43 miles, its course being deflected so as to cut Lakes San Cristóbal, Xaltocan, and Zumpango. Near the town of Zumpango the canal empties into the tunnel, completely lined with brick, which has been dug through the mountains a distance of 32,869 feet to a river which carries the sewage to the Gulf of Mexico. These works thus carry all the surplus waters and sewage of the city of Mexico outside of the valley, and also control the entire waters of the valley, affording an outlet to those that might otherwise overflow fields and towns.

Government. With the exception of the temporary organization of a municipal government at Vera Cruz to further the ambitious plans of Cortés, the municipal corporation of Mexico City was the first to be established upon the American continent. The probable date of its establishment by the Great Conqueror is 1522, but the earliest preserved record of its meetings is that of March 8, 1524. In that year the officers consisted of two alcaldes (municipal judges), four regidores (members of the council), a procurador (attorney), and a notary. Later the number of regidores was increased to six. The first council was appointed by Cortés. Afterward the regidores were appointed annually by the Governor and royal officials upon nomination by the people, and the alcaldes were chosen by the regidores. Later there were 15 perpetual and hereditary regidores, who were either appointed by the crown or purchased their office. They were empowered to name two alcaldes every year and six regidores and an attorney every two years. By this arrangement the city council became a closed corporation. It offered, however, the only official positions which were open to the creoles. Its powers were never clearly defined, but in general it busied itself with the local government, including the police power and administration of justice.

Although created at first as the creature of Cortés, the cabildo (municipal corporation) of Mexico soon became a powerful body, strong enough in some cases to make or mar the reputation of succeeding viceroys. It greatly interfered with the salutary reforms of the Count of Revilla Gigedo (1789–93), and on the abdication of Ferdinand VII in 1808 it took a prominent part in the assembling of a general junta of New Spain to resist the pretensions of Joseph Bonaparte.

Following the declaration of Mexican independence and the division of New Spain into the states of the Republic of Mexico, there arose a conflict between the state authorities of Mexico and the national government which resulted in the creation, Nov. 18, 1824, of a federal district, comprising the territory within a radius of two leagues of the main plaza. The federal district was subsequently enlarged, until it comprises 12 municipalities besides that of Mexico, which of itself covers 15 square miles. The city now has an Ayuntamiento Constitucional (Constitutional City Council), consisting of 21 members, elected by a popular vote. It chooses its own president and vice president. The Ayuntamiento is quite overshadowed by the Superior Council of the federal district, which consists of the Governor of the district, the Director General of Public Works, and the president of the Superior Board of Health. This council, which is responsible directly to the president, controls much of the local administration. It must, however, consult the Ayuntamiento in all matters of a general importance to the municipality, such as the water supply, sanitation, and contracts. The Ayuntamiento holds a limited veto power in respect to contracts affecting the city. The income of the municipality is derived from taxes on the water supply, commercial establishments, public amusements, slaughter houses, vehicles, and pulque. The revenues of the city have increased greatly, in 1911–12 amounting to 4,461,461 pesos, of which 1,030,920 was from the pulque tax.

History. The city dates from about 1325 A.D., when the Aztecs, looking for a favorable site, saw perched on a cactus an eagle devouring a snake. The omen was interpreted to mean that this was to be the site of their city; hence its original name, Tenochtitlan (cactus on a stone), changed later to Mexico in honor of the war god Mexitli. With the progress of Aztec culture the city expanded and improved, and about 1450 tradition reports that the mud and rush houses were replaced by solid stone edifices built partly on piles amid the little islands of Lake Texcoco. The Aztec city was an imposing spectacle at the time of the arrival of the Spaniards in 1519, when it is reported to have contained at least 50,000 buildings and several hundred thousand inhabitants. It was about 10 miles in circumference, everywhere intersected by canals and connected with the mainland by six long and solidly constructed causeways. It was thus essentially a lacustrine city, but the subsidence of Lake Texcoco has left the modern city high and dry, with the lake 2½ miles away. The Aztec city was almost wholly destroyed by Cortés, who in 1521 employed the friendly natives to rebuild the city on the same site. Under Spanish domination the city in 1600 contained about 15,000 inhabitants, which number gradually increased to 120,000 two centuries later.

The city is full of historic interest and has been the scene of many events of national importance. It was captured by the United States after the battle of Chapultepec, on Sept. 13, 1847, and by the French forces under Marshal Forey in 1863. Upon the downfall of Emperor Maximilian, Juárez entered the city (July 15, 1867), and on Nov. 23, 1876, Díaz was here proclaimed provisional President and began his long régime. In February, 1913, 10 days of sanguinary street fighting and bombardment of public buildings took place during the struggle between the Madero government and the Revolutionists under Felix Díaz and Gen. Bernardo Reyes. It was occupied by the Constitutionalists in August, 1914, and subsequently was alternatively in the hands of Carranza, Zapata, and Villa. It suffered greatly from the chaotic conditions existing in 1915. In spite of its misfortunes it is a leading centre of intellectual and industrial development of Latin America, and is at once one of the most interesting and most promising cities of the western continent.

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York, 1888); E. J. Howell, *Mexico: Its Progress and Commercial Possibilities* (London, 1892); A. García Cubas, *Mexico*, translated by Thompson and Cleveland (Mexico, 1893); E. Below, *Mexico* (Berlin, 1899); O. Percival, *Mexico City* (Chicago, 1901); J. Galindo y Villa, *Ciudad de México* (Mexico, 1906); J. Romero, *Guía de la ciudad de México* (ib., 1910); C. R. Enock, *Mexico* (New York, 1910); T. P. Terry, *Mexico* (London, 1911).

MEXICO. A town of Luzon, Philippines, in the Province of Pampanga (Map: Luzon, D 6). It is situated on an arm of the Pampanga Delta, 5 miles northeast of Bacolor. Pop., 1903, 13,469.

MEXICO. A city and the county seat of Audrain Co., Mo., 110 miles by rail northwest of St. Louis, on the Wabash, the Chicago and Alton, and the Chicago, Burlington, and Quincy railroads (Map: Missouri, E 2). It is the seat of Hardin College for Women (Baptist), founded in 1873, and of the Missouri Military Academy; and contains a Carnegie library and fine high school and post office buildings. There is a considerable trade in horses and cattle, and the industrial establishments include flour mills, shoe and ice factories, fire-brick, marble, stove-lining, and cigar works. The surrounding region abounds in clay of an excellent grade. Settled in 1833, Mexico was incorporated in 1852. The government is administered under a charter of 1893, which provides for a mayor, elected biennially, and a unicameral council. Pop., 1900, 5099; 1910, 5939.

MEXICO, Gulf of. A partially inclosed basin of the Atlantic Ocean, having the United States on the north and Mexico on the west and south. It has an extreme length from east to west of about 1100 miles and a breadth from north to south of 800 miles; its area is estimated at 700,000 square miles (Map: America, North, J, K, 7). The opening of the gulf eastward is narrowed by the peninsulas of Florida and Yucatan, which approach within 450 miles of each other. Near the middle of the outlet lies the island of Cuba, forming two passages—the Strait of Florida, 125 miles wide, between Florida and Cuba, and the Yucatan Channel, 120 miles wide, between Cuba and Yucatan. The north entrance connects with the Atlantic Ocean and the south with the Caribbean Sea. The basin of the gulf attains a maximum depth of 12,700 feet, while a large proportion of its area exceeds 10,000 feet in depth. From Florida west to the Mexican boundary the shores form a part of the coastal plain and slope so gradually that the 100-fathom line is distant 100 miles or more from land. Off the Mexican coast, however, the basin rapidly sinks to the level of the submarine plain known as Sigsbee's Deep, which has an average depth of 12,000 feet. The passages leading to the Caribbean Sea and the Atlantic are relatively shallow. The gulf contains few islands and these are located in proximity to the coasts; the Florida Keys, the delta of the Mississippi, and the islands on the coast of Yucatan are the most important. Numerous small bays and innumerable lagoons inclosed behind sand bars give relief to the coast line, which is otherwise quite regular. The Bay of Campeachy, between Yucatan and the main mass of Mexico, is the only broad indentation. Owing to the low shores, good harbors are not numerous, the best being those of Vera Cruz, Galveston, Mobile, Tampa, Pensacola, and Havana. The principal rivers flowing into the gulf descend from the United States, and include the Mississippi, Rio Grande, Colorado of Texas, Brazos, Sabine, Mobile, and Apalachicola. The prevailing winds from March to September are the northeast trades, while during the colder portion of the year, owing to the relatively high temperature of the gulf, there is a cyclonic inflow of air, associated with strong northerly winds, which sometimes move with terrific force, causing violent gales. The tides in the gulf rarely exceed 4 feet for the spring tides, and 2½ feet for the neap tides. The most remarkable feature in connection with the Gulf of Mexico is the Gulf Stream (q.v.), which enters it by the south channel, passes round it, and emerges through the Strait of Florida. The swiftest portion of the stream, as it issues from the gulf, has a velocity of more than 4 miles per hour. Owing partly to the presence of this heated current, the temperature of the gulf is eight or nine degrees higher than that of the Atlantic in the same latitude.

MEYER, mī'ĕr, Adolf (1866–). An American pathologist and alienist, born at Niederwenigen, near Zurich, Switzerland. Having studied medicine at Paris, London, Edinburgh, Vienna, Berlin, and Zurich (M.D., 1892), he came to the United States; lectured on neurology at the University of Chicago (1892–95); and served as pathologist to the Illinois Eastern Hospital for the Insane at Kankakee, Ill. (1893–95). While pathologist and later director of the clinical and laboratory work of the Worcester (Mass.) Insane Hospital, he lectured on psychiatry at Clark University (1895–1902). From 1902 to 1910 he served as director of the Pathological Institute of New York State Hospitals and in 1904–09 also as professor of psychiatry at Cornell University Medical College; and in 1910 he was appointed to the corresponding chair at Johns Hopkins University and director of the Henry Phipps Psychiatric Clinic of Johns Hopkins Hospital. He was president of the New York Psychiatric Society and of the American Psychopathological Association. Besides contributing to the New International Encyclopædia, he published *Dementia Præcox*, with others (1911).

MEYER, Adolf Bernhard (1840–1911). A German zoölogist and anthropologist, born in Hamburg. After a prolonged course of study in medicine and natural history at the universities of Göttingen, Vienna, Zurich, and Berlin, he explored the Malay and Philippine Islands, and in 1874 became director of the Dresden Royal Museum of Natural History, retiring in 1905. Among his writings are *Abbildungen von Vogelskeletten* (1879–95); *Publikationen des königlichenethnographischen Museums zu Dresden* (1881–1903); *Album von Philippinentypen* (1885–1904); *The Birds of Celebes* (1898); *The Distribution of Negritos* (1899); *Studies of the Museum* (of Natural History) *and kindred Institutions of New York, etc.* (1905); *Amerikanische Bibliotheken und ihre Bestrebungen* (1906); *Römerstadt Agunt* (1908).

MEYER, Annie Nathan (1867–). An American author and promoter of the higher education of women, a sister of Maud Nathan. She was born in New York City and in 1887 was married to Dr. Alfred Meyer. She was instrumental in founding Barnard College, New York, now a part of Columbia University, and became known also as an opponent of woman suffrage. At one time she was associate editor

of the *Broadway Magazine*. Besides editing *Woman's Work in America* (1891) and contributing a series of articles on "Higher Education for Women" to the New York *Evening Post*, Mrs. Meyer published *Helen Brent, M.D.* (1892); *My Park Book* (1898); *Robert Annys: A Poor Priest* (1901); *The Dominant Sex* (1911); *The Dreamer* (1912).

MEYER, Balthasar Henry (1866–). An American railway expert, born at Mequon, Ozaukee Co., Wis. He graduated from the Oshkosh Normal School in 1893; studied at the University of Berlin in 1894–95; and finished his education at the University of Wisconsin (B.L., 1894; Ph.D., 1897), where he was instructor in sociology (1897–99), assistant professor of sociology (1899–1900), and professor of political economy (1900–10). He served as member (1905–11) and chairman (1907–11) of the Railroad Commission of Wisconsin; was a member of the United States Railroad Securities Commission in 1910; and was appointed by President Taft a member of the Interstate Commerce Commission in January, 1911. He had charge of the valuation of railroads in the United States in 1904–05. He is author of *Railway Legislation in the United States* (1903); *A History of the Northern Securities Case* (1906).

MEYER, Christian Erich Hermann von (1801–69). A German paleontologist, born at Frankfort-on-the-Main. He was educated at Heidelberg and at Munich and from 1837 to 1866 was connected with the financial administration of the government. He received the Wollaston medal from the Geological Society of London in 1858. The published results of Meyer's paleontological researches include: *Palæologica zur Geschichte der Erde und ihrer Geschöpfe* (1832); *Die fossilen Zähne und Knochen und ihre Ablagerung in der Gegend von Georgensgmünd* (1834); *Neue Gattungen fossiler Krebse* (1840); his most important work, *Zur Fauna der Vorwelt* (4 vols., 1845–60); *Die Reptilien und Säugertiere der verschiedenen Zeiten der Erde* (1852).

MEYER, Claus (1856–). A German genre painter, born at Linden, near Hanover. He studied first at the School of Arts in Nuremberg, then at the Munich Academy, chiefly under Löfftz, whose influence led him to an intimate study of the Dutch masters of the seventeenth century. He acquired such delicate nuances of color and subtle characterization as almost to equal his models. His best-known works are Flemish or Dutch interiors with quiet contemplative figures or merry groups, painted with exquisite detail and fine naturalism. Such are "The Dice Players" (Berlin Gallery); "Merry Company" (Düsseldorf); "Dutch Interior" (1882); "Sewing Room in a Béguine Convent" (1883, Munich Gallery), awarded the great gold medal at the International Exhibition in Munich. "Old and Young Cats" (1885, Dresden Gallery) and "Infants' School" (1888, Karlsruhe Gallery) are also notable. Meyer was professor at the School of Art in Karlsruhe in 1891–95, and afterward at the academy in Düsseldorf. His later works include religious pictures, such as "Christ Among the Doctors" (Barmen Gallery) and "Fear Not"; also some notable mural decorations in the city hall at Duisburg and in Castle Burg on the Wupper. Consult Board, in *Kunst für Alle* (Munich, 1907), and Schippang, in *Kunst unserer Zeit* (ib., 1909).

MEYER, Eduard (1855–). A German historian, born at Hamburg and educated at the universities of Bonn and Leipzig. He was appointed professor at Breslau in 1885, at Halle in 1889, and at Berlin in 1902. He lectured at Harvard in 1909. Honorary degrees were given him by Oxford, St. Andrews, Freiburg, and Chicago universities. His principal work is his *Geschichte des Altertums* (1884–1902; 3d ed., 1913). He also published: *Forschungen zur alten Geschichte* (1892–99); *Untersuchungen zur Geschichte der Gracchen* (1894); *Wirtschaftliche Entwickelung des Altertums* (1895); *Die Entstehung des Judentums* (1896); *Zur Theorie und Methodik der Geschichte* (1902); *Die Israeliten und ihre Nachbarstämme* (1906); *Der Papyrosfund in Elephantine* (1912).

MEYER, George von Lengerke (1858–1918). An American political leader, diplomatist, and cabinet officer, born in Boston. He graduated at Harvard in 1879 and from then until 1899 maintained active mercantile and banking interests. He served as common councilman and alderman of Boston and as a member of the Massachusetts House of Representatives (1892–97), being Speaker during the last three years. In 1900–05 he was Ambassador to Italy and then for two years Ambassador to Russia. In 1907 he became Postmaster-General, under President Roosevelt, and during President Taft's administration he was Secretary of the Navy. He served on the Republican National Committee from 1898 to 1904.

MEYER, Hans (1846–). A German engraver, etcher, and painter. He was born in Berlin and studied under Mandel and at the Berlin Academy, and later traveled in Italy, Holland, Belgium, and France. He became a professor at the Academy for Fine Arts in Berlin, and received many honors, including medals at Munich in 1891, Chicago in 1893, Antwerp in 1894, and the great gold medal at Berlin in 1899. Among his best plates are "Poetry" after Raphael; "Mary and Elizabeth" after Moretto; "The Lady with the Glove" after Van Dyke; "Peace and War" after Geselschap's mural paintings in the Berlin Hall of Fame; and a series of fantastic original etchings, the "Dance of Death." He also painted landscapes in water color and tempera.

MEYER, Hans (1858–). A German explorer and publisher. He was born at Hildburghausen and studied science and political economy at Leipzig, Berlin, and Strassburg. He traveled in Asia, North America, and South Africa (1883) and in 1887 explored Kilimanjaro in East Africa. After several venturous attempts to ascend the mountain he reached the top of the higher of the two peaks, the Kilbo summit (1889), where he found a crater more than a mile wide and about 19,700 feet above the sea. In 1898 he made an exhaustive study of the mountain and its glaciers and wrote *Der Kilimandjaro* (1900). In 1884 he entered the Bibliographisches Institut (Leipzig), founded by his grandfather, Joseph Meyer (1796–1856). Upon the retirement in 1885 of his father, Hermann Julius (1826–1909), Hans Meyer and Arndt Meyer became directors of the well-known publishing house. In 1903 Herman Meyer joined the firm. In 1903 Hans studied the glaciation of the Ecuadorian Cordilleras. In his *Zum Schneedom des Kilimandscharo* (1888) he gives a full account of his experiences and discoveries in that region. In 1908 he made another trip to East Africa. Among his other

writings are *Eine Weltreise* (1884); *Ostafrikanische Gletscherfahrten* (1890); *Die Eisenbahnen im tropischen Africa* (1902); *In den Hoch Anden von Ecuador* (1907); *Das deutsche Kolonialreich* (1909, 1910), with others.

MEYER, Heinrich (1760–1832). A Swiss writer on art and antiquity. He was born at Zurich and studied painting there under Füessli. In 1784 he went to Italy and at Rome in 1788 he met Goethe, with whom he contracted a friendship so intimate that he was known in Germany by the name of "Goethe-Meyer." In 1792, through the influence of Goethe, he was appointed a professor in the Weimar Academy of Design. Three years later he revisited Italy, and in 1797 returned to Weimar, where he was made a director of the academy in 1807. Many of the critical portions of Goethe's essays on art in *Kunst und Altertum* are to be credited to Meyer, and he also assisted Goethe in his *Propyläen*. As a painter, his production was scanty. He edited, with extensive annotations of his own, the works of Winckelmann (1808–20). These notes he subsequently expanded into a general history of Greek art, which appeared under the name of *Geschichte der bildenden Künste bei den Griechen und Römern* (with an additional volume by Riemer, 1824–36). He died at Weimar, leaving to that city a bequest of 33,000 thalers for the establishment of a foundation for the poor.

MEYER, Heinrich August Wilhelm (1800–73). A German Bible commentator. He was born at Gotha, studied theology at Jena, and held various pastoral charges. After 1841 he resided in Hanover as a member of the consistory. His fame rests upon his *Kritisch-exegetisches Kommentar zum neuen Testament*, in some respects the greatest modern biblical commentary, of which the first volume, containing the first three Gospels, appeared in 1832. It was completed in 1859, though some of the later volumes were done by others. An English translation appeared at Edinburgh, with the exception of the *Revelation* (20 vols., 1873–82), and an American in New York (11 vols., 1884–88). More recently German revisions by later scholars have been published.

MEYER, Henry Herman (1874–). An American Methodist Episcopal clergyman and editor, born at Champaign, Ill. He attended the California State Normal School; graduated from German Wallace College (Ohio) in 1900 and from Drew Theological Seminary in 1903; and later was a graduate student at Columbia University and at Jena. For several years before being ordained in 1900 he had held various pastorates; he was then for a year a professor in St. Paul's College (Minnesota). In 1903 he became assistant editor of the Sunday-school publications of the Methodist Episcopal church, and after the death of the editor in chief, J. T. Macfarland, he was elected to succeed him (1914). In 1911 he served as secretary of the Sunday School Council of the United States and Canada, and he became a member of the executive council of the Religious Education Association. He edited the *Lesson Handbook* after 1904, and is author of *Stencil Maps and Missionary Chalk Talks* (1904) and *The Graded Sunday School in Principle and Practice* (1910).

MEYER, Hugo Richard (1866–). An American economist. He was born in Cincinnati, Ohio, and was educated at Harvard University (A.B., 1892; A.M., 1894), where he was an instructor in political economy from 1897 to 1903. He served as assistant professor of political economy at the University of Chicago in 1904–05 and after 1907 spent considerable time in travel. He is author of *Government Regulation of Railway Rates* (1905); *Municipal Ownership in Great Britain* (1906); *The British State Telegraphs* (1907); *Public Ownership and the Telephone in Great Britain* (1907).

MEYER, Johann Georg (Meyer von Bremen) (1813–86). A German genre painter, born at Bremen. He was a pupil at Düsseldorf of Sohn and Schadow and at first painted biblical subjects, but after 1842 practiced genre painting. His favorite subjects were peasants of the Hessian, Bavarian, and Swiss mountain districts. Among his early works were "The Anniversary of the Hessian Parson" (1842) and "The Penitent Daughter" (1852), Bremen Gallery. His scenes from child life followed after he settled in Berlin in 1852. These include: "Girl Telling Fairy Tales," "Blindman's Buff," "The Youngest Brother," and the "Little Mother" (1852), National Gallery, Berlin. He also painted single or group figures of young girls, like his "Awaiting," "The Courting," and "Reading the Love Letter." The Metropolitan Museum of New York possesses "The Letter" (1873). Meyer's pictures are often naïve and full of humor, but lack sound pictorial qualities, and are illustrations rather than paintings. He was a professor at the Berlin Academy and received a medal in Philadelphia in 1876.

MEYER, Jürgen Bona (1829–97). A German philosophical writer and follower of Kant. He was born at Hamburg and studied science and philosophy in Berlin and Bonn. In 1862 he was admitted as privatdocent to the philosophical faculty at Berlin University and in 1868 he became professor of philosophy at Bonn. From 1889 to 1892 he was editor of the *Deutsche Zeit- und Streitfragen*, and from 1893 to 1896 of the *Vereinsblatt des liberalen Schulvereins Rheinlands und Westfalens*, both social-political journals. In these most of his later essays appeared. He published: *Aristoteles Thierkunde* (1855); *Voltaire und Rousseau in ihrer socialen Bedeutung* (1856); *Zum Streit über Leib und Seele* (1856); *Grundzüge der Schulreform unserer Zeit* (1861); *Religionsbekenntniss und Schule* (1861); *Kants Psychologie* (1869); *Philosophische Zeitfragen* (1870; 2d ed., 1874); *Leitfaden zur Geschichte der Philosophie* (1882); *Probleme der Lebensweisheit* (1887).

MEYER, Konrad Ferdinand (1825–98). A Swiss poet and historical novelist. He was born in Zurich, the son of the historian and official F. Meyer, spent a part of his youth in the French cantons, where he learned the language. He studied law in Zurich and then devoted some years to the private study of history. After visiting Paris in 1857 and Rome in 1858, he settled permanently in Kilchberg, near Zurich. The little volume of 20 historical *Balladen* (Leipzig, 1864), by which he first attracted attention, is halting in expression, as are the verses of *Romanzen und Bilder* (Leipzig, 1870). More plasticity appears in *Huttens letzte Tage* (Leipzig, 1871; 50th ed., 1911) and in *Engelberg* (ib., 1873), both narrative poems of power. Meyer then turned his attention from verse to prose, still remaining faithful to historical themes, and produced six striking epic narratives, which, though they require in the reader too wide a culture to be popular, are an endur-

ing part of German novelistic literature. These are: *Jürg Jenatsch* (1876; 117th ed., 1912); *Der Heilige* (1880; 63d ed., 1912); *Leiden eines Knaben* (1883); *Die Hochzeit des Mönchs* (1884); *Die Versuchung des Pescara* (1887; 43d ed., 1912); *Angela Borgia* (1891). Meantime he had written a remarkable group of historical short stories, first collected as *Kleine Novellen* (1883) and later as *Novellen* (50th ed., 1912). Characteristic and perhaps best of these is *Gustav Adolfs Page*. His early poems are incorporated, with many changes, almost always for the better, in *Gedichte* (1882; 59th ed., 1912). Meyer's literary characteristics, which combine to make him the most important imaginative writer in Switzerland in his generation, are truthfulness of observation, a realistic plasticity in description, clearness of style, objectivity in statement. A uniform edition of Meyer's works appeared in 1892; his collected works in eight volumes (Leipzig, 1912). For his biography, consult Trog (Basel, 1897) and Frey (Stuttgart, 1900; 2d ed., 1909); also Moser, *Wandlungen der Gedichte K. F. Meyers* (Leipzig, 1900); Kraeger, *K. F. Meyer, Quellen und Wandlungen seiner Gedichte* (Berlin, 1901); A. Stern, *Studien zur Litteratur der Gegenwart*, vol. ii (Dresden, 1904); H. Stichelberger, *Die Kunstmittel in Meyers Novellen* (Burgdorf, 1907); M. L. Taylor, *A Study of the Technique of C. F. Meyer's Novellen* (Chicago, 1909); E. Korrodi, *Conrad F. Meyer* (Leipzig, 1911).

MEYER, Kuno (1858–1919). A German scholar, distinguished in the field of Celtic literature, born at Hamburg and educated in the schools of that city and at the University of Leipzig. At first devoting himself to Germanic and Celtic philology, he eventually made Celtic philology the centre of his studies. An appointment (1884) as lecturer in Teutonic languages at University College, Liverpool, was followed by an appointment as professor in the same institution 10 years later, and in 1911 he accepted the chair of Celtic at Berlin. He founded the *Zeitschrift für celtische Philologie* in 1895, and, with Whitley Stokes, the *Archiv für celtische Lexicographie* three years later. In 1903, with John Strachan, he founded the Summer School of Irish Learning, Dublin, the purpose of which was the promotion of the study of the old Irish language and literature. His scholarly enthusiasm was an inspiration to the leaders of the Gaelic League, which sought to make Irish the spoken language of Ireland, and a help to the translators and poets of the Irish literary revival of the 1890's. His contributions to Celtic scholarship have been important and original. The Irish recognized his services to them by making him an honorary freeman and burgess of the cities of Dublin and Cork, but Dublin withdrew the freedom of the city in 1915 because of several pro-German war-time addresses made by Meyer in the United States. An invitation to lecture at Harvard in the same year he first accepted and later declined, incensed at what he considered the unneutral attitude of the university. Honorary degrees (D.Litt.) came to him from the University of Wales, from Oxford, and from St. Andrews. Among his publications are: *The Irish Odyssey* (1885); *The Vision of MacConglinne* (1892); *The Voyage of Bran* (1894), with A. Nutt; *King and Hermit* (1901); *Early Relations of the Brython and Gael* (1896); *Selections from Ancient Irish Poetry* (1911); *Sanas Cormaic, an Old Irish Glossary* (1912); *Learning in Ireland in the Fifth Century* (1913); *Ueber die älteste irische Dichtung* (1914). In 1912 a volume of *Miscellany* was presented to him by pupils and friends in honor of his election to the chair of Celtic at the University of Berlin.

MEYER, Leo (1830–1910). A German philologist, born at Bledeln, near Hanover, and educated at Göttingen and Berlin. From 1862 to 1865 he was professor in Göttingen, and in 1865 he became professor of comparative philology at Dorpat. In 1889 he again accepted a chair at Göttingen. His contributions to philological literature, works of great merit, include: *Vergleichende Grammatik der griechischen und lateinischen Sprache* (1861–65); *Die gothische Sprache* (1869); *Handbuch der griechischen Etymologie* (1901). He also wrote *Glauben und Wissen* (1876) and *Ueber das Leben nach dem Tode* (1882).

MEYER, Lothar Julius (1830–95). A German chemist, born in Varel, Oldenburg. He studied medicine in Zurich and Würzburg and chemistry and physics at Heidelberg, where, in 1857, he made the discovery that the taking up of oxygen by the blood takes place through the chemical affinity between oxygen and the coloring matter of the blood. This view, published in *Die Gase des Blutes* (1857), was supplemented by the study *De Sanguine Oxydo Carbonico Infecto* (1858). In 1859 he became professor at Breslau, in 1866 at Eberswalde, and in 1868 at Karlsruhe, whence in 1876 he went to Tübingen. Meyer also wrote: *Die modernen Theorien der Chemie* (1864; 6th ed., partially, 1896); *Die Atomgewichte der Elemente* (1883), with Seubert; *Grundzüge der theoretischen Chemie* (3d ed., 1902). But he is best known as one of the discoverers of the Periodic Law (q.v.), for which achievement he received the Davy medal of the Royal Society in 1882.

MEYER, mā'yâr', Paul (1840–). A French philologist, born in Paris on Jan. 17, 1840. He studied at the Ecole des Chartes; served in the manuscript department at the Bibliothèque Nationale (1863–65); and was keeper of the national archives from 1866 to 1872. In 1865 he founded the *Revue Critique*, of which he was joint editor until 1872, when, with Gaston Paris, he established *Romania*. Meyer became secretary of the Ecole des Chartes in 1872, was professor of the languages and literatures of southern Europe in the Collège de France from 1876 until 1906, and from 1882 was director of the Ecole des Chartes. He was elected to the Institute in 1883. His researches into the literature of the Middle Ages, which began with a study of that of Provence and was very comprehensive, involved laborious investigations in many libraries, particularly those of France and England. His works include: *Recherches sur les auteurs de la chanson de la croisade albigeoise* (1865); *Recherches sur l'épopée française* (1867); *Les derniers troubadours de la Provence* (1871; 2d ed., 1901); *Mémoire sur l'étude des dialectes de la langue d'oc au moyen âge* (1874); *Recueil d'anciens textes bas-latins, provençaux et français* (1874–77); *Alexandre le Grand dans la littérature française du moyen âge* (2 vols., 1886); *Nicole de Bozon* (1889); *Guillaume le Maréchal* (3 vols., 1891–1901); *L'Escoufle: roman d'aventure* (1894), with Michelaut; *Guillaume de la Barre: roman d'aventures par Arnaut Vidal de Castelnaudari* (1895); *Histoire des relations de la*

France avec Venise (1896); *L'Apocalypse en français au XIIIe siècle* (1901); *Pour la simplification de notre orthographe*, containing also the report of the commission on the simplification of French orthography (Paris, 1905); *Documents linguistiques du midi de la France* (1909), an important and extensive work. On account of ill health he resigned the editorship of *Romania*.

MEYER, mī'ẽr, VICTOR (1848–97). A German chemist, born in Berlin. He studied in Berlin and (under Bunsen) at Heidelberg and was appointed professor in the Stuttgart Polytechnikum in 1871 and in 1872 professor of chemistry and director of the chemical laboratory in the Polytechnic Institute of Zurich. In 1885 he became professor at Göttingen, and in 1889 he was called, as Bunsen's successor, to Heidelberg. He carried out a number of investigations in organic chemistry, among the results of which may be mentioned his discovery of thiophene and its derivatives. He also made important contributions to organic stereochemistry. But he is perhaps best known among chemists as the inventor of a practical method of determining the molecular weights of vaporizable substances—a method which is in almost constant use in chemical laboratories. (See MOLECULES—MOLECULAR WEIGHTS.) In addition to numerous contributions to the reports of the German Chemical Society he wrote: *Gutachten betreffend den Verkehr mit Petroleum und anderen feuergefährlichen Flüssigkeiten* (1879); *Probleme der Atomistik* (1896); and, jointly with Jacobson, a brilliant treatise on organic chemistry (vol. i, 1893). The treatise was completed after Victor Meyer's death.

MEYERBEER, mī'ẽr-bâr, GIACOMO (1791–1864). A famous German composer. He was born at Berlin, of wealthy Jewish parents, and gave early promise of musical talent, which his parents encouraged. Lauska, considered the best teacher in Berlin, superintended his studies, while Clementi took a special interest in his progress and instruction. He made his first public appearance as a boy of nine. In 1806 he became a student under Vogler and entered the latter's academy in Darmstadt, where he formed a friendship with Weber, which proved to be lifelong. Meyerbeer's earliest compositions gave little indication of the success he afterward achieved, and in style were largely ecclesiastical. An opera, *Jephthah's Vow*, dating from this period, is singularly dull and heavy. *Abimelek* (1813) was a comic opera which met with a more favorable reception than any of his previous efforts, and was especially fateful in that it took its composer to Vienna, where he first heard Hummel, whose virtuosity on the piano so impressed him that he postponed all his plans and went into retirement with the object of perfecting his own style. After a brief stay in Paris he went to Venice (1815) and attempted to duplicate Rossini's success with a series of operas in the Italian vein: *Romilda e Costanza* (1815); *Semiramide riconosciuta* (1819); *Emma di Resburgo* (1819); *Margherita d' Angiù* (1820); *L' esule di Granata* (1822); *Il crociato in Egitto* (1824), which latter made a tremendous success. In none of these operas is there the faintest trace of his German training. An attempt to win German favor with the last-named opera proved a failure, as did a similar attempt in Paris. From 1826 to 1831 little was heard of him publicly, but apparently the time was not wasted. According to Mendel he was devoting himself to the study of the French style, and particularly French opera. His father's death and the subsequent death of two of his children weighed upon him, for he was a man of strong family attachments. He resolved to expatriate himself from Germany and at the same time to desert the Italian for the French style of composition. *Robert le Diable* (1831) and *Les Huguenots* (1836) were the first fruits of his French studies—operas so intimately descriptive of French history and customs as to appeal irresistibly to the French public. Their success was immediate, so much so that, despite the determined opposition of the German classicists, *Robert le Diable*, *Les Huguenots*, *Le Prophète*, and *Dinorah* were all successfully given in Germany. His success in both France and Germany caused the Prussian government to invite him to Berlin, where, in 1842, he was made Royal Music Director. Although not a great orchestral leader, he nevertheless accomplished important results during his stay in Berlin. *Das Feldlager in Schlesien* belongs to this period and had moderate success, as did *Struensee*, a scarcely known work. In 1849 he returned to Paris, where *Le Prophète* was performed with remarkable success. His last opera, *L'Africaine*, on which he had worked on and off for over 30 years, was finished only shortly before his death, which occurred at Paris, May 2, 1864. It was first produced at the Grand Opéra in 1865. Besides these operas he wrote an oratorio, *Gott und die Natur* (1811), a number of cantatas, and some instrumental music. Meyerbeer's importance rests entirely upon his operas. For many years after the composer's death *Robert*, *Les Huguenots*, *Le Prophète*, and *L'Africaine* maintained their popularity, but even before the end of the last century there were unmistakable signs that even these four were rapidly declining. It is not a mere coincidence that in direct proportion as Wagner gained ground Meyerbeer lost it. Throughout his life Meyerbeer strove for only one object—success. He won it by carefully studying the public taste of his time and sacrificing art to the prevailing fashion. It cannot be denied that he was a musician of eminent gifts and a master of technic and form, but he lacked noble ideals and strong artistic convictions. Even a superficial study of Meyerbeer's orchestration must convince the student that it was not the dramatic situation so much as the effect upon the audience that far too often determined the choice of instruments. Hence his frequent juxtaposition of violent dynamic contrasts without inner necessity. His melodies almost always lack distinction and not infrequently sink to the level of the trivial. As an artist Meyerbeer is the direct counterpart of Wagner, and one can accept only the one or the other. Consult: H. Blaze de Bury, *Meyerbeer, sa vie, ses œuvres, et son temps* (Paris, 1865); A. Kohut, *Meyerbeer* (Leipzig, 1890); H. de Curzon, *Meyerbeer: biographie critique* (Paris, 1910); H. Eymieu, *L'Œuvre de Meyerbeer* (ib., 1910); A. Hervey, *Meyerbeer* (London, 1913).

MEYERHEIM, mī'ẽr-hīm, FRIEDRICH EDUARD (1808–79). A German genre painter. He was born at Danzig, and studied under his father, and at the Berlin Academy, under Schadow. He was the first to introduce rustic genre scenes into Germany. His subjects are usually good-humored, idyllic, and somewhat sentimental inter-

pretations of the lives of the peasants of the Harz Mountains, Thuringia, and north Germany, and are smoothly and clearly painted. He became a member of the Berlin Academy in 1838 and professor in 1850. Among his works are: "Altenburgers in the Field" (1838); "The King of the Shooting Match" (1836), "Tid-Bit" (1852), both in the National Gallery, Berlin; "Domestic Happiness" (1847), "Going to Church," and "Good Morning, Dear Father!" (1858), all in the Ravené Gallery, Berlin.

MEYERHEIM, Paul (1842–1915). A German painter, born in Berlin, son and pupil of Friedrich Eduard Meyerheim. He also studied at the Berlin Academy, and traveled and studied in Germany, the Tirol, the Netherlands, and Paris. His later travels were extensive. Although he won distinction in genre, landscape, and portraiture, and as a decorative artist, his fame rests chiefly on his masterly and usually humorous rendering of the animal world. His management of light and shade is admirable, and an idea of his versatility may be gained from the following list of works: "An Amsterdam Antiquary" (1869), "Menagerie" (1885), both in the National Gallery, Berlin, the staircase of which he adorned with a charming frieze in fresco, allegorizing "The Four Seasons" (1883) in the life of birds; "The Life-Course of a Locomotive" (1878), in the Villa Borsig, Berlin; "Sheep-Shearing" (1872); "The Young Lions"; "The Card Sharpers" (monkeys, 1882); "Monkeys in a Studio," and, out of many fine landscapes, a "Charcoal Pit in the Bavarian Alps" (1887, Hamburg Gallery) and "Burning Windmill" (1903). Of numerous excellent portraits those of his father and of Daniel Chodowiecki (1887), both in the Museum at Danzig, are representative examples. He received great gold medals at Berlin (1872) and Munich (1888), and gold medals at Paris, Philadelphia, and Chicago. Consult Meissner, in the *Art Journal* (London, 1895).

MEYER-HELMUND, mī'ĕr-hĕl'mụnt, Erik (1861–). A Russian-German composer, born in St. Petersburg. He received the rudiments of musical instruction from his father and afterward went to Berlin, where he studied under Kiel and Stockhausen. He became famous in Germany as a song composer, and for many of his songs he himself wrote the words. All his music is marked by strong local color and a distinct individuality. His larger works include the operas *Margitta* (1889); *Die beiden Klingsberg, Der Liebeskampf* (1893); *Heine's Traumbilder* (1908); and the ballet music *Der Berggeist* (1893), followed one year later by the burlesque opera *Trischka.*

MEYER-LÜBKE, lụp'ke, Wilhelm (1861–). A Romance philologist, born at Dübendorf in the Canton of Zurich, Switzerland. From 1879 to 1883 he studied at Zurich and Berlin, coming under the influence of Adolf Tobler (q.v.). In 1887 he became professor extraordinary at Jena, and in 1890 was made full professor of Romance philology at Vienna. In 1906–07 he was rector of the university. His works include *Die Schicksale des lateinischen Neutrums im Romanischen* (1883) and the *Grammatik der romanischen Sprachen* (4 vols., 1890–1902), translated as *Grammaire des langues romaines* (4 vols., 1890–1905). This is the most important grammar of the Romance languages since that of Diez. Other books are the *Italienische Grammatik* (1891), the *Einführung in das Studium der romanischen Sprachwissenschaft* (1901; 2d ed., 1909), of which a good Spanish translation, revised by the author, was made by Castro, under the title *Introducción al estudio de la linguistica romance* (Madrid, 1914); *Romanische Namenstudien* (1905); *Die Ziele der romanischen Sprachwissenschaft* (1906); *Historische Grammatik der französischen Sprache* (1908; 3d ed., 1913); *Romanisches etymologisches Wörterbuch* (1911 et seq.); *Prinzipienfragen der romanischen Sprachwissenschaft* (1910); and numerous articles in the *Zeitschrift für romanischen Philologie.*

MEY'ERSDALE. A borough in Somerset Co., Pa., on Casselman River, 113 miles by rail southeast of Pittsburgh, on the Baltimore and Ohio and the Western Maryland railroads (Map: Pennsylvania, C 8). Its chief industry is the mining of coal, and there are brickkilns, shirt, washing-machine, and maple-sugar factories, planing mills, machine works, cigar factories, etc. Meyersdale was first settled as early as 1776, but the growth of the town dates from the advent of the first railroad in 1871. Coal mining was begun in the following year. Pop., 1900, 3024; 1910, 3741.

MEYNELL, mĕn'nĕl, Alice (Christiana) (c.1853–1922). An English poet and essayist, born in London, a daughter of Thomas J. Thompson, an intimate friend of Charles Dickens. With her elder sister, Elizabeth (Lady Butler, well known for "The Roll Call" and other military paintings), she was educated by her father. The Thompsons lived much abroad, especially in Italy. While a girl, Miss Thompson went over to the Church of Rome and was followed by other members of the family. In 1877 she married Wilfrid Meynell (q.v.). Her first poems, *Preludes* (1875; new ed., 1893), were warmly praised by Ruskin, Rossetti, and Browning. In 1901 she collected in a volume called *Later Poems* a group of short lyrics. Soon after her marriage, Mrs. Meynell began to contribute to the London periodicals, gaining wide recognition for her graceful and delicate style. She published several delightful volumes of essays, as *The Rhythm of Life* (1893); *The Colour of Life* (1896); *The Spirit of Place* (1898). Among her other publications are: *The Flower of the Mind* (1897), an anthology of English poetry; *John Ruskin* (1900); *Ceres Runaway* (1910); *Mary, Mother of Jesus* (1912); *Collected Poems* (1913); *Essays* (1914). Consult William Archer's chapter on her in his *Poets of the Younger Generation* (New York, 1902).

MEYNELL, Wilfrid (1852–). An English author and journalist of Yorkshire descent, educated privately at York. He was for many years a journalist and was long editor of the *Weekly Register.* To reviews and periodicals, notably to the *Contemporary Review,* the *Athenæum,* and the *Saturday Review,* he was a frequent contributor. In 1877 he married Alice Thompson. (See Meynell, Alice.) His writings include: *Journals and Journalism* by "John Oldcastle" (2d ed., 1880); *Benjamin Disraeli: An Unconventional Biography* (2 vols., 1903); *Collected Poems* (1913); *Johnson* (1913). He edited *Selections from Newman* (1907) and the *Works of Francis Thompson* (3 vols., 1913), and wrote a biographical sketch of Thompson for the fifth edition of the latter's *Selected Poems* (1909).

MEYNERT, mī'nĕrt, Theodor (1833–92). An Austrian neurologist, born at Dresden. He

was educated at the University of Vienna; in 1865 was appointed lecturer on anatomy at the university; in 1866 was prosector in the Vienna insane asylum; and in 1870 professor of psychiatry. He was a member of the Vienna Academy of Sciences. A member of the staff of the *Psychiatrisches Centralblatt* in 1871–78, he also published several volumes, including *Zur Mechanik des Gehirnbaues* (1874), *Psychiatrie: Klinik der Erkrankungen des Vorderhirns, etc.* (1884), and *Klinische Vorlesungen über Psychiatrie* (1890).

MEYR, mīr, MELCHIOR (1810–71). A German poet and novelist, born at Ehringen, near Nördlingen. He was educated at Munich and Heidelberg. His most important works are: *Erzählungen aus dem Ries* (4th ed., 1892), his best work; his *Gedichte* (1857); the long political novel *Vier Deutsche* (1861); the tragedies *Karl der Kühne* (1862) and *Herzog Albrecht* (1862); and the anonymous and extremely clever *Gespräche mit einem Grobian* (1866). He also wrote the philosophical *Religion des Geistes* (1871). Consult Bothmer and Carriere, *Melchior Meyr: Biographie, Briefe und Gedichte* (Leipzig, 1874).

MEYRICK, mĕr'rĭk, FREDERICK (1827–1905). A Church of England scholar. He was born at Ramsbury vicarage, Wiltshire; was educated at Trinity College, Oxford, of which he was scholar, fellow, and tutor; and held the university offices of select preacher and public examiner. In 1856 he was appointed one of the Queen's Whitehall preachers, in 1859 inspector of schools, and from 1868 to his death was rector of Blickling, Norfolk, and from 1869 nonresidentiary canon of Lincoln. He was the chief agent in establishing the Anglo-Continental society for making known the principles of the English church in foreign countries, and wrote much for that purpose. He traveled widely on the Continent, and in 1886–87 was principal of Coddington College, Barbados. He was the author of *The Moral and Devotional Theology of the Church of Rome, According to the Authoritative Teaching of S. Alphonso de' Liguori* (1856); *The Outcasts and Poor of London* (1858); *On Dr. Newman's Rejection of Liguori's Doctrine of Equivocation* (1864); *Is Dogma a Necessity?* (1883); *The Doctrine of the Church of England in the Holy Communion* (1883; 4th ed., 1889); *The History of the Church of Spain* (1892); *Justin Martyr* (1896); *Scriptural and Catholic Truth and Worship* (1901; 2d ed., 1908); *Appeal to the Primitive Centuries* (1904); *Appeal to the Sixteenth and Seventeenth Centuries* (1905).

MEYRICK, SIR SAMUEL RUSH (1783–1848). An English antiquary. He graduated from Oxford University as B.A. in 1804, took several later degrees, and practiced law in the ecclesiastical and admiralty courts. He possessed a very fine collection of armor, and his *Critical Inquiry into Ancient Armour* (splendidly illustrated, 3 vols., 1824; 2d ed., 1844) is still considered authoritative. He assisted Rev. T. D. Fosbrooke in 1823–25 in the publication of the *Encyclopædia of Antiquities.* In 1826 he arranged the arms and armor in the Tower of London, and in 1828 performed the same service at Windsor Castle. During his administration of the office of high sheriff of Herefordshire in 1834 he revived some of the old ceremonial display, including javelin men in full accoutrement. He published also *History and Antiquities of the County of Cardigan* (1810; reprinted, 1907) and an edition of Lewis Dunn's *Heraldic Visitations of Wales* (2 vols., 1846).

MEYWAR. See UDAIPUR.

MEZEN, mā-zĕn'y', or **MESEN.** A river of north Russia. It rises near the north boundary of the Government of Vologda and flows northwest through the Government of Archangel, entering the White Sea at the Gulf of Mezen after a course of about 510 miles (Map: Russia, G 1). It is navigable in its lower part, but is free from ice only about six months in the year.

MÉZERAY, mâz'rā', FRANÇOIS EUDES DE (1610–83). A French historian and man of letters. He was born at Ruy, near Argenton, in the Department of Indre, studied at Caen, and after some military service in Flanders came to Paris and set to writing history. Richelieu patronized him and put him into the Academy. His *Histoire de France* (1643–51) brought him fame and is still of considerable value. During the Fronde he was an active pamphleteer against Cardinal Mazarin.

MEZE'REON (Fr. *mézéréon*, Sp. *mezeron*, from Ar. *mēzariyim*, camellia). The bark of *Daphne mezereum, Daphne gnidum,* and *Daphne laureola* of the family Thymelæaceæ, three shrubs from 2 to 4 feet high. *Daphne mezereum* has rose-red or purple, fragrant flowers, in small clusters, preceding the deciduous leaves. It is indigenous to hilly and mountainous regions of Europe, extending to the Arctic circle and eastward to Siberia, and is cultivated in the United States and established in some localities. The other two species grow in southern Europe. *Daphne laureola,* spurge laurel, has large evergreen leaves and yellowish-green flowers in axillary clusters. *Daphne gnidum,* spurge flax, has narrow, deciduous leaves and small white flowers in terminal racemes. Formerly the bark was extensively employed in medicine. The dried bark is inodorous, but has a persistently acrid and burning taste. The bark of *Daphne gnidum* is darker and that of *Daphne laureola* is more gray and has a greenish cast. They resemble mezereon in acridity. The root bark of the three species is the strongest, but the stem bark is the more common. It is used as an adjunct to sarsaparilla in making the compound decoction and the compound extract of that drug. The juice of the fresh bark is irritant and is said to blister the skin. See DAPHNE.

ME'ZES, SIDNEY EDWARD (1863–). An American college president. He was born at Belomont, Cal., and was educated at the University of California (S.B., 1884) and at Harvard University (A.B., 1890; A.M., 1891; Ph.D., 1893). He was adjunct professor of philosophy (1894–97), associate professor (1897–1900), professor (1900–08), dean (1902–08), and president (1908–14) at the University of Texas. In 1914 he became president of the College of the City of New York. He received the honorary degree of LL.D. from Southwestern University in 1912 and from the University of California in 1913. He is coauthor of *The Conception of God* (1897) and author of *Ethics, Descriptive and Explanatory* (1901) and articles in reviews on education, ethics, and philosophy.

MEZHIRETCHIE, mĕ'zhĕ-rĕ'chyĕ. A town in the Government of Siedlce, Russian Poland, about 80 miles from Siedlce. It has several educational institutions, manufactures leather, brass articles, etc., and had a population in 1910 of over 14,000, largely Jews.

MÉZIÈRES, mā′zyâr′. The capital of the Department of Ardennes, France, at the confluence of the Meuse and Vence, 55 miles northeast of Rheims (Map: France, N., K 3). It is situated in a bend of the river, with the towns of Charleville, Arches, Pierre, and Mohon immediately about it. The sixteenth-century parish church was the scene of the marriage of Charles IX to Elizabeth of Austria in 1570. The town manufactures ammunition and has iron and copper foundries, but most of its iron industry has been transferred to Charleville, with which it is connected by a suspension bridge. It also manufactures dyes. In 1521 the Chevalier Bayard, with 2000 men, successfully defended the place against 40,000 Spaniards under Charles V. In 1815 the town held out for six weeks against the allies, who besieged it after the battle of Waterloo. In the Franco-German War of 1870–71 Mézières capitulated after a cannonade of two days. Its fortifications were razed in 1886. Mézières was the scene of extremely heavy fighting between the Germans and the allies during the European War which broke out in 1914. See WAR IN EUROPE. Pop. (commune), 1901, 7884; 1911, 10,403.

MÉZIÈRES, ALFRED JEAN FRANÇOIS (1826–1915). A French literary critic, born at Rehon (Moselle). Educated at the lyceum at Metz and the French school at Athens, he participated in the revolution of 1848 as captain. After 1885 he was president of the journalistic association of Paris. He became professor of foreign literature at Toulouse (1853), Nancy (1854), and Paris (Sorbonne, 1863); was admitted to the Academy in 1874; and was elected deputy (1881) and Senator (1900). His publications are mainly literary studies. Among them are: *Mémoire sur le Pélion et l'Ossa* (1853); *Shakespeare, ses œuvres et ses critiques* (1861); *Prédécesseurs et contemporains de Shakespeare* (1863); *Contemporains et successeurs de Shakespeare* (1864); *Dante et l'Italie nouvelle* (1865); *Pétrarque* (1867), crowned by the Academy in 1868; *Goethe, les œuvres expliquées par la vie* (1872–73). His *En France* (1883), *Hors de France* (1883), *Mirabeau* (1891), are of political stamp. Later works include: *Pétrarque* (1895), crowned by the Academy; *Morts et vivants* (1897); *Au temps passé* (1906); *Silhouettes de soldats* (1907); *Hommes et femmes d'hier et d'avant hier* (1907); *De tout un peu* (1909); *Pages d'automne* (1911); *Ultima verba* (1914). The *Revue des Deux Mondes* and the *Temps* published many of Mézières' articles.

MÉZIÈRES, MARIE JEANNE LABORAS DE. A French novelist. See RICCOBONI, MARIE J. L. DE.

MÉZIÈRES, PHILIPPE DE (1327–1405). "The old pilgrim," as he called himself, was born at Mézières in Picardy, the youngest of 12 children. He was educated at Amiens. When about 18 years old he took part in the war in Lombardy, and after that, for a time was in the service of Andrew, King of Naples. In 1346 he took the cross and fought at Smyrna, after which he received the honor of knighthood. All the rest of his life was devoted to the cause of the crusades against the Mohammedans. In 1347 he made a pilgrimage to Jerusalem. On his return he stopped at Cyprus and entered the service of Peter of Lusignan. After the latter became King of Cyprus Philippe was his chancellor and accompanied him on his travels in Europe to kindle zeal for a crusade, and on his expedition against Alexandria. After the capture of this city in 1365 one-third of it was given to Philippe as a foundation for the Knights of the Passion of Jesus Christ, an order which he planned. The city was soon lost and the order was never founded, although it was the lifelong desire of Philippe, who dreamed of a knighthood of 100,000 men devoted to the service of the Holy Land. The members were to take most of the monastic vows, but were to marry in order to have sons to continue their work. After the death of Peter, Philippe returned to the west and in 1372 induced the Pope to adopt for the West the Festival of the Presentation of the Virgin, for which he translated the Greek office. In 1373 he went to Paris and became a councilor of Charles V, from whom he received a pension, and a little later became the preceptor of the Dauphin. In 1380, after the death of Charles V, he retired to the convent of the Célestines at Paris, and thereafter devoted himself to writing in favor of a new crusade. He was one of the most original thinkers of the fourteenth century and his writings are important for the history of France. A full list of them and a lengthy analysis of each are given by Jorga. Among them may be noted a life of his friend and colaborer, Peter Thomas, and the *Songe du vieil pèlerin*, which is a project for a new crusade. He labored by his writings to bring about peace between France and England, in order to make the conditions more favorable for a crusade. He died in the convent on May 29, 1405. Consult: article by Jorga on the letters of Philippe, in *Revue Historique* (Paris, 1892); Nicolas Jorga, *Philippe de Mézières et la croisade au XIVe siècle* (ib., 1896)—this study supersedes all previous works and renders it unnecessary to quote any of the numerous books which had been written about Philippe; Auguste Molinier, *Les sources de l'histoire de France*, vol. iv (ib., 1904); Louis Bréhier, *L'Eglise et l'Orient au moyen âge* (ib., 1907).

MÉZIRIAC, mā′zē′rē′āk′, SIEUR DE. See BACHET, C. G.

MEZÖTÚR, mĕ′zē-tōōr. A town in the County of Jasz-Nagykun-Szolnok, Hungary, situated on an affluent of the Körös, 80 miles east-southeast of Budapest (Map: Hungary, G 3). It has a Gymnasium and trades in cereals, wine, horses, and cattle. It has large pottery factories. Pop., 1900, 25,383; 1910, 25,835, mostly Magyars.

MEZ'ZANINE (Fr. *mezzanine*, It. *mezzanino*, from *mezzano*, middle, from *mezzo*, middle, half). An intermediate subordinate story between two main stories; especially, in its strictest sense, such a story interpolated into the upper part of a lofty main story. An intermediate story thus introduced between the ground story and the *premier étage* is called in French the *entresol*. In many European palaces and public buildings accommodations for servants and lodgers have been provided by mezzanines which formed no part of the original design.

MEZZO, mĕd′zō (It., middle). A term generally used in music in conjunction with some other word, as mezzo forte, moderately loud; mezzo piano, rather soft; mezza voce, with a moderate strength of tone; mezzo orchestra, with half the orchestra; etc. When written alone and applied to the grand pianoforte it indicates that the soft pedal is to be used. Mezzo-soprano

means a voice lying halfway between the high soprano and contralto.

MEZZOFANTI, mĕd'zō-fän'tē, GIUSEPPE (1774–1849). An Italian linguist and a cardinal in the Church of Rome. He was born in Bologna, was educated there, and became a priest in 1797 and, in the same year, professor of Hebrew at the university. When the Cisalpine Republic was established he refused to take the oath of allegiance and lost his chair, but was reinstated in 1803 and became university librarian in 1815. In 1831 he went to Rome, where he was appointed librarian of the Vatican and secretary of the College of the Propaganda (1833), and in 1838 was raised to the rank of Cardinal. He acquired a European reputation by his linguistic attainments, and at the time of his death was credited with knowing at least 58 languages. Consult Russell's *Life of Cardinal Mezzofanti* (London, 1858) and the biographies by Manavit (Paris, 1853), Bellesheim (Würzburg, 1880), and Mitterrutzner (Brixen, 1885).

MEZZOTINT, mĕd'zō-tĭnt *or* mĕz'ō- (It. *mezzotinto,* half colored). A method of engraving on a copper or steel plate, which is prepared by making on it a ground with an instrument called a cradle or rocker. This instrument is a flat plate of hardened steel, of which one side is brought to a segment of a circle with a sharp cutting edge, the bevel of which, engraved with fine parallel lines, resembles a file, and the edge itself is brought to a ridge of very fine points. This has to be rocked across the plate many times, in various directions, until the whole surface is reduced to a close-set mass of small teeth or points. The plate thus pricked offers a uniformly roughened surface, upon which the engraver begins his proper work. Now, this prepared plate, if inked and printed from, would yield an entirely black impression; so it is the business of the engraver to work from dark to light, or from black to white. This he does with various instruments, such as the scraper, employed to diminish the burr and such asperity of surface as tends to retain too much ink, and the burnisher, to remove all surface roughness when the highest light or pure white is required in the picture he is producing.

Mezzotint is admirably adapted to the reproduction of those works in which broad effects of light and shade are dominant, as opposed to those where close line, contour, and small detail are demanded. Mezzotint has another limitation—its failure to bear much printing. The burr is soon destroyed in the copper plates, and, although steel is more enduring, mezzotint on this medium is still far behind line engraving in reproductive possibilities. From 25 to 30 impressions of the first class are all that may be drawn from copper plates. The original inventor or discoverer of mezzotint engraving was Louis von Siegen, a lieutenant colonel in the service of the Landgrave of Hesse-Cassel, and his first published work was a portrait of the Princess Amelia Elizabeth of Hesse, dated 1642, 15 years anterior to the earliest date on the plates of Prince Rupert, to whom a charming legend ascribes the invention of the art.

The art is peculiarly identified with eighteenth-century Britain, among the greatest mezzotint engravers being James McArdell (died 1765), James Watson, J. Raphael Smith, and Valentine Green. In their work were mirrored the achievements of a national school of portraiture. The process served also for genre and sporting scenes, and later on for David Lucas's reproduction of Constable's landscapes and Turner's famous *Liber Studiorum.* In the United States the mezzotint style was a favorite with magazine publishers in the early days of magazines, being introduced from England by John Sartain (q.v.) in 1830. In recent years Arlent Edwards and others have reproduced paintings in mezzotints printed in color. Consult: P. G. Hamerton, *The Graphic Arts* (London, 1882); J. C. Smith, *British Mezzotint Portraits* (4 vols., ib., 1883); Hubert von Herkomer, *Etching and Mezzotint Engraving* (ib., 1892); A. Whitman, *Masters of Mezzotint* (ib., 1898); C. J. H. Davenport, *Mezzotints* (ib., 1904); Julius Leisching, *Schabkunst: ihre Technik und Geschichte in ihre Hauptwerken von XVII. zum XX. Jahrhundert* (Vienna, 1913). See ENGRAVING.

MHOW, mou. A city and important British military station in the State of Indore, Central India Agency, 13 miles southwest of the town of Indore, near the Vindhya Mountains, on an eminence on the Gumber River 1800 feet above the sea (Map: India, C 4). On the southeast are the cantonments, arranged like a European town, having a spacious lecture room, a well-furnished library, three schools, and a theatre. They are occupied under the Mandsaur Treaty of 1818 by a considerable force of British and native troops. Pop., 1901, 36,039; 1911, 29,820.

MIAGAO, mē'ä-gä'ō. A town of Panay, Philippines, in the Province of Iloilo (Map: Philippine Islands, D 5). It is situated on the south coast of the island, 22 miles west of Iloilo. Pop., 1903, 20,656.

MIAKO, mē-ä'kō. A city of Japan. See KYOTO.

MIALL, mī'ąl, EDWARD (1809–81). An advocate of English church disestablishment. He was born in Portsmouth, England; studied at Wymondley Theological Institute, Hertfordshire; entered the Congregational ministry, and was installed pastor at Ware in 1831 and at Leicester in 1834. Becoming an active advocate of the disestablishment of the Church of England, he removed to London and established the *Nonconformist* newspaper as the organ of that policy in 1841. He represented Rochdale (1852–67) and Bradford (1869–74) in Parliament. He favored universal suffrage and opposed class legislation and compulsory religious education. He led in the establishment, in 1844, of the British Anti-State Church Association, which afterward became the Society for the Liberation of Religion from State Patronage and Control. In 1856 he introduced in the House of Commons a resolution on the disestablishment of the Irish church. His motion for a committee on the disestablishment of the English church was introduced three times in 1871 and 1872 and lost. He was appointed in 1858 a member of the Royal Commission on Education as a representative of the Nonconformists. Among his principal publications are: *Views of the Voluntary Principle* (1845); *Ethics of Nonconformity* (1848); *The British Churches in Relation to the British People* (1849); *The Franchise as a Means of a People's Training* (1851); *Title Deeds of the Church of England to her Parochial Endowments* (1862); *Social Influences of the State Church* (1867). Of less polemical character is *An Editor off the Line, or Wayside Musings and Reminiscences* (1865). A *Life* of Miall was published by his son, Arthur Miall (London, 1884).

MIAMI, mī-ăm'ē. A town in Gila Co., Ariz.,

11 miles by rail from Globe, on the Arizona Eastern Railroad. It is in a rich copper district, the mining of which constitutes the town's sole industry. Water and electric power are derived from the Roosevelt Dam and Reservoir (see DAMS AND RESERVOIRS), which is 40 miles distant. Miami was incorporated in July, 1914. Pop., 1915 (local est.), 6500.

MIAMI, mī-ăm'ī. A city and the county seat of Dade Co., Fla., 366 miles south of Jacksonville, on the Florida East Coast Railway (Map: Florida, F 6). Trucking and fruit growing are the chief industries of the surrounding country, and large quantities of grapefruit, oranges, avocados, limes, and winter vegetables are shipped to northern markets. Miami on account of its remarkably equable climate is a popular winter resort, being situated on Biscayne Bay, one of the largest natural harbors on the east coast of Florida, and at the mouth of the Miami River, which is the eastern terminus of one of the large canals draining the Everglades. The winter homes of James Whitcomb Riley, William Jennings Bryan, and others of national prominence are situated here, and there are many hotels and boarding houses. Other noteworthy features are the courthouse and school buildings, a fine yacht club, and a bridge across the bay 2½ miles in length. Pop., 1900, 1681; 1910, 5471; local estimates place the population in 1915 as about three times that of 1910; 1920, 29,549.

MIAMI. A city and the county seat of Ottawa Co., Okla., 30 miles southwest of Joplin, Mo., on the St. Louis and San Francisco, the Missouri, Oklahoma, and Gulf, and the Oklahoma, Kansas, and Missouri Interurban railroads (Map: Oklahoma, G 2). Lead and zinc mining, lumbering, and the growing of cereals are the chief industries. The water works and electric-light plant are owned by the municipality. The commission form of government was adopted in 1909. Miami was the first town in the former Indian Territory to be built on land purchased and set apart for town purposes by the act of Congress. Pop., 1900, 1893; 1910, 2907.

MIAMI. An important Algonquian tribe residing, when first known to the French about 1660, in southeastern Wisconsin. They were somewhat superior to the northern tribes generally in their manner of living, and occupied a stockaded town with mat-covered houses. About the year 1690, in consequence of difficulties with the Illinois and Sioux, they removed to the southeast and established themselves on the site of what is now Chicago and upon the St. Joseph River of Michigan, whence they soon spread to the Wabash and Maumee and later to the Miami. Their principal band made headquarters at Kekionga, where Fort Wayne now stands, while others, settled lower down on the Wabash, developed later into two distinct tribes, known respectively as Wea and Piankishaw (q.v.). All three, however, continued until the end of the eighteenth century to regard themselves as one people, and first cousins of the Illinois, their western neighbors, whose language differed only dialectically from their own. In the Colonial wars the Miami sided alternately with either party, but joined Pontiac's alliance in 1764 and took sides against the Americans in the Revolution, continuing the struggle with the other tribes of the Ohio valley until their crushing defeat by General Wayne compelled them to make peace at the Greenville Treaty in 1795. The great chief, Little Turtle, who led the allied forces to victory against St. Clair and Harmar, was a Miami. Under Tecumseh they again joined the English side in the War of 1812. At its close, being now thoroughly broken, they began to sell their lands, and by 1827 had ceded almost the whole of their original territory and agreed to remove to Kansas. Here they rapidly died out from disease, famine, and dissipation, until about 1873 the remnant, only 150 in number, were placed upon the Quapaw reservation, in Oklahoma, where they number now 123. A considerable band had continued to occupy a reservation in Wabash Co., Ind., until 1872, when the land was divided and tribal relations dissolved. These now number about 90, practically all of mixed blood.

MIAMI, or GREAT MIAMI, RIVER. A river of western Ohio, formed by the confluence, in Logan County, of several small streams which rise in Auglaise and Hardin counties. It flows in a slightly southwesterly direction, joining the Ohio River at the Indiana State line (Map: Ohio, B 6). Its length is about 140 miles and its drainage area 5400 square miles, about two-thirds of its basin being within Ohio. Its more important tributaries are the Stillwater River and the Mad River, which join the main stream near Dayton, and the Whitewater, which comes in a few miles above its mouth. The sources of the river are at an elevation of about 1000 feet above sea level. The Miami and Erie Canal parallels the river from Hamilton to Piqua.

MIAMISBURG, mī-ăm'īz-bûrg. A village in Montgomery Co., Ohio, 46 miles north by east of Cincinnati, on the Great Miami River and the Miami and Erie Canal and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Ohio Electric, and the Cincinnati, Hamilton, and Dayton railroads (Map: Ohio, B 6). It is an important industrial centre, the manufactures being favored by good water power, and including paper mills, carriage and buggy works, steel furniture, safe and tobacco factories, wheel works, etc.; and is also an important market for tobacco, which is cultivated extensively in the adjacent region. There is a Carnegie library. The water works and electric-light plant are owned by the municipality. Just outside of the corporate limits is the largest Indian mound in the State. A large part of the village was inundated in March, 1913, by the overflow of the river. The property damage amounted to about $1,500,000. Pop., 1900, 3941; 1910, 4271.

MIAMI UNIVERSITY. A coeducational institution of learning at Oxford, Ohio, founded in 1809. The first school was opened in 1816 and the university proper began its work in 1824. It has a college of liberal arts and a normal college. A considerable freedom is allowed in the election of studies. In 1914–15 the faculty numbered 51 and the attendance was 651. The library contained 47,000 volumes. The institution was endowed in 1809 with one township of land in Ohio, and receives financial aid from the State, the endowment amounting to $104,000 and the income to about $213,000. The college campus occupies about 114 acres. The grounds, buildings, and equipment were valued in 1914 at $835,000. The president in 1915 was Raymond M. Hughes, A.M.

MIANA (mī-ā'nȧ) **BUG.** See MITE.

MIANTONOMO, mī-ăn'tō-nō'mō. A Narragansett sachem, who succeeded his uncle, Ca-

nonicus, in 1636. He was on friendly terms with the early settlers of Massachusetts and assisted them during the Pequot War of 1637. In 1643 he conducted an unsuccessful expedition against Uncas, the Mohegan sachem, his bitter rival, with whom, however, he had agreed in 1638 not to open hostilities without first appealing to the whites. Being captured, he was handed over by Uncas to the Commissioners of the United Colonies, and was tried by an ecclesiastical court organized for the purpose, which condemned him to death and commissioned Uncas to carry out the sentence. A brother of the latter soon afterward killed the unsuspecting captive on the spot now called Sachem's Plain (near Norwich, Conn.), where he had originally been captured. A monument erected there in 1841 commemorates the event.

MIAO-TSE, mē-ä′ō-tsĕ, or **MIAU-TSI,** also known as MÁNS-TIERA, MÁNS-COC, and MEO. The inhabitants of the mountainous regions of southern China, in parts of the provinces of Hupeh, Szechuan, Yunnan, Kweichow, Hunan, Kwanghsi, and Kwangtung. They number several millions and represent an aboriginal population of this portion of the Celestial Empire driven back in recent times by the Chinese. Many of the Miao-tse tribes are under Chinese rule, but some of them still maintain their independence. The Miao-tse are shorter in stature than the northern Chinese, and apparently not Mongoloid in form and features. Consult: Edkins, *The Miautsi Tribes* (Foochow, 1870); Henry, *Lingnam* (London, 1886); Bourne, *Journey in Southwest China* (ib., 1888); A. H. Keaw, *Man: Past and Present* (Cambridge, 1900). See CHINA, *Ethnology.*

MIAOULIS. See MIAULIS.

MIAS. See ORANG-UTAN.

MIASMA mī-ăz′mȧ (Neo-Lat., from Gk. *μίασμα,* stain, from *μιαίνειν, miainein,* to pollute). A term formerly applied to any disease which was thought to arise from polluted air. Miasma has had slightly different meanings at different times, but has been most generally used to indicate certain imponderable morbific emanations from the soil of particular localities. Since the discovery of the specific plasmodium of malaria and its conveyance by the mosquito, the term "miasma" has lapsed into disuse and is now rarely seen in medical literature. See MALARIA AND MALARIAL FEVER; INSECTS, PROPAGATION OF DISEASE BY.

MIASSKY ZAVOD, mē-ȧs′kĕ zȧ-vôd′. A mining town in eastern Russia in the Government of Orenburg, situated among the Ural Mountains, 35 miles west of Cheliabinsk and near the railroad to that town. Its mines produce over 17,000 ounces of gold annually. Pop., 1897, 16,100; 1910, 25,479.

MIAULIS, mē-ou′lĕs, ANDREAS VOKOS (c.1768–1835). A Greek admiral, born in the island of Negropont. Vokos, or Bokos, was his family name, the surname Miaulis being derived from the Turkish word for felucca. For long a merchant captain, he gave his services and his property heartily to the cause of the Greek revolution in 1821 and was put in command of the Greek fleet, consisting of a great number of small craft. In March, 1822, he defeated a Turkish squadron at Patras and in September another squadron near Spezzia. In 1825 he burned the fleet commanded by Ibrahim Pasha near Modon. In 1827, upon the appointment of the Englishman Lord Dundonald as his superior in command, he loyally continued to serve as a subordinate. He was restored to his old rank by President Capo d'Istria. He participated in the insurrection of 1831 and burned the fleet under his command at Poros, to keep it out of the hands of the Russians. He opposed the President's Russian policy and was actively engaged in the bitter controversies of the period. In 1832 the naval stations in the Archipelago were placed in his charge, and he served on the deputation sent to Munich to offer the crown to Prince Otho of Bavaria. In 1889 a monument was erected to him in Syra.

MIAU-TSI. See MIAO-TSE.

MIAVA, mē-ô′vŏ. A city of the County of Neutra, Hungary, on the Miava River, at the foot of the Little Carpathians, 56 miles northeast of Vienna (Map: Hungary, E 2). The manufacture of woolen and linen goods and bagging is the chief industry. Pop., 1900, 10,639; 1910, 10,063.

MI′CA (Neo-Lat., from Lat. *micare,* to flash; confused with and influenced by *mica,* crumb). A group of minerals that crystallize in the monoclinic system and consist essentially of aluminium silicate with varying proportions of potassium, sodium, lithium, iron, magnesium, etc. The different species are characterized by a basal cleavage, yielding thin, tough scales that are colorless to jet black. The principal members of the group include the following: *Muscovite,* or common mica, called also potassium mica, as it is essentially an aluminium and potassium silicate. The colorless varieties of muscovite are used in the doors of stoves and as lamp chimneys. It is also employed as an insulating material, in wall-paper manufacture, as a lubricant, and when ground it is used as an absorbent for glycerin in the manufacture of dynamite. During 1913, 1,700,677 pounds of sheet mica were mined in the United States. *Paragonite,* or sodium mica, is similar to the foregoing, except that the sodium replaces the potassium in its composition. It is of a yellowish to greenish color. *Lepidolite,* or lithium mica, is a potassium, lithium, aluminium silicate, also containing fluorine, and is of a rose or peach-blossom color. It finds some use for ornamental purposes and is a source of lithium salts. *Zinnwaldite* is of a complex composition, containing iron in addition to the potassium, lithium, and aluminium silicates. In color it is of a pale violet or yellow to brown and dark gray. *Biotite* (q.v.), or magnesium iron mica, is a magnesium, potassium, and iron silicate. It is usually dark-colored, as green, brown, or black. *Phlogopite* is also a magnesium mica, generally nearly free from iron, and usually containing some fluorine. It is usually dark in color, being yellowish brown to brownish red. *Lepidomelane* is an iron mica generally black in color. The micas occur in crystalline rocks, muscovite being a normal constituent of granite, gneiss, and similar rocks. The deposits from which sheet mica is obtained are found in a coarse granite called pegmatite. The preparation of mica for the market is comparatively simple. The blocks, after being hoisted from the mine, are freed from adhering rock and then split by means of wedges or heavy knives. After this the mica is cut up into sizes suitable for the market, usually in pound packages. The mica waste is utilized as described previously under *Muscovite.* Consult G. W. Colles, *Mica and the Mica Industry* (New York, 1906); H. S. de Schmid, *Mica, its Occurrence, Explora-*

tion, and Uses (2d ed., Ottawa, 1912); Hans Zeitler, *Mica, its History, Production, and Utilization* (London, 1913); also the volumes of the *Mineral Resources, United States Geological Survey* (Washington, annually).

MICA, Pearl. See Margarite.

MI'CAH (Heb. abbreviation of *mīkāyāh*, interpreted as, Who is like Yahwe?). One of the minor prophets, a contemporary of Isaiah. His book is sixth in the ordinary arrangement of the minor prophets, but third according to the Jewish canon, and this order is followed in the Greek version. All that we know of his life is that he was a native of Moresheth, a small town dependent upon Gath (Mic. i. 1; Jer. xxvi. 18), and that his activity falls in the reigns of Ahaz and Hezekiah, but hardly in the days of Jotham; roughly speaking, therefore, between 734 and 700 B.C. The Book of Micah, in its present form, may be divided into three sections, each beginning with "Hear ye." (1) Chaps. i and ii, addressed to all the people, describe the coming of Yahwe in judgment on the transgressions of Israel and Judah and the doom of Samaria; denounce luxury and covetousness as the sources of transgression and condemn the false prophets for leading the people astray; foretell the banishment of the people into captivity and promise their return under the guidance of Yahwe. (2) Chaps. iii–v, addressed to the heads and princes of the people, condemn their oppressive rapacity and declare that as they had been deaf to the cry of the poor in their wrongs, they, too, shall call on Yahwe, but will not be heard. The false prophets also who had deceived others shall themselves be made ashamed. This second threatening of judgment is followed by a second and fuller promise of a better time. (3) In chaps. vi and vii Yahwe, calling on the people to hear and on the mountains to be witnesses of the controversy, appeals to all His past government over Israel as approving His righteousness. The people, answering, complain that the burden of the sacrifices required is too great to be borne, and Yahwe, in reply, says that He asks of them only to do justly, love mercy, and walk humbly with God. That they had failed to comply with these demands is shown by the treasures of wickedness found in their houses, by the scant measures used, the false balances, the deceitful weights. For these crimes punishments will be inflicted; the wheat, the oil, and wine shall be cut off. The prophet mourns the justice of the sentence and acknowledges the guilt of all classes of the people. Yet he waits for the salvation of Yahwe, triumphing in His pardoning mercy, which will certainly be manifested, and in His faithfulness, which will perform all that He had solemnly sworn to Abraham in the days of old.

These three divisions, however, do not correspond either to the original order or character of the discourses embodied in the book. The first three chapters (with the exception of ii. 12–13) depict conditions prevalent prior to the destruction of Samaria and may be attributed to the prophet Micah, though with editorial additions and adjustment to the rest of the book. Chaps. iv and v, however, with their glimpse into future times, are regarded by many scholars as embodying the views and aspirations of the struggling postexilic religious community, weighted by the sense of guilt, regarding its own sufferings as a punishment for transgressions in the past, and looking forward to a redemption and restoration of national glory, which can only come from Yahwe Himself. There are reasons for supposing that chaps. i–v once formed the entire Book of Micah, the first three being by the prophet himself and forming the text, as it were, to the last two chapters, justifying the sufferings in postexilic days. By way of consolation the prophecy of the restoration of the Davidic dynasty was composed and added. In the same spirit, as a comment upon the real Micah, chaps. vi and vii are supposed to have been written, which again present the same two sides—Yahwe's justification in bringing such sufferings upon His people and the consolatory promises for the future. Chaps. iv–vii, according to this view, belong in the main to the latter part of the Persian period, with minor additions thought to have been made in still later times. The text of the Book of Micah, it should be added, is not well preserved, and this enhances the difficulties of a satisfactory interpretation.

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MICARE DIGITIS. See La Morra.

MICA SCHIST. A metamorphic rock (q.v.) possessing a schistose or foliated structure and composed essentially of the minerals mica and quartz. The mica is generally the colorless variety known as muscovite (q.v.), though the dark variety, biotite, may be present also. When garnet or staurolite is present in addition to the quartz and mica, the rock is designated a garnetiferous or a staurolitic mica schist. Probably the greater number of mica schists have been formed by the metamorphism of sedimentary rocks through the agency of orographic (mountain-building) forces. Other mica schists, and especially the variety known as sericite schists, have been developed from acid igneous rocks (q.v.) by the action of the same forces. Of many mica schists, and especially those of Pre-Cambrian age, it has been found impossible as yet to determine whether their origin is sedimentary or igneous. See Metamorphic Rocks.

MICAWBER, Mr. Wilkins. In Dickens's *David Copperfield*, an improvident, unpractical, and visionary character, believed to be intended as a portrait of Dickens's father, and Mrs. Micawber is said to represent his mother.

MICELLAR THEORY (from Neo-Lat. *micella*, dim. of Lat. *mica*, crumb). A theory proposed by the botanist Nägeli in 1862 to account for the physical properties of organized bodies like starch grains, cell walls, etc. He assumed that the molecules of the chemist are united into larger unions, constituting molecules of a higher order, which he called micellæ. These

hypothetical micellæ are extremely minute, never being visible even with the highest powers of the microscope. He further claims that the growth in thickness of a cell wall is due to the intercalation (intussusception) of new micellæ of cellulose between the micellæ which have become widely separated from each other by the stretching of the wall. Strasburger, the most important opponent of the micellar theory, holds that the growth in thickness of a cell wall is due to the deposition of material upon its inner surface. The micellar theory is still current, but is not so strongly supported as formerly.

MICHABO, mē-chā′bō. See MANABOZHO.

MICHAEL, mī′kā-ĕl *or* mī′kĕl (Heb., Who is like God?). One of the archangels. In Dan. x. 13 he is called "one of the chief princes"; in x. 21, "Michael your prince"; and in xii. 1, "the great prince which standeth for the children of thy people." It is thought by some scholars that Michael is also meant by "the one like unto a son of man" in Dan. vii. 13. In Ethiopic Enoch ix, 1, Michael appears as one of the four great angels, with Uriel, Raphael, and Gabriel; in xl, 9 and lxxi, 9, Phanuel takes the place of Uriel; while in xx, which gives the oldest list of the seven archangels (Uriel, Raphael, Raguel, Michael, Saraqael, Gabriel, and Remiel), he occupies fourth place. In Jude 9 Michael is represented as fighting with the devil for the body of Moses; this account was taken from the Apocalypse of Moses, though it is not extant in the part of the Latin version of this work that has been preserved. In Rev. xii. 7–9 he fights against the dragon. His special function, as described in Enoch, is to act as scribe in entering in the heavenly books the deeds of the angelic patrons of nations, while in the *Ascension of Isaiah* he records the deeds of all men in the heavenly books. According to the Talmudic account, Michael is the prince, the chief of the angels, the high priest who in the fourth heaven offers the souls of the departed as a sacrifice. He is looked upon as the medium through whom the Law was given to Moses on Mount Sinai. In the Western Christian church, September 29 (Michaelmas) has been set aside as his day; the Greek church keeps November 9. Zimmern has shown that some of the conceptions connected with Michael represent attributes of Babylonian gods, like Marduk and Nebo, transformed to angels.

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MICHAEL, mī′kĕl *or* mī′kā-ĕl. The name of nine emperors of Constantinople.—MICHAEL I (died 845) succeeded to the throne on the death of Stauracius, in 811, conducted a war against the Bulgarians, but was a feeble monarch, who abdicated without fighting against Leo the Armenian, a general in his service, in 813 and, retiring to a monastery, passed the remainder of his life in devotional exercises.—MICHAEL II (died 829), surnamed the Stammerer, was born in upper Phrygia, of an obscure family, but was ennobled by Leo the Armenian, who, however, afterward condemned him to death on a charge of conspiring against him. His life was saved by the assassination of Leo, and Michael was crowned Emperor in 820. He was cruel and arbitrary. His reign was threatened by a revolt on the part of his general Euphemius, who proclaimed himself Emperor. The rebellious general was slain near Syracuse in Sicily. During Michael's reign the Saracens wrested Crete and Sicily from the Empire.—MICHAEL III (c.838–867), surnamed the Drunkard, was grandson of Michael II and succeeded his father, Theophilus, in 842, his mother, Theodora, being Regent until 856. In his reign the Varangians appear as foes to the Empire, and the foundation for the separation of the Eastern and Western churches was laid by a quarrel between the Patriarch, Photius, and the Pope, Nicholas I. Michael was assassinated by Basil the Macedonian in 867.—MICHAEL IV (died 1041), surnamed the Paphlagonian, from the place of his birth, was raised to the throne by the Empress Zoë, who on account of her infatuation for him is suspected of having murdered her husband. He was successful in war against the Bulgarians in 1040, but died in 1041.—MICHAEL V succeeded the last named, who was his uncle. Having exiled the Empress Zoë, he was overthrown by the people in 1042 and, after having his eyes put out, was sent to a monastery.—MICHAEL VI succeeded the Empress Theodora in 1056, but retained the throne only a year, when he was compelled to resign in favor of Isaac Comnenus. He retired to a monastery. He was surnamed Stratioticus, and with him the Macedonian dynasty became extinct, his successor being of the family of the Comneni.—MICHAEL VII DUCAS, or PARAPINACES (starver), was a son of Constantine X, and after the regency of his mother Eudoxia he ascended the throne in 1071. Having given too much power to unworthy favorites, he was forced by an insurrection to abjure the throne in 1078 and retire to a monastery.—MICHAEL VIII PALÆOLOGUS (1234–82) was the first of his family to ascend the Byzantine throne. He was proclaimed joint Emperor of Nicæa with John Lascaris about 1259, and soon after became sole ruler. In 1261 Constantinople, which had been held by the Latins since 1204, was captured, and Michael caused his young colleague to be blinded and dethroned. In order to retain possession of the capital he made some pretense at an attempt to bring about a union of the Western and Eastern churches, which, however, proved to be of short duration.—MICHAEL IX, son of Andronicus II, was associated with his father, but died before him in 1320. See BYZANTINE EMPIRE. Consult: Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury, vols. v, vi (London, 1898), for all the above; for Michael I, II, III, J. B. Bury, *History of the Eastern Roman Empire* (ib., 1912); for Michael VIII, Edwin Pears, *Destruction of the Greek Empire* (ib., 1903), and Alice Gardner, *Lascarids of Nicæa* (ib., 1912).

MICHAEL, ARTHUR (1853–). An American chemist, born in Buffalo, N. Y. He studied at Berlin and Heidelberg and at the Ecole de Médecine of Paris. In 1882–89 and from 1894 to 1907 he was professor of chemistry in Tufts College; in 1912 he became professor of organic chemistry at Harvard. His researches in organic chemistry include studies in a new process for the formation of aromatic sulphones, in forming aldol from ethyl aldehyde,

in the action of aldehydes and aromatic oxyacids on phenols, and in new reactions with sodium malonic ester. His writings include contributions to the *Proceedings* of the National Academy of Science, to the *American Chemical Journal*, and to the *Berichte der deutschen chemischen Gesellschaft*.

MICHAEL ANGELO. See MICHELANGELO.

MICHAEL AT'TALIA'TES. A Byzantine jurist of the eleventh century. By command of Michael Ducas, Emperor of the East, he published in 1073 a work entitled Πόνημα νομικὸν ἤτοι σύνοψις πραγματική, i.e., a compendium of law. He also wrote other works, including a history of the period from 1034 to 1079. A Latin rendering of the *Synopsis* by Leunclavius is to be found in his second volume of the compilation *Jus Græco-Romanum*. The *History* is published in the Bonn edition of the corpus of Byzantine writers. Consult Karl Krumbacher, *Geschichte der byzantinischen Litteratur* (2d ed., Munich, 1897).

MICHAELIS, mē'kȧ-ā'lĭs, ADOLF (1835–1910). A German archæologist. He was born at Kiel and studied at the university of his native town, in Berlin, and in Leipzig. After 1862 he was professor of classical philology and archæology at Greifswald, Tübingen, and Strassburg. In 1873 he edited *Bilderchroniken*, by O. Jahn, his uncle and teacher, a discussion of the Greek inscribed reliefs of mythological and historical scenes. In 1874 he became a member of the German Central Archæological Institute in Rome, the history of which he published in 1879, in *Geschichte des deutschen archäologischen Instituts zu Rom*. Besides his critical edition of Tacitus' *Dialogus de Oratoribus* (1868) and articles in the periodicals, he published many archæological treatises, such as *Der Parthenon* (1871); *Ancient Marbles in Great Britain* (Eng. trans. by Fennell, 1882); *Strassburger Antiken* (1901); *Die archäologischen Entdeckungen des neunzehnten Jahrhunderts* (1906; Eng. trans. by Bettina Kahnweiler, *A Century of Archæological Discoveries*, 1908). He also prepared editions of Springer's *Handbuch der Kunstgeschichte* (1898, 1901, 1904, 1907).

MICHAELIS, JOHANN DAVID (1717–91). A German biblical scholar. He was born on Feb. 27, 1717, at Halle, where his father, Christian Benedict Michaelis, was professor. After completing his studies at the university of his native town he traveled in England and Holland. In 1746 he became professor of philosophy at Göttingen and in 1750 professor of Oriental languages. From 1753 to 1770 he was one of the editors of the *Göttinger gelehrte Anzeigen*, and for some years he filled the office of librarian to the university. He died at Göttingen, Aug. 22, 1791. Michaelis may be regarded as among the earliest to use Oriental critical learning in the service of biblical interpretation. His chief works are his *Hebräische Grammatik* (1778); *Einleitung in die göttlichen Schriften des neuen Bundes* (4th ed., Göttingen, 1788; Eng. trans., *Introduction to the New Testament*, London, 1823); *Mosaisches Recht* (2d ed., 1776–80; Eng. trans., *Commentaries on the Laws of Moses*, 1810–14); *Moral* (1792–1823); *Orientalische und exegetische Bibliothek* (1786–93). Consult his *Lebensbeschreibung von ihm selbst abgefasst*, edited by Hassencamp (Rinteln, 1793); his letters (Leipzig, 1794–96); his *Life* by R. Smend (Göttingen, 1898); T. K. Cheyne, *Founders of Old Testament Criticism* (London, 1893).

MICHAËLIS, KAROLINE. See VASCONCELLOS, KAROLINE MICHAËLIS.

MICHAËLIS, mī-kȧ-ā'lĭs, SOPHUS (1865–). A Danish author, born at Odense. Educated at the University of Copenhagen, he traveled extensively abroad and wrote *Solblomster* (1893), a collection of poems, and the romance *Æbelö* (1895), which were successful. Later appeared *Sirener* (1898), a collection of poems; *Livets Fest* (1900); *Palmerne* (1904), impressions from Egypt; the novels *Dödedansen* (1900) and *Giovanna* (1901); the dramas *Revolutionsbryllup* (1906), *Lægen* (1906), *St. Helena* (1911), and *Den evige Sövn* (1912). His lyric verse, showing French influence, represents his best work. He wrote also a monograph on Jens Jerichau, the sculptor (1906), and edited *Kunst* (1900–06). His translations of Flaubert's *Salammbô*, *Aucassin et Nicollete*, and *Tentation de St. Antoine* were excellent.

KARIN MICHAËLIS STANGELAND (1872–), Michaëlis' first wife, separated from him and married an American. For purposes of authorship she wrote her name as above. She was born (Beck-Brönndum) at Randers. Her poems and novels include: *Höit Spil* (1898); *Fattige i Aanden* (1901); *Barnet* (1902); *Hellig Enfold* (1903); *Gyda* (1904); *Munken gaar i Enge* (1905); *Betty Rosa* (1908); *Tro som Guld* (1909); *Den farlige Alder* (1910); *Bogen om Kjærighed* (1912); *Grev Sylvains Hævn* (1913); also *Danske Foregangsmænd i Amerika* (1911), with Joost Dahlerup.

MICHAELIUS, mē-kȧ'lē-ŭs, JONAS (1577–?). The first clergyman of the Dutch Reformed church in New Amsterdam. He was born in north Holland. In 1600 he entered the University of Leyden and after his graduation became a country pastor. In 1624 he was appointed to São Salvador in Brazil, the next year to a settlement in Guinea, and in 1628, after a short visit to Holland, he sailed for New Amsterdam. His ministrations there probably lasted until 1633, when he was succeeded by Everardus Bogardus (q.v.). A letter written by him in 1628 and now in the manuscript collection of the New York Public Library gives the only extant first-hand account of New Amsterdam as it then was. A translation of this letter appears in the *Collections* of the New York Historical Society for 1880.

MICHAELMAS, mĭk'el-mas (from *Michael* + *mass*). The old English name of the day set apart in commemoration of St. Michael and the other angels, September 29. The observance of this day is commonly traced to an apparition of the archangel which is supposed to have taken place on Monte Gargano in Apulia in 493, or more probably in 520; but it is likely, for various reasons, that the festival is even older. This particular apparition is commemorated in the Roman Catholic church on May 8; the feast day in September has a wider application, in the Eastern and Anglican churches as well, and is intended to recall the benefits received through the ministry of angels. In England it has been for centuries an important date as a quarter day and the beginning of legal and university terms. For the old beliefs and customs connected with the day, consult Robert Chambers, *The Book of Days* (new ed., 2 vols., London, 1906).

MICHAEL NIKOLAIEVITCH, mī'kĕl nē'kō-lā'yĕ-vĭch (1832–1909). Grand Duke of Rus-

sia, the fourth son of the Emperor Nicholas I. In the artillery branch of the army he was elevated to the rank of general. He was for some time Governor of the Caucasus and in 1877 commanded the army which invaded Turkish Armenia. In 1881 he was made President of the Privy Council of State and commander in chief of the cavalry.

MICHAEL OBRENOVITCH (ô-brĕn'ô-vĭch) **III** (1823–68). Prince of Servia, born at Kraguyevats, the younger son of Prince Milosh. After the death of his elder brother Milan in 1839 he was declared Prince of Servia by the Turkish government. He soon made himself very unpopular by favoring the Russian policy, and the discontent of the Servian people was increased by his policy of arbitrary and heavy taxation. A revolution broke out in 1842, and an act of the National Assembly expelled him and his family from the country. He fled to Semlin in Slavonia and lived in Vienna and Berlin, spending several years in traveling. In 1858 he returned to Servia, together with his father, whom he again succeeded in the government in 1860. He was a man of great ability and seemed honestly desirous to do his best for the country. He was successful in effecting cardinal changes in the military organization and freed the Servian fortresses from Turkish garrisons. On June 10, 1868, he was shot by a follower of Prince Alexander Karageorgevitch. He was succeeded by his cousin Michael Obrenovitch IV.

MICHAEL ROMANOV. Czar of Russia. See Romanov.

MICHALOWSKI BLASTING POWDER. See Explosives.

MICHAUD, mē-shō', Joseph François (1767–1839). A French historian, born at Albens in Savoy. He studied in the ecclesiastical college of Bourg and in 1787 published a work, *Voyage au Mont Blanc,* followed by other essays. In 1791 he went to Paris, where he embraced the teachings of Voltaire and Rousseau. He was, however, a Royalist and advocated his views in the three Royalist papers, the *Gazette Universelle,* the *Postillon de la Guerre,* and the *Courrier Républicain.* In 1794 he founded the *Quotidienne* and after the fall of Robespierre he contributed articles so openly favoring the Restoration that on Oct. 27, 1795, he was condemned to death, and only escaped by having this sentence commuted to one of banishment. In 1799 he returned to Paris and with a younger brother undertook the publication of the *Biographie moderne, ou dictionnaire des hommes qui se sont fait un nom en Europe depuis 1789.* His work *Tableaux historiques des trois premières croisades* began to appear in 1811, though not completed until 1822. Michaud was made member of the French Academy in 1812; the previous year he had founded, with his brother, the *Biographie universelle.* He also collaborated with Ponjoulat in editing the *Collection de mémoires pour servir à l'histoire de France,* which began to appear in 1836. In the *Dernier règne de Buonaparte* (1815) Michaud made a valuable contribution to Napoleonic history. He died at Passy, Sept. 30, 1839. In 1792 Michaud wrote a work *L'Apothéose de Franklin,* of interest to Americans.

MICHAUT, mē-shō, Gustave (1870–). A French literary critic, born at Perrigny. He taught French literature in various institutions before becoming a lecturer at the University of Paris in 1904. In 1911 his lectures in the United States were well received. Several of his works were crowned by the Academy. Michaut became an authority on Pascal and Sainte-Beuve, his publications including: *Edition des pensées de Pascal* (1896); *De l'abrégé de la vie de Jésus* (1897); *Des Discours sur les passions de l'amour de Blaise Pascal* (1900); *Le génie latin* (1900); *Aucassin et Nicolette* (1901); *Les époques de la pensée de Pascal* (1902); *La comtesse de Bonneval* (1903); *Sainte-Beuve avant les lundis* (1903); *Etudes sur Sainte-Beuve* (1904); *Etude sur le livre d'amour de Sainte-Beuve* (1905); *La Bérénice de Racine* (1907); *Pages de critique et d'histoire littéraire* (1910); *Histoire de la comédie romaine* (1912); *La Fontaine* (1913).

MICHAUX, mē'shō', André (1746–1802). A French botanist and traveler. He was born at Satory, near Versailles, and studied under the noted botanist Bernard de Jussieu. In 1779 he traveled in England, and the next year through Auvergne and the Pyrenees, and, on his return to Paris, introduced several new varieties of Spanish grain and other plants. In 1782 he was sent to Persia on a scientific mission. From 1785 on he traveled extensively in eastern North America on a similar mission at government expense, but the French Revolution compelled him to return for want of funds. He was shipwrecked on the voyage to France and lost nearly all his specimens. In 1800 he sailed for Madagascar, where he died two years later. His most important publications are *Histoire des chênes de l'Amérique septentrionale* (1801) and *Flora Boreali-Americana* (1803).

MICHAUX, François André (1770–1855). A French botanist, son of André Michaux. He accompanied his father to the United States, and his *Histoire des arbres forestiers de l'Amérique septentrionale* (3 vols., 1810–13) contains the result of his explorations and gives an account of the distribution and the scientific classification of the principal American timber trees north of Mexico and east of the Rocky Mountains. Under the title *The North American Sylva* it was translated by Hillhouse, with three supplementary volumes on the trees of the Rockies by T. Nuttall (1841–49).

MICHEL, mē'shĕl', Claude, called Clodion (1738–1814). One of the most prominent French sculptors of the rococo period. He was born in Nancy and studied in Paris under his uncle, J. S. Adam, and under Pigalle. In 1759 he won the first prize for sculpture and in 1762 removed to Rome, where he remained nine years. Clodion was a typical representative of the graceful, coquettish, and often immoral art which was fashionable in France before the Revolution. He showed inexhaustible fantasy and skill in his small delicate figures, usually of terra cotta, and reliefs representing nymphs, fauns, cupids, and the like, by which he is chiefly known, but in the more serious works, such as the statue of Montesquieu, now in the Palais de l'Institut, Paris, and the "Vestal Crowned with Flowers," the noble lines and fine arrangement of drapery rank him among the best masters of the age. After the Revolution he attempted to adopt the new classical style, but without much success. His reliefs for the Arc du Carrousel and the Colonne de la Grande Armée date from this late period. He modeled also many charming decorations for private palaces, which have not survived. Most of his terra cotta and marble statuettes, vases, candelabra, etc., are pre-

served in private collections; there are several examples in the J. P. Morgan collection, on loan in the Metropolitan Museum, and this museum owns (Altman collection) two particularly fine specimens. The statue and relief of St. Cecilia in Rouen Cathedral also deserve mention. Clodion was elected an associate of the Academy, but never attained a full membership. Consult Thirion, *Les Adam et Clodion* (Paris, 1885).

MICH'EL, Dan (i.e., *Dominus* or Master Michael), of Northgate (fl. 1340). An English translator. Nothing is known concerning his personal history except that he was a brother in the cloister of St. Augustin of Canterbury. In 1340 he completed his translation of *La somme des vices et des vertus*, a moral treatise, founded on *Le miroir du monde* (c.1250), and written in 1279 by Frère Lorens, a Dominican monk, for the use of Philip II of France. The translation is entitled the *Ayenbite of Inwit* (the again biting of the inner wit) or the *Remorse of Conscience*. The work gives a detailed exposition of the Ten Commandments, the twelve articles of faith, the seven petitions of the Lord's Prayer, the seven gifts of the Holy Spirit, and the seven heads and ten horns of the beast in the Apocalypse. Interesting in itself, it is of great linguistic value, as it is written in the dialect of Kent. Consult the edition by Morris, Early English Text Society (London, 1866).

MICHEL, mē'shĕl', Francisque Xavier (1809–87). A French historian and antiquary. He was born in Lyons and educated there. He went to Paris and in 1833 he was sent by Guizot to England to examine documents pertaining to the ancient history of France. In 1837 he was in Scotland on the same mission. He edited many monuments of old French literature, among them the *Chanson de Roland* and the *Roman de la rose*. His historical works include *Histoire des races maudites de la France et de l'Espagne* (1847); *Les Ecossais en France et les Français en Ecosse* (1862); *Recherches sur le commerce pendant le moyen-âge* (1852–54); *Le pays basque* (1857).

MICHEL, François Emile (1828–1909). A French painter and writer on art, born in Metz. He was the pupil of Migette and Maréchal, the glass painter, and began to exhibit in 1853. His paintings include "Autumn Sowing" (1873) and "The Dunes near Haarlem" (1885), both in the Luxembourg. He contributed articles on art to the *Gazette des Beaux-Arts* and other periodicals and published *Les musées d'Allemagne* (1886); *Rembrandt* (1886; Eng. trans., 1903); *Jacob van Ruysdael et les paysagistes de l'école de Haarlem* (1890), and other biographies for the series, *Les artistes célèbres; Les Maîtres du paysage* (1906; Eng. trans., *Great Masters of Landscape Painting*, London, 1910); *Nouvelles études sur l'histoire de l'art* (1908); *La forêt de Fontainebleau* (1909). He was elected a member of the Institute in 1892.

MICHEL, Louise (1830–1905). An anarchist agitator, called the Red Virgin. She was the illegitimate daughter of the son of the master of the château of Vroncourt, in the Department of Marne, France; received a good education from her grandfather and went to Paris, where she taught school till the rising of the Communists in 1871. She joined them, fought among the insurgents, and was taken prisoner by the Versailles troops. Tried by court-martial, she was condemned to death, but her sentence was commuted to transportation to New Caledonia. Freed in 1880, she devoted herself to agitation among the poor in Paris, and was sentenced in 1883 to six years' imprisonment. She was released, however, in 1886 and went to London, whence she continued to carry on her propaganda. In 1895 she returned to Paris. She published two novels, two plays, and her *Mémoires* (1886). Consult E. Girault, *La bonne Louise* (Paris, 1906).

MICHELANGELO, mē'kĕl-än'jä-lō (Michelagniolo Buonarroti) (Michael Angelo) (1475–1564). A Florentine sculptor, painter, architect, and poet, the most prominent artist of the High Renaissance and the most influential figure in modern art. He was born at Caprese, March 6, 1475, the son of Lodovico Buonarroti. His family, the Buonarroti-Simoni, held small landed possessions and had long been honorably identified with public office in Florence. At the time of Michelangelo's birth his father was podestà (governor) of Chiusi and Caprese, Tuscan mountain towns tributary to Florence. The infant was christened Michelagniolo (Florentine for Michelangelo), and upon his father's return to Florence was put to nurse with the wife of a stonemason of Settignano, imbibing, as he himself said, the love of sculpture with his nurse's milk. Destined for a scholar, he was then placed in the school of Francesco d'Urbino at Florence. Instead of devoting himself to books he spent his time drawing, and with painters' apprentices. By one of these, Francesco Granacci, with whom he had formed a friendship, he was introduced to the studio of the brothers Ghirlandaio, and, after much opposition on the part of his family, he was, in 1488, apprenticed to these masters. He does not appear to have acquired much besides a conscientious execution and sound knowledge of the fresco technique. His drawings while there excited admiration and surprise, as did also his first painting, a transcript on panel of Martin Schongauer's print, the "Temptation of St. Anthony."

In company with Granacci Michelangelo left Ghirlandaio's studio in 1489, to study sculpture in the garden of the Medici at San Marco. With the design of reviving sculpture, which had fallen behind painting at Florence, Lorenzo de' Medici had established an academy there, at the head of which he placed Bertoldo, a pupil of Donatello. A marble masque of a faun (Uffizi), which Michelangelo skillfully changed in accordance with the advice of Lorenzo, so pleased the latter that he invited him to live in his house, and procured his father a place in the Florentine customs. In the society of such men as Poliziano the poet, Pico della Mirandola, Marsilio Ficino the Platonist, and Lorenzo himself, he became familiar with Italian literature and humanist culture. He was also influenced by the great political and religious movements of the day. To the spell of Savonarola's eloquence may be attributed, at least in part, his intense love for Florentine liberty and his deep religious feeling. His artistic training was an admirable combination of Florentine realistic and classic influences. Through Bertoldo he became grounded in the works of Donatello; he studied the antique in the Medici collection and sketched Masaccio's frescoes in the Brancacci Chapel. He was also, perhaps at this early period, and certainly later in his career, influenced by the painting of Luca Signorelli, who alone among the early painters

used the human nude to express emotion. Of the two surviving works of his student days—both bas-reliefs now in the Casa Buonarroti, Florence—the seated "Madonna with the Infant Jesus" is in the manner of Donatello. The other, the so-called "Battle of the Centaurs," is in the over-rich style of late Roman reliefs, which were doubtless his models; but it shows the great, though still incipient, dramatic talent which marked his later works.

On the death of Lorenzo in 1492 Michelangelo returned to his father's house. Besides carving a statue of a Hercules, now lost, he devoted much time to the study of anatomy. In 1494 he returned to the palace of the Medici, where Lorenzo's impetuous son Piero now presided, but, frightened at a vision foretelling their destruction, in October of the same year he fled to Bologna and thence to Venice. At Bologna he found employment for almost a year upon the shrine of San Domenico. He completed a statue of San Petronio by Nicola da Bari, and carved a kneeling angel of rare beauty, bearing a candelabrum, which, as Grimm has shown, was long confounded with another by Nicola in the same church. At Bologna he saw on the façade of San Petronio the reliefs of Jacopo della Quercia (q.v.), a Sienese sculptor of great power and originality and related to himself in spirit. The influence of this master, strengthened during a later visit to Bologna, is seen as late as Michelangelo's frescoes of the Sistine Chapel. Returning to Florence, in 1495 he carved for Lorenzo de' Medici, of a younger branch of the family, a statue of the youthful St. John, which is usually identified with an original in the Berlin Museum, though Wölfflin thinks the latter a work by Girolamo da Santa Croce (d.1537). The sale of his next work, a "Cupid," of which the original is lost, caused his first journey to Rome, and during his stay there, which lasted till the spring of 1501, he executed a number of important works. For Jacopo Galli he carved the "Bacchus" in the Museo Nazionale, Florence, a statue realistic to the verge of ugliness, and lacking entirely the element of divinity. To the same period is usually assigned the well-known statue in South Kensington Museum, which may be the "Cupid" that Condivi says Michelangelo executed for Jacopo Galli, although Springer has shown that this statue is more probably an "Apollo." The subject represented is a beautiful youth kneeling in the act of discharging his bow. But the chief work of this early Roman period, which raised him to the rank of the greatest sculptor of the day, was the "Pietà" in St. Peter's Church (1498–99), the first group, in the highest sense of the word, in modern sculpture. Seated at the foot of the Cross, the Virgin is represented with the dead Christ in her lap, gazing sadly at his wounded side and gently raising her hand. She is of youthful appearance, and of more heroic proportions than her son, whose dead body, the flesh of which is treated with marvelous delicacy, is reduced in size to preserve the harmony of the group.

After his return to Florence in 1501 Michelangelo, on June 5, signed a contract for 15 statues of saints for the Piccolomini Chapel in the cathedral of Siena. The inferior quality of these works as they now stand is such that it is impossible to attribute them to him. In August of the same year he received from the city of Florence a commission for a statue of David, 9 cubits in height, to be carved from a single block of marble. The statue was of national importance, intended to mark the deliverance of the city from the Medici and Cesare Borgia. On June 8, 1504, it was erected to the right of the entrance to the Palazzo Vecchio, where it remained as a sort of palladium until, in 1873, it was removed to the Academy of Fine Arts for protection against the weather. The figure is frankly naturalistic, head and hands being unduly large, as in the case of the undeveloped youthful frame. The expression denotes expectation and confidence of victory; the action represented is at the moment at which the youth is about to unloose the string.

The "David" is the last work of Michelangelo's early or realistic period. A number of other works of the years 1501–04 cannot be exactly dated. While engaged on the "David" he completed, at the request of the signory, another statue of the same subject in bronze, which was sent as a present to a high official of the French court. Resembling the "Pietà," though probably somewhat earlier, is the life-size "Madonna of Bruges," purchased by the Mouscron family and still in their chapel in the cathedral of Bruges. He also carved two circular bas-reliefs of the Madonna, one in the Museo Nazionale, Florence, another in the Royal Academy, London. While executing the "David" he was also engaged in painting a "Madonna" for Angelo Doni (Uffizi). Though deficient in color this picture is wonderful in drawing and in the sturdy realism of the figures and is original in conception. Somewhat earlier than this is the unfinished Madonna in the National Gallery, London.

Michelangelo's second manner is characterized by an increasing departure from the realism of his early days and a reliance upon an unbridled imagination. His first work in which this new style prevails was his cartoon for the fresco of one of the long walls of the hall of the Great Council in the Palazzo Vecchio, executed in rivalry with Leonardo da Vinci (q.v.), to whom the other wall had been assigned. Begun in August, 1504, the cartoon was not completed till 1506, the fresco never having been carried out. The subject was the so-called "Battle of Pisa," an incident from the war between Florence and Pisa, in 1364, when 400 Florentines were surprised by the enemy while bathing in the Arno at Anghiari. This was considered by contemporaries as his greatest painting, and practically revolutionized Florentine art. The cartoon was destroyed in 1516, and only survives in drawings at Holkham and Vienna (Albertina) and in the well-known line engraving of a single group by Marcantonio, entitled "Les Grimpeurs."

Its execution was interrupted early in 1505 by a summons to the artist from Rome by Pope Julius II, who of all Michelangelo's patrons best understood the man and his art. His first commission was for the Pope's sepulchral monument, to be placed under the cupola of the new church of St. Peter's, and to contain 40 colossal statues, besides bronze reliefs and other decorations. Michelangelo spent over eight months in Carrara procuring the marble for this, the darling scheme of his life. But when, after his return to Rome, the Pope, moved by the intrigues of Bramante, wished to defer the execution of the monument, and the artist was slightingly treated, he left Rome in a rage, sending the Pope word to seek him elsewhere. Notwithstanding the latter's efforts and the mediation of the Florentine govern-

ment a reconciliation was not effected till the end of 1506, at Bologna, which the Pope had just added to the papal domains. Until Feb. 21, 1508, the artist was occupied with the bronze statue of Julius II, three times life size, which was destroyed when the Bentivogli recovered the city three years later. Upon rejoining the Pope at Rome he was induced, much against his will, to undertake the decoration of the vault of the Sistine Chapel.

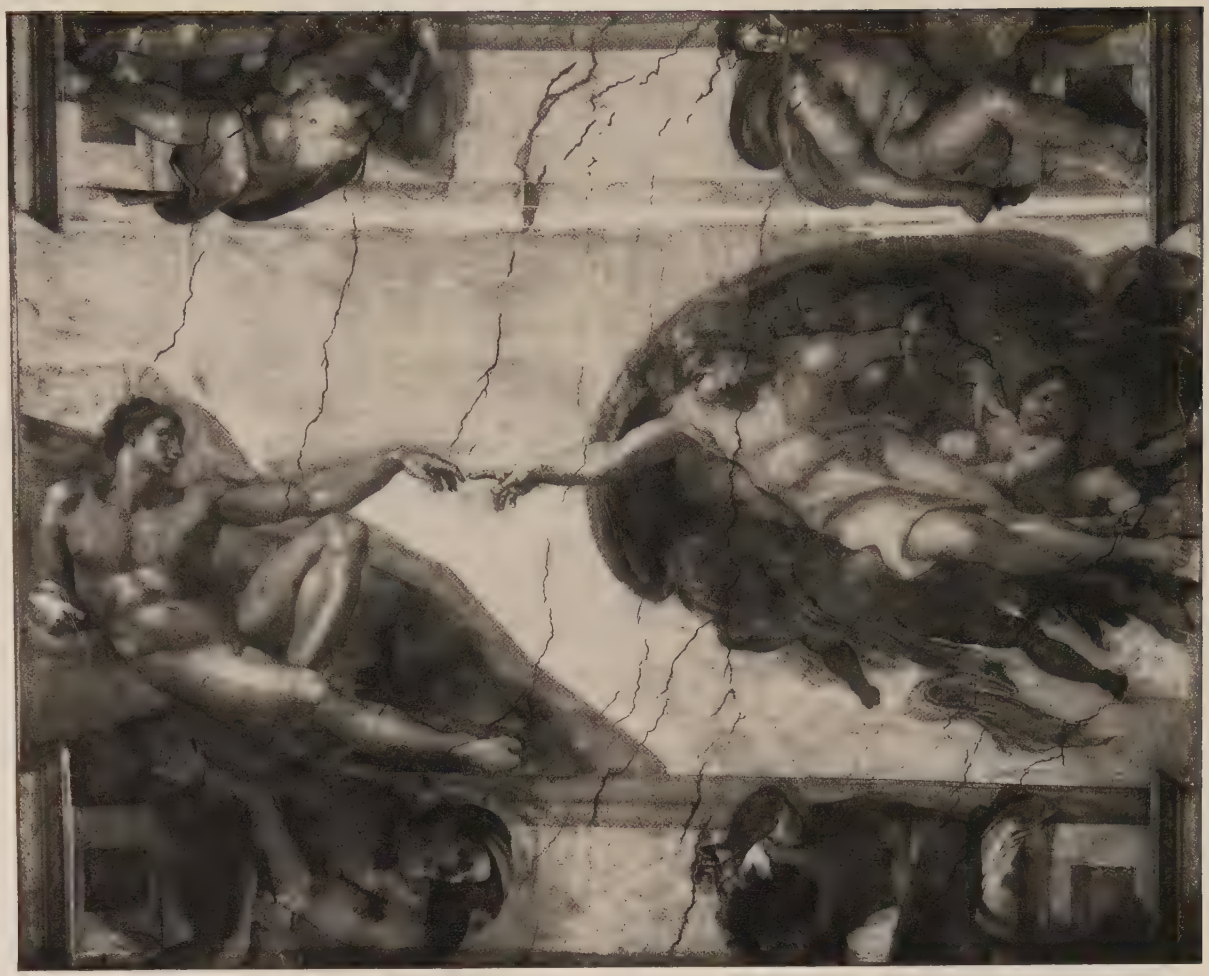
It was a task of colossal proportions (the ceiling alone measuring 132 feet by 44 feet) and he did it practically alone. In October, 1521, the scaffolding was removed. Immediately upon its completion it was hailed as the greatest piece of work ever done by painter's hand. Even Raphael's style was transformed after he had seen it. Michelangelo arranged the vast space as though it had been roofless, framing it with architecture in perspective delusion and filling the open spaces with paintings. Just above the windows are the figures of the ancestry of Christ in attitudes of eager waiting; above them, 12 gigantic figures of the prophets and sibyls; in the corners, four representations from the history of Israel; while in the centre of the vault the stories of the "Creation of the World," the "Fall of Man," and the "Deluge" are told in nine pictures. The spaces of the architecture are filled with figures of male nudes, generally termed "slaves" (schiavi), in various attitudes. Among the central pictures the "Creation of Adam" is preëminent. Adam is depicted just on the point of rising, just as God's touch sends the first thrill of life through his veins. His body is the perfection of anatomical form and action, and the representation of the Almighty as the incarnation of omnipotence and mild compassion has never been equaled. The Delphic sibyl is young and beautiful, with an upturned look of rapture, the Cumæan is old and withered, the wisdom of the ages in her countenance. Of the prophets, Jeremiah is the image of deep thought and Zechariah a type of mental absorption; Jonah, typical of the resurrection, is a nude figure of remarkable foreshortening. In a clever and convincing critique Professor Wölfflin has established the chronological order in which the various subjects were painted. Among surviving figures intended for the tomb as originally planned are the two incomparable "Slaves" in the Louvre. One struggles with mighty effort to free himself from the bonds which hold him, the other sinks exhausted from the struggle. Both are an epitome of power and pathos. Belonging also to the original design are four rough-hewn figures now in the Florentine Academy.

On the death of Julius II in 1514 Michelangelo resumed work on his mausoleum, in accordance with a second plan on a slightly reduced scale, a pen-and-ink drawing of which is in the Uffizi. He was thus occupied till 1516; during this time he executed, at least in part, the most important of the statues intended for it. Foremost of these is the "Moses"—certainly the greatest colossal statue in modern art. Moses is portrayed at the moment when, enraged at the idolatry of the Israelites, he starts, with threatening brow, to quell and crush them. The technical execution is perfect, even to such details as the mighty beard, which his hand grasps convulsively, the muscular forearm, and the wonderful fold of drapery upon his knee. The two "Captive Youths" in the Louvre, also termed "Prisoners" and "Slaves," are ideal representations of the arts, dying and captive because of the death of their great patron.

In December, 1516, Michelangelo was compelled by the wishes of Pope Leo X, a Medici, to remove to Florence and busy himself with a façade for San Lorenzo, the family church of the Medici. He wasted three years of his life in the quarries of Carrara and Pietra Santa procuring the marble for this colossal design, when in 1520 the Pope gave up the plan. Then Cardinal Giulio de' Medici commanded his services for the Medicean Chapel in the same church, upon which work was begun in 1521. During this period he found time for the "Christ Risen," now in the church of the Minerva, Rome, upon which the finishing touches were put by the sculptor Frizzi—a figure which may justly be termed mannered, since it is rather an athlete than a Christ. Upon Cardinal Medici's elevation to the papacy as Clement VII, in 1523, the artist's entire time was taken up by the designs and statues for the Medicean Chapel and plans for the Laurentian Library. This work, however, was interrupted by the last great struggle of Florence for liberty.

Upon the sack of Rome by the army of Charles V, in 1527, the citizens arose and drove the Medici from Florence. Though he had never taken active part in public life Michelangelo was an ardent patriot, willing to serve his country. On Jan. 25, 1529, he was chosen one of the nine citizens in charge of the defense of the city, and on April 9 he became governor of the fortifications. His work took him to Pisa and Livorno, and he visited the Duke of Ferrara, the greatest Italian authority on fortifications. But convinced that Malatesta Baglioni, the general of the mercenaries, meant to betray Florence—as was actually the case—in September, 1529, he fled to Venice. He was received with great honor by the Doge and the nobility, but, declining their hospitality and the invitation of the King of France to enter his service, he returned to Florence and resumed his duties on the fortifications. After the capitulation of the city, Aug. 12, 1530, he remained for a time in hiding, but, on the Pope's invitation and pardon, resumed work on the statues for the Medicean Chapel. He had also received a commission from the city for a colossal "Hercules and Cacus," to stand opposite the "David," in commemoration of the expulsion of the Medici, but he only made the wax model now in South Kensington Museum. A copy of Michelangelo's "Leda and the Swan," a tempera painting executed some time later for the Duke of Ferrara, is at Dresden.

The chapel of the Medici—the new sacristy of San Lorenzo—is the most important work of its kind in modern art. In sculpture it marks the culmination of Michelangelo's style. The architectural problem was not constructive but decorative; and, conceived as a framing for the sculptures, the architecture is above criticism. The sculptures were only in part executed. On the entrance wall is an incomplete statue of the Madonna (1522) by Michelangelo, flanked by the patron saints of the Medici, Cosmas by Montorsoli, and Damian by Montelupo. Far more important are the tombs of the two Medicean dukes, on opposite sides of the chapel. The dukes are represented over life size, seated above their sarcophagi, and are rather allegorical than portrait statues—the representatives of contemplative and active life. Lorenzo's head rests



MICHELANGELO

"CREATION OF ADAM," FROM THE FRESCO IN THE SISTINE CHAPEL OF THE VATICAN

heavily on his wrist, and the beaver of his helmet is drawn over his eyes, which gaze on vacancy. Giuliano is represented as the victorious general looking down upon the battle field. Nothing could exceed the technical perfection of his Roman cuirass and of his hands resting upon the general's staff. At Lorenzo's feet, reclining upon the sarcophagus, are "Dawn" and "Twilight"; at Giuliano's, "Day" and "Night." "Dawn" is the most finished and beautiful of the statues; she starts as if from a dream, her face full of despondency. In "Night," a sleeping woman of magnificent physique, the sculptor has solved the difficult problem of a reclining figure in profile. "Twilight" and "Day" are male figures of Herculean proportions, the heads of which are unfinished. "Day," the grander of the two, is represented as gazing over his shoulder, showing treatment of the muscles of the back in this difficult position. In reality these allegories, intended for quite another purpose, were used by the artist to express his sorrow for the loss of Florentine liberty.

Though chiefly engaged upon the Medicean statues Michelangelo had also worked at Rome upon the tomb of Julius II. Luckily he was there when Clement VII died in 1534. As Duke Alessandro of Florence was bitterly hostile to him he remained at Rome, residing there until his death. At last he hoped to complete the mausoleum, which had been the darling scheme, as well as the bane, of his life. By threats and lawsuits the heirs of Julius II had embittered his existence during the reigns of Leo and Clement, but the popes used their power in his behalf, forcing the heirs to repeated changes of contract, each of which reduced the scale of the monument. Paul III was as unwilling as his predecessors to forego the glory of being served by Michelangelo. He annulled the contract with the Duke of Urbino, Julius's heir, compelling the latter to make a new one in 1542, according to which the tomb was finally erected before 1550. As it now stands in the church of San Pietro in Vincoli, the monument is but a shadow of the artist's great design. The statues adorning the lower part are by Michelangelo himself—the colossal "Moses" and on either side "Active Life" ("Leah") and "Contemplative Life" ("Rachel"). In their present position, which was not the one originally intended, the two female statues are dwarfed by the architectural surroundings. The statues of the upper story were imperfectly executed, after Michelangelo's designs, by Montorsoli, the best of them being a Madonna, begun by the designer himself. Four rough-hewn figures are now in the Academy, Florence.

Having thus freed the sculptor from all cares regarding the monument, Paul III required his services for the completing of the decoration of the Sistine Chapel. The entire altar wall (18 meters by 16) was to be covered by a painting of the "Last Judgment," the cartoon for which had been executed under Clement VII, but which was not carried out until 1534–41. It is the largest fresco in the world, containing above a hundred figures over life size. The centre of the composition is Christ, a beardless figure of Herculean proportion, in the act of condemnation, and the Virgin sits shrinking beside him. From all sides the terrified masses stream to the judgment seat. Below the graves are opening and the dead become flesh. The colors have suffered much from dust and candle smoke and the grand figures are much defaced. Their nudity having aroused adverse criticism, Paul IV employed Daniele da Volterra to clothe the most conspicuous examples—a task for which he received the name of "Il Braccetone" (the breeches maker). Michelangelo's last paintings (finished in 1550) were for the same patron—two large frescoes in the Pauline Chapel—the "Conversion of St. Paul" and the "Crucifixion of Peter," both of which were spoiled by restoration.

The last years of the artist's life were devoted chiefly to architecture. In 1546 he designed the beautiful cornice of the Farnese Palace and in 1547 he was appointed chief architect of St. Peter's. He accepted the post as a religious duty, refusing all pay, and until his death, through the reigns of five popes, he filled with credit this responsible position. Only the cupola of the present edifice, for which he left a model, was carried out, at least in part, according to his plans. Unfortunately he left no model for the whole church. We know, however, that he returned to Bramante's plan of a Greek cross, and that his design was much superior to the present building. (See SAINT PETER'S CHURCH.) His architectural works included plans for the Porta Pia and the transformation of the Baths of Diocletian into Santa Maria degli Angeli, which was unfortunately rebuilt during the eighteenth century, although his court of 100 columns survives. The general plan of the Capitoline Hill is due to him, the grand staircase and the Palace of the Senators being after his designs. He made a number of grand designs for the church of the Florentines at Rome and one for the well-known staircase of the Laurentian Library, Florence, which was carried out by Vasari. Finally, his plans were followed in the new fortifications of Rome.

The latter part of Michelangelo's life was dominated by deep religious feeling, which found expression in his drawings and poetry, besides the grand religious paintings and works of architecture upon which he was engaged. Of wonderful pathos and deep religious feeling is the unfinished sculptured group, the "Deposition from the Cross," which now stands behind the high altar in the cathedral of Florence. But the Florentine patriot was revealed in his bust of Brutus (Museo Nazionale), carved when Duke Alessandro was assassinated by Lorenzino in 1539. Though living almost like a hermit, Michelangelo received every honor that could come to an artist. Under successive popes he was chief architect, painter, and sculptor of the Vatican; he was made head of the new Academy of Florence. Popes, kings, and princes sought the honor of a work by his hand. He died Feb. 18, 1564. His body was conveyed secretly from Rome and buried at Santa Croce, the Pantheon of Florence. His house in Florence was left by the last surviving member of the family to the city, and is now used as a museum of his works, containing the family archives.

In appearance he was of medium height and broad-shouldered; he had a large head, with broad forehead and protruding temples, small eyes, and a nose disfigured by a fist blow of Torrigiano, a fellow pupil in the Medici Gardens. He was of a noble and generous character. If lovingly treated, any favors could be obtained from him; but if treated otherwise, not even the popes could influence him. Some of his most charming traits were his devotion to his family, his obedience and humility towards his father,

a selfish and whimsical man, and his kindness to his greedy brothers. He was kind and gentle to his dependents and fair in his judgment of other artists; but if he thought himself ridiculed his tongue could be sharp enough. The sad experiences of a highly sensitive nature tended to make him increasingly suspicious and irritable. Nevertheless, he remained charitable and generous, and he was scrupulously honest at a time when this was a virtue exceedingly rare.

No biography of Michelangelo could omit mention of the beautiful friendships which formed the chief joy of his declining years. Chief among these was his friendship for Vittoria Colonna, which began with his sixtieth year. The popular idea, which sees in this noble old lady the artist's Juliet, is quite erroneous, for their relation was based on a common love of literature and art and common religious views. In Cavalieri, a handsome and accomplished young Roman nobleman, as in other young friends, he saw an idealization of youthful beauty.

Michelangelo has been admirably characterized by Burkhardt as the "Man of Destiny" in the arts. Never in history were they so dominated by a single personality. For centuries the forms which he originated dominated architecture and sculpture, as the baroque style, and, to a large extent, painting as well. That which most impressed his followers and his contemporaries was the quality which the Italians call *terribilità*—his stormy energy of conception and intense dramatic, even violent, action. With him this was natural, the result of his own stormy emotions; with his imitators it was mannerism. His art is sublime rather than beautiful; its chief attribute is power. It does not condescend to win, but overwhelms by intellectual grandeur of conception and technical perfection of execution. It is absolutely original and unique. Evident in his earliest works, this quality predominates increasingly in his art, becoming arbitrary in later life. He is a destroyer of traditions, a creator of new types. Such an artist cannot be said to belong to any school; he stands apart in a class for himself.

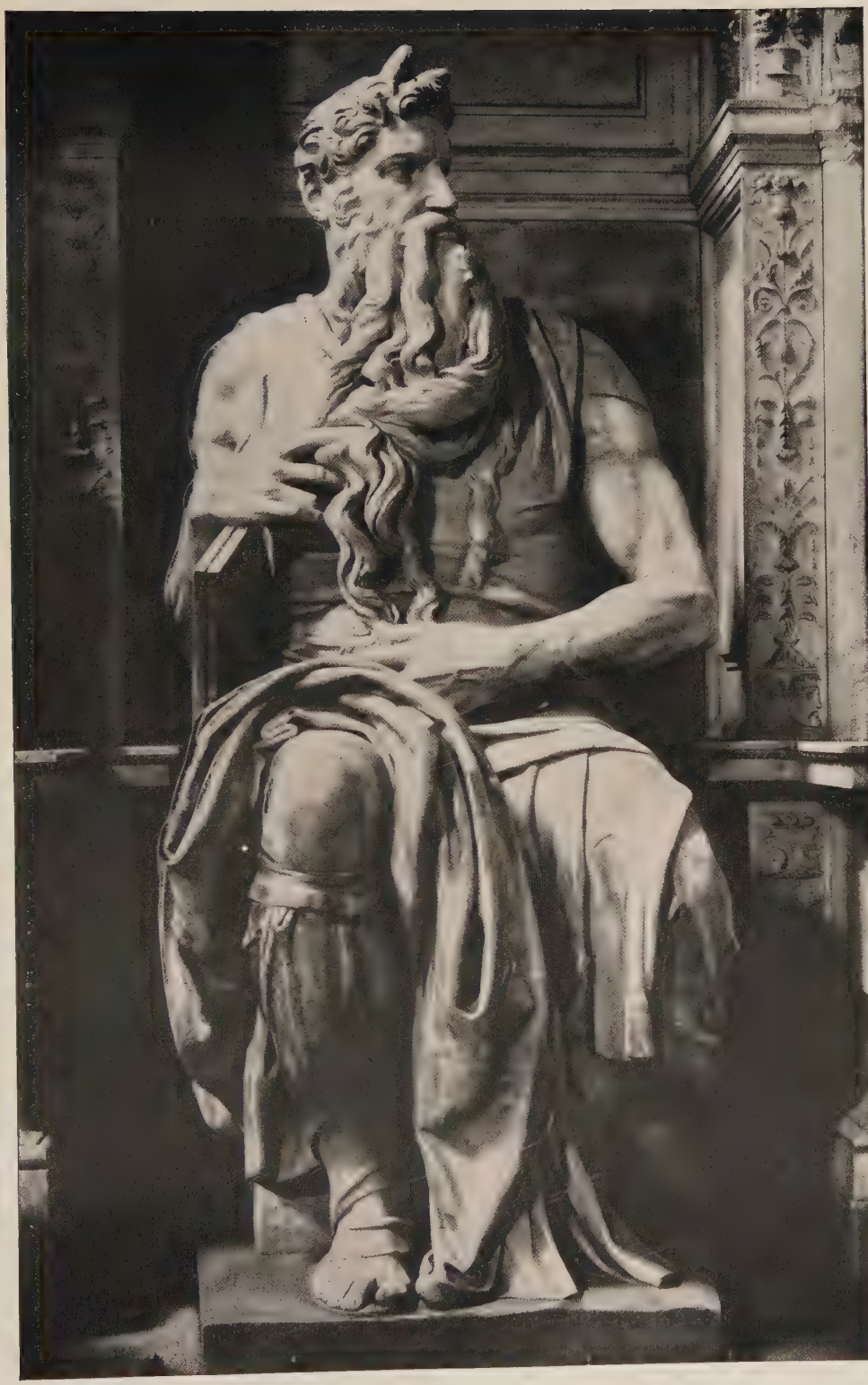
He had, perhaps, as perfect a command of line as has ever been achieved. For his own works, as well as independent of them, he drew great numbers of designs, sometimes as many as a dozen heads to evolve an ideal type. Nearly all the chief galleries of Europe possess specimens of these drawings. In early life the pen was his favorite instrument; but later, when he relied more upon memory, he preferred chalk as a softer medium. To this last period belong the most celebrated examples, like the "Phaeton," "Tityus," and "Ganymede," drawn for Tommaso Cavalieri; the series of designs for Christ's "Crucifixion" and "Deposition," meditative and deeply religious in mood; and the "Archers" (Windsor collection), nude figures of wonderful beauty and movement.

His knowledge of anatomy is probably more nearly perfect than that of any artist since the Greeks. He acquired it in long years of diligent study, not only of the nude model and of classic sculpture, but through use of the dissecting knife in a laboratory furnished by his enlightened friend, the prior of Santo Spirito in Florence. He preferred to represent the human body as highly developed, and he inclined to the male type. His women, likewise of fully developed charm, are mostly types of middle life, although he created a few youthful examples of rare beauty, like the Delphic sibyl and the Madonna of Bruges. Like the Greeks, he used the human figure as expressive of emotion, only that with him the emotion is particular instead of general. Unlike other Italians he generalizes the faces, refusing all portraiture.

Michelangelo was essentially a sculptor, and only painted under protest. As his sonnet so beautifully states, he saw in every block of marble an imprisoned idea awaiting the sculptor's art to be freed. He probably made previous sketches, and in his early period used the human model, but his usual method was to use only a small wax model. Unlike present-day sculptors, he did all the work, even the rough-hewing, himself. He finished the bodies first, reserving the heads for the last. In his paintings the essentially pictorial qualities of perspective, atmosphere, and light are absent; nor was he a colorist in the Venetian sense. His color scheme was broadly massive and subdued, being subordinated to the human figures in his pictures. His paintings are decorative in the highest sense, and in his artistic development they are of especial importance, because he found a more facile medium in painting than in sculpture for the expression of his titanic thoughts. His architecture was decorative rather than constructive. He regarded only the general effect, which he obtained by heavy masses of light and shade, requiring of detail only a sharp and effective formation. In the cupola of St. Peter's, however, he created a complete constructive masterpiece, as perfect as any of the early Renaissance.

Michelangelo's poetry was valued as highly by his contemporaries as were his other artistic activities. They admired especially its deep philosophic thought, in which respect he indeed stands above the other poets of his day. Indeed, the value of his poetry is rather psychological than literary; it is often obscure and labored in expression. But when his nature was stirred by powerful emotions it found expression in some of the most beautiful sonnets and madrigals in the Italian or any other language. Some of the very finest are dedicated to Vittoria Colonna and Tommaso Cavalieri; these are mostly love poems. Others, like madrigals on the loss of Florentine liberty, are patriotic in character, and many are deeply religious, expressing the dignified attitude of a great soul, calmly awaiting the end.

Bibliography. The most important sources for the life of Michelangelo are the documents preserved in the Casa Buonarroti, Florence, consisting mainly of letters to and from the artist, his poems, memoranda, contracts, and like material, and a large collection of his letters purchased by the British Museum in 1859 from one of the Buonarroti family. The latter were first made known to the public by Hermann Grimm in his *Leben Michelangelos;* a selection of the former was indifferently edited by Milanesi, *Le lettere di Michelangelo* (Florence, 1875), and by Sebastiano del Piombo, *Les correspondants de Michel Ange* (vol. i, "Sebastiano del Piombo," Paris, 1890). By far the best edition of the letters, comprising all of historical importance, many for the first time published, is that of Carl Frey (Berlin, 1899). A brief selection of these letters, affording a picture of the artist's life, will be found in Carden's *Michelan-*



MICHELANGELO

"MOSES," FROM THE STATUE IN THE CHURCH OF SAN PIETRO IN VINCOLI, ROME

gelo (Boston, 1915). Of high importance also are the contemporary biographies of Michelangelo. The earliest of these appeared in the first edition of Vasari's *Lives* (Florence, 1550). The inaccuracies of this account impelled Ascanio Condivi, then an inmate of Michelangelo's household, to write his brief biography (Rome, 1553; later ed., Pisa, 1823; Eng. trans. in Charles Holroyd, *Michael Angelo Buonarroti* (New York, 1904). Based on the recollection of the great artist himself, this is the most important and reliable source, after his correspondence. It was pirated without acknowledgment by Vasari in his second edition of the *Lives* (1568; ed. by Milanesi, Florence, 1878), who supplied valuable additional information on Michelangelo's later years. Both of these biographies, together with other contemporary biographical materials, are best edited by Frey, *Sammlung ausgewählter Biographien Vasaris* (Berlin, 1887).

To no artist of any epoch have so many works been devoted as to Michelangelo. Among the more important modern biographies are those of Duppa and Quatremère de Quincy, *Lives and Works of Michael Angelo and Raphael* (London, 1856); J. S. Harford (London, 1857); H. F. Grimm, *Leben Michaelangelos* (Hanover, 1860; 10th ed., Berlin, 1901; Eng. trans. by F. E. Bunnett, new ed., 2 vols., Boston, 1896); also Charles Clement (Paris, 1860; trans. in "Great Artist Series"); Aurelio Gotti (Florence, 1875); C. C. Black (London, 1875); C. H. Wilson (London, 1876); Perkins (Boston, 1878); A. H. Springer (Leipzig, 1892); Scheffler (Altenburg, 1892); J. A. Symonds (London, 1892; 3d ed., 2 vols., ib., 1899); Knackfuss (Bielefeld, 1895); Karl Justi (Leipzig, 1900), an able and scholarly work, to which his *Michelangelo, kritische Untersuchungen* (2 vols., ib., 1908) forms a valuable appendix; Ricci (Florence, 1901); R. S. Gower (London, 1903); Charles Holroyd (ib., 1903); Fritz Knapp, in the "Meisterwerke der Kunst Series" (Stuttgart, 1906); Hans Mackowsky (Berlin, 1908); Romain Rolland (Eng. trans., London, 1912), a romantic effusion; A. Gottschewski (Stuttgart, 1913). The first critical work was that of Grimm, in which the artist is sympathetically treated and with high literary skill. Although as much space is devoted to his time and environment as to the artist himself, it remains an admirable work for the general reader. Of value for the artist's youthful period is H. Wölfflin, *Die Jugendwerke Michelangelos* (Berlin, 1887). W. R. Valentiner, *The Late Years of Michelangelo* (New York, 1914), is a good, though brief, critical appreciation. A. H. Springer, *Raffael und Michelangelo* (Leipzig, 1892), is a work of sound learning and criticism; also "Youth of Michael Angelo," from Vasari's *Lives*, in *Old South Leaflets, Annual Series*, vol. ix, no. 7 (Boston, 1891); *Masters in Art*, vol. ii (ib., 1901), containing an exhaustive bibliography; John La Farge, *Great Masters* (New York, 1903); G. B. Rose, *Renaissance Masters* (3d ed., ib., 1908); J. A. Gobineau, *Renaissance* (ib., 1913); F. P. Stearns, *Midsummer of Italian Art* (Boston, 1914). The most complete English life, of high literary and historical value, is that of J. A. Symonds. Henry Thode, *Michelangelo und das Ende der Renaissance* (3 vols., Berlin, 1902–12), gives an exhaustive treatment from the psychological standpoint. The latest extensive biography, Karl Frey, *Michelagniolo Buonarroti* (Berlin, 1907 et seq.), is a monument of scholarship and painstaking research, from the historical rather than the art critical point of view. Michelangelo's drawings have been ably treated in Bernhard Berenson, *The Drawings of the Florentine Painters*, vol. ii (New York, 1903), and published in facsimile with comments by Frey (800 plates, Berlin, 1907 et seq.).

Michelangelo's poems suffered much by being known through the garbled and mutilated edition of his grandson, Michelangelo the younger. A more complete edition was that of Guasti (Florence, 1863); but the best is by Frey (Berlin, 1897). The best English translation is by J. A. Symonds (3d ed., New York, 1912). Consult also: Wilhelm Lang, *Michelangelo als Dichter* (Stuttgart, 1861); Gabriel Thomas, *Michel Ange, poète* (Paris, 1892); and the admirable essay of Walter Pater, in his *The Renaissance: Studies in Art and Poetry* (New York, 1912).

MICHELET, mē'shlâ', JULES (1798–1874). The greatest French historian of the Romantic school, born in Paris, Aug. 21, 1798, the son of a printer. He studied literature under Villemain (q.v.) and at 23 became professor of history in the Collège Rollin. He delivered lectures at the ancient Collège Sainte-Barbe and the Ecole Normale and, after the Liberal triumph in 1830, received an appointment at the Record Office, was made assistant of Guizot at the Sorbonne, and tutor of the Princess Clémentine. In 1838 he was made Academician and professor in the Collège de France, where he presently became involved in a bitter controversy with the Jesuits, the popular echoes of which may be felt in Sue's (q.v.) famous novel *Le juif errant*. In 1851 he refused the oath of allegiance to Napoleon, lost his offices, and lived mainly in Brittany and on the Riviera, giving himself wholly to literature, chiefly poetically romantic impressions of nature: *L'Oiseau* (1856); *L'Insecte* (1857); *La mer* (1861); *La montagne* (1868); of society, *L'Amour* (1858); *La femme* (1860); *La sorcière* (1862); *La bible de l'humanité* (1864); *Nos fils* (1869). From this imaginative and sociologic work he returned in his last years to history, adding 3 volumes (1872–75) to the 18 (1833–67) of his *Histoire de France* and bringing the narrative to Waterloo. Besides this monumental work he had contributed to history a *Précis d'histoire moderne* (1828); *Introduction à l'histoire universelle* (1831); *Origines du droit français* (1837); *Le procès des templiers* (1841–51); *Mémoires de Luther* (1845); and to religious and political controversy, *Les Jésuites* (in collaboration with Edgar Quinet, 1843); *Du prêtre et de la famille* (1845); *Du peuple* (1846). Characteristics of all Michelet's work are democratic enthusiasm, hatred of priests, sympathy for the oppressed, and a picturesque imagination that transformed vast learning into poetry and history into intuition. He is seldom an objective observer and rarely a dispassionate judge. Michelet's style, like his history, lacks continuity, it is striking rather than flowing, proceeds by leaps and bounds, appeals by rhythm as well as thought to emotion rather than reason. Michelet died at Hyères, Feb. 5, 1874. An edition of his *Works* in 40 volumes (1895 et seq.) is nearly completed. Besides the autobiographical *Ma jeunesse* (Paris, 1884) and *Mon journal* (ib., 1888), consult for his life: Jules Simon (Paris, 1886), F. Corréard (ib., 1886), J. Brunhes (ib.,

1898); Madame Quinet, *Cinquante ans d'amitié* (ib., 1900); Gabriel Monod, *Jules Michelet, études sur sa vie et ses œuvres, avec des fragments inédits* (ib., 1905); and for criticism: Taine, *Essais* (ib., 1855–56); Emile Faguet, *Politiques et moralistes du XIXe siècle* (ib., 1891); *Quarterly Review* (London, 1901).

MICHELET, mīsh'lā', KARL LUDWIG (1801–93). A German philosopher and follower of Hegel. He was born at Berlin and graduated at the University of Berlin. In 1829 he was appointed assistant professor of philosophy there. He published a large number of works on metaphysical subjects, including *Die Ethik des Aristoteles, etc.* (1827); *Das System der philosophischen Moral* (1828); *Geschichte der letzten Systeme der Philosophie in Deutschland von Kant bis Hegel* (1837–38); *Anthropologie und Psychologie* (1840); *Entwickelungsgeschichte der neuesten deutschen Philosophie* (1843); *Geschichte der Menschheit in ihrem Entwickelungsgang seit 1775* (1855–60); *Das System der Philosophie als exakter Wissenschaft* (1876–81); *Wahrheit aus meinem Leben* (1884), an autobiography; *Historisch-kritische Darstellung der dialektischen Methode Hegels* (1887), with S. H. Hering. From 1832 to 1842 he assisted in publishing the works of Hegel, whose best-known pupil he was, and from 1860 to 1873 he edited *Der Gedanke.*

MICHELET, mē'shĕ-lā', SIMON TEMSTRUP (1863–). A Norwegian theologian, born at Trondhjem. He was educated in Christiania, where he secured the Crown Prince's gold medal, and from 1888 at German universities. In 1894 he attained the doctorate in theology, and in 1896 he was appointed professor of Old Testament theology in the University of Christiania as Caspari's successor. His lecture at the Religious-Scientific Congress in Stockholm (1897) attracted much attention. In 1898 he studied in England and Scotland. He lectured extensively, and wrote many essays on the Old Testament, published in *Luthersk Kirketidende, For Kirke og Kultur,* and *Norsk theologisk Tidsskrift,* of which last he was coeditor after 1900. He wrote also *Det gamle Testamentes Syn paa Synden* (1899); *Gamle Helligdomme i nyt Lys* (1902); *Det gamle Testamentes Betydning for os.*

MICH'ELIN'IA. A fossil coral. See FAVOSITES.

MICHELL, mĭch'el, JOHN (1724–93). An English physicist and astronomer. He graduated at Queens' College, Cambridge, in 1748, became a fellow there the next year, and in 1762 was appointed professor of geology in the university. He invented the torsion balance, with the aid of which Cavendish later determined the mean density of the earth, and devised an "easy and expeditious method" of making magnets, described in a *Treatise of Artificial Magnets* (1750). He rendered important services to astronomy through numerous original contributions, including his *Enquiry into the Probable Parallax and Magnitude of the Fixed Stars from the Quantity of Light which they Afford us* (1767).

MICHELL, JOHN HENRY (?–). An Australian mathematician. He was a fellow of Trinity College, Cambridge, and later became assistant professor of mathematics at the University of Melbourne. In 1902 he was elected a fellow of the Royal Society. Michell became known for his researches in mathematical physics. His publications include: "Theory of Free Stream Lines," in the *Philosophical Transactions* (1890); "The Wave-Resistance of a Ship," in the *Philosophical Magazine* (1898); "The Stress in the Web of a Plate Girder," in the *Quarterly Journal of Mathematics* (1900); "The Direct Determination of Stress in an Elastic Solid," in the *Mathematical Society Proceedings;* and other papers in the same publications and in the *Messenger of Mathematics.*

MICHELOZZO, mē'kĕ-lŏt'sō, MICHELOZZI (1396–1472). One of the foremost Florentine architects of the early Renaissance, also a sculptor and goldsmith. Michelozzo was born at Florence, the son of Bartolommeo, a Burgundian tailor, who was made a citizen of Florence in 1376. His name is a variation of Michele. He was brought up as a die cutter and goldsmith and assisted Ghiberti on the doors of the baptistery. At an early period he appears to have come under the influence of Brunelleschi, and in 1425 he entered into an association with Donatello (q.v.), which lasted until about 1435. There is little independent sculpture which can be definitely ascribed to Michelozzo, but he probably had a greater part in Donatello's and Luca della Robbia's work than has been credited to him. The bas-reliefs of the Aragazzi Monument in the cathedral of Montepulciano, the silver figure of John the Baptist in the Opera del Duomo, Florence, a terra-cotta statue of the Baptist in the court of the church of the Annunziata, Florence, and a bronze statue of the same in the Bargello, Florence, are the best known of his independent works. They are classic in motive, dignified, and well proportioned, but lacking in imagination and freedom and realism of treatment. His principal importance is in architecture, to which he devoted himself from about 1435, and in this art he ranks second only to Brunelleschi in the annals of the early Renaissance. His style is classic, with reminiscences of the Gothic, and is distinguished by great simplicity of decoration. As preferred artistic adviser and court architect to Cosimo de' Medici, he secured wide and important commissions. In 1446 he succeeded Brunelleschi as superintendent of the Florentine cathedral, but appears to have done very little on that building. In 1437 he built the chapel of the Medici in Santa Croce, Florence, and between 1437 and 1452 superintended the construction of the monastery of San Marco in Florence. The library and the two courts, where the Ionic order appears for the first time in the Renaissance, are especially interesting. From 1444 to 1455 he was chief architect of the monastery of the Annunziata in Florence, and in 1447 constructed the tabernacle of the Holy Cross in San Miniato, Florence. In 1457 he went to Milan to rebuild the fine palace presented by Francesco Sforza to Cosimo de' Medici, the so-called Medici Bank. Of his work in this city only the chapel of the Portinari, on the exterior of Sant' Eustorgio, survives.

His most famous work, however, is the Riccardi Palace in Florence, built for the Medici, and probably begun about 1440. The Riccardi Palace, which is perhaps the finest city house in existence, is really only a development of the typical Florentine palace of the Middle Ages under the refining influence of classical ideals. The last of Michelozzo's larger undertakings, his work upon the Palazzo Vecchio in Florence, was begun in 1454. His last recorded work is the Palazzo Rettorale at Ragusa in Dalmatia

(1464). Consult: Geymüller, *Jahrbuch der königlich preussischen Sammlungen*, vol. xv; Fabriczy, ib., vol. xxv (1904); Fritz Wolff, *Michelozzo di Bartolommeo* (Strassburg, 1900); Wilhelm Bode, *Florentiner Bildhauer* (Berlin, 1910).

MICHELS, mĭk'els, Robert (1876–). A German sociologist, born in Cologne and educated at the universities of Paris, Munich, Leipzig, and Halle. He lived in Italy for two years before becoming docent at the University of Brussels (1905), and in 1907 became a teacher (later professor) of economics at the University of Turin. He was appointed professor of economics and statistics at the University of Basel in 1913. His works, in Hungarian, German, Dutch, French, and Italian, are particularly important in so far as they deal with Italy. Among them the following may be mentioned: *Brautstandsmoral* (1903); *Ethik und Patriotismus* (1906); *Borghesia e proletariato nel movimento socialisto italiano* (1907; in German, 1906); *Storia del Marxismo in Italia* (1908); *Zur Soziologie des Parteiwesens* (1910; also in French and Italian); *Sexual Ethics* (1914; in German, 1911; in Italian, 1912; in French, 1913); *Saggi economici sulle classe popolari* (1914); *Probleme der Sozialphilosophie* (1914); and, in part, *Grundriss der Sozialökonomik* (1914).

MICHELSEN, mē'kĕl-sĕn, Peter Christian Hersleb Kjerschow (1857–). A Norwegian statesman, born at Bergen. He became prominent as a lawyer and shipowner, was elected to the Storthing in 1891, and from the radical Left passed over in 1903 to the coalition of conservatives and liberals which was in favor of an amicable settlement of the consular representation dispute with Sweden. In October he entered the Hagerup ministry, representative of that party, first as member of the State Council at Stockholm and later as Minister of Finance. Upon the resignation of Hagerup in March, 1905, Michelsen formed a new cabinet, and with the unanimous support of the Storthing entered on a course of rapid action which culminated in the dissolution of the union with Sweden. (For details, see Norway.) Michelsen was instrumental in the election of Prince Charles of Denmark (Haakon VII) as King, and by the new monarch was appointed first Premier of independent Norway in November, 1905, which position he held until his resignation in October, 1907.

MICHELSON, mī'kel-son, Albert Abraham (1851–). An American physicist, born in Strelno, Germany, and brought up in San Francisco. He graduated from Annapolis in 1873, and after several years' service in the navy went abroad and studied at Berlin, Heidelberg, and Paris (1880–82). On his return to America, Michelson was professor of physics at the Case School of Applied Science, Cleveland, Ohio (1883–89), then held a like chair in Clark University (1889–92), and in 1892 became head of the department of physics in the University of Chicago. His determinations of the velocity of light were marked by a high degree of accuracy. These experiments were begun in 1878, when Michelson was at the Naval Academy, and were concluded in 1882. His invention in 1887 of an interferential refractometer enabled him to determine linear distances in terms of the wave length of light, and he was invited by the International Bureau of Weights and Measures at Paris to ascertain the length of the standard meter in terms of the wave length of cadmium light. This investigation, carried on at the laboratories of the Bureau at Sèvres, was of great importance in that it enabled the International Prototype Meter to be reproduced at any time by reference to certain known quantities which are not only constant, but also are readily reproducible. In connection with Professor Morley, Michelson carried on a series of elaborate experiments designed to show the relative motion of matter and ether. He also devised the echelon spectroscope, by which he was able to secure greater dispersion than with a prism, and thus was able to study the Zeeman effect and other phenomena. His interferometer as applied to astronomy in connection with the telescope was found useful in resolving the light from the stars. A new and more efficient dividing engine for the construction of diffraction gratings for use in spectroscopy also represented a notable achievement by Professor Michelson. In 1897 he was a member, for the United States, of the International Committee of Weights and Measures and in 1902–03 a member of the Bureau International des Poids et Mesures. He was elected to the National Academy of Sciences and to numerous foreign societies, and became president of the American Physical Society (1901–02) and of the American Association for the Advancement of Science (1910). He received various prizes and medals, including a grand prize at the Paris Exposition of 1900, the Copley medal of the Royal Society of London in 1907, and also in 1907 the Nobel prize for physics. In addition to honorary degrees from many American universities he received an honorary D.Sc. from Cambridge in 1899 and a Ph.D. from Göttingen in 1911. He published *Light Waves and their Uses* (1903), a notable course of lectures delivered at Lowell Institute, Boston, in 1899.

MICHETTI, mē-kĕt'tē, Francesco Paolo (1851–). An Italian genre painter, born at Tocco da Casauria in the Abruzzi. He studied under Morelli (q.v.) at the Naples Academy and identified himself with the modern realistic school of Italian painters. His works are genre subjects of peasant life in southern Italy, painted with a rich, dazzling color, dramatic insight, and versatility of style, but at times they are erotic and morbid. His "Corpus Domini" (1877), "Palm Sunday" (1879), "The Shepherdess of the Abruzzi" (Modern Gallery, Rome), "Peasant Girl" (Pennsylvania Academy), and above all "The Vow" (1883, Modern Gallery, Rome) are good examples of this school of Italian art.

MICHIE, mĭk'ĭ, Peter Smith (1839–1901). An American military engineer and writer. He was born in Brechin, Scotland, came to the United States in 1843, and was brought up in Cincinnati. He graduated second in the class of 1863 at West Point and entered the Engineer Corps; served in the campaign of 1864 against Richmond; was chief engineer of the Army of the James (1865); and was at the head of all engineering operations of the left column at Hatcher's Run and in the pursuit of Lee's army. After the war, having attained brevet rank of brigadier in 1865, he was for a year engaged in the government survey of the theatre of the war; from 1867 to 1869 he taught various branches at West Point; was member of a coastal fortification commission which visited

Europe in 1870; and for the last 30 years of his life was professor of natural and experimental philosophy at West Point. He wrote: *Elements of Wave Motion Relating to Sound and Light* (1882; 2d ed., 1891); *Life and Letters of Emory Upton* (1885); *The Personnel of the Seacoast Defense* (1887); *Elements of Analytical Mechanics* (1887); *Hydromechanics* (1888); *Practical Astronomy* (1891; 2d ed., 1893), with F. S. Harlow; *General McClellan*, in the "Great Commanders Series" (New York, 1901).

MICHIELS, mē'shĕ'ĕl', JOSEPH ALFRED XAVIER (1813–92). A French historian and writer on art and literature, born in Rome of Dutch-Burgundian parents. After studying law at Strassburg (1834) he made his home in Paris, where he devoted himself to the study of art and history. His writings, which display exact historical knowledge, critical ability, and careful research, include: *Etudes sur l'Allemagne* (1830; new ed., 1850); *Angleterre* (1844); *Histoire de la peinture flamande et hollandaise* (1845; new ed., enlarged, 1865–76) and its sequel, *L'Art flamand dans l'est et le midi de la France* (1877); *L'Architecture et la peinture en Europe depuis le Ve au XVIe siècle* (3d ed., 1873); *Rubens et l'école d'Anvers* (4th ed., 1877); *Histoire secrète du gouvernement autrichien* (4th ed., 1879); *Van Dyck et ses élèves* (1882).

MICHIGAN, mĭsh'ĭ-gan (Algonquin *michi*, great + *guma*, water), is one of the north-central States of the United States of America. Its area includes two large peninsulas, a northern and a southern peninsula, and several islands. Mackinac Island is one of the most historic areas in America. The international boundary line between the United States and the Dominion of Canada forms the eastern and most of the northern boundaries of the State. Ohio and Indiana lie to the south and Lake Michigan to the west of the southern peninsula. Wisconsin is south of the western part of the northern peninsula. The length and width of the northern peninsula are 318 miles and 164 miles respectively; of the southern peninsula, 277 miles and 195 miles respectively. The latitude extent is from 41° 44′ N. to 47° 30′ N. (Isle Royal is crossed midway by the forty-eighth parallel.) The longitude extent is from 82° 35′ W. to 90° 31′ W. Area, 57,980 square miles, including 500 square miles of inland waters, but not including the water surface of the Great Lakes within the State boundaries. Michigan ranks twenty-second in area among the States.

Topography. The northern peninsula is divided naturally into two provinces, one of considerable relief to the west of the meridian of Marquette and one of low relief to the east. The western part of the northern peninsula consists for the most part of a table-land 1600 to 1800 feet above the sea, or 1000 to 1200 feet above the level of Lake Superior (602 feet in altitude). Above this table-land rise many rocky knobs and ridges, some locally termed mountains, varying in height from 200 to 300 feet. Porcupine Mountains in the western part of Ontonagon County, on the border of Lake Superior, reach an altitude of 2000 to 2100 feet. These mountains are the highest and most conspicuous physiographic feature of the State. The eastern part of the northern peninsula is in general much lower in elevation and has less relief than the western. Much of the surface is ancient lake bottom. In the south and in the northwest there are low table-lands. The table-land in the south is of limestone (Niagara limestone), analogous in origin and topographic features to the Niagara escarpment in western New York. The table-land in the northwest, in Alger County and eastern Marquette County, is of sandstone. The north clifflike face, in places rising 100 to 200 feet sheer from the water surface of Lake Superior, and colored in shades of red, brown, and gray, and weathered and eroded into fantastic forms, constitutes the famous "pictured rocks" of Lake Superior.

The average altitude of the southern peninsula is estimated at about 850 feet, or 270 feet above the level of lakes Huron and Michigan (581 feet in altitude). The northern portion of the southern peninsula is occupied for the most part by a broad table-land bordered by gentle slopes. The surface of this table-land is from 1000 to 1200 feet above sea level. The highest point in the southern peninsula is a few miles southeast of Cadillac. Here two hills have altitudes of more than 1700 feet. A broad ridge of land in southeast Michigan extends from the southern boundary of the State in Hillsdale County northeastward as far as Sanilac County. Many square miles in this ridge are more than 1000 feet above the sea. The surface of this tract is very rough, hills and ridges alternating with lake-filled basins. The remainder of the surface of the southern peninsula has flat or rolling topography. Lake plains from 5 to 40 miles wide extend along the eastern border of the peninsula from Alpena southward to the Ohio boundary. Hills of sand (dunes) occupy a narrow belt along much of the west shore of the southern peninsula.

Hydrography. Michigan has no large rivers. Few of the rivers are navigable, except in their lower courses where the United States government has made improvements, by even small vessels. Many will furnish abundant water power when the power possibilities are fully developed. The numerous lakes and swamps and loose soil tend to give to the rivers a nearly continuous flow. Most of the drainage of the northern peninsula is tributary to Lake Michigan. The Menominee, Manistique, and Ontonagon rivers are the more important. The Menominee River has numerous power sites. One at White Rapids develops 8500 horse power from a 50-foot fall.

The drainage of the southern peninsula is about equally divided between east-flowing and west-flowing streams. The Saginaw basin (area 6250 square miles), the largest in the southern peninsula, is made up of several widely branching rivers. These rivers were an invaluable aid in concentrating the lumber industry in the Saginaw valley for so many years. Down them floated millions of feet of logs to the mills at Saginaw and Bay City. The United States government has spent more than $1,000,000 in dredging the Saginaw River, as far up as Saginaw, to a depth suitable for lake vessels. Grand River (drainage area 5600 square miles) furnishes water power at several points along its course. The lower course from Grand Rapids to the lake has been improved by the United States government so that it is navigable for small steamers. About $1,000,000 has been expended to provide a deep harbor at Grand Haven. The other important rivers are the St. Joseph, Kalamazoo, Muskegon, Manistee, Cheboygan, Thunder Bay, Au Sable, Huron, and Raisin. Most of

MICHIGAN
SCALE OF STATUTE MILES
0 5 10 20 30 40 50 60
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80
County Towns
Railroads
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
DOMINION OF CANADA
NORTHWEST PART OF MICHIGAN
Same scale as main map
KEWEENAW
Calumet
Laurium
Hancock
Houghton
Lake Linden
Dollar Bay
Portage L.
Chassell
Jacobsville
Keweenaw Bay
Eagle Harbor
Eagle River
Copper Falls Mine
Phoenix
Pilchark
Allouez
Gay
Demmon
Baraga
Alston
L'Anse
Silver
Herman
BARAGA
Keweenaw Pt.
Skanee
Pequaming
Big Bay Pt.
Bigbay
Big Bay
Dead R.
Marquette
Granite Pt.
Laughing Fish Pt.
Negaunee
Ishpeming
Sandso
Republic
Champion
Michigamme
Humboldt
Covington
Sidnaw
Nestoria
MARQUETTE
Perch L.
Witch Lake
Princeton
Amasa
Iron River
Crystal Falls
Stambaugh
Mansfield
Channing
Ralph
Sagola
IRON
DICKINSON
Metropolitan
Florence
Foster
Hardwood
Iron Mountain
Norway
Whitney
Loretto
Schaefer
Wells
Waucedah
Hermansville
Powers
Nadeau
Gourley
Bagley
Faithorn
Peshtigo R.
Menominee R.
MENOMINEE
Daggett
Stephenson
Koss
Cedar River
Ingalls
Wallace
Arthur Bay
Crivitz
Menominee
Marinette
Suring
Gillett
Oconto
Oconto R.
Shawano L.
Shawano
Sturgeon Bay
Egg Harbor
CHAMBERS I.
Ephraim
Peshtigo
Laona
Nadeau
Escanaba
Ford River
Gladstone
Big Bay
Pt. Au Sable
Grand Marais
Au Train
Munising
Onota
Au Train B.
Grand Portal
Pictured Rocks
Granite I.
Pt. Au Sable
Big Two Hearted R.
Little Two Hearted R.
Sheldrake
Whitefish Pt.
PARISIAN I.
WHITE FISH BAY
Pancake Pt.
BATCHEWANA I.
Vermilion
Emerson
Pickerman
Bay Mills
Strongs
Brimley
Rosedale
Sugar I.
Sault Ste. Marie
St. Marys R.
Parsons
LUCE
ALGER
SCHOOLCRAFT
CHIPPEWA
Munising
Newberry
McMillan
Lake Superior
Dollarville
Soney
Petrel
Wetmore
Limestone
Chatham
Carlshend
Forsyth
Turin
Winters
Trenary
Au Train R.
Au Train
Grand Marais
Germfask
Helmer
Soo Junction
Manistique L.
Trout Lake
Caffery
Donald
Curtis
Gould City
Garnet
Blaney
Steuben
Hiawatha
Uno
Indian L.
Hunspur
Viola
Naubinway
Epoufette
Kenneth
Hessel
Gulliver
Rapid River
Manistique
Thompson
Isabella
Nahma
Big Bay
Pt. Aux Barque
Vans Harbor
Garden
Cooks
Pt. Paterson
Slumons
Allenville
Cedarville
Detour
DRUMMOND I.
Maxton
Drummond
Rockview
Gatesville
Raber
Pickford
Rudyard
Dryburg
Strongville
Ozark
Dick
Tone
Barbeau
Neebish
ST. JOSEPH I.
North Channel
NORTH PASSAGE
JOHN I.
AID
COCKBURN I.
BARRIE I.
MANITOULIN I.
WESTERN DUCK
GREAT DUCK
OUTER DUCK
MACKINAC
Mackinac
Straits of Mackinac
Groscap
MACKINAC I.
Bois Blanc
BOIS BLANC I.
TO MACKINAC COUNTY
South Channel
Carp Lake
Bliss
Weadock
Cheboygan
Cross Village
Pellston
Mullet Lake
Alverno
Grace
Hammond
Alanson
Manning
Forty Mile Pt.
Goodhart
EMMET
Brutus
Odessa
Mullet L.
Black L.
Rogers
Adams Pt.
Harbor Springs
Lit. Traverse Bay
Bayshore
Bayview
Indian River
Allis
Millersburg
Hagensville
Presque Isle
Petoskey
Roundo
Tower
Onaway
PRESQUE ISLE
Walloon L.
Wolverine
Crowbridge
Metz
Posen
Bell
Long L.
CHARLEVOIX
Charlevoix
Ellsworth
Boyne City
Boyne Falls
Cornell
Leer
Long Rapids
Bolton
Alpena
Valentine
Hillman
Flanders
MONTMORENCY
Vanderbilt
Hetherton
Atlanta
ALPENA
North Pt.
Thunder Bay
Dafoe
Sprait
Osmeneken
Hubbard Lake
South Pt.
Blackriver
Sturgeon Pt.
Spruce
Hawes
Curran
Lincoln
McKinley
Hubbard L.
Cominsville
Judge
Redoak
Diggs
Hardgrove
Frederic
Cedar Creek
Kalkaska
Traverse City
Edgewater
Lake Ann
Cedar Run
Empire
Maple
Solon
Acme
Parker
Leelanau
Glen Arbor
Burdickville
Good Harbor
Sutton's Bay
Elk Rapids
Alden
Bellaire
Alba
Wetzel
Mancelona
Rapid City
Lestersville
Bayard
Waters
Otsego Lake
Johannesburg
Lewiston
Klein
Gaylord
Elmira
Central Lake
Eastport
Torch Lake
Torchlight
Northport
N. Manitou I.
Omena
Leland
NORTH MANITOU I.
SOUTH MANITOU I.
Suttons Bay
Grand Traverse
Traverse Bay
Lake Michigan
TO LEELANAU COUNTY
TO CHARLEVOIX COUNTY
NORTH FOX I.
Leelanau
WASHINGTON I.
Detroit Har.
ST. MARTIN I.
POVERTY I.
SUMMER I.
LIT. SUMMER I.
Pt. Detour
HIGH I.
BEAVER I.
GARDEN I.
HOG I.
St. James
Pt. Aux Barques
Big Bay
Ne Noc
Stonington
Fayette
Harris
Powers
Nadeau
Gourley
Bagley
Faithorn
Peshtigo R.
Menominee R.
Escanaba R.
Whitefish Bay
Whitefish Pt.
Pancake Pt.
Batchewana I.
Parisian I.
Pie I.
Blake Pt.
Isle Royal
Lake
Siskawit B.
Johns
Menagerie I.
Porcupine Mts.
Ontonagon
Lone Rock
Presque Isle Bluff
Greenland
Rockland
Victoria
Rubicon
Elmriver
Toivola
Fourteen Mile Pt.
Mineral Range
Montreal
Bessemer
Wakefield
Gogebic L.
Ironwood
Hurley
Gogebic
Dunbar
Marenisco
Matchwood
Ewen
Trout Cr.
Kenton
Bruce Crossing
Korelook
Robbins
Watersmeet
Merriott
State Line
WISCONSIN
Beacon Hill

L A K E M I C H
W I S C O N
I L L I N O I S
L A K E E R I E
C A N A D A
S A G I N A W B A Y
LAKE ST. CLAIR
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
HURON
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
TUSCOLA
SANILAC
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST. CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
Manistee
Ludington
Muskegon
Grand Haven
Holland
Grand Rapids
Big Rapids
Bay City
Saginaw
Flint
Port Huron
Lansing
Pontiac
Mt. Clemens
Detroit
Ann Arbor
Ypsilanti
Jackson
Battle Creek
Kalamazoo
Benton Harbor
St. Joseph
Coldwater
Adrian
Monroe
Milwaukee
Sheboygan
Fond du Lac
Racine
Kenosha
Waukegan
Chicago
87° Longitude C West 86° from D Greenwich 85°
84°
83°
A 88° B E F G
L.L. POATES ENGR'G CO., N.Y.

these rivers have been dredged for short distances in their lower courses to make them navigable for lake vessels, and hydroelectric plants have been located along most of them.

Geology. Michigan lies within the glaciated area of North America and for the most part the bed rock is deeply buried in glacial drift. The area of bed rock exposures (little or no drift) is less than 9 per cent of the area of the State. The bed rock of the State includes all the systems of Pre-Cambrian and nearly all the Paleozoic series.

Pre-Cambrian rocks in Michigan occur as bed rock only in the western part of the northern peninsula, west of the meridian of Marquette. These rocks—schists, gneisses, granites, conglomerates, and slates—and rich deposits of iron ore and copper have been folded and faulted and metamorphosed by pressure and igneous intrusions and extrusions, so that their structure is complex. They differ greatly in hardness. This has resulted in unequal weathering and degradation and, consequently, in a rugged topography. Much of this area is bare rock. Glacial drift partly fills the depressions.

Paleozoic rocks outcrop or underlie the glacial drift in the remainder of Michigan. These rocks are arranged like a pile of saucers in a series of diminishing sizes from bottom to top. Only the rims of the "saucers" are exposed at places. The oldest of the series, the Cambrian, underlies the surface deposits in the northern part of the northern peninsula from Sault Ste. Marie westward to Marquette, and gives rise to the rapids of the St. Mary's River and the sandstone table-land in Alger and Marquette counties. The youngest of the series (Pennsylvanian, containing coal seams) outcrops, or is reached by, wells and mine shafts, in a large area in the central part of the southern peninsula. The arrangement of the strata is such that gypsum is quarried or mined from the same formation at Alabaster, on Saginaw Bay, and at Grand Rapids. The same limestone is quarried at Alpena and Petoskey, and could be quarried in southeast Michigan but for the thick drift. The Paleozoic rocks in general are more easily eroded than the Pre-Cambrian. The location, shape, and size of lakes Michigan, Huron, and Erie, Green Bay and Georgian Bay, as well as some of the lowlands of the Lakes region, are undoubtedly due to differential erosion of the Ordovician, Silurian, and Devonian formations.

Climate. Michigan lies in the interior of the continent, partly in the cold temperate belt (with extreme winters and mild summers) and partly in the warm temperate belt (with cold winters and hot summers). Its position would naturally give it a high range of temperatures, daily, monthly, and annual; but owing to the tempering influence of the lake waters its climate for the most part is markedly insular. The climate is characterized by frequent changes of temperature, wind direction, and moisture conditions. The mean annual temperature for the State as a whole is 44° F. (48° F. for the southern counties of the State and 39° F. for the northern). The average summer maximum for the interior of the southern peninsula is 85° to 90° F.; for the lake shore counties, 80° to 85°. The extreme maximum temperature occasionally exceeds 100° F. Hot spells rarely last more than one or two days. The average winter minimum is about 0° F. for the northern peninsula and 10° F. for the southern peninsula.

At Marquette in the northern peninsula the average temperature for the coldest month, January, is 16° F.; for the warmest month, 65° F. Cheboygan has a February mean (coldest month) of 16° F., a July mean of 66° F. Detroit has a January mean of 25° F. and a July mean of 72° F.; Grand Haven, a January mean of 24° F. and a July mean of 69° F.

In the northern peninsula frosts may occur every month in the year, but summer frosts even in the interior are not severe. In general the growing season is from 90 to 120 days. The southern peninsula is free from frost on the average from May 1–15 to October 1–10—about 160 days in the southern counties and 130 days in the northern. The lakes tend to prolong the cold season and thus retard the early budding of fruit trees, check the occurrence of late frosts, and prolong the warm season into the autumn.

Michigan is well supplied with rain. The average precipitation is about 33 inches and is fairly evenly distributed over the State. About one-third of the rainfall comes in the growing season, May, June, and July. Snow covers the ground for five to six months on the average in the northern peninsula, about three to five in the southern peninsula.

Soils. The soils of Michigan are wholly glacial or fluvioglacial in origin, and wholly unlike the bed rock in chemical composition. Only in a few areas in the State has bed rock been incorporated in the overlying or near-by soil. In the southern peninsula the soils vary in thickness from a few inches to 700 or more feet; the average thickness is about 200 to 300 feet. According to Leverett 12 per cent of the southern peninsula is covered by swamp and lakes; about 56 per cent has a sandy or gravelly soil and 33 per cent clay soil. Much of the sandy areas has a subsoil of clay. In the southern part of the southern peninsula almost the entire area is in productive farms. Some counties in the northern half have less than 10 per cent of the area in farms, mainly because of thin and sandy soils. In the northern peninsula swamps and lakes cover 25 per cent of the area; about 30 per cent has sandy soil, 20 per cent clay soil, and 10 per cent thin soils. Thin soils and large areas of swamp and the short growing season explain in part the retarded agricultural development. At present in 12 of the 15 counties of the northern peninsula less than 10 per cent of the area is in farms.

Mining. In 1913 Michigan ranked eighth among the States in the value of its mineral production. It owes this prominence to its great wealth in two metals—copper and iron. In the production of iron ore it ranked second, being exceeded only by Minnesota; and in the production of copper fourth, being exceeded by Arizona, Montana, and Utah. The mining of copper in Michigan antedates the earliest visits of European explorers to the region. The production on a commercial scale, however, dates from 1845, since which time the State has been a steady producer and an important factor in the copper industry of the world. To the close of 1913 Michigan had produced 5,361,432,892 pounds of copper, or 28.43 per cent of the output from the United States since 1845. In total output it is second only to Montana. The mining of copper is limited to the Keweenaw or Lake Superior district. Previous to the perfection of the electrolytic process of refining,

"Lake" copper enjoyed the distinction of being the highest grade produced, and even to the present time it sells at a figure slightly higher than the copper from other districts. Although the copper district has been an active producer for 65 years, most of the older mines still have large reserves of ore and new mines are being opened, while much of the territory remains to be prospected. The Lake Superior region is unique in being the only district from which a large output is derived from native copper. (See *Geology*, above.) The native copper occurs in the lodes in masses varying from microscopic size to bodies weighing hundreds of tons. The production of refined copper in Michigan in 1912 was 231,112,228 pounds. In 1913 the production was 155,853,409 pounds, valued at $21,057,278. The great decrease in the output was due to labor troubles. The iron ores of Michigan, as of the other two States included in the Lake Superior region (Minnesota and Wisconsin), are hematites of Bessemer grade. In 1882 the Marquette and Menominee ranges were the only ones opened in the Lake Superior region. The production in the region in that year was a little short of 3,000,000 long tons, most of which was from Michigan. The Gogebic range was opened in 1884, as was also the Vermilion range, in Minnesota. The Mesabi range, in Minnesota, now the greatest iron producer in the world, was opened in 1892, but Michigan continued to lead in the production of iron ore until the first year of the twentieth century. The production of iron ore in the State in 1913 was 12,668,560 long tons, valued at $33,479,954.

The coal fields occupy an isolated area in the lower peninsula. It is only since about 1900 that these mines have been developed to a considerable extent, and whatever importance this industry has obtained is due to the decline of the lumber industry. In earlier years the refuse of the lumber mills furnished the principal fuel for the salt works, but the exhaustion of the forests and the decline of the lumber industry has created a demand for coal to supply the salt works and for the other manufacturing plants. The maximum production of coal was in 1907, when 2,035,858 tons were produced. The production in 1913 was 1,231,786 short tons, valued at $2,455,427.

Michigan ranks among the most important States in the manufacture of cement, which is third in importance among the State's industries. There were produced 4,081,281 barrels in 1913, valued at $4,228,879. In the value of the salt production Michigan and New York have for many years alternated as first in rank. In 1913 Michigan held first place. The salt production (exclusive of rock salt) amounted to 10,829,307 barrels, valued at $3,054,532 in 1913. At the time when salt making was subsidiary to the lumber industry the plants were largely located along the lake shore in Bay and Saginaw counties.

The principal clay products are common brick and drain tile. The value of the clay products was $2,674,125 in 1913. The mining and calcining of gypsum is an industry of considerable importance. There are produced also important quantities of sand and gravel. The principal quarry product is limestone, the value of which in 1913 was $1,408,708. Other commercial mineral products are occasional gems, lime, manganiferous ore, mineral paints, mineral waters, natural gas, petroleum, quartz, scythestones, and silver. The total value of the mineral products in 1913 was $72,143,211.

Agriculture. The soils of the south central and southwestern part are well suited to the production of corn, winter wheat, oats, and grass, while in the vicinity of the lakes much soil is especially suited to the production of sugar beets. In the northern part of the lower peninsula and in a limited portion of the upper peninsula are soils well suited to the production of Irish potatoes, buckwheat, rye, and clover. On the drained swamp lands that lie along the margins of lakes and rivers are many acres used for growing sugar beets, celery, onions, and cabbages.

The total number of farms in 1910 was 206,960. Of an approximate land area of 36,787,200 acres, the land in farms in 1910 was 18,940,614 acres. The improved land in farms in 1910 was 12,832,078 acres. The average acreage per farm was 91.5 in 1910. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry and bees, was, in 1910, $1,088,858,379. The average value of all property per farm was $5261 in 1910. Of the total number of all farms (206,960) in 1910, 174,271 were operated by owners and managers. In 1910 more than one-third of all Michigan farms were between 50 and 99 acres in size.

The native white farmers in 1910 numbered 147,790, the foreign-born white farmers 58,224, and the negro and other nonwhites 946. Of the foreign-born white farmers the greatest number were born in Canada.

The table below shows the acreage, value, and production of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	1,750,000	63,000,000	$42,210,000
Wheat	879,000	17,316,000	17,835,000
Oats	1,515,000	50,752,000	22,338,000
Barley	90,000	2,340,000	1,521,000
Rye	371,000	5,936,000	5,402,000
Buckwheat	57,000	1,054,000	748,000
Potatoes	364,000	44,044,000	13,213,000
Hay	2,352,000	*3,011,000	36,132,000

* Tons.

The total value of crops in 1909 was $162,005,000, and the combined acreage of crops for which acreage was reported was 8,198,578, representing 63.9 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that more than two-fifths of the total value of crops in 1909 was contributed by the cereals, more than one-fifth by hay and forage, and one-tenth by potatoes and other vegetables. In 1909 hay and forage was the leading crop; its acreage amounted to 2,715,301 and the production to 3,632,930 tons. The acreage of corn in that year was 1,589,596 and its production 52,906,842 bushels. The other leading crops, oats, wheat, and rye, had acreages of 1,429,076, 802,137, and 419,020 and produced 43,869,502, 16,025,791, and 5,814,394 bushels respectively. Aside from the cereals and hay and forage, the two most important crops were beans and potatoes.

The manufacture of cereals into prepared foods, which in recent years has become one of the leading industries, has resulted in greatly

increased acreages of corn, wheat, and other cereals.

The total acreage of potatoes and other vegetables was, in 1909, 456,368 and their value was $16,201,328. Excluding Irish potatoes and sweet potatoes and yams, the acreage of vegetables was 90,861 and their value was $6,287,000. As noted in the first part of this section large areas of land in Michigan are especially adapted to the growing of sugar beets, and this has become one of the most important agricultural industries. In the acreage and production of sugar beets Michigan is second, being surpassed only by Colorado. In 1909 the acreage planted to sugar beets was 78,779. The product amounted to 707,639 tons, valued at $4,014,123. The area planted to this product in 1913 was 107,965 acres, and the production 955,242 tons. There were, in 1913, 15 sugar-beet factories in operation. The refined sugar made from the raw product in that year amounted to 122,424 short tons.

Orchard fruits in large quantities are grown. The value of these products in 1909 was $9,020,842. The most important of these fruits was apples, of which 12,332,296 bushels, valued at $5,969,080, were grown. Large quantities of grapes are also grown. These in 1909 amounted to 120,695,997 pounds, valued at $1,531,057. Of small fruits, the total value in 1909 was $2,028,865, and of these 27,214,659 quarts were grown. The most important of these fruits is the strawberry. Michigan is one of the leading States in the growing of celery. Portions of its soil are particularly adapted to the growing of this vegetable. The State also produced the greater part of the peppermint and chicory grown in the United States.

Live Stock and Dairy Products. The growing of live stock has been superseded in importance by mining and the growing of fruits, vegetables, and other agricultural commodities. The total value of live stock of all kinds in 1910 was $137,803,795, and of domestic animals, $131,746,348. On Jan. 1, 1915, the estimated number of cattle other than milch cows was 707,000, valued at $21,069,000; milch cows, 814,000, valued at $49,247,000; horses, 673,000, valued at $88,836,000; mules, 4000, valued at $524,000; sheep, 2,033,000, valued at $10,165,000; swine, 1,392,000, valued at $15,173,000. Poultry of all kinds numbered in 1910 9,967,039, valued at $5,610,958. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $26,727,538. The milk sold was 74,025,769 gallons, and the butter sold amounted to 30,010,783 pounds.

Fisheries. Owing to its favorable position on four of the Great Lakes, Michigan ranks first among the Great Lake States in the value of its fishery products. There are no statistics of this industry prior to 1890, but in general it shows signs of growing importance. In all there are at least 23 species of fish caught, but lake trout, whitefish, lake herring, suckers, and various pike perches constitute, in the order named, the most important products. There were, in 1908, 3472 persons and 97 vessels of 1407 aggregate tonnage engaged in fisheries. The capital invested was $2,013,000. To the total value of products of $1,473,000 Lake Michigan contributed, in 1908, $661,000 and Lake Huron $486,000.

Forest Products. The lumber and timber industry dates from 1834, when the first steam saw mill was built in the Saginaw valley. Its growth thereafter was very rapid, and in 1849 there were 558 establishments reported, which employed an average of 2730 wage earners and turned out products valued at $2,464,000. The industry was at first concentrated along the borders of the Grand, Saginaw, and Muskegon rivers and their tributaries, and at certain of the lake ports. In former years the greater portions of the forest were conifers, though hard woods were intermingled with those in the South. White pine was originally the most abundant variety of wood, but the forests of this wood have been greatly depleted and this has necessitated the utilization of other woods, of which the State has a considerable supply. In 1909 the combined output of soft wood formed only little over one-half of the total cut. Hemlock contributed over two-thirds, and white pine only about one-fourth of the soft wood, while small quantities of spruce, cedar, tamarack, and balsam fir were also reported. Maple was by far the most important of the hard woods, while beech, basswood, birch, elm, and oak constituted most of the remainder. In 1909 the State ranked first in the cut of maple and beech. The method of exploiting the forests of the State has in past years been extremely wasteful. In recent years, however, a sentiment in favor of the adoption of improved methods of forestry has arisen, and a commission has been created to secure better protection of the forests. The total cut of rough lumber in 1909 was 1,889,724 M feet. There were cut also 218,308 thousands of lath and 891,649 thousands of shingles. In addition to these figures, forest products valued at $7,911,901 were produced on the farms of the State.

Manufactures. The growth of the manufacturing industries has been closely related to the development of the transportation facilities. Its advance dates from about 1825, when the Erie Canal was opened, affording connection with the eastern seaboard. Michigan's position on four of the Great Lakes, with the attendant facilities for water transportation, has been a great factor in establishing its position as one of the leading manufacturing States in the Union. There were, in 1910, 24 cities with a population of over 10,000. These, while containing but 37.1 per cent of the population, were credited with 88.5 per cent of the total value of its manufactures. The value of its manufactured products in 1849 amounted to $11,169,000; by 1869 it had increased to $118,395,000; and in 1909 it amounted to $685,109,000. The early development of manufactures was due largely to the utilization of its extensive forests, while the growing markets afforded by the rapidly developing West, the advantageous situation of the State with respect to the markets of both the East and the West, and its important agricultural and mineral resources have also been influential factors in its later progress. The table on page 586 gives the most important figures relative to the 10 leading manufactures for 1909 and 1904, as reported by the Bureau of the Census.

There were, in 1909, 58 industries for which products valued at more than $1,000,000 were reported. In addition to this there were 13 other industries with a product valued at this amount, which are not included in the table, because the operations of individual establishments would be disclosed if they were shown separately. Among such industries are the

smelting and refining of copper, which is among the leading industries. The manufacture of cash registers and calculating machines is another important industry for which separate statistics cannot be presented. This industry centres in Detroit and has developed almost entirely since 1904.

The manufacture of automobiles, including bodies and parts, is the most important single industry as measured by value of product. The manufacture of automobiles in Michigan on any considerable scale began in Detroit about the beginning of the twentieth century, although it had been carried on to a limited extent prior to that time. The industry developed rapidly, and by 1904 Michigan had become the leading State in the manufacture of automobiles, which position it held in 1909. In the latter year the State contributed 38.8 per cent of the total value of products for this industry. In 1909 there were produced 64,800 machines of all kinds, valued at $70,359,749, compared with 9125 machines, valued at $6,552,804 in 1899. The increase in production has been great since 1909 and has increased each year. In Detroit are located several of the largest manufactures of automobiles and parts. Industries connected with lumber and timber products are second in value of products. (For a more detailed account of this industry see the paragraph *Forest Products*, above.) In 1909 Michigan was the second State in the Union in the manufacture of furniture and first in the manufacture of refrigerators alone. The importance of the industry is due largely to the abundant available supply of pine and hard wood suitable for such manufactures. While the supply of such woods has diminished of late, the quantity of high-grade lumber imported has increased largely, and the industry has maintained the impetus afforded by its early natural advantages and has continued to prosper. Other leading industries are printing and publishing, manufactures of tobacco, tanning and currying of leather, manufacturing of paper and wood pulp, manufacturing of brass and bronze products, the manufacture of patent medicines and compounds and druggists' preparations, the manufacture of chemicals, and the manufacture of carriages and wagons and materials. The great development of the paper and wood pulp industry has been due to the more extensive use of wood pulp in the manufacture of paper. Other industries in addition to those mentioned in which Michigan holds high rank are the manufacture of stoves and furnaces and of corsets, the salt industry, wood distillation, and the manufacture of fur goods, show cases, and wall plaster.

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	9,159	271,071	231,499	$583,947	$118,968	$685,109	$316,497
	1904	7,446	200,196	175,229	337,894	81,279	429,120	199,039
Automobiles, including bodies and parts	1909	113	28,098	25,444	52,926	15,491	96,651	42,769
	1904	33	2,953	2,735	4,347	1,268	7,997	4,554
Butter, cheese, and condensed milk	1909	435	1,740	1,073	3,434	554	14,287	1,910
	1904	371	1,301	875	1,888	432	8,209	1,182
Flour-mill and gristmill products	1909	520	2,623	1,530	11,147	806	34,861	5,502
	1904	405	2,353	1,508	7,654	767	26,512	3,098
Foundry and machine-shop products	1909	654	25,334	21,649	48,065	12,344	45,399	26,688
	1904	452	18,604	16,396	23,167	8,657	31,434	17,348
Furniture and refrigerators	1909	202	18,299	16,610	28,222	8,300	28,642	16,924
	1904	142	15,602	14,565	17,768	6,468	20,502	11,862
Leather, tanned, curried, and finished	1909	24	2,440	2,291	12,012	1,133	15,331	3,210
	1904	25	1,852	1,747	6,861	866	9,340	2,069
Lumber and timber products	1909	1,180	39,011	35,627	57,290	16,298	61,514	32,472
	1904	1,058	37,124	34,193	48,771	15,995	57,217	32,488
Paper and wood pulp	1909	32	4,581	4,327	15,754	2,142	13,922	4,897
	1904	30	3,221	3,052	8,398	1,306	7,341	2,760
Printing and publishing	1909	1,045	11,048	7,219	13,725	4,000	17,348	12,413
	1904	937	8,650	5,999	9,079	2,981	12,050	8,626
Tobacco manufactures	1909	729	9,242	7,876	6,837	3,076	16,179	8,971
	1904	706	7,619	6,428	4,147	2,467	11,864	7,017

The total number of wage earners in the State in 1909 was 231,499, of whom 199,298 were males. The wage earners under 16 years of age numbered 2517, of whom 1521 were males. For nearly one-half of the wage earners employed in the industries of the State the hours of labor in 1909 were 60 a week.

There were two cities, Detroit and Grand Rapids, with a population of 100,000 and over, and these were the principal manufacturing cities. The average number of wage earners in Detroit in 1909 was 81,011, and the value of the manufactured products was $252,992,123. The manufacture of automobiles is by far the most

important single industry of the city. In Grand Rapids there were, in 1910, 17,590 wage earners, and the value of manufactured products was $42,230,675. By far the most important industry is the manufacture of furniture. It is, in fact, the recognized centre of the furniture industry in the United States. Flint, the third city in value of manufactured products in 1909, owes its advance to the development of the automobile industry. Battle Creek was fourth. Its chief product is the manufacture of cereal or "breakfast" food preparations, the output of which was valued at $9,717,000 in 1909, outranking all other cities in the United States in this manufacture. Other cities, the value of whose product in 1909 was $10,000,000 or over, were Saginaw, Kalamazoo, Lansing, Jackson, and Bay City. Further information relating to the manufacturing industries of these cities will be found under their separate titles in other portions of this work.

Transportation. The transportation facilities, both by rail and by water, are excellent. In 1909, with 9059 miles of railroad, Michigan was the sixth State in the length of its trackage. The mileage of single track on June 30, 1914, was 8898.89. The State borders on four of the Great Lakes, which furnish intrastate and interstate communication by water. Detroit, located on the main lines of several of the most important railroad systems connecting the Eastern States with the Middle West, and near the western end of Lake Erie, is particularly well situated as a commercial centre. The Great Lakes are connected by canals, and in addition a short canal connects the northern end of Lake Portage with Lake Superior. The New York Central and Hudson River system operated 1951 miles on June 30, 1914. The chief roads of this line in the State and their mileage on that date are the Michigan Central, 1199, and the Lake Shore and Michigan Southern, 587. The Grand Trunk system, of which the longest road in the State is the Grand Trunk Western (236 miles), operated 881 miles of main track. Other important roads with their mileage of single track were: Père Marquette, 1820; Chicago and Northwestern, 520; Duluth, South Shore and Atlantic, 509; Grand Rapids and Indiana, 429; Detroit and Mackinac, 400; Ann Arbor, 295; Minneapolis, St. Paul, and Sault Ste. Marie, 248; Chicago, Milwaukee, and St. Paul, 245.

Banks. The Bank of Michigan, organized in Detroit in 1817, was the first in the Territory. It incurred large losses in the panic of 1837–38, and was placed in the hands of trustees for liquidation in 1842. In 1835, shortly before Michigan was admitted as a State, nine new banks were organized. The free banking law of 1837 was the first in the United States to put into practice the system of securing the circulation of banks by deposit of collaterals. It also provided for examination of banks by bank commissioners. The law was imperfectly administered, however, and, in 1839, 42 banks were in the hands of receivers, and more than a million dollars of bills became worthless. In 1844 the banking law was declared unconstitutional. The banking system of the State did not recover from this depression for many years, and the banking business was carried on mainly by brokers and private bankers. In 1857 a new banking law was adopted, similar to the law of New York. On Sept. 12, 1914, there were 100 national banks with a capital of $17,069,730; surplus, $9,052,193; cash, etc., $2,993,101; loans, $114,304,546, and deposits, $140,851,238; 270 State banks with a capital of $14,469,800; surplus, $7,140,910; cash, $14,032,151; loans, $128,704,861, and deposits, $160,520,674.

Government. The present constitution was adopted by a constitutional convention on Feb. 21, 1908, and was ratified by the electors on November 3 of the same year. The original constitution was adopted in 1835. The second constitution was framed and adopted in 1850, when many features, radical for the time, were introduced. Amendments to the constitution may be proposed in either branch of the Legislature. If agreed to by two-thirds of both houses, they are submitted to the people at the next election, and become part of the constitution if ratified by a majority of the electors qualified to vote for members of the Legislature. Under a constitutional amendment ratified in 1913, amendments may also be proposed by petitions of not less than 10 per cent of the qualified electors, filed with the Secretary of State at least four months before election. Another amendment, also ratified in 1913, provides that statute laws may be enacted by the initiative and referendum.

Legislative.—The legislative power is vested in a Senate and a House of Representatives. The Senate consists of 32 members, who are elected for two years and by single districts. The House of Representatives consists of not less than 64 nor more than 100 members. The apportionment acts since 1861 have all fixed the number at 100. Representatives are chosen for two years and by single districts. Every 10 years, beginning with 1913, the Legislature is required by law to rearrange the senatorial districts and apportion anew the representatives among the counties and districts according to the number of inhabitants. The election of Senators and Representatives is held on the Tuesday succeeding the first Monday of November of every second year, dating from 1910. The Legislature meets on the first Wednesday in January of every second year, dating from 1909.

Executive.—The executive officers are a Governor, Lieutenant Governor, Secretary of State, State Treasurer, Auditor General, and Attorney-General. They are elected at each general biennial election for a term of two years. The chief executive power is vested in the Governor. No person is eligible to office of Governor or Lieutenant-Governor who has not attained the age of 30 years and who has not been five years a citizen of the United States and a resident of the State two years next preceding his election. The Lieutenant Governor is president of the Senate, but has no vote. The Secretary of State, State Treasurer, and Superintendent of Public Instruction constitute a board of State auditors, with the duty of examining and adjusting all claims against the State not otherwise provided by general law. They also constitute a board of State canvassers to determine the results of all elections of State officers. The same officers act as a State board of escheats and a board of fund commissioners.

Judiciary.—The judicial powers are vested in a supreme court, circuit courts, probate courts, justices of the peace, and such other courts of civil and criminal jurisdiction inferior to the supreme court as the Legislature may establish.

The supreme court consists of one chief justice and seven associate justices. The State is divided into judicial districts, in each of which there is elected one circuit judge, unless the Legislature provides for more. They are elected on the first Monday in April, dating from 1911, and serve for six years. In each county organized for judicial purposes there is a probate court. In addition to the ordinary powers these courts have original jurisdiction in all cases of juvenile delinquents and dependents. Judges of probate are elected in the counties in which they reside and hold office for four years.

Suffrage and Elections.—All males 21 years old or over who have resided in the State six months, and in the township or ward 20 days prior to the day of election, and who are included in one or more of the following categories are entitled to vote: (1) citizens of the United States; (2) those who were residing in the State on June 24, 1835; (3) foreigners who have resided in the State and who have, two years and six months prior to Nov. 8, 1894, declared their intention of acquiring citizenship; (4) civilized Indians who are natives of the United States. There is a primary election law, amended in 1913. All nominations must be made on the last Tuesday in August. Party candidates for United States Senator are also nominated at the primaries, and there is a provision for a presidential preferential primary. (See *History*, below.) A constitutional amendment was ratified in April, 1913, which provides for the recall of all elective public officers excepting judges of the courts. Women have the right to vote for members of school boards, and, if taxpayers of legal age, on questions involving the direct expenditure of public money or the issue of bonds.

Local and Municipal Government.—Each organized county is a body corporate, with such powers as shall be established by law. Each county may have a board of jury commissioners to be appointed by the Governor if it so votes. A board of supervisors, consisting of one from each organized township, has general charge of the administration of counties. Cities have such representation in the board of supervisors of the counties in which they are situated as may be provided by law. No county may incur an indebtedness which shall increase its total debt beyond 3 per cent of its assessed valuation. Each organized township is a body corporate, with such powers and immunities as may be prescribed by law. Each city and village has power and authority to frame, adopt, or amend its charter, and, through its regularly constituted authority, to pass all laws and ordinances relating to its municipal concerns, subject to the constitution and general laws of the State. Cities or villages may acquire, own, and operate their public utilities.

Miscellaneous Constitutional and Statutory Provisions.—Corporations may be formed under general laws, but shall not be created, nor shall any rights or privileges or franchises be conferred upon them, by special act of the Legislature. No corporation shall be created for a longer period than 30 years except for municipal, railroad, insurance, canal, or cemetery purposes, or corporations organized without any capital stock for religious, benevolent, social, or fraternal purposes. The Legislature may establish courts of conciliation, with such duties and powers as may be prescribed by law. Minors under 21 years of age may not be employed more than 60 hours in any one week, save in exceptional circumstances. There is an employers' liability law. Michigan is under county local option law and, under this, cities and towns vote annually for license or no-license. In 1909 a search and seizure law was enacted by the Legislature. The Legislature of 1913 passed a measure prohibiting the drinking of alcoholic liquors on trains other than dining cars, and prohibiting drunken men from riding on trains. The same Legislature passed what is known as the Pray Law. This prohibits the shipment of liquor designed for illegal purposes into dry territory, and is supplementary to the national Webb Law.

Finance. The first Legislature authorized in 1837 a loan of $5,000,000, which was to be devoted to public improvements. Only a small portion of the bonds were sold direct and paid in full. About two-thirds of them were deposited by the United States Bank of Pennsylvania, which failed in 1841 after selling some of the bonds. The State became liable for interest on these bonds, for which it never received any payment. It could not meet the interest payment in 1842, and an adjustment was reached which amounted to a partial repudiation of the State debt. In 1861 the debt was $2,316,328, which was increased during the war to $3,880,399. This, in 1880, fell to $905,150, and was decreased 10 years later to $10,993. In 1905 this debt was entirely paid off. By the Constitution of 1908, the State may contract debts to meet deficits in revenue, but such debts shall not in the aggregate at any time exceed $250,000. The funded debt on June 30, 1913, was $6,896,212. It consisted solely of special debt obligations to public trust funds, which were derived from the sale of all lands given by the United States to the State for educational purposes. The State has used these moneys for the expenses of the government, and pays interest to the various funds for the use of the same. The floating debt on June 30, 1913, was $192,880, which was composed of private trust funds in the form of various deposits. The total receipts for the fiscal year 1913 amounted to $13,434,472, and the disbursements $13,165,468. The balance at the beginning of the fiscal year was $8,980,404, leaving a balance at the end of the year of $9,249,408. The chief sources of revenue are the State tax, railroad tax, telephone and insurance taxes. The chief expenditures are for primary schools and educational and charitable institutions.

Militia. The organized militia consists of one brigade of infantry including the first, second, and third regiments, two troops of cavalry, a battalion, field artillery, a company of engineer corps, a company of signal troops, and companies of sanitary troops with a field hospital. The total strength of enlisted men in 1913 was 2551, the officers numbered 199. The males of militia age in the State in 1910 numbered 616,739.

Population. The population at various periods is as follows: 1810, 4762; 1830, 31,639; 1840, 212,267; 1850, 397,654; 1870, 1,184,059; 1890, 2,093,890; 1900, 2,420,982; 1910, 2,810,173. The est. pop. on July 1, 1914 was 2,976,030; 1920, 3,668,412. The State rose from twenty-seventh rank in 1830 to eighth in 1910. There were 48.9 persons to the square mile in 1910. The fertile prairie region of the south was the first portion settled, and the majority of the population is still

found in the southern half of the lower peninsula. The population, however, is steadily increasing in the more northern regions. The early settlers were largely from New England and New York, but a large German element made settlements about the middle of the nineteenth century. The nearness to Canada has resulted in a large Canadian element, greater than that of any other State except Massachusetts. The total white population in 1910 was 2,785,247. The native white population in 1910 was 1,224,841. The native whites of foreign or mixed parentage in 1910 numbered 964,882. The population in 1910 was divided by sexes into 1,454,534 males, and 1,355,639 females. The males of voting age in 1910 numbered 870,876. Detroit, the largest city, had in 1910 a population of 465,766. The estimated population of Detroit in 1914 was 537,650. Other large cities with their estimated populations in 1914 are as follows: Grand Rapids, 123,227; Saginaw, 52,988; Bay City, 47,047; Kalamazoo, 45,842; Flint, 49,546; Jackson, 34,097; Lansing, 37,512; Battle Creek, 28,122; Muskegon, 25,442; Ann Arbor, 14,948; Sault Ste. Marie, 13,499.

Education. Michigan has always been among the foremost States in the maintenance of high educational standards. The percentage of illiteracy in 1910 was only three and three-tenths per cent, and among the native white population it was only one per cent. The total number of illiterates in that year, of 10 years of age and upward, was 74,800. Of these 54,113 were foreign-born whites.

The total school population, ages 6 to 20 years, in 1910, was 796,887; of these 539,739 attended school in that year. The statistics of the State Superintendent of Public Instruction for the year ending June 30, 1913, show a school population in that year of 815,849 with a total enrollment of 572,201. The total number of teachers employed was 17,987. The average monthly salary of men teachers was $79.07 and of women teachers $52.03.

The Legislature in recent years has been particularly active in passing new educational measures and in the revision of old ones. The compulsory education law passed in 1905 was revised in 1911. It now includes the compulsory education of deaf and blind children. The Legislature of 1913 passed a measure governing the sale of text books in the State. It is estimated that approximately $100,000 annually will be saved by the operation of this law. Teachers' institutes are held yearly and these have been an important factor in keeping teachers in touch with advanced movements along educational lines. The high schools have shown a remarkable growth. An effort has been made to adapt the courses of studies in these schools to the needs of the communities in which they are placed. Since the beginning of the county normal system in 1903–04 these schools have furnished for the State 5850 teachers.

The schools in general are in charge of the district boards, which are elected annually and which have the power to vote taxes for school purposes, except for the erection of schoolhouses or additions, purchase of sites, and the payment of tuition in excess of $20 per year per pupil. The board of any school district which does not maintain a legal high school must on application pay up to $20 a year for each qualified student to any high school in the State.

By means of the township unit system all the various districts are united into one district with one board of five members to conduct all the schools of the township, instead of many boards. Towns with a population of 900 or over may be exempt from the unit system. A child-labor law passed in 1909 and amended in 1911 contains strict provisions in regard to the employment of children of school age. Special attention is given to the education of the backward and feeble-minded. Classes are conducted in Detroit, Grand Rapids, and elsewhere and at Lapeer a training school is carried on each summer for teachers of backward and mentally defective children.

The school districts may establish a vocational school or a gymnasium, and physical training must be taught in public schools in city school districts with a population greater than 10,000 and in all State normal schools.

The State normal schools include the Western State Normal School at Kalamazoo, the Northern State Normal School at Marquette, the Central State Normal School at Mount Pleasant, and the Michigan State Normal College at Ypsilanti.

The University of Michigan, at Ann Arbor, is a part of the educational system, as are also the Michigan Agricultural College, at East Lansing, and the Michigan School of Mines, at Houghton. The other colleges include Adrian College at Adrian, Albion College at Albion, Alma College at Alma, Hillsdale College at Hillsdale, Hope College at Holland, Kalamazoo College at Kalamazoo, and Olivet College at Olivet. These are all coeducational. The University of Detroit is a college for men only, under the auspices of the Roman Catholic church.

Charities and Corrections. The charitable and correctional institutions are under the control of the Board of Corrections and Charities. These institutions include Kalamazoo State Hospital, Pontiac State Hospital, Traverse City State Hospital, Newberry State Hospital, Ionia State Hospital, the Michigan Home for the Feeble-Minded and Epileptic at Lapeer, the State prisons at Jackson and Lansing, the Michigan Reformatory at Ionia, the Industrial School for Boys at Lansing, the State Industrial School for Girls at Adrian, the State Public School at Coldwater, the Michigan School for the Deaf at Flint, the Michigan School for the Blind at Lansing, the Michigan Employment Institution for the Blind at Saginaw, the Michigan Soldiers Home at Grand Rapids, the State Sanatorium at Howell, an additional State sanatorium for the care and treatment of persons afflicted with tuberculosis, and a farm colony for the care and treatment of epileptics. There are also under the care of the board juvenile courts, county agents for the care of the poor, maternity hospitals, and child caring and placing agencies. There is a uniform probation law passed in 1913. The medical and surgical treatment of dependent children is provided for, and provision is also made for the medical treatment of children of indigent parents. Dependent and neglected children are educated and cared for at the State Public School and in other institutions approved by the State Board of Corrections and Charities. The State has a parole law for inmates of jails and prisons.

Religion. The Methodist and the Roman Catholic churches are in the lead, followed in the order named by the Lutherans, Baptists, Presbyterians, Congregationalists, and Protestant Episcopalians.

History. Remains of ancient mines and mining implements have been found within the present limits of the State. The white discoverers and first settlers were French missionaries and fur traders, some of whom visited the site of Detroit as early as 1610. In 1641 French Jesuits found their way to the falls of the St. Mary. The first actual settlement by Europeans within the limits of the State was the mission at Sault Ste. Marie, founded by Father Marquette and others in 1668. Three years later Michilimackinac (now Mackinac Island) was established. In 1679 and 1686 forts were built at the mouth of the St. Joseph and at the outlet of Lake Huron, and in 1701 Antoine de la Mothe Cadillac founded Detroit. Through the entire period of French occupation the town dragged out a painful existence, though the centre of a considerable fur trade and a place of meeting for friendly Indian tribes. The territory, with other French possessions, fell into the hands of the English at the end of the French and Indian War. Detroit was occupied in 1763, but early in May of that year the Indians, loyal to the French, rose under Pontiac (q.v.), massacred the garrison at Mackinac Island, and besieged Detroit for about five months. The English showed no capacity for government and the country made no progress under their rule. By the Quebec Act of 1774 the territory became a part of Canada, and during the Revolution Detroit was the starting point for many Indian expeditions which laid waste the American frontier. By the Treaty of Paris in 1783 the region passed to the United States, although England did not at once relinquish possession. After 1784 the Indians of the Northwest, deeming themselves unjustly treated by the Americans, waged a bloody warfare against the western settlements till they were brought to terms by General Wayne in 1795. By the treaty of peace concluded in that year they ceded large tracts of land on the eastern shore of the southern peninsula of Michigan and in the north to the United States. It was not until June 11, 1796, that the United States took actual possession of Detroit, though the region was included within the boundaries of the Northwest Territory, so called, and amenable to the Ordinance of 1787. In 1800 Ohio was set off from the Northwest Territory, including the eastern portion of Michigan, but in 1802 the whole of the lower peninsula was annexed to the Territory of Indiana. Its southern boundary was a line drawn east from the southerly extreme of Lake Michigan to Lake Erie. At that time the white population of Michigan was about 4000, consisting for the most part of Canadian traders and *coureurs de bois*. On June 30, 1805, Michigan was set off as a separate Territory, with substantially its present limits, and Gen. William Hull was appointed Governor. During the War of 1812 the inhabitants were harassed by the British and Indians; Mackinac was captured by the British; Detroit was surrendered by Governor Hull (q.v.); and at Frenchtown, in 1813, a number of American prisoners of war were massacred by the Indians. (For military operations during the War of 1812, see UNITED STATES.) At different times after 1814 the Indians ceded large tracts of land, and by 1836 all the lower peninsula and part of the upper peninsula had been freed from Indian title. Surveys were made as early as 1816, and in 1818 a large tract of land was put on the market. In 1819 the Territory was authorized to send a delegate to Congress, and in 1823 the system of rule by a Governor and three judges was replaced by that of a Governor and a council of nine, selected from 18 chosen by the people; in 1825 the council was increased to 13, and after 1827 the members were elected by popular vote. In 1835 a State constitution was adopted by a convention called for that purpose, but the admission of Michigan into the Union was delayed by a dispute with Ohio concerning the southern boundary. (See TOLEDO WAR.) There was danger that the dispute would lead to bloodshed, but in 1836 Congress agreed to admit Michigan upon condition that she should surrender her claim to the disputed territory and accept in lieu thereof a larger area in the upper peninsula. The first convention called to consider this proposal, Jan. 26, 1836, rejected it, but it was accepted by a second in December, 1836, and on Jan. 26, 1837, Michigan was admitted into the Union. Michigan has consistently supported the Republican party, except for three lapses—in 1882 and 1883, when the Democrats and Greenback party in fusion elected their candidate for Governor, and in 1890 when the Democrats alone carried the State.

The constitution was revised in 1908 and went into effect the following year. Michigan was a consistently Republican State from 1890 until the rise of the Progressive party in 1912 broke the Republican strength. In the presidential election of 1908 Taft received 335,580 votes compared with 175,771 for Bryan. Warner, the Republican candidate for Governor, was elected by a plurality of only about 10,000 votes. In 1910 a United States Senator was for the first time nominated at direct primaries. Charles E. Townsend defeated Julius C. Burrows for the nomination, and was elected by the Legislature in 1911. Chase S. Osborn, a Republican with strong Progressive leanings, was elected Governor in 1910. By 1912 the Progressive party had developed great strength. Governor Osborn was one of the seven governors who signed a letter urging Mr. Roosevelt to be a candidate for the nomination in that year. Roosevelt carried the State in the presidential election of 1912, receiving 219,012 votes compared with 154,244 for Taft and 150,751 for Wilson. The Democrats succeeded in electing their candidate for Governor, W. N. Ferris, but the remainder of the ticket was Republican. At the same election an amendment providing that amendments to the constitution could be made by the initiative and referendum without recourse to the Legislature and an amendment providing ways for the recall of all elective and public officials except judges were also passed.

Governor Ferris was reëlected in 1914, defeating Mr. Osborn, who was a candidate for reelection. The Progressive vote showed a falling off from 214,584 in 1912 to 36,747 in 1914. The following have been governors of the State:

TERRITORIAL

William Hull	1805–13
Lewis Cass	1813–31
George B. Porter	1831–34
Stevens T. Mason	1834–35
John S. Homer	1835–36

STATE

Stevens T. Mason	Democrat	1836–40
William Woodbridge	Whig	1840–41
James W. Gordon (acting)	"	1841–42
John S. Barry	Democrat	1842–46
Alpheus Felch	"	1846–47

STATE — *Continued*

John S. Barry	Democrat	1850–52
Robert McClelland	"	1852–53
Andrew Parsons (acting)	"	1853–55
Kinsley S. Bingham	Republican	1855–59
Moses Wisner	"	1859–61
Austin Blair	"	1861–65
Henry H. Crapo	"	1865–69
Henry P. Baldwin	"	1869–73
John J. Bagley	"	1873–77
Charles M. Croswell	"	1877–81
David H. Jerome	"	1881–83
Josiah W. Begole	Democrat and Greenback	1883–85
Russell A. Alger	Republican	1885–87
Cyrus G. Luce	"	1887–91
Edwin B. Winans	Democrat	1891–93
John T. Rich	Republican	1893–97
Hazen S. Pingree	"	1897–1901
Aaron T. Bliss	"	1901–05
Fred M. Warner	"	1905–11
Chase S. Osborn	"	1911–13
Woodbridge N. Ferris	Democrat	1913–17
A. E. Sleeper	Republican	1917–21
Alexander J. Groesbeck	"	1921–

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MICHIGAN, Lake. The third largest freshwater lake in the world (the largest being Lake Superior) and the only one of the American Great Lakes which lies wholly within the United States. It is bounded on the north by Michigan, on the east by Michigan and Indiana, on the south by Indiana and Illinois, and on the west by Illinois, Wisconsin, and Michigan (Map: United States, J 2). It lies between lat. 41° 37′ and 46° 5′ N. and long. 84° 45′ and 88° W.; is 320 miles long (north and south), with an average width of 65 miles; and has an area of 22,400 square miles. Its drainage basin includes 68,100 square miles. The lake's surface lies 581 feet above mean sea level, and its maximum depth is 858 feet. A true tidal variation of 3 inches has been recorded at Chicago.

Currents of from 4 to 10 miles a day set northward along the east short towards the lake's outlet at Mackinac Strait, and heavy north or south winds affect its normal level, raising or lowering it at either extremity—sometimes sufficiently to interfere seriously with navigation. There is also considerable seasonal fluctuation, the highest level from this cause being reached in February and the lowest in July or August. The lake is connected with the Mississippi River (which may have been its ancient outlet) by means of the Chicago Drainage Canal (q.v.). Green Bay (about 100 miles long) on the west shore and Grand Traverse Bay (about 30 miles long) on the east shore are the principal indentations, besides which there are minor ones, such as Big Bay de Noc and Little Bay de Noc, just north of the entrance to Green Bay. This scarcity of harbors and shallowness of the water near the shores make navigation dangerous during the not infrequent heavy winds. An elaborate system of lighthouses, lightships, foghorns, buoys, weather-report and storm-signal stations, established and maintained by the Federal government, lessens these perils. There are no islands except in the northern portion of the lake, where are Beaver Island (about 50 miles long), Washington Island (at the entrance to Green Bay), and North Manitou and South Manitou islands (west of Grand Traverse Bay). In the winter months the northern reaches of the lake are frozen over, but the solid ice stops well north of Milwaukee. Mackinac Strait is usually closed from about the end of the first week in January until about the middle of April.

Lake Michigan receives no large rivers; the most considerable streams which flow into it are the Menominee and the Fox (qq.v.), which empty into Green Bay, and the Manistee, Muskegon, and Kalamazoo (qq.v.), which are Michigan rivers. The lake has important fisheries, especially of lake trout and salmon, which are exported in large quantities, both fresh and canned. Along the north shore is some rugged highland country, with one peak which reaches an altitude of about 1400 feet above sea level, and much of the east shore is skirted by sand hills from 100 to 250 feet high. Elsewhere, and especially along or near the southern portion of the lake, is some of the most productive agricultural land in the United States; and these conditions make the lake an exceedingly important medium in a huge trade in all kinds of grains, fruits, live stock, lumber, etc., as well as various metals and minerals which are also found near by. Chicago and Milwaukee (qq.v.) are the principal cities on the lake. Consult: "Sailing Directions for Lake Michigan, Green Bay, and the Strait of Mackinac," United States Navy, Hydrographic Office, *Publication No. 108 B* (Washington, 1906); "Survey of Northern and Northwestern Lakes," United States Lake Survey Office, *Bulletin No. 117* (Detroit, 1907); *The Gulf and St. Lawrence River*, published by the United States Navy, Hydrographic Office (3d ed., Washington, 1908). See Great Lakes.

MICHIGAN, University of. A coeducational State institution at Ann Arbor, Mich., chartered in 1837. According to the terms of the charter, branches were established at various places to serve as preparatory schools of the university. These existed only a short time and were the forerunners of the State high schools, which are now in intimate relation with the university. The institution was opened in 1841, graduating its first class in 1845. It is intended primarily for the higher education of residents of the State, but receives students from all parts of the country on payment of a small tuition fee. The governing body is a board of regents, elected for terms of eight years. The university is organized in eight departments: College of Literature, Science, and the Arts; College of Engineering and Architecture (opened in 1853); Medical School (1850); Law School (1859); College of Pharmacy; the Homœopathic Medical School (1875); the College of Dental Surgery (1875); and the Graduate School (separated from the other departments in 1912). Each department has its special faculty, with representation in the University Senate, which considers questions of common interest. The degrees conferred are bachelor and master of arts, science, engineering, architecture, and law; civil, mechanical, electrical, chemical, and marine engineer; and doctor of philosophy, science, medi-

cine, public health, dental surgery, and dental science. The total attendance in 1913–14, including the Summer Session, was 6500, of whom 2614 were students in the College of Literature, Science, and the Arts, 1332 in engineering, 123 in architecture, 288 in medicine, 612 in law, 107 in pharmacy, 78 in homœopathic medicine, 286 in dentistry, and 298 in the Graduate School. The total attendance of women, exclusive of the Summer School, was 857. The university, up to 1914, had conferred degrees on 29,614 persons, of whom over 3500 were women. The university was a pioneer in coeducation, women having first been admitted in 1870. They now constitute about one-third of the College of Literature, Science, and the Arts and about one-sixth of the student body. Coeducation at the university has been uniformly successful. The libraries of the university, including a number of important collections, aggregate 350,000 volumes. The university museums contain collections illustrative of natural history, the industrial arts, chemistry, materia medica, anatomy, archæology, ethnology, the fine arts, and history, including a very full Chinese exhibit sent by the Chinese government to the New Orleans Exposition and presented to the university in 1885. The Detroit Astronomical Observatory contains a meridian circle, mounted clocks, a 13-inch refracting telescope, and a reflecting telescope with a mirror 37⅝ inches in diameter, together with a set of horizontal and vertical seismographs. A smaller observatory is used in the work of instruction. There are two hospitals connected with the university, and the State Psychopathic Hospital is located in Ann Arbor in charge of the university. The Waterman Gymnasium, for men, and the Barbour Gymnasium, for women, are free to all students, and physical training is required of all freshmen. The general supervision of athletic sports is vested in a board of control of 11 members, five chosen from the University Senate, three from the alumni, and three from the Students' Athletic Association. The university is a member of the Northern Oratorical League, which includes the universities of Chicago, Minnesota, and Wisconsin, the State University of Iowa, Northwestern, and Oberlin. It belongs to the Central Debating League, with the University of Chicago and Northwestern University. Entrance to the colleges of literature, science, and the arts, engineering and architecture, and pharmacy is based upon examination or upon certificates from accredited schools. Two years of collegiate work are required for admission to the medical and law schools, and one year for admission to the dental college. The university has two dormitories for women, but no commons. Among other developments the establishment of courses in forestry, in marine engineering, in highway and in conservation engineering, in aëronautics, in wireless telegraphy, and in public health is noteworthy. The faculty in 1914 numbered 553. The endowment of the university was $940,284, and its gross income for 1913–14 was $2,202,860. The total value of the college property was $5,844,601, of which the grounds and buildings were valued at $3,910,179. The president in 1915 was Harry B. Hutchins. Consult E. E. Slosson, *Great American Universities* (New York, 1910).

MICHIGAN CITY. A city in Laporte Co., Ind., 56 miles by rail east of Chicago, Ill., on Lake Michigan and on the Père Marquette, the Lake Erie and Western, the Chicago, Indianapolis, and Louisville, and the Michigan Central railroads (Map: Indiana, D 1). It is the seat of the Northern Indiana State Prison and has a public library, a United States life-saving station, a public park on the lake front, and a soldiers' monument. There are good transportation facilities, to which are due the city's large commercial interests, the trade being principally in lumber, salt, and iron ore. The manufactures of railroad cars, chairs, hosiery and knit goods, lumber and products of lumber are important. The government, as provided by the charter of 1837 and numerous amendments thereto, is vested in a mayor, who holds office for four years, and a common council, which elects all administrative officials, excepting the statutory municipal officers, who are chosen by popular vote. The city owns and operates the water works. Michigan City was laid out in 1832, settled in the following year, and incorporated in 1837. Pop., 1900, 14,850; 1910, 19,027; 1914 (U. S. est.), 20,710; 1920, 19,457.

MICHIGAN COLLEGE OF MINES. A mining school at Houghton, Mich., established in 1885. There are nine college buildings, with a library of about 27,000 volumes. In 1913–14 there were 26 instructors and 138 students. Its financial support is derived from the State.

MICHIGAN HERRING. The cisco (q.v.).

MICHIGAN STATE AGRICULTURAL COLLEGE. A coeducational State institution at East Lansing, Mich., the oldest institution of its kind in the country. It was established in pursuance of a constitutional provision in 1855 and was opened in 1857. Its endowment consists of a fund of $990,000 derived from the sale of part of the lands (235,673 acres) given by the general government through the Act of 1862. There are five courses—agricultural, engineering, forestry, veterinary science, and women's or home economics—which were attended in 1914–15 by 1907 students under a faculty of 130. The library contained 33,000 volumes. Farmers' institutes are carried on annually in each county of the State, the total attendance at these schools in 1913–14 being about 214,000. The income from the endowment fund, with other government grants and State appropriations, amounted in 1914 to $358,000. In that year the buildings and grounds were valued at $585,600. The president in 1915 was J. L. Snyder, LL.D., Ph.D.

MICHMASH, mĭk'măsh. The site of the camp of the Philistines in the war at the beginning of Saul's reign, connected with the notable exploit of Jonathan (q.v.) related in 1 Sam. xiv. It was a town of Benjamin, about 7 miles north of Jerusalem. Its importance arose from its position on one of the two main roads from Jerusalem northward, at a point where the road descends into a steep and rugged valley. Josephus (*Ant.*, vi, 6, 2) gives a detailed account of Jonathan's exploit, which tallies well with the features of the locality to-day. Men of Michmash returned with Zerubbabel (Ezra ii. 27; Neh. vii. 31). It is mentioned in the forecast of an Assyrian invasion in Isa. x. 28 et seq. In the time of the Hasmonæans it became the headquarters of Jonathan (1 Macc. ix. 73) and was a large village in the time of Eusebius. It is the modern Makhmas, a village of 400 inhabitants. Near it the Wadi el Suweinit narrows into a ravine answering to the description of the passage of Michmash in 1 Sam. xiv. 4, 5, and the two "sharp rocks" have also been

identified. Consult Benzinger, in Baedeker's *Palestine and Syria* (5th ed., Leipzig, 1912).

MICHOACÁN, mē-chō'ä-kän'. A Pacific coast state of Mexico, bounded by the states of Jalisco, Guanajuato, and Querétaro on the north, Mexico on the east, Guerrero and the Pacific Ocean on the south, and Colima and Jalisco on the west (Map: Mexico, H 8). Area, 22,617 square miles. The surface is generally mountainous, although its highest elevations are below 13,000 feet. It is divided by the Sierra Madre Occidental into a northern region, which forms a part of the great central plateau, and a southern one, consisting of fertile valleys and wooded ranges, sloping gradually to the Balsas River and the Pacific Ocean. The northern region is rather flat and interspersed with numerous lakes, of which the largest are Chalapa, partly in the State of Jalisco, Cuitzeo, and Pátzcuaro. With the exception of the large rivers Lerma and Las Balsas, forming part of the boundaries, and the Tepalcatepec, a tributary of Las Balsas, crossing the state from east to west, the rivers are small. The climate is on the whole healthful, except in the southern part, where fever prevails to some extent. The soil is of remarkable fertility; the principal products are cereals in the more elevated parts and sugar cane, coffee, vanilla, tobacco, and other tropical plants in the valleys. An abundance of fine timber is found in the southern valleys and on the Pacific slope. The mining industry is important; the principal metals are gold, silver, copper, and iron. The Dos Estrellas mine, producing gold and silver, is the richest in the Republic. Stock raising is carried on to a considerable extent, and there is some manufacturing. The state lacks railway facilities, having only three short branches of the National railways, in the northern part. Pop., 1900, 935,808; 1910, 991,880. Capital, Morelia (q.v.). Michoacán was inhabited by the Taraseos, who had successfully resisted the domination of the Aztecs up to the time of the Conquest.

MICKIEWICZ, mits'kī-ā'vīch, ADAM (1798–1855). The greatest of Polish poets. He was born near Novogrodek, Lithuania; his father was a lawyer of the lesser nobility. Inclined to the study of nature, he took up mathematics and physics at the University of Vilna, which was at that time the centre of Polish national and intellectual life, but later passed to biology and literature (1815–19). After that he taught Latin and Polish at the Gymnasium in Kovno until 1823, publishing there the first collection of his poems in two volumes in 1822. To the legends, superstitions, and tales of the Polish nation contained in it Mickiewicz gave a wonderfully poetic form, and at one bound became the national poet of the Poles. The volumes contained two longer works, *Dziady* (Ancestors, Festival in Honor of the Dead), a romantic drama, and *Gražyna*, an historical epic. The former contains much autobiographical material. The poem is deficient in orderliness, the episodes being flung together with almost reckless freedom, but the chief theme—love—has, perhaps, never been better sung. *Gražyna* relates the noble death of a princess of that name, who dons the armor of her husband and thus disguised leads his army against the Teutonic Knights.

In 1824 Mickiewicz was arrested in Vilna on suspicion of revolutionary plotting and was sent to St. Petersburg. In the capital he formed a warm friendship with Pushkin, but soon went to Odessa (1825) as instructor in the Richelieu Lyceum. After nine months he visited the Crimea, and this was a turning point in his career. *The Crimean Sonnets* recording his impressions are glowing with Oriental color and graceful in form. In December, 1825, he obtained a position in the office of the Governor-General, Prince Golitzin, at Moscow. In 1828 he returned to St. Petersburg, and there published his second epic, *Conrad Wallenrod*, descriptive of the struggle of the Lithuanians against the Teutonic Knights. In 1829 the poet received permission to travel in Italy, Germany, and France. In Rome he became acquainted with Lamennais and Montalembert. In Weimar he met Goethe, who became greatly interested in him. After staying for a time in Rome, where he met James Fenimore Cooper, he started for Poland on hearing of the uprising of 1830, but, unable to cross the strictly guarded frontier, he went to Dresden, after lingering in Posen for a while, and soon settled in Paris. There he published in 1832 the famous *Books of the Polish Nation and Polish Pilgrimage* and the third part of his *Dziady*. In poverty and distress, he published in 1834 his masterpiece, *Sir Thaddeus* (*Pan Tadeusz*), a delightful portrayal of the life of Polish nobility at the beginning of the nineteenth century. In 1839 he was called to the chair of Latin literature at Lausanne and in the year following he was appointed the first incumbent of the newly founded chair of Slavic literatures at the Collège de France. But after a year or two, being influenced by one of his countrymen, Towianski, he began to intermingle his lectures with irrelevant discussions on politics, religion, and mysticism, and the French government was forced to stop his lectures in 1844. In 1848 he went to Italy and there undertook to form Polish regiments against Austria. Then, in 1849, he edited at Paris the *Tribune des Peuples*, which was soon stopped by the French government. In 1852 he was appointed a librarian in the Arsenal, and on the outbreak of the Crimean War Louis Napoleon sent him to Constantinople to organize Polish regiments against Russia. Here he died shortly afterward. He was buried in Paris; in 1890 his body was transferred to Cracow.

The best edition of Mickiewicz' works is that of 1838, in eight volumes, published in Paris, under the poet's personal supervision. The *Mélanges posthumes* were published in 1872–79 by his son Wladislaw, who also edited his father's *Correspondence* (1870–85). A critical edition of the poet's works was undertaken by the Mickiewicz Society (Lemberg, 1894 et seq.); the latest edition was prepared by Kallenbach (Cracow, 1911). They have been translated into most European languages. In French his *Chefs d'œuvre poétiques* appeared in 1882. His ballads and sonnets are to be found, in German, in Reclam's *Universal Bibliothek; Dziady* (Ahnenfeier), in German by Lipiner (Leipzig, 1887); *Gražyna*, in German by Nitschmann in *Iris* (ib., 1880); *Wallenrod*, by Weiss (Bremen, 1871); *Herr Thaddäus*, by Weiss (Leipzig, 1882) and Lipiner (ib., 1883). *Conrad Wallenrod* was translated into English by Leo Jablonski, and a poetical version of it by Cattley appeared in London in 1840. *Master Thaddeus* was rendered into English by Biggs (London, 1885). The best biography in French is by his son, Wladislaw Mickiewicz (Paris, 1888); revised and enlarged in Polish (Posen, 1890–94). In Polish there are, moreover, several biographies by

Chmielowski, Belcikowski, Kallenbach, and others; in Russian that of Pogodin (Moscow, 1912) is the latest. Consult M. M. Gardner, *Adam Mickiewicz, the National Poet of Poland* (New York, 1911).

MICKLE, mĭk"l, WILLIAM JULIUS (1735–88). A Scottish poet, born at Langholm, Dumfriesshire. Mickle failed as a brewer, settled in London as a writer, and became corrector to the Clarendon Press, Oxford (1765). In 1767 he published a narrative poem called *The Concubine*, reissued in 1778 as *Sir Martyn*. Excepting Thomson's *Castle of Indolence*, it is the best of the eighteenth-century imitations of Spenser's *Faerie Queene*. Retiring to a farm near Oxford, Mickle made a free version of the *Lusiad* of Camões (1775). To Evans's *Old Ballads* (1777–84) he contributed the fine ballad *Cumnor Hall*, which suggested Scott's *Kenilworth*. He may also have written the exquisite Scotch song *There's nae Luck about the Hoose* (ascribed also to Jean Adams). In 1779 Mickle went to Lisbon as secretary in the *Romney* man-of-war. He was most hospitably received and made a member of the Royal Academy of Portugal. He died at Forest Hill, not far from Oxford. Consult his *Poetical Works*, with biography, edited by Sim (London, 1807).

MIC'MAC. An important Algonquian tribe of Canada, occupying all of Nova Scotia, Cape Breton Island, and Prince Edward Island, with large portions of New Brunswick, Quebec, and Newfoundland. The name is of uncertain etymology. In all the colonial wars the Micmac sided with the French, those of southern Nova Scotia especially making a reputation by their inroads upon the New England settlements. They are now all civilized, fairly industrious as hunters, fishers, guides, and basket and curio makers, but without any appreciable desire to advance their condition; moral, sober, and law-abiding, and almost solidly Roman Catholic through the effort of early French missionaries and their successors. Their language and traditions have been investigated by the missionary Rand. Consult S. T. Rand, *Legends of the Micmacs* (New York, 1894).

MI'CON (Lat., from Gk. *Μίκων, Mikōn*). An Athenian painter and sculptor who flourished about the middle of the fifth century B.C., closely associated with Polygnotus (q.v.). He painted three of the walls of the Theseum, or Temple of Theseus, built by Cimon (not to be identified with the so-called temple of Theseus, still standing at Athens), and is said to have had a hand in the great picture of the battle of Marathon in the Stoa Poikile. He helped to decorate also the Anaceum, or Temple of the Dioscuri (Castor and Pollux), at Athens. (Consult E. A. Gardner, *Ancient Athens*, London, 1902, and C. H. Weller, *Athens and its Monuments*, New York, 1913.) He was especially skillful in the painting of horses.

MI'CROBE. A microscopic organism; especially applied to a bacterium. Various infectious diseases are caused by its presence. See BACTERIA.

MICROCEPH'ALUS. A condition in which the head is disproportionately small. The child is born with the skull completely ossified, or ossification takes place soon after birth. Normally the bones are separated by ununited sutures and by spaces called fontanelles, thus giving opportunity for expansion and growth of the brain. Microcephalics are generally deficient mentally, and may be abnormal in other ways. The bones of the cranium may be artificially separated by a surgical operation known as linear craniotomy, which in a measure restores the natural spaces between the bones. See MONSTROSITY.

MICROCHIROPTERA BAT. See CHIROPTERA.

MI'CROCLINE (from Gk. *μικρός, mikros*, small + *κλίνειν, klinein*, to incline). A potassium-aluminium (see POTASSIUM) silicate that crystallizes in the triclinic system and is near orthoclase in its properties, being a member of the triclinic group of feldspars (see FELDSPAR). It has a vitreous lustre and is white to cream yellow in color, and sometimes red or green. The green varieties are known as Amazon stone and are occasionally cut for semiprecious stones. The ordinary microcline, which is found both as crystals and in masses in granitic rocks, is of common occurrence; excellent specimens are found at Magnet Cove, Ark.

MI'CROCOC'CI. See BACTERIA.

MI'CROCON'ODON (Neo-Lat., from Gk. *μικρός, mikros*, small + *κῶνος, kōnos*, cone + *ὀδούς, odous*, tooth). A small fossil jaw of uncertain affinities found in the Triassic rocks. It has been considered by some American authors to belong to a group of vertebrates intermediate in position between the highest anomodont reptiles, the Theromorpha, and the lowest polyprotodont mammals. Consult Osborn, "On the Structure and Classification of the Mesozoic Mammalia," in *Journal of the Philadelphia Academy of Natural Sciences* (Philadelphia, 1888).

MI'CROCOSM (Lat. *microcosmus*, Gk. *μικρόκοσμος, mikrokosmos*, little world, from *μικρός, mikros*, small + *κόσμος, kosmos*, world) and **MAC'ROCOSM** (from Gk. *μακρός, makros*, great + *κόσμος, kosmos*, world). The belief, current in ancient times, that the world or cosmos was animated, or had a soul, led to the notion that the parts and members of organic beings must have their counterparts in the members of the cosmos. The natural philosophers of the sixteenth century took up this notion anew in a somewhat modified shape, and considered the world as a human organism on the large scale and man as a world, or cosmos, in miniature; hence they called man a microcosm and the universe itself the macrocosm. With this was associated the belief that the vital movements of the microcosm exactly corresponded to those of the macrocosm, and this led to the further assumption that the movements of the stars exercised an influence on the temperament and fortunes of men.

MI'CROCOS'MIC SALT, or SALT OF PHOSPHORUS. An ammonium-sodium-hydrogen phosphate, $NH_4NaHPO_4.4H_2O$, that crystallizes in the monoclinic system and is found native as the mineral *stercorite*. It was known to the older chemists, who extracted it from human urine. It may be made by dissolving crystallized sodium phosphate and ammonium chloride in water, heating the solution to boiling, then filtering and cooling to crystallization. On heating, the crystals melt readily, giving up water of crystallization, and later ammonia, and leaving sodium phosphate, which melts and solidifies on cooling to a clear colorless glass. It is used chiefly as a flux in blowpipe analysis.

MI'CROCY'CAS. A genus of cycads, one of the great groups of Gymnosperms, which is rep-

resented by a single species restricted to western Cuba.

MI'CRODIS'CUS (Neo-Lat., from Gk. *μικρός, mikros,* small + *δίσκος, diskos,* disk). A small Cambrian trilobite with body of oval outline, head and tail shields alike, and only three or four thoracic segments. Another name for the fossil is Goniodiscus. See AGNOSTUS; CAMBRIAN SYSTEM.

MI'CROFAR'AD. See FARAD.

MIC'ROLES'TES (Neo-Lat., from Gk. *μικρός, mikros,* small + *λῃστής, lēstēs,* robber). A small fossil jaw with multituberculate teeth found in the Triassic rocks of Württemberg and England. This fossil has figured prominently in discussions on the origin of the mammalia, and it is usually placed among the prototherian mammals; but, as the skull to which it belongs is entirely unknown, its exact systematic position is undeterminable, and it may prove to be the jaw of an anomodont reptile (Theromorpha) instead of that of a mammal.

MICROM'ETER (from Gk. *μικρός, mikros,* small + *μέτρον, metron,* measure). Any device by means of which it is possible to make a linear measurement more accurately by employing levers, screws, or magnifying glasses than by using a simple rule or scale. Figure 1 shows a simple form of lever micrometer adapted to the measurement of thicknesses, diameters, and the like. The movable lever *AB* turns on a pivot at *C*, and since the arm *CB* is five times as long as the arm *CA*, the pointer at the end of *B* will move over the scale *D* five times as far as the points are opened at *A*, and consequently the measurement is about five times as accurate as if a scale were applied directly. Figure 2 illustrates a form of simple screw micrometer. The screw has 10 threads to the inch, and consequently one complete revolution will remove the point of the screw *A* from the plate *C* one-tenth of an inch. The head *B* of the screw has its rim divided into 100 equal parts; hence a rotation of the screw through one of these parts means one one-hundredth of a complete revolution, and such a motion would remove the point from the plate by a distance of $\frac{1}{100}$ of $\frac{1}{10}$, or $\frac{1}{1000}$ inch. A very common form of screw micrometer, described and illustrated under CALIPERS, has 40 threads to the inch, and the head is divided into 25 parts, making the value of a scale division $\frac{1}{25}$ of $\frac{1}{40}$, or again $\frac{1}{1000}$ of an inch.

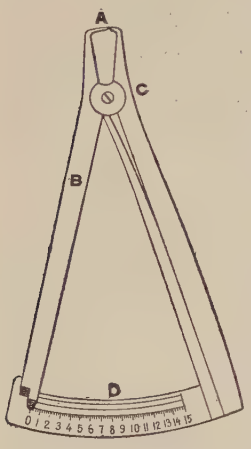

FIG. 1. LEVER MICROMETER.

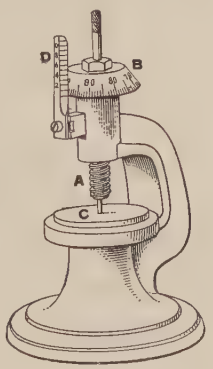

FIG. 2. SIMPLE BENCH MICROMETER.

In working with the telescope and the microscope it becomes necessary to make measurements upon the image formed by the objective, and for this purpose a micrometer ocular is employed. The simplest form of this device is a fine scale ruled upon glass in hundredths of an inch, or tenths of a millimeter, and so mounted in the draw tube that it will be seen distinctly by means of the eyepiece, and hence will be in the plane of the image formed by the objective. The scale appears to lie upon the object, and it is only necessary to read off the dimensions. A revolution of the draw tube makes measurements in different directions possible without moving the objective.

A more accurate and satisfactory micrometer ocular is that devised by Ramsden and illustrated in Fig. 3. *H* is the divided head of a micrometer screw *S* reading to a hundredth of a screw revolution, $\frac{1}{200}$ millimeter, e.g., where the pitch of the screw is a half millimeter. The screw is so arranged that it will cause a rectangular frame *AA* to move backward and forward as the screw revolves. Across the middle of the frame *AA* are stretched two fine spider lines, at right angles to the axis of the screw and quite close together. The whole device is so attached to the draw tube of the microscope or telescope that the spider lines lie in the focal plane of the objective and hence are distinctly seen magnified by the ocular. In making measurements with this instrument the screw *S* is turned until the spider lines straddle one point, and then a reading is made of the position of the head *H*. Next the screw is again turned until the lines straddle the other point, another reading is made, and the difference of the two readings gives the distance between the points upon the image. By placing a known scale, e.g., a tenth of a millimeter, upon the stage of the microscope, and measuring the image as above, the magnifying power of the microscope objective is obtained, and it is possible to calculate what distance upon the stage or in the object corresponds to one revolution of the micrometer screw. The whole number of revolutions of the screw is sometimes read by means of a second wheel so geared to *H* that it makes one revolution for 20 or 30 revolutions of the screw *S*. In other cases a strip of metal with small teeth like saw teeth, and as far apart as the threads of the screw *S*, is placed across

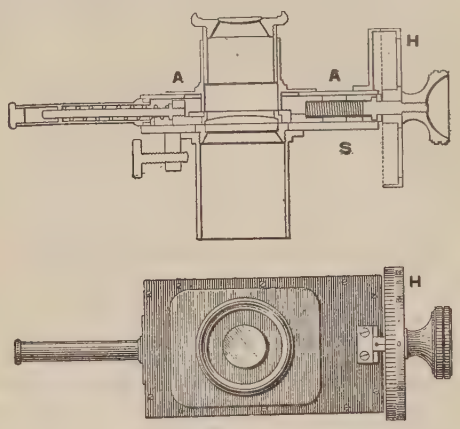

FIG. 3. MICROMETER OCULAR.

the side of the opening so that the double spider line appears to move over it from tooth to tooth, each tooth corresponding to one complete revolution of the screw. Such micrometers are used in measuring objects under the microscope, in most accurate linear and angular determinations, and in telescopes for obtaining star distances, and for a great variety of measurements. A very elaborate and delicate micrometer attached to the eye end of the telescope and used in star work is called a position micrometer. A special form of micrometer is used for measuring the star distances on the photographic plates that are taken of star groups and clusters. See MICROSCOPE; TELESCOPE.

MICROMETER CALIPERS. See CALIPERS; MICROMETER.

MI'CRONE'SIA (Neo-Lat., from Gk. *μικρός, mikros,* small + *νῆσος, nēsos,* island). A name of Greek origin, meaning "small islands." It is used to designate that part of Oceanica which consists of the Ladrone and Caroline islands, Marshall Islands, the Gilbert group, and many others of small size. All of these lie northwest of Polynesia, north of Melanesia, and east of the Philippines, between long. 130° and 180° E. The group also forms an ethnological division of Oceanica. (See MICRONESIANS.) Politically they were apportioned to Great Britain, the United States, and Germany, but in the War of 1914 Germany's islands were seized by the allies.

MI'CRONE'SIANS. The inhabitants of Micronesia (q.v.). They belong undoubtedly to the Malayo-Polynesian race, although the authorities differ concerning their ethnic purity. Finsch, who had personal knowledge of most Oceanian tribes, unites Micronesians and Polynesians under a single head, attaching to their separation a purely geographical, not anthropological, meaning. The languages of Micronesia are Melanesian. The mass differ in type slightly from the Polynesians; they are more hairy, are shorter, and their heads are more elongated. Culturally the Micronesians have developed considerable individuality. Adzes are usually of shell, even where excellent stone material is available. Matting and plaitwork are highly developed, and the Caroline Islanders even weave on a loom. Bark cloth, while not lacking, is far less common than in Polynesia. Shells are very largely used as currency. The Marshall Islanders are skilled mariners and in former times they constructed stick charts to guide their navigations. For part of the Micronesians (e.g., those of Ponape and the Marshall group) an exogamous clan system with maternal descent has been established, and the kinship terminology is of the classificatory type and of the form originally called "Malayan" and now "Hawaiian." In the Gilbert Islands the warlike natives used very dangerous spears and daggers set with sharks' teeth and wore a protective armor of coconut-fibre cuirasses, jacket, and trousers.

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MI'CROÖR'GANISM. See BACTERIA.

MI'CROPHONE. See TELEPHONE.

MI'CROPHOTOG'RAPHY, or PHOTOMICROGRAPHY. The art of photographing minute objects, generally microscopic preparations of bacteria or tissue, for the purpose of making illustrations or projections upon the screen. The apparatus consists of a large-barreled compound microscope and a suitable camera having a long bellows which fits over the eyepiece of the microscope to exclude all light except that illuminating the object to be photographed. Both microscope and camera are fixed upon an immovable base, free from vibration. Sunlight or artificial light may be utilized, the latter being derived either from a paraffin lamp, incandescent gas, oxyhydrogen, acetylene, or electric light. There is also provided by certain microscope makers an elaborate illuminating system of condensers and lights such as is used in a projection apparatus. When dealing with fields under a low power of magnification and using a paraffin lamp the substage condenser may be dispensed with; under high powers of magnification a substage achromatic condenser is required. The whole field must be evenly illuminated and the flame image eliminated. This is done in various ways: with the paraffin lamp, e.g., the flame image is focused accurately in the centre of the field and the light rays are then broken up by interposing a bull's-eye condenser. When using the oxyhydrogen light the lantern is removed far enough away to secure the requisite diffusion. Depending on the intensity of illumination and the character of the object, exposures vary from $\frac{1}{25}$ of a second to 10 minutes. The degree of amplification varies with the object and with the distance of the focusing screen from it. The amplification afforded at a given distance is determined by photographing, under exactly similar conditions, the lines of the micrometer slide. The manipulation of plates and holders and the developing methods are the same as in ordinary photography (q.v.). See also MICROSCOPE; MICROSCOPY.

MI'CROPYLE (from Gk. *μικρός, mikros,* small + *πύλη, pylē,* gate), IN PLANTS. The ovule of seed plants differs from the megasporangium of Pteridophytes in developing an integument of one or two layers. The body of the ovule (the real sporangium), covered by the integument, has been called the nucellus. In most cases the integument is not complete around the nucellus, but is open at its tip, and this passageway through the integument is called the micropyle. Through this micropyle the pollen tube usually reaches the nucellus. In some cases the integument is complete around the nucellus, and leaves no micropyle; also in quite a number of plants the pollen tube does not enter the ovule by way of the micropyle. (See CHALAZOGAMY.) When the structures connected with the ovule have developed into a seed the position of the micropyle is represented by a scar; and in the germination of the seed the tip (hypocotyl) of the embryo usually emerges through the seed coat at the micropyle. See OVULE.

MICRORADIOMETER. See RADIOMETER.

MI'CROSCOPE (from Gk. *μικρός, mikros,* small + *σκοπεῖν, skopein,* to view). An instrument by which objects are made to appear of greater magnitude. Undoubtedly the oldest miscroscope on record is a plano-convex lens of quartz found by A. H. Layard amid the ruins of Nineveh, surrounded by articles of bronze and other materials. It is now in the British Museum, and is 0.5 cm. (less than 0.2 inch) in thickness, 3.5 cm. (1.4 inches) in diameter, and its focal length is 10.7 cm. (about 4 inches). Many authorities believe with good reason that this lens was used as a burning glass, as similar ones were used for that purpose at the time of Socrates. On the other hand, there can be no doubt that such lenses were used as simple microscopes, or magnifying glasses, inasmuch as the apparent increase of size of an object seen through them must inevitably have attracted the attention of such good observers, and moreover the elaborate and delicate engraving on many of the seals and gems of that period furnishes sufficient evidence that some means must have been employed to aid the eye in executing this work. Spherical glass vessels filled with water would also have called attention to their employment as magnifiers; spherical drops of glass would act similarly.

During the later Middle Ages such simple lenses came more and more into use, especially as aids to the eye in ordinary vision, as spectacles. A spectacles maker of Middelburg, Holland, Zacharias Janssen, undoubtedly was the first to build a compound microscope, and about 1590 constructed such an instrument and presented it to Charles Albert, Archduke of Austria. It was nearly 6 feet long, supported upon brass dolphins on an ebony board. It contained only two lenses. Robert Hooke (1635–1703), secretary of the Royal Society, made many improvements in the construction and use of the microscope, and Divini in 1668 improved the instrument by using two plano-convex lenses as an eyepiece. (See below.) In 1686 Campani improved the form of the instrument and introduced the use of a screw for proper focusing. Nevertheless the development of the microscope took a different direction, on account of the serious difficulties with aberration (q.v.) in short-focus lenses, and under the influence of Leeuwenhoek attention was returned to the development of the simple microscope. Antony von Leeuwenhoek (1632–1723) constructed very efficient and convenient simple microscopes, developing the method already tried by Hooke and Hartsoeker of making high-power lenses by allowing a drop of molten glass to occupy a small hole in a plate of brass. Even a drop of water or oil was also used in this way. Leeuwenhoek is said to have made 247 microscopes, observing the circulation of the blood in the feet of frogs, spermatozoa, and many other interesting things. To this period belong also the names of Wilson (1708–88), Hartsoeker (1656–1724), Stephen Gray (?–1736), Jan van Musschenbroek (1687–1748), Leutmann (1667–1736), and others.

About this time Samuel Reyher (1635–1714) employed such a lens to project an image upon the wall or a screen, using the sunlight for illumination, and is thus probably the inventor of the solar microscope. Baker (1698–1774), with the aid of the mechanic Scarlett, constructed in 1736 a catoptric microscope, using mirrors instead of lenses in a manner suggested by the Gregorian telescope. But such instruments never came to be of much importance, since Dolland (1706–61) in 1757 confirmed the theoretical conclusions of Euler (1707–83) and Klingenstierna (1698–1765) that for the same refraction the dispersion might be different, and thereupon proceeded to construct an achromatic objective, i.e., a lens in which the color effects are eliminated by the use of two kinds of glass. Nevertheless the great difficulty of grinding such small lenses with sufficient accuracy for the correction of the errors due to aberration prevented their use in a manner at all commensurate with their successful employment in astronomical telescopes.

In 1823 Selligues and Chevalier departed from the plan of using only two lenses to correct aberration and employed two or three pairs of lenses (see Fig. 6), each pair consisting of a plano-concave of flint glass, which dispersed the colors far apart, combined with a double convex of crown glass, which has a low dispersion. In this way excellent achromatic objectives were produced. In the next year Tulley of London, upon the suggestion of Dr. Goring, constructed an achromatic combination of three lenses, without knowing of the work of Selligues and Chevalier. Amici of Modena had been endeavoring to produce achromatic microscope objectives as early as 1812, and, encouraged by the success of Selligues and Chevalier, he took up the work with new energy and produced in 1827 a combination much superior to any known at that time. His work was soon rivaled by that of Andrew Ross and Powell in London. J. J. Lister, as a result of his theoretical investigations, directed James Smith in the construction of an objective that surpassed all others in the perfection of its correction, angular aperture, and flatness of field.

With these lenses A. Ross soon discovered that the presence or absence of a cover glass over the object affects the success of the correction. In other words, he discovered that the cover glass must be considered as a part of the objective system. He pointed out that its effect may be counteracted by undercorrecting the first pair of lenses in the objective and overcorrecting the other two pairs; moreover, if the distance between the first and second pairs of lenses of the objective can be varied, this makes it possible to adapt the correction of the objective to various thicknesses in the cover glass and to various kinds of cover glasses.

For a long time the best microscope objectives of high power were composed of three pairs of achromatic lenses, but Amici himself tried a single plano-convex lens next to the object and recently this has become quite popular. (See Fig. 7.) Amici also pointed out that where very short-focus lenses are used a drop of water may be introduced between the cover glass and the first face of the objective, thereby reducing the loss of light. It is, however, evident that this would affect the refraction and dispersion of the system and hence throw out the correction. Apparently Amici was never able to adapt his systems to this method of use, and it remained for Hartnack and Nachet to succeed in constructing objectives for such use and to point out their great superiority in many ways over the older form, which came to be called "dry" objectives, in distinction from this new form, which were called "immersion" objectives. The immersion system has very great advantages

over the dry on account of the gain in light by avoiding the strong reflection from the front lens in air, also because the correction of the cover glass is greatly simplified, and besides the range, or working distance, is considerably increased. Naturally a lens constructed for immersion cannot be used satisfactorily for dry work, but Powell and Lealand so arranged their objectives that by exchanging the front lens it could be changed from dry to immersion or vice versa. Wenham still further improved upon this by so constructing the system that the objective could be changed from one form to the other by simply changing the distance between the first and second elements of the system, this being accomplished by turning a screw, as in correcting for cover glasses in dry systems. See Fig. 6.

Wenham also seems to have been the first to suggest the advantage of substituting for water a liquid which should have the same dispersion and refraction as the cover glass and first lens of the objective, and it is to the zeal and energy of Zeiss of Jena, under the able guidance of Dr. Abbé, that are due the almost perfect objectives which are available at the present day. The complex form shown in Fig. 7 is due to Abbé and is known as an "apochromat"; its corrections are so perfect that it appears that the theoretically ideal conditions have been reached. Bausch and Lomb in America and Carl Zeiss in Germany are now constructing lenses under the specifications of Dr. Abbé. It should be stated in this connection that the present great success in the construction of lenses of all sorts is in large measure due to the manufacture by Schott of Jena of glass upon scientific principles, so that it is not only possible to get glass with the same optical properties in large quantities and at any time, but it has been possible to make glass with just those optical properties which are wanted for any particular purpose. Objectives designed to be used as immersion lenses, with a liquid of refraction and dispersion identical with that of the glass in contact with the liquid, are called "homogeneous" immersion lenses. Oil of cedar and oil of fennel are well adapted to use with such objectives.

Simple Microscope. A simple lens, or a combination of two or more lenses nearer together than the sum of their focal lengths, and acting as a single lens, so used as to supplement the optical system of the eye and increase the apparent size of an object, is properly called a simple microscope, or magnifying glass. The observer judges of the size of an object by the

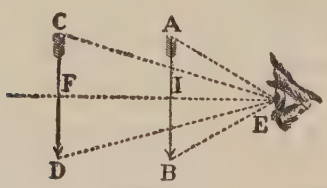


Fig. 1.

visual angle which it subtends. For example, *AB*, Fig. 1, appears larger than *CD* because the visual angle *AEB* is greater than the visual angle *CED*. Any device which increases the visual angle which an object subtends makes it appear larger. It is impracticable to bring the object indefinitely near to the eye and thus enlarge the visual angle, because the accommodation of the normal eye does not enable it so to adjust its optical system as to see distinctly an object much less than 20 to 25 cm. (8 or 10 inches) distant. In other words, the normal eye can bring to a sharp focus on the retina only such rays of light as are parallel or slightly divergent. If a convex lens is placed close in front of the eye and an object in front of it, and distant a little less than its focal length, as shown in Fig. 2, the lens will form a virtual

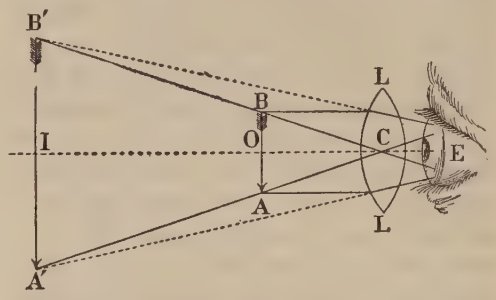


Fig. 2.

image *I* of the object *O* at *A′B′*, and the light issuing from *LL* is of such divergence as to be readily brought to a focus upon the retina by the lenses of the eye, and hence vision is distinct and the visual angle and apparent size of the object are increased. From a consideration of Fig. 1 it is evident that practically the apparent increase in size is approximately proportional to the decrease in distance between the object and the eye. Under the normal conditions that the distance *IE*, Fig. 1, is at least 20 to 25 cm. (8 to 10 inches), and we can see distinctly only a comparatively small area at once, the angle *AEB* is small and approximately proportional to the ratio of *AB* to *IE*, hence $AEB \div CED = FE \div IE$, and the visual angle is inversely proportional to the distance from the eye to the object. Applying this to Fig. 2 gives $A'B' \div AB = IC \div OC$, inasmuch as *C* is very close to the eye. *IC* is the distance of distinct vision and *OC* is practically the focal

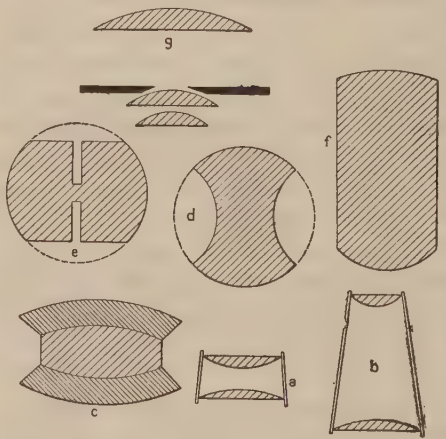


Fig. 3. LENSES FOR SIMPLE MICROSCOPE.

length of the lens *C*. It is hence evident that the magnifying power of a simple lens is equal to the ratio of its focal length to the distance of distinct vision. For example, a lens of a

focal length of 1 cm. (⅔ inch) would magnify 25 cm. ÷ 1 cm., or 25 diameters. Magnifying powers are always given in diameters, i.e., in the magnifying of any linear dimension and not of the area of the object.

Simple lenses of very short focus are not well adapted to obtaining very high magnifying power, on account of their chromatic and spherical aberrations, which render the image so colored and indistinct that accurate work is impracticable. A form of stand for simple microscope especially convenient for biological work is shown on the accompanying plate (Fig. 1). *A* is the lens or lens combination, *B* is the table for holding the object, and *D* is the mirror for concentrating light upon the latter; *C* is the rack and pinion enabling a convenient adjustment of the focus. Such instruments are useful for dissecting small organisms, and can be furnished with magnifying power up to 100 diameters. Fig. 3, above, shows several methods of obtaining strong combinations with less aberration and without the cost of elaborate correction. Fraunhofer designed the doublet *a*; *b* is a form used by Wilson; *c* is a so-called aplanatic triplet by Steinheil; *e* is the original Coddington, modified to the form *d* by Brewster, and *f* is the common cylindrical lens that obtains good results on account of the slight curvature of the face nearest the object; *g* is the original Holland triplet in which the diaphragm cuts off the stray light and improves the correction greatly, a result attained in *e* and *d* by the side cuts in towards the axis. Wollaston pointed out that the improvement in using the two lenses is in the fact that the aberration of one is in large measure corrected by the other, the diaphragm serving to cut off that portion of stray light which would interfere with the distinctness of the image. The field of vision is also larger and more nearly flat than when a single lens is used.

Compound Microscope. In its simplest form as invented by Janssen the compound microscope consists of two lenses as shown in Fig. 4. The so-called objective lens *cd* forms a greatly enlarged image of the object *ab* at *a′b′*. The eyepiece *lm* is a simple microscope, or magnifying glass, and the eye of the observer is at *e*. The magnifying power of such a combination is obtained as follows: the image *a′b′* is larger than the object in the proportion of *b′c* to *ca*, and the eyepiece *lm* magnifies the image *a′b′* in the proportion of its focal length to the distance of distinct vision, 25 cm. In a particular case, suppose *ca* is 0.2 cm., *cb′* is 20 cm., and the focal length of *lm* is 2 cm. Then the image *a′b′* will be larger than the object in the proportion of 20 to 0.2, i.e., 100, and the eyepiece *lm* will magnify the image in the ratio of 25 cm. to 2 cm., i.e., 12.5, and the total apparent increase in size will be 100 × 12.5, or 1250 diameters. The Huygens eyepiece, so called from its inventor, is also called a negative eyepiece, because the two lenses are too far apart to make its use possible in the same manner as other forms. The action of this eyepiece is shown in Fig. 5 and also on the accompanying plate. The objective would form an image at *aa* if it were not that the lens *ff* of the eyepiece is introduced, and consequently the combined effect is to form the image really at *bb;* this is then viewed by the eye lens *ee*. A diaphragm is interposed at *bb* to cut off stray light and improve the distinctness. *ff* is called the field lens of the eyepiece and *ee* is the eye lens. The great advantage of this form of eyepiece lies in the fact that the chromatic and spherical aberration of the field lens *ff* is opposite and about equal to that of the eye lens *ee*. Although this lens is very satisfactory for general microscopic work it is practically little used where it is necessary to use a micrometer (q.v.) in the eyepiece, or a cross hair.

Naturally the most important optical part of the microscope is the objective, as upon its perfection depend the satisfactory results of the whole combination. In its simplest form it is only a plano-convex lens with its flat side towards the object. As usually seen it is as

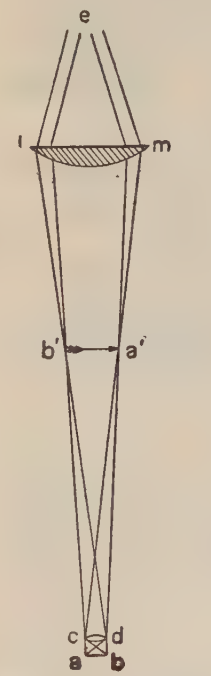


FIG. 4. SIMPLE COMPOUND.

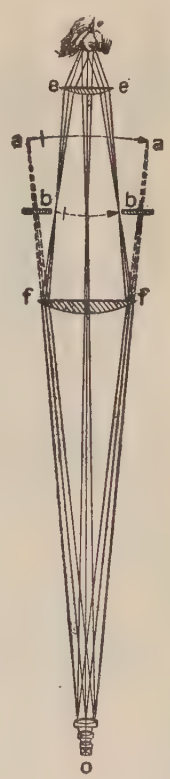


FIG. 5. COMPOUND MICROSCOPE WITH HUYGENS EYEPIECE.

shown in Fig. 6, with two or more achromatic pairs; the Zeiss objective there shown also illustrates how the cover-glass correction is accomplished by varying the distance between the first two and the last two pairs of the objective, by means of a screw *E*. Figure 7 illustrates the lenses of one of Dr. Abbé's most perfect objectives, the "apochromat." In general the eyepiece must not be astigmatic, i.e., it must be able to form a sharp image of a point. It must be orthoscopic, i.e., it must magnify all parts of the image equally. It must be achromatic, i.e., it must not show any colors not really present in the object.

The above characteristics must also be possessed by the objective even more essentially and perfectly than the eyepiece. In addition it is necessary to understand what is meant by other peculiarities of the objective. Under "aperture" is meant the angle between the limit-

ing rays of the effective beam in the formation of the image by the objective, e.g., the angle *cad* or *cbd*, Fig. 4. This is naturally affected by the index of refraction of the medium between the object and the objective, and would hence be different with the same objective if it were used dry, as water immersion, or homogeneous immersion, and consequently it has been proposed to use the product of the sine of half this angle by the index of refraction as indicating the effective aperture irrespective of the method of using the objective, and this constant is called the numerical aperture. The resolving power of an objective must not be confused with the mag-

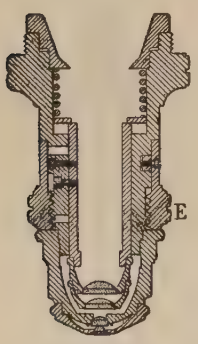


FIG. 6. SECTION OF ZEISS OBJECTIVE.

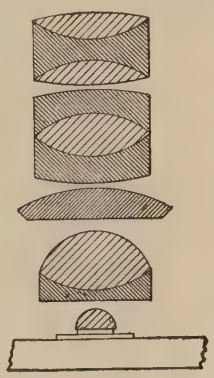


FIG. 7. "APOCHROMAT" OF ABBÉ.

nifying power, for theoretically any desired degree of magnification can be obtained, but there is a definite limit to the resolving power set by diffraction phenomena, as pointed out by Dr. Abbé. Owing to the fact that a lens on account of diffraction is not able to form an actual point, as the image of a point, it is evident that if the little rings which are formed overlap, then no degree of further magnification can separate them, and they will confuse the vision. It has been shown that the success of an objective in gathering in all the components due to diffraction is directly dependent upon the numerical aperture. Abbé has calculated that the theoretical limit of resolving power for an aperture of 180° would be lines about 120,000 to the inch, falling to about 95,000 for 107°. This has been nearly reached in some of the best instruments. Theoretically two lines must be distant from each other at least $\lambda/2a$, in order to be seen distinctly, where a is the numerical aperture and λ is the wave length of the light.

While Abbé succeeded in increasing the resolving power of the microscope by increasing its numerical aperture a (i.e., by decreasing the value of the fraction $\lambda/2a$), Koehler attacked the problem by decreasing the value of λ. As a source of light he employed the intense *cd* line of wave length 275 $\mu\mu$ lying in the ultra-violet. The entire optical system of the microscope was made of crystal quartz and the results were obtained by photography. Thus, by using light of wave length 275 $\mu\mu$, which is but one-half as great as that of visible green light (λ = 550 $\mu\mu$), and by using an immersion of glycerin and water (thus increasing the value of a), a great increase in the resolving power was attained. Photographs of diatoms obtained by this procedure showed a wealth of detail never before observed. Another advantage to be derived by this method is that different portions of a cell possess different transparency towards ultra-violet light and thus become visible in the final photograph.

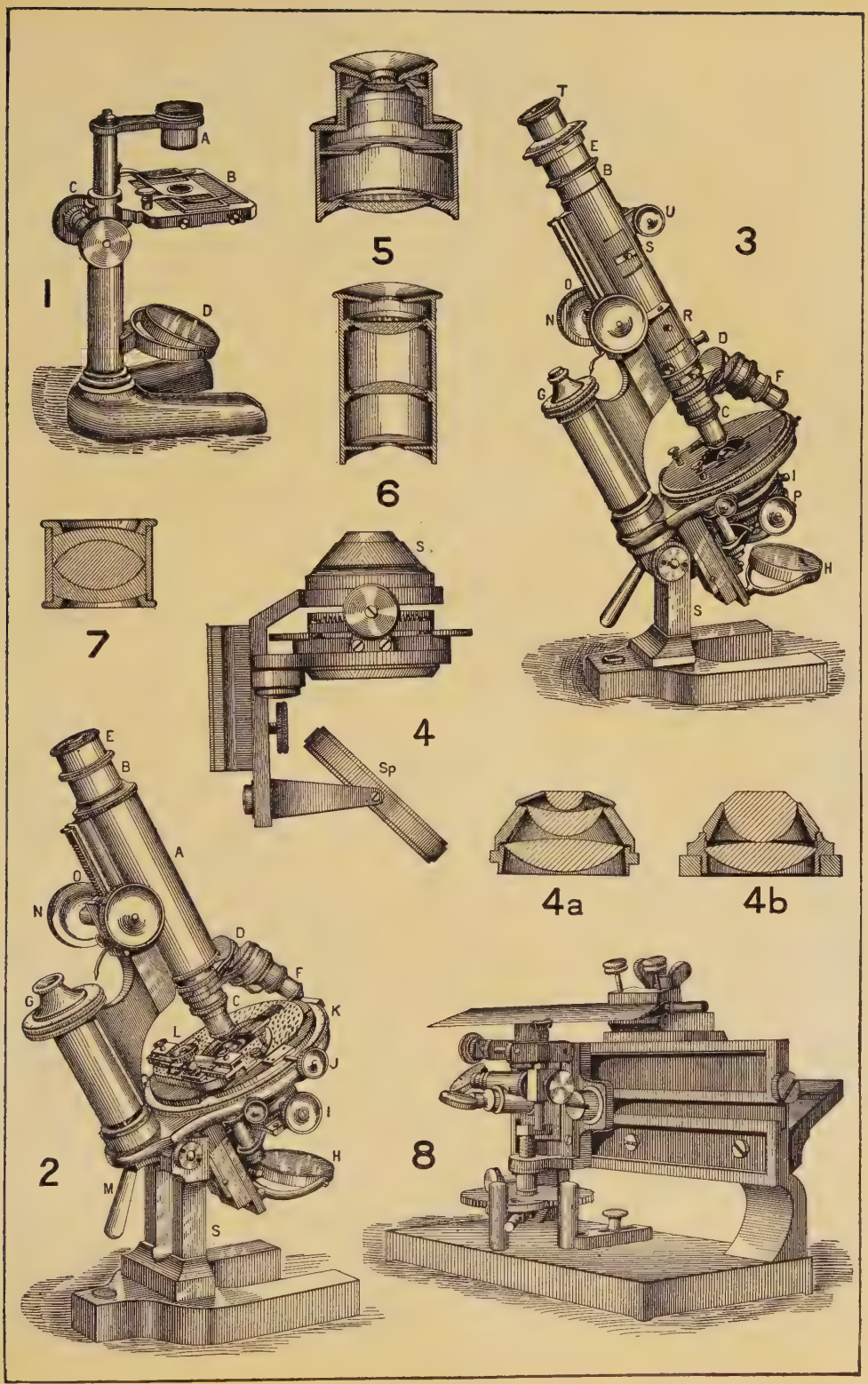
In order to make use of the highest efficiency of the objective it is necessary to devote much attention to the concentration of the light upon the object in order that the image may be well lighted and also that the full aperture of the objective may be utilized. A form of condenser which is placed under the object is shown in the accompanying plate (Fig. 4); *Sp* is the mirror for reflecting the light into the condenser *S*, and the rest is mechanism for suitable adjustments. The adjoining figures show the section of such a condensing lens.

On the accompanying plate (Fig. 2) is shown a modern microscope of a high order as fitted for general and biological work. The main stand *S* is so hinged that the top may be tilted at any angle and clamped by the lever *M*. The tube *A* carries at its lower end a triple nose piece *D*, enabling the observer rapidly and easily to exchange objectives *C*, *F*, etc. In the upper end of *A* is the draw tube *B*, enabling the observer to change the distance between his objective *C* and eyepiece *E*. *LCKJ* is the stage or table on which the objects are placed. *K* is a vernier reading the angular rotation of the stage. *L* and *J* are milled heads operating the mechanical stage, making it possible to move the object regularly up and down or right and left in searching for an object in the slide, in counting, and the like. *I* is the substage condenser and its mounting, including a diaphragm. *NO* is the rack and pinion for rough adjustment of the focus and *G* is the fine adjustment, making it easy to adjust accurately the focus of a high-power objective and in some cases to make measurements.

A similar instrument, as fitted for petrographic work where polarized light is used, is also illustrated on the plate. This particular microscope is not fitted with a mechanical stage. At *P* is introduced a polarizer Nicol prism for furnishing a beam of polarized light, and another Nicol prism used as the analyzer is slid into the side of the tube at *R* or for other combinations at *S*. *U* is a rack and pinion for the adjustment of the draw tube, *B*. For some purposes the analyzer is put on top of the eyepiece at *T*. Either the polarizer or the condenser may be turned out from under the stage when not wanted. Between the objective and the analyzer is a side slot, into which may be introduced the quartz wedge, mica plate, etc., which are used in the determination of the optical constants of the minerals under study. For use in such instruments the rock to be investigated is ground to a very thin section mounted upon a glass strip, like any microscope preparation. Under these circumstances most minerals are quite transparent and the student is enabled, not only to learn the size and form of the grains, but also to subject them to an investigation under polarized light and identify their optical properties and determine completely their nature. The petrographic microscope has revolutionized the study of rocks.

There is also the binocular microscope, in which two eyepieces are used in order to secure a stereoscopic effect. (See STEREOSCOPE.) In a binocular microscope there is the usual arrangement of the objective, but one or more prisms of special design are interposed so as to deflect

MICROSCOPE



1. SIMPLE MICROSCOPE on stand for biological work
2. HIGH-POWER COMPOUND MICROSCOPE
3. PETROGRAPHIC MICROSCOPE
4. ABBÉ SUB-STAGE CONDENSER: 4a and 4b, lenses in section
5. HUYGENIAN EYEPIECE
6. RAMSDEN EYEPIECE
7. STEINHEIL POSITIVE EYEPIECE
8. MICROTOME

some of the rays to a second eyepiece. It is unavoidable that a certain amount of light is cut off in passing through the prism, or that the path of the rays is increased so that where the highest powers are employed the binocular is not used.

There are used in connection with the microscope many forms of the "camera lucida" (q.v.), a device to enable the operator to make a drawing of the object under study by tracing over the virtual image which he seems to see on the paper, as the eye of the observer sees both the light which comes up from the object and that which comes from the paper and pencil below the microscope. In preparing slides for work in microbiology it is necessary that the material should be in very thin sections, and this is accomplished by embedding the whole object in paraffin and then shaving off thin sections with a microtome, one form of which is shown on the accompanying plate (Fig. 8). Afterward the paraffin is removed and the shaving mounted upon a glass slide. These preparations are usually hardened by chemicals, and are frequently dyed with special solutions, which may, e.g., color the nerves and not the other parts, thus bringing out the contrast and assisting the work. Under some circumstances the object is frozen by means of liquid carbonic acid gas and then shaved in sections. It should be evident that by a simple device a camera may be made to take the place of the eye in any of the above cases, and by that means photographs may be taken of the objects under investigation.

Perhaps the most important development in the field of microscopy in recent years is the ultramicroscope. This instrument is due to Siedentopf and Zsigmondy, who had at their disposal the facilities of the Zeiss optical works. The principle upon which this instrument operates is as follows: on the basis of Abbé's theory a perfect microscope will separate distinctly two points in the object studied having a linear separation equal to $\lambda/2a$, where λ is the wave length of light used and a is the numerical aperture of the objective. If now we consider a particle which is small in comparison to $\lambda/2a$ it is evident that the microscope will no longer yield a correct delineation of the true form of this particle but will, instead, show a central diffraction disk surrounded by concentric bright and dark rings. As a matter of fact such a particle will be invisible under usual illumination, owing to the glare of light entering the eye. In order to overcome these difficulties Siedentopf and Zsigmondy illuminated the small particles laterally in such a manner that none of the light coming from the condenser would enter the objective directly. Each minute particle thus illuminated scatters light in all directions and hence throws some light upward into the microscope. Upon looking into the microscope the observer sees a number of diffraction disks upon a black background. In other words, the principle is similar to that which enables one to see the dust in the air of a darkened room through which a narrow beam of sunlight is passing. This mode of illumination has been termed "dark-field illumination." Many types of condensers have been devised to accomplish this purpose, the more important types being due to Wenham, Stephenson, Ignatowsky, and Siedentopf and Zsigmondy. The best by far, however, is the "cardioid" condenser developed by Siedentopf himself. A sectional drawing of this condenser is shown in Fig. 8.

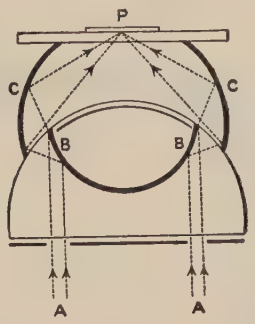


FIG. 8. SECTION OF "CARDIOID" CONDENSER.

A system of parallel rays AA, after passing through an annular opening in a diaphragm, is reflected from the convex surface of a sphere BB, suffers a second reflection at the concave surface of the cardioid CC, and is finally united in a point at P. It is evident that the rays, after passing through P, cannot enter the microscope objective on account of their great inclination.

A microscope supplied with a condenser producing dark-field illumination is appropriately termed an "ultramicroscope," and the objects thus made visible are termed "ultramicroscopic particles." Of the latter the variety is extremely great. Their dimensions lie between that of the wave length of light and of individual molecules. Characteristic ultramicroscopic bodies are colloidal gold in ruby glass, colloidal silver (Carey Lea's solution), gelatins, albumens, etc. While the size of the diffraction disks due to larger and smaller particles in the same field of view is the same, their intensities differ tremendously, for the intensity of the light scattered is proportional to the square of the linear dimension. Upon this basis a rough determination of the size of the particles may be carried out. The most accurate method, however, consists in ascertaining in advance the mass of the total number of ultramicroscopic particles; then, by counting the number contained in a minute volume of known dimensions and by determining the total volume through which the particles are spread, the average mass of the individual particle may be ascertained. Since, as previously stated, the intensity of the scattered light varies with the square of the linear dimension, eventually a particle, when sufficiently small, will scatter so little light that it is no longer visible. The smallest particles of colloidal gold thus far seen have dimensions of the order of 4 to 7 $\mu\mu$, where $1\ \mu\mu = \frac{1}{1,000,000}$ millimeter.

Bibliography. For the early history of the microscope, the reader should consult Gerland and Traumüller, *Geschichte der Experimentierkunst* (Leipzig, 1899). Drude, *The Theory of Optics*, translation by Mann and Milikan (New York, 1902), and Czapski, *Grundzüge der Theorie der optischen Instrumente* (Leipzig, 1904), treat the theoretical side. A practical and complete treatise is W. B. Carpenter, *The Microscope* (8th ed., ed. by Dallmeyer, Philadelphia, 1901). The more modern developments of the microscope are described in the following articles: Siedentopf and Zsigmondy, "Ultra-mi-

kroskop," *Annalen der Physik*, vol. x (1903); A. Köhler, "Eine mikrophotographische Einrichtung für ultra-violettes Licht ($\lambda = 275\ \mu\mu$)," *Physikalische Zeitschrift*, vol. v, p. 666 (1904); Siedentopf, "Kardioidkondensor," *Berichte der deutschen physikalischen Gesellschaft*, vol. viii (1910). See MICROSCOPY, CLINICAL.

MICROSCOPE, SOLAR. See SOLAR MICROSCOPE.

MICROSCOP'ICAL SOCIETY, THE AMERICAN. An association organized in 1878 and incorporated in 1891, at Washington, D. C. It has a membership of 400. Its objects are the encouragement of microscopical research and the diffusion of knowledge on the subject of microscopy. The society published 34 volumes of *Transactions*, which are now issued as a quarterly journal of microscopy. The Spencer-Tolles Research Fund in 1915 amounted to $5000. Its income is used to stimulate research in microscopic subjects.

MICROS'COPY, CLINICAL. With the rapid increase made in comparatively recent times in the perfection of instruments at our disposal and in our knowledge of the differences in normal and pathological appearances of body tissues and organs and their products, the microscope has come to be an indispensable adjunct to medical diagnosis. (See the article MICROSCOPE for description and illustration of microscopes.) For most diagnostic work two objectives are sufficient—a low power having a focal length of about two-thirds of an inch and a high power having a focal length of about one-fifth of an inch. For a microscopic examination of bacteria and the blood a higher magnification is in many cases desirable.

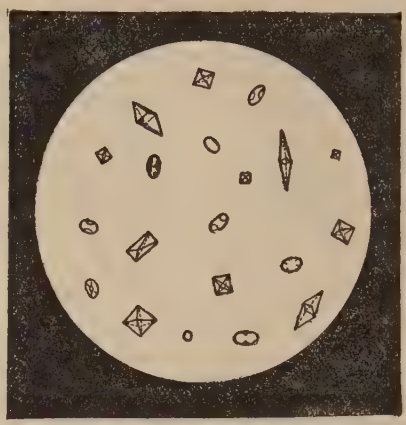
Before examining with the microscope most specimens require some special preparation. As these preparations differ for different specimens, they will be described under separate headings.

Urine. Microscopic examination of the urine is made for the purpose of determining disease

CRYSTALS OF CALCIUM PHOSPHATE × 150.

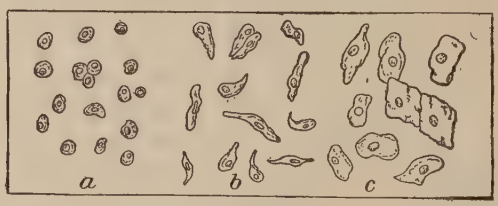
of the kidney, ureter, bladder, and urethra. For microscopic examination the specimen should be allowed to stand for from eight to twelve hours and the sediment taken by means of a pipette from the bottom of the fluid; or the urinary solids may be precipitated at once by means of a machine called the centrifuge. A small drop of the sedimented urine is placed upon a glass slide and covered by a thin piece of glass known as a cover glass. The specimen may then be examined.

Crystalline Substances.—(*a*) Uric acid occurs as whetstone-shaped crystals. These lying across one another in groups form radiating masses or rosettes. Crystals somewhat dumb-bell in shape are less common, and after the addition of acid to urine large platelike crystals of uric acid may



CRYSTALS OF CALCIUM OXALATE × 350.

be found. (*b*) The salts of uric acid, or urates, may also be seen, usually as a granular deposit—amorphous urates. In urine which is undergoing ammoniacal fermentation ammonium urate crystals occur either as clumps of short thick needles or as rough spherical crystals. (*c*) Hippuric acid crystals are rather infrequently found in acid urine. (*d*) Phosphates, ammonium magnesium or "triple phosphate" crystals, occur in slightly acid and in alkaline urine. They are large and are usually described as "coffin lid" in shape. In alkaline urine the phosphates sometimes come down as fine feathery crystals. Calcium phosphate occurs as clear, slender, needle-shaped crystals. Large colorless platelike crystals of basic magnesium phosphate and granular deposits of the basic phosphates of lime and magnesium may also be found in alkaline urine. (*e*) Calcium oxalate crystals occur in acid urine. They are clear and diamond or envelope shaped. Less common are crystals of a somewhat dumb-bell shape. (*f*) Calcium carbonate is found in alkaline urine which is undergoing fermentation. It occurs as coarse granules



EPITHELIAL CELLS.
a, round; *b*, columnar; *c*, squamous.

which dissolve with gas formation on the addition of acetic acid. (*g*) Less common crystals found in urinary sediments are those of bilirubin, hæmatoidin, leucine, tyrosine, and cystine.

Organic Substances.—(*a*) Epithelial cells, mainly from the bladder and vagina, occur in normal urine. In inflammatory conditions of

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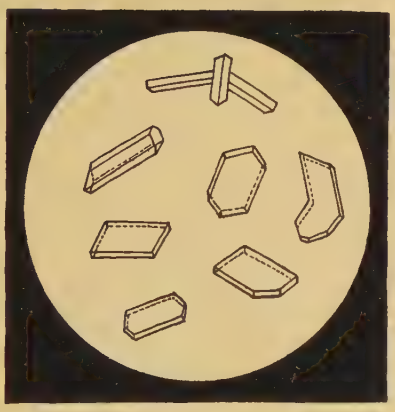

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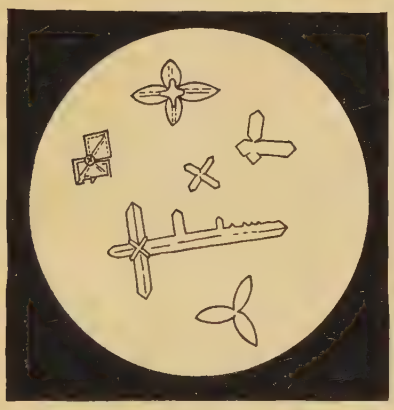

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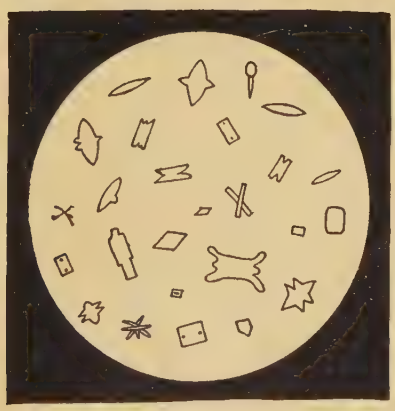
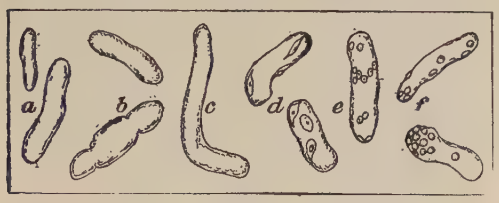


6

1. UREA FROM WATER SOLUTION, magnified 25 times.
2. UREA NITRATE, magnified 75 times.
3. UREA OXALATE, magnified 75 times.
4. UREA SODIUM CHLORIDE, magnified 75 times.
5. URIC ACID FROM ACID URINE, magnified 25 times.
6. URIC ACID FROM SNAKE'S EXCREMENT, magnified 200 times.

(These figures, together with many of the text illustrations, are from drawings by Prof. C. E. Pellew, and are used by his permission, and that of his publishers, D. Appleton and Co.)

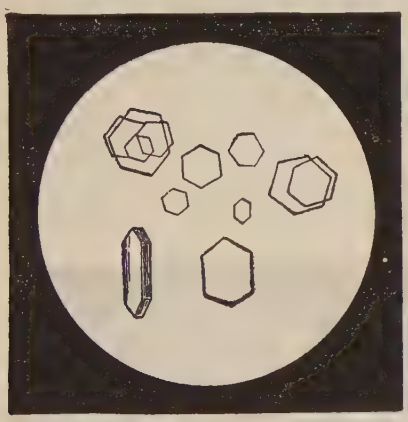
the bladder and vagina their number is greatly increased. Epithelium from the kidney is cuboidal or columnar in shape and most abundant in degenerative conditions of the kidney and in pyelitis. Pigmented columnar epithelium



CASTS.

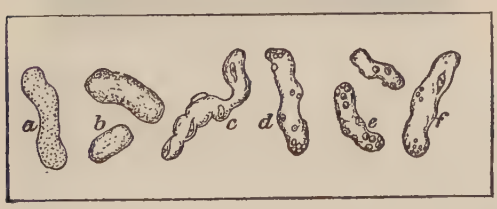
a, hyaline; *b*, waxy; *c*, hyaline and granular; *d*, hyaline and epithelial; *e*, hyaline and blood; *f*, hyaline and pus.

from the seminal vesicles may sometimes be found. (*b*) Casts are among the most important of the organic substances found in urine, indicating parenchymatous inflammation of the kidneys. They are formed by the coagulation of albuminoid matter in the tubules of the kidney. Casts almost clear composed of albumin and a few fine granules are known as hyaline casts.



CRYSTALS OF CYSTIN.

Occurring in small numbers hyaline casts may be of little significance, being present in functional albuminuria, in the urine of old persons, and often in urine otherwise normal. In chronic inflammation of the kidney these casts occur in large numbers. So-called "waxy" casts are less transparent than the hyaline and turn brown



CASTS.

a, fine granular; *b*, coarse granular; *c*, epithelial; *d*, blood; *e*, pus; *f*, fatty.

when subjected to the action of iodine. They are characteristic of the waxy degeneration of the kidney which sometimes accompanies chronic nephritis. Casts containing epithelial cells are known as epithelial casts. They are associated with acute disease of the kidney. Blood casts, or casts containing red blood cells, are found in urine in cases of acute exudative nephritis and in connection with the hemorrhages which sometimes occur. Casts containing pus cells are found in suppurative nephritis and in some of the more severe cases of acute nephritis. Casts containing fine or coarse granules are of frequent occurrence.

Pus cells are found in the urine in the more severe forms of acute nephritis and in suppurative inflammation of any part of the genito-urinary tract. Pus is most abundant in cystitis; less abundant and more thoroughly mixed with the urine in pyelitis; least abundant, and confined mainly to the first part of the specimen passed, in urethritis.

Red blood cells appear as round biconcave disks, about 7 micromillimeters in diameter.

HUMAN SPERMATOZOA GREATLY MAGNIFIED.

a, view of broad surface; *b*, view of profile.

They may be found in severe acute inflammations of the genito-urinary tract and in conditions determining hemorrhage along the tract.

Spermatozoa are frequently found in the urine of healthy individuals. Constant presence of spermatozoa in the urine may occur in certain diseases of the prostate and seminal vesicles. The condition is also frequently present in sexual neuroses.

Yeast and mold plants are frequently found in the urine of diabetics, more rarely in other conditions.

Bacteria.—Normal urine in the normal bladder contains no bacteria. Nonpathogenic bacteria are, however, frequently added to the urine from the urethra or from the external genitals. Of these the *Micrococcus ureæ* is one of the most common. The smegma bacillus is also sometimes present in large numbers and is important from the similarity which it bears to the tubercle bacillus as regards its staining qualities. Among pathogenic bacteria found in urinary sediments may be mentioned the *Staphylococcus pyogenes*, *Streptococcus pyogenes*, the colon bacillus, tubercle bacillus, and gonococcus. In such infectious diseases as septicæmia, pyæmia, erysipelas, diphtheria, and tuberculosis the specific germ of the disease is sometimes found in the urine. For descriptions of the appearance which these different germs present under the microscope the reader is referred to the special articles on the diseases which they cause. For a description of the staphylococcus and streptococcus the reader

is referred to the article on BACTERIA. In examining urinary sediment for bacteria a small amount of the sediment is taken up with a platinum loop and smeared on a cover glass in a thin layer. This is allowed to dry. To fix the specimen, the cover glass is passed through a blue flame of sufficient heat to bring the specimen just to the boiling point of water. The specimen may now be stained by placing upon it a few drops of a watery solution of fuchsine, gentian violet, or methylene blue. After staining it is washed in water and may then be examined.

For other organisms more rarely present in urine the reader is referred to special works upon microscopical urinalysis.

Blood. The main purposes for which blood is examined microscopically are as follows:

1. To count the red blood cells.
2. To determine the amount of hæmoglobin in the red cells.
3. To determine the size, shape, etc., of the red cells and the presence of abnormal forms, e.g., nucleated red blood cells.
4. To determine the number of white cells.
5. To determine the relative proportion of the different kinds of white blood cells—"differential count of leucocytes."
6. For the *Plasmodium malariæ*.
7. In suspected typhoid for Widal's reaction and other agglutination tests.
8. For bacteria and other foreign substances.

For description of the normal histology of blood the reader is referred to the article on BLOOD.

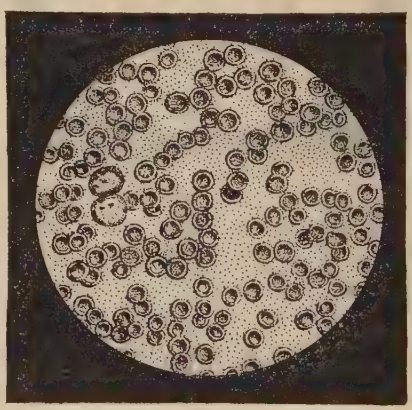
Counting the Red Blood Cells.—This is best accomplished by means of Thoma's hæmatocytometer or blood-counting apparatus. This consists of a pipette with bulb and graduated capillary tube. The graduation of the tube is 0.5 and 1, that of the bulb and tube together 100. By filling the tube to mark 1 with blood and then the bulb and tube to mark 100 with an inert diluting fluid such as normal saline, a dilution of 1 to 100 is obtained. The counting slide has in its centre a round chamber, in the centre of which is a raised flat glass surface which is marked off into 400 equal squares, each of which is one four-hundredth of a square millimeter. The surface of the marked-off area is just one-tenth of a millimeter lower than the surface of the rest of the slide. A drop of the diluted blood is placed upon the centre of the graduated area and a flat cover glass placed over it. As will be seen, the amount of fluid over one of the small squares is one-tenth times one four-hundredth or one four-thousandth of a cubic millimeter. The number of cells in one square is then counted. This multiplied by 4000 and then by the dilution, 100, gives the result desired, i.e., the number of red cells in one cubic millimeter of blood examined. In actual practice a large number of squares is counted and the average taken. The white blood cells may be counted in the same specimen if desired. Owing, however, to their smaller number a larger number of squares should be counted to avoid error. For determining the richness of the individual corpuscles in hæmoglobin, the shape and size of the cells, the relative number of the different kinds of white cells, the presence of the malaria plasmodium, etc., the preparation of fixed and stained specimens is required as follows. Blood from a needle prick is taken up on the end of a glass slide and this is drawn across the surface of a second slide, thus making a thin "smear" of blood. This is dried quickly in the air, after which it is "fixed" by equal parts of alcohol and ether, the vapor of osmic acid or of formalin, or by subjecting to the action of dry heat. The specimen is now ready for staining. A combination of eosin and methylene blue, and Ehrlich's triacid stain, are the most satisfactory. After staining the specimen is washed in water. The eosin-methylene blue method is the most satisfactory for general purposes and stains the malaria plasmodium. Ehrlich's stain is most satisfactory for making a differential count of the leucocytes.

Persistent marked reduction in the number of red cells occurs in primary pernicious anæmia and in the severe secondary anæmias due to some of the infectious diseases. It may also be due to the action of certain mineral poisons (phosphorus, arsenic, etc.), to long-continued suppurative processes, cancer, malaria, conditions of malnutrition, etc.

Loss in the hæmoglobin content of the individual cells occurs especially in that form of anæmia known as chlorosis. Moderate diminution in number of cells may also occur. In leucocythæmia there may also be both a reduction in the number of cells and a reduction in hæmoglobin content. This loss of hæmoglobin on the part of the individual cell is shown in the eosin-stained specimen by an increase in the clear central area of the cell.

Irregular red cells (poikilocytes), small red cells (microcytes), and large red cells (megalocytes) are found in severe anæmias whether primary or secondary.

Nucleated red blood cells are found in all forms of anæmia. As they represent developmental types, their presence may be construed as an attempt on the part of nature to replace lost cells. Very large nucleated red cells (megaloblasts and gigantoblasts) are sometimes present in severe anæmias.



HUMAN RED BLOOD CORPUSCLES AND TWO LEUCOCYTES.

Moderate increase in the number of white blood cells occurs physiologically during the first few days after birth, in the later months of pregnancy, and after eating. Pathological increase in the number of white cells occurs in many of the infectious diseases, especially those accompanied by exudation or suppuration. It is notably absent in typhoid, typhus, tuberculosis, measles, and malaria. Lymphocytosis, or increase in the number of lymphocytes, is

frequent in the later weeks of typhoid, in anæmia, in intestinal diseases of children, and in lymphatic leucocythæmia. Persistent increase in the number of white blood cells independent of other lesions is characteristic of leucocythæmia. This increase may be very great, and is usually irregular, i.e., the proportionate numerical relation of the different kinds of white blood cells is changed. In lymphatic leucocythæmia the greatest increase is in the lymphocytes. In myelogenous leucocythæmia the increase in leucocytes is often enormous, sometimes more than a million per cubic millimeter. Abnormal forms of leucocytes also appear.

In patients suffering from malaria the *Plasmodium malariæ* may be found. The forms which the organism assumes are known as tertian, quartan, and æstivo-autumnal. They occur within the red blood cells, rarely in the plasma.

Free pigment is sometimes found in the blood. This condition is known as melanæmia.

Various foreign bodies, such as fat, bacteria, animal parasites (*Distoma hæmatobium, Filaria sanguinis hominis*, and the eggs of the trichina and echinococcus), endothelial cells, pus cells, tumor cells, etc., are sometimes found in the blood.

Examination of the blood in typhoid for the so-called Widal reaction should be mentioned. The blood or serum to be examined is mixed with ten times its amount of a 24-hour-old broth culture of the typhoid bacillus and examined under the oil immersion lens. A positive reaction consists in the rendering motionless of the bacilli and their collection into groups. If a reaction with the one-to-ten dilution occurs, a one-to-twenty should be tried. Positive reaction with the one-to-twenty dilution makes the diagnosis of typhoid extremely probable. A negative result is of less value.

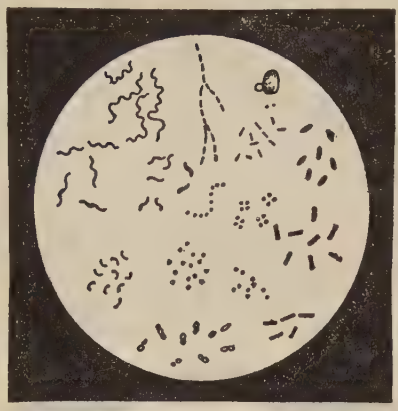
Stains may be examined to determine the presence or absence of blood, as follows. A drop of normal saline solution to which a few scrapings from the stain have been added is evaporated on a glass slide. This is then covered and a drop of glacial acetic acid allowed to run under the cover. The preparation is next heated until it bubbles. More acid is added and the slide heated until a brownish color appears. The specimen is then slowly dried and mounted in glycerin. If any blood was present it is shown by the presence of small rhombic crystals which result from the conversion of hæmoglobin into hæmin. In cases of suspected rape stains from the clothing or smears from the vagina are examined for the presence of spermatozoa.

Fæces may be examined by mixing a small amount with a drop of normal saline solution on a glass slide and covering with a cover glass. Detritus from incomplete digestion of food forms a large part of normal fæces. Thus, it is common to find in a specimen of fæces vegetable cells of various kinds, starch granules, muscle fibres from meat, fat globules, coagulated albumins, etc. In addition to these there are usually found mucus and epithelial cells, and not infrequently crystals of calcium oxalate, calcium phosphate, calcium sulphate, the fatty acids, triple phosphates, cholesterin, etc.

Epithelial cells in large numbers are frequently associated with intestinal catarrh, especially in children.

Red blood cells may be found in conditions associated with hemorrhage. In suspected cancer or ulcer of the stomach or intestines the search for evidences of "occult hemorrhage" is extremely important.

Pus cells are frequent in catarrhal inflammations of the bowels. They are more abundant when the inflammation is suppurative in character. In typhoid fever and other ulcerative



BACTERIA × 500.

conditions bits of an ulcer which has sloughed or groups of epithelium with pus cells attached may be found in the fæces.

A great variety of bacteria are present in normal fæces. Some of these gain entrance with the food; others exist normally in the gastro-intestinal canal. Among these may be mentioned the *Bacillus coli communis, Proteus vulgaris, Leptothrix*, and the *Bacillus lactis aerogenes*. Under certain as yet little understood conditions it appears that some of these microörganisms may assume a pathological significance.

The typhoid bacillus occurs in the stools of persons suffering from typhoid fever.

Tubercle bacilli may be found in the fæces. (For method of staining, see TUBERCULOSIS.) Occurring with pulmonary lesions and without intestinal symptoms, their source is usually in swallowed sputum. If, however, symptoms of enteritis are associated with tubercle bacilli in the stools, there is certainly a strong probability that the enteritis is tubercular.

The "comma" bacillus is present in the stools of persons suffering from Asiatic cholera.

The *Amœba coli* is found in the fæces in amœbic dysentery. It is best to examine stools for amœba as soon as possible after their passage and on a warm stage, as their motility is a valuable aid in their detection. The presence of hookworm and many other intestinal parasites can only be certainly determined by a microscopical examination of the fæces.

Sputum is examined microscopically to determine the character of the secretion of the respiratory tract. It may be examined by smearing on a cover glass or slide, fixing, and staining with dilute aqueous solution of methylene blue. If there are little lumps of cheesy matter scattered through the sputum, it is well to select one of these from which to make the smear, especially if the tubercle bacillus is to be looked for. Photographs of typical bacteria as seen through the microscope are shown in the article DISEASE, GERM THEORY OF.

Epithelial cells from various parts of the

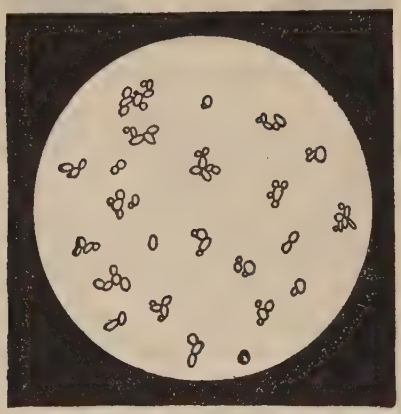
respiratory tract are often present. Their origin can frequently be determined by their appearance.

Red blood cells occur in the sputum in acute bronchitis, pneumonia, tuberculosis, and in any condition associated with hemorrhage into the respiratory tract.

White blood cells are also readily recognized in methylene blue stained specimens by their irregular or multiple nuclei and their unstained cell bodies. They are found in acute and chronic bronchitis, in pneumonia, tuberculosis, abscess, and gangrene of the lung, in fact in any inflammatory condition of the respiratory tract characterized by a catarrhal or suppurative exudation.

Mucus, fat droplets, fibrin, elastic fibres, crystals of calcium carbonate, triple phosphates, cholesterin, the fatty acids, and the so-called Charcot-Leyden crystals may be found in sputum on microscopical examination.

A large number of harmless species of bacteria are found in sputum, most of these being



YEAST × 250.

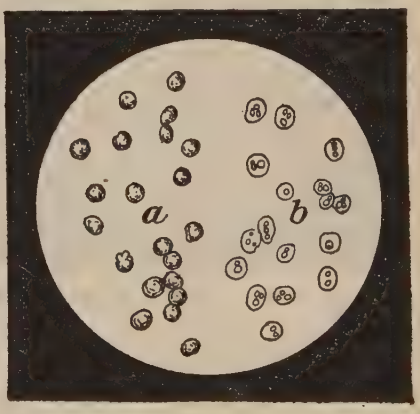
derived from the mouth, nose, and upper respiratory tract. Of disease-producing species the most important are the tubercle bacillus, the bacillus of influenza, the pneumobacillus of Friedländer, the pneumococcus, the streptococcus, and the staphylococcus. (For the staining qualities and appearance of the tubercle bacillus, see article on TUBERCULOSIS.) The bacillus of influenza is an extremely minute bacillus measuring only about half the length of the tubercle bacillus. It is apt to occur in clumps and does not stain very readily with methylene blue. A rather weak solution of carbol-fuchsine, however, gives good staining of the microörganism. The bacillus of Friedländer is the less common of the pneumonic organisms. It is capsulated and decolorizes by Gram's method of staining. The more common cause of pneumonia, the *Pneumococcus* or *Diplococcus lanceolatus*, is also surrounded by a capsule, but is shorter than the Friedländer bacillus and does not decolorize by Gram's method. For the appearance of certain germs, see DISEASE, GERM THEORY OF.

The "ray" fungus, or fungus of actinomycosis of the lung, is sometimes demonstrable in the sputum, as are also yeasts, molds, and *Leptothrix*.

Stomach Contents. Microscopical examination of specimens from the stomach is often of value in determining the condition of that organ. Material is obtained as vomitus or by introducing the stomach tube. Incompletely digested food may be recognized as muscle fibres, fibrous and elastic shreds, fat, starch, and various kinds of vegetable cells. Epithelial cells

MOLD PLANTS × 100.

from the mouth or œsophagus or from the stomach itself may be found. Red blood cells may come from the stomach or may have been swallowed. White blood cells are quite commonly found. The condition of the stomach may sometimes be determined by the forms of microörganism which are found growing there. Thus, a long bacillus which occurs in chains, the so-called Boas-Oppler bacillus, is a common habitant of a stomach free from hydrochloric acid, the contents of which are undergoing lactic-acid fermentation. The Sarcinæ, on the other hand, a species of cocci which hang together in cubes of eight, sixteen, thirty-two, etc., occur in exactly opposite gastric conditions, i.e., where



PUS CELLS.
a, natural condition; *b*, after the addition of acetic acid.

hydrochloric acid is present and lactic acid is absent. Yeasts, molds, and *Leptothrix* are also found.

Exudates. *Serous exudates* usually show little of diagnostic import. After standing or after centrifuging the sediment may show some epithelial cells, red blood cells, leucocytes, fat globules, cholesterin crystals, etc. Bacteria, if

present, are usually in such small numbers as to require culture for their recognition. Fairly frequently, however, the gonococcus may be found in the exudate of gonorrhœal arthritis, by simply staining the sediment. Less frequently the tubercle bacillus may be identified in a similar manner.

Purulent exudates when examined under the microscope show large numbers of pus cells which are mainly polynuclear leucocytes. Red blood cells and exfoliated epithelium are also often present. Of bacteria may be mentioned the tubercle bacillus, the bacillus of anthrax, the diphtheria bacillus, the streptococcus, staphylococcus, gonococcus, and pneumococcus. For methods of examining for tubercle bacillus, see article on TUBERCULOSIS; for streptococcus and staphylococcus, see article on BACTERIA; for pneumococcus, see PNEUMONIA.

The diphtheria or Klebs-Löffler bacillus may be found in sputum. For examination it is usually, however, obtained directly from the suspected membrane. See DIPHTHERIA.

Leptothrix and *Oidium albicans* are organisms sometimes found in exudates associated with diseases of the mouth and pharynx. The former is not infrequently the apparent cause of very obstinate pharyngitis, while the latter is found in connection with the disease known as thrush.

Tissues and Organs. The examination of pieces of tissue or of organs for the purpose of determining the nature of the disease affecting them is often of great importance.

Some tissues may be examined in the fresh state by simply teasing apart in such an inert fluid as normal saline solution (¾ per cent aqueous solution of sodium chloride). The satisfactory examination of most tissues requires, however, a more or less elaborate preliminary preparation. This consists in (1) fixing, (2) hardening, (3) embedding, (4) section cutting, (5) staining, and (6) mounting.

1. *Fixing.*—This consists in placing the tissue, as soon as possible after its removal, in a solution which will kill the tissue elements rapidly, so that they retain the same form and structure that they had during life. Of the most commonly used fixing agents may be mentioned alcohol; formalin, in aqueous solutions of from 2½ to 10 per cent; and Müller's fluid (potassium dichromate, 2.5 grams; sodium sulphate, 1 gram; water, 100 cubic centimeters).

2. *Hardening and Preserving.*—After fixing, tissues are thoroughly washed in running water and then hardened in graded alcohols, i.e., first in 50 per cent, then in 60 per cent, then in 80 per cent. For permanent preservation they are usually left in 80 per cent alcohol.

3. *Embedding.*—This is for the purpose of impregnating the tissues with some substance which will hold them together during the subsequent manipulations. The now most commonly employed embedding mass is celloidin, although for special purposes paraffin is used.

4. *Section Cutting.*—This is now accomplished by means of an instrument known as a microtome. While many of these instruments are quite complicated, the purpose of them all is to carry a knife through the specimen in such a way that sections of any desired thickness may be obtained.

5. *Staining.*—Sections may be stained in a great variety of ways. For general purposes what is known as double staining gives satisfactory pictures. This is accomplished by staining the specimen first in a watery solution of hæmotoxylin and then in an alcoholic solution of eosin. The specimens are next placed in oil of origanum, which removes the alcohol and renders the sections more transparent ("clearing").

6. *Mounting.*—From the oil the section is transferred to a glass slide, the excess of oil removed by blotting with filter paper, a drop of Canada balsam placed on the specimen, and the whole covered by means of a cover glass. This makes a permanent mount.

For other methods of staining and mounting the reader is referred to special textbooks on histology and histological technique.

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MI'CROSOME (from Gk. *μικρός, mikros,* small + *σῶμα, sōma,* body). A name given to minute granules which occur in protoplasm.

MI'CROSPORAN'GIUM (Neo-Lat., from Gk. *μικρός, mikros,* small + *σπόρος, sporos,* seed + *ἀγγεῖον, angeion,* vessel, from *ἄγγος, angos,* jar). When spores become differentiated in size (heterospory, q.v.) the two kinds are produced by different sporangia, and the sporangium producing microspores is the microsporangium. In heterosporous Pteridophytes the microsporangia and megasporangia do not differ in appearance, but differ in the number and size of the spores produced. Among the seed plants, however, the microsporangia are the so-called pollen sacs borne by the stamens. See HETEROSPORY; SPORANGIUM.

MI'CROSPORE (from Gk. *μικρός, mikros,* small + *σπόρος, sporos,* seed). In certain Pteridophytes and in all seed plants two kinds of spores are produced, which differ in size, the smaller being the microspores. In germination a microspore produces a male plant, which is so small that it does not escape from the spore. In the flowering plants this male gametophyte usually consists of three cells or nuclei, and in this same group the microspores have long been called pollen grains. See ALTERNATION OF GENERATIONS; HETEROSPORY; SPORE.

MI'CROSPO'ROPHYLL (from Gk. *μικρός, mikros,* small + *σπόρος, sporos,* seed + *φύλλον, phyllon,* leaf). In those plants which produce megasporangia and microsporangia (q.v.) the sporangia are borne upon foliar structures called sporophylls. The sporophylls bearing the microsporangia are microsporophylls, which in the flowering plants have long been known as stamens. See HETEROSPORY; SPOROPHYLL.

MI'CROTASIM'ETER (from Gk. *μικρός, mikros,* small + *τάσις, tasis,* extension + *μέτρον, metron,* measure). An instrument invented by Thomas A. Edison in 1877 for the purpose of measuring very minute variations of temperature or moisture. The action of the apparatus depends on the effect which the pressure of an expanding rod has upon the electrical resistance of a piece of carbon placed in the circuit of a galvanic battery. A rod of vulcanite is used as the expanding element when it is desired to em-

ploy the instrument to ascertain slight variations in the heat radiation from any object, as the sun or a gas or electric light. This rod is adjusted in a strong frame kept at an equable temperature, so that no expansions or contractions shall exert any influence except those which take place in the vulcanite rod itself. In the chamber which receives one end of this rod or plate there is placed under a follower or slide a piece of carbon, which becomes compressed with great force upon the expansion of the vulcanite rod. If radiant heat is to be measured, a large funnel is placed in front of the apparatus to gather the rays and throw them upon the rod or plate. When the rays increase in intensity the rod expands, compresses the button, and changes its resistance, the variation of which is indicated by a galvanometer. The instrument was used to ascertain the variations in the radiation from the sun during the solar eclipse of July 28, 1878. It may also be used to note the variations taking place on a day when clouds are passing across the sun's disk, or when the transmission of its rays is affected by increase or decrease of moisture. It may be used as a delicate hygrometer by substituting in place of the vulcanite rod a body containing gelatin, which expands under the influence of moisture. The chief disadvantage possessed by this instrument is that the carbon does not regain its original resistance after the pressure is removed. Modern microradiometers and bolometers are, in addition, far more sensitive and are usually employed for the measurement of radiation.

MI'CROTOME. See MICROSCOPE, and Plate of MICROSCOPE.

MICTLAN. See MITLA.

MI'DAS (Lat., from Gk. *Mídas*). A common name of the more ancient Phrygian kings, of whom Midas, the son of Gordius (see GORDIAN KNOT) and Cybele, is the most famous. According to one legend he captured Silenus by mixing wine with the water of the fountain at which the god drank, and secured for himself the wisdom of the god. Herodotus tells this story as Macedonian, but later writers transferred it to Phrygia. Another version, told by Ovid, *Metamorphoses*, xi, 85–145, and Hyginus, *Fabulæ*, 91, relates that he restored Silenus to Dionysus, and, when asked by the god to name his reward, prayed that whatever he touched might become gold, from which great inconvenience ensued, since even food and drink set before him were changed to gold, so that he was glad to get himself relieved from the burden by washing, at the command of the god, in the Pactolus, the sands of which became thenceforth productive of gold. Another legend represents him as having offended Apollo by assigning the prize in the musical contest to Marsyas, or in later versions to Pan, and as having therefore been endowed by Apollo with a pair of ass's ears. These, concealed under his Phrygian cap, were known only to his barber, who dared tell no man, but, unable to contain his secret, whispered it into a hole in the earth, which he then covered up. His precaution, however, was vain, for the reeds which sprang up at this spot, as they rustled in the wind, proclaimed the news to the world. Some regard this Midas as an ancient Phrygian nature god, probably conceived, like Silenus and other similar fructifying deities, in animal form, but transformed by Greek story-tellers. The story of the ass's ears is a common folk tale. Consult J. G. Frazer, *The Golden Bough*, part ii (London, 1907), and the article "Midas" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MI'DAS. The name of a genus of marmosets, now superseded by other names on the basis of priority, but sometimes the special name of the marakina (*Midas*, or *Leontocebus, rosalia*). See MARMOSET; Plate of MONKEYS, AMERICAN.

MIDDELBURG, mĭd'*e*l-bŭrĸ. The capital of the Province of Zealand, Netherlands, situated on the island of Walcheren, 4 miles north-northeast of Flushing (Map: Netherlands, B 3). It is connected with the sea by a canal 5 miles long, which admits ships of heavy burden. The city is surrounded by a broad canal and has handsome houses, ornamented with gardens; the canals and streets are shaded with trees. The town house, built in the sixteenth century, has a beautiful tower and is decorated with 25 colossal statues of counts and countesses of Holland. It contains a museum with old Dutch portraits. At the beginning of the thirteenth century an abbey was founded here, which was later enriched by William II, Count of Holland and Zealand. The buildings are now occupied as the meeting place of the provincial states, and contain tapestries representing battles in the Spanish invasion, and biblical scenes. The new church contains a monument to William II of Holland. The town possesses a dry dock, corn exchange, provincial library, a Gymnasium, a high school, and a normal school, and is the seat of several learned societies, with important collections of antiquities and objects of local interest. The city's commerce was formerly very large. It has some inland trade in grain, potatoes, and madder, and manufactures of cotton goods. Pop., 1903, 19,002; 1910, 19,560. Middelburg was a Hanse town in the Middle Ages, having received its charter in 1225. In 1574, during the war for independence, it was captured by the Dutch from the Spaniards after a siege of two years. It suffered heavily during the wars between England and France in the beginning of the nineteenth century. It was formerly the capital of the province.

MIDDELBURG, PAUL OF. See PAUL OF MIDDELBURG.

MIDDELSCHULTE, mĭd'*e*l-shŭl'te, WILHELM (1863–). An American organist and composer, born at Dortmund, Westphalia, Germany. He was educated at the Royal Academy of Church Music in Berlin under Haupt, Loeschorn, and Julius Alsleben. He served as organist of St. Lucas's Church, Berlin (1888–91); then settled in Chicago, where he was organist of the cathedral of the Holy Name (1891–95) and of St. James's (Roman Catholic) Church after 1899. After 1894 he was organist for the Thomas Orchestra, and in 1899 he added to his other duties those of director and professor of organ and musical theory at the Wisconsin Conservatory of Music, Milwaukee. He composed *Passacaglia in D Minor, Toccata*, and a concerto, a fugue, and a fantasie on themes by Bach.

MIDDENDORFF, mĭd'*e*n-dôrf, ALEXANDER THEODOR VON (1815–94). A Russian traveler and naturalist. He was born in St. Petersburg and studied medicine in Germany. With Baer, in 1840, he went on an ornithological expedition into Lapland, and in 1844–45 made an important trip in northeast Siberia. He again journeyed in Siberia in 1869, accompanied by the Grand

Duke Vladimir; and he also made journeys to Asiatic Turkey and many of the islands off the coast of Africa. His journeys were detailed in government reports and in his book, *Reise in den äussersten norden und osten Sibiriens* (1848–75). He was a member of the St. Petersburg Academy (zoölogical section) and for some time its secretary; founder of the Russian Geographical Society; and in 1846 gold medalist of the London Geographical Society.

MIDDLE AGES. The designation applied to the historical period between the times of classical antiquity and modern times. The beginning and close of this period are not well agreed upon. It is usual, however, to regard the Middle Ages as beginning with the overthrow of the Western Roman Empire by the barbarians in the fifth century and ending at the close of the fifteenth century or the beginning of the sixteenth century. Some scholars prefer to regard the Renaissance (q.v.) as the beginning of modern history. By some, who prefer to use precise landmarks, the Middle Ages are made to extend from the deposition of the Roman Emperor by Odoacer in 476 to the fall of the Byzantine or Greek Empire in 1453, when Constantinople was taken by the Turks. Others again make the Middle Ages terminate with the discovery of America in 1492. The term Dark Ages formerly was frequently used to cover the greater part of the Middle Ages, the designation being applied by some to the period from the fifth to the eleventh century and by others made to embrace all but the last two centuries of the Middle Ages.

In 395 A.D. the Emperor Theodosius died, leaving two sons, one to rule in the West, the other at Constantinople. But in theory there was a single Roman Empire, embracing practically the whole Christian world, extending from the Atlantic to the Euphrates, from the Rhine and the Danube to the great Sahara, with a single government and the same system of laws. Christianity was the recognized state religion. The Roman civilization was in many respects uniform throughout the Empire; a great network of roads bound all the parts together. In the fifth century the Germanic barbarians overran the Western Empire and settled as conquerors in various parts. Thus the three most important factors which were to influence the civilization of western Europe during the early Middle Ages were the Roman, the Christian, and the German. The Roman civilization had absorbed much of Greek art, Greek literature, Greek philosophy, and Greek science. It had developed to a marvelous degree a system of administration and law. It had so completely assimilated the various races in the Western Empire that they were proud to be called Romans. The Christian Church had brought in high ideals and had taught new duties. But at the same time it exalted asceticism, and had a tendency to oppose everything pagan which conflicted with the teachings of the Church. Much of the classical literature and art was under the ban of the Church, because these were intimately associated with the pagan religions. Consequently the Church diminished the inheritance which the Middle Ages would otherwise have received. On the other hand, the Church adopted the magnificent Roman system of administration and thus became a great centralizing governmental force. The German barbarians contributed to the mediæval civilization certain ideas of freedom and of the importance of the individual, as shown in their public assemblies, but the most important contribution was the Germans themselves, a strong race, capable of rapid advance, and always ready to assimilate itself to surrounding conditions. Furthermore, those who settled in the Empire were relatively few in number, and consequently were profoundly influenced by the more numerous population among which they dwelt.

The fifth and sixth centuries were marked by the migrations of the German nations. One tribe after another broke through the Roman frontier and carved out a territory for itself. By 600 almost the whole of the former Western Empire was in the power of the Germans. During the seventh and eighth centuries the Romanic population and the barbarians were going through a process of fusion. By 800 the two formed practically a homogeneous society of a composite nature. The civilization was far higher than that of the early Germans, far lower than that of the Romans. During this period the Church was converting and bringing under its authority the various peoples of the North and West. (See FRANKS.) Its monks were missionaries of culture and also political agents of great importance in binding the separate nations to Rome. From 800 there was again a Roman Empire in the West. (See CHARLES THE GREAT.) Although the Carolingian Empire soon disintegrated, its brief existence had been of great importance as a precedent and had had a lasting effect upon the relations between the Germans and the Roman Catholic church. In the states which arose with the disruption of the Frankish realm the absence of a strong central government threw each district upon its own resources. Local rulers arose, defended their territories against invaders, and maintained a semblance of order. These leaders were sometimes bishops or abbots, sometimes lay nobles. The power fell into their hands. (See FEUDALISM.) The Church was the only bond of union and the only restraining force in the disturbed conditions of the times. It became a mighty engine of government, whose interests were by no means restricted to religious matters. From this time until the close of the thirteenth century the Church was the most important factor in mediæval history. Its authority, wealth, and influence increased constantly; its members were prominent in every sphere of activity.

In the latter half of the tenth century Otho the Great (q.v.) more closely connected the fortunes of Germany and Italy by restoring the Empire of Charles the Great. His action was to result in weakness and disunion for both countries, but for three centuries the German monarch was apparently the leading power in western Europe. During this period the Normans (q.v.) conquered England, southern Italy, and Sicily, and strong monarchies began to develop in England, France, and Spain. Ever since the early part of the eighth century Christendom had been waging a fierce warfare against the Mohammedan power in the West. At the close of the eleventh century began a great onslaught of western Europe upon the Mohammedan power in the East, known as the Crusades (see CRUSADE). The broadening of the horizon, the resultant skepticism, and the enrichment of Europe, which resulted from the Crusades, caused the progress in many lines to be more rapid. The twelfth and thirteenth centu-

ries were periods of great intellectual activity, marked by the foundation of universities, the prevalence of heresy, the development of vernacular literatures, the rise of cities, and the growth of national feeling. The following centuries are generally designated the period of the Renaissance (q.v.).

It is difficult to describe the Middle Ages as a whole, because there was a constant evolution for over 1000 years. The characteristics which contrast most sharply with those of the classical world are these: in the Middle Ages the civilization as a whole was much ruder and mixed with barbaric elements; the individual was of greater importance than the state; men were dominated by a militant, vital religion. If contrasted with the modern period which followed, the Middle Ages were a period when the human intellect was restricted by a deference to the authority of tradition in every phase of life, a deference which was wholly at variance with a critical and skeptical attitude of thought. Again, the physical world, the world of investigation, the world of action, were very limited for the mediæval man. The discoveries at the close of the fifteenth century which disclosed new continents were coincident with the development of the printing press, the revolution in warfare due to the introduction of gunpowder, and the discoveries in the various sciences which opened new worlds of thought and activity. The important artistic activity of the Middle Ages falls into three distinct epochs, the Early Christian (see CHRISTIAN ART), Romanesque, and Gothic, under which titles the art of the period is treated.

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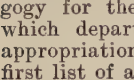
MID'DLEBORO. A town, including several villages, in Plymouth Co., Mass., 35 miles by rail south by east of Boston, on the Nemasket River and on four branches of the New York, New Haven, and Hartford Railroad (Map: Massachusetts, F 5). It has a public library, is an attractive summer resort, and is noted as an industrial centre. Its manufacturing interests are represented by several large shoe factories, woolen mill, paper-box factory, saw and planing mills, and varnish factories. The town receives the income of about $500,000, bequeathed to it by Thomas S. Peirce, a former citizen. The government is administered by town meetings. Middleboro owns its gas and electric-light plants. Pop., 1900, 6885; 1910, 8214; 1914 (U. S. est.), 8778. Settled about 1662 on the site of an old Indian village, Nemasket, Middleboro was incorporated in 1669. Consult Barber, *Historical Collections of Massachusetts* (Worcester, 1840), and Thomas Weston, *History of the Town of Middleboro* (Boston, 1906).

MID'DLEBURY. A village and the county seat of Addison Co., Vt., 34 miles north by west of Rutland, on the Rutland Railroad (Map: Vermont, B 4). The village is situated in the Otter Creek valley, near the Green Mountains, in a region of picturesque scenery. It is the seat of Middlebury College (q.v.), and has the Sheldon Art Museum and Library, a public library, and a fine courthouse and opera house; also attractive fair grounds. The industries are represented by agricultural interests and by several marble quarries, marble mills, limekilns, and flour, saw, door, sash, and pulp mills. The village possesses valuable water power. Under a revised charter of 1877 Middlebury village is governed by a board of trustees, chosen annually, who elect subordinate administrative officers. Pop. (village), 1900, 1897; 1910, 1866. Middlebury was founded in 1773, but, owing to threatened attacks from the English and the Indians, was almost completely deserted during the Revolutionary War. In 1813 it was incorporated as the borough, and in 1832 as the village of Middlebury. Consult Swift, *History of the Town of Middlebury* (Middlebury, 1859).

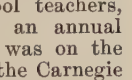
MIDDLEBURY COLLEGE. An institution for higher learning, founded at Middlebury, Vt., in 1800, and which is under no denominational control. The trustees are elected for life and are not restricted in the choice of their successors. The departments of instruction include French, German, economics, history, political science, pedagogy, philosophy, physics, mathematics, chemistry, biology, geology, home economics, drawing and surveying. The attendance in all departments in 1914–15 was 340, with 31 instructors. The original campus of the college, which was presented to the corporation by Col. Seth Storrs in 1810, was increased in 1908 by a gift from Col. Joseph Battell of 35 acres adjoining. This is used as a site for buildings

for women. In 1912 a further gift of 79 acres was received for the Porter Athletic Field. There are 13 buildings on the campus, of which the most important are Painter Hall (1815), Starr Hall (1861), the chapel (1836), Egbert Starr Library (1900), Warner Science Hall (1901), Hamlin Commons (1882), McCullough Gymnasium (1912), Music Hall (1913), and the Chemistry Building (1913). The State of Vermont in 1908 established a department of pedagogy for the training of high-school teachers, which department is sustained by an annual appropriation. Middlebury College was on the first list of accepted institutions of the Carnegie Foundation and has received a grant from the General Education Board. In 1915 the Mead Memorial Chapel was presented by John A. Mead, former Governor of the State. The college has been coeducational since 1883, but in 1902 a charter was granted by the Legislature authorizing the establishment by the corporation of a separate college for women. The grounds and buildings of the college are valued at $430,000 and the entire property at $1,070,000. The library contains about 45,000 volumes. The president in 1915 was John M. Thomas, D.D., LL.D.

MIDDLE C. In music, the note c^1, which is on the first leger line below the treble staff,



, or above the bass staff



The C clef always represents the note termed middle C, and the lines and spaces above or below are designated accordingly. See MUSICAL NOTATION, *The Clefs*.

MIDDLE EAR, INFLAMMATION OF. See OTITIS MEDIA.

MIDDLE ENGLISH. See ENGLISH LANGUAGE; ENGLISH LITERATURE.

MIDDLE KINGDOM. A native name of China, believed by its inhabitants to be the middle point of the earth.

MIDDLE LATITUDE SAILING. See SAILINGS.

MID'DLEMARCH. A novel by George Eliot (1872). It appeared serially in *Blackwood's Magazine* in 1871. The author considered this story of a provincial town her greatest work. It consists of two stories, that of the Vincy family and that of Dorothea Brooke, who is the chief character.

MID'DLESBORO. A city in Bell Co., Ky., 64 miles north by east of Knoxville, Tenn., and on the Louisville and Nashville and the Southern railroads (Map: Kentucky, G 6). It has considerable reputation as a summer resort, and contains a Carnegie library, the W. K. Evans Hospital, and commodious city hall and courthouse buildings. The chief industrial establishments include ironworks, coal mines, and a brewery. Pop., 1900, 4162; 1910, 7305.

MIDDLESBROUGH, mĭd'd'lz-b'rŭh. A manufacturing town, port, and parliamentary and county borough in the North Riding of Yorkshire, England, near the mouth of the Tees, 48 miles north of York (Map: England, E 2). It is the centre of the Cleveland iron district, one of the largest in the world. The town is well built, with handsome specimens of architecture, including the town hall with library, a memorial museum, and a Roman Catholic cathedral. In the Royal Exchange, a fine building, the weekly iron market is held on Tuesdays, attended by persons connected with the iron trade from all parts of the Kingdom, as well as foreigners. It is the headquarters of a Roman Catholic bishop. Albert Park, containing 72 acres, is tastefully laid out. The town owns its water, gas, abattoirs, markets, and cemeteries, and maintains baths, washhouses, and free libraries. Middlesbrough was founded in 1830. The opening of the docks in 1842 gave it additional importance. From the year 1852, when iron ore was discovered in the Eston Hills, the town increased rapidly and has acquired an important position as an iron-manufacturing centre, turning out over 2,500,000 tons per year of pig iron alone, and having smelting furnaces on an extensive scale, iron foundries, manufactures of rails, locomotive engines, tubes, boilers, wire, chemicals, salt, oil, and pottery. Shipbuilding is extensively carried on. There are spacious docks, and a breakwater nearly 2½ miles long. The harbor accommodates vessels with a draft of 32 feet. The tonnage entered and cleared, excluding coastwise vessels, was 3,225,000 in 1911. Middlesbrough was incorporated in 1853. Pop., 1901, 91,302; 1911, 104,767. Consult H. G. Reid, *Middlesbrough and its Jubilee* (Middlesbrough, 1881).

MID'DLESEX. The metropolitan county in the southeastern part of England, bounded north by Hertfordshire and south by Surrey (Map: England, F 5). Next to Rutland it is the smallest of the English counties, with an area of 283 square miles, 50 square miles of which comprises a part of metropolitan London. It is generally flat, being watered by the Thames, Colne, Lea, and Brent. Outside of London the land is chiefly devoted to grass and hay farms and to market gardens, the produce of which is sent to supply the metropolis. Capital, Brentford. Pop., 1901 (excluding the metropolitan area), 798,738; 1911, 1,126,465.

MIDDLE TEMPLE. One of the four great guilds or societies of barristers in England, known as Inns of Court. The Inns of the Middle Temple are so called from the group of ancient buildings in London occupied by them, which were the seat of the Knights Templars and passed into the hands of the lawyers after the dissolution of that famous order of chivalry. They are grouped with the buildings of the three other Inns near the Law Courts. See INNS OF COURT.

MID'DLETON. A municipal borough and market town in Lancashire, England, in the valley of the Irk, 6 miles north of Manchester (Map: England, D 3). Its chief industries are the manufacture of cotton, silk, soap, chemicals, and machinery. Much coal is mined near by. It has a fifteenth-century church, a grammar school dating from 1572, a fine town hall, and a technical school. The municipality owns gas works, electric-lighting plant, markets, and public baths, and maintains free library, park, recreation grounds, and a sewage farm. Pop., 1901, 25,180; 1911, 27,980.

MIDDLETON, ARTHUR (1681–1737). An American colonist, born in South Carolina. He was educated in England. After his return to his native Colony he was elected a member of the Commons House, was appointed naval officer for the Colony (1711), member of the Provincial Council (1711–17), and afterward Speaker of the Commons. In 1719 he was president of the convention which took the government of the Colony away from the Lords and placed it directly under the crown. Later he became

president of His Majesty's Council, and as such was acting Governor from 1725 until the arrival of the first regularly appointed royal Governor in 1731. Middleton was an uncompromising supporter of the royal authority.

MIDDLETON, Arthur (1742–87). A signer of the Declaration of Independence, grandson of Arthur Middleton (1681–1737). He was born in South Carolina. In 1754 he went with an uncle to England, where he was educated at Harrow, Westminster School, and St. John's College, Cambridge. He returned to South Carolina in 1763, settled at Middleton Place, on Ashley River, became a justice of the peace, and from 1765 to 1766 served in the Commons for St. Helena. He then again went abroad and spent three years in England and southern Europe. On his return in 1772 he was again elected to the Commons, and in 1774 became a member of the Upper House of the Provincial Congress. He was one of the ablest and boldest opponents of the royal authority, and early in 1775 became a member of the Secret Service Committee and in June of the same year of the Council of Safety. Early in 1776 he helped frame a constitution for the State, and later in the same year he was sent as a delegate to the Continental Congress and signed the Declaration of Independence. In 1778 he was elected a member of the State Legislature and was also chosen Governor and commander in chief of South Carolina, but refused to serve. He assisted in the defense of Charleston, and upon the capture of that place was imprisoned in St. Augustine and later in the prison ship *Jersey*. Being exchanged in July, 1781, he was again elected to the Continental Congress, where he served until peace was declared. Later he became a member of the State Senate and a trustee of Charleston College. Middleton was a man of much energy and judgment, an able debater, and a forceful writer. Under the pseudonym of "Andrew Marvel" he wrote a number of effective political essays; he also left stenographic reports of many of the debates in which he participated.

MIDDLETON, Conyers (1683–1750). A divine of the Church of England. He was born Dec. 27, 1683, at York or Richmond in Yorkshire. He studied at Cambridge, where he took the degree of B.A. in 1702, was elected a fellow in 1706, and shortly after married a lady of fortune. The views he expressed and defended were generally such as to draw down upon him the imputation of being an "infidel in disguise," though some of them—such as that the Jews borrowed some of their customs from Egypt, that the primitive writers in vindicating Scripture found it necessary sometimes to recur to allegory, and that the early stories of Genesis are not literal history—are now commonly held. Middleton died at Hildersham in Cambridgeshire, July 28, 1750. His controversial writings are acute, but marred by bitterness. His principal writings are: *A Letter from Rome, Showing an Exact Conformity between Popery and Paganism; or the Religion of the Present Romans Derived from that of their Heathen Ancestors* (1729), which provoked the most violent indignation among Roman Catholics, and *The History of the Life of M. Tullius Cicero* (2 vols., 1741). All his pamphlets, treatises, etc., were collected and published under the title of *Miscellaneous Works* (4 vols., London, 1752). Consult Leslie Stephen, *English Thought in the Eighteenth Century* (London, 1876).

MIDDLETON, Sir Frederick Dobson (1825–98). A British soldier. He was born in Belfast, Ireland, and, graduating at the Royal Military College at Sandhurst in 1842, saw active service in New South Wales, New Zealand, Burma, and India. In the Indian Mutiny (1857–58) he was decorated with the Victoria Cross for gallant conduct. In 1868 he accompanied his regiment to Canada, but returned to England in 1870. In 1884 he returned to Canada as commander in chief of Canadian militia, and in 1885 he energetically suppressed the Riel rebellion in the Northwest, for which he received from the Canadian Parliament a grant of $20,000 and the honor of knighthood from the Queen. In 1890 he returned to England, and in 1896 was appointed keeper of the crown jewels.

MIDDLETON, George (1880–). An American playwright, born at Paterson, N. J. He graduated from Columbia University in 1902. In 1911 he married Fola La Follette, an actress and writer, the daughter of Robert M. La Follette (q.v.), and a year later became literary editor of *La Follette's Weekly*. His plays, several being dramatized novels, include: *The Cavalier* (1902), with Paul Kester; *The Wife's Strategy* (1905); *The Sinner* (1907); *The House of a Thousand Candles* (1908); *Rosalind at Red Gate* (1910); *The Enemy* (1911); *The Prodigal Judge* (1913). He published: *Embers* (1911), *Tradition* (1913), and *Possession* (1915), all three volumes containing one-act plays; and *Nowadays* (1914), a comedy.

MIDDLETON, Henry (1717–84). An American patriot, born in South Carolina, a son of Arthur Middleton (1681–1737). He was elected to the Commons and served as Speaker of that body in 1745–47 and in 1755–70 he was a member of the Council. He was a delegate to the Continental Congress (1774), serving as president of that body from October of that year to May, 1775. He was also president of the Provincial Congress of South Carolina in 1775–76, and was one of a committee of 11 to prepare a plan of government until the dispute between Great Britain and the colonies could be settled; was elected a member of the Legislative Council in 1776, later of the Council of Safety, and was chosen to the Senate of South Carolina under the new constitution of 1778. He was a wealthy planter and slave owner and a man of marked public spirit.

MIDDLETON, Henry (1771–1846). An American statesman and diplomat, the son of Arthur Middleton (1742–87). He was born in Charleston, S. C., was carefully educated by private tutors and at South Carolina College, and in 1801 was elected to the South Carolina Legislature, where his brilliant powers as an orator attracted wide attention and led, in 1810, to his election as Governor of the State. He held this office until 1812, was a strong supporter of the war policy of the Madison administration, and in 1815, after a brief retirement from politics, was elected to Congress, serving until 1820. In that year he was appointed by President Monroe Minister of the United States to Russia, where in a service of 10 years he did much to strengthen the commercial relations between the two nations, negotiating in 1824 the first treaty which provided for the regulation of trade and fisheries in the Pacific. On his return to America in 1830 he retired from public life.

MIDDLETON, John Henry (1846–96). An English classical scholar, born at York. He studied at Cheltenham College and at Exeter College, Oxford, but ill health prevented his graduating. During this period he read widely in the fields of art and archæology. Afterward he traveled in various parts of the world and returned to become a partner of his father (an architect) at Westminster. In 1886 he was elected Slade professor of fine art at Cambridge, where three years later he became director of the Fitzwilliam Museum. Appointed art director of the South Kensington Museum, London, he carried out various important reforms. He wrote *Ancient Rome* (1885; rev. ed., 1888) and *The Remains of Ancient Rome* (2 vols., 1892), valuable works, giving among other things an excellent account of the building materials used by the Romans and of their methods of constructing walls, arches, buildings, etc. Middleton also published descriptions of collections in the Fitzwilliam Museum.

MIDDLETON, Thomas (?1570–1627). An English dramatist, born probably in London. Hardly a detail of his life is known. He seems to have studied law, and may thus be one of the two Thomas Middletons entered at Gray's Inn in 1593 and 1596. It is thought that he began writing for the stage as early as 1599, but the first mention of him is in Henslowe's *Diary*, on May 22, 1602. He was then collaborating with Munday, Drayton, Webster, and others on a lost play called *Cæsar's Fall*. In this year he published a comedy entitled *Blurt, Master-Constable*, and in 1603–04 two prose tracts, *The Black Book* and *Father Hubburd's Tales*, lively and highly colored satirical sketches of London life. Between this time and his death he wrote more than 20 plays and 12 masques and pageants. In 1620 he was made chronologer to the city of London. He died in London near July 1, 1627. He was successful in both comedy and tragedy. His humor is seen at its best in *A Trick to Catch the Old-One* (1608); *The Roaring Girl* (1611); *The Spanish Gypsy*, a tragi-comedy (acted as early as 1623, but not printed till 1653); *A Chaste Maid in Cheapside* (not printed till 1630). All except the third in this list depict contemporary London life. The second has as heroine the notorious Mary Frith, known as Moll Cutpurse. Middleton's dramatic power is at its height in *Women Beware Women* (first printed in 1657). It is a romantic tragedy founded in part on the history of Bianca Capello. Almost equal to this play are *The Spanish Gypsy*, cited above, and *The Changeling* (printed 1653), considered by some the most powerful of all the plays with which Middleton's name is connected. *A Game at Chess*, a political drama, attacking Spain, aroused such enthusiastic hatred that the Spanish Ambassador protested, and the piece was taken off the stage after scoring a great success (1624). A play called *The Witch* (printed 1778) is of considerable interest because it has the same motive as Shakespeare's *Macbeth*. Middleton is in the forefront of the group of greater Elizabethan dramatists, and there is little, outside the work of Shakespeare himself, which can match the best of his scenes, tragic or comic. The lack of care evident in his plays makes it impossible for them to take the highest rank. Consult: *Works*, edited by Alexander Dyce (5 vols., London, 1840); *Works*, edited by A. H. Bullen (8 vols.; ib., 1886); selections from the plays, edited by Havelock Ellis, with an introduction by Swinburne, for the "Mermaid Series" (ib., 1887); P. G. Wiggin, *Inquiry into the Authorship of the Middleton-Rowley Plays* (Boston, 1897); D. H. Jung, "Das Verhältnis Thomas Middletons zu Shakspere," in *Münchener Beiträge zur romanische und Englische Philologie* (Munich, 1904); F. G. Fleay, *Biographical Chronicle of the English Drama, 1559–1642* (2 vols., ib., 1891); A. W. Ward, *History of English Dramatic Literature* (rev. ed., New York, 1899).

MIDDLETON, Thomas Fanshaw (1769–1822). Bishop of Calcutta. He was born in Kedleston, Derbyshire, England; was educated at Christ's Hospital, and graduated at Pembroke College, Cambridge, in 1792; was ordained to a curacy in Gainsborough in 1792, and in 1795 became rector at Tansor, Northamptonshire, and in 1802 at Bytham, Lincolnshire. He exchanged these in 1811 for the curacy of St. Pancras, London. In 1814 he was consecrated first Bishop of Calcutta, where he did much to promote the advancement of Christianity and education, founded the Bishop's Mission College in 1820, and established a consistory court. He was editor for short periods of the *Country Spectator* at Gainsborough and the *British Critic* (new series) in London. The work by which he was best known was that on *The Doctrine of the Greek Article Applied to the Criticism and Illustration of the New Testament* (1808). Consult C. W. Le Bas, *Life of Bishop Middleton* (London, 1831).

MID'DLETOWN. A city and the county seat of Middlesex Co., Conn., 16 miles south of Hartford, on the Connecticut River and on the New York, New Haven, and Hartford Railroad and the line of the Hartford and New York Transportation Company (Map: Connecticut, E 3). It is connected with the opposite town of Portland, known for its brownstone quarries, by an unusually long drawbridge. Middletown is the seat of Wesleyan University (q.v.); the Berkeley Divinity School (Protestant Episcopal), opened in 1854; the State Hospital for the Insane; and the State Industrial School for Girls. Other features are the municipal building, Middlesex Hospital, and the Russell Free Library. The city has considerable trade, as the river is navigable as far as Hartford for light-draft steamers, thus increasing the transportation facilities. Middletown is also an important industrial centre, with manufactures of cotton webbing, hammocks, pumps and pump machinery, marine hardware, locks, woolen blankets, dress shields, canopies, belting, paper boxes, electrical appliances, toys, boots and shoes, chemicals, silver-plated ware, rubber, bone, silk goods, etc. There are valuable mineral deposits in the vicinity, and the region is rich in fruit and tobacco. Middletown is governed, under a charter of 1882, by a mayor, elected biennially, and a city council, chosen on a general ticket. The water works are owned and operated by the municipality. Pop., 1910, 11,851; 1914 (U. S. est.), 12,815.

Founded in 1650 and incorporated as a town under the name of Mattabeseck in 1651, Middletown received its present name in 1653 and was incorporated as a city in 1784. Previous to the Revolution and for some time thereafter it was a very important commercial port, a large number of its citizens being engaged in the West Indian trade. For many years prior to 1886,

when the Custom House was moved to Hartford, it was a port of entry. Consult: Whittemore, *History of Middlesex County, Connecticut* (New York, 1884); an article on "Middletown," in the *Connecticut Quarterly* (Hartford, 1898); C. C. Adams, *Middletown Upper Houses: A History of the North Society of Middletown from 1650 to 1800* (New York, 1908).

MIDDLETOWN. A town in Newcastle Co., Del., 25 miles south-southwest of Wilmington, on the Philadelphia, Baltimore, and Washington Railroad and on the Appoquinomink River. (Map: Delaware, H 2). It has considerable fruit-canning interests, owing to its location in the noted fruit-growing belt of the State, also creameries and vegetable canneries, and manufactures farming implements, shirts, etc. There are municipal water works and an electric-light plant. Pop., 1900, 1567; 1910, 1399.

MIDDLETOWN. A city in Orange Co., N. Y., 67 miles northwest of New York City, near the Wallkill River and on the Erie, the New York, Ontario, and Western, and the Middletown and Unionville railroads (Map: New York, Insert A 1). It is the seat of a State Hospital for the Insane, the largest homœopathic institution in the United States, and has a public library and fine high-school and Federal buildings. The centre of an agricultural and dairying district, Middletown enjoys a considerable trade in the products of the region; and among its industrial establishments are straw-hat factories, car shops (N. Y., O., and W.), saw and file works, cigar factories, a tannery, a milk condensery, and manufactories of shirts, automobile tires, wrapping machines, and cut glass. The city owns and operates the water works. Pop., 1900, 14,522; 1910, 15,313; 1914, 15,650 (excluding over 2000 State Hospital patients); 1920, 18,420. Settled before the Revolution and named from its central location between Montgomery and Mount Hope, Middletown was incorporated as a village in 1848 and was chartered as a city in 1888. Its situation as the halfway station between the Hudson and the Delaware rivers, on the old Minisink road leading to the "far West" of New York State, made it of considerable importance in the later years of the eighteenth and the early years of the nineteenth century; while its position as a terminal of the Erie Railroad and the consequent establishment of a foundry about 1845 gave it a start as an industrial centre.

MIDDLETOWN. A city in Butler Co., Ohio, on the Miami River and the Miami and Erie Canal, 34 miles north of Cincinnati, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Cincinnati, Hamilton, and Dayton, the Cincinnati Northern, and other railroads (Map: Ohio, B 7). It has a public library, a hospital, a government building, and a fine opera house; and there are extensive manufactures of tobacco, paper, bicycles, steel, steel sheets, iron, motor cycles, paper machinery, gas engines, and paper boxes and bags. The water works are owned by the municipality. Middletown was settled as early as 1794, and in 1913 adopted the commission form of government. Pop., 1900, 9215; 1910, 13,152; 1914 (U. S. est.), 14,827; 1920, 23,594.

MIDDLETOWN. A borough in Dauphin Co., Pa., 9 miles southeast of Harrisburg, on the Susquehanna River and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, H 7). It is in a farming region and has flouring and planing mills, stove works, car shops, and shoe, hosiery, cigar, and furniture factories, the products of which constitute a considerable export trade. The electric-light plant is owned by the municipality. Middletown was founded in 1755 and was incorporated as a borough in 1828. Pop., 1900, 5608; 1910, 5374.

MIDDLE TOWN INDIANS. See MIWOK STOCK.

MIDDLE VOICE. See DEPONENT; GRAMMAR, near the end.

MIDDLINGS. See FLOUR.

MIDEWIN, mē′dĕ-wĭn, or **MIDEWIWIN,** mē′dĕ-wē′wĭn, or **MIDE,** mē′dĕ, **SOCIETY.** A secret organization found among many Algonquian (q.v.) Indian tribes, consisting of progressive degrees or ranks having some vague resemblance to the Masonic ritual. In the public initiation ceremonies the candidates spit up shells as proof of their having been magically shot into their bodies, or symbolic of the spiritual influence of the ritual. Consult W. J. Hoffman, in *Bureau of American Ethnology, Seventh Annual Report* (Washington, 1891).

MIDGE (AS. *mycg*, OHG. *muccā*, Ger. *Mücke*, Icel. *my*, midge, fly; connected with Gk. *μυῖα*, *myia*, fly). The popular name of the little flies of the family Chironomidæ, applied also in Europe to the Simuliidæ, which in this country are called black flies and buffalo gnats. There is nothing very specific in the use of the name, and it is generally applied to almost any minute flying insect, most of which are true flies.

MIDHAT PASHA, mē′d'hät′ pä-shä′ (1822–84). A Turkish statesman, born in Constantinople. His origin was humble, but his marked ability secured him rapid promotion in the Ottoman civil service. He visited England and France; was made a Pasha; governed Bulgaria and other provinces with energy and wisdom; and in 1872 was named Grand Vizier. He had already identified himself with the progressive party known as Young Turkey and was disliked and feared by the reactionaries. He took a leading part in the conspiracy which led to the dethronement of Abd-ul-Aziz (May 30, 1876) and was made Grand Vizier, Dec. 20, 1876, by Abd-ul-Hamid II, but was dismissed and banished in February, 1877. A constitution which he had promulgated failed. Later he was permitted to return, and became Governor of Syria and then of Smyrna. In 1881 he was tried, with others, upon the charge of murdering Abd-ul-Aziz and was condemned to death, but the sentence was commuted to perpetual banishment when Great Britain interfered. He died in Arabia, May 8, 1884. He was the author of *La Turquie, son passé, son avenir* (Paris, 1878); Consult: B. Brunswick, *La vérité sur Midhat Pasha* (Paris, 1877); L. A. Léouzon Le Duc, *Midhat Pasha* (ib., 1879); Ali Haydar Midhat, *The Life of Midhat Pasha: A Record of his Services, Political Reforms, Banishment, and Judicial Murder* (London, 1903).

MIDIANITES, mĭd′ĭ-an-īts. The name of a Semitic people. According to Gen. xxv. 2, Midian, the eponymous ancestor, is a son of Abraham through his wife Keturah. That the Midianites are to be reckoned with the Arabs is clear. We find them now at Mount Sinai (Ex. iii. 1), again to the east of Israel (Gen. xxv. 4); in the days of Gideon they advance from the Syrian Desert (Judg. vi), and in Num. xxv. 6–9 they are represented as occupying a portion of Moab. They were evidently in the

main a nomadic people whose general habitat was a region including the northern portion of Hejaz and the fringe of the Syrian Desert east of Edom and Moab. The Midianites east of the Gulf of Akabah seem to have been a pastoral people, while those farther north, whose attacks are described in Judges vi–viii, make the impression of Bedouin hordes. According to Ex. iii. 1, Moses's father-in-law, Jethro, was a Midianitish priest. Grimme has suggested that Midian is mentioned under the form Midhi in a Minæan inscription (Halevy, 535; Glaser, 1155). The land of Midian extended northward from Horeb, or Sinai, close to the eastern shore of the Gulf of Akabah. A place called Madiana is mentioned by Ptolemy close to the Red Sea and about opposite the extremity of the Sinaitic Peninsula, and no doubt this stands in some relationship in the original application of Midian in the Old Testament. Consult: R. F. Burton, *Gold Mines of Midian* (London, 1878); id., *Land of Midian Revisited* (2 vols., ib., 1878–79); Grimme, *Die Weltgeschichtliche Bedeutung Arabiens: Mohammed* (Munich, 1904).

MID'LAND. A town in Simcoe Co., Ontario, Canada, on Georgian Bay and on the Grand Trunk Railway (Map: Ontario, E 4). A line of steamboats runs to Parry Sound. Midland's industrial establishments include three grain elevators, four lumber mills, a blast furnace, iron smelters, woolen and flour mills, engine works, a box factory, a shipbuilding yard, and foundry and machine shops. Power for manufacturing is supplied from the Severn River. Pop., 1901, 3174; 1911, 4663.

MIDLAND. A city and the county seat of Midland Co., Mich., 20 miles northwest of Saginaw, at the junction of the Tittabawassee and Chippewa rivers and on the Pere Marquette and Michigan Central railroads (Map: Michigan, E 5). It has large chemical factories, cement-block works, and a tile factory. The water works are owned by the city. Pop., 1900, 2363; 1910, 2527.

MID'LETON, ninth VISCOUNT. See BRODRICK, WILLIAM ST. JOHN FREMANTLE.

MID-LOTHIAN, mĭd-lō'thĭ-an. A county of Scotland. See EDINBURGHSHIRE.

MIDNAPUR, mĭd'nȧ-pōōr'. The capital of a district of Bardwan, Bengal, British India, on the Kasai River, 68 miles by rail west of Calcutta, with which it is also connected by a canal (Map: India, F 4). It is an educational centre, with a municipal arts college, high school, public library, central jail, and printing establishments, and is also the seat of an active American missionary settlement. It has manufactures of cloth, baskets, mats, oil, copper, brass, silk, indigo, and timber, and an important trade in rice. Pop., 1901, 33,140; 1911, 32,740.

MIDNIGHT APPOINTMENTS. In American history, a term applied to the court officials appointed under the Act of February, 1801, by John Adams on the last night of his administration as President. The commissions were signed but left undelivered in the executive offices.

MID'RASH (Heb., from *dārash*, to seek, search). The general name given to the exposition of the Old Testament among the Jews. The prohibitions and ordinances contained in the Pentateuchal codes were specified and particularized according to certain hermeneutical rules, and further surrounded by traditional ordinances and inhibitions. This division of Midrash is represented by the Halacha (q.v.), the binding authoritative, civil, and religious law as laid down in the Talmud. Another branch of the Midrash, however, is the Haggada (q.v.), a kind of free poetical homiletics on the whole body of the Old Testament, and the term Midrash without further specification generally refers to this branch of rabbinical literature. The chief collections of this part of the Midrash are *Midrash Rabba* or *Midrash ha-gadol* (on the Pentateuch and the five scrolls) and *Pesikta* to various sections of the Bible. Besides this there are Midrashim to the separate books of the Pentateuch, Exodus, Leviticus, Numbers, and Deuteronomy.

Bibliography. Steinschneider, *Jewish Literature* (London, 1857); Chenery, "Legends from the Midrash," in Löwy, *Miscellanies of Hebrew Literature* (ib., 1877); A. Wünsche, *Der Jerusalemer Talmud in seinen haggadischen Bestandteilen zum ersten Male ins Deutsche übertragen* (Berlin, 1880); id., *Der babylonische Talmud in seinen haggadischen Bestandteilen wortgetreu übersetzt* (ib., 1887–89); Israel Abrahams, *Chapters on Jewish Literature* (Philadelphia, 1899); Herford, *Christianity in Talmud and Midrash* (London, 1904); M. S. Zuckermandel, *Aus Israels Lehrhallen: kleine Midraschim* (Berlin, 1907 et seq.); id., *Tosefta, Mischna und Boraitha* (ib., 1908–09); P. W. J. Fiebig, *Jüdische Wundergeschichten in des neutestamentlichen Zeitalters* (ib., 1911).

MID'RIFF. The diaphragm (q.v.).

MID'SHIP'MAN. In the United States and British navies *midshipman* is the lowest grade of line or executive officers. The title originated in the British navy more than 200 years ago and was derived from the fact that the "young gentlemen" on British men-of-war who were under instruction for the purpose of becoming officers were given quarters *amidships* abreast the mainmast on the lower deck. When the navy of the American Colonies was organized, the practice of the British service was followed as regards this and other ranks. Previous to the Civil War, midshipmen who had finished their course of instruction were called *passed midshipmen* until promoted. A few years after the war the title of midshipman at the Naval Academy, and on probation at sea for two years afterward, was changed to *cadet midshipman*. In 1882 it was changed to *naval cadet*, but in 1902 the title of midshipman was restored. For many years midshipmen served two years at sea after graduation, but now they are commissioned as ensigns as soon as they leave the Academy. See CADET; NAVAL ACADEMY.

MIDSHIPMAN. See SAPO.

MIDSHIPMAN EASY, MR. A story by Frederick Marryat (1836).

MIDSHIPMAN'S BUTTER. See AVOCADO.

MIDSHIPMAN'S HITCH. See KNOTTING AND SPLICING.

MIDSUMMER EVE. See SAINT JOHN'S EVE.

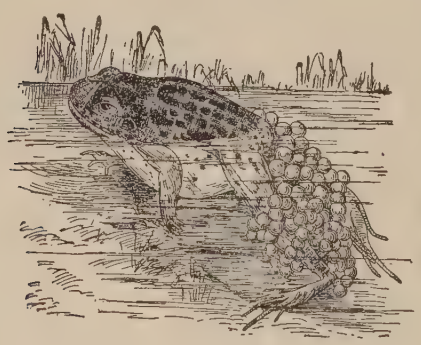
MIDSUMMER NIGHT'S DREAM, A. A comedy by Shakespeare, written about 1595, printed in 1600, when two editions appeared, by Thomas Fisher and by James Roberts, the latter being used for the folio reprint. It is evidently a masque or festival play and is a jumble of classic, mediæval, and fairy lore. The parts of Theseus and Hippolyta may have been taken from Chaucer's "Knight's Tale," but more probably from North's translations of Plutarch's "Theseus" (1579). Pyramus and Thisbe, drawn from Ovid's *Metamorphoses*, may have come

through Chaucer's *Legend of Good Women*, or was based on Robinson's *Handfull of Pleasant Delights*. Oberon, originating in the French *Huon of Bordeaux* in the Charlemagne cycle, is found in Greene's *James IV* (1590). Titania, without the name, can be traced to Chaucer's "Wife of Bath's Tale." Puck is the Robin Goodfellow of old English folklore. The rest of the fairy scenery is Shakespeare's own, except for a slight debt to John Lyly.

MID'WAY ISLAND. An atoll in lat. 28° 14′ N. and long. 177° 23′ W. discovered July 5, 1859, by Capt. N. C. Brooks of the *Gambia* and proclaimed American under the name Brooks Islands, formally annexed and named Midway in September, 1867, by the U. S. S. *Lackawanna*, at which time the Pacific Mail Steamship Company planned a coaling station. Since 1903 it has been continuously occupied as a relay station of the Commercial Pacific cable between Honolulu (1254 miles) and Guam (2593 miles). The atoll is pear-shaped, 2½ miles in its longer dimension, and has two inlets available for small vessels. Its coral wall carries two sandy islets, Middle Brooks or Eastern Island, 15 feet high and 1 mile long, and Lower Brooks or Sand Island, 55 feet high and 1½ miles long. The cable superintendent is a game warden of the Pacific bird reservation. The atoll has been the scene of many wrecks, the most important being the stranding of the mail steamer *Mongolia* Sept. 15, 1906, without loss of life or property. The cable company now maintains a light. Consult "Correspondence Relative to Legislation for Relief of Midway Islands," in 58th Congress, Third Session, *Senate Document 183* (Washington, 1905); and Churchill, "Midway Island" in the *Sun* (New York, March 10, 1912).

MIDWIFE and **MIDWIFERY.** See OBSTETRICS.

MIDWIFE FROG, or OBSTETRICAL TOAD. A smooth toadlike terrestrial frog (*Alytes obstetricans*) of the family Discoglossidæ, found along the Mediterranean coast, and numerous and ubiquitous. From March to August the double call-note of the male, sounding like a



MIDWIFE FROG.

small bell, is heard, but it is difficult to see the performer. The remarkable feature of this frog's life, however, is its egg nurture. When the female is ready to extrude her eggs, which are of large size and attached to one another, in two rosary-like strings, to the number of several dozen, the accepted male mounts upon her back. During the expulsion of the eggs they are fecundated by the male, who then pushes his hind limbs through the tangled mass, after which he releases the female, and retires to his hole dragging with him the burden, wrapped about his legs. He comes out each night to feed and to moisten the eggs in the dew or the nearest puddle, and after about three weeks, when the eggs are nearly ready to hatch, he takes them into the water, where he remains until the tadpoles escape through the softened envelopes. Broods born in early summer mature the same autumn, but later broods remain as tadpoles until the following May. A second species (*Alytes cisternasi*), of similar habits, occurs in Central Spain and Portugal.

MIELATZ, mē'läts, CHARLES FREDERICK WILLIAM (1860–). One of the foremost American etchers and lithographers. He was born in Breddin, Germany, and came as a boy to the United States. He studied drawing in the Chicago School of Design, and painting under F. Rondel in New York. As a teacher of etching in the National Academy of Design, of which he became an associate member, he exercised a powerful influence upon the younger generation, and for a long time was secretary of the New York Etching Club. Although a master of many techniques, adopting or combining those best suited to the subjects represented, he never parades his craftsmanship. Much of his later work was done in color. His art is virile, his line clean cut and energetic, his presentation fresh and original. He is chiefly known as an etcher of picturesque and interesting views of New York City; such as "The Naval Arch"; "Coenties Slip," a color print; "Entrance to Brooklyn Bridge"; the "Battery"; "In the Bowery"; "New York from Brooklyn Bridge"; "Poe Cottage, Fordham," a large and imposing print; "A Pell Street Balcony," a soft ground etching in color; "High Bridge," a lithograph. For the Society of Iconophiles he designed three important series of lithographs representing views in New York City, one of them after quaint old subjects in Staffordshire ware, printed in blue ink. Among his other works are "The Wave," an aquatint in green and yellow; "Winter Night," an aquatint; "Flowers," a dry point; and "The Passing Storm." His latest important works include a series of etchings of Georgian Court, Lakewood, N. J.

MIER, myâr. A Mexican town, situated on the Rio Grande, 110 miles in a straight line from its mouth (Map: Mexico, J 4). It is noted in connection with an attempted invasion of Mexico by Texans in 1842. Pop., 4000.

MIERES, myā'râs. A mining town of north Spain in the Province of Oviedo. It is situated 9 miles southeast of the city of Oviedo, among forest-covered mountains, and is surrounded by gardens and orchards. It has a score of mines and extensive factories for iron and chemical products. In the neighborhood are important mines of coal, iron, and cinnabar. Pop., 1900, 17,867; 1910, 27,866.

MIEREVELT, mē're-vēlt, MICHIEL JANSZOON VAN (1567–1641). A Dutch portrait painter. He was born at Delft, and studied under Willem Willemz and A. van Montfoort, called Blocklandt. Mierevelt was the court painter of the house of Orange, and attained celebrity. His portraits are simply and correctly painted and well characterized, but are somewhat cold and hard. Many inferior copies by pupils are also signed by his name. Among his best-known

works are William the Silent and other princes of Orange-Nassau, in the Rijks-Museum, Amsterdam; the poet Jacob Cats (ib.); and Oldenbarneveldt (Louvre). He is also represented by portraits in the galleries at The Hague, Dresden, London, Berlin, and in the Metropolitan Museum, New York. In the hospital at Delft is the "Anatomy Lesson," designed by him and executed by his son and pupil Pieter (1596–1623).

MIERIS, mē′rĭs. A family of Dutch painters. FRANS VAN MIERIS, the elder (1635–81), a genre painter, was born in Leyden, and was a pupil of Torenvliet, of Gerard Dou, and of Adriæn van den Tempel. His pictures are characterized by elegance of line; the color is clear, delicate, and rich, especially in painting velvets, satin, and other rich stuffs. The treatment is too superficial and smooth, however, to be strong. His principal works include the "Lady in the Crimson Jacket," National Gallery, London; "Lady at her Toilet," "Two Ladies Drinking Tea," "Interior of a Household," and a "Male Portrait," in the Louvre; "Boy Blowing Soap-Bubbles" and "The Artist and his Wife" (1663), in The Hague Museum; "Lady Writing a Letter" (1680) and "Lady Playing the Lute," Amsterdam Museum; the "Smoker" (1662) and a "Woman Fainting," Munich Gallery; the "Tinker" and many others in the Dresden Gallery.—JAN VAN MIERIS (1660–90), a genre and portrait painter, son and pupil of Frans the elder; he studied also under Lairesse. Examples of his work are an "Assembly of Ladies and Gentlemen with a Lute-Player," Gotha Museum; "Surgeon Dressing a Wound," Hermitage, St. Petersburg.—WILLEM VAN MIERIS (1662–1747), a genre and mythological painter and sculptor, was born in Leyden, the son and pupil of Frans the elder. His work represents the school in its decline, and is inferior to his father's in drawing and impasto. He also modeled statuettes and vases adorned with bas-reliefs. Among his works are the "Trumpeter," the "Poultry Dealer," and the "Merry Toper," all in the Dresden Gallery.—FRANS VAN MIERIS, the younger (1689–1763). A genre painter and writer. He was the son and pupil of Willem, and a distinguished antiquary, and published works of merit on numismatics and history. His books include the *Historie der nederlandsche vorsten* (1732–35) and *Groot charterboek der graven van Holland, van Zeeland en heren van Vriesland* (1753–56). Among his paintings, which are of an inferior order, are the "Pharmacy" (1714), Amsterdam Museum; portrait of his father (1737), Copenhagen Gallery; and the "Fishmonger" (1747), Rotterdam Museum.

MIEROSLAWSKI, myĕ′rô-slăf′skĕ, LUDWIK (1814–78). A Polish revolutionary leader, born at Nemours, France. He was the son of a Polish officer in the service of France, received his education at the military school in Kalisz, and joined the Polish insurgents in 1830. Mieroslawski distinguished himself greatly, and was made an officer, serving until the fall of Warsaw, when he settled in Paris. Here he published a number of books in Polish and French, the most significant of which are: *Histoire de la revolution de Pologne* (vols. i–iii, Paris, 1837; iv–v, 1878); *The Revolution in Posen* (in Polish, ib., 1853). In 1846 he was at the head of another revolutionary movement in Poland, which resulted in his being captured and sentenced to death. From this fate he was rescued by the outbreak of the general revolutionary movement of 1848. After fighting in Posen, Mieroslawski resigned his command in the face of ultimate defeat. In 1849 he participated in the revolutionary movement in Sicily, and after resigning his command placed himself at the head of the revolutionary army in Baden, but eventually retired to Paris. His last appearance as a revolutionist was in Poland in 1863, and, after the failure of that attempt, he spent the last years of his life writing political pamphlets. He died in Paris, Nov. 23, 1878.

MIF′FLIN, FORT. See FORT MIFFLIN.

MIFFLIN, GEORGE HARRISON (1845–1921). An American publisher, member of the firm of Houghton, Mifflin & Company. Born in Boston, and educated at Harvard, he became connected with the publishing house of Hurd and Houghton (1867) and with the Riverside Press; he was admitted to the firm in 1872, and continued a partner in the succeeding firms of Houghton, Osgood & Company (1878–1880) and Houghton, Mifflin & Company (1880–1908). After 1908 he was president of the last-named company. He became president also of the Riverside Press, Cambridge, Mass.

MIFFLIN, LLOYD (1846–1921). An American poet, born at Columbia, Pa. He studied painting under his father, J. Houston Mifflin, a portrait painter and writer of verse, under Thomas Moran (1868–69), and later in Italy and Germany (1870–72). His work was exhibited in the United States, but failing health having forced him to abandon painting he turned to the writing of poetry. Among his numerous volumes of verse are: *At the Gates of Song* (1897); *The Slopes of Helicon, and Other Poems* (1898); *Echoes of Greek Idyls* (1899); *The Fields of Dawn and Later Sonnets* (1900); *Castalian Days* (1903); *The Fleeing Nymph and Other Verse* (1905); *Collected Sonnets* (1905); *Toward the Uplands* (1908); *Flower and Thorn* (1909).

MIFFLIN, THOMAS (1744–1800). An American soldier and statesman. He was born at Philadelphia, of Quaker parentage. He graduated at Philadelphia College in 1760, was a member of the Pennsylvania Legislature in 1772 and 1773, and in 1774 was sent as a delegate to the Continental Congress. Entering the army as a major in 1775, he became Washington's first aid-de-camp with the rank of colonel; was made quartermaster-general in August, 1775; and finally (Feb. 19, 1777) was promoted to the rank of major general and appointed a member of the Board of War. During the retreat from Long Island he commanded the covering party, and afterwards rendered valuable service by rousing the people to enlist, bringing essential aid to General Washington before the battles of Trenton and Princeton. Becoming dissatisfied with Washington's management of the war, he intrigued for his removal, forming with Conway and others the so-called "Conway Cabal" (q.v.), on the failure of which he was replaced (March, 1778) by Nathanael Greene as quartermaster-general, and in October, 1778, was removed from the Board of War. He was elected to Congress in 1782 and became its President the following year. He was a member and Speaker of the Pennsylvania State Legislature in 1785, and a delegate to the Constitutional Convention of 1787. From 1788 to 1790 he was President of the Executive Council of Pennsylvania, and from 1790 to 1799 was the first Governor of the State.

As such he took a conspicuous part in the suppression of the Whisky Insurrection, assuming personal command of the Pennsylvania militia. Consult: Simpson, *Eminent Philadelphians* (Philadelphia, 1859); J. H. Merrill, *Memoranda Relating to the Mifflin Family* (ib., 1890); William Rawle, "Sketch of the Life of Thomas Mifflin," in Historical Society of Pennsylvania, *Memoirs*, vol. ii (ib., 1830).

MIFFLIN, Warner (1745–98). An American reformer, cousin of General Thomas Mifflin. He was born of Quaker parentage in Accomac Co., Va. While a mere boy he became impressed with the wrong of slavery, and about 1774 freed all his slaves and gave them compensation for past services. From that time forward he traveled about frequently to the various meetings of his sect, and did much to create a sentiment against slavery among his fellow Quakers. His religious principles led him to oppose the Revolutionary War, and at the request of the Yearly Meeting at Philadelphia he visited both Howe and Washington in order to point out the wickedness of the struggle. Mifflin is perhaps best remembered for having in November, 1792, presented to Congress a strong memorial against slavery which resulted in a spirited debate over the question of the right of petition. Consult Hilda Justice, *Life and Ancestry of Warner Mifflin* (Philadelphia, 1905).

MIG'DOL. A place in Egypt mentioned in Ex. xiv. 2; Ezek. xxix. 10 (A. V. margin); Jer. xliv. 1 and xlvi. 9. The name is identical with the Hebrew *migdal*, 'tower,' 'castle.' As an appellation it occurs in Egyptian inscriptions as early as the fourteenth century B.C. The exact location of the Migdol referred to in the story of the Exodus is uncertain. It may have been only a guardhouse on the road. A *Makthal* is spoken of in Papyrus Anastasi v. 20 as the "watchtower of Seti," but this place cannot be identified with certainty. From Ezek. xxix. 10 it is evident that a locality in the extreme north of Egypt is intended, as it is contrasted with Syene in the extreme south. In Jer. xliv. 1 it is mentioned in connection with Tahpanhes (Daphnæ) and Noph (Memphis), and in Jer. xlvi. 9 as a place inhabited by exiled Jews. This may be identical with *Magdolo* in a Roman itinerary, possibly at the modern Tell el Her, 12 miles south of Pelusium.

MIGNARD, mē'nyȧr', Pierre (1610–95). A French portrait and historical painter. He was born at Troyes, studied under Jean Boucher in Bourges and Simon Vouet in Paris, and resided for twenty-two years in Italy, where he was much influenced by the works of Annibale Carracci. At Rome he painted the portraits of Pope Alexander VII and many of the Roman nobility, and at Venice many Venetian nobles. In 1657 he was summoned by Louis XIV to Paris, where he painted the King ten times, Cardinal Mazarin, and many other celebrities. In 1664 he decorated the cupola of the church of Val-de-Grâce, Paris, where he represented a colossal Paradise, with two hundred figures, some of which are three times the size of life. This is the most ambitious fresco decoration in France, but the color has suffered much from time. He also painted decorations in the palace of Versailles. He was famous in Paris as the leader of the opposition against Le Brun and the Academy, but upon the latter's death in 1690 he fell heir to all his positions, becoming director of both the Gobelins and the Academy.

Mignard was the leading French portrait painter of the seventeenth century. His other pictures are rather cold, superficial, and conventional, but his coloring, derived from the Venetians, is good. The Louvre contains a number of his works, including the portrait of Madame de Maintenon, "The Virgin of the Grapes," "Saint Cecilia," and "Saint Luke Painting the Virgin." Others are in the galleries of Versailles, Madrid, St. Petersburg, Vienna, Berlin, London, and Florence. Consult Eugène Lebrun-Dalbanne, *Etude sur Pierre Mignard, sa vie, sa famille, et son œuvre* (Paris, 1878).

MIGNE, mē'ny', Jacques Paul (1800–75). A Roman Catholic editor. He was born in St. Flour, France, Oct. 25, 1800, and was educated at Orléans. In 1824 he became a priest and performed the functions of his office till 1833, when a pamphlet published by him, entitled *De la liberté, par un prêtre*, brought upon him the censure of the Bishop of Orléans, who forbade its publication. Migne went to Paris, and the same year established *L'Univers Religieux* (later called merely *L'Univers*), designed to harmonize the church with the free spirit of civil government. Later he commenced the publication of a collection of works called *Cours complets de théologie et d'écriture sainte*, and founded a publishing house on a large scale called *L'imprimerie catholique*, designed to furnish standard religious works at a low price. He established the daily *Vérité*, which in 1856 became the *Courrier de Paris*. The *Cours complets* finally grew into a very long series of volumes of standard authors under the general head of *Bibliothèque universelle du clergé et des laïques instruits*. The parts which are best known are *Patrologia Latina*, in 221 volumes (Paris, 1844–64); *Patrologia Græca* (Greek and Latin) in 165 volumes (Paris, 1857–66); and *Patrologia Græca* (in a Latin version), in 85 volumes (Paris, 1856–67). They are reprints of the famous Benedictine editions and many others, and, while not perfect, bring together very conveniently well-nigh the whole library of the ecclesiastical writers to Innocent III (d. 1216). His printing establishment suffered severely from fire in 1868, from the Franco-Prussian War in 1870, and from later ecclesiastical opposition. Migne died in Paris, Oct. 25, 1875.

MIGNET, mē'nyȧ', François Auguste Marie (1796–1884). A French historian. He was born May 8, 1796, at Aix, in Provence, studied law in his native city with his lifelong friend, Adolphe Thiers, and in 1822 went to Paris in order to devote himself to a literary career. He found employment in writing for the public journals, and after giving lectures on modern history, which were received with great approbation, he wrote his *Histoire de la révolution française* (1824). In 1830 Mignet and Thiers in conjunction founded the liberal journal *Le National*. After the revolution of July he became a Councilor of State, and Keeper of the Archives of the Ministry of Foreign Affairs, but he lost these offices in 1848. In 1836 he was received into the French Academy. He edited *Négociations relatives à la succession d'Espagne sous Louis XIV* (1836–42). Other of his works are: *Notices et mémoires historiques* (1843–53, 1854); *Vie de Franklin* (1848); *Histoire de Marie Stuart* (1851); *Charles Quint, son abdication, son séjour et sa mort au monastère de Yuste* (10th ed., 1882); *Eloges historiques* (5th ed., 1884);

and *Rivalité de François I et de Charles V* (1872–75); also a drama entitled *Antonio Perez et Philippe II* (1845–46). Mignet died in Paris, March 24, 1884. Consult: Trefort, *Mignet und seine Werke* (Budapest, 1885); Simon, *Mignet, Michelet, Henri Martin* (Paris, 1889); Edouard Pet, *François Mignet* (ib., 1889); G. P. Gooch, "The Growth of Historical Science," in *Cambridge Modern History*, vol. xii (New York, 1910).

MIGNON, mē'nyôn' (Fr., darling). 1. An Italian girl in love with Wilhelm, in Goethe's *Wilhelm Meisters Lehrjahre* (q.v.). 2. A derisive name applied to the effeminate favorites of Henry III of France. 3. An opera by Ambroise Thomas (q.v.), first produced in Paris, Nov. 17, 1866; in the United States, Nov. 22, 1871 (New York).

MIGNON, mĭn-yông', Abraham (c.1640–79). A German painter, born in Frankfort-on-the-Main. He studied under Jacob Marrel, who took him to Haarlem, where he became the pupil of Jan David de Heem, the celebrated fruit and flower painter. He selected subjects similar to those his master painted, but never equaled him. His composition is more formal, his color less agreeable, and there is too much detail, although his better works are rich, warm, and harmonious. Among his more notable works are a study of flowers, fruit, and other objects, and some "Flowers in a Vase," in the Amsterdam Museum. The Van der Hoop collection in Amsterdam also has a dish with fruit, oysters, and bread, that is more broadly painted than is usual with him. Of his six pictures in the Louvre, two are very fine—a "Bouquet of Wild Flowers" and "Flowers and Fruit." He is also well represented by similar pieces in Dresden, Munich, Brussels, The Hague, Vienna, and other European cities.

MIGNONETTE, mĭn'yŭn-ĕt' (Fr. *mignonette*, dim. of OF., Fr. *mignon*, favorite, dainty, from OHG. *minna*, Ger. *Minne*, love, Icel. *minna*, recollection; connected with Goth. *gamunan*, AS. *munan*, Icel. *muna*, to be mindful, Lat. *mens*, Gk. *μένος*, *menos*, mind, Skt. *man*, to think), *Reseda odorata*. An annual or perennial plant of the family Resedaceæ, a native of the north of Africa, widely cultivated in gardens during summer and in greenhouses and windows during winter for its fragrant flowers. It has lanceolate entire or trifid leaves, and erect terminal racemes of small yellowish-white flowers, which have a six-parted calyx as long as the corolla, and three-toothed capsules. What is called tree mignonette is not even a distinct variety, but merely the common kind trained in an erect form, and prevented from early flowering by pinching off the ends of the shoots. White or upright mignonette (*Reseda alba*), a native of southern Europe, another very popular species, which grows from two to three feet high and bears its white flowers with brownish anthers in dense erect spikes, makes a fine border plant and grows well on ordinary garden soils. The seeds are sown in the open in April or May and later on the plants are thinned to a foot or 18 inches apart. Dyer's weed, or weld (*Reseda luteola*), is a tall species with long spikes of yellowish flowers. All species are generally propagated from seeds, but cuttings are sometimes used.

MIGRAINE, mī-grān' (OF., Fr. *migraine*, from Lat. *hemicranion*, from Gk. *ἡμικρανία*, *hēmikrania*, pain in one side of the head, from *ἡμι-*, *hēmi-*, half + *κρανίον*, *kranion*, head), Megrim, Hemicrania, Sick Headache. A paroxysmal affection characterized by severe headache, usually one-sided and often associated with disorders of vision. The pain is more frequently left-sided, but the right half or the whole head may be affected. There is an hereditary element in many cases and the disease is apt to become established before the age of 30. Hemicrania has been recognized as a peculiar affection and attempts to explain its origin have continued from the earliest times to the present day. Aretæus and Galen associate it with diseases of the stomach and bile passages, and medical writers generally accepted this explanation up to the end of the Byzantine period. Tissot (in 1784) is credited with the first satisfactory description of the disease. He points out its hereditary character, the fact that the pain may be bilateral, and describes the associated phenomena. Tissot's description remained authoritative until 1873, when Liveing's monograph *On Megrim, Sick Headache, and Some Allied Disorders* appeared, although Vater, Heberden, Schönlein, Romberg, Du Bois Reymond, Claude Bernard, and many other distinguished investigators had also made observations upon the eye symptoms and nervous phenomena. At the present time several theories as to the etiology are put forward, all of which have a reasonable basis. These may be merely mentioned as follows: 1. The toxic hypothesis, which assumes that the irritation is due to poisons formed within the body, giving rise to irritation in the cranial nerves. These poisons have been variously assumed to be uric acid, xanthin, paraxanthin, etc. 2. The vasomotor theory assumes that the essential feature is a vasomotor spasm, followed by dilatation, causing anæmia and hyperæmia alternately, which acts on the nervous tissues and causes the headache. These two theories do not necessarily conflict. 3. The reflex hypothesis implicates the sensory nerves in different parts of the body, such as those supplying the eyes, ears, nose, throat, ovaries, and intestines. 4. Recently (1907) Spitzer advanced the theory that migraine is due to an hereditary or acquired anatomical defect resulting in complete or partial stenosis of the foramen of Monro. Whatever causes a passive or active hyperæmia of the brain in such individuals leads to hyperæmia of the choroid plexus with increased secretion of cerebro-spinal fluid and a more or less complete plugging of the foramen of Monro, followed by a rise of intracranial pressure due to distention of the lateral ventricle. The final result of this is an increase in intracranial tension with pressure on the branches of the fifth nerve supplying the dura mater. From all these theories a fairly correct understanding of the phenomena of migraine may be formed. The essential feature is increased intracranial pressure due to vasomotor changes. These may be brought about either by toxic, mechanical, or reflex influences. Women are the chief sufferers. Migraine is associated with gout, rheumatism, decayed teeth, eye strain, and uterine disorders. It is often due to reflex causes, such as powerful emotions, mental or bodily fatigue, disorders of digestion, and the like. The attacks may be unheralded, but generally there are premonitory symptoms of a widely different character in different individuals. Among these may be mentioned a sense of heaviness, with yawning, chilliness, dizziness, or depression, spasmodic closure of the eyelids, twitching, and various sensory disturbances,

ringing in the ears, irregularity in the taste and smell, and diminution of the saliva. These symptoms may be felt several minutes before the attack or may precede it by hours or several days. The speech may be disturbed, the phenomena being those of sensory aphasia. This, according to Charcot, is an intermittent aphasia, in which the patient can recall the right word at one moment but is unable to do so at the next. In some patients there is a transient loss of memory. Charcot attributes these disturbances to a vasomotor spasm near the speech centre. The headache may originate in the temple, forehead, eyeball, or occiput, whence it spreads gradually over one side of the head, sometimes extending to the neck or even to the arm. The face may be pale or congested and the eyes red; nausea or vomiting appears very early in the attack. Few affections are more prostrating than migraine. The attack endures for a variable time; the sufferer may be incapacitated for a few hours only or for a period of two or three days.

Treatment depends in large part upon the etiology, and is generally satisfactory. Exercise in the open air, moderate diet, hydrotherapy, and other measures tending to stabilize the blood pressure are demanded in most cases. Careful search is made for reflex factors in every part of the body, particularly those parts which are supplied by the fifth cranial nerve, since it is in branches of this nerve that the pain is localized. Ocular troubles, such as refractive errors and muscular imbalance, must be corrected. Points of pressure in the nose must be relieved and active or latent disease of the accessory nasal sinuses cured. The teeth must be thoroughly investigated and search made for cavities, diseased foci, or unerupted molars. An X-ray photograph will often reveal a diseased condition in the teeth or nasal cavities which may otherwise be unsuspected. In rare instances excessive auditory stimulation may bring on an attack. The persistent search for and correction of the above-mentioned peripheral or reflex factors has done far more to cure migraine than any other system of treatment devised. The medicinal treatment is merely symptomatic. The vast number of drugs which are mentioned in this connection attest the inefficiency of this plan of treatment. Among the pain relievers are antipyrine, cannabis indica, and chloroform; nitroglycerin and ergot are used to equalize the circulation, and iron, arsenic, nux vomica, etc., may be given as tonics. Electricity and massage are often helpful. During the paroxysm the sufferer should remain quiet in bed and in a dark room. There is an extensive literature in connection with the subject, most of it German. Consult: Edward Liveing, *On Megrim, Sick Headache, and Some Allied Disorders* (London, 1873); Alexander Spitzer, *Ueber Migräne* (Jena, 1901); George Flatau, *Die Migräne* (Berlin, 1912); Auerbach, *Headache*, translated by Playfair (London, 1913). See HEADACHE.

MIGRA'TION (Lat. *migratio*, from *migrare*, to migrate). The movement of peoples from one place to another, usually, though not necessarily, for the purpose of settlement. Movements of population were no doubt common in prehistoric times, and in the historic period there have been notable migrations that have affected the history of civilization. Students of African ethnology have traced migrations among the negro tribes of that continent that are of importance to the ethnographer; and a more complete knowledge of the ethnology and prehistoric archæology of America will probably make it possible to trace such movements among the American tribes, and perhaps will throw some light upon their origin. Migration has played a large part in theories for the explanation of cultural transmission, but W. H. R. Rivers has recently suggested that cultural traits may be diffused by relatively small groups of wandering immigrants, provided their culture succeeds in profoundly impressing the people with whom they come into contact.

Aryan. The accepted hypothesis until recently was that the so-called Aryan or Indo-European family—embracing the Celtic, Teutonic, Greek, Latin, Balto-Slavonic, Armenian, and Indo-Iranian peoples—originated in the Pamirian region of Central Asia, whence the last-named group moved into India and the Iranian Plateau, while the remaining groups migrated westward, the Celtic peoples leading the way and advancing to central Europe, the Teutons settling about the Baltic, the Greeks and Latins finding their way to the Mediterranean, the Balto-Slavonic to the Baltic Provinces, Lithuania, and the region of steppes and rivers to the southeast, while the Armenians settled near the Caspian Sea. Later investigation of the remains of primitive man in Europe, together with a comparative study of the Aryan tongues, has cast grave doubt upon this theory, and made it seem probable that there never was an undivided Aryan family, unless the term be restricted to the peoples of northern India and Persia, and that the European Aryan groups originated near their present habitats; that the Baltic was the original centre of diffusion of European races, and that the Græco-Latins migrated southward to the Mediterranean and the Indo-Iranians and Armenians southeast into Asia. Another hypothesis locates the original Aryan home in the steppes of southeastern Europe. (See ARYAN; INDO-GERMANIC LANGUAGES.) In prehistoric times the Celtic peoples spread over much of Europe and even into Asia Minor in great migrations. From them the Teutonic tribes acquired much of their civilization. See CELTIC PEOPLES.

German. The migrations of whole Teutonic tribes, during the years of decline of the Roman Empire, had a profound influence upon the social and political development of Europe, and are known preëminently as the migrations (*Völkerwanderung*). These peoples had been on migrations, intermittently, for centuries before the time when Tacitus wrote his *Germania*. In the centuries following the period when he gave his account of them they were engaged in intertribal strife, which resulted in the loss of identity of the weaker tribes, the remnants of which were merged in the new confederacies—Goths, Vandals, Alemanni, Franks, and Burgundians (qq.v.). In the fourth century A.D. the Goths were spread over the country north of the Danube. There came upon them from Asia a great migratory wave of the nomadic Huns (q.v.), a Mongolian people. The Goths (q.v.) were unable to resist this inroad, the Ostrogoths were enslaved by the Huns, but the Visigoths obtained permission from the Roman Emperor to cross the Danube into Roman territory. Because of ill treatment by the Romans they revolted and in the battle of Adrianople (378 A.D.)

annihilated a Roman army and killed the Emperor. But they made peace with the new Emperor, Theodosius, and until his death, in 395 A.D., remained quiet. Then they started on their great migration under Alaric (q.v.), which resulted in the establishment of the Visigothic kingdom in southern Gaul and Spain. This march of the Visigoths was the beginning of "the migrations," and it was soon followed by movements of other Germanic tribes. The Vandals (q.v.), who in the fourth century were settled between the Danube and the Theiss, in 401 A.D. started on their long migration which traversed part of Gaul and Spain and finally led to the establishment of their kingdom in north Africa. The Burgundians (q.v.), who at an early date had migrated from their home between the rivers Oder and Vistula, invaded Gaul early in the fifth century and established a kingdom on the Rhine. After defeats by both the Romans and the Huns the small remnant settled in what is now Savoy. The Ostrogoths (see GOTHS), who were living north of the Black Sea, escaped from servitude to the Huns about the middle of the fifth century. Under Theodoric the Great (q.v.) they invaded Italy, nominally as soldiers of the Emperor, and established there the Ostrogothic kingdom, in 493, after the murder of Odoacer (q.v.). The last great German migration into Italy was made by the Lombards. At the beginning of the Christian era their home was on the left bank of the lower Elbe. Little is known of their wanderings until they reached the Danube about 487 A.D. In 568, under the leadership of Alboin (q.v.), they and their allies, including 20,000 Saxons, crossed the Alps and soon conquered northern Italy, Lombardy. Under "the dukes" they spread over almost the whole of Italy. In the meantime the Franks (q.v.) had gradually extended their conquests and migrations southward. Under Clovis (q.v.) they obtained possession of almost all Gaul. The Angles, Saxons, and Jutes (qq.v.), probably from Schleswig and the neighboring lands, invaded Britain from about 449 to 549 A.D.

The above were the most important of the German migrations. The numbers involved in them were considerable, but not so great as was formerly supposed; no accurate estimate can be given. These migrations show the depopulation of some portions of the Roman Empire, as whole tribes of barbarians found homes without exterminating or driving out the inhabitants. They also show the weakness of the Empire, which was powerless to check these bands encumbered by their women and children and all their property. In the sixth century Justinian (q.v.) reconquered Africa from the Vandals and Italy from the Ostrogoths; the Franks conquered the Burgundians and the Visigoths in Gaul. In the eighth century the Mohammedans conquered the Visigoths in Spain and the Franks subdued most of the Lombards in Italy.

Asiatic. The migrations of the Asiatic peoples are very different from the Teutonic, because they did not carry their households with them. From time immemorial the weaker tribes in the steppes of Central Asia have been driven out from their pastures and robbed of their wives by the stronger, and consequently have been compelled to seek homes elsewhere. While weaker than their conquerors they have been almost invincible to the settled peoples, whose lands they harried by sudden invasions on horseback. When they found a competent leader they made widely extended conquests, enslaving the people and taking their women from them. On the death of the leader the unification frequently ceased and the tribe lost its power. Of this character were all the great invasions of Europe by the nomads, Scythians, Sarmatians, Huns, Bulgars, Avars, Magyars (qq.v.), and Cumans. Of these invasions that of the Huns, in the fourth century, was probably the most influential for European history, as it forced into feverish activity the German migrations. Under Attila (q.v.), in the first half of the fifth century, the Huns built up a strong power in central Europe, but this went to pieces after Attila's death. In the later Middle Ages the movements begun by Genghis Khan (q.v.) had a great effect upon all eastern Europe. Consult: Bryce, "Migrations of the Races of Men Considered Historically," in *Smithsonian Institution, Annual Report, 1893* (Washington, 1894); E. A. Freeman, *Western Europe in the Fifth Century* (New York, 1904); J. A. G. von Pflugk-Harttung, *Great Migrations* (Philadelphia, 1905); A. C. Haddon, *The Wanderings of Peoples* (Cambridge, 1912). See MONGOL DYNASTIES; TIMUR; TURKEY, section *Ethnology*.

The migrations in modern times have been on a larger scale than in the past, and are discussed in the article upon EMIGRATION. For the effects of the Germanic migrations, see EUROPE, section on *History*. For bibliography, see the articles on the various nations and tribes mentioned.

MIGRATION, WAGNER'S LAW OF. In evolution, one of the main agencies leading to the isolation of animals, and consequently to the formation of local races, varieties, and species. This was first pointed out by Moritz Wagner in 1868. He stated his views in three general propositions: (1) the greater the change in the conditions to which individuals are subjected on emigrating to another territory, the more intense must be the inherent individual variability of each organism; (2) the less the even tenor of this increased individual variability of organisms is interrupted by frequent crosses with emigrants of the old stock, the more frequently will nature be successful in forming a new variety or incipient species by the accumulation and inheritance of fresh characteristics; (3) the more advantageous to the variety the change in each single organ, the better it will be able to adapt itself to surrounding circumstances; and the longer the selection of an incipient variety of colonists remains undisturbed by the old stock, the more frequently will a new species arise out of the variety. These laws are fully illustrated by Wagner in his works, and by later observers. Wagner claimed that evolution by natural selection is impossible unless it be assisted by geographical isolation in order to prevent the swamping effects of intercrossing. The numerous facts observed by Wagner and others show that some of the barriers isolating incipient species are broad rapid rivers, oceans, and mountains. He speaks of the extraordinary phenomena of so many species of plants and animals peculiar to the volcanoes and isolated mountains of Quito. "Without the distribution of organisms by migration in connection with local selection it would be inexplicable. The gigantic isolated mountains of this highland act a similar part in the formation of varieties and species as the islands of the archipelago, for instance, of the Galapagos." Wagner also

claimed that adaptation to changed conditions of life and transformation appear to be tantamount to a renovation. Species, he said, which did not migrate, and consequently did not alter in form, became extinct. Consult Moritz Wagner, *The Darwinian Theory and the Law of the Migration of Organisms* (Munich, 1868; trans. by Laird, London, 1873).

MIGRATION OF ANIMALS. The word migration is used in two senses: either to refer to those periodical changes of location such as are made by many species of birds and fishes, by some mammals, and by a few insects, or to those irregular dispersions caused by overcrowding and lack of food or water.

Mammals. Among mammals migrations in the first sense are mainly confined to certain Cetacea, which regularly move from and to the polar seas with the alternating seasons. Regular seasonal movements, truly migratory but short, are practiced by many land animals, especially the herbivores. All deer, goats, sheep, antelopes, and the like, which dwell in mountainous regions, regularly ascend the heights in early summer to get the new grass, find safer solitudes, escape the lowland flies, and otherwise better themselves. In the fall they come down as the snow and cold increase upon the heights, and seek the valleys or the neighboring plains. The American bison formerly was wont to retreat from the mountains to the plains during severe winters, while those on the northerly plains tended to move south. Before the time of railroads the great body of the pronghorns of the plains used to migrate from the northern area of their range to the milder regions south of the Platte River, and returned north in the spring. Still more striking is the regular and prolonged annual migration of the caribou from the Arctic shores of America to the southerly interior, especially in the region north and east of Hudson Bay; they cannot live so far north during the winter, but go back as soon as the snow melts in spring. In all these cases there is an accompanying migration of certain large predacious animals, such as wolves, which depend upon the grazers for food. Similar facts may be cited from the plain regions of Asia, Australia, Patagonia, the Sahara, and South Africa, where seasonal changes, either of cold or drought or the parching of pasturage, compel annual migrations to and from other regions not far distant. It will be seen that these movements are under compulsion of the lack of food (or frequently in desert regions of water), and are continued only when and so far as necessary. Mammals are too slow and hampered in their movements on land to make long, rapid journeys, such as a bird or fish is able to accomplish through the unobstructed air or water; and most mammals either can find food all the year round, or have acquired the power, by storage of provisions or by sinking into dormancy, of tiding over the seasons of scarcity.

Overflows of Mammalian Life. Mammals, including man, take part in certain much more rare but more universal and permanent removals. The most conspicuous instance is afforded by the lemmings of central Norway and Sweden, which at uncertain intervals come down in vast hordes into the lowlands, as is fully described under LEMMING. They travel by night, feed and multiply excessively, and in from one to three years the few which escape the hordes of enemies following them reach the Atlantic or the Gulf of Bothnia. It is believed that these sudden incursions are the dispersal of an overpopulation in the ordinary habitat of the species, due to a combination of favoring circumstances causing an increase of a naturally fecund race until the country cannot longer support the numbers. The animals are started abroad by famine, and continue the flight in aimless restlessness until an equilibrium is restored. The same thing happens occasionally with various other small rodents. "Plagues" of mice have broken out frequently in the grain-growing regions of southern Russia and in other parts of the world. In the western part of the United States, until hunting kept down the stock, there used to be irregular but prodigious movements of squirrels (normally extremely numerous there), which would appear in droves over a wide range of country, all traveling steadily in one direction, until they gradually vanished. The writings of Audubon, Godman, and other early naturalists contain many records of these movements, which did not cease until about 1840. The theoretic and historic incursions of human hosts from Asia into Europe, the spread of the Bantu races which overran Africa, and similar "waves" or "migrations" of conquering men, fall into the same category, but their superior adaptability has enabled them, or some of them, to remain and possess the land.

Insects. The insects afford many cases of mass movements similar to those of mammals, and also a rare approach to true migrations. The swarms of grasshoppers, or locusts, which occasionally visit parts of Africa and Asia, are one of the most familiar phenomena of those regions; and they are accompanied by a rapacious following of birds and mammals feeding upon the traveling hosts of insects, which disperse, dwindle, and finally disappear. In the United States the most disastrous excursions of these insects have been from the Rocky Mountains eastward. They are of irregular occurrence, and the returning swarm the succeeding year is composed only of the descendants of the original emigrants—a fact which contains a hint as to the possible origin of the true migratory habit in others. Irregular movements without, so far as we know, any attempt to return to the original home are illustrated by the army worm, chinch bug (qq.v.), and cotton worm. (See COTTON INSECTS.) These migrations are due to overcrowding and lack of food. There are still slower migrations among insects, which may be termed "spreading." Thus the Colorado potato beetle, a native of the Rocky Mountain plateau, spread eastward, when suitable food was offered it by the cultivation of potatoes, until it now occurs all over the potato region of eastern North America, and, like the brown rat, it permanently occupies all the new territory it enters. A few insects (butterflies) are known to migrate in the sense that fish and birds do.

Reptiles and Fishes. Such phenomena are entirely unknown among reptiles, for obvious reasons, with the possible exception of seagoing turtles, which may withdraw into deeper water or more southerly latitudes in winter than in summer. Many fishes perform long and complex wanderings, but how they are guided in some cases across and up and down the ocean will be a very difficult problem to solve. Salmon and other anadromes come from the sea each spring and ascend hundreds of miles up rivers so as to spawn in places suited to the needs of

the young. The fish so bred return to spawn in the water of their birth, as has been demonstrated by marking smelt that have been transplanted and hatched in rivers previously unoccupied by them; the marked smelt returned from the sea to spawn in the river of their adoption. Experiments upon herring along the Massachusetts coast confirm this conclusion. Sea fishes generally retire to comparatively deep water, and probably many species go southward in winter, while in summer they spread northward and approach the shores, river mouths, or other spawning places. These migrations are induced by reproductive desires and necessities, and the slight variation in the time of the coming of each species, which fishermen expect with fair regularity, seems due to variations in the temperature of the water. It is probable that even these ocean wanderers return to the same part of the coast where they were bred, and that in some cases, as of the Atlantic salmon, exaggerated notions have prevailed as to the distance to which they go in winter. See SALMON.

The Migration of Birds. More conspicuous and interesting, and quite as difficult to explain, are the migrations of the birds, which have been the theme of poetry, homily, and fable, as well as a baffling subject of inquiry, ever since men began to notice the ways of animals.

Most persons have a vague idea that the habit of yearly migration among birds is uniform and universal, but this is not so. Most birds do not migrate at all, and among those that do great diversity exists, so great that the custom seems almost an individual rather than a racial one. The whole body of ratite birds—ostriches, rheas, cassowaries, and the like—are nonmigratory. The fish-eating sea fowl make no more of an annual migration than is necessary to escape from the ice and darkness of their most polar haunts to where there may be open sea. These are wanderers rather than migrants. Gulls and terns, geese, ducks, and the wading marsh and beach birds are in the main migratory, and include some of the most remarkable examples. Of the game birds fewer are real migrants, but here again a few notable exceptions exist, of which one of the most familiar is that of the common European quail, which has been taken so numerously for centuries on both sides of the Mediterranean, and whose migratory flocks still feed travelers wandering in the wilderness of Sinai. The pigeon tribe is sedentary as a rule, also, yet one of its species—the passenger pigeon of North America—has become the very type and exemplar of a migratory bird. Many, but not all, birds of prey regularly migrate, but it is a question whether they do not, in most cases, accompany the movements of the smaller birds rather than travel of their own impulse. Parrots are almost wholly nonmigratory. It is not, then, until we have passed 21 of the 23 classified orders of birds (with the exceptions above noted) that we come to those groups, the picarian and passerine birds, in which the custom of seasonal migration is a prominent characteristic. These are, to be sure, the most numerous as well as the most highly organized orders; yet a large number even here do not migrate at all from temperate regions, but form a resident or partially migrant population in all moderate latitudes, where they remain all the year round. On the whole, the large majority of the total list of the birds of the world are not migratory to any considerable degree.

When we examine the minority which does annually alternate between southerly winter and northerly summer residences many curious facts are discernible. First, it is noticeable that all migratory birds belong to the colder latitudes of the globe; and, on the other hand, that those groups which are wholly nonmigratory represent the primitive types—birds whose ancestry goes back to times when a comparatively warm climate prevailed over the now unbearably cold and sterile polar regions. In general, two-thirds of the birds of the middle temperate zones, both north and south, are migrants, and the total is a very small part of the entire avifauna of the world. Taking up the character of the migratory birds as a class, it appears, first, that they are such as either subsist wholly or mainly on soft-bodied insects—larvæ, worms, and the like—or give their young such fare; second, such as gain their living from fresh or brackish waters or mud, which is likely to freeze; and third, such as follow small birds in order to prey upon them. It is also significantly true that they represent families whose mass and affiliations are found in the tropics, in many cases only one or two species being known elsewhere. Europe's single cuckoo, the eastern North American humming bird, tanagers, orioles, and the like, are familiar and striking examples of this fact. On the other hand, the nonmigratory or resident birds of the temperate zones belong to families mainly distributed outside the tropics and separable, broadly speaking, on other grounds. This state of things points to the explanation that the extratropical parts of the world, depopulated of birds by the cold, ice, and excessive rains of the Pleistocene or Glacial period, were restocked from the crowded intertropical preserves as fast as the amelioration of the climate permitted plants and animals to occupy the temperate and subarctic regions; and that the reactive effect of the new country steadily checked colonization by selecting only those species adapted or adaptive to the new conditions. In this light the seasonal migration of birds must be viewed as an annual excursion, constantly repeated by certain species that have the habit (and not by others), outward from equatorial regions to a greater or less distance poleward.

Beginning of the Seasonal Movement. As the close of the rainy season approaches in the tropics migratory strangers gradually separate themselves from the resident birds, now beginning domestic cares, and disappear. What starts them off just as the rains are bringing an increase of both plant and insect food we do not know. Their ovaries show little preparatory enlargement, and few or none are mated. As they slowly proceed, keeping pace with the lifting sun and the opening spring, they will gradually concentrate upon certain highways, or "migration routes." The old males take the lead, probably merely through superior strength of wing; and it is not until the bulk of these have passed by that the females appear, followed, after an interval, by yearling birds.

The weather encountered, always uncertain, influences this progress decidedly, warm southerly winds encouraging the birds to go forward, while cold spells or northerly storms check them, sometimes for a fortnight or more, and occasionally destroy large numbers. When sunshine and southerly breezes again prevail the accumulated host goes forward in what observers call a "wave" of migration. Such checks are local;

and larger influences have an effect, so that the movement is uniformly earlier in some parts of the continent than in others.

Migration Routes. It is also true that the movement is not uniformly distributed. On the contrary, there are certain definite routes or paths which birds follow in especially great numbers. The greater of these routes, or "fly lines," are generally recognized and seem to be determined partly by topography, but to a greater degree by considerations of security and subsistence. The most thickly frequented routes are along ocean coasts, river valleys, or mountain ranges. European specialists, like Palmen and Middendorf, have outlined several such "fly lines" with great particularity, and when sketched upon a map they are seen to coincide in a general way with the valley system of that continent. Similar highways are traceable in North America. One runs along the Pacific coast and another up the valley of the Rio Grande and along the connected valleys and parks between the parallel ranges of the Rocky Mountains. East of the plains a horde of spring birds enters the United States along the eastern lowlands of Mexico and by way of the West Indies, and soon divides into definite streams of travel. Parted first by the southern extremity of the Alleghanies into two main currents, one goes to the right up the Atlantic coast and through the Hudson Valley and New England, while a second, to the left, ascends the Mississippi, Missouri, and Ohio, diverging more and more up tributary valleys, until all the central and northern parts of the continent are supplied. A little reflection will show how likely, from the nature of the case, are these routes. They are natural bird roads, without obstacles, and they afford easy guidance, plentiful vegetation, and consequent protection against enemies and storms, and the abundance of insect food belonging to watercourses.

Nocturnal and High-Flying Migrants. A large part of the migration of many birds is made at night, especially the natural night fliers, like owls and goatsuckers and the great body of small, timid birds that in their daily life seek concealment and obtain their food in shady, secluded places. It is only the day goers that we ordinarily see migrating, and these more commonly in spring than in fall; but every observer has noted how after a favorable night the woods will be full of birds at dawn where none were to be seen the evening before. English and American ornithologists, led by Baird about 1875, have collected at lighthouses and other watching places systematic data in respect to night migration.

Guidance. What guides these travelers on their annual journeys across continents and over seas? This has been an eager question ever since men began to watch the ways of the birds. If anything approaching a rule has been disclosed it is that diversity prevails rather than uniformity. Birds closely allied in structure, diet, nesting habits, and so forth, vary immensely in the extent and manner of their migrations. While some travel twice a year from the equator to near the poles, others of the same family, or genus even, never leave warm latitudes at all. The increasing perception of this individuality in animals inclines one more and more to believe that migratory birds are guided in the majority of cases by the teaching of their elders, and by their own observation and memory, rather than by any extraordinary faculties or process. Brewster declares that the manner of migration of birds is determined by one, two, or all of the following considerations, viz.: (1) habitual manner of procuring food; (2) disposition; (3) wing power. Much evidence exists in favor of this simple and practical explanation, but unfortunately contrary and unexplained facts still confront us. European ornithologists assert that there the young of many species precede the adults on their journey southward in the autumn. Cooke and Widman, in their elaborate *Report on Bird Migration in the Mississippi Valley*, say the same for the interior of North America. On the other hand, William Brewster, who has observed this matter with the highest zeal and intelligence, maintains the opposite view as the result of long experience in New England and eastern Canada, and declares that the young never precede older birds in the fall, explaining that the first southward flights of adult birds have been overlooked because they were unexpectedly early. He has elucidated this with much detail in the *Memoirs* (No. 1) *of the Nuttall Ornithological Club.*

That this is the true history of migration in respect to many and various kinds of birds cannot be gainsaid; that it is an all-sufficient explanation is not universally admitted. The powers of recognition and recollection involved are doubted by some; yet all animals are strong in this direction—perhaps no mental faculties are so distinctly manifested by brutes as observation and memory. Examples might be drawn from every class, but homing pigeons are most closely to the point. There can be no reason to suppose other birds are less able in this respect until we have taken pains to exploit their abilities. No mysterious "homing faculty" need be summoned. The great height at which pigeons usually fly enables them to survey a wide extent of country and find some points with which they have been previously familiarized; from this a second is visible, and so on, leading the pigeon straight home as the pioneer follows a blazed trail through a forest. Wild birds may be supposed to do the same, and their wish to get a very wide view of the landscape explains the height to which they rise in these journeys and their descent and confusion in murky weather. From a height of 10,000 feet both shores of the Mediterranean, e.g., would probably be visible to a bird's eye, at any rate in the narrower places where they mostly cross. It must be confessed, however, that this explanation does not cover the case of those birds which migrate across ocean spaces of one or two thousand miles. Here it seems necessary to believe that they are guided by an intuitive sense of direction—a *feeling* for the points of the compass, so to speak. Something so closely akin to this instinctive power of orientation is observable among other animals, including the human savage, that it may be very well conceded to the birds. The placing of small, marked metal bands on the legs of young birds has recently been carried on extensively both in the United States and Europe, and has already begun to yield valuable, definite results in indicating the general movements of individual birds.

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MIGRATION OF PLANTS. The natural movement of plants from one area to another. This term is thus somewhat in contrast to naturalization (q.v.). Migration of species is possible by reason of variations in the structural adaptations which are found in most plants. Among these perhaps the most important are the structures which are concerned in the dispersal of seeds and spores, which may be scattered by means of birds, wind, or water to very great distances. Besides these methods of dispersal, certain plants may be scattered in a vegetative way for great distances and become established far from the original home. Thus, the common water weed *Elodea* is believed to have spread all over Europe vegetatively from a single plant introduced in the early part of the nineteenth century. It seems likely that after a time a certain equilibrium between the various species of the world will have been reached and that each particular species will be found in the conditions best suited to it. When this time comes further migration would seem to be without result, whether the scattering of seeds takes place or not. It must be remembered, however, that various factors enter in to disturb any equilibrium which may be formed. In the first place, there are changes in the organic world itself; i.e., new species of both plants and animals are developed from time to time through evolution and new disturbances in the so-called equilibrium must arise. In the second place, the external world suffers tremendous changes. It is probably this last cause which has been most responsible for the migration of plants. Through the geological ages continents have arisen and passed away, and all these changes must have been accompanied by changes in the mutual relations of the species then living. Changes in climate have taken place many times in the world's history, and all of these changes must have been attended with great plant migrations. To illustrate: the oncoming of the ice epoch caused a southern movement of the climatic zones, and the species which had become adapted to a particular climate moved south to a greater or less degree *pari passu* with the climatic movement. Postglacial times have witnessed northern migrations, which are necessarily much slower than the northern migrations of the southern zones. Plants must not be regarded as less active migrants than animals, though they make no seasonal migrations.

MIGUEL, mē-gāl′, Dom Miguel Maria Evaristo de Bragança (1802–66). An aspirant for the Portuguese throne, the third son of John VI of Portugal. He was brought up in Brazil, whither his parents had fled in 1807, and returned to Portugal in 1821 with very little education, a debauchee and a superstitious bigot. He put himself at the head of the reactionary party and plotted the overthrow of his father and of constitutional government. In 1824 he caused his father to be closely guarded, arrested the ministers, and sought to overthrow the government, but failed and was sent into banishment. In 1826 his brother Dom Pedro, Emperor of Brazil, succeeded to the throne. He relinquished the crown of Portugal to his young daughter, Dona Maria da Gloria, and betrothed her to her uncle Miguel, who was made regent. Dom Miguel in 1828 usurped the throne, abolished the constitution, and introduced a reign of terror. Dom Pedro, who had been forced to abdicate the throne of Brazil in 1831, placed himself in 1832 at the head of an expeditionary force, which had been collected by the opponents of Dom Miguel, and proceeded to dethrone the usurper. He entered Oporto in July, and a year later, after the defeat of Dom Miguel's fleet, was in possession of Lisbon. Spain recognized Maria as the legitimate sovereign. England and France followed suit, and Dom Miguel was forced to give up all claims to the crown (1834). He died at Brombach in Baden. To the common estimate of Dom Miguel's character exception is taken by Cardinal Hergenröther in the *Handbuch der allgemeinen Kirchengeschichte,* vol. iii, p. 847 ff., (3d ed., 1886), where he is said to be a noble prince, possessing the affection of his subjects.

MIHRAB, mē-räb′. See Kiblah; Mosque.

MIJATOVICH, mē-yä′tô-vĕch, Chedomille (1842–). A Servian diplomat and author. He was born in Belgrade; studied at Munich, Leipzig, and Zurich; taught economics at Belgrade (1866); and was general secretary in the Servian Ministry of Finance from 1869 to 1871 and Minister of this department in 1873–75 and of Foreign Affairs as well as Finance in 1880. About 1874 he broke with Ristič, in whose cabinet he had served, and joined the Progressive party. From 1875 on he was a Senator of the Kingdom of Servia. In 1886 he represented Servia in making peace with Bulgaria; in 1894 was Minister of Finance again and Ambassador to Rumania; in 1899 was delegate to The Hague Peace Conference; and in 1895–1900 and (after serving at Constantinople) in 1902–03 was Minister from Servia at the Court of St. James's, resigning after the assassination of King Alexander, which he described in *A Royal Tragedy* (1906). He wrote *Servia and the Servians* (1908), *Servia of the Servians* (1913), and, in Servian, several volumes of history, economics, and fiction. His English wife, Elodie Lawton (died 1908), wrote a *History of Modern Servia* (1872) and *Serbian Folk Lore* (1874).

MIKADO, mē-kä′dō (Jap., Exalted Gate). Formerly the popular and official title of the Emperor of Japan, occurring in poetry and history throughout the whole range of Japanese literature. Though comparatively obsolete in the Japan of the twentieth century, the word has found a fixed and honored place in the English language. The Mikado dynasty is probably the oldest in the world, Yoshihito (q.v.) being reckoned by most authors the one hundred twenty-second of the Imperial line, the first being Jimmu Tenno, who in the official chronology began to reign 660 B.C. Descent is claimed from the gods that created heaven and earth. The origin of the line is lost in mythology, and there is little or no historical foundation for it before the fourth century. The first 17 mikados (660 B.C.–399 A.D.) are said to have died at ages ranging from 100 to 141 years. The average reign in the whole line is 20 years. Each mikado has a personal name, but no family name, nor is the name of the mikado ever repeated. Each has also a posthumous title, by which he is known in history. Seven of the mikados were women. See Meiji Tenno.

MIKADO, The. A comic opera by William S. Gilbert and Sir Arthur S. Sullivan (qq.v.), first produced in London, March 14, 1885; in the United States, Aug. 19, 1885 (New York).

MIKAL. See Lebensohn, Micah Joseph.

MIKA′NIA (Neo-Lat., named in honor of J. C. Mikan, a Bohemian botanist of the nineteenth century). A genus of plants of the family Compositæ, nearly allied to *Eupatorium* (q.v.). *Mikania officinalis* is a Brazilian species, with erect stem and heart-shaped leaves, abounding in a bitter principle and an aromatic oil, reputed useful in medicine. *Mikania amara* and *Mikania cordifolia* (twining herbs), also natives of the warm parts of South America, are among the plants which have acquired a high reputation—deserved or undeserved—for the cure of snake bites. The former is remarkable for the large indigo-blue spots on the underside of its ovate leaves. *Mikania scandens,* sometimes called climbing hempweed, is a native of the United States, growing in moist soils from New England to Texas.

MIKHAILOFF-SHELLER, mē′kä-yīl′ŏf-shĕl′lĕr, Alexander. See Sheller, Alexander Konstantinovitch.

MIKHAILOV, mē-kä-yīl-ôf, Mikhail Larionovitch (1826–65). A Russian journalist and novelist, born in the Ural Mountains. He was educated in St. Petersburg and began his literary work with translations, chiefly from Heine. These were collected in one volume (1858), and his articles for the *Sovremennik* (*Contemporary*) and other periodicals, as well as his stories, notably *Adam Adamovitch* (1851), were published in two volumes in 1859. He shared the dreams of the revolutionists of his own country and was exiled to Siberia, where he died.

MIKHAILOVSKI, mē′kä-yīl-ôf′skē, Nikolai Konstantinovitch (1842–1904). A Russian essayist, critic, and sociologist. He translated one of Proudhon's works into Russian, but it was his critical work on the famous *Annals of the Fatherland* (*Otĕčestvennya Zapiski*), with which he was connected from 1869 to its suppression in 1884, that made him famous. For it he wrote literary notes regularly, beginning in 1872, and many papers, on truth, heroes, and the crowd, Darwinism, Socialism, positivism, and the systems of Spencer and Mill. In 1873 he became one of the editors of the *Northern Messenger* (*Sĕvernvi Vĕstnik*), and from 1890 to his death he edited the *Russkoe Bogatstvo* (*Russian Wealth*). Mikhailovski's best-known monograph is on *The True Nature of Progress* (trans. into French by Louis, *Qu'est-ce que le progrès?* 1879). Mikhailovski rejects the organic conception of society and holds that social processes are not wholly reducible to biological or intellectual terms. Social progress, in his view, presupposes social justice—the proper division of labor—and is brought about through the conscious and sympathetic coöperation of the individuals striving to realize their full measure of individuality. The end of progress is the identity of truth and justice (Russ., *pravda*). Mikhailovski also wrote several literary studies, notably on Tolstoy (1887) and Shtchedrin (1890). His papers have been collected several times, the latest edition of his *Works* being prepared by Kolosov (St. Petersburg, 1913).

MIKHAILOVSKI-DANILEVSKI, mē′kä-yīl-ôf′skē dä′nē-lyĕf′skē, Alexander Ivanovitch (1790–1848). A Russian soldier and historian. He took part in the war with France (1812–13) as Kutusoff's aid-de-camp and was head chancellor of Wolkonski in 1813–14. In the war with Turkey (1829) he served as major general, was promoted to be lieutenant general in 1835, and became a member of the war council and Senator in 1839. He wrote a *History of the Turkish War of 1806–12* (1843), besides accounts of his experiences in the campaigns of 1812–13 (1834) and of 1814–15 (1849–50). His collected works were published (1849–50) in seven volumes. They are marked by a freedom of style and a patriotic sentiment that sometimes verged into inaccuracies.

MIKKELSEN, mĭk′kel-sĕn, Aksel (1849–). A Danish educator, born at Hjörring, the introducer and organizer of sloyd schools in Denmark. In 1872–83 he operated a machine shop, later he organized sloyd schools, finally the Sloyd Seminary in Copenhagen, and in 1907 he was appointed sloyd inspector for Denmark. Through his energetic work as teacher, author, and lecturer he greatly developed this form of education throughout the country. Among his many writings on the subject are: *Hvad er Slöid?* (What is Sloyd?) (1886); *Hvordan arbeider Slöidskolen?* (How Does the Sloyd School Work?) (1886); *Slöidlære* (Instruction in Sloyd) (1894); *Arbeidsstillinger* (Positions when Working) (1896).

MIKKELSEN, Ejnar (1880–). A Danish explorer, born at Vester Brönderslev, Jutland, who served in the Amdrup expedition to Christian XI Land, East Greenland (1900), and in the Baldwin-Ziegler expedition to Franz Josef Land (1900–02). With Leffingwell he organized the Anglo-American polar expedition which wintered at Flaxman Island, Alaska, in 1906–07. They lost their ship, but in a sledge journey over the ice they located the continental shelf of the Arctic Ocean, 65 miles offshore, where in 2 miles the sea increased from 50 meters to more than 690 meters in depth.

Organizing an expedition to map out the northeast coast of Greenland, to recover the bodies of Mylius-Erichsen (q.v.) and Lieutenant Höeg-Hagen and their records, Mikkelsen wintered (1909–10) at Shannon Island, East Greenland. His ship sank, and the rest of the party returned home on a whaler. Remaining with his engineer, Iversen, Mikkelsen succeeded

by a series of most remarkable and hazardous sledge journeys in recovering the lost records and in disproving the existence of Peary Channel. The two explorers, who later wintered at Shannon Island, were rescued, when in the direst of extremities, by a Norwegian whaler (1912). Mikkelsen's writings are: *Conquering the Arctic Ice* (1909); *Lost in the Arctic* (1913; Ger. trans., 1913); "Mylius-Erichsen's Report on the Non-Existence of Peary Channel," in *Meddelelser om Grönland*, vol. xli., (1913); *The aar paa Grönlandsöstkyst* (1914).

MIKLOSICH, mĭk'lō-shĭch, FRANZ VON (1813–91). A famous Slavic philologist of Slovene nationality. He was born in Luttenberg, Styria, studied law at Gratz, and settled to practice in Vienna in 1838. There the famous Kopitar (q.v.) aroused in him an interest in Slavic philology, and he first attracted attention by his review of Bopp's *Comparative Grammar* in 1844. Henceforth he devoted himself to philology, and until his death his productivity was enormous. In 1844 he obtained a position in the Imperial Library and in 1850 was made professor of Slavic philology in the University of Vienna, retaining his post until 1886. He was also government censor of Slavic, Rumanian, and Greek publications. His scientific career is remarkable for profundity of research. Miklosich is not only the founder of modern Slavic philology, but he also greatly promoted the historical study of the Albanian, Gypsy, Hungarian, modern Greek, and Rumanian languages. Aside from numerous articles on special points of phonetics, syntax, archæology, etc., chiefly published in the *Denkschriften* and the *Sitzungsberichte* of the Vienna Academy of Sciences, the most important of his works are: *Vergleichende Grammatik der slawischen Sprachen* (1852–74; 2d ed. of vols. i, iii, iv, 1876–83); *Formenlehre der altslowenischen Sprache* (2d ed., 1854); *Lexicon Palæoslovenico Græco-Latinum* (2d ed., 1865), one of the best of its kind for completeness and the abundance of material; *Altslowenische Formenlehre in Paradigmen* (1874); *Altslowenische Lautlehre* (3d ed., 1878); *Etymologisches Wörterbuch der slawischen Sprachen* (1886). Miklosich also edited several important texts, such as: *Apostolus* (1853); *Lex Stephani Dušani* (1856); *Monumenta Linguæ Palæoslovenicæ e Codice Suprasliensi* (1857); *Monumenta Serbica* (1858); *Acta et Diplomata Græca Medii Ævi* (1860–87), with J. Müller. Consult: Jagić, *Entsiklopediia Slavianskoi Filologii*, vol. i (St. Petersburg, 1909).

MIKLUCHO-MACLAY, mē-klōō'kō-mă-klī', NĬKOLAI (1846–88). A Russian traveler and ethnographer, born in the Ukraine of a noble family. He studied medicine and zoölogy at St. Petersburg and in Germany. After traveling widely in Europe he went with Haeckel to Madeira (1866), visited the Canary Islands in 1867, and after a trip to Morocco in 1870 undertook a great anthropological tour in Oceanica. At Sydney he founded a museum and zoölogical station and in 1885 returned to St. Petersburg, where he died before he had classified his collections. He wrote on his travels in New Guinea in Petermann's *Mitteilungen* (1874, 1878) and on the temperature of oceanic depths for the *Bulletin* of the St. Petersburg Academy (1871), and made many other contributions to technical journals in Europe, Asia, and Australia.

MIKNAS, mĭk'năs. A town of Morocco. See MEQUINEZ.

MIKOVEC, mē'kō-vĕts, FERDINAND BRETISLAV (1826–62). A Bohemian dramatist and archæologist, born at Bürgstein and educated at Česká Lípa and Prague. He founded the literary journal *Lumír* (1851–64) and edited two volumes of Bohemian antiquities under the title *Starožitnosti a památky země, české* (1858–64). He wrote the tragedies *Záhuba rodu Přemyslovského* (The Fall of the Přemyslids, 1851), *Dimitri Ivanovič* (1856), and other dramatic works.

MILAN, mĭl'ăn *or* mĭ-lăn' (It. *Milano*, Lat. *Mediolanum*). The second-largest city in Italy, the chief city in Lombardy, and the capital of the Province of Milan. It is situated in the great plain of Lombardy, 400 feet above the sea, on the little river Olona, an affluent of the Po, 93 miles northeast of Turin and 166 miles west of Venice; lat. 45° 28′ N., long. 9° 11′ E. (Map: Italy, B 2). The climate is rather changeable and trying. It is extremely hot in summer and quite cold in winter, the winds from the frozen Alps sweeping across the Lombardy plain. The thermometer at times drops below zero. The mean annual temperature is 55.4° F.; rainfall, 39.37 inches.

Milan is a fairly symmetrical polygon in shape, the circuit of its customs district being now nearly 20 miles. Its focus is the splendid Piazza del Duomo (Cathedral Square), from which broad avenues and electric railways radiate in all directions. These radials are connected by an inner circle of modernized streets just outside the canal that marks the location of the ancient moat and of the inner and most ancient city. An additional connection is furnished by a splendid boulevard and by a belt electric railway 7 miles long beyond the sixteenth-century walls that are pierced by a dozen gates and are now planted with trees and used as a promenade, commanding the view of the suburbs. The most magnificent of the radials is the modern Via Dante, constructed in 1888, leading from the handsome Piazza de' Mercanti to the spacious Foro Bonaparte, and thence to the New Park, which was formerly a part of a national drill ground. This park is paved with wooden blocks on a concrete foundation, and on each side, next to the front foundation walls of the houses, has large subways containing water and gas pipes, electric wires, etc. It is beautified by a large pond and spacious promenades, and is faced by the Castello Sforzesco, and also by the Anfiteatro dell' Arena, which was constructed by Napoleon I for races and is capable of seating 30,000 persons. The park is lighted by electricity. Adorning the northeastern section of the city are the splendid Giardini Pubblici, surpassed by few gardens on the Continent. The Corso Vittorio Emanuele is one of the most elegant shopping streets in Italy and the centre of traffic in Milan. The Galleria Vittorio Emanuele, connecting the Piazza del Duomo with the Piazza della Scala, is a splendid glass-covered arcade, with shops, designed by one of Milan's distinguished architects, Mengoni. It is in the form of a Latin cross, with a cupola 160 feet in height.

Architecture is superbly represented in Milan, nearly all styles being displayed in rare examples. Bramante dwelt here many years and left his genius impressed on more than one fine monument. The city is particularly famous for fine churches. Of these the principal is the world-renowned Gothic cathedral, the Duomo of

Milan, one of the finest of ecclesiastical structures, ranking with St. Peter's at Rome and the cathedral of Santa Maria del Fiore at Florence. The vast church has an exterior of white Carrara marble, which is adorned by 98 pinnacles and with more than 4000 statues, besides a variety of carvings of unsurpassable beauty. In form it is a Latin cross, with a length of 486 and a breadth of 287 feet, and covers an area of 14,000 square yards. The height of the tower is 356 feet. The great windows of the choir, said to be the largest in the world, are of stained glass of 1844. Its foundation was laid in 1386 by Gian Galeazzo Visconti, and during its erection many of the greatest European architects contributed designs for its embellishment. Within it Napoleon was crowned King of Italy in 1805. The baroque façade, completed in 1805 after designs by Tibaldi, has been considered out of harmony with the Gothic style of the other portions of the structure, and the inharmonious features began to be removed in 1900, to be replaced by features in keeping with the general style of the structure. At the front of the cathedral is a colossal bronze statue of Victor Emmanuel II. The view of the Alps, Lombardy, and the city from the top of the cathedral is celebrated. The quaint mediæval church of Sant' Ambrogio, erected on the site of a church founded by St. Ambrose in the fourth century, possesses inscriptions, sarcophagi, and monuments full of antiquarian interest, and is historic as the place where St. Ambrose baptized St. Augustine and where the German emperors were crowned kings of Italy. There are also the Dominican church of Santa Maria delle Grazie, which contains in its refectory the now almost obliterated picture of the "Last Supper" by Leonardo da Vinci; the church of San Carlo Borromeo (1847); and San Nazaro, which possesses a masterful fresco by Lanino, and also San Sebastiano, once a Roman temple. The church of San Satiro has a beautiful sacristy—a creation of Bramante. The mural paintings of Luini in the church of San Giorgio al Palazzo are visited by all art lovers. San Lorenzo is an important church, and is in addition the oldest one in the city, tracing its history back to Roman times.

Of the secular buildings of Milan the most noteworthy is the magnificent Brera Palace, formerly a Jesuit college and now used for the fine arts, with the official name of Palace of Arts and Sciences. (For illustration, see LOMBARDY, RENAISSANCE ARCHITECTURE OF.) Within its vast precincts this unique institution includes an academy of art, a choice gallery of paintings of the Bolognese and Lombard schools, a fine collection of casts for modeling purposes, a splendid national library containing about 300,000 volumes and pamphlets, and a rare collection of coins numbering 60,000, with many rare manuscripts and antiquities. It has also attached to it an observatory and a botanical garden. The masterpieces of painting here include Raphael's far-famed "Sposalizio," Mantegna's "Pietà," and Bellini's "St. Mark." The Brera has been greatly enlarged latterly, and many pictures of high rank have been added to its collection. One of the features of the national library is a room devoted to the editions and autograph writings of Manzoni. Another large library is the Ambrosian (q.v.). The Borromeo Palace also has a meritorious collection of paintings. The Museo Poldi-Pezzoli offers a fine collection of paintings, weapons, furniture, porcelain, etc. The Museò Civico is worthy of mention for its superb ornithological collection. There is also a permanent art exposition, and Milan now has good scientific collections.

The Palazzo Reale and the archiepiscopal palace are old and have some attractive features. The fine and elaborate Castello di Porta Giovia dates from 1368 and is the castle of Milan, being associated with the city's governmental and historic career. Among the noteworthy new and attractive secular buildings are the Exchange, finished in 1901, the prefecture, and Palace of Justice. Notable features in the city also are the Court of the Marino Palace, the Corinthian Colonnade, the finest relic of Roman times in Milan, and the well-known triumphal arch begun by Napoleon I. Other conspicuous public monuments are the statues of Victor Emmanuel II and of Cavour, Canova's notable statue of Napoleon I, the huge equestrian statue of Garibaldi, an equestrian statue of Napoleon III in commemoration of Magenta, the monument to Leonardo by Magni, the statues of Cardinal Borromeo and Parini, and the monument to Manzoni. The Cimitero Monumentale, with its decorative tombs and its elaborate cremation temple, is visited by all tourists. Milan is famous for its vast Scala Theatre, which was built in 1178 for operas and ballets. It accommodates 3600 persons and is the largest theatre in Europe after the San Carlo at Naples. Milan is the centre for music in Italy. The famous Conservatory of Music is established in the buildings of an ancient monastery.

Milan has an Academy of Science and Literature, a college for girls, and medical, high, and normal schools. The fine polytechnic, dating from 1865, a commercial academy, an agricultural school, a royal astronomical observatory, and an Academia di Belle Arti are other educational institutions. There are also a municipal zoölogical collection, botanical gardens, and theatres. The government of the city is highly efficient and enormous sums have been expended on public improvements. The system of sewers, about 50 miles in length, empties into the swift covered-over Seveso, whence the sewage passes to the Adriatic by way of the Po. The city water for domestic purposes comes principally from large artesian wells, about 150 feet in depth, and for industrial purposes from the canals. The different philanthropic organizations under the control of the Board of Charities have property valued at over $53,000,000 and a yearly income of $1,600,000. The municipal schools are well organized, with 80 buildings and 50,000 pupils, in addition to which are evening schools attended by over 10,000 older pupils. The Maggiore hospital is one of the largest in the world, accommodating 4000 patients. It dates from 1456. There are deaf-and-dumb institutions and institutions for surgical operations and for ailments of the eyes. Milan has also public dormitories, soup kitchens, etc. The Milan poor suffer greatly from overcrowding. An official investigation showed that 38,000 families were living in one room each and that 333,000 persons, or 70 per cent of the population, were living in 172,417 rooms. Thousands of these rooms had no light except through the entrance door. In 1905 the citizens voted for municipal construction of houses for the working people, providing for an expenditure of $1,000,000 for the erection of 48 tenement houses to

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contain 500 apartments of one, two, and three rooms each. The Humanitarian Society also appropriated $400,000 for the building of model tenements.

Milan is the leading financial city of Italy and possesses vast wealth. It markets large quantities of grain, cheese, butter, eggs, and poultry, and its manufactures include silk, leather, and woolen goods, stationary engines, locomotives, railway machinery, steam boilers, motors, automobiles, carriages, furniture, glass and earthenware, and chemical products. Cotton weaving and dyeing are also an important industry. A royal mint and a royal tobacco factory are situated here, and there is a corn exchange. It is the centre also of the Italian book trade. Not only are its industries by far the most important in Italy, but its commerce is very extensive. The Grand Canal connects the navigable Olona with Lake Maggiore and the Ticino. The city is also in canal communication with the Po, and with Lake Como through the Adda. It is an important centre of the national railway system. Milan is connected by street railways with the neighboring towns of Lombardy. The local system of electric street railways is excellent. In the last 20 years of the nineteenth century Milan grew more rapidly than any other Italian city. Pop., 1810, 124,000; 1860, 191,000; 1881, 321,839; 1901, 491,460; 1911, 599,200.

History. Livy (v, 34) declares that Milan, the ancient Mediolanum, or Mediolanium, was founded in the time of Tarquinius Priscus by Gauls who had come over the Alps. The ancient name is regarded as Celtic. Milan appears first definitely in history in 222 B.C., when it was taken by the consuls Cn. Scipio and Marcus Marcellus from the Gauls. Later, the town sided with Hannibal; its final and complete submission to Rome dates from 196 B.C. Its inhabitants became Roman citizens in 49 B.C.; in the second century A.D. it was colonized from Rome. Since roads ran from the city in all directions its trade rapidly increased. It rose to great prominence at the close of the third century A.D., when Diocletian made it the capital of Italy. Thereafter Milan was frequently a favorite Imperial residence. It was from Milan that Constantine issued in 313 the famous edict by which Christianity was recognized. Milan became the seat of a bishop, and from 374 to 397 this office was held by the celebrated Ambrose (q.v.). He established a ritual which in some points varied considerably from the Roman, and for a time Milan was the religious metropolis of northern Italy and almost entirely independent of Rome. This first era of prosperity was destroyed by the barbarian invasions by Attila (q.v.) in 452, by the Heruli under Odoacer in 476, and by the Goths under Theodoric in 493. In 539 the city was laid waste by the Goths so completely that but few remains of the city of Roman times have been found; these include a theatre, much below the present level of the ground. Many inscriptions, however, showing clearly the Celtic character of the population have been found; for these see the *Corpus Inscriptionum Latinarum*, vol. v. Only in the tenth century did Milan begin to recover.

During the greater part of the Middle Ages the population of Milan was divided into great nobles (*capitanei*), petty knights (*valvassores*), and the general populace. For a long time the history of the city turns upon conflicts between these various classes. In 1036 the Archbishop Aribert sought to make himself independent of all ecclesiastical and temporal control and for this purpose united with the *capitanei*. He was, however, opposed by the Emperor Conrad II, who was aided by the *valvassores*. The Emperor in 1037 captured and imprisoned Aribert, but he escaped after two months, and the death of Conrad in 1039 put an end for a time to the conflict. But a long-continued revolt against Aribert resulted in the people's obtaining a share in the government. Henry III (1039–56) ruled the whole Empire (Italy included) with a firm hand, but during his reign the forces developed which resulted in the great conflict of the *Pataria* after his death. According to the Ambrosian rules priests were permitted to marry, but Hildebrand (later Pope Gregory VII) attempted to establish sacerdotal celibacy and also sought to connect the church of Milan more closely with that of Rome. He was aided in this attempt by the lower classes of the populace, who were known as *patarini*, i.e., ragamuffins, and were in reality infected with the Manichean heresy. Opposed to this whole movement were the Archbishop and his party, supported by the Emperor, Henry IV (1056–1106), who was also at war with the papacy. The conflict was violent, but terminated with a compromise, by which marriage of priests was forbidden for the future, but those who were married were allowed to retain their wives. The independent position of the archbishops, however, was gone forever, and the way was clear for the establishment of a republican commune, especially as a very powerful artisan class had gradually developed.

By the end of the eleventh century Milan was practically free from external government and was ruled by consuls elected by the three orders; it rapidly acquired a hegemony over the other Lombard cities. When, however, Frederick Barbarossa became Emperor he proceeded to reëstablish the old Imperial power in Italy, and in 1153 began with Milan. Twice the city was compelled to submit, in 1158 and 1162, and the last time it was razed to the ground. The cities of northern Italy, which at first had been glad to witness the destruction of a rival, now, however, saw their own danger and hastened to the assistance of Milan under the leadership of Pope Alexander III. The Lombard League was formed against the Emperor, and in 1176 Frederick was defeated at Legnano, and in 1183 by the Peace of Constance recognized the independence of Milan and the other cities of Lombardy. After these foreign dangers were averted intestine strife again broke out between the various factions—the plebians, who had united in the *Credenza di Sant' Ambrogio;* the merchants; the lesser nobles, or *motta;* the great nobles, or *Società dei Gagliardi*. Wearied by these continuous quarrels, the citizens began to call in foreigners to rule and mediate, thus giving rise to the office of the *podestà*. In 1226 the Lombard League was renewed to prevent the aggressions of Frederick II, who was finally defeated in 1237 at the battle of Cortenuova.

In the thirteenth century Milan gradually lost its republican liberties. In 1259 the Guelph leader Martino della Torre headed the citizens in a struggle against the Ghibelline nobles and temporarily assumed the lordship of the city. But in 1277 a revolution was effected by the Ghibellines under the Archbishop Otto Visconti, who in turn became the ruler of the city, and at

his death in 1295 the power passed to his nephew Matteo Visconti, who had already been appointed Imperial vicar of Lombardy. From that time the Visconti (q.v.) ruled Milan almost continuously until 1447. Under their supremacy was not only Milan, but the whole of Lombardy; the arts were fostered and prosperity was general. In 1395 the Emperor Wenceslas granted Gian Galeazzo Visconti the title of Duke of Milan. The last of the Visconti, Filippo Maria (1412–47), after a short-lived republic, was succeeded in 1450 by his son-in-law, the celebrated *condottiere* Francesco Sforza (q.v.). The Sforzas were the typical princes of the Renaissance, patrons of art and learning, but at the same time guilty of the greatest cruelties. Milan became involved in the many Italian wars of the period, and finally Lodovico Sforza called in Charles VIII of France, who entered Italy in 1494. From this time on the history of Milan as such has little interest. Louis XII of France, as the descendant of the Visconti, claimed Milan, and the city and duchy for a while changed hands repeatedly between the French and the Sforzas, the latter being supported by Spain. In 1535 the last of the male line of the Sforzas died and Milan became a Spanish possession. In 1713 the Peace of Utrecht, which ended the War of the Spanish Succession, gave Lombardy to Austria. In 1797 Milan became the capital of the Cisalpine Republic, founded by Napoleon, and in 1805 the capital of the Napoleonic Kingdom of Italy. The Congress of Vienna in 1815 gave Lombardy back to Austria, and Milan shared with the rest of the Hapsburg possessions the oppressions of the Metternich régime. On March 18, 1848, the inhabitants rose in insurrection, and on March 23 General Radetzky was compelled to evacuate the city, which was occupied by the Sardinian forces. On August 6, however, Radetzky reëntered Milan. The riots of March, 1849, and Feb. 6, 1853, were vigorously suppressed by the Austrian commanders. In 1859, after the battle of Magenta, the Austrians evacuated the city, which was handed over to Napoleon, who surrendered it to Sardinia with the rest of Lombardy. In May, 1898, it was the scene of serious bread riots.

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MILAN, mĭ'lan. A city and the county seat of Sullivan Co., Mo., 112 miles by rail northeast of Kansas City, on the Quincy, Omaha, and Kansas City and the Chicago, Burlington, and Quincy railroads (Map: Missouri, C 1). It is in a farming and stock-raising region, which has some mineral deposits, particularly of coal. The principal industrial establishments are the coal mines and the shops of the Quincy, Omaha, and Kansas City Railroad, Milan being a division point on that road. The water works and electric-light plant are owned by the city. Pop., 1900, 1757; 1910, 2191.

MILAN DECREES. See CONTINENTAL SYSTEM.

MILANESI, mē-lä-nā'zē, GAETANO (1813–95). An Italian art historian, born at Siena. He studied law in his native city; was employed in a public library; and in 1856 became a member of the Accademia della Crusca. In 1858 he was made assistant keeper of the Tuscan archives at Florence; later took charge of the Medici archives; and in 1889 was appointed director of archives. He retired in 1892. Besides preparing an important edition of Giorgio Vasari's *Vite de' più eccellenti pittori, scultori, ed architetti* (9 vols., 1878–85), and *Les correspondants de Michel Ange*, only 1 vol. of which ("Sebastiano del Piombo," 1890) appeared, Milanesi published: *Il diario inedito di Alessandro Sozzini* (1842); *Documenti per la storia dell' arte senese* (3 vols., 1854–56); *Discorsi sulla storia civile ed artistica di Siena* (1862).

MILANÉS Y FUENTES, mē'lä-näs' ē fwān'-tās, JOSÉ JACINTO (1814–63). A Cuban poet, born at Matanzas. His first verses appeared in the *Aguinaldo Habañero* (1837) and were favorably received. From this time his work was well known. His early life had been one of poverty and hardship, but afterward he obtained a satisfactory position and was able to travel abroad in 1848. He had been the victim of a mental disease for some time, and during the last years of his life was quite insane. The poetry of Milanés is contemplative and melancholy and, like that of his fellow poets Heredia and Plácida, saddened by the thought of his country's wrongs. Editions of his poems were published at Havana (1846) and New York (1865), the latter with biography and criticism by Federico Milanés.

MILAN OBRENOVITCH (mē'lân ō-brĕn'ō-vĭch) **IV** (i.e., fourth in the Obrenovitch (q.v.) family) (1854–1901). Prince of Servia from 1868 to 1882 and King from 1882 to 1889. He was born Aug. 22, 1854, at Manassee, Rumania, and was educated at Paris. The assassination of Prince Michael III in 1868 caused his recall to Servia, where he was proclaimed Prince. A council of regency administered the government till he was 18. The revolt of Servia against the Ottoman power, its alliance with Russia in the Russo-Turkish War (q.v.), and its resulting independence and recognition as a kingdom (1882) made his reign memorable. In 1875 he married Natalie Ketchko, the daughter of a Russian colonel, and his quarrels with her and his personal vices deprived him of all prestige. In 1888 he was illegally divorced, and on March 6, 1889, he abdicated in favor of his son Alexander I (q.v.). He became reconciled to Natalie in 1893 and died at Vienna, Feb. 11, 1901. See SERVIA.

MILÁ Y FONTANALS, mē-lä' ē fôn'tä-näls', MANUEL (1818–84). A Spanish historian of literature, born at Villafranca del Panadés. He was appointed professor in the University of Barcelona in 1845. He did not obtain wide celebrity until he was appointed president of the Floral Games at Barcelona in 1859. The influence of his philosophical studies is apparent even in so early a work as his *Arte poética* (1848). This was followed by the *Romancerillo*

catalán (1848), a collection of the lyrics of his native region, and by the *Elementos de literatura* and the *Teoría literaria*, which apply philosophical methods to the study of literature. His *Observaciones sobre la poesía popular* appeared in 1853. His noblest productions are *Los trovadores en España* (1861) and *La poesía heróico-popular* (1874). Consult: Rubió y Ors, *Noticia de la vida y escritos de D. Manuel Milá y Fontanals* (Barcelona, 1887), and the edition of his *Obras completas* (id., 1885), prepared by M. Menéndez y Pelayo, who never wearied of praising Milá y Fontanals as a great scholar and a great teacher.

MILAZZO, mē-lät'sō, or **MELAZZO.** A city in the Province of Messina, Sicily, 16 miles by rail west of the city of Messina, at the base of a narrow peninsula, 4 miles long (Map: Italy, E 5). It has a very large and safe harbor which serves as a refuge for vessels trying to make the north entrance of the Strait of Messina. Its thirteenth-century castle is now used as a jail. It has a city hospital, a technical school, a city library of 10,000 volumes, and a municipal theatre. It markets wine, fish, cattle, fruit, and sulphur and has a considerable foreign trade and extensive tunny fisheries. Pop. (commune), 1910, 16,422; 1911, 16,569. Milazzo is on the site of the ancient Mylæ, founded prior to the eighth century B.C. by colonists from Messina. A great naval victory was won here over the Carthaginians in 260 B.C. by G. Duilius. The crowning point of Garibaldi's victorious Sicilian campaign was his defeat of the Neapolitans here, July 20, 1860.

MIL'BANK, Joseph (1848–1914). An American philanthropist, born in New York City. Between 1896 and 1903, together with his sister, Mrs. Elizabeth Milbank Anderson, he gave $3,000,000 to Teachers and Barnard colleges, Columbia University. Connected with the former is Milbank Memorial Chapel and with the latter Milbank Hall. In 1901 he established the Milbank Baths at a cost of $150,000, and in 1905 he gave $200,000 to found the Jersey City People's Palace, a clubhouse for the people under the control of the First Congregational Church of Jersey City. With his sister he gave $650,000 to establish a Social Welfare Bureau and $500,000 to the Children's Aid Society. In all they gave nearly $5,000,000.

MIL'BURN, William Henry (1823–1903). An American clergyman. He was born in Philadelphia and educated at Illinois College. He entirely lost the sight of one eye and partially that of the other while he was a boy, and finally became wholly blind. He became a minister of the Methodist Episcopal church in 1843 and was appointed to circuits in Illinois and the South, with several appointments at Montgomery, Ala., in 1848, and Mobile in 1850, and for two years after 1852 preached in an independent church. He was ordained a deacon in the Protestant Episcopal church in 1865 and priest in 1866, but returned to the Methodist Episcopal church in 1871. He was elected chaplain of Congress in 1845 and 1853, chaplain of the House of Representatives in 1885 and in succeeding terms, and was chaplain of the Senate from 1893 to 1902. He published *Rifle, Axe, and Saddlebags, Symbols of Western Character and Civilization* (1856); *Ten Years of Preacher Life, Chapters from an Autobiography* (1858); *Pioneers, Preachers, and People of the Mississippi Valley* (1860), comprising lectures given at the Lowell Institute in 1854; *The Lance, Cross, and Canoe in the Valley of the Mississippi* (1893).

MIL'COM. The national god of Ammon, mentioned in 1 Kings xi. 5, 33; 2 Kings xxiii. 13; Jer. xlix. 13; probably 2 Sam. xii. 30; and also 1 Kings xi. 7, where the true reading seems to be supplied by the Greek version. The name is clearly derived from *melek*, 'king,' and the final *m* probably represents the old determinative mimmation. If Milcom was the original reading in 2 Sam. xii. 30, it would seem to indicate that the Ammonitish god was represented by an idol in human form. There is no evidence that this deity was also called Molech (q.v.) or that children were sacrificed to Milcom, though it is not in itself improbable that this rite was practiced by the Ammonites on extraordinary occasions, as it certainly was by their kinsmen, the Moabites. (See Moab.) Solomon erected a sanctuary to Milcom on the Mount of Olives, possibly on the site of the present Jebel batn el hawa, which Josiah afterward defiled. (2 Kings xxiii. 13.)

MILDER-HAUPTMANN, mēl'dĕr-houpt'-mân, Anna Pauline (1785–1838). A German opera singer, born at Constantinople, the daughter of an Austrian attaché. She studied under Tomascelli and Salieri in Vienna; made her first appearance in that city in 1803, but was at the height of her power in Berlin (1815–29). She toured Russia, Sweden, and Denmark at the close of her stage career. She was one of the earliest examples of a great vocalist possessed at the same time of extraordinary histrionic ability. For this reason Beethoven chose her to create the rôle of Leonora in his *Fidelio*.

MIL'DEW (AS. *meledēaw*, honeydew, from **mele*, Goth. *miliþ*, Lat. *mel*, Gk. μέλι, *meli*, honey + *dēaw*, dew). A somewhat indefinite term used to designate a number of plant diseases that are caused by fungus parasites, as well as spots caused by microscopic fungi on cloth, paper, leather, glassware, etc. In England the term as applied to plant diseases has a much wider significance than in the United States. It is there made to include what are known in America as cereal rusts and smuts, as well as many other diseases not recognized as due to the mildews proper. In the United States the mildews are divided into two classes: the true or powdery mildews, due to fungi belonging to the family Erysiphaceæ; and the false or downy mildews caused by fungi of the family Peronosporaceæ. The powdery mildews attack the leaves, stems, flowers, and fruits of many of the most valued plants. For the most part they form superficial flourlike patches of white upon their host plants. The fungus most commonly develops over the surface of the leaves and sends minute suckers into the epidermis, by which they absorb nourishment from the host. They cause distorted and stunted growth and often the death of the part of the plant affected. During the summer the fungus sends up numerous branches, which bear myriads of one-celled spores called conidia, by which the mildew is rapidly spread to other plants. Later in the season thick-walled resting spores are produced, by which the fungus is carried through the winter. These spores have appendages of various kinds, by which they retain their attachment to the leaves, and in the spring they develop a new generation of thin-walled spores for the spread of the disease. There are about 150

described species of powdery mildews, and there are very few plants that are not subject to attack from some of them. Among the common ones injurious to economic plants are the apple, pear, and cherry mildew (*Podosphæra oxycanthæ*), rose mildew (*Sphærotheca pannosa*), hop mildew (*Sphærotheca castagnei*), grape mildew (*Uncinula spiralis*), mildew of wheat and other grasses (*Erysiphe graminis*), gooseberry mildew (*Sphærotheca mors-uvæ*), cucumber mildew (*Erysiphe cichoracearum*), which also attacks verbenas, sunflowers, asters, and other plants, pea mildew (*Erysiphe polygoni*), etc. Downy mildews are internal parasites which grow through the tissues of the plants that bear them and only appear outside to shed their microscopic spores. The branches of the fungus bearing these spores are often so abundant as to give a peculiar downy or frosty appearance to the leaf or other part of the plant infested. The spores (conidia) are one-celled, thin-walled, and readily blown about by the wind. Falling upon a new leaf or plant, if the moisture conditions are favorable, they quickly germinate and set up a new infection. In this way they spread with great rapidity and often produce epidemic outbreaks of disease. The resting spores are formed within the tissues of the host and are thus carried over from season to season. They are liberated by the decay of the tissues surrounding them, and from these a new generation is derived. Among the downy mildews are some of the most serious plant parasites. The more common ones are the potato rot or mildew (*Phytophthora infestans*), the grape downy mildew (*Plasmopara viticola*), lima-bean mildew (*Phytophthora phaseoli*), lettuce mildew (*Bremia lactucæ*), onion mildew (*Peronospora schleideni*), beet mildew (*Peronospora schachtii*), cucumber and melon downy mildew (*Plasmopara cubensis*), downy mildew of radishes and other cruciferous plants (*Cystopus candidus*), etc. Most of these mildews are more fully described under the diseases of their respective host plants. The problem of combating them has been a subject of much experimentation in America and in Europe. It has been found that many of the powdery mildews can be held in check and often serious loss prevented by dusting the plants with sulphur, or, if in a house or frame where it can be done, exposing them for a few moments to the fumes of boiling, but not burning, sulphur. Spraying thoroughly and repeatedly with Bordeaux mixture, ammoniacal copper carbonate solution, or other standard fungicide (q.v.) will prevent the serious attack of both classes of mildews. Success in these preventive treatments depends upon thoroughness. See Diseases of Plants; Fungi, Economic; Plate of Fungi, Types of; Peronosporaceæ; Phycomycetes.

MILE. A measure of length in common use in Great Britain and the United States and their colonies. The name was also in use in the continent of Europe to designate generally a much larger measure of length, although the official measure is now generally the kilometer (.6213 mile). The mile is derived from the Roman *milliare*, which contained 1000 paces (*mille passuum*) of 5 Roman feet each, the pace (*passus*) being the length of the double step (*gradus*) made by one foot from the time it was taken off the ground until it was put down again. The Roman foot being between 11.62 and 11.65 English inches, the Roman mile was thus less than the present English mile by from 142 to 144 yards. The mile is found referred to in a law of King Athelstane (925–940 A.D.) and as a unit of length has not altered from before the Norman Conquest to the present time. On the continent of Europe previous to the general adoption of the metric system, the length of the modern mile in different countries exhibited a remarkable diversity not satisfactorily accounted for. In some cases, such as the Prussian mile, which was 4.68 statute miles, and the Swedish mile, equal to 6.648 statute miles, the length was far in excess of current understanding of the measure. Such miles, however, have long been obsolete and are only interesting to the student of metrology or the surveyor working on old maps. Before the time of Elizabeth scientific writers made use of a mile of 5000 English feet, from the notion that this was the Roman mile, forgetting the difference in value between the English and the Roman foot. The present English statute mile was incidentally defined by an act passed in the thirty-fifth year of the reign of Elizabeth to be "8 furlongs of 40 perches of 16½ feet each"—i.e., 1760 yards of 3 feet each —and it has since retained this value. The *geographic, nautical,* or *sea* mile is variously defined as (*a*) the length of a minute of latitude at any point, (*b*) the mean length of a minute of latitude (6082.66 feet), and (*c*) the length of a minute of longitude on the equator (6087.15 feet). The United States Coast Survey has adopted as the standard geographic mile the length of a minute of latitude of a sphere having the same surface as the earth. This gives a length of 6080.27 feet. The British Admiralty mile is 6080 feet. The United States nautical, sea, or geographical mile as given by the National Bureau of Standards (Circular 47, 1914) is 6080.20 feet. As the United States statute mile is 5280 feet, a nautical mile is 1.151553 statute miles, or 1853.249 meters. For ordinary purposes of navigation the nautical mile is assumed to be equal to a minute of latitude in the region navigated, the error being inappreciable in the calculations. See Weights and Measures; Metric System; and the various authorities referred to thereunder.

MILE'AGE. Compensation reckoned at so much per mile in lieu of traveling expenses usually allowed public officers who are compelled to journey to the seat of government in order to discharge their official duties. It is usually reckoned according to the shortest route by which the officer is able to travel. American army officers traveling under orders are allowed seven cents a mile; Senators and Congressmen are allowed 20 cents a mile when traveling to the seat of government at the opening of a session and to their homes at its close. An abuse of the system is constructive mileage, allowed for distances not actually traveled, as when the time between the close of one session and the opening of another is too brief to admit of a return of Senators and Congressmen to their homes.

MILELLI, mê-lêl'lê, Domenico (1841–1905). An Italian poet, born at Catanzaro in Calabria. His poetry shows much imagination, but little sustained force. His *Odi pagane* (1879) were much criticized, not only for their pagan spirit, but on account of attacks on Manzoni. Other works are: *In giovinezza* (1879); *Gioconda* (1874); *Hiemalia* (1874); *Povertà* (1879); *Discerpta* (1881); *Il rapimento di Elena*

(1882); *Canzoniere* (1884); *Verde antico* (1885); and *Miscellanea* (1886), a volume of essays. Consult Patari, *L'opera poetica di D. Milelli* (Cosenza, 1912).

MILES, NELSON APPLETON (1839–). An American soldier, born at Westminster, Mass., Aug. 8, 1839. He received an academic education and between 1856 and 1861 was engaged in business in Boston. During the Civil War he rose from the rank of first lieutenant of the Twenty-Second Massachusetts Infantry to be major general of volunteers (Oct. 21, 1865). "For highly meritorious and distinguished conduct throughout the campaign and particularly for gallantry and valuable services at the battle of Reams Station, Va.," he was brevetted major general of volunteers (Aug. 25, 1864), and March 2, 1867, he received brevets of brigadier general and major general for services at Chancellorsville and Spottsylvania respectively. He had fought also at Antietam, Fredericksburg, and in the campaign before Richmond (1864). His conduct at Chancellorsville, where he had been seriously wounded, brought him the congressional medal of honor in 1892. After the war General Miles became an officer in the United States army, being appointed colonel of the Fortieth Infantry in July, 1866, and rising to be brigadier general (1880), major general (1890), and lieutenant general (in pursuance of an Act of Congress of June 6, 1900). Upon the retirement of General Schofield in 1895 he became senior officer commanding the army. During a period of about 15 years Miles was known chiefly for his distinguished services against the Indians in the West. In 1875 he defeated the Cheyenne, Kiowa, and Comanche tribes, and in 1879 the Sioux and Nez Percés in Montana. After his campaign (1886) against the Apaches, in which he compelled their chiefs, Geronimo and Natchez, to surrender, he received the thanks of the legislatures of Kansas, Montana, New Mexico, and Arizona. In 1890–91 he suppressed Indian outbreaks in South Dakota. During the railroad strike troubles of 1894 in Chicago he commanded the Federal troops ordered by President Cleveland to prevent interference with the carriage of the mails. Later he represented the United States army at the seat of the Turco-Grecian War, and on the occasion of Queen Victoria's Diamond Jubilee (1897). During the war of 1898 against Spain he directed in person the occupation of Porto Rico. Within two weeks the entire western part of the island was cleared, the total loss of Americans being only four killed and forty wounded. In 1902–03 General Miles made a tour of inspection in the Philippine Islands. He was retired Aug. 8, 1903. The degree of LL.D. was conferred on him by Harvard, Brown, and Colgate universities. He published *Personal Recollections, or from New England to the Golden Gate* (1897); *Military Europe* (1898); *Observations Abroad* (1899); *Serving the Republic* (1911).

MILES CITY. A city and the county seat of Custer Co., Mont., 114 miles by rail northeast of Billings, on the Chicago, Milwaukee, and St. Paul and the Northern Pacific railroads (Map: Montana, L 3). Farming, cattle and sheep raising, and the manufacture of saddlery are the chief industries. It is a jobbing centre and shipping point for considerable quantities of wool, and a large market for range horses. In 1914, 28,442 horses were sold here at auction. The water works and electric-light plant are owned by the city. Miles City contains a county hospital, a beautiful park on the Tongue River, an Ursuline convent, a well-equipped high school, a State industrial school, and a public library. Pop., 1900, 1938; 1910, 4697; 1915 (state census), 7621.

MILES GLORIOSUS, mī'lēz glō'rĭ-ō'sŭs (Lat., braggart soldier). A comedy by Plautus.

MILE'SIANS. The original Gaelic colonists of Ireland, so called, according to the bardic accounts, from the three sons of Mil (Latinized Milesius), who, coming in force from the opposite coast of Spain or Gaul, landed on the southern end of the island and defeated the preceding colonists and conquerors, the Tuatha De Danann, in two great battles, thus making themselves masters of the country. The date is indefinitely placed some centuries before the Christian era. This was the last of the traditional prehistoric colonizations of Ireland, the dominant Milesians fusing with the Tuatha De Danann (q.v.) and Firbolgs (q.v.) to form the Irish race as we find it at the dawn of history. The native kings, chieftains, and prominent families up to the period of the Norman Conquest all claimed direct descent from Milesian ancestry.

MILESIAN TALES (Μιλησιακά, *Milēsiaka*). The name given to a class of short, indecent anecdotes in vogue at Miletus and through Asia Minor in the first century B.C. The compilation of six books of these stories was ascribed to a certain Aristides of Miletus. Fragments of these works, from the translation by Sisenna (q.v.), are printed in Bücheler's small edition of Petronius (5th ed., Berlin, 1882). Consult H. T. Peck, *Trimalchio's Dinner*, pp. 20–32, 40–44 of the "Introduction" (New York, 1898), and L. C. Purser, *The Story of Cupid and Psyche as Related by Apuleius*, xix–xxi, pp. 125–127 (London, 1910).

MILET DE MUREAU, mē'lā' de mu'rō', LOUIS MARIE ANTOINE DESTOUFF, BARON (1756–1825). A French soldier and politician, born at Toulon. He entered the army and was made a captain. As a member of the States-General, in 1789, he voted with the Right; afterward he commanded the artillery in the army of occupation in Italy. He was made a brigadier general in 1796; was War Minister for a few months in 1799; was created Baron by Napoleon in 1809; served as a prefect of the Department of Corrèze in 1802–10 and director of the general War Department in 1814, but retired two years afterward. He edited the Pérouse journals, which were published under the title *Voyage de La Pérouse autour du monde 1785–88* (1797; 2d ed., 1798).

MILE'TUS (Lat., from Gk. Μίλητος, *Milētos*). Anciently the greatest city of Ionia (q.v.) in Asia Minor (Map: Greece, Ancient, E 3). It was situated on the Latmic Gulf, at the mouth of the Mæander, in a rich valley, and was famous for its woolen manufactures and for its extensive trade with the north and the south, and with Phrygia. The site is said to have been occupied by a Carian town when the Ionian colonists, under Neleus, seized the place, massacred the men, and took possession of their wives. Pottery found by Wiegand (see the bibliography below) proves that the city was in touch with the Ægean civilization in the latest Minoan period. (See ARCHÆOLOGY, II, *Minoan*, or *Ægean, Period*.) Though the inhabitants prided themselves on their Ionian descent, the names of their tribes show the presence of a foreign element. The

city early came to occupy a commanding position in the Greek commercial world and established many colonies in the north, as Abydos and Lampsacus, on the Hellespont; Cyzicus, on the Propontis; Sinope, Olbia, Istria, Tomi, and Panticapæum, on the Black Sea. Under the tyrant Thrasybulus it offered so resolute a resistance to the Lydian kings that it was at last received into an alliance on equal terms. By 500 B.C. it was one of the first Greek cities, if not actually the first. It took a prominent part in the Ionian revolt (500 B.C.; see IONIA), and after the battle of Lade was besieged by the Persians, and after a long resistance captured and destroyed in 494 B.C. It seems to have revived after the formation of the Athenian League, and near the close of the Peloponnesian War ventured to revolt and join the Spartans (412 B.C.). It also offered some resistance to Alexander, but seems to have declined from that time, though it continued to exist for several centuries. St. Paul spent two or three days there on his last journey to Jerusalem before his imprisonment at Rome, and delivered his farewell address to the elders from Ephesus, who visited him at his request. (Acts xx. 15–xxi. 1.) Another visit, referred to in 1 Tim. iv. 20, is best placed in a period later than that covered by the Book of Acts. In Roman times the city retained commercial importance, especially under Trajan. In time its four harbors were filled up by deposits made by the Mæander; Lade, once an island protecting the harbors, is now a hill several miles inland. Miletus has a distinguished place in the history of Greek literature, having been the birthplace of the philosophers Thales, Anaximander, and Anaximenes, of the historians Cadmus and Hecatæus, and of the poet Timotheus. Aspasia, wife of Pericles, also was born at Miletus. The site of the city itself is a swampy plain, occupied by the little Turkish village of Palatia. Excavations were begun for the Berlin Academy in 1899, by Th. Wiegand, and in spite of great difficulties have determined the course of the ancient walls, some streets, the Bouleuterion and part of the Agora, and other points important for the topography of the city. A theatre, the largest, perhaps, in Asia Minor, with 54 rows of seats, still rising 100 feet or more, has been uncovered; so, too, a stadium. On the southeast a large temple of Apollo Delphinius, with a central court surrounded by a triple colonnade, was found; in this building, the chief temple of the city, public records were kept. A sacred way, bordered by tombs, led to Didymi. (See BRANCHIDÆ.) Reports of the excavations are published in the *Sitzungsberichte der Akademie der Wissenschaft zu Berlin* for 1900 et seq. Consult also the unfinished work of Rayet and Thomas, *Milet et le Golf Latmique* (Paris, 1877 et seq.); Arnold von Salis, "Die Ausgrabungen in Milet und Didyma," in *Neue Jahrbücher für das klassische Altertum*, vol. xxv (Leipzig, 1910); K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., with map and plan, ib., 1914).

MILETUS, EUBULIDES OF. See EUBULIDES OF MILETUS.

MILETUS, HECATÆUS OF. See HECATÆUS OF MILETUS.

MILETUS, HESYCHIUS OF. See HESYCHIUS OF MILETUS.

MILETUS, TIMOTHEUS OF. See TIMOTHEUS OF MILETUS.

MI'LEY, JOHN (1813–95). An American Methodist Episcopal theologian. He was born near Hamilton, Butler Co., Ohio; graduated at Augusta College, Kentucky, in 1838; entered the ministry in the same year; and served churches in Ohio and eastern New York from 1838 to 1873, except during 1848–50, when he was teacher in Wesley Female College, Cincinnati. From 1873 till his death he was professor of systematic theology in Drew Theological Seminary. He was a member of the General Conferences of 1864, 1872, 1876, 1888, and 1892, and of the Centennial Methodist Conference of 1884, where he presented a paper entitled "The Work of the Christmas Conference of 1784." In 1886 he was the fraternal delegate to the General Conference of the Methodist Episcopal church, South. He was the author of a *Treatise on Class Meetings* (1851); *The Atonement in Christ* (1879), which advocates the governmental theory; *Systematic Theology* (1892–94). He was a progressive conservative, holding to the substance of the traditional Methodist theology, but introducing important and some even radical changes of view. He was the brother-in-law of Bishop Randolph S. Foster.

MILFOIL. An herb. See ACHILLEA.

MIL'FORD. A seaport in Pembrokeshire, Wales, on the famous Milford Haven, 6 miles from its entrance and 273 miles west of London by rail (Map: England, A 5). The haven is formed by an estuary running inland for 17 miles to Langwin (easily reached by vessels of 2000 tons), and varies from a mile to two miles in breadth. It is protected from winds by a girdle of hills; its lower reaches are well fortified. The distance of Milford, however, from the Channel, the highway of British commerce, is a serious disadvantage, and its trade is not commensurate with the natural advantages furnished by its excellently protected harbor. The town has passenger and cattle traffic with Irish ports, and an average of 2700 vessels of 575,000 tons' burden enter and clear annually. Area of docks, 60 acres; depth of water over sill (high tide), 34 feet. The proposition to make Milford the eastern terminus of the English transatlantic steamers has been discussed since 1790. It would shorten by several hours the time now necessary for reaching London. It has important and rapidly increasing fish and oyster industries. The United States is represented by a consul. The town owns its water and gas supplies. The haven is frequently mentioned in Shakespeare's *Cymbeline*. Henry VII, when Earl of Richmond, landed here in 1485, on his way to claim the crown. Pop., 1901, 5102; 1911, 6399.

MILFORD. A town in New Haven Co., Conn., 9 miles southwest of New Haven, on Long Island Sound, at the mouth of the Wepowaug River, and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 5). It is an attractive summer resort, with fine boating and bathing facilities. Its noteworthy features include the Taylor Library, an interesting Memorial Bridge, erected (1889) on the two hundred and fiftieth anniversary of the town's settlement, a soldiers' monument, and the Broad Street Park of four acres. The leading industries are farming, seed growing, oyster cultivation, wood turning and sawing, and the manufacture of straw hats, gas meters, brass novelties, car furnishings, etc. Pop., 1900, 3783; 1910, 4366; 1920, 10,193.

Milford, called Wepowage by the Indians, was settled in 1639 by a company from New Haven and Wethersfield. In 1644 Milford became one of the six towns which constituted the confederate "Colony of New Haven," and in 1664 it came under the jurisdiction of Connecticut. Robert Treat, an early Colonial Governor, lived in Milford, and here, from 1661 to 1663, the regicides Goffe and Whalley were secreted. Consult "Early Milford," in the *Connecticut Magazine*, vol. v (Hartford, 1899).

MILFORD. A town in Kent and Sussex counties, Del., about 73 miles by rail south of Wilmington on Mispillion River and on the Philadelphia, Baltimore, and Washington Railroad (Map: Delaware, J 3). A steamship line also connects the town with Philadelphia. It is the shipping point for the surrounding agricultural and fruit-growing district and has various industrial interests, including large packing houses and manufactories of dental supplies and lumber products. Milford was founded in 1680 and was incorporated in 1787. The town owns its water works and electric-light plant. Pop., 1900, 2500; 1910, 2603.

MILFORD. A town in Worcester Co., Mass., 18 miles (direct) southeast of Worcester, on the Charles River and on the Boston and Albany and the New York, New Haven, and Hartford railroads (Map: Massachusetts, D 4). It has a fine Federal building, public parks, a splendid system of schools, a public library, and a hospital. The town is the distributing centre for a wide area and is noted as a manufacturing centre, its products including shoes, straw goods, bone cutters, foundry and machine-shop products, looms, rubber goods, etc. There are also extensive quarries of a high grade of granite, which is used in the construction of some of the largest buildings in the country and which is shipped in large quantities. The government is administered by town meetings, which convene at least twice a year. Pop., 1910, 13,055; 1914 (U. S. est.), 13,770; 1920, 13,471. Settled as early as 1669, Milford, with a population of 750, was incorporated as a separate town in 1780, having previously been the East Precinct of Mendon. Consult Ballou, *History of the Town of Milford* (Boston, 1882).

MILFORD. A town in Hillsboro Co., N. H., 11 miles northwest of Nashua, on the Souhegan River and on the Boston and Maine Railroad (Map: New Hampshire, F 8). Milford is one of the largest granite-producing towns in the United States, having 27 firms in that business, and there are also manufactories of furniture, post-office equipment, baskets, celluloid, woolen cloth, towels, ice-cream freezers, and shoes. Ample water power is obtained from the Souhegan. The water works are owned by the municipality. Pop., 1900, 3739; 1910, 3939.

MILHAU, mē'lō'. A town of France. See MILLAU.

MILHAUD, mē'yō', GASTON (1858–). A French philosopher, born at Nîmes. He was at first an assistant professor of mathematics at the University of Montpellier, where he obtained a doctorate in letters in 1894 and became professor of philosophy in the same year. In 1910 he was appointed professor of the history of philosophy at the Sorbonne, Paris. He is author of *Leçons sur les origines de la science grecque* (1893); *Essai sur les conditions et les limites de la certitude logique* (1894; 2d ed., 1898); *Le rationnel* (1898); *Les philosophes-géomètres de la Grèce* (1900); *Le positivisme* (1902); *Le progrès de l'esprit* (1902); *Etudes sur la pensée scientifique chez les Grecs et les modernes* (1906); *Nouvelles études sur l'histoire de la pensée scientifique* (1911).

MIL'IA'RIA (Lat. fem. sing. of *miliarius*, relating to millet, from *milium*, millet). A structural affection of the sweat glands, caused by an obstruction to the sweat secretion and generally accompanied by inflammation. It is classed with the skin diseases.

In *miliaria crystallina*, or *sudamina*, the non-inflammatory form, the lesion consists of minute, pearly vesicles set closely together, but always discrete, generally appearing on the neck, chest, and abdomen, but sometimes in other parts of the body. The vesicles appear rapidly and depart in a few days. Invasions of fresh crops may occur, thus continuing the eruption for weeks. The vesicles are collections of sweat under the superficial layers of the skin.

In *miliaria vesiculosa*, or *rubra*, inflammation occurs in the gland, and the vesicles appear as if raised on a red base. This is the *strophulus*, or *red gum*, of the ancients and is seen principally in children during hot weather and when excessively heavy clothing is worn.

Miliaria papulosa, or *lichen tropicus*, is commonly known as prickly heat. In this variety red, pointed papules are crowded together, with here and there a vesicle or pustule. It is accompanied by excessive sweating and annoying prickling and tingling. It is a tropical disease, of which a milder form is seen in this country.

The treatment of miliaria consists in removing heavy clothing, administering cool baths and saline diuretics, and applying locally soothing and astringent lotions, such as lead water, black wash, dilute vinegar, or powdered camphor mixed with starch or oxide of zinc.

MIL'IA'RIUM AU'REUM (Lat., golden milestone). A gilded column of bronze near the rostra, towards the west end of the Roman Forum. On it were engraved the distances from the city gates of the main stations and cities on the great roads leading out of Rome. It was set up in 29 B.C. by Augustus as a record of the results of a survey of the Roman domain. Portions of an exquisite marble base, supposed to be the base of the Golden Milestone, were discovered on the spot in 1849. Consult R. A. Lanciani, *The Ruins and Excavations of Ancient Rome* (Boston, 1897).

MIL'IARY FEVER. See MILIARIA; SWEATING SICKNESS.

MILIČEVIČ, mē'lē-chĕv'ĭch, MILAN. See MILITCHEVITCH, DJAKOV MILAN.

MILICZ, mē'lĭch, or **MILITSCH,** OF KREMSIER (c.1325–74). A predecessor of John Huss. He was born at Kremsier, Moravia; entered holy orders and was attached to the court of the Emperor Charles IV; became a canon and later Archdeacon. In 1363 he resigned his appointments, giving himself up to preaching, and was very successful. He went to Rome in 1367 to expound his views as to ecclesiastical abuses, but was thrown into prison by the Inquisition, from which he was released by Pope Urban V on his arrival from Avignon in the autumn of that year. He returned to Prague, where he preached daily with greater success than ever till in 1374 he was summoned before the Papal Court at Avignon, upon complaint as to his orthodoxy, preferred by the clergy of Prague. He obeyed, and the complaint, after investiga-

tion, was dismissed. He died in Avignon on June 29, 1374. Consult Palacky, *Die Vorläufer des Hussitenthums* (Prague, 1869), and Lechler, *Johann von Wiclif und die Vorgeschichte der Reformation*, vol. ii (Leipzig, 1873).

MILIN'DA. The Pali form of the name of the Græco-Bactrian King Menander (q.v.). In the literature of the Buddhists his name is important through a book entitled *Milindapañha* or "Questions of Milinda," a work which professes to give an account of a discussion between him and the Buddhist sage Nagasena. It has been translated into English by Davids, *The Questions of King Milinda* (Oxford, 1890–94).

MILIOUKOV, PAUL. See MILYUKOV, PAVEL.

MILITARISM. A term employed somewhat loosely to designate a tendency to subordinate civil to military considerations in the policy of the state. In time of peace the civil power is theoretically supreme: the military power is an instrument to be employed in the execution of civil policies. Practically, however, the constitutional position of the army may be so strong as to give it an important, or even paramount share in the determination of both domestic and foreign policy. This is especially likely to be the case where a nation is surrounded by powerful antagonistic nations. The German Empire presents the best modern instance of militarism, but all the great powers of continental Europe manifest in greater or less degree the characteristics of militarism.

The term is still more loosely used to designate an acceptance of the theory of the inevitableness of warfare, and of the policy of military preparedness. Militarism in this broad sense is the antithesis of pacifism in the narrow sense of a movement towards immediate and absolute disarmament. See IMPERIALISM; INDUSTRIALISM; PEACE MOVEMENT, *International*.

MILITARY ACADEMY, ROYAL. An establishment at Woolwich, England, through which must pass all candidates for the Royal Artillery and the Royal Engineers. See MILITARY EDUCATION.

MILITARY ACADEMY, UNITED STATES. The national institution for the theoretical and practical training of cadets for commissions in the United States army. It is situated at West Point, N. Y., on the west bank of the Hudson, 50 miles from its mouth, amid the picturesque peaks of the Highlands. This place has been occupied as a military post continuously since Jan. 20, 1778. (See WEST POINT for Revolutionary history of the locality and description of the modern post buildings, surroundings, etc.) The Academy itself had its origin in a resolution passed by Congress on Oct. 1, 1776, which appointed a committee to prepare a plan for "a military academy of the army," but the earliest proposal for a military school for the United States was that of General Knox (May, 1776). His plans were seconded by Col. Alexander Hamilton and approved by General Washington. On June 20, 1777, it was ordered that a Corps of Invalids organized as "a military school for young gentlemen previous to their being appointed to marching regiments" be instituted; which order was carried into effect almost immediately. General Washington was untiring in his efforts to establish the Academy, and it was at his request in 1781 that the Corps of Invalids was marched from Philadelphia to join the garrison at West Point, where an engineer school, a laboratory, and a library had already been established. Two years later Washington again brought the idea of a military academy before his officers at Newburgh, and made a special reference to it in his message of Dec. 3, 1793. On May 9, 1794, his ideas and aspirations were crystallized in a law approved on that date, whereby was authorized the organization of a Corps of Artillerists and Engineers with two "cadets" to each company, and a school of instruction for them was established at West Point in the same year.

The buildings, used as an engineer school, laboratory, and library respectively before 1781, were in 1796 burned down, and thus for a time the work of the Academy was suspended. Instruction was resumed on Sept. 1, 1801, by order of the Secretary of War, who, on July 20 of that year, issued an order directing that all the cadets of the Corps of Artillerists should report at West Point for instruction. The faculty of the Academy at this time was made up of four army officers and a civilian, who acted as administrators and instructors. The actual creation of the Military Academy as it is known today occurred in 1802, under the authorization of an Act of Congress approved on March 16. West Point was selected for its location, and with a class of 10 cadets present it was formally opened on July 4, 1802. The bill authorized the establishment of a Corps of Engineers to consist of 5 persons, a major, 2 first lieutenants, 2 second lieutenants, and 10 cadets, with the pay of $16 per month. Provision was also made for promotions in the corps, not to exceed 1 colonel, 1 lieutenant, 2 majors, 4 captains, 4 first lieutenants, and 4 second lieutenants; but it was also distinctly ordained that the entire corps should not exceed 20 officers and cadets. The following year an increase of 40 cadets was authorized, and, in 1808, 156 became eligible, but, owing to the lack of provision for them at the Academy, very few of them were enabled to report for instruction.

The Academy passed through many vicissitudes about this time, and in March, 1812, was without a single instructor. Students entered without any mental or physical examination and with little regard to age. The War of 1812, however, called the attention of the government to the pressing needs of the Academy. Only 71 students had been graduated in its first 10 years, and President Madison called the attention of Congress to the necessity of making the Academy a scientific as well as a military college, in consequence of which, on April 29, 1812, the Academy was reorganized upon the principles which underlie its present organization. In 1818 the rules approved by President Monroe went into effect and provided that the assignment of cadets to the different corps in the army and their relative rank must depend upon their general merits, to be determined by a competent board of examiners, and that cadets should not be promoted until after they had received a diploma. Col. Sylvanus Thayer was appointed superintendent of West Point in 1817, and succeeded in making the institution famous among the military schools of the world. In 1815 he was sent by the government to Europe to study military schools, and during the 16 years of his superintendency (1817–33) completely reorganized the curriculum of the United States school. He organized the system of divisions of classes into sections, organized the corps of

cadets into a battalion, and created the position of commandant of cadets. In 1833 he took issue with President Andrew Jackson regarding details of management and resigned his post. In 1838 it was again offered him, together with concessions that gave him almost absolute control, but he declined to accept. From this time on little change has been made in the organization of the Academy other than those natural to the progress of time. Thayer is justly regarded as the Father of the Military Academy; with him began the present era of the Academy's history.

The Civil War (1861–65) brought West Point into considerable prominence throughout the civilized world—so much so that since then its methods have been carefully studied by the experts of nearly every great European country. Every one of the commanding generals on both sides in the Civil War who earned high military honors was a graduate of West Point.

The authorized number of cadets for 1916 is 745, but unless the Law of 1910 making certain increases be reënacted, this number will afterward fall to 571; the number of officers and civilians on duty on Jan. 1, 1915, was 132. The course of instruction is to a large extent mathematical and professional. The curriculum is as follows (September 1–June 4):

First year (fourth class): mathematics, English, history, surveying, drill regulations, gymnasium.

Second year (third class): mathematics, French, drawing, military hygiene, drill regulations, riding, gymnasium.

Third year (second class): natural and experimental philosophy (physics), chemistry, electricity, geology and mineralogy, drawing, drill regulations, Spanish, riding, gymnasium.

Fourth year (first class): civil and military engineering, military, international, and constitutional law, hippology, riding, ordnance and gunnery (with machine-shop practice), Spanish, gymnasium.

The physical training of a cadet is most carefully attended to. Apart from the regular drills and target practice, he learns to swim, ride, box, fence, and wrestle. So far as the limited time will permit, he is allowed to take part in football, baseball, tennis, golf, and track athletics. Polo is compulsory for the first class.

Upon the completion of the course (June 12), cadets who have been two years at the Academy are allowed to go home on a furlough of two months. The remainder go into camp, during which they receive practical instruction in the exercises of the various arms of the service, including practice marches and tactical exercises. In addition, cadets of the third and fourth classes are taught dancing.

The superintendent is assisted by a military staff, and the instruction is given by an academic staff, consisting entirely of army officers, with the additional rank of professors, assistant professors, and instructors of the several departments in which they serve.

In 1902 the requirements for candidates seeking admission were raised. The increased requirements, while making entrance more difficult, greatly assist the student during his period of instruction at the Academy by reducing the amount of work he is called upon to do during his course. Under General Orders, No. 38, War Department, 1914:

"A candidate for admission to the United States Military Academy from a State, District, or Territory may be excused by the Academic Board from the mental examination for admission upon one of the following conditions:

"1. That he present a properly attested certificate that he is a regularly enrolled student in good standing without condition in any university, college, or technological school accredited by the United States Military Academy, provided that the entrance requirements for the course he is pursuing in such institution require proficiency in subjects amounting to 14 units of the College Entrance Examination Board, which must include mathematics A_1 (algebra to quadratics), A_2 (algebra, quadratics and beyond), and C (plane geometry); English A (reading and practice) and B (study and practice), as outlined by the College Entrance Examination Board. A certificate indicating enrollment at an irregular time or for the specific purpose of obtaining such certificate will not be accepted.

"2. That he present a properly attested certificate of graduation from a preparatory school or public high school which is on the accredited list of one of the institutions referred to above, provided that he is thus certified to have established proficiency in subjects amounting to 14 units of the College Entrance Examination Board, which must include mathematics A_1, A_2, and C, and English A and B, as outlined by the College Entrance Examination Board. A certificate indicating graduation at an irregular time for the specific purpose of obtaining such certificate will not be accepted.

"3. That he present a properly attested certificate from the College Entrance Examination Board that he has passed 14 units of its examinations, including mathematics A_1, A_2, and C, English A and B, and history A (ancient history) and D (American history and civil government)." After 1915 ancient history will not be required.

The system of training officers at West Point is regarded as more complete than that of any other country; but perhaps the greatest difference is the West Point method of holding the student firmly to his studies during his four years' course.

One feature of the system of instruction at the Military Academy consists in the division of each class into sections of from 7 to 12 cadets each, to each of which sections an instructor is assigned. Each cadet thus recites every day in every subject of his course of study; the result is a hold on his achievement and progress which would be impossible of attainment with larger classes. Transfers to higher or lower sections are continually made; an industrious attentive cadet thus realizes that his work will be recognized by promotion to a higher place in the class. Conversely, a cadet who neglects his studies is sure to "go down." This competition is valuable, because the original rank of graduates among themselves in the army depends on standing at the Academy. At the close of the four years' course, cadets of the highest standing are recommended, in numbers varying from year to year with local conditions, for all the corps of the army; these almost without exception pass into the engineers; then come a few recommended for all branches except the engineers. The remainder are recommended for cavalry, field artillery, coast artillery, and infantry.

The cadet mingles little with the outside world, except in his furlough at the close of two years, so that the four most impressionable years of his life are spent in a training and environment well calculated to produce a thorough soldier. The Academy has been described as a model institution by many distinguished European military authorities, and in the reorganization of the methods of military instruction in England many of the West Point ideas were suggested. The West Point cadet uniform (see UNIFORMS, MILITARY) is the famous cadet gray. The total number of graduates from 1802 to 1914 inclusive is 5347.

Bibliography. Mansfield, *The United States Academy at West Point* (Hartford, Conn., 1863); Boynton, *History of West Point* (New York, 1864); G. W. Cullum, *Biographical Register of the Officers and Graduates of the United States Military Academy, 1802–1910* (5 vols., ib., 1891–1910); Farley, *West Point in the Early Sixties* (Troy, N. Y., 1902); H. I. Hancock, *Life at West Point* (New York, 1902); *The Centennial United States Military Academy, 1802–1902* (2 vols., Washington, 1904); E. S. Holden (ed.), *West Point and the United States Military Academy* (New York, 1909); the annual reports of the superintendent of the Academy (Washington).

MILITARY AËRONAUTICS. The application to and in the military service, whether ashore or afloat, of any device or apparatus intended (*a*) to carry passengers and war material from one point to another in the air, for purposes of observation or of destruction or both, and (*b*) to rise and remain in the air, at an altitude controllable within limits, for purposes of observation. Hence there must be considered, balloons, captive and free; kites (see under KITE; MILITARY OR MAN-RAISING KITE); dirigibles; aëroplanes; and organization and training of air service.

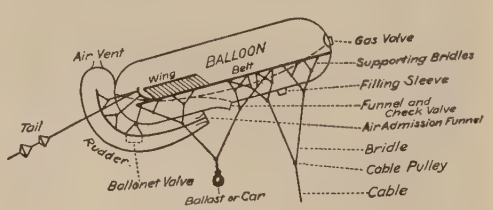
BALLOONS

Captive Balloons. The balloon was first used in war, and by the French, at the battle of Fleurus, June 26, 1794. This balloon, a captive one named the *Entreprenant*, was mounted by Charles Coutelle, and was of material benefit to the French General Jourdan by informing him as to the movements of the enemy. This same balloon was later used in the defense of Maubeuge, and in the sieges of Charleroi and Mayence, 1796.

No balloons were employed during the wars of the Empire. The French sent up one in 1859 before Peschiera; balloons were used during the American Civil War and by the United States troops in Cuba in 1898 before Santiago, where they proved not only a failure in respect of the acquisition of information, but a source of positive danger by giving the Spaniards the exact range. Since the development of the dirigible and the invention of the aëroplane spherical ballooning, whether free or captive, has diminished in interest and value. This is, however, not to say that it has become obsolete. For example, the French army in 1914 made use of *auxiliary* balloons (320 cubic meters) for colonial expeditions; of the so-called *normal* balloons (560 cubic meters), captive, for field service; of siege balloons (750 cubic meters) equipped with a ballonet; and of *ballons de place* (fortress balloons) 980 and 1600 cubic meters respectively, for free ascensions. All of these are inflated with hydrogen, save the 1600 cubic meter, which uses coal gas.

Spherical balloons are to-day *paneled;* i.e., whereas formerly the seams followed the meridians of the surface, they now in addition are sewed along seams parallel to the equator. This has the effect of limiting a tear, should one develop. Captive balloons are usually made of double vulcanized cloth, and thus do not require varnishing, besides being stronger, more impervious and more durable. To preserve the India rubber from the effects of the sun, balloons are painted with lead chromate, thus producing a characteristic yellow color.

Kite Balloons. The spherical captive balloon is open to some very serious objections: it offers a poor resistance to wind squalls; in a wind of 8 to 12 meters per second observation becomes difficult, and beyond 12 meters impossible. A German officer, Von Parseval, therefore conceived the idea of constructing a balloon which should at the same time be a kite, the so-called *Drachenballon,* or kite balloon. The stability of this balloon would increase as the wind rose and the only limit to its possibilities in this respect would be the strength of the materials used. It consists of a long cylindrical part closed at each end by a spherical cap. At the rear is attached a rudder of toric form, carrying at its



KITE BALLOON.

forward end an air-admission funnel and at the other a vent. In the interior of the balloon proper is situated a ballonet, whose function is to preserve the invariability of form of the system, and into which air is admitted by a funnel and valve. The tail of the kite consists of a series of reversed parachutes opened by the wind. To a sort of belt parallel to the axis of the cylinder are attached, forward, the bridles, which themselves work down to the main retaining cable. No net is used in this type of balloon; the car is suspended from bridles fixed to the rear.

As soon as the balloon is released it orients itself so that its main axis lies in the plane of the wind; this axis, moreover, is so inclined as to cause the nose of the balloon to lift. The wind now enters the rudder by the admission funnel; the rudder, inflated and assisted by the parachutes, fixes the orientation of the balloon. At the same time air begins to fill the balloon by the funnel, escape being prevented by a check valve. When the interior pressure becomes too great, relief is afforded by the escape of air into the rudder through the ballonet valve. The filling sleeve is always kept closed. Finally, should the pressure of the gas in the balloon exceed a certain limit, the interior wall of the ballonet bears upon the envelope of the balloon proper so that the latter pulls a cord communicating with the gas valve and automatically causes the latter to open. All danger of bursting by excess of pressure is thus eliminated. The supporting

effort of the balloon is increased by the effect of the wind on the rectangular lateral wings; these serve further to diminish the inclination of the balloon as the wind rises.

This balloon is the regulation captive balloon of the German and Austrian armies. If we are to believe the French, it is not after all superior to the French siege balloon; it ascends to a lower altitude for the same length of cable unwound; it is difficult to transport and to operate. However, in open country and on good roads, the Parseval even while up in the air can be transported from one point to another of a field, even at a trot. A small balloon (100 cubic meters) of this type has been used in France to carry the antennæ of the field wireless system. It may also serve to carry a photographic camera.

Use of Captive Balloons. Captive balloons may be employed to observe the movements and positions of the enemy and to guide indirect artillery fire. Reports are usually made by telephone. Conventional signals are also employed. In average country an altitude of 500 meters permits a reverse view of defiladed positions and, if the weather be clear, of observations as far as 7 kilometers. Before and during a battle an observer in a captive balloon may check the reports of cavalry reconnoissance, pick up reserves, make out field works, etc. During sieges captive balloons might be very useful. At night they may be used for the transmission of luminous signals as far as 30 kilometers. But after all is said and done, their use has always been limited: fog, rain, snow, would prevent observation and they are exceedingly vulnerable to artillery fire; if attacked, the only means of safety is to descend at once as rapidly as possible.

Naturally the possibilities of the captive balloon have led to the organization of balloon service and of balloon troops. As a rule, these troops belong to the Engineers, and are charged with the care, maintenance, and use of the material. Apart from the balloon proper and its equipment, the material includes vehicles for transport, trucks for ascensions, apparatus for generating hydrogen gas, and the necessary supplies, tools, etc., and is usually assembled and kept in balloon parks. These are stationed in the great fortresses, while the general administration, instruction of officers and men is managed by a central establishment. The train accompanying a captive balloon in the field is considerable, including the reel wagon with its tender, a tool wagon, tube wagons carrying compressed hydrogen, and wagons for the balloon equipment proper.

The siege-balloon train is somewhat smaller, but one of its wagons carries photographic equipment.

Free Balloons. Free balloons have no value in military operations save as a means of communication or of escape from besieged places. The Austrians, however, in 1848, made an attempt to use them to bombard Venice, but failed because the wind drove them off. At the siege of Paris, in 1870–71, between September 23 and January 28, 64 free balloons were sent out. These carried out about 2,500,000 letters and 358 carrier pigeons, of which 56 returned to the besieged city. Of the 64 balloons, 2 fell into the sea, 7 into the hands of the enemy, 12 others were captured, but their crews managed to escape.

DIRIGIBLES

The modern dirigible balloon owes its origin to the efforts of two French officers, Renard and Krebs, of the Engineer Corps, who, experimenting in 1884 and 1885, constructed a balloon, *La France*, 50.4 meters long and 8.4 meters in diameter, driven by a propeller actuated by an electric motor. A speed of 6.5 meters per second was attained, and under favorable conditions of wind and weather this balloon made trips, modest to be sure, but significant of greater progress. Since the work of the French officers, as is discussed under AËRONAUTICS, there have been important developments of the dirigible, but all things considered, so far as practical value is concerned, it is almost useless save for military purposes, and even in war its application and possibilities are limited.

Types. Three types of dirigibles are found in the military service. The semirigid and nonrigid are thought to be in many respects greatly superior to the rigid. Their chief advantage consists in the ease with which they can be taken apart and assembled, and in the fact that they can be transported deflated. The keel alone of the semirigid, however, calls for several freight cars, while the Parseval, a nonrigid dirigible, e.g., can be completely loaded on two. On the other hand, if the envelope should be torn, the semirigid and the nonrigid are put out of commission. To the usual classification into rigid, semirigid, and nonrigid some objection has been raised. In the first place the term "semirigid" is in itself improper, inasmuch as the balloon itself is collapsible, but uses a rigid member or frame to connect the car and its accessories with a gas bag. A more rational classification, according to French authorities, from the military point of view, would seem to rest on volume as the determining factor. We thus have:

Vedettes: 2000–4000 cubic meters and taking up three aëronauts. Limited radius of action; to accompany field armies and remain as close as possible to the enemy; easy to handle and to transport; rapidly inflated; no special hangars needed.

Scouts: 6000–7000 cubic meters. Capable of remaining up a considerable time and of going far; of special value when hostile armies are making their approach marches; special hangars needed.

Cruisers: "aërial dreadnoughts," exceeding 10,000 cubic meters; able to go far and remain up a long time, and thus available for strategic reconnaissance; to be concentrated near frontier and ready to start at the first signal; special hangars needed.

But this classification is almost completely robbed of any value by a brief consideration of the requirements a military dirigible must satisfy. In order to be safe from hostile fire a dirigible must rise to a considerable altitude. This altitude is at least 1500 meters, and will increase as balloon artillery improves. Moreover, since it is important that a dirigible shall pass as little time as possible in friendly territory, it must reach this minimum altitude as rapidly as possible and there maintain itself during the greater part of its journey. Hence the condition imposed upon dirigible builders of furnishing a machine that will stay up for a considerable number of hours and remain for at least two-thirds of the time at an altitude of at least 1500 meters. An airship failing to satisfy these

conditions would have very little military value. In order to control rising there must be ballast; if, further, long voyages are contemplated, the supply of ballast must be increased; we thus necessarily arrive at the conclusion that the military dirigible must be of great volume.

The present tendency is towards the construction of the dreadnought class. In illustration of the progress made we may compare the German M I of 1912, of 6000 cubic meters, equipped with two motors of 75 horse power each, developing a speed of 45 kilometers an hour, and having two propellers, with the Z VIII, built in 1914, of 22,000 cubic meters, having three motors of 180 horse power each and four propellers. The Zeppelins actually built on Jan. 1, 1914, with 540 horse power, developed a speed of 77 kilometers an hour. The comparison is still more striking in France. Thus, the Ville de Paris, of 1906, of 3200 cubic meters, speed 43.2 kilometers an hour, developed by one 70-horse-power motor, and with one propeller, is plainly obsolete when compared with Astra XVI, of 23,000 cubic meters and a speed of 90 to 100 kilometers an hour, developed by four 250-horse-power motors actuating four propellers.

So rapid has been the evolution of airship design that dirigibles built before 1910 by the time of the European War which began in 1914 were quite obsolete. In the development of actual type most nations were content to follow models of French or of German origin. In the construction of some of their ships, however, the Italians even before the European War exhibited originality by inclosing the stiffening member or frame in the gas bag itself. This frame is not rigid, but composed of articulated panels, thus accommodating itself to the variations of form of the envelope. The car of the P class (containing dirigibles of smallest volume) is of steel and water-tight, so that in case of need it may float on the surface of the water. In the M class (M = mean, between the smallest class, P, and the largest, G) the car is of steel and completely closed, and thus shelters the crew from wind and weather and at high altitudes. These are real military qualities, for they permit the balloon to go out under unfavorable climatic and weather conditions. In the G class the car forms an integral part of the balloon body. A later type was a crewless dirigible operated by Hertzian waves. These work one propeller forward and two aft, and a fourth, of vertical axis, under the car and thus helping the dirigible to rise. It was said that the trials of this dirigible in July, 1913, turned out very well. We give below, illustrating type, equipment, speed, etc., lists of the war dirigibles of Germany and of France respectively. The latter contains only the airships recognized by the French as having any military value. The tables giving the published state of affairs as it existed early in 1914 just before the war are taken from Rasch and Hormel's *Taschenbuch der Luftflotten* for 1914, though some differences, occasionally quite marked, will be noticed when such information is compared with French authorities.

On Jan. 1, 1914, the military airship (army and navy) fleets of the world were as shown in table at top of page; and to these must be added a certain number of commercial and experimental ships, of which on Jan. 1, 1914, Germany had nine (one building), France two, Italy three, Japan one, Austria two. Germany excepted, none of these has any military value.

There is reason to believe that the number of military dirigibles in existence at the outbreak of the European War was considerably greater than the number published, and during

COUNTRIES	In service	Building
Germany	12	7
France	*17	†10
Belgium	1	..
England	7	2
Italy	9	2
Japan	1	..
Holland	1	..
Austria-Hungary	3	..
Russia	13	4
Spain	2	..
Turkey	1	..
United States	1	..

* Including three not recognized as of military value.
† Includes Astra XV, XVI.

the progress of the war new dirigibles were built and placed in commission, while others were destroyed. It is reported that L I, L II, L III, L IV, and L VIII have all been destroyed, wrecked, or lost.

Employment of the Dirigible. Dirigibles may be used in two ways: (1) in the acquisition of information; (2) in the infliction of damage upon the enemy. Certain general conditions affect both uses. The dirigible must be equipped with means of communicating with its own side. So long as it remains within the working range of telescopes or field glasses it may use visual signals; when beyond this range it must have recourse to wireless telegraphy. Since a dirigible is liable to attack by other dirigibles or by aëroplanes, it must carry rapid-fire or machine guns to beat off such attacks. By reason of its very nature the dirigible must have a "port" or base, at which are found the hangars for housing the dirigible when not on service, machine and repair shops, gas generators, in short all the apparatus and tools for use and maintenance.

Information. Bearing in mind the constitution of airship fleets, the nature of the duty will depend on the volume of the dirigible. The smaller airships naturally will be useful for tactical reconnoissances, e.g., to report on armies executing their marches of approach; they may conceivably be employed even when armies are in actual hostile contact. The value of such reconnoissance will naturally depend on the rapidity with which the information obtained may be transmitted to the headquarters interested. Obviously wireless telegraphy is here indicated. Communication by this means over a range of 300 miles and more is an accomplished fact. On the actual field of battle accurate information may be sent of the emplacement of the hostile batteries—information of the greatest value and importance—as well as of the general situation of the enemy. This sort of work, however, falls more naturally to the aëroplane, as indeed will probably be found the case with all close work.

Dreadnoughts, the "battleships" and "battle cruisers" of the air, would be used on what is known in the military profession as "strategic reconnoissance," i.e., on long journeys into the heart even of the enemy country, for the purpose of detecting the concentration of troops and the direction of great movements. This function calls for the installation during peace of stations near the frontier, from which without loss of

time dirigibles may proceed into hostile territory. Such stations were found along both sides of the Franco-German frontier, in the great fortified positions, e.g., Metz, Strassburg, Verdun.

Offensive Employment of the Dirigible. Even before the war military authorities expected no great results from bomb throwing and this opinion has been sustained. This must not be understood to mean that such results are impossible or even improbable. With improved apparatus for releasing the bomb or projectile, with more experienced operators, it is possible that success will be attained. It appears to be true that at altitudes safe for the dirigible the expectation of hits is slight; at lower altitudes the dirigible would probably be destroyed before achieving any useful purpose. Since the supply of really destructive ammunition that may be carried along is limited, the possibilities of destructive effect are limited. If the attack fail, the journey of the dirigible is worse than useless, and in any case its ammunition once exhausted, it must return to its home port in order to replenish. It is conceivable of course that a government disposing of a fleet of say 25 or 30 dirigibles may send it to hover over an army, or the capital, or a great fortress, over dockyards and arsenals, in the hope of sending down so many projectiles, incendiary and others, that some of them will strike the target. But, as before remarked, if the fleet remain at a safe height, its own fire is uncertain; if it descend so low as to assure a reasonable expectation of hits, it exposes itself to the high angle fire of the defense. It would seem from the state of affairs, so far as made known, and the experience of the European War, that the dirigible has been a disappointment to its partisans. Offensively its performance would seem to have been negligible; whether it achieved in reconnoissance results more tangible is not as yet known.

Defects of the Dirigible. The dirigible is open to some objections, the chief of which may be summed up in one word—bulk. A corollary is its inability to operate by day through fear of hostile aëroplanes. The first cost of a military dirigible of the dreadnought class is great—in the neighborhood of $500,000. Compared with other items of the military budget, this is not in itself a large sum. But it is large compared with the cost of an aëroplane —$12,000 to $15,000—when it is considered that both machines have similar functions. If a remedy be sought in the construction of smaller dirigibles, we must realize that, although the first cost is much reduced, nevertheless a large sum has been spent to build an instrument whose work can be as well done, if not better done, by a much less expensive machine, the aëroplane. In fact, as the dirigible diminishes in volume its functions tend more and more to coincide with those of the aëroplane. In particular its offensive powers, varying as these do with carrying capacity, tend to disappear, or at least to reach so low a point as to be more than compensated by the superior advantages of the aëroplane, in respect of reconnoissance. Accepting, then, the fact that the dirigible must be of great volume, it is clear that its plant must be of vast size and correspondingly costly. A dirigible in

GERMAN DIRIGIBLES (1914)

NAME AND YEAR BUILT	Volume cubic meters	Length meters	Maximum diameter meters	Motor and horse power	Speed kilometers per hour	Number of propellers	Useful load kilograms	Maximum ascension meters	Type
M IV 1913	13,000	97	13.5	3 Körting of 150 H. P.	75	..	....	....	Semirigid
M I 1912	6,000	74	11	2 Körting of 75 H. P.	45	2	1,250	....	Semirigid
P IV 1912–13	10,000	84	15	2 Maybach of 180 H. P.	71	2	3,500	2,500	Nonrigid
P III 1911	10,000	84	15.5	2 Körting of 200 H. P.	65	2	2,800	2,000	Nonrigid
Ersatz P II 1910	8,000	77	14	2 Maybach of 180 H. P.	51	2	2,200	2,000	Nonrigid
Z VII 1913	22,000	156	14.8	3 Maybach of 180 H. P.	..	4	....	....	Rigid
Z VI 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z V 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z I 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z IV 1913	19,500	141	14.8	3 Maybach of 180 H. P.	77	4	....	....	Rigid
Z III 1912	17,500	140	14	3 Maybach of 150 H. P.	78	4	....	....	Rigid
Z II 1910–11	17,800	148	14	3 Maybach of 150 H. P.	76	4	....	....	Rigid

GERMAN AIRSHIPS BUILDING (1914) *

S. L. II	23,000	144	18.4	4 Maybach of 180 H. P.	80	4	8,000	....	Rigid
Z VIII	22,000	156	14.8	3 Maybach of 180 H. P.	..	4	....	....	Rigid
L IV (navy)	30,000	165	18.4	4 Daimler of 240 H. P.	80	4	14,000	....	Rigid
L III (navy)	27,000	...	...	4 Maybach of 180 H. P.	..	.	....	....	Rigid

* Previous to war.

a fixed shed is a prisoner until the wind is favorable to its issue. The objection is removed, however, by constructing a revolving hangar, such as those built by the Siemens-Schuckert firm in Germany at Biesdorf. This opens at both ends, and may turn 90° either to the right or to the left. It is even proposed to construct subterranean or semisubterranean hangars, into which the ship would be allowed to sink, and then be closed in by a trap-door roof. The cost of these installations would evidently form a serious item in the military budget.

On the outbreak of war the fleet would of be sheltered, is at the mercy of the wind. But as yet no dirigible has been built which is able to "keep the air," not to say indefinitely, but for a relatively long time, a week or two weeks, without landing. It must return to its own or to some other base or make a landing in order to renew supplies. It is a fact that some dirigibles may remain up 30 hours and longer, and it is certain that this duration allows an ample margin of time for action. But it is also a fact that, from its bulk, the dirigible is vulnerable, far more vulnerable than the aëroplane.

FRENCH WAR DIRIGIBLES *

NAME AND YEAR BUILT	Volume cubic meters	Length meters	Maximum diameter meters	Motor	Speed kilometers per hour	Number of propellers	Useful load kilograms	Maximum ascension meters	Type
Conté 1912–13	9,130	82.5	14	2 Chenu of 200 H. P. each	65.5	2	....	3,050 (recow)	Nonrigid
Lieut. Chauré 1911	8,950	86.7	14	2 Chenu of 200 H. P. each	52	2	....	....	Nonrigid
Adjudant Réau	8,950	86.7	14	2 Brasier of 120 H. P. each	52	3	....	2,150	Nonrigid
Colonel Renard 1909	4,300	60.4	10.5	1 Panhard-Levassor of 110 H. P.	46	1	....	....	Nonrigid
Dupuy de Lôme 1912	9,000	88	16	3 Chenu of 130 H. P. each	55	2	2,900	2,940	Nonrigid
Adjudant Vincenot 1911	9,000	88	16	2 Clement-Bayard of 130 H. P. each	56	2	2,717	1,967	Nonrigid
Capitaine Marchal 1910–11	7,200	89	14.6	2 Panhard-Levassor of 80 H. P. each	45	.	....	....	Semirigid
Lieut. Selle de Beauchamp 1910	10,000	89	14.6	2 Panhard-Levassor of 80 H. P. each	45	2	1,685	....	Semirigid
Liberté 1909–10	7,000	85	12.8	2 Panhard-Levassor of 80 H. P. each	53	2	....	....	Semirigid
Spiess Rebuilt 1913–14	16,400	140	13.5	2 motors of 200 H. P. each	70	4	....	....	Rigid
Capt. Ferber 1911	6,000	76	12.4	2 Dansette-Gillet of 110 H. P. each	56	2	2,500	2,000	Nonrigid
Commandant Coutelle 1911	9,500	92	14	2 Dansette-Gillet of 200 H. P. each	62	4	....	....	Nonrigid
Le Temps 1911	2,500	50.4	9.5	1 Dansette-Gillet of 110 H. P.	50	2	....	....	Nonrigid
Fleurus 1912	6,500	77	12.4	2 Clement-Bayard of 80 H. P. each	..	.	....	....	Nonrigid

FRENCH AIRSHIPS BUILDING (1914) †

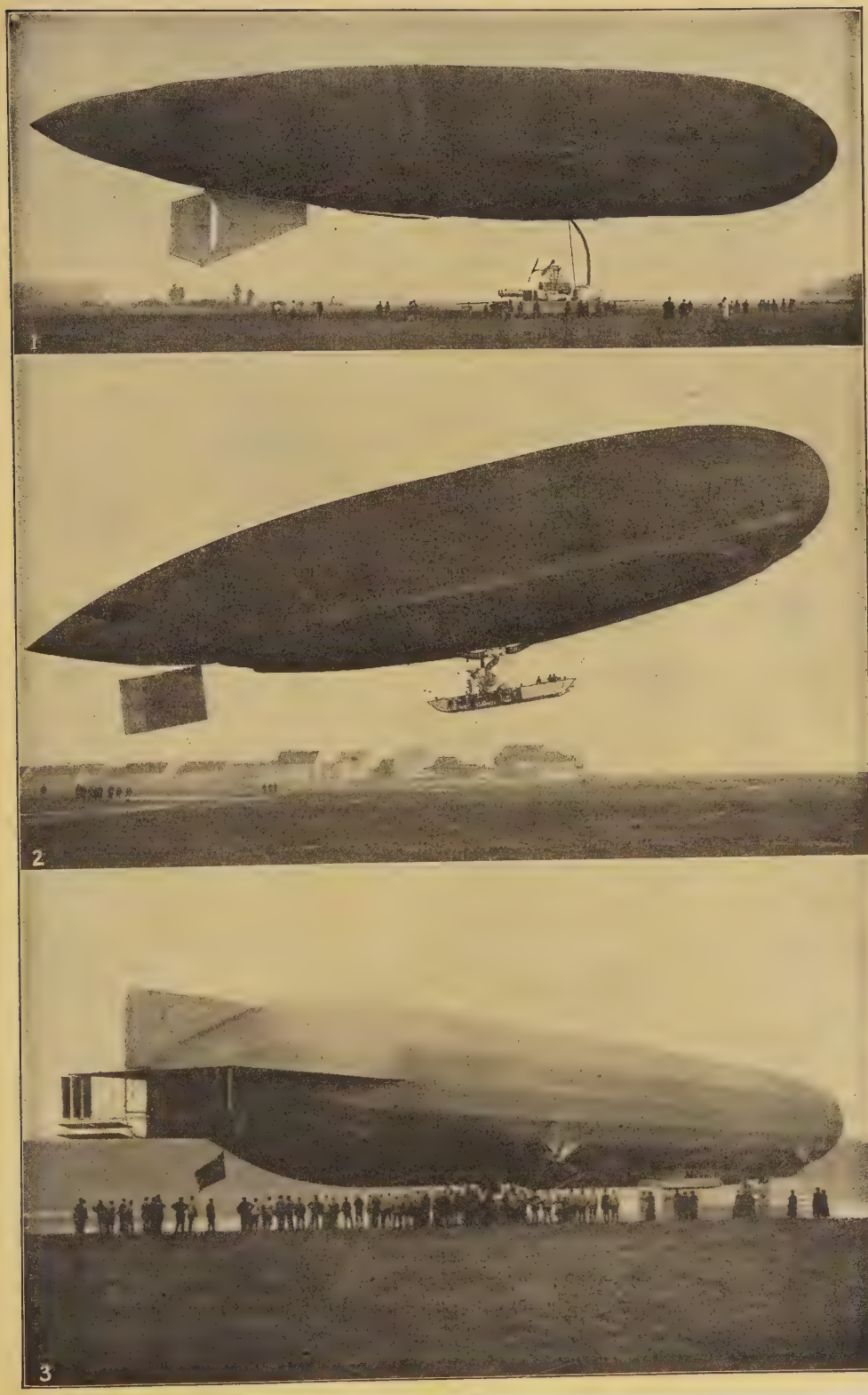
Astra XVI	23,000	120	16	4 Chenu of 250 H. P. each	90–100	4	....	....	Nonrigid
Astra XV	23,000	120	16	4 Chenu of 250 H. P. each	90–100	4	....	....	Nonrigid
Clement-Bayard VII and VIII	22,000	...	...	4 Clement-Bayard of 250 H. P. each	65	.	....	....	Nonrigid
Lebaudy XI	17,000	110	15.5	3 Panhard, 1000 H. P.	..	.	....	....	Semirigid
Lebaudy X	10,000	103	14.5	3 Panhard	..	2	....	....	Nonrigid
Zodiac 16	17,000	110	15	3 Chenu, 1000 H. P.	..	.	....	....	Nonrigid
Zodiac 14–15	10,000	95	13.5	2 Panhard	..	2	....	....	Nonrigid
X	17,000	110	15	2 Dansette-Gillet of 600 H. P. each	..	.	....	....	Nonrigid

* French war dirigibles were to have their name in large black letters on undersurface of front of balloon, and to carry national colors.

† Previous to war.

course use the stations established during peace on or near the frontier. If these, however, should be destroyed, or if an invasion should be made into the heart of a country, then, if dirigibles are to accompany the army, either a dismountable plant must be provided as a part of the train or the ship must return to a far-distant base. The transportation of such a plant would be a serious matter; the absence of the ship might involve a military disadvantage. The transportable mooring mast of the English army furnishes a sort of solution, but so far as known it is used for only very small models. A dirigible that has landed in the open, if it cannot

The maximum ordinate of the trajectory of the 6.5 centimeter Düsseldorf gun is given as 7900 meters, that of the 10.5 centimeter as 8300 meters. To say nothing of the present impossibility of a dirigible's rising to such a height (the altitude record for dirigibles is 3300 meters) it is clear that long before reaching it its usefulness both in offense and reconnoissance would be very seriously diminished if not completely destroyed. The dirigible is further seriously exposed to aëroplane attack, against which it might prove helpless, unless escorted by its own combat aëroplanes. The value of the dirigible is greatly reduced at night; at useful alti-



TYPICAL EUROPEAN MILITARY DIRIGIBLES

1. "PARSEVAL XI", A TYPICAL GERMAN ARMORED AIR CRUISER
2. "EUGÈNE MONTGOLFIER", A FRENCH CLÉMENT-BAYARD DIRIGIBLE
3. GERMAN NAVAL ZEPPELIN STARTING FROM WATER AT POTSDAM

TYPICAL AËROPLANES OF THE GREAT EUROPEAN WAR

1. FRENCH ARMORED NIEUPORT MONOPLANE.
2. THOMAS (AMERICAN) HIGH SPEED BIPLANE.
3. BRITISH SOPWITH SCOUT MILITARY TRACTOR ARMORED BIPLANE. Many of these machines were used in raids over German territory for bomb dropping.
4. CURTISS (AMERICAN) MILITARY TRACTOR, MODEL "N".

tudes its bulk in clear weather should be easily discernible, where an aëroplane would be practically invisible. Again, the proper speed of a dirigible must exceed by 4 or 5 meters that of any wind it may have to meet; a speed of 20 meters would allow a dirigible to proceed on 85 days out of 100, one of 12 meters on 40 out of 100. If we diminish these numbers on account of rain, snow, or fog, and take into account gas leakage, it is clear that the usefulness of the dirigible would be still further reduced. Obviously some of the objections cited will lie also against the aëroplane, but in a lesser degree, because of lower cost, greater ease of handling, comparative invulnerability, and ability to profit by fleeting opportunities not within the grasp of its bulky rival. Lastly and in general, the dirigible must for the present be regarded as a more or less delicate machine, exposed to danger from fire, e.g., from the blast of its own guns, weather, and the unforeseen causes of disaster.

Advantages of the Dirigible. The dirigible is superior to the aëroplane in that it affords a better gun platform, can carry heavier guns, can navigate by night, remain in the air a much longer time, and carry a much greater useful weight. Its wireless equipment has a much longer range. In gun practice some notable results have been attained; e.g., the German Z V at Döberitz early in 1914 made hits on a target 12 by 3 feet at a range of over 1800 yards. In yet other trials a 2-inch gun at an elevation of 2000 feet scored bull's-eyes on a target 30 by 15 feet suspended 1000 feet in the air from a kite balloon; this gun was mounted on top of the gas bag. Z VIII ascended on March 29, 1914, to a height of 10,000 feet, and, as a further example of the possibilities of the dirigible, L III (since reported lost in 1915), after a trip of 35 hours at 62 miles per hour, had enough fuel left for a journey of 16 hours more. This airship carried a searchlight of 40,000 candle power.

AËROPLANES

That motor flying should have made a special appeal to the military profession was perfectly logical; sporting apart, no real use for flying has so far been imagined comparable with that of the service of reconnoissance in war. In 1909, at the Rheims meeting, the first real tests of aëroplanes from a military point of view so impressed the French government that it ordered several Wright machines for military use. It was at this meeting that the Gnome motor first appeared. In 1910 we find the French using aëroplanes (and dirigibles) at the fall manœuvres held in Picardy, with results so satisfactory as to lead to the prediction that the whole service of reconnoissance would be revolutionized.

The progress of military flying was still further strikingly displayed at another notable aviation meet held at Rheims in the following year, and at the Paris Aëroplane Salon, which marked the close of the aëronautical season of 1911. The machines shown indicated that at least an approximate solution had been reached of the various problems of military flying. The engines were more powerful; an improvement had been made in the landing chassis in respect of both strength and simplicity. The single-seat, high-speed monoplane attracted very serious attention; indeed it may be said that this machine emerged approximately as a distinct and important type. Capable of reaching a speed of 80 miles an hour, it was recognized that a most valuable instrument of reconnoissance had been created, limited, to be sure, in its purpose, but that purpose possibly of the most vital importance.

In the development of military aëroplanes France early took and maintained the lead. In 1912 she appropriated nearly $5,000,000 to military flying, an amount increased by a popular subscription of $500,000. Germany, wedded to the dirigible, and at first regarding flying as of limited value, nevertheless took alarm after the French manœuvres of 1910, and with characteristic thoroughness set to work to build machines and to develop and train military flyers. In 1912 she appropriated over $3,000,000 for this element of her war power, and increased the amount to $10,000,000 in the budget of 1913. Russia followed suit and her aërial budget in 1911 was $5,000,000. Austria, Japan, Italy, and Spain then took up the subject. England was far slower; it was not until 1912 that she gave it serious consideration. What was expended by the combatant nations in connection with the great war is of course only a matter of conjecture until the publication of the detailed budgets. In the meantime it is reported that orders to the value of $16,000,000 have been placed in the United States by European nations at war, for aëroplanes and motors.

Use of the Aëroplane in War. Like the dirigible, the aëroplane has two functions in warfare—reconnoissance, involving the acquisition and transmission of intelligence, and attack, the infliction of damage upon the *matériel* and *personnel* of the enemy. Of these reconnoissance far outweighs the other in importance and value. The applicability of the aëroplane to the business of collecting information has been almost self-demonstrated from the start; its usefulness as an engine of destruction remains on the whole undeveloped. Other uses have suggested themselves during the course of the war. Daily communication between Przemysl and the Austrian lines seems to have been maintained by aëroplane. Russian aviators have been employed to bring up ammunition from the distant rear. These cases, however, are special.

Information. Air craft, i.e., dirigibles and aëroplanes, have no effect on strategy, the principles of which are declared to be immutable. But having in view the hugeness of modern armies, preliminary strategical operations must to-day be carefully considered; the strategical plan once adopted, air craft may serve to accelerate the passage to the tactical phases of the situation. This effect can never be great, however, since it is to the interest of any army to reach the tactical phases without loss of time. It is therefore in the domain of tactics that we must seek the influence of air craft. This statement almost shuts us up to a consideration of the aëroplane alone. The dirigible conceivably is superior in strategical reconnoissance, because of its ability to keep in the air longer than its winged rival, and especially because it is better adapted to navigate by night; but in tactical reconnoissance, in the observation of troops after they have left the roads, after they have taken up the formations leading to combat, the dirigible must take second place.

In its simplest terms the military problem to be solved by a military aviator consists in

knowing how to get the information wanted and to transmit it to the headquarters interested; hence the military aviator must be able, in full flight, to read a map, must thoroughly understand the three arms, be acquainted with their carried out by both infantry and cavalry, but chiefly by cavalry. Since each side is doing its best to conceal its own strength and purpose from the other, there results what is called the "fog of war," i.e., the uncertainty as to the intermediate purposes of the enemy and as to the means he employs to carry them out. In spite of all efforts the information brought in to headquarters may be untrustworthy, if only because it may be several hours old before it is received.

formations, and know how to follow a manœuvre.

From the earliest time of mobilization, concentration, and advance of an enemy, each side to obtain information resorts to reconnoissance,

TYPES OF MILITARY AËROPLANES

I. GERMANY *

DESCRIPTION	Length over all meters	Spread meters	Area of supporting surface square meters	Speed, kilometers per hour	Motor and horse power	Climbing power	Weight kilograms	Useful load, kilograms	Supply of fuel carried	Number of propellers and mode of mounting	Remarks
Ago monoplane 1913–14	8	9	15	135	Argus, 150	1000 meters in 8 minutes	...	...	...	One; tractor	Not an army machine
Albatros biplane	8	14.5	40	110	Argus and Mercedes, 100	1000 meters in 8 minutes	620	200	For 4 hours	One; tractor	Army
Aviatik biplane	8	14	48	100	Argus and Mercedes, 100	1000 meters in 8 minutes (full load)	690 (unloaded)	200	For 4 hours	One; tractor	Army
L. V. G. biplane 1913	9	14	..	100	Argus and Mercedes, 100	.....	400 (unloaded)	..	...	One; tractor	Army
Rumpler monoplane 1913	9.85	13.25	32	100	Argus and Mercedes, 100	.....	400 (unloaded)	..	...	One; tractor	Army

II. ENGLAND

Bristol biplane 1913	8.6	11	38	67–100	Gnome, 80	.....	430 (unloaded)	300	For 4 hours	One; tractor	Army
Martin-Handasyde 1913	10.6	13	26.5	105	Dansette-Gillet, 80	.....	300 (unloaded)	250	...	One; tractor	Army
Handley-Page biplane	...	13.25 (upper surface)	38.5	...	Anzani, 100	.....	...	..	...	One; tractor	Army

* German military aëroplanes carry on the undersurfaces of the wings a large black Maltese cross.

III. FRANCE *

DESIGNATION	Length over all, meters	Spread meters	Sup'ting surface, sq. m'rs	Speed, km. per hour	Motor and horse power	Weight kilograms	Useful load, kilograms	Supply of fuel carried	Number of propellers and mode of mounting	Remarks
Blériot biplane 1913–14	9.15	12.7	36	..	Gnome, 80	400 (unloaded)	250	.....	One; tractor	Army
Deperdussin monoplane 1913	7.3	10.6	..	105	Gnome, 80	...	...	.....	One; tractor	Army
Clément-Bayard monoplane 1914	9.5	9.2	16	120	Gnome, 80	320 (unloaded)	200	.....	One; tractor	Army
Farman biplane 1913	8.32	14	..	110	Gnome, 80	...	...	In 1914 carry gasoline for 24 hours in special tanks	One; rear mounting	Army
Nieuport monoplane	8	....	14	140	Nieuport, 85	240 (unloaded)	...	.....	One; tractor	Army; in 1914 armored type carrying automatic rifle
Nieuport-Dunne biplane 1913	6.75	14.75	50	95	Gnome, 80	425 (unloaded)	...	For four hours	Two; rear mounting	Not an army machine
Zodiac biplane	11.75	15 (upper surface)	32	95	Gnome, 50	460 (unloaded)	250	.....	One; tractor	Not an army machine

IV. RUSSIA

Sikorsky biplane, "Ruski Witjas"	20.2	28.2	125	...	4 Argus of 100 H. P. each	...	...	.....	Four; tractor	Not an army machine

* French military aëroplanes, it was announced, should carry on the under side of each wing (lower wing in biplanes) a tricolor cockade one meter in diameter.

Hence it has been the business of military genius, other things equal, to pierce this fog of war and by the proper use of troops to beat the enemy.

The aëroplane has almost completely dissipated the fog of war. Long before an army comes up its strength and composition are known, its direction and rate of march disclosed, its purpose revealed. Suitable measures can therefore be taken in ample time, for doubt has given way to certainty, and a commanding general may act in full knowledge of the task before him.

So complete and accurate is the information possible by air scouting that enthusiasts have declared that the reconnoissance duty of cavalry has become obsolete. But to accept this view would be to fall into grave error. With two armies at grips, or about to come to grips, much remains to be done by the intimate, immediate, and local reconnoissance, both of the ground and of the enemy by the troops immediately interested; in other words, the aëroplane can never be made to feel the enemy. The aëroplane is of inestimable value in giving notice, as already said, of an impending attack, and even of the nature of the attack; the immediate dispositions however, must, as before, be left to the troops themselves.

To form a concrete idea of the service of reconnoissance possible to the aëroplane, a machine doing no more than 80 kilometers per hour may fly say 125 kilometers in advance (four days' march) and observe a strip from 8 to 10 kilometers wide. The information brought in, if the machine returns, will be only an hour or two old when received; with wireless, it would represent at the moment the exact military situation. Now this information, if sent in by cavalry patrols, may be 24 or 48 hours old. Moreover, cavalry can never report more than the "apparent contour," whereas the aëroplane looks down into the heart of things. It may do admirable service in the transmission of orders and for establishing contact between troops engaged. The opportunity for this presents itself when roads are choked with troops and guns, when telegraph and telephone lines are cut, and wireless ceases to operate.

Some idea of the importance of air service may be formed from the record of over 18,000 hours of flight, and distance of 1,800,000 kilometers by French aviators. The other combatants no doubt can furnish similar records.

Moreover, the aëroplane has directly intervened on the battle field itself. Thanks to the increased range and calibre of modern artillery, effects, sometimes surprise effects, are possible at distances undreamed of in elder days. The case may be even more generally stated: so powerful is the modern gun, whether the classic fieldpiece or the larger calibres brought into action in later years, that distant action may be said to be the rule. But in order to produce results the nature of the target and the range must be exactly known. Now, in obtaining these elements the aëroplane is of the greatest value, as appears when we recollect that modern fire is indirect, i.e., the batteries engaged do not see the target. Hence it has been found necessary for the captain of a battery to take his post at some point from which he could observe the fall of the projectiles and so correct his practice. The aëroplane to-day enables the battery to *see;* it indicates targets, checks and corrects fire. Communication upward, from the commanding officer of the battery with the aviator, is easily established by means of visual signals. Communication downward is effected by dropping written indications suitably weighted within easy reach of the battery. Doubtless improved methods will be adopted in time. See FIELD ARTILLERY.

More generally, the aëroplane reveals the extent of the position occupied by the enemy on the field, the number and position of his reserves; from its reports the general may decide whether a turning movement is possible or desirable, when the moment has arrived for a general offensive movement. According to one authority, "it may be and will be offensively used to bombard important points, such as hills, woods, river banks, bridges, etc. Aëroplanes equipped for offense will be held in reserve and sent out just before the assault to drop their projectiles upon these points in such volume that no troops could possibly remain in the position." The aëroplane may warn its own side of the dangers to which it is exposed from batteries whose presence within range would otherwise be unknown, and thus lead to the adoption of measures either to destroy the batteries or to seek protection from their fire. We cite a few instances from the present war. A single French aviator on Feb. 17, 1915, discovered 21 enemy batteries. Air reconnoissances in the Dardanelles succeeded in locating new gun positions in the forts, a line of surface mines, encampments, and permanent batteries. Aviators flying over the German lines in the La Bassée district picked up six batteries, which a few minutes later were being shelled by the French Artillery (February, 1915). The success of the British Artillery at Neuve Chapelle is in no small measure due to the air service. It has increased the effect of infantry fire; will probably be found of great assistance in coast defense, and lead to increased use of movements by night and to attempted concealment by day.

In reconnoitring the ground from an aëroplane telephotography has been found extremely useful. Not only may a terrain otherwise inaccessible thus be forced to reveal its nature, but the results of the reconnoissance are brought in long before an ordinary reconnoissance patrol could have set to work. Military features are presented in their relation to one another; by suitably projecting them upon a map distances may be accurately measured. Other valuable information may also be obtained, such, e.g., as the possibilities of a defensive position or the seriousness of the opposition to be expected at a given point from its physical configuration.

Photographic views may be obtained by the use of the ordinary camera with the telephoto lens, by a motion picture camera which presents a continuous view of the section over which the aëroplane or dirigible passes, or by the use of the phototopographic camera, invented by Capt. Scheimpflug of Vienna, Austria, by which a combination of lenses presents an accurate view of an area of 32 square miles if taken from an elevation of 3000 feet or of 126 square miles if taken from an elevation of 6000 feet.

Inasmuch as the aëroplane is above all things an instrument of reconnoissance, the question of communication with it, and of receiving information from it, while in flight, is of the first importance. Among all methods tried, obviously wireless telegraphy holds first place.

The installation of wireless on board an aëroplane in some respects is notably different from installation at a permanent station. No ground connection for the antennæ is possible, so a second aërial or "counterpoise" is employed to replace the ground. In the aëroplane two systems exist; in the first, a fine trailing or drop wire, almost a hundred feet long, is used as an antenna, and the counterpoise is formed by the fuselage and metallic parts; in the second, an aërial is permanently fixed to the aëroplane, and the counterpoise consists of a second antenna similar to the first. The first system is the better in respect of efficiency; but the trailing wire may be caught by objects on the ground in case of sudden descent, or in the propeller itself. This last disadvantage disappears of course in the tractor type of aëroplane. The permanent aërial set has one serious objection—its small range of communication, not over 10 or 12 miles. In the matter of apparatus the generator and transformer are greatly superior to the induction coil. On account of the noise of the motor it is easier to send messages from an aëroplane than to receive them on board. This difficulty however, will very likely be removed by the perfection of a device to shut out to a great extent the noise of the motor and at the same time to increase the strength of the received signals. It should be remembered, too, that it is far more important for an aviator to send than it is to receive.

Other means of communication are visual signals, such, e.g., as the Means smoke telegraph. This is an apparatus emitting long and short puffs of smoke as desired, thus producing visually the dots and dashes of the Morse telegraph code. A similar apparatus tested in France consists of a tube parallel to the main axis of the machine and so placed as to catch the blast of the propeller. To this tube is connected by a suitable valve a reservoir of lampblack; by opening and shutting the valve long or short puffs may be produced, thus giving the Morse alphabet. Signals are visible at 10 miles. In Germany a lamp using an Edison accumulator has been invented showing green to starboard and red to port for 110 degrees, and white forward and aft. The current may also be used to light up the instruments on board; by introducing a keyboard signals may be made. Other visual methods are flashing lamps by night, between air craft in the air or between them and the ground. On dirigibles the semaphore may be used. Written messages of course may be dropped at prearranged points or where needed; parachutes may be used for this or messages may be merely weighted. A special apparatus for this class of communication is Fugairon's: a hollow cylinder carrying the message is fitted with a mercury-fulminate cap which on landing ignites a charge of Bengal fire and so attracts attention. This signal may be seen by day.

THE AËROPLANE AS AN ENGINE OF DESTRUCTION

The possibility of using the aëroplane to inflict damage upon the enemy has of course been a matter of discussion and experiment. Given a machine able to pass, if not to hover, over an enemy or his arsenals, dockyards, depots, etc., and itself apparently out of harm's way, the idea of using this machine to injure the enemy is alluring. And apparently nothing could be easier than to drop a bomb, whether explosive or incendiary, upon the target; if the target be large enough, a miss would seem to be impossible. But a little reflection shows that the conditions under which an aëroplane must work militate against the success of its offensive effort. It must maintain a certain speed; any error in the evaluation of this speed destroys the accuracy of the fire. In order to be safe itself from hostile fire it must remain at a certain height, and at 1000 meters in the air infantry fire is still to be avoided. Now, the greater the altitude, the less accurate becomes the practice of the aëroplane. Moreover, projectiles dropped or launched from great altitudes may encounter air currents wholly different from those in which launched and thus be deflected from the target. This condition is general, defies correction, and is independent of the precision of the instrument used and of the skill of the operator. Its effect increases with the crudeness of the ammunition; i.e., pear-shaped bombs, even spherical projectiles, apart from their inherent inferiority to ogival projectiles, are more likely to be affected by the perturbations of the atmosphere than a projectile designed to stay on its intended trajectory. The uncertainty attendant upon the use of primitive ammunition is so great that we may regard this sort of fire as almost useless. A pear-shaped bomb, dropped or thrown from an aëroplane going at speed at a great altitude, will probably miss its target. The conditions laid down, so far, as affecting the precision of bomb dropping, naturally, other things being equal, apply to aimed fire from a suitable gun carried by an aëroplane.

Of a different sort is the limitation imposed by the nature of the machine itself—the impossibility of carrying explosives in any serious quantity. But this limitation may prove only temporary. An aëroplane able to carry 1000 pounds of explosive is entirely possible, and it is conceivable that a fleet of 20 such machines might do an immense amount of damage, even if only one of four projectiles should find the target. Much would depend upon the nature of the target; e.g., dockyards, dirigible sheds, reserve troops of all arms in mass or in bivouac, especially if surprised—all or any of these might suffer great damage under aëroplane attack, where troops intrenched might escape serious injury. If the target is able to defend itself, the aëroplane's chances of hitting are still further reduced. As is well known, the accuracy of gun fire from the surface of the ground is checked by observation of the fall of the shots. Such control would be extremely difficult if not impossible for an aëroplane. But it would not be impracticable in an attack delivered by an air fleet to cause one machine to expend ammunition in trial shots, under the observation of its companions, and so enable these, on receiving by signal or wireless the data used, to open fire with increased chances of success. And it is obviously always possible for a skillful and daring aviator by a well-placed bomb to destroy a gun, wreck a troop train, or stampede a cavalry regiment. But after all these results would be only local, almost negligible in the sum total of operations.

This is far from saying, however, that the offensive functions of the aëroplane may not be so developed as to constitute a valuable factor. British aviators were reported to have done considerable harm to one or two German air-

ship stations, and even to have made two attacks in force, employing fleets of 34 and 40 aëroplanes, upon the German emplacements and depots near Ostend, with the purpose especially of destroying naval equipment and so defeating offensive preparations directed against English shores and commerce. Other examples are the reported (March 4, 1915) destruction of the German powder works at Rottweil, and the raid of 18 aëroplanes, May 27, 1915, on the German chemical factory at Ludwigshafen. Clearly such actions, if successful, would not be local in their results. It must not be forgotten that the subject is still in its infancy, that experience is lacking, even with the War in Europe, and particularly that the service of the aëroplane in reconnoissance has thus far so outweighed its possibilities in offense that these remain as yet undeveloped.

The announcement in 1911 of the Michelin prize for bomb-throwing contests led to some investigations of the problem of launching. P. Charbonnier, president of the Experimental Commission of Havre, published in the *Revue d'Artillerie* for December, 1911, the "Ballistics of the Aëroplane," in which he gave for a spherical projectile the elements of the trajectory *in vacuo* as well as tables of fire for both a vacuum and air. In the same number of the review just cited appeared a description of an aiming device, or sight, to be used by an aëroplane in flight. In the 1912 competition for the Michelin prizes Mr. Riley Scott, an American ex-officer of artillery (U. S. M. A., 1900), won both prizes, the first of 25,000 francs to the competitor who should from a height of 800 meters place out of 15 shots the greatest number of projectiles inside of a rectangle 140 by 20 meters, and the second of 50,000 francs to the competitor who from a height of 200 should place out of a series of 15 shots the greatest number in a circle of 10 meters radius. In the first contest Scott landed 8 out of 15 projectiles; in the second, 12 out of 15. He used an Astra-Wright biplane, at a speed of nearly a mile a minute. This was a very remarkable performance; it established beyond peradventure the fact that projectiles may be successfully launched from an aëroplane in flight with a more than satisfactory expectation of hits.

Scott's apparatus consisted essentially of two parts—the aiming device and the launching mechanism. The aiming device carries a telescope swung in gimbals by means of two concentric rings. In the launching mechanism the projectile rests in a sling one end of which is fixed to a crossbar of the inner ring, the other is held in position by an electromagnet and bolt. On the passage of the current this end of the strap is released and the projectile launched. It is best to discharge projectiles in pairs, as the equilibrium of the aëroplane thus remains unaffected; if desired, however, the apparatus may be so adjusted as to carry and release only one projectile at a time. The projectiles Scott used were ogival, with conical base, from the vertex of which projected a rod with three flanges, resembling the feathers of an arrow, and intended to keep the shot on the trajectory. Scott's apparatus is equally well adapted to the dirigible, but as it is possible for a dirigible to come to a stop in air, a special form of apparatus has also been devised for dropping projectiles vertically downward. This consists of a set of four tubes, each containing a projectile; the release is made by mechanical means.

Another apparatus (German) for launching bombs was Renaud's. Three discharge tubes, fixed at the vertices of an equilateral triangle, are mounted on a plate and receive the drop-shaped bombs; to these tubes are fitted covers containing a mechanism for holding the bomb in place. Each tube is worked by a pedal set in a board before the operator; by pressing on the proper pedal the corresponding tube is opened; upon disengaging the cover the discharging mechanism proper is set, and a fresh pressure on the pedal releases the bomb. It is claimed for the apparatus that it is safe, light, quickly assembled, and sure of action.

A special (English) projectile was held up by bolts fixed to the aëroplane frame and released by a hand lever. These bolts engage in the projectile in such a fashion as to constitute the safety device of the system; hence on release the projectile is automatically set to explode. The projectile has a tail rudder and carries the percussion apparatus in its nose. An aëroplane bomb developed in England, known as the Martin-Hale, could be hand dropped from an aëroplane or airship or fired from a spring gun. One variety of bomb carrying shrapnel had a total weight of 20 pounds. This includes an explosive charge of four pounds of trinitrotoluol and shrapnel consisting of 340 steel balls. Previous to dropping or firing the bomb the safety pin is withdrawn, and this leaves a tailpiece free to rotate under the action of the wind on the vanes.

Metal darts have appeared as weapons for discharge from the aëroplane. One of these, invented by a Frenchman named Guerre, was an incendiary arrow, 40 centimeters long, 8 centimeters in diameter, and weighing about one kilogram. It contains a reservoir holding about a quarter of a liter of gasoline, which is set on fire by the striking of the point; it is thus intended for the attack on hangars, supply depots, dirigibles, etc. Experiments made with this type seem to have been convincing, for it was reported that the French Minister of War had decided to supply these arrows to aëroplanes. Thanks to a safety device, they can be carried and handled with impunity. Other types are darts pure and simple, about 15 centimeters in diameter, made of steel, cannelured or flanged to keep them from tumbling. Dropped in showers from a considerable height it is conceivable that these darts might prove effective against troops or horses, but at best the results to be expected are aleatory.

The problem of aërial discharge will not be completely solved until certain difficulties inherent in the aëroplane itself shall have been overcome. For example, fuse setting may be a delicate operation aboard an aëroplane in flight. The nature of the fuse itself is an important matter; percussion fuses might be dangerous, especially in the case of a hard landing. One problem has already been solved. Since light projectiles are harmless, aëroplanes of special ascensional power have been built carrying projectiles weighing 100 pounds to 200 pounds and, according to French reports, successfully employed in May, 1915.

Armament of the Aëroplane. The question of arming an aëroplane with a machine or other gun presents itself under a twofold aspect. Material targets being here obviously out of

the question, such a gun would be used (*a*) against troops, (*b*) in combat against other air craft.

Against Troops.—No argument is needed to show that an opportunity, however fleeting, may present itself to an aviator to inflict considerable damage upon, e.g., a cavalry regiment, reserve troops in mass, or even upon a line engaged. But, as before remarked, such damage would be local and relatively unimportant. The real question turns on the possibility of so organizing aërial attack that a commanding general could send out a detachment or fleet of aëroplanes, just as he would a regiment or a brigade, to repel an attack or to make one itself. It would be rash to assert that an achievement of this sort were impossible; it is safer to say that unless aërial gunfire can be so organized it cannot be counted upon as a factor in the combat situation.

Combat between Air Craft.—The case is altered when we contemplate combat in the air between opposing aëroplanes and dirigibles. Here we may reasonably arm an aëroplane with a machine gun, such as the Lewis or the Benet-Mercie, in order to beat off or destroy a hostile aëroplane or to attack a dirigible. In fact, bearing in mind the great difficulty of reaching an aëroplane by fire from the surface of the ground, no other reasonably sure method presents itself of resisting a menacing aëroplane than to attack it with a machine of the same nature. To this end it must carry a suitable weapon and must expect to find its adversary similarly armed. A dirigible, to say nothing of the difference of bulk, owing to its slower flight and greater difficulty of manœuvring, would seem to be no match for an aëroplane carrying a machine gun and explosive projectiles. By remaining constantly above the level of the dirigible an aëroplane ought to be able to destroy it by bomb dropping; unless the dirigible itself carried guns upon its upper surface it could make no adequate answer to its smaller and more active antagonist. Apart from bombs, well-directed machine-gun fire delivered in the dirigible dead angles, if any exist, should put the airship out of commission. It is said, however, that the body of the dirigible has little to fear from machine-gun fire using small-arm ammunition. The 37-millimeter Hotchkiss is therefore mounted on some flying machines, and probably would prove effective. A totally different weapon is the Steinmetz "air-craft destroyer." This consists of a bomb at the end of a long wire let down just before the attack, which would consist in flying across and over the air craft to be destroyed, so as to cause the wire to bring up against it. As the flight continued the bomb would come in contact, "hook" itself in, and a suitable mechanism would cause it to explode. This device is recommended for the attack of dirigibles by night, and may even be used against hangars, depots, etc. The Germans, according to press reports, are dropping asphyxiating bombs from aëroplanes.

Upon the general subject of the tactics of air combat we must await the verdict of further experience. One point, however, would seem to be clear: since it is the business of an air scout to observe and report back, it would be his duty to avoid combat, just as a cavalry patrol may receive orders to avoid coming to blows with the enemy. Further, in future wars, aërial fleets will strive for the "command of the air," as sea fleets now strive for that of the seas. Symbolical of this strife is the air battle, March 21, 1915, between Lörrach and Mülhausen, in which 20 aëroplanes were engaged on both sides. This is regarded as the greatest aërial battle since the beginning of the war.

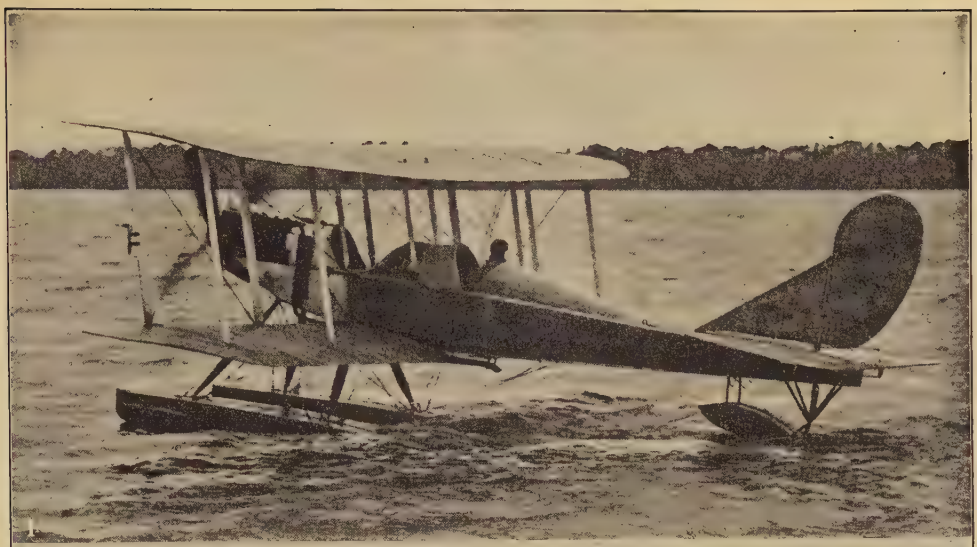
If an early conclusion from the War in Europe be permissible, it would seem that the offensive effect of an air attack, so far as measured by the known general situation, has, in marked contrast with the reconnoissance effect, been without any specially significant results. Air scouting, in the west at least, soon produced a state of virtual siege between the contending armies. No effect in the least comparable with this apparently can be attributed to air combat. But this conclusion is advanced with hesitation, because official reports later may bring to light instances of air attack of the greatest importance to the combatants concerned, instances perhaps immediately local, but attended with the greatest consequences.

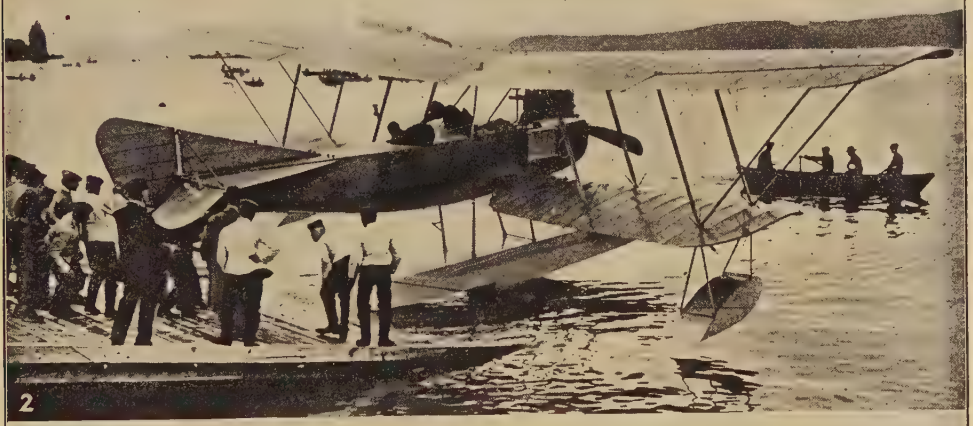
The Attack of Air Craft.—With the development of air craft, whether dirigible or aëroplane, has come the development of weapons for their attack. Obviously the conditions are difficult. The target moves at high speed and the opportunities of aiming and firing are fleeting. The possibility afforded, in firing at a land target, of correcting for subsequent shots by observing the fall of the projectile, does not exist in firing at a target in the air, certainly not to the same degree. All ordinary weapons, the fieldpiece, the howitzer, the rifle, are well-nigh useless against air craft. The fieldpiece cannot be elevated, the howitzer fires (comparatively) slowly and its trajectory is curved. Both lack the facility of turning in azimuth, and the nature of the projectile used by them makes the observation of fire difficult. Rifle fire and machine-gun fire lack range; they might probably inflict no serious damage, even if the target were hit, and observation of results is practically impossible. Hence the necessity of providing special rapid-fire guns for the attack of air craft. These must have an all-around field of fire, be susceptible of elevating to at least 70 degrees, and admit of rapid changes of aim. Special ammunition must be provided, suited to the target and permitting the observation of the projectile during its flight. The fire itself must be carried on in a special manner. Ranging shots being out of the question, the only course is to use sweeping fire, based on the estimated or measured distance.

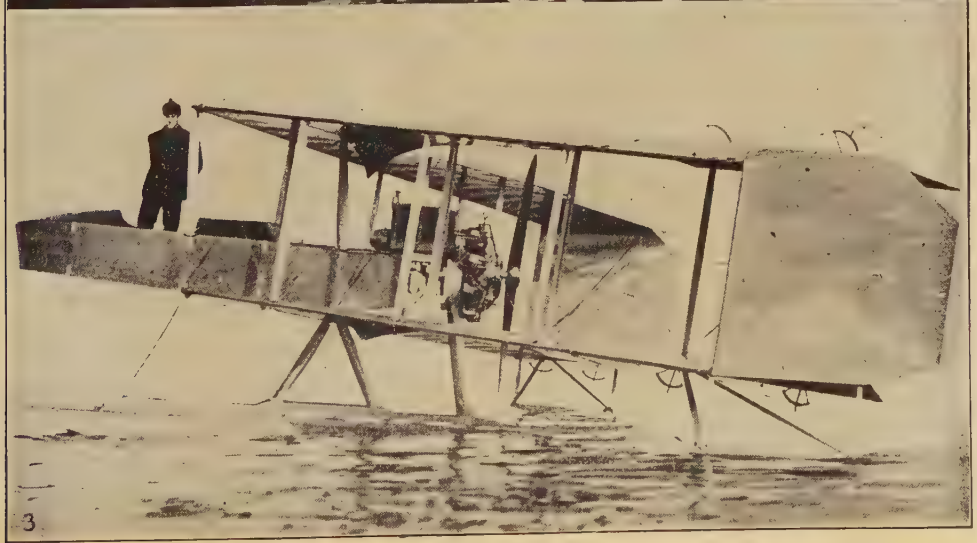
The calibre of balloon artillery depends on the conditions of service and varies from 3.7 centimeters to 12 centimeters. In a tactical point of view, i.e., to repel or destroy air craft threatening an army, whether by reconnoissance or by attack, great mobility is required. Hence the necessity of automobile mounts.

Various gun makers have addressed themselves to the business of making balloon-attack artillery intended to accompany an army in the field, to be mounted on shipboard and to be emplaced in coast fortifications. The guns manufactured by the Krupps are shown in the accompanying table, taken from Rasch and Hormel's *Taschenbuch der Luftflotten*, 1914.

The Rheinische Metallwaren- und Maschinenfabrik of Düsseldorf constructed 5-centimeter pieces on automobile mounts of two types—fully armored and half armored—besides other cali-







1. BRITISH HYDROPLANE. A Type Developed for the British Navy in the War.

2. GERMAN NAVY CENTRE-FLOAT ALBATROSS SEAPLANE. A Type Used in the War in Co-operation with Zeppelins for Coast Raids and Harassing Shipping.

3. BURGESS-DUNNE SEAPLANE.

TYPICAL WAR AËROPLANES MOUNTING MACHINE GUNS

1. BURGESS (AMERICAN) WAR PLANE, mounting Benét-Mercié automatic rifle on swinging crane giving 240 degrees arc of fire.

2. ARMORED DEPERDUSSIN (FRENCH) MONOPLANE, with aëro-mitrailleuse.

3. FRENCH ARMY SPECIAL TYPE ARMORED AËROPLANE, OR AVION, OF 1914, with Hotchkiss machine gun.

4. FRENCH ARMED AND ARMORED AËROPLANE. One of the machines assembled in 1914 to defend Paris from attack by Zeppelins. This is a Henri Farman biplane

bres ranging from 6.5 centimeters to 10.5 centimeters. The 6.5 had an automobile mount, as also the 7.5 half armored; another 7.5 had a field carriage, so constructed as to admit of elevation to 70 degrees and of depression to 5 degrees. The 10.5-centimeter had a so-called "firing carriage." At maximum elevation, the 5-centimeter will send their projectiles to a height of 3720 meters, the 6.5 to one of 7900 meters, the two 7.5 to 5860 and 6800 respectively, and the 10.5 to 8300. A special aëroplane machine gun was manufactured in England. This piece may be fired from the shoulder, like an ordinary rifle, or it may be mounted in the aëroplane itself. Schneider (France) made a balloon gun on an armored automobile mount, the Armstrongs one of 15.2 centimeter calibre. The (French) Deport air-craft gun can traverse 45 degrees on its carriage. Its trail is divided along its length, and the parts can be moved to the right and left respectively when in action.

	7.5 cm. fieldpiece L/30 on traversing carriage	7.1 cm. gun L/30 on automobile mount	7.5 cm. naval gun L/45 with shield	8.8 cm. naval gun L/35 without shield	8.8 cm. naval gun L/45 with shield	10.4 cm. coast gun L/45 with shield	12 cm. coast gun L/45 with shield
Calibre, centimeters	7.5	7.1	7.5	8.8	8.8	10.4	12
Length of bore in calibres	30	30	45	35	45	45	45
Weight of piece in firing position, kilograms	1,030	1,230	4,360	3,469	5,840	5,480	8,530
Weight of carriage, kilograms	1,700	...	...	...	...	...	...
Weight of shield, kilograms	...	...	940	...	2,400	780	1,080
Thickness of shield, millimeters	...	...	12	...	50/12	12	12
Limits of elevation, degrees	+65 −5	+75 −0	+70 −10	+80 −10	+60 −10	+60 −10	+60 −10
Limits of azimuth, degrees	360	360	360	360	360	360	360
Rapidity of fire, rounds per minute	...	...	25–30	20–25	20–25	15	10
Weight of projectile, kilograms	6.5	5	5.8	9.5	9.5	15.5	24
Muzzle velocity, meter seconds	510	650	800	800	800	800	800

The Krupp balloon projectile is a double-chambered shell; the forward chamber carries the bursting charge, the rear chamber a smoke-producing composition. Should a hit be made, a suitable fuse operates to detonate the charge. The smoke composition burns during flight and emits smoke from apertures in the wall of the shell. The flight of the projectile may thus be followed and corrections made. The fuse is extraordinarily sensitive; it must act on meeting the slightest resistance, and yet be safe in the bore of the gun and during flight. The Düsseldorf company already mentioned supplied three types of projectiles for balloon attack—a *brisant* shrapnel, a smoke shrapnel, and a balloon shell. In the first of these a suitable charge drives forward the bullets and the head of the projectile. This head has its own bursting charge, intended to act about 125 meters ahead of the bullets. Should the head strike before bursting, a suitable fuse causes it to burst on impact. While the bullets go forward several hundred meters in a sharp cone of 12 to 14 degrees, the head sends its splinters with great violence, two or three hundred meters up, down, right and left, in a broad cone of 200 degrees. The smoke shrapnel carries a head filled with smoke composition; this leaves a visible track of smoke from the point of burst on, and to a certain extent thus permits of the correction of fire. The balloon shell carries a detonating charge, and behind this, smoke composition. At 250 meters before the intended point of burst smoke begins to issue and continues the same distance beyond this point. If in the meantime the shell should have failed to hit, a time fuse is set in operation and produces detonation; should this occur near the target, the flying fragments may hit and cause damage. The possibility of "mining" the air above fortifications against air-craft attack has been suggested. This plan would consist of sending up each evening a large number of small captive balloons to different heights to detonate either by judgment or on contact, each carrying a sufficient quantity of explosive to destroy any aëroplane or dirigible with which it might come in contact. These balloons may be supplemented by kites provided with long tails of malleable iron designed to foul the propellers of any air craft.

THE 7.1 CM. L/30 AUTOMOBILE TRUCK

Weight of truck without gun	4,620 kilograms
Weight of truck with gun, without ammunition	5,850 kilograms
Weight of truck marching order, including detachment of six men	7,100 kilograms
Average speed per hour	45 kilometers
Greatest speed per hour	60 kilometers
Climbing power, slopes of	1:5

TYPES OF AËROPLANE

The division into monoplane and biplane does not of itself furnish a basis of military classification. Furthermore, whatever the basis, machines differ so much from one another in respect of form, size, and materials of construction as for the present to rob classification of any special usefulness. This question of type is not purely academic; apart from the importance of determining what type is best suited to the military service and what modifications it must undergo in order to adapt itself to varying conditions, it is clear that unity of type would greatly simplify repairs and replacements and the instruction and training of aviators. A step in the right direction would be so far as possible to adopt a standard system of control mechanism. So important is unity of type regarded by some authorities that it is asserted that 100 mediocre machines absolutely alike are better (in the military service) than 100 different models, however admirable each may be.

Since the sustaining power of an aëroplane varies with the square of its velocity, it is natural and logical that every effort should have been made to increase the velocity of its flight. Under these conditions the pilot's chief duty is to attend to his machine; it is therefore conceivable that his observations may be imperfect or inaccurate. As the aëroplane is above all other things an instrument of reconnoissance,

the military machine should therefore in the general case be at least two-seated—should carry an observer and a pilot. Further, since it is in the highest degree desirable if not essential that an observer should transmit his observations to headquarters as rapidly as possible, and without returning to his point of departure, we have to consider the possibility of adding still a third passenger charged with the dispatch of intelligence by wireless telegraphy or otherwise; and if, lastly, the aëroplane be offensively equipped, a fourth passenger must be taken on board to serve the gun or other engine of destruction. These conditions point to an aëroplane of great sustaining power.

On the other hand, the military situation may call for immediate information of a special character about a particular point. There is no question of destruction or of mapping but of special reconnoissance, e.g., the assistance of cavalry, the detection of hostile batteries, or the control of the fire of one's own batteries. What is needed is a trustworthy report by a trained observer, sent in or brought back with the utmost dispatch. Hence the one-seat machine, light, easily transported, driven preferably by a staff officer attached to headquarters. It may be found that for one class of duties the biplane, for the other the monoplane, is the better suited; but this is a matter to be determined by experience and one that in a military point of view does not necessarily affect the question of type. So far apparently we may recognize the high-speed machine, of small supporting surface, and a slower machine for duty, in which weight, rather than speed, is the feature to be considered; i.e., more specifically, we have the armored monoplane for cavalry and artillery reconnoissance, minimum speed 120 kilometers per hour; the armored biplane for general staff work, minimum speed 100 kilometers per hour; the armored biplane for purely offensive work, minimum speed 120 kilometers per hour; and finally, the large multiple-seated for special service requiring the coöperation of several passengers. In the United States the biplane has been favored for military purposes. As a matter of fact, all sorts of machines were and are found in the aëroplane fleets of the great military nations.

The conditions of the field-artillery service seem to require that aëroplanes should be permanently attached to this arm. In other words, the artillery feels that it should be emancipated from the necessity of calling upon the commanding general for aëroplanes when needed; that it should, on the contrary, possess and control its own machines, to be sent up at once when needed. And just as the needs of the military service call for the special assignment of flying machines, so should these, on account of the special duty they are called upon to perform, satisfy certain conditions.

In France the justice of the demands of the field artillery would seem to have been recognized; the plans for 1915 provided for the assignment of 20 squadrons (*escadrilles*) to assist the artillery. Similarly 10 squadrons were to be attached to the cavalry; provisional squadrons were indeed organized in 1914. A typical fighting biplane is the Vickers, designed for weight carrying and having a speed of 40 to 70 miles per hour. It is of the pusher type, built almost entirely of steel, and carries a small Vickers automatic gun covered in front by a hemispherical shield mounted on the barrel and moving with it; this shield has mica windows. The muzzle of the gun projects through the nose of the fuselage, which is entirely covered in. The arc of fire forward is 30 degrees on each side of the line of flight. Another English military machine is the "Mark R. E." (reconnoissance—experimental), said to be automatically stable, of the tractor type, and propelled by a four-bladed screw driven by a 120-horse-power Beardmore-Austro-Daimler motor. A French mount is the Loiseau for a Hotchkiss rapid-fire gun, on a support high enough to allow fire over the tractor even with considerable depression. The gun is protected by a 4-millimeter shield in front; although the gunner is partly covered by this arrangement, he is nevertheless seriously exposed. From a purely military point of view this mount is regarded as meeting the objections to the tractor type of aëroplane.

Nearly all military aëroplanes are of the tractor type, i.e., have the propeller, generally two-bladed, in front. The machine is thus pulled, not pushed, through the air. This special form of mounting is safer for the aviator, who in case of accident falls above the weights rather than under them. It has the disadvantage of limiting the field of fire forward.

The war machine has an inclosed body, or fuselage; this, however, is not necessarily a military feature. The Russian biplane "Russki Wijas" (1913–14) carried a deck house, affording complete shelter to the crew. The armored aëroplane was seen during the war in such examples as the French Dorand biplane (1914), the Nieuport monoplane (1914), and the Voisin biplane. The fuselage of the Dorand carried steel armor 2.5 millimeters thick, said to be proof against rifle fire beyond 750 meters, and in many models the armor protection covered the pilot, observer, provisions, instruments, and especially the propelling mechanism. It may be remarked that all machines not aggressive were fitted with wireless. Multiple screws are the exception; the vast majority of aëroplanes are single-screwed. One form of the Dorand armored biplane has twin screws, and so have the Nieuport, Dunne, and Savary biplanes; the Russian Sikorski biplane carries four screws in front, driven by four Argus motors of 100 horse power each. This aëroplane has a supporting surface of 125 square meters, with a speed of 28.20 meters and a length fore and aft of 20.20 meters —an indication perhaps of the enormous increase in size and power to be expected in the future. If very long, continuous flights are attempted, special tanks are provided for the gasoline carried, as in the Farman biplane (1914), supplied for a 24-hour flight. All aëroplanes of course carry instruments; among these are found an inclinometer, to give the angle of incidence of the machine, a clock, an aneroid barometer to measure the height, a speedometer, and a tachometer to give the revolutions per minute of the motor. In addition some good form of compass must be carried, as well as maps in a map case. These instruments, as need hardly be mentioned, are not peculiar to the military machine.

To mark the progress made in the evolution of the military aëroplane there follows an extract from the conditions governing the military aviation contest at San Diego, Cal., in October, 1914. The conditions bear date July 1, 1914, and, as before, were fixed by the United States Army Signal Corps.

"The type desired, namely, a military recon-

noissance aëroplane, must possess the following characteristics: biplane, inclosed fuselage, two-seated, dual control, and have a minimum speed of not less than 40 miles per hour when carrying fuel and oil for four hours' flight at 70 miles per hour and a useful load of 450 pounds, and under these conditions of load to climb 4000 feet in 10 minutes. The head resistance is to be kept down by avoiding unnecessary parts exposed to the wind and by using recognized stream lining for those parts necessarily exposed. The power plant is to be located in front of the occupants and suited to the requirements of the aëroplane. The motor must be capable of throttling to 20 per cent of full speed and running without overheating over the land. The motor must be supplied with a positive means of stopping by a short-circuiting device, by release of compression, or by other suitable means. It is desirable that the radiators, if used, should conform to stream-line requirements and act as an effective shelter for the motor. The motor should be provided with positively driven pump for pumping gasoline from the reservoir to the service tank and will also be provided with attachments for hooking on a flexible tachometer, the shaft for this purpose to come off the motor at right angles to the propeller shaft preferably downward. The propeller or propellers should be of sufficient form and construction and suited for the particular machine and possessing a minimum efficiency of 70 per cent, that is to say, to have a slip of not over 30 per cent. Wear and friction in the control leads must be eliminated in every possible way and the leads shall be as direct as possible. Leads to pitching and steering shall be in duplicate. The landing gear to be as strong and simple as possible to be efficient in absorbing shocks in landing and running at full speed over rough and plowed ground. The maximum gliding angle shall under no condition exceed 1 on 6, that is to say, one foot of drop for each six feet of advance. All parts shall be efficiently protected from the action of the weather by the use of suitable paint or furnished with covers. The power plant shall be so arranged as to be readily removed and replaced bodily without disturbing the alignment or the fastenings of the planes or landing gear. The machine complete shall be capable of being assembled from transportation cases in not to exceed two hours by four mechanicians and of being disassembled and packed in transportation cases in not more than one hour and a half by the same number of mechanicians. No part shall be of such length that when packed in its case the case shall exceed 20 feet in length."

Bibliography. In addition to the works listed in the bibliography under AËRONAUTICS there are available the following official reports and other works the range and number of which constantly are increasing: *Military Aviation*, April 26, 1912 (Washington, 1912); *United States Senate Report 1107*, Jan. 14, 1913 (ib., 1913); Committee on Military Affairs, *Aëronautics in the Army, House Report, 5304*, 1913 (ib., 1913); *Reports of the Chief Signal Officer*, U. S. A., especially 1914, and official reports generally (ib., 1914); R. P. Hearne, *Airships in Peace and War*, being the second edition of *Aërial Warfare* (New York, 1910); Grahame-White and Harper, *The Aëroplane in War* (Philadelphia, 1912); Bertrand, *Etat actuel de l'aëronautique militaire et navale* (Paris, 1913); Faroux and Bonnet (eds.), *Aéro-manuel*, 1914 (ib., annually); Rasch & Hormel (eds.), *Taschenbuch der Luftflotten*, 1914, 1915, the latter a war edition (Munich, annually); Hamel and Turner, *Flying* (London, 1914). All military journals and reviews contain articles on military aëronautics, e.g., the *Revue d'Artillerie* (Paris), *Army and Navy Journal* (New York), *United Service Magazine* (London), *Artilleristische Monatshefte* (Berlin). To give a list would be simply to name here the important military periodicals of the world. The general aëronautical periodical press (see article AËRONAUTICS) may be profitably consulted. In the technical though nonmilitary press, such as the *Scientific American* (New York), may also be found from time to time articles of value. See AËRONAUTICS; ARMY ORGANIZATION; MILITARY, OR MAN-RAISING, KITE; NAVAL AËRONAUTICS; RECONNOISSANCE; SIGNAL CORPS; STRATEGY; TACTICS; WAR IN EUROPE.

MILITARY ARCHITECTURE. The various branches of architecture concerned with the design and construction of buildings for distinctly military purposes. Until the early Middle Ages, military architecture consisted almost entirely of the building of strong walls, towers, and gates around cities and permanent camps. For the engineering of works of defense, see FORTIFICATION.

Egypt. The earliest completely fortified city in good preservation is El Kab in Egypt, which formed a parallelogram of about 1500 by 2000 feet. The walls were of brick, over 30 feet thick and less than 30 feet high, with gates only on two sides. There were no towers, no moats, and the gates were merely openings. Such walls have been found at Thebes, Heliopolis, and in many other cities. Egyptian engineers, however, were sufficiently skillful in the Middle Empire (2000 B.C.) to take advantage of the natural defensive features of rocky situations and to abandon the defective rectangular ground plan; this is evident at Kummeh and Semneh at the Second Cataract, built to protect Egypt from Nubian invasions. Crude brick was the material, projecting buttresses strengthened the walls at intervals, and there were stations where archers could protect the approaches; the wide moat which encircled the fort was defended by a low stone wall; the interior of the fort was filled up solid to the level of a chemin de ronde. The Hittite wars made the Egyptians acquainted with the far more advanced systems of western Asia. Towers, bastions, elaborately fortified gates, and the use of stone for brick were some of the results.

Western Asia. The use of crude brick has made impossible any detailed knowledge of the methods of fortification used in Babylonian cities, though they are known to have been protected by walls of immense thickness and height. The plan of placing the Royal Palace on one side and using it as a citadel, of rectangular shape, was followed by the Assyrians, as shown in the city of Sargon, near Nineveh. But it was in the more mountainous countries of western Asia, especially in Syria and Armenia, that the earliest really scientific types of military engineering were thought out. The rectangular type was abandoned in favor of the circular or ovoidal, by which the weak angles were entirely avoided. In place of a single wall with an advance wall or scarp, there were usually three concentric lines of increasing heights, each with towers and battlements and chemins

de ronde. The Hittite cities were the most famous of such fortifications, from which both the Egyptians and Assyrians learned much. The mountainous races of western Asia thus created a type that was long to remain the highest known to military architecture and to be perpetuated by the successors of Alexander, by the Byzantine emperors, and by the Crusaders.

Ægean Peoples. The Pelasgians and other Ægean peoples built also in stone, often with Cyclopean and polygonal masonry. There were many types: first, the groups of defensive forts on the outskirts, or constituting a citadel; then later, the walls encircling the entire city. This wall sometimes rises 60 to 70 feet; the citadel as much more. The walls of Tiryns, with chambers within their thickness, and the Lion Gate at Mycenæ, defended by a narrow passage or *dromos*, are especially famous.

Greek. The great majority of fortifications found in Greece belong to the prehistoric period just described, e.g., those in Acarnania, at Orchomenus and Phigalia. The advances made in later historic times are shown, e.g., at Mantineia, with two round towers protecting its double gate, and especially at Messene, with gates within large towers having a circular inner court. The towers are battlemented and are sometimes rectangular. Wherever a suitable rugged eminence permitted, a citadel was established, inclosed by walls and difficult of access, as at Athens. See CITADEL.

Roman. The walls of Pompeii, of Aosta, and of Rome are a few among many examples showing the use of a simple encircling wall. The walls of Aurelian around Rome show three tiers of defenses, two lines of embrasures opening on galleries, and the chemin de ronde behind the battlements, besides a fourth and higher line at the summit of the numerous square towers. A unique combination of camp, palace, and fortress was Diocletian's palace at Spalato, also a superb work of late Roman architecture, with heavily projecting circular and rectangular towers.

Byzantine. The Eastern Empire continued the traditions of the ancient Orient. Antioch, Edessa, Constantinople, Amida, and other great cities trace their genealogy from Alexander's successors to Justinian. The essay of Procopius on the fortresses of Justinian shows how the Byzantine science of fortification was then being revolutionized under this Oriental influence, as in the great works at Dara. Between the towers permanent échauguettes and machicoulis, hurdles, or overhanging galleries, were built—originally of wood, but then of stone, in order better to let missiles fall on the besiegers. The system of several concentric walls triumphed permanently over the single rectangular Roman circuit. The citadel was not, as with the Romans, placed in the centre, but in touch with one of the outer walls, so that, if the city were taken, communication could still be maintained between the citadel and the outside world. Their system was adopted throughout the Empire and even in Europe, under Justinian. The walls of Constantinople, though in ruins, still exist—both the land walls and a part of the seaward defenses.

Mohammedan. In the great wars with the Byzantine Empire the Arabs quickly learned the science of military engineering, especially after the titanic struggle with the Macedonian dynasty in the ninth and tenth centuries. Syria, Mesopotamia, Armenia, and Asia Minor are still covered with the ruins of forts, castles, and fortified cities of this period. The triple-walled citadel of Cairo was erected by architects from Syria. When the Crusaders came to the East, they came into contact with these two forms of Oriental engineering and borrowed its ideas for the West. The golden age of military works in the Orient extended from the ninth to the twelfth century. The combination of citadel and palace, which did not originate in Europe until the fourteenth century, was then a common thing with the emirs of the Mohammedan world; many such castles, of which the Granada Alhambra is an example, are still found in ruins—sumptuously beautiful within, magnificently strong without. The Seven Towers at Constantinople and the two castles of Hissar on the Bosporus represent the highest development by the Turks of Byzantine models (fifteenth century).

Mediæval Europe. With the barbarian invasions of the fifth and sixth centuries there had been a veritable fury of haste to fortify the cities throughout the Roman world. This was particularly noticeable in Gaul, e.g., at Grenoble and Vienne, and in Spain, as at Cartagena. Mediæval cities often—as at Carcassonne—have their later fortifications based on late Roman or Gothic prototypes. But ordinarily the Roman fortification was a *castrum*, which did not inclose the city. City defense seems to have remained at a higher level than feudal castle architecture until the twelfth century, for while castles long remained mere earthworks in the north of Europe, cities had stone walls and even, as at Piacenza, two concentric circuits; and while the castle keeps were rectangular and in the centre of the circuit, the citadels were often curvilinear and astride the outer walls. For a well-preserved fortified city the best example is Carcassonne in southern France, built during the twelfth and thirteenth centuries. It has an inner and an outer circuit with towers of several shapes, bastions, and barbicans, with a magnificent citadel on the west edge. Avignon, Cologne, Cracow, Aigues-Mortes, Lucerne, Rothenburg, and Nuremberg have more or less complete mediæval fortifications, mostly of somewhat later date.

In the thirteenth and especially the fourteenth and fifteenth centuries in Europe æsthetic beauty was to an eminent degree united with military science in the design of fortress castles. This transformation is exemplified by such structures as Vajda-Hunyad Castle in Hungary, Marienburg in Prussia, and the ducal castle of Milan. The rebuilt castle of Pierrefonds in France carries this conception to its utmost limit. The city gates, as at Lübeck, Cologne, Tangermünde, Stendal, became works of municipal decoration as well as defense. A like combination of art and science was practiced during the Renaissance in Italy: accomplished artist architects like San Michele, San Gallo, and Michelangelo were employed to design fortifications and city gates; e.g., the Porta Nuova, Porta del Palio, etc., at Verona, the Porto del Lido at Venice, the fortifications of San Miniato, etc. After the seventeenth century the work of the architect was more and more severed from that of the engineer. Architecture as distinguished from military engineering at the present day is confined to the designing

of barracks, storehouses, stables, workshops, hospitals, and other buildings required for military purposes but not in themselves defensive. See BARBICAN; BASTION; BASTILLE; CASTLE; CITADEL; DONJON; EMBRASURE; FORTIFICATION; GATEWAY; PORTCULLIS; POSTERN; WALLS; and bibliographies under FORTIFICATION and CASTLE.

MILITARY BAGGAGE. See BAGGAGE, MILITARY.

MILITARY BRIDGES. See BRIDGES AND DOCKS, MILITARY.

MILITARY COMMISSIONS. Special military courts created during the occupation of conquered territory, for the trial of offenses which cannot by the rules of war be tried or punished by courts-martial, and yet which are not within the jurisdiction of any existing court. A military commission, unlike a court-martial, is exclusively a war court. It may be legally convened and assume jurisdiction only in time of war or when the civil authority is suspended on account of the existence of martial law or military government. The powers and procedure of this class of military tribunals have not been defined by statute law nor have they even been expressly authorized by any act of Congress, although they have repeatedly been recognized by the legislative, executive, and judicial departments of the government. According to usage the same rules which apply in the organization and procedures of courts-martial are held to be applicable to military commissions, and their proceedings are subject to review in the same manner and by the same authority as courts-martial. Certain offenses which in time of peace are regarded as civil offenses become in time of war military offenses and are triable by military commission, even though the civil courts may be open and in the unobstructed discharge of their duties. During the Civil War and Reconstruction periods capital offenses were frequently tried by military commissions and the parties punished, although they were in neither the military nor the naval service and in spite of the constitutional provision that all persons held for capital or otherwise infamous crimes, except when arising in the land or naval service, shall be tried by jury. Consult S. V. Benet, *Treatise on Military Law and the Practice of Courts-Martial* (6th ed., New York, 1868), and W. E. Birkhimer, *Military Government and Martial Law* (2d rev. ed., Kansas City, 1905). See COURTS, MILITARY; MILLIGAN, EX PARTE; MILITARY LAW.

MILITARY COURTS. See COURTS, MILITARY.

MILITARY EDUCATION. The education of the modern military officer may be divided into two parts, the preparatory and the technical. The increased demands made upon him in the exercise of his profession entail a most exacting and comprehensive preliminary training—so much so that in many countries candidates for army commissions are trained from earliest youth and molded mentally and physically for their future career. Below is a review of the systems of military education as practiced in Europe and the United States.

In **Austria** army training for cadets begins between the ages of 14 and 17, there being a number of schools (Realschulen) set apart for that work. Of these the greatest number are for the infantry, then the remainder for artillery, cavalry, and pioneers respectively. On graduation cadets are taken into the army as cadet officer substitutes (*Cadet-offizier-stellvertreter*) and granted commissions according to seniority, each selecting his own regiment or corps in the branch to which he is assigned—subject to the approval of the officers of such regiment or corps. In addition to these schools there are four military preparatory schools, a military orphanage, and the upper military school, whose pupils, sons of officers without means, enter the academy of Wiener-Neustadt, with its three years' course for cavalry and infantry officers, and the Technical Academy of Vienna, with a similar course for artillery and engineer officers. Pupils unfitted for the courses of these academies go to the cadet schools (Realschulen). Pupils capable of passing the entrance examination of the academies may enter direct. German is the language used in all military educational establishments, the curriculum also being based on the German system. For officers there are at Vienna the war school (staff college) and the superior artillery and engineer schools.

Belgium, previous to the great war, trained the officers of all arms at the Ecole Militaire, Ixelles, the course covering a period of two years for infantry and cavalry and four for artillery and engineers. Entrance is gained by competitive examination, there being an average of 80 vacancies in the school each year.

England possesses two military educational institutions: the Royal Military Academy at Woolwich, which is set apart for Royal Engineers and Royal Artillery cadets; and the Royal Military College at Sandhurst for cavalry and infantry cadets. No one is allowed to compete who has not been passed by the Army Council as socially qualified to hold a commission. The entrance examinations are conducted under the supervision of the Civil Service Commissioners, and there is also a rigid physical examination. The age of admission is from 17 to 19½ years for Sandhurst, and from 16½ to 19½ years for Woolwich, successful candidates paying half-yearly fees, the amount of which varies with the status, official or otherwise, of their families. At Woolwich the period of instruction covers two years and is divided into four classes, of which the fourth is the junior. The third and fourth classes are educated together, but on passing out of the third class into the second, the cadets are separated into two divisions, engineers and artillery, where they remain until graduation. Those passing out of the third class with the best percentage of marks go to the engineers, and the remainder to the artillery. Once the assignment has been made to any particular division a transfer is never allowed. The Royal Military College at Sandhurst is confined to cadets for cavalry and infantry, the entrance examination, fees, and academic terms being similar to the Royal Military Academy. A few cadets are received as royal cadets, or India cadets, who enter without payment and receive a small allowance. They are usually specially favored sons of poor or distinguished officers or have served as court pages. The course of instruction extends over a period of 18 months, divided into three terms, or classes of six months each, known as junior, intermediate, and senior. The peculiarity of the British method of instruction, compared with that of all other countries, is the brief period of instruction in the schools and the very exacting competitive standard and examination for admission, which, as well as the expense

involved at the very outset, limits the class from which cadets are drawn.

Schools of application are the Royal Engineers' at Chatham, the School of Gunnery at Shoeburyness, the Artillery College at Woolwich, the School of Musketry at Hythe, and the Staff College at Camberley. The Army Medical School at Netley trains candidates for appointment in the Royal Army Medical Corps. For schools for rank and file, see ARMY SCHOOLS.

France has two celebrated Cadet schools: (*a*) The Polytechnique at Paris, founded in 1794, supplies not only officers of artillery and of engineers, but also officials of the scientific branches of the government, such as roads and bridges, mines, naval construction, etc.; (*b*) the Ecole Spéciale Militaire, founded in 1808 at Saint-Cyr, and hence popularly called Saint-Cyr, whose graduates enter the cavalry and infantry. Entrance is by competitive examination, and candidates must, on the first of January of the year of examination, be between 17 and 21 years of age. The course lasts two years. Under a law passed in 1905, candidates who have passed must serve one year in the ranks under exactly the same conditions as a private soldier. At the end of this year they enter the schools. This law is due to the democratizing tendencies of the French Republic and, inasmuch as in principle one-half of the officers come from the ranks, rests on the supposed necessity of *unity of origin* for all officers. The artillery school at Fontainebleau has two divisions, one preparing noncommissioned officers of artillery to become officers of that arm, the other of postgraduate studies for lieutenants of artillery. At Versailles are found the same arrangements for the engineers. The school of the train is attached to the artillery school. At Saumur is the postgraduate school for officers of cavalry, as well as a school for noncommissioned officers of cavalry, candidates for commissions. The corresponding school for noncommissioned officers of infantry is situated at Saint-Maixent, but, unlike the other arms, there is no postgraduate school for the infantry.

The Ecole Supérieure de Guerre (Superior War School), or staff college, at Paris receives, after examination, officers of at least five years' service for a thorough course in strategy, tactics, military history and policy, and other subjects relating to the conduct of war. Other schools are those of military administration, of the medical service, etc.

Germany. Officers of the German Army come from the Kriegsschulen (war schools), of which there are 11 in the Empire. All candidates for commissions, whatever their origin, must, after having been appointed Porte-épée Fähnrich, be graduated from one of these schools. The Porte-épée Fähnrich, in turn, are composed of two classes, avantageurs and cadets, and must satisfy certain conditions before being appointed, such as passing the examinations of the Central Board of Officers at Berlin, have served at least five months as private, etc. Avantageurs are young men who announce themselves as candidates for commissions; most of the officers come from this class, the remainder from the cadets, who are pupils of the 10 cadet schools. To these schools boys are admitted at 11 years of age; they remain until they are 15, when they are transferred to the Cadetten Hauptschule (principal cadet school) at Gross Lichterfelde near Berlin.

The course at the Kriegsschulen lasts 35 weeks and is so adjusted that four classes are graduated in three years. Officers of foot artillery and of pioneers pass to the artillery and engineer schools of application (Berlin and Münich). The Technical War Academy completes the training of officers in mathematics, mechanics, physics, chemistry, and engineering, in the application of these sciences in general, and in their special application to the military service. This academy is open to lieutenants of all arms, and the course lasts three years. There are three riding schools (Hanover, Dresden, and Münich); as the purpose of these schools is the development of equitation and horse training, they are hardly to be regarded as educational in the usual sense of the word.

Finally we have the Kriegs Akademie, or General Staff School, at Berlin. The purpose of this school is, through its course of superior military instruction, to disseminate in the army a knowledge of the higher questions of strategy and tactics, and of military policy as an element of national policy. Secondarily this school serves to train officers for the staff. There is an entrance examination open to all officers of at least three years' service in a commissioned grade. The professors are drawn as a rule from the officers of the great general staff. There are no examinations, but very careful notes are kept of the progress, capacity, and ability of each student officer. These are sent at the close of the three years' course to the chief of the general staff, who makes them the basis of selection of officers to serve a detail in the great general staff. Munich has a similar academy.

Italy. Military schools in Italy are divided into three classes: (1) the college militari, or preparatory schools; (2) the military academies at Turin for engineers and artillery, and at Modena for infantry and cavalry; (3) scuole militari complementari (schools of application). The Scuola di Guerra, the school of application for artillery and engineer officers, is at Turin, and the cavalry school is at Pinerola. The courses of instruction at the military academies of Turin and Modena are three years and two years respectively. There is a school for underofficers at Caserta, where approved noncommissioned officers are educated for commission. In each arm of the service fully one-third of the commissions are held by men from the ranks.

Japan. The military academies of Japan compare very favorably with the best in Europe, being in effect organized, as is the army, on the German model. There are establishments devoted to military education under the Minister of War, including the school of military music and the various schools of application. In 1902 several parties of Chinese army officers were sent by their government to undergo a course of instruction at the Japanese Military Academy.

Russia draws most of her officers of cavalry and infantry from cadet (*younker*) schools, of which there are a number in the Empire. Officers not coming from these schools are furnished by the military schools and by the corps of pages. Staff instruction is given at the Nicolas (Staff), technical artillery training at the Michael (artillery), technical engineer training at the Nicolas (engineer) academies respectively, all at Petrograd. The military law and the military medical academies are also situated at Petrograd.

Spain educates her infantry cadets at Toledo, cavalry at Valladolid, engineers at Guadalajara, artillery at Segovia, and administrative at Avila. Suitable academies have been established at these respective places.

United States. Military education in the United States is practically a university system, bringing as it does all the different branches of military education into one system and under the direct control and supervision of a body of specially qualified officers, making every part of the system effective. The United States Military Academy at West Point, N. Y. (see MILITARY ACADEMY, UNITED STATES), is the foundation of the entire system and is generally conceded to be unequaled in the thoroughness and comprehensiveness of its training. The practical education of the cadet, in its broadest sense, begins with his assignment to his regiment or corps, there being in addition an officers' school at each military post for elementary instruction in theory and practice. The special service schools or schools of application are: (*a*) the Coast Artillery School at Fort Monroe, Va., which has a division for enlisted men; (*b*) the Engineer School, Washington Barracks, D. C.; (*c*) the Mounted Service School, Fort Riley, Kans.; (*d*) the Army Medical School, Washington, D. C.; (*e*) the army service schools at Fort Leavenworth, Kans., comprising (1) the Army School of the Line, (2) the Army Staff College, (3) the Army Signal School, (4) the Army Field Engineer School, (5) the Army Field Service and Correspondence School for Medical Officers; (*f*) the Army War College (q.v.) at Washington Barracks, D. C. To these may be added the School of Musketry and the School of Fire for Field Artillery, both at Fort Sill, Okla., and the Aviation School at San Diego, Cal. A general supervision of all the different schools enumerated above is exercised by the general staff. Officers' schools at military posts, the army service schools, and the Coast Artillery School are open to National Guard and volunteer officers, as well as to graduates of military schools and colleges which have had regular army officers as instructors. Military education is also furnished by certain State and private schools and by the "Students' Military Instruction Camp." (For other schools, see ARMY SCHOOLS.) Information in respect of military schools must usually be sought in official publications. For the United States, consult especially I. L. Reeves, *Military Education in the United States* (Burlington, 1914).

MILITARY ENGAGEMENT. See BATTLE; ENGAGEMENT; STRATEGY; TACTICS, MILITARY.

MILITARY ENGINEERING. See ENGINEERING, MILITARY.

MILITARY EVOLUTIONS. See EVOLUTIONS, MILITARY.

MILITARY FACINGS. See FACINGS, MILITARY.

MILITARY FRONTIER. See FRONTIER, MILITARY; MILITARY GEOGRAPHY.

MILITARY GEOGRAPHY. Geography is that branch of science which deals with the phenomena of the earth's surface. Military geography considers these phenomena in their relation to or as they influence the practice of the military art in each of its four subdivisions of strategy, tactics, logistics, and military engineering. Although military geography is concerned principally with natural physical features and resources (physical geography) as modified artificially by man (topography), the statesman and soldier must also study the influence of political, historical, and commercial geography in so far as such influence is felt in national military policies. The knowledge gained from these studies is essential to the formulation of effective strategic plans designed with a view to realizing a particular national policy. The study of the geography and topography of possible theatres of war in the vicinity of political frontiers or boundaries develops a knowledge of military frontiers, i.e., those lines of positions naturally or artificially made strong in a military sense. These lines are usually located near, but are seldom coincident with, political boundaries.

Influence of Geography on Military Operations. In making a general preliminary study of a country with a view to analyzing former campaigns or preparing a plan for future military operations it is advantageous first to consider the great rivers. This has been well expressed and explained by Brigadier General May (*An Introduction to Military Geography*, London, 1909) in the following words: "In studying the military geography of a country we cannot do better than follow up the path of its great watercourses. We are soon in touch with questions of vegetation, of crops, of the distribution of domestic animals, with villages, towns, great cities, fortresses. We reach them by *communications*, and the story of a nation's struggles and growth hinges upon these. For communications govern supply, and supply governs war."

The details of the physical features of the theatre of war must be thoroughly studied beforehand in order to arrive at the character of the troops best suited to that terrain. The means of transportation also is determined by the character of the roads and trails forming the line of communications. In an open plains country with good roads a preponderance of mounted troops and wheeled transportation might be advantageous; in a rough, mountainous country only dismounted troops and mountain artillery, transported on mule back, might be possible. Great howitzers sufficiently mobile on the roads of continental Europe might be useless on American roads. Thus, calibre and power of artillery may be fixed by geography and topography.

The nature and quantity of food, fuel (including petroleum), and forage afforded by the country to be traversed; how the additional amounts required for great modern armies are to be obtained from their own or neutral countries; and by what lines of communication, sea or land, such supplies are to be transported to the main, intermediate, and advance bases—all these are questions of the greatest moment to the responsible statesmen and generals, and they all must be answered, in part, in geographical terms. Thus, physical geography, by giving a knowledge of the resources of all countries, and commercial geography, by affording a familiarity with all the sea lines of communication, are of the utmost value to these national leaders who foresee the inevitable conflicts resulting from national expansion.

Physical geography also treats of weather, climate, and seasons, and these directly affect military operations, both strategic and tactical, as well as questions of supply of food, clothing,

shelter, and transportation. To safeguard the health and comfort of men and animals on tropical service special precautions must be taken. A knowledge of the tropics is essential if proper preparations are to be made. The American campaign of Santiago in 1898 is an illustration of the almost disastrous loss of efficiency due to an inadequate appreciation of the difficulties of tropical service.

The influence of mountains on the strategy and tactics of the attack and defense has many historical instances. Opinions differ as to the relative value of a mountain chain to the offense and to the defense. But the attacker, if he knows his terrain, has the great advantage of being able to select the particular pass to be forced and of concentrating a superiority of numbers at this point before the defender, with difficult lateral communications, can concentrate his troops. The Alps were crossed by Hannibal, Francis I, and Napoleon. The Pyrenees have been crossed frequently by large armies. Alexander in his great march to India led his armies across mountain ranges which would try the skill and endurance of modern soldiers. Jackson in his valley campaign skillfully utilized the mountains as a screen and obstacle to a hostile attack on his flank in his advance paralleling the general trend of the Massanuttons.

Valleys, being the line of least resistance, determine the line of advance, communication, and supply. He who holds the valleys holds the country. Railroads follow the valleys, just as ancient military roads and trails followed the watercourses. It is for this reason that the modern general finds it useful to study the geography of ancient campaigns, the historical routes of barbarian invasion. In going from Constantinople to Vienna the modern traveler to-day passes over the Roman route by way of Adrianople, Philippopolis, Sofia, Belgrade, and Budapest.

Great valleys usually carry great rivers. Rivers may form obstacles, as in the case of mountain ranges, or they may be the principal lines of communication and supply when navigable. They often become the military or strategic frontiers, the defended passages of which form the crucial points during a campaign. Though offering serious difficulties as obstacles, they may be successfully crossed, as are mountain ranges, when the will and skill exist. The Danube, one of the greatest military barriers, has been crossed more than 20 times in the face of defending forces.

A river may guard the flank of an army advancing along its course or may determine the direction of march on account of water supply. Rivers must be studied with reference to strategical points and as a means of supply. The bridges, ferries, fords, roads to each; current, nature and height of banks, floods and ice conditions, must all be considered before military operations are undertaken. Although rivers form natural boundaries and effective military frontiers, it is noticeable in Europe that the expansion and contraction of states in the past has in most cases resulted in the elimination of rivers as political boundaries. Junctions of rivers may form important strategical points or keys, as they control the intersecting valleys and require a besieging army to advance with forces separated by the intersecting rivers.

In planning military operations it is always necessary to study the geography of the theatre of operations with a view to selecting definite objectives, called strategical points, against which the operations are to be conducted. Such objectives may be political, commercial, or purely military, or all three. The objective, whenever practicable, should be so situated that an advance against it will surely threaten the principal line of communication and supply of the defending army. Examples of such points are important river crossings, mountain passes, railway centres, capitals, water supply, a river port controlling access to the sea and to the interior, etc.

Sea power determines the ultimate eminence of a nation politically, and the development of such power is largely due to geographical location and conditions in relation to the sea. Great Britain's frontier is the sea, and her national existence in peace and war depends on sea trade and sea control. The materials for shipbuilding, coal, and iron are near her great seaports, which control the trade routes through the English Channel to the North and Baltic seas. Similarly, a geographical study of Japan's location and relation to the shores of the Pacific will give an insight into her aspirations and probable future development as the great sea power of the Pacific. For a complete understanding of the political and military history of any country—Germany, Russia, France, Spain, Italy, Holland, the United States—or their present international policies, we must study their geographical location with respect to the sea and the sea routes to other lands.

A knowledge of natural features as modified by man with harbor improvements, wharves, communication to the interior by river, canal, or rail are of utmost importance in planning combined operations of the army and navy. The great interoceanic canals, Panama and Suez, and their approaches introduced new policies and modified strategic plans. The attack and defense of a great seaport like New York involves a knowledge not only of harbor channels, but also (which is far more important) a detailed study of all adjacent landing beaches, tide, surf, prevailing winds, character of beach, lines of advance to the rear of the city and its coast defenses, and the natural positions for interior land fortifications to resist an assault from the rear.

The importance of lines of communication cannot be overestimated. In the words of General May, "Success or failure in war ultimately hinges on communications. That side which can stay the longest—that is to say, which continues to be fed and supplied and reënforced with regularity—will at length emerge victorious. Communications spell strategy, and it is generalship or strategy that wins wars, though it is possible for courage and skill at arms to win battles, or even campaigns."

Above we have touched upon the vital importance of the control of the high seas. On land one of the most striking developments of modern war has been the increased efficiency of railways. During the Russo-Japanese War (1904–05) it was freely predicted that Russia would fail because of the insufficiency and inefficiency of her means of communication by a single line of rail 5000 miles from Moscow. As a matter of fact Russia was able to assemble and maintain at a distance of 5000 miles from her base a force of over 1,000,000 men, a force which was but little less than that of Japan,

who was only six days by sea from her base. Strategical railways are being rapidly constructed not only in continental Europe, but in both Asia and Africa. It was to such railways constructed by Germany in time of peace that she owed her wonderful mobilization on both the western and eastern fronts in the Great European War of 1914. Her six main lines of railway to the French frontier, and those built to the frontiers of Belgium and Luxemburg, double-tracked and equipped with the most modern landing platforms and sidings, joined together by railways paralleling the front along the Rhine, enabled Germany to transport, with great rapidity, vast armies to any part of the French and Belgian frontier and to reënforce any threatened point by troops from any other point. On the Russian side Germany had 17 lines (23 tracks) leading to the frontier, by means of which she was able to dispatch 500 troop trains per day. Against these 17 lines Russia had only five. From Austria eight lines (10 tracks), with a capacity of 260 trains per day, run into the intrenched camps of Galicia, from which an advance into Russia may be made. Against these the Russians have only four lines of railway. Since 1905 the Carpathian Mountains have been pierced by five lines of railway and preparations made to lay three more. To these strategic railways was due the ease with which Germany carried the war into the enemy's territory and placed both France and Russia on the defensive at the very outbreak of the war.

Napoleon once said that "the frontiers of states are either large rivers or chains of mountains or deserts. Of all these obstacles to the march of an army the most difficult to overcome is the desert; mountains come next, and broad rivers occupy the third place." Since his day, however, modern railroad engineering has eliminated the terrors of deserts in Asia, Africa, and America, and thus compelled new policies and new strategic plans of offense and defense.

An article on military geography, no matter how brief, would be incomplete without some reference to buffer states, protectorates, and spheres of influence. Such terms designate the territory of weak states declared inviolate by the mutual agreement of stronger neighbors. Sometimes the purpose is to provide against aggression, sometimes to conceal preparations for aggression. In any case the weaker neutralized state is at the mercy of one or all the stronger. Switzerland, surrounded by France, Germany, Austria, and Italy, is an example of the geographical location of a neutral state influencing the strategy of her neighbors. Belgium, the cockpit of Europe, is an illustration of a buffer state used as the battleground for stronger neighbors. Luxemburg has a similar history. Afghanistan is a true buffer state between the Indian Empire of England and Russia.

The fundamental cause of war is national expansion, which means a forcible rearrangement of international boundaries. A study of the geography of frontiers is therefore most valuable to statesmen responsible for policy as well as to soldiers charged with the execution of policy. For these reasons we find that military geography is largely concerned with the subject of military frontiers—those selected and strengthened lines of defense established in the vicinity of international boundaries as a bulwark against aggressive neighbors. Under modern conditions of war permanent fortifications constitute a minor part of frontier defense, the main reliance being placed on mobile field armies, for the movement of which in war there have been prepared in peace ample lines of communication leading to the national boundary, and lateral communications, connecting these, parallel to the general front. There is given below as examples a brief geographical outline of a few military frontiers as they existed at the outbreak of the European War in 1914. By reference to a suitable map there will be noted the location of the military frontier, and its rail and other communications, with reference to the international boundary protected.

France. Northern frontier, from Dunkirk to Longwy, 220 miles. Fortified towns: Calais, Gravelines, Dunkirk, Bergues, Lille, Douai, Maubeuge, Mézières, Montmédy, Longwy. Between these are other fortified places, and behind this front a second line: Péronne, Arras, Laon, La Fère. Eastern frontier, from Longwy to Delle, 240 miles. The line of defense extends from Mézières through Verdun, Toul, Epinal to Belfort. Verdun is a fortress of the first class and is on the direct road from Metz to Paris. Between the places given are many minor fortifications. Behind this front is a second line: Rheims, Langres. Still further to the rear is Paris, with its circle of fortifications.

Germany. Here we find a different and more modern principle of defense, noticeably in the absence of fortifications. The Vosges Mountains on the boundary constitute a natural military frontier or obstacle. The only great fortifications are the entrenched camps of Metz and Strassburg. Behind these flows the Rhine, a natural obstacle with guarded passages and a railway on each bank for lateral communication along the front. There is a second line with a few strongholds: Mainz, Coblenz, Cologne, New Breisach, Diedenhofen, Bitsch, and Rastatt. Berlin, unlike Paris, is not defended by great fortifications. Germany's frontier dispositions foretold what the European War of 1914 proved, viz., that the defense of her territory would be accomplished by promptly assuming the initiative and carrying the fight into Belgium and France. On the northeast front there are important fortifications: Danzig, Thorn, Gaudenz, Dirschau. To the northeast of Danzig the strong fortress of Königsberg, with its adjacent strong places at Pillau and Memel, and Boyen near Lötzen. West of Thorn is Bromberg and to the southwest Posen, with strong places. Since the Oder offers an easy advance to Berlin, the fortifications at Glougau have been constructed. Still farther to the south is Neisse.

Bibliography. For other European military frontiers and the geographical reasons for their selection and fortification, consult May, *An Introduction to Military Geography* (London, 1909). On account of the past isolation of the United States with respect to great military powers there is but little published technical literature on the subject of its four great frontiers—the Atlantic, the Pacific, the Canadian, and the Mexican. Expert technical studies have been made by officers of the general staff, but the records of these studies are to be found only among the confidential records of the War College at Washington. However, an interesting geographical military study of the Pacific coast, by a civilian, is to be found in Homer Lea's *Valor of Ignorance* (New York, 1909). A read-

ing of this book will suggest the absorbing interest and great value of geographical studies in relation to general national and military policies.

Consult also: T. M. Maguire, *Military Geography* (New York, 1900); James, *Modern Strategy* (London, 1904); Lyde and Ferryman, *Military Geography of the Balkan Peninsula* (New York, 1905); A. C. Macdonnell, *Outlines of Military Geography* (2 vols., London, 1911); United States Army Service School Press, *Moltke's Correspondence* (Fort Leavenworth, Kans., 1911).

MILITARY GOVERNMENT. The administration of territory taken from the enemy which is authorized under martial law (q.v.). It is under this power, arising from the necessity of the case, that provisional governments are instituted in conquered territory. All proceedings of government under martial law are, within the scope of their authority, as legal and constitutional as any other military proceedings. Military government is more properly applied only to governments established in territory outside the boundaries of the state to which the troops establishing it belong. Military rule established in disturbed areas of a state to which the force establishing it belong is more properly to be termed martial law (q.v.).

MILITARY HONORS. Compliments paid to certain officers, officials, or other distinguished persons. See SALUTES; HONORS, MILITARY.

MILITARY HOSPITALS. See HOSPITAL.

MILITARY HYGIENE. See HYGIENE, *Military Hygiene.*

MILITARY INSIGNIA. Devices used to distinguish the various corps, branches, ranks, and grades of the military and naval services. In all the armies of the world it has been found necessary to employ badges and devices to mark the necessary distinctions incident to such organizations. The term "insignia" is here employed to include such badges, devices, etc., in contradistinction to equipment, clothing, etc. The custom in Europe is a natural result of the evolution of the various countries both politically and militantly, and in the case of England particularly the badges, mottoes, and devices used by the various regiments are emblematic of conspicuous incidents in their history and not infrequently have been taken in battle from some regiment of the enemy.

Commencing with the insignia distinguishing the various grades of rank, German usage may be described at length, seeing that its system in a large measure obtains in every other army in Europe. Throughout the Imperial army the epaulets of all commissioned ranks are crescent-shaped. The various grades are distinguished as follows: 1. General field marshal, two batons (staffs of command crosswise over each other). 2. General in chief, three stars. 3. General of the infantry, cavalry, or artillery, colonel, captain, two stars. 4. Lieutenant general, lieutenant colonel, first lieutenant, one star; major generals, majors, and second lieutenants do not wear a star. Second and first lieutenants and captain wear epaulets having a gold rim but no trimming; colonels, lieutenant colonels, and majors wear epaulets with gold rims and silver trimming. The general field marshal, general in chief, lieutenant general, and major general are distinguished by the silver rims and silver trimming of the epaulets. The noncommissioned ranks are distinguished by the gold or silver lace on the collars, cuffs, and facings of the tunics. On the shoulder straps is the number of the soldier and the monogram of his regiment. The various arms of the service are also distinguished by the color of the tunic lace; e.g., infantry regiments have red lace. On the right side of every German soldier's helmet is placed the black, white, and red cockade of the German Empire, while the cockade on the left side indicates the particular state of the German Confederation to which the regiment belongs, as follows: Prussia, black-white; Bavaria, white-sky blue; Hamburg-Bremen-Lubeck, white with red cross; Saxony, white-green, Württemberg, black-red; Baden, yellow-red; Hesse, white-red; Mecklenburg, sky blue-yellow-red; Oldenburg, white-dark blue with red cross; Saxe-Weimar, yellow-green; Brunswick, sky blue-yellow; Anhalt, green; Saxon duchies, green-white; Lippe, yellow-red; Schaumburg-Lippe, white-red; Waldeck, yellow-red; Schwarzburg-Sondershausen, white-dark blue; Schwarzburg-Rudolstadt, dark blue-white; Reuss, yellow-red. Other distinguishing marks between the various services of the German army are found in the color of their uniform, for which see UNIFORMS, MILITARY.

In the British army insignia play an important part. They are used as much to encourage esprit de corps as a mark of distinction between regiments. There is a large degree of variety in the badges in use among the various regiments of the army, most of them reminiscent of stirring periods in regimental history. In 1836 the King commanded that an account should be published concerning the insignia, badges, devices, etc., of the regiments of the army, together with the particulars recounting the reasons for their existence. The result was a very excellent history of the British army. The introduction of the territorial system in 1881 destroyed in a measure the individuality of the regiment and made it a part of the territorial district to which it was assigned. In the effort to bind still further the regiment and its district together the attempt was made by the military administration to abolish many of the insignia formerly characteristic of the different regiments. The attempt, however, created so much opposition and ill will among all ranks of the army that a compromise was effected, and to-day nearly all the old devices are employed, the expense usually being borne by the officers of the regiment. The authorized and unauthorized badges include the royal arms (in the case of the guards and all other regiments distinguished by the prefix "royal"), the whole or part of numerous orders, and other royal honors. Still others are purely regimental, i.e., badges distinguishing regiments of the same arm, as castles, arms of counties and cities, the Prussian eagle, the French eagle, the death's head, the elephant, the antelope, tiger, dragon of Wales, dragon of China, the sphinx of Egypt (this is worn by the 30 regiments who served in the first English expedition against the French in Egypt), the Paschal Lamb, the white horse of Hanover, the white horse of Kent, the lion of England, a gun, a grenade, the bugle (all light infantry and rifle regiments are distinguished by this badge), the bear and ragged staff, the figure of Britannia, St. George and the dragon, the harp and crown, the shamrock (as in the case of the newly formed Irish guards), the Scottish thistle, the Cross of St. Andrew, and many others. The royal arms are borne by the Royal

Engineers and the Royal Artillery, the difference between them being in the mottoes, *Quo Fas et Gloria ducunt* and *Ubique*. With the latter motto is coupled an artillery gun.

As with Germany, the various branches, arms, departments, etc., of the service are distinguished by their distinctive uniforms and not by any particular badge. In the mounted branches rough riders (or young horsemen) are distinguished by a spur worn above the elbow on the sleeve of the tunic; farriers and shoeing smiths wear a horseshoe. Expert swordsmen and gymnasium instructors of all branches wear the crossed swords. Marksmen (sharpshooters) of all arms wear the crossed guns placed immediately above the cuff of the tunic. Pioneers wear the crossed axes on the upper sleeve. Commissioned and noncommissioned ranks of the infantry wear the sash, which in the case of officers is of silk and is worn over the left shoulder, and with noncommissioned officers is of worsted and worn over the right shoulder. Scottish Highland regiments are further distinguished by the differences in pattern of their clan tartans. See UNIFORMS, MILITARY.

In the United States at the time of the Revolution the distinguishing characteristics of army ranks were largely copied after French, Prussian, and English usages. General and staff officers were distinguished by the color of their sash or ribbon, which was worn over the waistcoat and under the coat. Cockades were worn by all other commissioned officers, and the noncommissioned officers were distinguished by the color of their epaulet. On June 18, 1780, a general order was promulgated authorizing the following insignia of rank and grade: major generals to wear two stars on each epaulet; brigadier generals, one star; field officers wore two epaulets; captains, one epaulet on the right shoulder only; lieutenants, one epaulet on the left shoulder. Other distinguishing marks were details of uniform. In 1782 the system of wearing stripes as badges of rank and service by the rank and file was instituted. Changes were frequent up to the Civil War, but the insignia since that time have remained substantially the same, the more important changes, particularly those of 1902, having had to do with uniform and equipment rather than with insignia. Officers' insignia (1914) are as follows:

(*a*) The letters U. S., of Gothic design, made of gold or gilt metal or dull-finish bronze, worn on the collar of the dress, service, or white coat, are placed at a distance of 1 inch from each end of the collar. When worn upon the dress or white uniform, the letters are of gold or gilt metal (of silver for Engineers). When worn upon the service uniform, they are of dull bronze metal. To designate officers of volunteers these letters are followed by the letter V.

(*b*) The insignia of corps, department, or arm of service are as follows: General Staff Corps, the United States coat of arms, of gold and enamel, superimposed on a silver star; Adjutant General's Department, a shield 1 inch high, ¾ inch wide; Inspector General's Department, gold or gilt sword and fasces crossed and wreathed; Judge-Advocate-General's Department, sword and pen in gold or gilt metal, crossed and wreathed; Quartermaster's Department, sword and key crossed on a wheel, surmounted by a spread eagle of gold or gilt metal, platinum and enamel; Medical Corps, a caduceus of gold or gilt metal; Medical Reserve Corps, same with letters R. C.; Dental Surgeon, same with letters D. C.; Acting Dental Surgeon, D. S., the caduceus of silver; Corps of Engineers, a silver turreted castle; Ordnance Department, shell and flame, of gold or gilt metal; Signal Corps, two crossed signal flags and a burning torch, in gold and silver; chief of the Bureau of Insular Affairs, seven arrows with wings on sides, 1 inch high, in gold or gilt metal; professors and associate professors of the United States Military Academy, shield and helmet surrounded by a scroll, in gold or gilt metal; aids-de-camp, a device 1⅛ inches high, consisting of a shield of the United States, of properly colored enamel ¾ inch high and ¾ inch wide at top, surmounted by a gold or gilt eagle, with wings displayed, on blue field of the shield a star or stars, according to rank of the general on whose staff the officer is serving. This device is worn on the collar in lieu of corps or line device.

The devices appropriate to the various arms of the service are as follows: Cavalry, two crossed sabres, 1 inch high, with number of regiment above intersection; of gold or gilt metal. Field Artillery, two crossed field guns, design to be 1 inch high, of gold or gilt metal, the number of the regiment ⅜ inch high in the upper angle. Coast Artillery, two crossed cannon, with oval at centre carrying a projectile, point up. Infantry, two crossed rifles, design to be 1 inch high, with number of regiment above intersection; of gold or gilt metal. Regimental adjutants, quartermasters, commissaries, and artillery district adjutants wear in the lower angles of their insignia the devices (of gold or gilt metal) of the respective departments to which their duties correspond; the battalion adjutant and quartermaster of engineer battalions wear the same devices above the centre turret. Chaplains, the same as for regimental staff officers, except that the pendant design is a Latin cross of the same material and size. The insignia of corps, department, or arm of service is placed upon the collar of the dress, service, and white coat ⅝ inch from the letters U. S. and is of gold or gilt metal with the dress or white uniform and of dull bronze metal with the service uniform. Veterinarian, device of arm of service, with foot of a horse in lower angle, number of regiment in upper angle.

(*c*) The insignia of rank are placed on the shoulder loops of the service coat and the white coat near the shoulder seam, also on the shoulder knots, as follows: General, coat of arms of United States between two stars; lieutenant general, one large star between two small stars; major general, two silver stars; brigadier general, one silver star; colonel, one silver spread eagle; lieutenant colonel, one silver leaf; major, one gold leaf; captain, two silver bars; first lieutenant, one silver bar.

Sleeve insignia of rank: major general, two silver stars; brigadier general, one silver star; colonel, a single knot composed of five strands of gold-wire lace, not exceeding ⅛ inch in width, applied to the sleeve of the full-dress coat below the elbow, the base resting on the gold band of the sleeve; lieutenant colonel, four strands, single knot; major, three strands, single knot; captain, two strands, single knot; first lieutenant, one strand, single knot; second lieutenant, without gold lace; chaplain, without gold lace. The outside dimensions of the gold-lace insignia are the same for all officers, the dimensions being made by taking strands from the interior. Metal

insignia of corps, department, arm of service, or aid-de-camp are placed in the centre of the open space under the lace insignia, except for general staff officers, who wear the corps insignia on the shoulder knot.

Sleeve insignia for overcoats, made of flat black mohair soutache braid ⅛ inch in width, follow the form of the gold-lace insignia for dress coats, but are applied with the base resting at lower end of the sleeve. Insignia of corps, etc., are not worn on the overcoat.

Epaulets: for general officers, of gold with solid crescent, the devices being the coat of arms of the United States embroidered in gold, and one star for brigadier general, two for major general. For general staff officers the insignia of the corps replace the coat of arms of the United States.

Shoulder knots: of gold-wire cord ¼ inch in diameter, formed of three cords in four plaits and rounded top, finished with small gilt regulation button; about 5½ inches long and 2½ inches wide, extending from the seam of the sleeve to the seam of the collar; slightly stiffened with a flexible backing which is covered with cloth of the color of the coat and made detachable; insignia of rank to be worn on knot.

Shoulder straps are as follows: general—dark-blue cloth, 1⅝ inches wide and 4 inches long, bordered with an embroidery of gold ⅜ inch wide; the field of strap to be of cloth the color of the facings of corps, department, or arm of service; the insignia of rank to be placed in field of strap as follows: general—two silver-embroidered stars of five rays each and gold-embroidered arms of the United States; lieutenant-general—three silver stars. Major general—the same as for a lieutenant general, except that there are two stars instead of three; the centre of each star to be 1 inch from the outer edge of the gold embroidery on the ends of the straps; both stars of the same size. Brigadier general—the same as for a major general, except that there is one star instead of two at the centre of the strap. Colonel—the same as for a brigadier general, omitting the star, with a silver-embroidered spread eagle on the centre of the strap. Lieutenant colonel—the same as for a colonel, according to corps, department, or arm of service, omitting the eagle, with a silver-embroidered leaf at each end, each leaf extending ⅞ inch from the end of the strap. Major—the same as for a lieutenant colonel, with a gold-embroidered leaf at each end, instead of silver leaf; each leaf extending ⅞ inch from the end of the strap. Captain—the same as for a major, omitting the leaves; at each end two silver-embroidered bars of the same width as the border, placed parallel to the ends of the strap; the distance between them and the border equal to the width of the border. First lieutenant—the same as for a captain; at each end one silver-embroidered bar of the same width as the border, placed parallel to the ends of the strap, at a distance from the border equal to the width of the border. Second lieutenant—the same as for a first lieutenant, omitting the bars. Additional second lieutenant—the same as for a second lieutenant. Chaplain—of dark-blue cloth of the usual size and pattern, with a plain Latin cross of silver in the centre.

Corps badges were first employed during the Civil War and proved to be an extremely valuable means of identification. The devices employed include a triangle (Fourth Army Corps); the star and crescent (Seventh); a six-pointed star (Eighth); an acorn (Fourteenth); an arrow (Seventeenth); a maltese cross (Nineteenth); a shield (Twenty-third). The device for Wilson's cavalry corps consisted of crossed swords surmounted by a carbine. The Signal Corps was distinguished by the crossed flags and torch. Division headquarters were marked by a square flag upon which was a badge designating the character of the headquarters. The old Twentieth Corps did not at first wear a badge, but when the new Twentieth was formed by the consolidation of the Eleventh and Twelfth Army Corps, it adopted the badge of the Twelfth, a five-pointed star. During the Spanish-American War the various corps were distinguished by the following corps badges: Artillery Corps, crossed conical projectiles, with round shot above the centre; Cavalry Corps, a winged horse's foot; First Corps, the letter I inclosed in a circle; Second Corps, a four-leaf clover; Third Corps, a three-toothed clutch; Fourth Corps, a caltrop; Fifth Corps, a five-bastioned fort; Sixth Corps, a six-spoke hub; Seventh Corps, a seven-pointed star; Eighth Corps, two overlapping circles, very much resembling the figure eight; Ninth Corps, a nine-toothed buzz saw; Tenth Corps, two triangles point to point; Eleventh Corps, same design as for the Tenth Corps, with the addition of a horizontal bar through the centre; Twelfth Corps, a square with a clover leaf at each corner; Thirteenth Corps, a palm leaf; Fourteenth Corps, a square with half circles on each side; Fifteenth Corps, a bugle; Sixteenth Corps, a spearhead; Seventeenth Corps, a battle-ax; Eighteenth Corps, an arch. The color of the symbol determined the division of the corps, as: red, First Division; white, Second Division; blue, Third Division. Such badges were worn on the hat or cap. Commissioned officers wore them on the left breast and not on the hat. See UNIFORMS, MILITARY AND NAVAL; AIGUILLETTES; CHEVRONS; ETC.

MILITARY JUSTICE, BUREAU OF. See MILITARY LAW.

MILITARY, or MAN-RAISING, KITE. The man-raising kite as employed for military observation is in principle a "captive" or "anchored" aëroplane (see AËRONAUTICS) in equilibrium under the action of three forces, the weight of the apparatus, the pressure of the wind, and the tension of the retaining cable. It is a military possibility because it is easily transported, may be used in a high wind, is quickly sent up, is safe, cheap, and easily repaired. Although of exceedingly limited application, it may yet, under special conditions, be of great value.

The possibility of using a kite for observation purposes is comparatively recent. Various models have appeared from time to time: Maillot's octagonal kite in 1886; Baden-Powell's hexagonal in 1894; Lamson's superposed planes in 1896; diedral kites, etc. But its serious practicability is due chiefly to the invention by Hargrave of the cellular or box kite. This consists essentially of two canvas parallelepipedons, presenting to the wind a double surface, one sustaining, the other directing; in reality it is a canvas beam, open at the ends and cut away in the middle. In the construction of the kite the important condition is to have a maximum sustaining surface and a minimum weight, without sacrificing the strength, the resistance of the system. Hence we have the so-called *density of*

the kite, the ratio of its weight to its bearing surface. Having the box kite then, the true solution of the problem was obtained when the idea of *trains* of kites suggested itself. By the application of this idea not only was the supporting power of the system increased, but its safety also; should one of the trains give way, the others would still hold. Observation from a kite is very convenient and safe; should the wind show signs of falling, the kite is hauled down. A squall even is not to be feared. It is noteworthy that the cable is but slightly influenced by changes of position of the kite in a gusty wind, and remains always stretched in the same direction, that of the prevailing wind. Hence the steadiness of the car, a valuable quality, especially if photographs are to be taken. Moreover, the observer is reasonably safe even under fire, for his stay in the air need be but brief; in other words, he may make his observations and come down before the enemy can get the range.

It is obvious that the possibilities of the man-raising kite are limited; it may, of course, accompany an army in the field, but cannot hope to compete with the dirigible and the aëroplane. Its chief application will be made in observing siege and fortress artillery fire; but even in these cases it will prove inferior to the captive or kite balloon. For one thing, in a given wind a kite will rise to a certain height, which it is useless to endeavor to exceed; any further attempt merely causes the kite to displace itself in the direction of the wind. According to one authority, Captain Saconney, of the French army, the useful limit of cable payed out is reached when the height of the car is equal to half the length of the cable unwound.

Two countries have made a specialty of the kite: Russia, in its navy chiefly, England in both army and navy. It is said that in England ascensions of 400 meters and even of 800 meters have been made. The results achieved excited attention in France; the outcome of the investigations and experiments was the Saconney apparatus, of which we shall here give a brief description. In this apparatus two cables are used; to one is attached a train of kites, called the principal train, the purpose of which is merely to raise its cable in the air. On this aërial rail, thus supported, runs a trolley, from which hangs the observation car, carried up by a second train of kites; the car is controlled by the second cable. The two cables are operated by a double winch driven by the motor of the automobile truck that transports the equipment when dismounted. This winch can take up cable at the rate of 180 meters per minute; should the principal train give way, this speed sets up a relative wind, sufficiently great to prevent accidents. The supporting cable is 5 millimeters in diameter, 1500 meters long, and has a resistance of 2000 kilograms; the car cable above the car is 5 millimeters in diameter, with a resistance of 2000 kilograms, and 3.5 millimeters below the car, with a resistance of 1000 kilograms; it is 1300 meters long.

The number of kites to be used obviously depends on the velocity of the wind that may be blowing at the moment. It is assumed that the traction of the cable is constant; this traction corresponds to a lifting effort of 300 kilograms sufficient to support the car, the observer, and the cable. This is always unwound to the same length, and its weight therefore does not change. The "independent variable" of the problem is consequently the velocity of the wind to be determined by observation; the "dependent variable" is the number of kites. This number is determined as follows: 10 kites of 100 meters' bearing surface will in a wind of 10 miles produce the normal lifting effort of 300 kilograms. This rule is known as the "rule of 10." Modifications of the normal case are assumed to vary with the square of the ratio of wind velocities. Hence a wind of 5 meters per second will support only 75 kilograms, and to raise 300 kilograms, 40 kites will be needed, an impracticable result. A wind of 20 meters per second, on the contrary, would support 1200 kilograms; hence three kites would suffice. The importance of the number of kites appears when we consider that, if the number remained always the same, the stress of the system would be increased ninefold for an increase of the wind velocity from 8 meters per second to 24 meters per second.

The kite used is the Hargrave model, fitted with wings; the car is a wicker basket one meter deep. (See KITE for illustration and description.) In operation two methods of launching the system are followed: the first is known as that of "successive postillions," in which the pilot kite is sent up to say 100 meters, and the others are then successively attached and allowed to run up until they come against the stops, about 6 meters apart; these stops increase in size with the distance, as do the split rings by which each kite is slipped on to the cable. The cable is then paid out. If the wind is strong, the pilot is sent up to its full height, then in succession the remaining kites. In the second method the whole apparatus (with the pilot) is set up on the surface of the ground, ready for launching; at the word of command the pilot is released and takes up the system. The first method requires only a limited space, 30 meters long, the second a space 10 times as long. The complete operation may be carried out in 20 minutes by a crew of some training. Transportation is furnished by an automobile pulling a baggage wagon and carrying besides the crew of 16 men. Apparatus and automobile cost about $3000, as compared with $12,000 to $15,000 for an aëroplane and $500,000 for a dirigible. Communication is had with the ground either by visual signals or by telephone. For further details, consult *Revue d'Artillerie* (Paris, August, 1912). See KITE; MILITARY AËRONAUTICS.

MILITARY LAW. That part of the law of the land which prescribes and enforces the public obligations of persons in the military service. The civil law not being adequate for the government of the military community, peculiar laws and institutions have been framed for its regulation, which invest military authority with the right to punish offenders who are under military rule for offenses contrary to military discipline, or breaches of military duty, the essential object being to maintain order and discipline in the army. Every country that maintains a standing army generally enacts articles for its government and confers special and limited powers upon the military authorities to enable them to enforce their provisions.

The Constitution of the United States confided to Congress the power to keep up a standing army and to make rules and regulations for its government. Under this grant Congress has

enacted Articles of War and other similar enactments which together constitute the statutory military law of the United States. These statutes deal not only with military offenses and punishments, but also with the constitution, composition, jurisdiction, and procedure of military courts. The power of the President to issue regulations and orders to the army is a right incidental to his constitutional power as commander in chief and is a means for carrying into execution his sovereign power. Such orders of the President, as commander in chief, and of superior officers, when not in conflict with existing law and regulations, are also a part of the code military. To declare what the law for the army shall be is the province of Congress; but to interpret this law is a judicial function. While American military law is mostly statutory, we must go to the decisions of the courts and to the opinions of the attorneys-general for interpretation and explanation of the enacted word.

Customs of the Service in peace and in war are a source of military law. These usages have become to the army a kind of common law, supplementing the statute law and regulations. The oath administered to the members of a court-martial requires them in doubtful cases to administer justice according to "the customs of war in like cases." This oath is almost identical with the one taken by members of courts-martial in the British service, and the term "custom of war" as used in the Articles of War of the United States must not be understood as referring only to the usages of the army of the United States.

Persons Subject to the Military Law are (1) officers and soldiers on the active list, whether militia or others, mustered and in pay of the United States, (2) retired officers and soldiers, (3) persons who fraudulently enlist and receive pay and allowances thereunder, (4) discharged officers and soldiers who have defrauded the United States, (5) discharged officers after summary dismissal and general prisoners. In time of war spies, retainers to the camp, persons who relieve and aid the enemy in the way specified in the statutes, are included. When a person subject to military law commits an offense he is placed in arrest or confinement. Except in cases of quarrels, frays, and disorders commanding officers have power only to put officers in arrest. An officer arrested confines himself to his quarters until his arrest is made open or its limits extended. He is not permitted to wear a sword or to visit officially his commanding or superior officer, unless directed to do so. Whenever a commanding officer places an officer in arrest and releases him without preferring charges he makes a written report to the department commander of the cause. When an officer is put in arrest for the purpose of trial, except at remote stations, the officer ordering the arrest must see that he has a copy of the charges on which he is to be tried within eight days after his arrest. Noncommissioned officers and privates to be tried by summary court are generally placed in arrest in their quarters. Privates to be tried by general court-martial are confined in the guardhouse. Confinement without trial as a punishment for an offense is forbidden. Consequent upon arrest follows a preliminary investigation as to the crime or offense charged against the prisoner and the evidence upon which it is to be supported. If the offense is one for trial by a superior court, the charges are forwarded by the commanding officer with the statement that he has investigated them, and his opinion as to whether or not they can be sustained. When an offense is a minor one a soldier may be given punishment by extra fatigue duty, restriction of privileges, etc., provided he consents to accept such punishment in lieu of trial.

Certain various offenses against military law when committed in time of war are punishable with death. In time of peace the ordinary punishments are dishonorable discharge, confinement at hard labor, and forfeiture of pay. The maximum punishment is given only when the offense is of the worst type or when an example is necessary. In a few instances the punishments are mandatory. The purposes of military process and proceedings in respect to offenses against military law have reference always to the prevention in future of the commission of these offenses. In the military code of England prominence is given to the principle of honor, and as the life of the military community will always depend on the zealous maintenance of this professional characteristic, one of the most important purposes for which the military law exists is to preserve the honor and purity of the service.

American military law began with the War of the Revolution. Articles of war were first made for the government of the army on June 30, 1775. In April, 1806, the present military code was established. This code was derived immediately from the English military laws, and for many years the American officer was compelled to look to English treatises on military law to solve questions which arose in the course of his judicial duties. In 1864 a military law department was established by Congress, to be known as the Bureau of Military Justice. In 1883 this bureau was consolidated with the corps of the judge advocates of the army under the title of Judge Advocates Department, which it still retains. This department as now organized consists of a judge-advocate-general and 12 judge advocates, holding permanent commissions in the department. These judge advocates are stationed in time of peace at the headquarters of the several military departments into which the country is divided. In time of war they are at the headquarters of armies, field armies, and divisions. They are consultative officers and legal advisers. In important trials the direct responsibility of their prosecution is upon them. They receive and revise the proceedings of courts-martial held in their several departments, give legal opinions, and administer oaths. In the English army a judge advocate never acts as a prosecutor or witness for the prosecution. He is a helper to the court, and the prosecutor and the prisoner are entitled to his opinion on any point of law that is relevant to the trial. The judge-advocate-general is a member of Parliament, a Privy Councilor, and a responsible adviser to the crown in all cases of general courts-martial which the crown confirms.

Military law requires that before a sentence of a court can be executed it must be confirmed. In England the sentences of general courts-martial are confirmed by the King or by an officer holding a warrant from the King. In the United States the officer ordering the court or the officer commanding for the time being must approve a sentence before it can be executed. Except in certain convictions in time of war a sentence of death must be confirmed by the President. In time of peace no sentence of a court-martial di-

recting the dismissal of an officer can be executed until approved by the President. It is the duty of a confirming officer to see that the finding and sentence are legal and that the latter does not award a punishment in excess of the punishment authorized by law. Where the sentence of a court-martial imposes several punishments one or more may be approved.

The principal offenses committed by soldiers are desertion, fraudulent enlistment, disobedience to superiors, quitting or sleeping on post, drunkenness, absence without leave, selling or losing by neglect clothing or equipment, and miscellaneous offenses to the prejudice of good order and military discipline. A person in the military service is not freed from his civil obligations. He is still a citizen and amenable to the civil authority for violation of local laws. He is liable to be taxed for his real estate or household goods. He may vote at the place where he has a legal residence.

French Military Law is administered by means of regular trial and sentence before a military tribunal or by infliction by any superior or inferior punishments for mere faults. The punishments inflicted upon officers for faults against discipline are: simple arrests, rigorous arrests, reprimand from the colonel, and prison. Faults of officers too grave for disciplinary punishment are referred to courts of inquest. Councils of war, answering to the American general court-martial, take cognizance of the graver violations of military law, which can only be punished by afflictive or infamous punishments. The judgments of councils of war may be revised by councils of revision. If the latter annul the judgment referred to them, proceedings and decision are sent to a second council of war having jurisdiction in cases of judgments annulled by councils of revision. There is also a court of appeal in cases of trial and sentence for the crime of capitulation. This court is styled the Court of Cassation. Punishments in the German, Austrian, and Russian armies are similar to those in the French service.

English Military Law so nearly resembles the American as to require in this article but brief description. It is embodied in the Army Act of 1881 and is kept in operation from year to year by the passing of the Army Annual Act. It consists of a written and unwritten part. 1. The written part consists of the Army Act, rules of procedure, King's Regulations, general orders, army circulars and orders, royal warrants, and orders in council. 2. The unwritten part consists of the laws or customs of war. The sovereign has power to make articles of war, but the articles of war and the Mutiny Act have been consolidated in the Army Annual Act, and it is doubtful if the necessity for articles of war will ever arise again. The military code of England describes in detail the serious offenses against military law and prescribes the maximum punishment that can be awarded for them.

Consult: W. W. Winthrop, *Military Law and Precedents* (2d ed., Boston, 1896); W. E. Birkhimer, *Military Government and Martial Law* (2d rev. ed., Kansas City, 1905); G. B. Davis, *Treatise on the Military Law of the United States* (New York, 1908); *Manual for Courts-Martial*, prepared by direction of the Secretary of War for the use of the army of the United States (Washington, 1910); S. C. Pratt, *Military Law* (8th ed., London, 1911). See COURTS, MILITARY; MARTIAL LAW.

MILITARY MUSIC. See BAND, MILITARY.

MILITARY OATHS. See OATHS, MILITARY.

MILITARY ORDER OF FOREIGN WARS. See FOREIGN WARS, MILITARY ORDER OF.

MILITARY POLICE. In European countries, the name given to that branch of the police force which has military as well as civil constabulary duties. In these countries the force exists in peace as well as in war. In the United States, in time of peace, there is no regular Federal military police, but they are organized as required during campaigns and during manœuvres simulating war. Selected men for such a force are detached from the army. Their status and duties are defined in the *Field Service Regulations, United States Army* (1914). The duty of military police is to enforce all police regulations in the theatre of operations and in mobilization and concentration camps. They protect the inhabitants of the country from pillage and violence and prevent excesses of all kinds, keep all roads clear, arrest all soldiers and civilian employees absent without proper authority, arrest all marauders, and collect all stragglers and hand them over to their organizations. They keep a list and description of all camp retainers and followers and watch their conduct. They take charge of all prisoners of war. They police all railroad stations, public houses, depots, and public buildings, protect telegraph and telephone lines and railways from damage, keep hostile inhabitants in order, disarm them, and prevent spying. All persons in the military service are required to assist the police when called upon to do so. Officers and enlisted men when actually performing the duty of military police wear a blue brassard on the left arm bearing the letters M. P. in white.

Although there are no Federal military police in the United States in time of peace, the State of Pennsylvania has maintained a State military mounted police force since 1909. It consists of about 300 selected men, many of them with prior service in the regular army, organized into four troops, with officers, under command of a major. The force is composed of experienced men, well paid, mounted, and armed. They guard an area of about 4500 square miles in western Pennsylvania and have proved far more successful than the local police and militia in arresting offenders and in preventing looting, disorder, and crime in time of strikes, floods, fires, and other disasters. In 1915 efforts were being made to secure a similar force for the State of New York.

A noted military police is the Royal Northwest Mounted Police of Canada. This force was organized in 1873 by the Dominion government to preserve law and order in the wilderness northwest of Lake Superior. Before the Great War of 1914 this force consisted of 55 officers and 708 selected men, distributed as follows: Alberta, 290; Saskatchewan, 390; New Manitoba (the northern and sparsely settled part), 22; Northwest Territories, 12; Yukon Territory, 49. In the summer of 1914 the force was increased by 500 men, owing to the fear of possible unrest and disorder among the 175,000 Germans and Austrians settled in the various provinces and districts patrolled by the police.

In the British army, in England, the military police consists of mounted and dismounted branches, with headquarters at Aldershot (q.v.). Their duties are similar to those of the civil police, but are confined to the soldiers of the

district in which they are stationed. In time of peace they are scattered in detachments of varying strength throughout the standing camps and large garrisons of England and Ireland. They are recruited from the regular army and are confined exclusively to noncommissioned officers and men of several years' service and unblemished record. Every member of the force is a noncommissioned officer and acts with the full authority of such. Their uniform is similar to that of the field artillery. In France similar duties are performed by the gendarmerie, a force of military police recruited from the army, but performing civil duties in time of peace. There is a legion in each army corps region, and some regions have more than one legion. The total strength is about 21,700 men, of whom about half are mounted. It is proposed to create a mobile gendarmerie, to deal with strikes and riots, so as to avoid the necessity for calling out troops on such occasions. The Garde Republicaine is also a police force and performs duties in Paris similar to those performed by the gendarmerie in the departments. Its strength is nearly 3000, of which about 800 are mounted. The military police of Germany come into active employment during war time, when each army corps mobilizes two detachments, one to accompany the corps itself and one for the line of communications. In their colonies the Germans, in addition to troops, usually maintain a military native police force officered by Germans. Police forces organized on a semimilitary basis exist throughout the British Empire. The crown colony of Hongkong has a semimilitary police force of 1173 men, of whom 164 are European, 462 Indians, and 547 Chinese. The Royal Irish Constabulary was organized in 1822 and at the present time consists of about 10,000 officers and men. This organization is famous for its efficiency and loyalty during many trying periods of Irish history. Similar bodies were organized throughout Australia, for duty in the gold-mining camps primarily and afterward to control the natives and protect isolated ranches or stations. In organization there is generally a colonel, lieutenant colonel, or major at the head, who is in turn responsible to the Minister of the Interior. Rank and title are the same as in the regular army. In South Africa the South African Mounted Riflemen, established April 1, 1913, are available for military duties whenever required and are included in the military defenses of the colony. The Nyasaland Protectorate (British Central Africa) employs a military police. They are under British officers and are charged with the duties of maintaining order and suppressing the slave traffic. The area under their jurisdiction covers 39,315 square miles and is divided into 14 districts. They also police the eastern portion of the British South Africa Chartered Company's territory, north of the Zambezi, for which they receive payment. British East Africa, besides a military force, has a police of 1735 men under 38 European officers and noncommissioned officers. The Rhodesian military police forces now include all the small bodies of men formerly engaged in the division of what is now termed Rhodesia, the corps as a whole being under the High Commissioner, as are also the forces of the Bechuanaland Protectorate and Basutoland. Similar forces were maintained throughout the German possessions in East and Southwest Africa. See PROVOST MARSHAL.

MILITARY PRISON. By law the government and control of the United States Military Prison is vested, under the Secretary of War, in the Board of Commissioners of the United States Soldiers Home, and the president of that board is required to submit to the Secretary of War annually a statement of the financial and other affairs of the prison. The board consists of the Surgeon-General, the Quartermaster-General, the Chief of Engineers, the Judge-Advocate-General, and the Governor of the Soldiers Home. The immediate administration is in the hands of army officers detailed for that duty by the Secretary of War. The United States Military Prison is divided into three branches: United States Military Prison, Fort Leavenworth, Kans.; Pacific Branch, Alcatraz Island, San Francisco harbor; Atlantic Branch, Fort Jay, Governors Island, N. Y. In addition to these prisons there are guardhouses at military posts in which general prisoners may be temporarily confined. In the United States army there are several classes of prisoners. They are designated as follows: enlisted men against whom charges have been preferred are designated as "awaiting trial"; those tried and prior to promulgation of result as "awaiting result of trial"; those serving sentences of confinement, not involving dishonorable discharge, "garrison prisoners"; officers or men sentenced to dismissal or dishonorable discharge and to terms of confinement at military posts or elsewhere as "general prisoners." So far as practicable general prisoners are kept apart from other prisoners and are the only class confined in the United States Military Prison and branches thereof. Under the law the United States Military Prison is for the confinement and reformation of military offenders against the rules, regulations, and laws for the government of the army of the United States and includes only officers and enlisted men of the army, and of the marine corps when detached for service with the army, who have been sentenced by court-martial to dismissal or dishonorable discharge and confinement. In February, 1912, was inaugurated the modern prison system of separating as far as practicable prisoners convicted of purely military offenses from those convicted of statutory or common-law crimes or misdemeanors. The general prisoners who are under sentence for purely military offenses and whose records and conduct are such as to entitle them to the privilege are now afforded an opportunity to receive a special course in military training. Under orders of the War Department, Sept. 17, 1913, four disciplinary companies were organized at the United States Military Prison, Fort Leavenworth, Kans., and one at Fort Jay, N. Y. Similar companies are to be organized at the Pacific Branch, Alcatraz Island. Bands composed of prisoners are also authorized. Prisoners granted the privilege of membership in the disciplinary companies work during half the day only, the other half being devoted to military drill and training. It is hoped by this system to reform and restore to the service a certain percentage of men now under sentence of dishonorable discharge and of forfeiture of certain rights of citizenship. Under the new plan, since September, 1913, the Judge-Advocate-General of the army has general charge, direction, and control, under the Secretary of War, of these prisons and their administration. The officers of each prison consist of a commandant, an adjutant, a quartermaster, a surgeon, a chaplain, an

executive officer, an exchange officer, an ordnance and signal officer, and such other officers as the War Department may assign. The enlisted men of the army detached for duty as prison guards are organized into companies, to which officers are assigned for the usual company duties. The number of prisoners confined at Fort Leavenworth varies between 900 and 1000; the number at Alcatraz Island, between 300 and 400; at Fort Jay, N. Y., about 100. About 1000 general prisoners are confined at military posts. In addition to the military instruction for the privileged class belonging to the disciplinary companies, the prison system provides schools, libraries, religious instruction, medical attention, and an opportunity to learn a trade.

MILITARY PUNISHMENTS. See MILITARY LAW.

MILITARY RESERVATION, UNITED STATES. A term applied to every military post, station, or other locality selected and set apart for present or future military occupation. Department commanders supervise all such reservations within their territory and are responsible that trespass and damage are prevented. They are also required to see that every consideration is given to their care, preservation, and adornment, and that every available means is employed to make them attractive homes for the army. The grounds are improved so far as possible. Where the reservations are of considerable extent or sufficiently practicable, they are stocked with game, and stringent rules made for the protection of native singing birds. Lands reserved for military use and military posts temporarily evacuated by troops are under charge of the quartermaster's department. Permanent works of defense and lands appurtenant thereto are under the direction and charge of the engineer department.

MILITARY SANITATION. See HYGIENE, *Military Hygiene.*

MILITARY SCHOOLS. See MILITARY EDUCATION; MILITARY ACADEMY, UNITED STATES.

MILITARY SCIENCE. Military science or "the art of war has for its object: first, to determine the time, place, and character of battles and conflicts so that the greatest benefits may result from victory and the least injury from defeat; second, to make one's self stronger than the enemy at the time and place of actual combat. The first of these objects is accomplished by strategy, including logistics; the second by logistics, discipline, grand and minor tactics, and military engineering. None of these branches can be practiced, or even intelligently studied separately; nor can one be rated as of higher value than the others, since ultimate success must depend upon them all. The highest strategy accomplishes nothing unless the logistic and tactical requirements for success in battle are satisfied. The best tactical arrangements and actions may result in victories entirely barren, even sometimes worse than defeat, owing to faulty strategical dispositions; while a failure in logistics will, of necessity, destroy all strategical and tactical combinations.

"To show more clearly the relations of these subdivisions to the objects of the art of war, it is only necessary to call attention to the fact that whether or not the 'greatest benefit will result from victory and the least injury from defeat' will depend upon the positions of the opposing armies with reference to each other's communications, lines of retreat, and objectives, before and after conflicts, the moral and political effects produced by the results of battles, and the times of their occurrence. These considerations evidently involve questions of strategy, including statesmanship, both in planning campaigns and forecasting their results; and logistics, in preparing for the execution of the plans. The second object will be accomplished to a greater or less degree: first, by rapidity of concentration, giving a greater number of men at the place of actual conflict. Second, by better arms, ammunition, and supplies, better defensive arrangements, better training and discipline, or better handling of the masses or small groups, making the same, or a less, number of men stronger than the hostile force. Third, by localizing the conflict upon a point where this superiority exists. The first is a question of logistics; the second of logistics, engineering, discipline, and grand or minor tactics; and the third of grand or minor tactics, depending upon the force engaged.

"Tactics may be defined generally as the art of so handling bodies of troops, large or small, as to utilize to the fullest extent the fighting, manœuvring, and resisting capacity of every individual, weapon, and resource of all arms of the service. When applied to the combined action of large masses, made up of different arms, it is called grand tactics. When restricted to the actions of small bodies, or single arms, it is called minor tactics. This division is general and not well defined, since the two run imperceptibly into each other.

"Logistics embraces all the details of moving and supplying armies. It is essentially the province of the staff, and its different branches are apportioned to the different staff departments.

"Strategy has for its object so to inaugurate and conduct wars, campaigns, and battles as, first, to take advantage of all available means for securing success; and, second, to cause the greatest benefits to result from victory and the least injury from defeat. . . . Under the first heading it involves questions of statesmanship and diplomacy. . . . Under the second it is more frequently concerned in the moral effect to be produced by a battle, resulting, in case of victory, from the absolute losses inflicted upon the enemy or the disadvantageous positions in which he may be placed with respect to his bases of supply and lines of communications; and, in case of defeat, from the corresponding losses of our own army." (*Elements of the Art of War,* by James Mercur, Colonel, U. S. A., professor of civil and military engineering at the United States Military Academy, West Point, N. Y.)

Military engineering includes the technical work connected with the construction of permanent and field fortifications, including siege works, reconnaissance, constructing and dismantling bridges, military roads and trails, the construction, operation, and maintenance of railroads in the theatre of operations under military auspices and for military purposes, the transportation of engineering equipment such as reconnaissance instruments, the light and heavy bridge trains, intrenching tools, etc. Consult *Engineer Field Manual, United States Army.*

Logistics falls under the general head administration, as distinguished from organization and operations. The details of moving and supplying armies, or logistics, come under two very general classes of activities: the service of the interior and the service of the theatre of opera-

tions. The service of the interior is carried on by department (territorial) commanders and bureau chiefs having for this purpose general depots of supply, general hospitals, arsenals, etc. The service of the theatre of operations is carried on by the commander of the field forces and is divided into two zones: (*a*) the zone of the line of communications, (*b*) the zone of the advance. The function of the service of the interior is to supply the commander of the field forces with the means necessary for the accomplishment of his mission, i.e., to concentrate such means at the principal base of the field forces. From this principal base up to and including the advance bases in rear of the fighting divisions extends the line of communications, the commander of which is responsible to the field commander for its efficient operation and defense. From the advance bases to the fighting units is the zone of the advance, within which operate the division combat, field, ammunition, supply, sanitary, and engineer trains, designed to supply their fighting units so as to keep them always ready for action and without hampering their freedom of movement. Consult *Field Service Regulations of the United States Army* (Washington, 1914). See Logistics; Strategy; Tactics, Military.

MILITARY SERVICE INSTITUTION OF THE UNITED STATES. An organization controlled by officers of the United States army, associated with the National Guard and others for professional improvement, the interchange of views upon military matters, and such topics in general as may be calculated to promote the military interests of the United States. In 1877 General Stanley, General Fry, General Rodenbough, and Colonel Lieber issued a circular requesting the presence of the officers in the army at a meeting to consider the practicability of forming an association similar to the Royal United Service Institution of Great Britain. About 40 officers responded, and the Institution was organized, with General Hancock as president. The headquarters of the Institution are at Governors Island, N. Y. The *Journal of the Military Service Institution*, a bimonthly, published its first number in January, 1880, and is devoted to military history and the discussion of current military questions, domestic and foreign. It is universally regarded as a publication of great international importance in its own domain. Under the management of the publication committee, essays upon military subjects, for which prizes of gold and silver medals and money are annually awarded, have been a feature. Under an agreement between the Public Library of the City of New York and the Military Service Institution, the entire collection of books and pamphlets belonging to the Institution (amounting to nearly 10,000 volumes, among which are many rare books and manuscripts), with the exception of those needed for reference, has now been placed in a section of the library at Fifth Avenue and Forty-second Street, to be known as the Military Section, duly catalogued and made available for the circulation to members of the Institution and for reference to the general public. The Institution also possesses a valuable collection of military relics and trophies, together with specimens or models after the latest war material, open to visitors.

MILITARY SIGNALING AND TELEGRAPHING. See Signaling and Telegraphing, Military.

MILITARY SURGEON. See Surgeon, Military and Naval.

MILITARY SURGERY. See Surgery, Military.

MILITARY TACTICS. See Tactics, Military.

MILITARY TENURE. A form of landholding in England under the feudal system of land tenure, originally based on the obligation of the freehold tenant to render actual military duty to the crown as the service or rent due from the land so held by him. It was also known as tenure in chivalry or by knight's service. See Feudalism; Tenure.

MILITARY TERRITORIES OF FRENCH SUDAN. Formerly three territories comprising the eastern part of the African region previously known as French Sudan (q.v.), and extending from the eastern boundary of French Senegal and French Guinea to Lake Chad, and from the northern borders of Nigeria, Dahomey, Togo, the Gold Coast, and the Ivory Coast northward into the Sahara Desert. The region included in these territories comprised in 1915 the French colony of Upper Senegal and Niger and the Military Territory of the Niger. See French Sudan; French West Africa; Niger, Military Territory of the; Upper Senegal and Niger.

MILITARY TRENCH. See Trench, Military.

MILITARY UNIFORMS. See Uniforms, Military and Naval.

MILITARY VOLUNTEER. See Volunteer, Military.

MILITCHEVITCH, mē'lĕ-chĕv'ĭch, Djakov Milan (1831–1908). A Servian ethnologist and writer on educational topics. He was born near Belgrade. Having studied theology and done some teaching, he obtained, in 1852, a state office and was made secretary to the Servian Minister of Education in 1861. In 1886 he was appointed librarian of the Belgrade National Library. Among his writings are an exhaustive topographical work, *The Principality of Servia* (1876); *Servian Peasant Life* (1867, 1894); *The Kingdom of Servia* (1884); *Letters on the History of the Servians and Bulgarians* (1858–59); *Education in America* (1863); *Letters of a Tourist* (1865); *Schools in Servia* (1868); *Lives of Famous Servians* (1888); the pedagogical periodical *Skola* (*The School*, 1868–76), and short sketches like *Furmus and Fatima* (1879) and *Winter Evenings* (1879). Militchevitch was one of the most learned and talented Servian authors of his time.

MILITELLO, mē'lĕ-tĕl'lō, in Val di Catania. A town in the Province of Catania, Sicily, situated 25 miles southwest of Catania, with which it is connected by rail. It trades in wine, tropical fruit, and silk. Pop. (commune), 1901, 11,539; 1911, 11,232.

MILITIA, mĭ-lĭsh'à (Lat. *militia*, military service, soldier, from *miles*, OLat. *meiles*, soldier). The entire body of male citizens liable to military duty. In England, since 1908, the organized forces are called the *regular army* and the *territorial army*. The regular army has two reserves—the *army reserve* and the *special reserve*. The latter was created out of the militia in 1907. The *territorial army*, which serves only at home in peace time and is intended primarily for home defense, amounted to 315,000 in 1914. This latter force corresponds to the *organized militia* in the

United States. In addition the colonies maintain militia forces, called citizen forces or territorial armies. Specifically the title applies to the purely defensive branch of the national military system of the countries referred to, the *mobile* and *territorial militia* of Italy and the *opolchénié* of Russia closely resembling it. The *Landwehr* and *Landsturm* of Germany and Austria and the *territorial army* of France may also be regarded as the militia equivalent, the service, however, being compulsory instead of voluntary as in England and the United States. In the United States the system differs somewhat from the English in that it is not a Federal or national force, unless called into the service of the Federal government or unless accepted as volunteers by the President during the existence of war or when war is imminent under the provisions of the Act of Congress approved April 25, 1914. When the militia, as such, is called into the service of the United States it must serve during the period specified by the President in the call for militia, but individuals cannot be held beyond the period of the existing State commission or enlistment, usually two or three years. As militia it cannot serve without the territorial limits of the United States. If the militia, however, changes its status to that of volunteers and is accepted as such under the Volunteer Act of April 25, 1914, such troops then serve, unless sooner discharged, for a period of four years, and may be employed beyond the territorial limits of the United States. The act quoted is regarded as one of great moment in that it affords a means of changing the State militia into a true Federal force subject to all the rules and regulations of the regular army except that no reserve service is required. From 1775 to 1783 the bulk of the Federal armies consisted of State troops, a condition which continued to exist long after the Revolution itself. The United States militia consists of every able-bodied male citizen of the respective States, Territories, and the District of Columbia, and every able-bodied citizen of foreign birth who has declared his intention to become a citizen, who is more than 18 and less than 45 years of age. It is divided into two classes—the organized militia, known as the national guards of the State, Territory, or District of Columbia, or by such other designation as may be given them by the laws of the respective States or Territories, and the remainder known as the reserve militia. It is impracticable of course for the President to call out this reserve militia, as it does not possess a military organization. The organization, armament, and discipline are the same as those prescribed for the regular and volunteer armies of the United States, but the effectiveness of the organized militia as a military force is seriously handicapped by the constitutional provisions which reserve to the State the appointment of all officers in peace and war, the training and government of the forces when not in the service of the United States, and the limited instruction provided by the State authorities in peace. The officers are usually elected by the men and appointed by the governor. The President may call out, for a period specified by him, such numbers of the militia of the States, Territories, or District of Columbia as he may deem necessary "to suppress insurrection, repel invasion, or to execute the laws of the Union," but for no other purpose. During their period of service they become subject to the same rules and articles of war as the regular forces, except that they cannot be called upon to serve outside the United States. Experience in using State militia as a Federal force has always proved unsatisfactory. In 1915 legislation for the creation of a national militia was under consideration. Each State and Territory and the District of Columbia has an adjutant general, who is charged with the duties as prescribed by the State and the rendering of regular reports to the Secretary of War regarding the strength, condition, etc., of the organized militia of the State to which he belongs. See *Army* under UNITED STATES.

The table on page 668 is an abstract of the militia force of the United States (organized), according to the report of the Chief of Division of Militia Affairs, War Department.

The militia of Great Britain was a constitutional force raised under authority of Parliament for national defense only. It could not be used on foreign service without its consent and the authority of Parliament. Before the Norman Conquest rents for land were paid in body service, the able-bodied men of each family bearing arms in numbers proportionate to the land held by the family. This system is attributed to the Saxon King Alfred. The country was organized into dukedoms, hundreds, tithings (ten tithings making the hundred), and families, the number of families in a tithing varying with the necessities of the times. After the decisive battle of Hastings (1066) the *fyrd*, as the militia was then called, ceased to exist officially, although continuing to give the Normans considerable trouble. The national exigencies during the Seven Years' War rendered imperative the reorganization of 1757, since which period more attention has been devoted to it. In 1871 the War Office assumed control and the county authorities ceased to have any active interest in it other than the right to nominate officers. In 1906 it was a part of the military territorial system, two or more local militia battalions being attached to each territorial district and forming the third, fourth, or fifth battalion (as the case might be) of the regular regiments to which they were attached. In 1908 the militia was abolished and converted into the special reserve and territorial force. See *Army* under UNITED KINGDOM.

In Russia what is now the opolchénié was originally a simple militia, which was reorganized in 1888 and again in 1891, when the period of service was changed from 40 to 43 years for the soldiers and from 50 to 55 for the officers. Service in the Russian army, 1914, is as follows: from the twentieth to the forty-third year, divided into two classes—service in the active army and its reserve for 18 years, service in the opolchénié or territorial army for 5 years. The opolchénié is divided into two "bans," or levies, (1) trained men who have passed through the active army and the annual surplus of young men, (2) the levy en masse, containing all those exempted from actual service, whether as students, only sons, or those not up to physical standards, and also the older classes of the surplus men who have all had a certain amount of training. This second "ban" corresponds to the United States reserve or unorganized militia.

Service in the Italian army, 1914, is for 19 years. Commencing at the age of 20, there are three classes, as follows: first, those in the permanent army; second, those in the permanent

STRENGTH OF THE ORGANIZED MILITIA OF THE UNITED STATES AND HAWAII, 1914

STATE, TERRITORY, OR DISTRICT	General officers of the line	Officers, Adjutant General's Department	Officers, Inspector General's Department	Officers, Judge Advocate General's Department	Quartermaster Corps or Department		Subsistence Department		Medical Department		Officers, Pay Department	Corps of Engineers		Ordnance Department		Signal Corps		Cavalry		Field Artillery		Coast Artillery Corps		Infantry		Total		Aggregate
					Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men		Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	Officers	Enlisted men	
Alabama	1	2	...	...	4	...	...	...	3	39	...	...	...	1	...	...	...	...	...	11	316	...	...	141	2,254	163	2,609	2,772
Arizona	...	(*)	...	...	1	...	...	...	4	12	...	...	...	...	...	...	...	...	...	...	...	...	...	40	633	45	645	690
Arkansas	...	2	1	1	2	...	...	...	11	2	...	...	...	1	...	...	...	...	...	...	...	...	...	91	1,400	109	1,402	1,511
California	1	2	1	1	2	...	...	...	26	110	...	...	...	1	...	3	84	16	237	19	263	41	716	139	2,194	252	3,604	3,856
Colorado	...	2	...	...	1	...	1	...	13	74	...	3	26	1	...	3	47	9	244	6	228	...	...	83	1,314	122	1,933	2,055
Connecticut	...	2	1	...	2	17	...	...	18	98	...	...	...	1	1	3	71	6	125	2	75	45	697	97	1,427	177	2,511	2,688
Delaware	...	1	1	1	1	2	...	...	3	10	...	...	...	1	1	...	...	...	...	...	...	...	...	33	452	41	465	506
District of Columbia	1	2	1	1	2	2	2	1	13	75	2	...	...	1	1	3	57	...	...	4	91	...	...	92	1,494	124	1,721	1,845
Florida	...	2	...	1	4	3	...	...	5	18	...	...	...	1	1	...	...	...	...	...	...	...	...	60	1,053	73	1,075	1,148
Georgia	1	3	1	1	5	1	...	...	15	26	...	...	...	2	...	...	...	18	229	12	214	14	143	153	1,877	225	2,490	2,715
Hawaii	...	1	1	1	3	...	...	...	5	15	...	...	...	1	...	...	...	...	...	...	...	...	...	44	843	56	858	914
Idaho	...	1	1	1	3	...	...	...	6	24	...	...	...	1	...	...	...	...	...	...	...	...	...	45	815	58	839	897
Illinois	2	6	3	3	14	1	...	...	45	177	...	4	60	3	1	3	51	36	522	14	260	...	...	375	4,375	508	5,447	5,955
Indiana	1	2	...	1	4	...	...	...	14	106	...	...	...	1	...	3	61	...	...	13	225	...	...	130	1,717	169	2,109	2,278
Iowa	1	2	...	1	5	...	...	...	21	84	...	...	...	1	...	...	...	...	...	...	...	...	...	186	2,930	217	3,014	3,231
Kansas	...	2	1	1	5	...	...	...	7	25	...	...	...	1	...	...	...	...	...	5	98	...	...	110	1,597	132	1,720	1,852
Kentucky	1	2	1	1	2	...	...	...	16	87	...	...	...	1	...	...	...	...	...	...	...	...	...	140	2,123	164	2,210	2,374
Louisiana	...	1	1	...	1	...	...	...	10	39	...	...	...	1	...	...	...	3	46	13	245	...	...	35	679	65	1,009	1,074
Maine	...	1	1	1	...	1	1	1	9	38	...	...	...	2	...	...	...	...	...	...	...	44	677	49	687	108	1,404	1,512
Maryland	1	2	1	1	3	2	...	...	16	78	...	...	...	1	1	...	...	3	57	...	...	...	...	129	1,848	157	1,986	2,143
Massachusetts	2	4	3	3	6	5	3	2	41	160	4	...	...	3	...	3	86	16	230	17	332	48	718	271	3,836	424	5,369	5,793
Michigan	1	2	1	1	2	...	1	...	11	106	1	3	97	1	...	3	56	6	97	12	127	...	...	144	1,995	189	2,478	2,667
Minnesota	(†)	3	1	1	4	...	...	...	14	49	...	...	...	2	...	...	...	...	...	36	626	...	...	159	2,568	220	3,243	3,463
Mississippi	...	2	1	1	1	...	1	...	12	16	1	...	...	1	...	...	...	...	...	...	...	...	...	74	974	94	990	1,084
Missouri	1	1	1	1	5	4	...	...	17	110	...	...	...	2	1	4	89	2	59	7	204	...	...	203	3,373	244	3,840	4,084
Montana	...	1	...	...	1	...	...	...	2	12	...	...	...	...	...	...	...	...	...	...	...	...	...	36	624	40	636	676
Nebraska	...	2	1	1	2	1	...	...	20	88	...	...	...	1	1	4	86	...	...	...	...	...	...	101	1,208	132	1,384	1,516
Nevada‡	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
New Hampshire	...	1	...	1	2	3	...	...	7	32	...	...	...	1	...	1	37	3	61	5	133	16	214	53	800	90	1,280	1,370
New Jersey	1	4	1	2	8	...	...	...	27	130	...	...	...	1	3	4	59	10	176	10	199	...	...	236	3,447	304	4,014	4,318
New Mexico	...	1	...	1	1	...	...	...	6	17	...	...	...	...	...	...	...	...	...	4	133	...	...	44	760	57	910	967
New York	5	7	5	3	4	48	3	7	117	581	...	46	708	5	18	6	155	59	921	60	1,063	106	1,839	548	10,251	974	15,591	16,565
North Carolina	1	2	1	1	5	...	...	...	26	59	...	...	...	2	...	...	...	6	89	...	...	20	354	145	1,865	209	2,367	2,576
North Dakota	...	1	...	1	1	...	...	...	4	23	...	...	...	...	...	...	...	...	...	...	...	...	...	53	656	60	679	739
Ohio	2	5	2	1	9	...	...	...	47	242	...	13	177	2	...	11	113	17	207	16	254	...	...	365	4,644	490	5,637	6,127
Oklahoma	...	1	1	1	2	...	...	...	11	46	...	3	61	1	...	5	163	5	118	...	...	...	...	47	942	77	1,330	1,407
Oregon	...	1	1	1	2	...	...	...	6	32	...	...	...	1	...	...	...	3	66	5	76	34	521	46	706	100	1,401	1,501
Pennsylvania	5	5	5	3	9	6	6	6	42	175	...	6	117	5	5	3	57	31	449	9	156	...	...	616	9,219	745	10,190	10,935
Rhode Island	...	1	1	1	1	6	...	...	9	36	...	...	...	...	4	...	...	11	157	5	112	67	988	...	...	96	1,303	1,399
South Carolina	1	2	1	1	5	...	...	...	5	24	...	...	...	1	...	...	...	...	...	...	...	...	...	140	1,770	156	1,794	1,950
South Dakota	...	1	1	1	3	...	...	...	6	22	...	...	...	1	...	...	...	...	...	...	...	...	...	55	851	68	873	941
Tennessee	...	1	1	1	2	1	...	...	14	138	...	...	...	1	...	...	...	3	48	...	...	...	...	94	1,611	117	1,798	1,950
Texas	1	2	1	1	6	...	...	...	23	57	...	...	...	1	...	...	...	14	207	3	94	...	...	140	2,373	192	2,731	2,923
Utah	...	1	1	...	...	1	...	...	3	17	...	...	...	...	...	3	52	...	...	5	88	...	...	16	261	29	419	448
Vermont	...	1	1	1	2	...	...	...	5	19	...	...	...	1	...	...	...	15	153	...	...	...	...	49	645	75	817	892
Virginia	1	2	...	1	2	1	1	...	14	66	1	...	...	1	...	3	69	...	...	17	215	...	...	163	2,255	206	2,606	2,812
Washington	...	1	...	...	2	1	...	...	7	24	...	...	...	1	...	4	77	3	76	...	...	15	283	55	851	88	1,312	1,400
West Virginia	...	1	...	...	2	...	...	...	8	36	1	...	...	1	...	...	...	...	...	...	...	...	...	91	1,481	104	1,517	1,621
Wisconsin	...	2	...	...	3	2	...	...	15	84	...	...	...	...	1	...	...	3	68	4	87	...	...	166	2,689	193	2,931	3,124
Wyoming	...	2	...	1	1	...	...	...	4	18	...	...	...	...	...	...	...	...	...	...	...	...	...	46	742	54	760	814
Total, inspections 1914	31	98	47	48	157	108	19	17	783	3,556	10	78	1,246	59	39	72	1,470	298	4,642	314	5,914	450	7,150	6,328	95,109	8,792	119,251	128,043

* Detailed from First Infantry; included in regimental report.

† Vacancy in office of brigade commander

‡ No organized militia (mustered out May 20, 1906).

army but with "unlimited leave"; third, those exempted from active service, who are assigned to the territorial militia. The time is spent as follows: 2 years with the colors, 6 years in the reserve, 4 years in the mobile militia, 7 years in the territorial militia, total 19 years, thus completing service at the age of 39.

Service in the French army, 1914, is from the age of 20 to 48. In the first line or active army, 3 years; in the reserve for that army, 11 years; in the territorial army, 7 years; in the territorial reserve, 7 years; total service 28 years, ending in the forty-eighth year.

In Switzerland the entire army, comprising as it does every able-bodied citizen, is a militia. Switzerland is unique in that it has no permanent or standing army, depending solely on its national militia. Service extends from the seventeenth to the forty-eighth year, actual service commencing at 20. Periods (1914) are as follows: 12 years in the first line, called the Auszug or Elite; 8 in the Landwehr; 8 in the Landsturm. A soldier has from 65 to 90 days' training the first year, and subsequent annual trainings of 11 days each for seven years, when all below the rank of sergeant are excused from further attendance. The Landwehr are called out only once for 11 days. It is thus seen that this is a true militia—first trained and then returned to civil pursuits, subject to call when needed—and that there is no standing or permanent army as in the other countries just referred to. This militia service, however, is compulsory and universal. See CONSCRIPTION; LANDSTURM; LANDWEHR; NATIONAL GUARD; VOLUNTEER, MILITARY; and section *Army* under the different countries.

MILIUM, mĭl'ĭ-ŭm. A skin disease known also as grutum. It is characterized by the formation of small, round, noninflammatory elevations situated immediately beneath the epidermis and consisting of sebaceous matter. These bodies are distributed mainly on the eyelids, forehead, and face, occur especially in elderly people, and may in time undergo calcification. Colloid milium is a rare form of the disease in which the bridge of the nose, forehead, and cheeks present minute shining lesions of a pale lemon color.

MILK (AS. *meole, meoluc*, Goth. *miluks*, OHG. *miluk*, Ger. *Milch;* connected with AS. *melcan*, OHG. *melchan*, Ger. *melken*, Lat. *mulgere*, Gk. ἀμέλγειν, *amelgein*, OChurch Slav. *mlĕsti*, Lith. *milsti*, to milk, Skt. *marj*, Av. *marəz*, to rub off). The liquid secreted by the mammary glands of all mammals and used primarily to nourish their young. From the earliest time it has been esteemed an important and necessary article of food and many hidden virtues were ascribed to it by the ancients. Its exact composition continued long unknown, and until the beginning of the seventeenth century fat, casein, and whey were the only constituents recognized. In the early part of the eighteenth century Leeuwenhoeck discovered the microscopical characteristics of milk, and about the same time Boerhaave made a qualitative examination. The first quantitative analysis of milk recorded was made in 1737 by Geoffrey, who determined with considerable accuracy the casein, milk sugar, and mineral matter.

The milk from different animals varies considerably in composition, as shown in the following table:

COMPOSITION OF MILK

KIND	Water	Total solids	IN TOTAL SOLIDS				
			Fat	Casein	Albumin	Milk sugar	Ash
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Woman	87.4	12.6	3.8	1.0	1.3	6.2	0.3
Cow	87.2	12.8	3.7	3.0	0.5	4.9	0.7
Buffalo	81.4	18.6	7.5	5.8	0.3	4.1	0.9
Goat	85.7	14.3	4.8	3.2	1.1	4.4	0.8
Ewe	80.8	19.2	6.9	5.0	1.5	4.9	0.9
Llama	86.5	13.5	3.2	3.0	0.9	5.6	0.8
Mare	91.5	8.5	1.2	1.2	0.1	5.7	0.3
Ass	89.6	10.4	1.6	0.7	1.6	6.0	0.5
Camel	86.6	13.4	3.1	4.6	4.0	5.6	0.7
Sow	84.0	16.0	4.0	7.2	7.2	3.1	1.1
Elephant	67.9	32.1	19.6	3.1	3.1	8.8	0.6
Porpoise	41.1	58.9	45.8	11.2	11.2	1.3	0.6
Dog	75.4	24.6	9.6	6.1	5.1	3.1	0.7
Cat	82.1	17.9	3.3	3.1	6.0	4.9	0.6

The above are general averages of a greater or less number of analyses, depending upon the kind of milk animal, each kind of which gives milk that varies considerably with the individual as well as with the species. There is, furthermore, some difficulty in arriving at a general average for any kind of mammal, since normal milk is obtained with difficulty from animals unaccustomed to being milked.

Properties of Cows' Milk. Since, in general properties and composition, cows' milk is typical of all milks, is of chief commercial interest, and has been studied much more in detail, it will be the main subject of this article. The milk secreted immediately after parturition is termed *colostrum* (q.v.), or *beastings*, and differs considerably from normal milk in both physical and chemical characters. Milk from which the fat has been removed by skimming or by the separator is called skim milk (q.v.), and the residue left after churning cream is known as buttermilk (q.v.). Whey (q.v.) is the liquid remaining after the curd of the milk has been separated.

Cows' milk is an opaque, whitish liquid, sometimes faintly yellow or bluish, with a slight alkaline reaction and a sweetish taste when fresh. It is heavier than water, its specific gravity ranging usually from 1.029 to 1.035, the average for mixed milk being about 1.032. By removing the fat (skimming the cream) the specific gravity is raised and by adding water it is lowered. This is the basis of a simple, but (when taken alone) unreliable, test of the qual-

ity of milk and of the practice of skimming. Chemically, milk consists of an aqueous solution of milk sugar, casein, albumin, and ash, with the fat in suspension, forming an emulsion. The water and the constituents dissolved in it constitute the milk serum, and the constituents (i.e., the dry matter) minus the water are designated total solids. The proportion of total solids is a general indication of the richness of the milk. Among the solids the chief importance attaches to the fat. First, it is the measure of the value of milk for butter making, and to a very great extent for cheese making also; second, it is the constituent which more than any other gives milk its appearance of richness; third, it fluctuates more widely than any other constituent. Milk fat is a familiar substance in the form of butter, which contains about 85 per cent of fat, some water, salt, and casein. The fat in milk is in the form of minute globules held in suspension, and on standing it rises to the surface as cream (q.v.), which contains some of the other constituents in smaller proportion. The globules may be readily seen by means of a microscope. For a long time fat globules were believed to be surrounded by a membrane or proteid coating, which was destroyed by churning the cream and thus allowed the fat to unite into a solid mass. This view is still held by some, but the prevailing belief at present is that the globules are free and owe their spherical form to the surface tension. The globules vary greatly in size, being from $\frac{1}{1800}$ to $\frac{1}{26000}$ of an inch in diameter. A pint of average milk has been estimated to contain not far from a million globules. The size of the globules varies with the period of lactation, diminishing towards the close, and to some extent with the breed and the individual. The globules in the Jersey and Guernsey milk are relatively large; in Holstein milk very small. The large globules rise more rapidly, and milk containing them creams more readily and completely.

Milk fat is a pale yellow substance consisting of a mixture of the glycerides of eight or more fatty acids. Of these olein constitutes about 35 per cent, palmitin 25.7, myristin 20, laurin 7.5, butyrin 3.85, caprin 3.6 per cent, and the remainder is principally caprylin and stearin. By the action of caustic alkali these glycerides are broken up into their respective fatty acids and glycerin, and a certain relatively small proportion of these, including the butyric, caproic, and caprylic acids, are volatile. The characteristic flavor and aroma of milk and butter are due largely to butyrin, and this decomposes readily, forming butyric acid, which is evident in rancid or "frowy" butter. The chief nitrogenous or albuminoid constituent of milk is casein, which is of prime importance in cheese making. It is coagulated by rennet and by acids, and this is what gives sour milk its thick curdled appearance. The acid developed in souring precipitates the casein, which gradually separates from the soluble constituents, inclosing much of the fat. Casein is held in solution in milk by the presence of lime salts, and lime water causes it when curdled to separate in a much more finely divided condition. The albumin of milk is not curdled by acids or rennet, but is acted upon by heat. Fibrin, similar to that of blood, globulin, nuclein, and several other nitrogenous bodies, have been found in milk in small quantities, but are of little importance. The sugar in milk, chemically known as lactose, is not so sweet as cane sugar. It is in solution. The ash of milk consists of a mixture of a number of salts, but is composed principally of the phosphates of lime and potash, the chlorides of potash and soda, and small amounts of phosphate of iron and magnesia. Some of the phosphate of lime appears to be associated with the casein, which also contains some sulphur. Most of the salts are in solution. Besides the constituents named, milk contains normally a coloring matter, a trace of citric acid, urea, and several other bodies. The fat and the albumin of milk are the most variable constituents, the ash and the sugar the least so. The casein bears a quite constant ratio to the fat, rising and falling with it.

The natural yellow color of milk, as Eckles has found, is due to the pigments carotin and xanthophyll, constituents of green plants, which are taken up from the feed and secreted in the milk fat.

Variations in Milk. The richness of milk is to a certain extent an individual characteristic; i.e., some individuals normally give rich milk, while others, for no apparent reason, give milk containing large percentages of water. The richness of milk has been increased by domestication, care, and breeding, and certain breeds of cows, sheep, goats, etc., have been produced which give a characteristically rich milk. The quality also varies with the stage of lactation. The milk given early in the lactation period is usually poorer than that secreted later, and grows richer towards the close of the period until the animal "goes dry." Young animals usually give poorer milk and less of it than after the third or fourth parturition, and the milk from the first part of any milking is poorer than the last part, or "strippings." The kind of food has little effect on the composition of milk, provided it is wholesome and the amount sufficient. Food influences the proportion of the different fatty acids composing the fat, and so has an effect on the hardness and other qualities of butter. But the rather prevalent notion that the milk fat can be permanently increased by feeding has been shown by much careful investigation to be a fallacy. Little is known of the physiological processes by which the constituents of the food are transformed into milk constituents. In some cases there appears to be a direct transmission of the constituents from the food to the milk, as is noticeable when cows eat garlic, onions, etc. The experiments of Jordan at the New York State Experiment Station have shown that milk fat is not derived solely from the fat of the food, for cows fed upon food from which the fats were practically completely extracted continued to secrete milk of normal composition for long periods, and, judging from the maintenance of their weight, did not draw upon their body fat to supply this ingredient. Under the conditions of the experiments the carbohydrates seemed to be utilized to some extent in the elaboration of milk fat. The more the process of milk secretion is understood the more apparent it becomes that richness and the volume of the yield are individual characters, and if cows have a tendency to give poor milk no amount of feeding will overcome it. The remedy lies in getting better cows. For general statements regarding the composition of the milk of different breeds of cows, see CATTLE.

As an illustration of the variation of the milk of ordinary cows of mixed breeding the data

obtained by Van Slyke in New York from the analysis of the mixed milk of 15,000 cows each month from May to October may be cited. The total solids ranged from 11.17 to 13.91 and averaged 12.67 per cent, and the fat from 3.04 to 4.06 and averaged 3.75 per cent. The content of total solids and of fat was lowest during the summer months and increased in the fall. In the analysis of over 3000 samples of milk at the Massachusetts Experiment Station the total solids varied from 10.02 to 19.55 and averaged 13.57 per cent, and the fat from 1.5 to 10.70 and averaged 4.32 per cent. The analysis of 800 samples made at the experiment stations in different parts of the country varied in total solids from 9.3 to 19.7 per cent, averaging 12.8 per cent, and in fat from 1.7 to 6.5, averaging 3.7 per cent.

Milk Fermentations. Milk is subject to a great variety of fermentations, for it is a favorable medium for the growth of many kinds of bacteria, yeasts, and other fungi which cause numerous changes in its constituents. Thus, while one class of organisms curdles milk by the production of lactic acid, another class gives it an alkaline reaction, at the same time curdling it; others impart to it a deep blue, violet, yellow, green, or red color, by the production of pigments in the milk; others give it a bitter or other unpleasant taste; another class produces alcohol from the milk sugar, and is taken advantage of in the preparation of such beverages as kumiss and kefir (qq.v.), and still others cause putrefaction. The most common and familiar change is the souring of milk, due usually to the action of lactic-acid bacteria. Under ordinary conditions normal milk nearly always undergoes some sort of lactic fermentation on standing. The production of lactic acid soon curdles the milk and obscures all other forms of fermentation, and the acid stops the growth of other bacteria, so that no subsequent effects are usually seen. The popular belief that the electricity in the air during thunderstorms sours milk appears to be unfounded, but its rapid souring at such times is due to the climatic conditions prevailing, which hasten bacterial growth. The same difficulty in keeping milk is experienced during very hot weather. Curdling is not always due to the formation of acid; milk apparently sour may have no acid taste. In such cases the cause is due to alkaline fermentation, induced by another class of organisms. The milk becomes coagulated into a soft slimy mass, which is usually bitter and has an alkaline or neutral reaction. Ordinarily this form of fermentation is not very apparent, as the organisms causing it grow slowly and the lactic-acid organisms get the start of them. The organisms which produce butyric acid in milk attack and decompose the fats, giving a rancid odor. In the ordinary handling of milk the latter are of little importance, but it is supposed that they have an important effect upon the keeping properties of butter. Several organisms have been described which impart a bitter taste to milk, due, in some cases at least, to the production of a bitter principle. Milk which has been boiled is likely to develop a bitter taste, for the reason that the heating kills the lactic-acid germs, while the bacteria causing the bitter taste usually possess endospores which are not destroyed by heat and so have a clear field for action. A slimy fermentation of milk is a somewhat common occurrence, and occasionally produces great trouble in dairies, since it destroys the milk for all ordinary uses. Such milk becomes thick and ropy, will not cream, cannot be churned, and is unfit for drinking. It may be caused by a variety of organisms. There are several forms of the trouble. One known as the "lange wei" (long or stringy whey) is made use of in the manufacture of Edam cheese in Holland, to control the gassy fermentation of the curd.

In addition to the fermentations and other changes in milk due to microörganisms, rennet, an unorganized ferment obtained from the stomach of the calf and from some plants, ferments milk, causing it to curdle. This ferment is employed in cheese making to produce the curd. Babcock and Russell have discovered an unorganized ferment termed "galactase" in milk, which they believe to be a normal and inherent constituent, and which is active in the ripening of cheese, causing the characteristic changes in the green cheese which make it suitable for eating.

The chief sources of bacteria in milk are the cow herself, the milker, the dust of the stable, and the dairy utensils. It has long been believed that pure milk drawn from a healthy cow contains no bacteria and that all bacterial contamination of the milk comes from external sources. However, the large calibre of the milk duct makes it possible for bacteria to enter it and grow to a considerable extent, so that it becomes a matter of extreme difficulty to obtain milk from the cow, even with the greatest precautions, which shall not be contaminated. The hairs of the cow are always covered with dirt and dust, and the air of the stable is charged with dust from the fodder and bedding material, so that it is impossible to prevent some dirt from falling into the milk pail. Thus large numbers of bacteria, especially in poorly ventilated stables, reach the milk. Any dirt upon the hands or clothing of the milker will have abundant chance to get into the milk pails and cans. The milk vessels themselves are an important source of contamination, the corners and creases retaining bacteria which have not been removed or killed by the washing. The warm milk furnishes favorable conditions for the growth of these microörganisms which have gained access and which for a time multiply rapidly.

Several species of bacteria classed as pathogenic organisms are capable of living or even increasing in milk, but since they do not ferment the milk or alter its appearance sufficiently to be detected by a physical examination, their presence is not readily determined. Except in very rare instances the milk becomes contaminated after it has been drawn and in practically all these cases the cause of contamination is some form of uncleanliness, either of the stables, the water, the utensils, or the attendants. It is gratifying to know, however, that through the efforts of the United States Department of Agriculture, the agricultural experiment stations, and the dairymen themselves, the sanitary management of dairies is being constantly improved, and through the vigilance of State-appointed dairy inspectors unsanitary conditions are corrected as soon as discovered.

Milk Adulteration and Control. The milk supply of towns and cities has for many years been regulated by laws and ordinances and subjected to inspection. The object of this was formerly to prevent adulteration, but of recent

years the inspection has often extended to the herds and stables and all that relates to the milk trade. It has come to be realized that such factors as the health of the cows, hygienic condition of the stables, and cleanliness in the handling of the milk are quite as essential to pure wholesome milk as freedom from adulteration. Hence the veterinary inspection, which has been introduced in some cities, should be extended. Milk is most often tampered with by removing a part of the cream or by diluting it with water or skim milk. Coloring matter is sometimes added to make it appear richer, but the addition of chalk, burnt sugar, or similar substances is now rare. Preservatives, such as formaldehyde, borax, and salicylic acid, are frequently added to prevent milk souring. Opinions differ as to the injuriousness of these preservatives, but their use is generally condemned on the ground that they are unnecessary in pure milk and that they are a cloak for insanitary practices in the dairy. The standards for milk adopted by different States vary from 11.5 to 13 per cent for total solids and from 2.5 to 3.5 per cent for fat. Milk found below these standards is held to be adulterated. A standard of 12.5 per cent of total solids and at least 3 per cent of fat seems fair.

Various means of testing milk as to its quality have been suggested from time to time. Of these the lactometer is the simplest and has been extensively used by milk inspectors who have a large number of samples to examine daily to detect watering or skimming. It is a form of hydrometer, and shows the specific gravity of milk upon a graduated scale. But there are so many factors that affect the specific gravity, and this may vary so much in pure milk, that the lactometer reading is only an indication and cannot be relied upon as final. The most reliable and satisfactory of the simple milk tests is the Babcock test, which has come into very widespread use in the milk inspection of towns and cities and in determining the fat content of milk as a basis for paying for the product at creameries. (See CREAMERY; BUTTER MAKING.) This test is made in a special bottle having a narrow graduated neck. A definite quantity of milk is treated in the bottle with sulphuric acid to dissolve the curd and set the fat free. The bottle is then whirled rapidly in a centrifugal apparatus for a few minutes, to aid in separating the fat; hot water is added to bring the fat up into the neck, after which the bottle is whirled a second time and the column of fat read off on the graduated scale. The reading gives the percentage of fat without calculation. A large number of samples may be tested simultaneously, and the method has been shown to be very accurate after a little practice. It shows only the fat content, which is the common measure of richness; but from it and the lactometer reading the total solids and other constituents can be calculated. A bacteriological examination is rarely made in connection with the ordinary milk inspection.

Milk as Food. Milk is peculiarly adapted to be a food for man principally because it contains the four classes of nutrients—protein, fat, carbohydrates, and mineral matter—in more nearly the proper proportions to serve as a complete food than perhaps any other single food material. (See FOOD.) A quart of milk contains about four ounces of nutritive material, or about the same as three-quarters of a pound of beef or as six ounces of bread. Although these quantities of milk, beef, and bread supply like amounts of total nutrients, their nutritive values are not the same. In other words, they would not be equally useful as food, owing to the relative proportion in which the nutrients are present. Protein, fat, and carbohydrates occur in milk in about equal proportions. The chief nutrients in bread are carbohydrates and protein, and in meat protein and fat. Either milk or bread eaten alone would make a better balanced food for man than meat. In general, milk and cream together furnish to the diet of average American families about 20 per cent of the total food, 11 per cent of the total protein and also of the total fat, and about 5 per cent of the total carbohydrates. Dairy products (milk, cheese, butter, and cream) furnish over 22 per cent of the total food, 12 per cent of the protein, 32 per cent of the fat, and 5 per cent of the carbohydrates.

As regards the digestibility of all its ingredients, milk is one of the most digestible of animal foods. It has been found that on an average an adult digests about 97 per cent of the protein, 95 per cent of the fat, and 98 per cent of the carbohydrates of milk. According to American experiments, a child one year old eating milk digests on an average only about 90 per cent of the protein, 96 per cent of the fat, and 86 per cent of the carbohydrates of cows' milk. When milk is taken into the stomach it is speedily curdled by the action of the pepsin and acid of the gastric juice. When eaten alone or in large quantities the casein gathers in large lumps, which in some persons may be difficult to digest. This is particularly the case with infants and with adults whose digestion is weak. The casein of human milk is precipitated in more flocculent form than that of cows' milk, and is thus more easily digested and does not cause irritation. Lime, which tends to prevent the curdling of the casein of cows' milk in lumps, is frequently added as lime water to milk that is to be fed to infants or to adults of delicate digestion. The results of experiments upon the effect of cooking milk are conflicting. The more common experience seems to indicate that cooking or heating the milk renders it more difficult to digest. Some persons, however, cannot take fresh milk with comfort, but can digest boiled milk.

Milk is often said to be a perfect food. It is so for the young of the species of animal producing it, but there are three reasons why it cannot be considered a perfect food for adults. 1. The proportion of water is so large that great quantities (from 4 to 5 quarts) would have to be consumed each day in order to obtain the necessary nutrients. 2. The protein is present in rather large quantities as compared with the fats and carbohydrates. Thus, the milk necessary to furnish the 0.28 pound of protein per day, estimated to be required by a man at moderately active work, would yield only 2700 calories of energy, while milk in sufficient quantity to furnish the 3400 calories estimated as necessary would yield 0.34 pound of protein. 3. It is a well-recognized fact that the digestive functions require that food itself, besides the water taken with it, shall have a certain bulk. Cattle cannot generally be maintained in health upon a condensed ration such as grain; they seem to require a certain distention of the stomach, such as is brought about by the fibre (cellulose or woody matter) of grass or hay. In

like manner it seems desirable that man should have a certain amount of bulky material to produce distention or to promote peristaltic action of the intestines, or for other purposes not well understood. Of course, the nutritive constituents of milk, considered separately, are highly concentrated foods. While, therefore, milk alone cannot be considered as a perfect diet for adults, it is of special value as a food for invalids, because it is, as a rule, easily taken, easily digested, and does not generally irritate the alimentary canal. Furthermore, a milk diet is more readily under the control of the physician both as regards quantity and quality than a mixed diet is. If for any reason a child cannot be nourished on mother's milk, the most useful substitute is modified cows' milk. Various infant foods and milk substitutes have been proposed and are sold under divers trade names.

As a food for adults cows' milk is unusually well adapted for use in connection with other foods, either in its uncooked form in tea and coffee, as a beverage, as bread and milk, etc., or incorporated and cooked with other materials. In many culinary products it can be used instead of water. Analysis of bread, rolls, etc., made with milk would show about one-tenth more protein and one-twentieth more fuel value than bread made with water. Milk is very generally used in many kinds of cake and pastry and in custards. Where desirable from economical reasons, or as a means of increasing the proportional amount of protein in a diet, skim milk can be advantageously substituted for whole milk. At the price ordinarily paid in our large cities milk is a food of reasonable cheapness, and at the prices prevailing in small cities and country towns it is an economical food. Condensed milk is a more nutritious food, pound for pound, than fresh milk, since it has been concentrated by evaporation. It is, however, usually diluted before it is used, and then approximates fresh milk more or less closely in composition and food value. If the condensed milk contains added sugar its carbohydrate content is, of course, higher than that of unsweetened condensed milk, and when diluted, proportionally higher than that of fresh milk. Cream, which contains the greater part of the fat of the milk, as well as some protein and carbohydrates, is chiefly valuable in the diet as a source of energy. Curds obtained in the manufacture of cheese are eaten to a limited extent. They consist quite largely of the casein of milk, and hence supply the body with building material as well as energy. Butter and cheese (q.v.), the principal milk products used as food, are of great importance as articles of diet.

There are at least four distinct fermented beverages prepared from milk—kefir (q.v.), kumiss (q.v.), matzoon (q.v.), and leben. They are properly classed as food beverages and are often recommended for the sick and for convalescents. A number of special foods are made from the dry casein of milk and are used to a considerable extent by physicians to supply protein in a readily digestible form. The albuminoids of milk are used in the manufacture of egg substitutes. Milk sugar prepared from whey is an important article of diet for invalids and is used in medicine and in other ways. See MILK PRODUCTION.

Condensed Milk is the fresh milk of cows from which a considerable part of the water has been removed by evaporation to a semifluid condition, and to which sugar is usually, although not always, added to aid in preserving it. Both the sweetened and the unsweetened products are put up in hermetically sealed tin cans, or in bulk for the use of bakers, confectioners, and ice-cream manufacturers. Originally the unsweetened milk was sold under the name of evaporated cream, but this is forbidden under the pure-food laws.

The process of making condensed milk was invented by an American, Gail Borden, and patented in 1856. In this process the milk was concentrated by heating in a partial vacuum under a low degree of heat, and this principle is still employed in making the great bulk of condensed milk in the United States and Europe, in spite of numerous other processes. The product is made at factories, which require to be equipped with expensive machinery and need a large milk supply, preferably 15,000 pounds a day.

In 1909 the United States Census reported the production of condensed milk at nearly half a billion pounds a year, valued at $33,563,129. In 1914 the total number of condenseries in the United States was estimated at nearly 250. The industry has made rapid progress in Canada, Austria, New Zealand, Switzerland, Germany, Great Britain, Holland, Sweden, Norway, Russia, Japan, and India. The standard for condensed milk is about 28 per cent of total solids.

Milk Powder, Desiccated Milk, or **Dehydrated Milk** is made by evaporating milk, whole or skimmed, to dryness. The difference between the product and condensed milk is mainly in degree of concentration. The industry has developed rapidly in recent years. The bulk of the powder is made from skimmed milk, as that from whole milk becomes rancid rapidly. There are several processes. In one of the most successful the milk is condensed in a vacuum pan to about one-third its volume and then sprayed into a current of hot air in an evaporating chamber, where it rapidly parts with its vapor, the milk solids falling to the bottom as a finely divided powder. The powder contains 5 to 8 per cent of water and from 10 to over 20 per cent of fat, according to the process and the kind of milk used. The skim-milk product has about 37 per cent of proteids and 46 per cent of milk sugar. This product will keep indefinitely if not allowed to become moist. Vast quantities of milk powder are used in making milk chocolate and by bakers and confectioners. The proteids must be in soluble form to make the powder a satisfactory substitute for milk when dissolved in water. This is secured by keeping down the temperature of evaporation to prevent change in these bodies.

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MILK, Condensed. See Milk.

MILK, Fermented Beverages. See Kefir; Kumiss; Matzoon.

MILK CURE. The treatment of disease in the adult by the use of milk as a diet. In the milk cure all other food and drink are suspended for a time. Acting upon the information that milk requires about three hours for complete digestion, four ounces of milk are taken by the patient every three hours, beginning on rising in the morning. In a few days one or two tumblerfuls are taken at a time in place of the smaller quantity. Usually a patient takes two quarts a day; in some cases the total amount reaches five quarts. It is generally administered warm. In cases of stomachic or intestinal disorders the milk is allowed to stand for 24 hours and is then skimmed before being administered. Lime water, in the proportion of one-fourth of the bulk, overcomes the patient's repugnance to the diet and renders it more easy of digestion. Or the milk may be flavored with coffee, cocoa, salt, or caramel. After two or three weeks of strict milk diet it is advised that a little stale bread be added three times a day. A week later about two tablespoonfuls of rice or a little arrowroot is added. At the fifth week a chop is given once a day, and a few days later two chops a day are allowed. At the end of the sixth week full meals of various foods are resumed, milk continuing to be a principal part of the diet. Coffee, or aloes, or laxative mineral water is employed to overcome the constipation attendant upon a milk diet in adults.

The milk cure is successful in some cases of dyspepsia, gastric ulcer, chronic intestinal indigestion, enteralgia, chronic diarrhœa, and dysentery. In the treatment of ascites of hepatic origin it has been used since the days of Hippocrates, who refers to it. It has also proved efficacious in kidney and cardiac diseases and in rheumatic and gouty affections.

MILK FEVER, in Women. A slight, transient rise in temperature, preceded by chilly sensations, attending the establishment of the milk secretion in parturient women. Antisepsis and rational feeding have largely done away with milk fever, some modern authorities even doubting its existence. The older writers describe a condition in which the breasts become swollen, reddened, and tender, with a diminution in the lacteal discharge. It is seen occasionally in well-marked form in debilitated women, in whom a distinct chill, followed by a sharp rise in temperature and sweating, occurs. The condition requires no treatment, as a rule, except purgation.

MILK FEVER, Parturient Apoplexy, or Parturient Paresis. An afebrile disease of cows, especially good milkers of improved breeds in good condition, which occurs only at or near the time of calving. Parturition and plethora are preëminently the causes of the disease. Predisposing causes include confinement in the stall, high temperature, electrical disturbances, constipation, and mature age. The latest work indicates that the main cause of the disease is the production of poisonous metabolic products by secreting cells of the follicles of the udder, which act on the brain and central nervous system. The disease rarely follows the first and second calvings. One attack seems to predispose towards another. It appears in two forms—congestive and torpid. In the congestive form the cow suddenly becomes dull, allows the head to droop, staggers in attempting to walk, falls, and lies either on the breastbone, with the head turned around to the side and resting on the muzzle, or stretched out on the side. The pupil of the eye is dilated and the head and horns are hot; the bowels and bladder soon become torpid or completely paralyzed and fail to operate unless recovery takes place. In the torpid form there is no marked fever and no congestion of the head. The animal slowly becomes drowsy and weakened, falls down, and, unless relieved, finally succumbs. Insensibility is a pronounced symptom in the later stages of both forms.

Preventive measures include a spare diet for a week before calving and at least four days after, a free access to salt and water, a dose of Epsom salt (one to two pounds) 12 to 24 hours before calving is due, and the postponing of the drawing of any milk from the udder for 12 to 24 hours after calving.

The treatment of milk fever has been completely revolutionized by the investigations of Schmidt of Denmark, which have resulted in the universal adoption of the method of inflating the udder with oxygen or filtered air. Under this treatment the mortality in milk fever in the cow has dropped from 60 to 75 per cent to less than 5 per cent in those cases which are promptly attended and in which no medicine has been administered by mouth. Drenching of cows suffering from this disease should be rigidly abstained from, since the mortality which follows is exceedingly high, due to portions of the drench passing down the trachea into the lungs. As a prophylactic measure, in case there appears to be any danger of an attack of milk fever, it is now uniformly advised that the udder be inflated at once.

MILKFISH. A large, silvery, herring-like fish of the genus *Chanos* and family Hiodontidæ, which inhabits the warmer parts of the Pacific. One well-known species (*Chanos chanos*), from 2 to 5 feet long, is a food fish of some importance in the south Pacific, Japan, Hawaii, and the Gulf of California. Foreign names for it are chani, awa, auged, sabalo, etc.

MILKING MACHINE. An apparatus designed to do away with hand labor in milking cows. Milking tubes, inserted into the milk ducts within the teats, have been tried, but

found unsatisfactory. Several forms of milking machines have been devised which milk a number of cows at the same time. The most successful of these operate on the principle of a vacuum maintained by a hand or power air pump and so arranged as to give a pulsating action. Pipes connected with the apparatus pass to the stalls and terminate in closed cans fitted with hose and cups, which fit over the cows' teats so as to make an air-tight joint. A pulsating action resembling hand milking or the sucking of the calf is imparted by the vacuum apparatus, alternating in pressure from five to fifteen pounds at quite rapid intervals. In recent years the milking machine has been developed to a quite high state of perfection. Several forms are rapid and effective, but are expensive to install and maintain, and must be thoroughly cleaned or they will soon become foul and contaminate the milk. As yet milking machines have come into only limited use either in America or Europe.

MILK LEG. See PHLEGMASIA ALBA DOLENS.

MILKOWSKI, mĭl-kôf'skĕ, ZYGMUNT (1824–1915). A Polish novelist, who wrote under the pseudonym Theodor Thomas Jez. He was born at Saracea in Podolia, and was educated at the Odessa Lyceum and at the University of Kiev, where he made a special study of physics and mathematics. He took an active part in the Hungarian uprising of 1848 and then traveled in the East. After identifying himself with the Polish insurrection of 1863 he was obliged to live abroad. He lived in Zurich and was curator of the Polish musems at Rapperswil. Besides romances founded upon Slavic history he wrote stories of contemporary life in which the manners and customs of the south Slavonians and Hungarians are faithfully portrayed. Among the best of these are *Handzia Zahornicka* (1860); *Szandor Kowacz* (1861); *Historya o praprawnuku i prapradziatku* (1864); *Uskoki* (1870). Among his later works are *Ofiary* (1874); *Hercog Slowianski* (1876); *Narzeczona Harambaszy* (1882); *Rycerz chrzescianski* (1890). Less successful than these were his Polish historical novels, such as *Derslarb z Rytwian* (1872); *Za Króla Olbrachta* (1876); *Z ciezkich dni* (1881).

MILK POWDER. See MILK.

MILK PRODUCTION. In a well-conducted dairy farm the following conditions should be enforced: the stable or cow house should be roomy, clean, dry, light, and well ventilated, for only under such conditions can cows be kept in the best of health. The animals themselves should be clean and healthy and should be well fed and contented. There should be an abundance of pure water, to which the cows should have access at least twice a day. The food should be of good quality and the grain and coarse fodder should be free from dirt and decay and not in a musty condition. All utensils which come in contact with milk should be thoroughly washed and sterilized or scalded after using. After the milk has been drawn from the cow it should be taken to a milk room which is free from all stable and other odors, poured through a fine strainer, and run over a cooling aërator (q.v.), to free it of animal and stable odors and cool it quickly. The milk is next transferred to the shipping can and set in cold water, or bottled and stored in a cold place until needed. During transportation from the farm to the town or city the milk should be kept as cool as possible. Refrigerator cars are provided by some railroads for that purpose. Much of the milk that is brought to large cities by rail is from 24 to 36 hours old before it reaches the consumer. This makes it necessary to exercise every precaution in its handling, in order to prevent spoiling, and cooling immediately after milking is an important factor in this connection.

Not only has the demand for clean, pure milk increased greatly, but it has led to the enactment of more rigid restrictions and closer supervision of dairies and to the production at some dairies of so-called sanitary milk. Such milk is produced under the most sanitary and hygienic conditions as regards the food and care of the animals, the stables, the milking, and the care and handling of the milk. The herds in these dairies are inspected often to determine their freedom from disease, and not infrequently the milk is "certified" or guaranteed to contain a certain fixed percentage of fat, as 5 per cent, this being maintained the year round by the addition of cream when necessary. Such sanitary or certified milk is usually sold at an advanced price, as the cost of its production is greater than that of ordinary market milk. The so-called modified milk is a prepared product used principally for infant feeding, and usually made according to a physician's prescription. Some physicians prescribe a milk with a definite composition, usually resembling mother's milk as closely as possible, but varying according to the apparent needs of the individual. Such prescription milk is generally prepared from cows' milk by reducing the amount of fat, and more particularly that of proteids, and increasing the proportion of sugar. Lime water is frequently added to reduce the acidity, and at times preparations made from cereals are added.

For the preservation of milk pasteurization is now extensively practiced. Pasteurization consists in heating the milk in closed vessels at from 60° to 65° C. (140° to 150° F.) for about half an hour and then cooling it as quickly as possible by cold water or ice. By this means most of the organisms contained in it are killed, and the milk will keep much longer than when it has not been so treated. Continuous pasteurizers are used in many creameries and large dairies, and there are a variety of small pasteurizers for family use. Where there is any doubt as to the purity of the milk it is much safer to pasteurize that used for children at home. To a certain extent, however, pasteurization may be used to cover up the effects of careless methods, and many people prefer the sanitary milk. In sterilizing milk the liquid is heated to boiling; but this changes the character of the milk, making it less suitable for drinking and giving it a cooked taste. Pasteurization is sufficient for household purposes.

Statistics. According to the returns of the census of 1910, over 20,000,000 cows are kept in the United States for the production of milk. These produce annually nearly 6,000,000,000 gallons of milk. The total value of the milk consumed as such was estimated at $252,436,757, and of the cream, $37,655,047. The total value of the milk, cream, and butter fat sold and the butter and cheese made in the United States in 1909 was $596,413,463.

See also BUTTER; BUTTERMILK; CHEESE; CREAMERY; DAIRYING; WHEY.

MILK SNAKE, or HOUSE SNAKE. A com-

mon widely spread North American colubrine snake, classified as an Eastern variety (*triangulus*) of the Southern king snake (*Osceola*, or *Ophibolus, doliatus*). It sometimes reaches a length of 4 feet, and its general color above is yellowish gray, with a dorsal series of large blotches, normally 55 in number, and separated by narrow intervals, which are dull chocolate bordered with black. There is also a double row of rounded spots along the sides and a dark band from the eye back to the corner of the mouth. The abdomen is yellowish white, with square black blotches alternating with those above them. This subspecies is abundant in the Middle States and southern Ontario, changing

MILK SNAKE.

southward and west of the Mississippi into other forms of this far-extended and highly variable species. (See KING SNAKE.) Everywhere it is an entirely harmless denizen of fields and gardens, and often comes into barns and outhouses in search of the mice upon which it principally feeds, thereby deserving the protection of farmers. It is swift and agile. Its name milk snake comes from the frequency with which it is seen in dairies or places where milk is kept. It is believed to drink the milk, and there seems to be good evidence that it does so. Another popular belief is that this snake sometimes sucks the milk from the teats of cows, and this belief seems to be founded upon fact, although the occurrence is much less common than some persons believe. See Plate of SNAKES, AMERICAN HARMLESS.

MILK SUGAR. See SUGARS.

MILK TEST. See MILK; DAIRYING.

MILKWEED. See ASCLEPIAS.

MILKWEED BUTTERFLY. A cosmopolitan butterfly (*Anosia plexippus*) which is found in nearly all parts of the world where milkweeds (*Asclepias*) grow. It is also known as monarch butterfly. It is a large reddish species, with its wing veins blackened, and its larva is striking in color, being grayish white and yellowish, transversely banded with black, giving it a zebra-like appearance. The chrysalis is delicate pale green with bright golden spots, and hangs from the leaves or stems of the food plant. The milkweed butterfly is a famous species for several reasons. It is one of the strongest flyers known among the Lepidoptera; specimens have been taken on vessels many hundreds of miles from the land, and there is in the United States an annual migration northward in the spring from the States bordering on the Gulf of Mexico. (See MIGRATION OF ANIMALS.) These flights, aided by the south winds, may reach up into Canada, the butterflies occasionally alighting and laying their eggs upon the milkweeds. In the autumn there is a return migration south, and the butterflies hibernate only in the Southern States, hidden away beneath the bark of trees and in other protected places.

Ordinarily the butterflies frequent open ground, but when they congregate, as at night and in cloudy weather, they are found resting on the stems of herbaceous plants, usually in the open spaces of forests, and in enormous numbers. They will alight upon the lee side of a tree, and particularly on the lower branches, in such vast numbers as almost to hide the foliage and to give their color to the trees. If disturbed, they rise like a flock of birds, but immediately settle again. Sometimes a tree will be so festooned with butterflies that it appears, at a short distance, to be covered with dead leaves.

This butterfly is one of the especially protected species, and is provided with scent scales, "androconia," which are supposed to make the insect distasteful to its natural enemies. It is the commonest and most widespread representative of the large group of butterflies which are thus protected, and is mimicked in coloration by other nonprotected species, e.g., in the United States by *Basilarchia disippus*, or *archippus*. Consult S. H. Scudder, *The Life of the Butterfly* (New York, 1893). See BUTTERFLIES AND MOTHS; MIMICRY; VICEROY.

MILKWORT. A plant common in the north temperate zone. See POLYGALA.

MILKY WAY. See GALAXY.

MILL (AS. *mylen, myln*, from Lat. *molina*, mill, from *mola*, millstone, from *molere*, to grind; connected with Eng. *meal*, mold). A name originally given to machinery for grinding grain for food or to the factory where this was done. The term is now applied in a general way to many other kinds of manufactories besides those where raw material is transformed by a grinding process, as a saw mill, planing mill, or cotton mill. It is also applied in a special sense to a steel rotating cutter for shaping raw material or metal stock. See FLOUR; ROLLING MILL; GRINDING, CRUSHING, AND PULVERIZING MACHINERY.

MILL, HUGH ROBERT (1861–). A Scottish geographer, born at Thurso (Caithness) and educated at Edinburgh University, where he received the degree of D.Sc. in 1886. He served as chemist and physicist to the Scottish Marine Station (1884–87), was a university-extension lecturer (1887–1900), and after 1900 edited *British Rainfall* and *Symons's Meteorological Magazine*. In 1901 he was president of Section E of the British Association and in 1907–08 president of the Royal Meteorological Society. He became chairman of the trustees and director of the British Rainfall Organization. His writings include: *Realm of Nature* (1892; new ed., 1913); *The Clyde Sea Area; the English Lakes* (1895); *Hints on the Choice of Geographical Books* (1897); *New Lands* (1900); *The Siege of the South Pole* (1905); besides many articles. He became best known perhaps as the editor of *The International Geography* (new ed., 1911).

MILL, JAMES (1773–1836). A British economist and philosopher. He was the son of a shoemaker, and was born near Montrose, Scotland, April 6, 1773. He studied at the University of Edinburgh, where he distinguished himself in Greek and in moral and metaphysical philosophy. He was licensed to preach in 1798, but instead of following this career he went to London in 1802 as tutor to Sir John Stuart's children and there settled as a literary man. He became editor of the *Literary Journal* and of the *St. James's Chronicle* and wrote for various periodicals. Not long after he was established in London he made the acquaintance of Jeremy Bentham, who influenced him greatly in his views. In 1806 he commenced his *History of British India*, which he carried on along with

other literary work and published in the winter of 1817–18. This important work, though containing an attack upon the administration of the East India Company, secured for him in 1819 the post of assistant examiner of Indian correspondence. Before his death he was appointed head of the examiner's office, where he had the control of all the departments of Indian administration—political, judicial, and financial —managed by the secret committee of the court of directors. He contributed many important articles to the *Encyclopædia Britannica* (1814). Some of these essays were printed in a separate form and became widely known. In 1821–22 he published his *Elements of Political Economy*, a work prepared primarily with a view to the education of his eldest son, John Stuart Mill. In 1829 his magnum opus, the *Analysis of the Human Mind*, appeared. The work is almost the Bible of associationism and deserves to be classed among the great English philosophical productions. He attempted to simplify associationism by recognizing only one principle at work—that which was later called association by contiguity. (See ASSOCIATION OF IDEAS.) This principle can so fuse various ideas and feelings that a result may be produced entirely different from the original element. This has been called mental chemistry. In his *Fragment on Mackintosh* (1835) Mill made great use of mental chemistry in support of the doctrine that morality is based on utility. (See UTILITARIANISM.) In this way he furnished a psychological basis for Bentham's ethical and legislative reforms. He took great interest in political questions and was a powerful advocate of an extended suffrage. Much of his influence was due to his strong personality and great conversational powers. In later life he entirely broke away from his early religious views and brought up his son John Stuart in utter religious indifference. He took a leading part in the founding of University College, London. He died at Kensington, June 23, 1836. Consult: J. S. Mill, *Autobiography* (London, 1873; new ed., ib., 1908); Alexander Bain, *James Mill: A Biography* (ib., 1882); Sir Leslie Stephen, *The English Utilitarians*, vol. ii (New York, 1900).

MILL, JOHN (1645–1707). A scholar of the Church of England. He was born at Shap, Westmoreland, studied at Queen's College, Oxford, and was elected a fellow in 1670. He entered the ministry and became distinguished as a preacher; he became rector in 1681 of the college living of Bletchington, Oxfordshire, and chaplain to Charles II. In 1685 he was principal of St. Edmund Hall and in 1704 became prebendary of Canterbury. The work for which he is most distinguished is his new edition of the Greek Testament, on which he spent 30 years and which appeared only 14 days before his death. It was undertaken at the advice and expense of Dr. Fell, Bishop of Oxford, but after the Bishop's death (1686) Mill continued it at his own expense and repaid to the executors what he had received. The text which Mill adopted is that of Robert Stephens of 1550, and his work contains 30,000 various readings collected from manuscripts, commentaries, writings of the fathers, etc. Dr. Daniel Whitby attacked the work in his *Examen Variantium Lectionum Johannis Millii* (London, 1709); but Dr. Richard Bentley approved the labors of Mill, and Michaelis, Marsh, and other critical scholars acknowledged the value of the edition.

MILL, JOHN STUART (1806–73). An English philosopher, the son of James Mill. He was born in London, May 20, 1806, and was educated at home by his father, who gave his precocious son an extraordinary amount of learning at a very early age. He is said to have begun Greek at three. He was never allowed to indulge in the plays of childhood. In 1820 he went to France, where he lived for upward of a year, making himself master of the French language and occasionally attending public lectures on science, but also, now that he was away from his father, getting some physical exercise in fencing and like sports. This stay in France gave him an intense appreciation for the pleasures of travel, and to the end of his days he was an ardent lover of mountain scenery. But the world of men had also its interest for him while he was abroad, for then he laid the foundation of his great familiarity with and interest in the politics as well as the literature of the French nation. On his return he read law, history, and philosophy, and in 1823 entered the India House as a clerk in the examiner's office, where his father was assistant examiner. For 33 years he was in the service of this company, gradually rising till at last he was head of his department, as his father had been before him. When the government of India was transferred to the crown in 1858, he declined a seat on the New Indian Council and retired from office in October of the same year, on a compensating allowance. At the general election of 1865 Mill was returned to Parliament for Westminster, and till he lost his seat at the election of 1868 he acted with the advanced Radicals and urged the extension of suffrage to women. In 1851 he married Mrs. John Taylor, who had been an intimate friend long before her first husband's death. He ascribed to her influence many of his most cherished ideals; she died in 1859, but Mill's devotion to her memory was his religion till his death, which took place May 8, 1873, at Avignon, where he had spent the greater part of the last years of his life.

Mill became an author at a very early age and may be looked upon as one of the foremost thinkers of his time. His first publications consisted of articles in the *Westminster Review*. He took an active part in the political discussions that followed the revolution of 1830 in France and the reform-bill movement in England; and from 1835 to 1840 was editor and, along with Sir W. Molesworth, proprietor, of the *London and Westminster Review*, where many articles of his own appeared. His chief works are: *A System of Logic, Ratiocinative and Inductive* (1843; 9th ed., 1875); *Principles of Political Economy* (1848; ed. by Ashley, 1909); *On Liberty* (1859); *Discussions and Dissertations* (4 vols., 1859–74); *Utilitarianism* (1863); *Comte and Positivism* and the *Examination of Sir William Hamilton's Philosophy* (1865); *Inaugural Address at the University of St. Andrews* (1867); *England and Ireland* (1868); *The Subjection of Women* (1869); *Chapters and Speeches on the Irish Land Question* (1870). He also edited with copious notes his father's *Analysis of the Phenomena of a Human Mind* (London, 1869). After his death appeared his *Autobiography* (1873) and *Three Essays on Religion* (1874). A collected edition of his works appeared in 1905–10. Two volumes of his *Letters* also appeared in 1910. In philosophy he was an empiricist, sensationalist, and asso-

ciationalist. In ethics he was a utilitarian, but departed from the utilitarianism of Bentham by recognizing differences in quality as well as in quantity of pleasures. "It is quite compatible," he says, "with the principle of utility to recognize the fact that some kinds of pleasure are more desirable and more valuable than others. It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied." Experience determines the rank of pleasures in the scale of quality; on this point he, perhaps unconsciously, follows Plato, assuming, contrary to fact, that experience gives the same valuation in all cases. In political theory Mill was a modified individualist, believing that every man should be allowed all liberty compatible with the liberty of his fellows. The tendency of modern thought has been so far away from individualistic standards that Mill's renown has been somewhat obscured, but his influence on his own generation would be difficult to overestimate. In metaphysics he followed the Humean tradition: the mind is "a series of feelings which is aware of itself as past and future," and matter is "the permanent possibility of sensations." His greatest work, however, was in logic, to which he added a fruitful treatment of the subject of induction (q.v.). His work in this science was considerably impaired by his sensationalistic empiricism, but when everything is taken into account, it must stand alongside that of Aristotle and of Hegel. His book was for many years the standard authority among those who shared his general standpoint in questions of philosophy, though it was keenly criticized from the opposite camp by Whewell and W. G. Ward.

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MILLAIS, mĭl-lā′, SIR JOHN EVERETT (1829–96). An English genre, landscape, and portrait painter. He was born at Southampton, June 8, 1829, and was brought up in the Isle of Jersey. In 1837 he received his first instruction in art from Bessel, a drawing teacher in Jersey. In 1838 and 1839 he studied at the School of Henry Sass in Bloomsbury, and the following years at the Royal Academy, in which he carried off every prize, receiving a gold medal in 1847. In 1848 he became associated with William Holman Hunt, Dante Gabriel Rossetti, and others in the formation of the Pre-Raphaelite Brotherhood (q.v.). His work attracted the attention of Ruskin, for whom he made some architectural designs and whose portrait he painted. In 1855 he married Ruskin's divorced wife. He was made associate member of the Royal Academy in 1853 and member in 1863. From 1860 to 1870 he was employed as illustrator, and among other books illustrated Tennyson's poems and Trollope's novels. He was appointed Officer of the Legion of Honor at the Paris Exposition in 1878 and was an honorary member of the French Institute and of several foreign academies. He was created Baronet in 1885, and a few months before his death, which occurred in London, Aug. 13, 1896, he was made president of the Royal Academy.

Aside from his landscapes and portraits, his subjects include scriptural, historical, and legendary themes, scenes from everyday life, and a few national in character, such as "The Rescue" (1855), painted in honor of the London firemen. From 1847 to 1853 his work was strongly influenced by Pre-Raphaelite theories and aroused much criticism. Works of this period are: "Isabella" (1849, Liverpool Gallery); "Christ in the House of his Parents" (1850) and "Ophelia" (1852, both in the Tate Gallery); "The Proscribed Royalist" (1853); "The Huguenot" (1852). After 1855 his work developed greater individuality and breadth, but lost in intensity, and his composition became more commonplace. His landscapes betray the ardent nature lover; his portraits are painted with masterly characterization. His art is forceful and robust, and his color brilliant. From 1870 on he gave much of his time to portrait painting, his sitters including Gladstone (National Gallery and Christ Church, Oxford); Leech, Lord Beaconsfield, Wilkie Collins, and Carlyle (all in the National Portrait Gallery); John Bright, Irving, Tennyson (Tate Gallery), and others. His landscapes include: "Spring" (1859); "Chill October" (1871); "The Vale of Rest" (1859, Tate Gallery); "Dew-Drenched Furze" (1881). Other important pictures are: "Eve of St. Agnes" (1863, water color, South Kensington Museum); "Effie Deans"; "The Black Brunswicker" (1860); "The Bride of Lammermoor" (1878) and "Portia" (both in the Metropolitan Museum, New York); "The Blind Girl" (1856, Birmingham Gallery); "The Northwest Passage" (1874); "The Order of Release" (1853); "The Boyhood of Raleigh" (1879); "A Yeoman of the Guard" (1877); "St. Stephen" (1895); "Speak! Speak!" (1895), and "A Disciple" (1895, all in the Tate Gallery).

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MILLAIS, JOHN GAILLE (1865–). An English artist and naturalist, born in London, a son of Sir John Everett Millais. He was educated at Marlborough and at Trinity College, Cambridge, and from 1886 to 1892, when he retired as first lieutenant, served in the

Seventy-second Highlanders. He shot big game in all parts of the world and made a remarkably large collection of British birds. Besides illustrating books on shooting and natural history, especially the *Encyclopædia of Sport*, to which he contributed, he wrote: *Game Birds and Shooting Sketches* (1892); *A Breath from the Veldt* (1895); *British Deer and their Horns* (1897); the *Life and Letters* (1899) of his father; *The Wild Fowler in Scotland* (1901); *British Surface-Feeding Ducks* (1902); *The Mammals of Great Britain and Ireland* (3 vols., 1904–06); *Newfoundland and its Untrodden Ways* (1907); an elaborate and beautifully illustrated *Natural History of British Game Birds* (1909); *British Diving Ducks* (1913); *Deer and Deer Stalking* (1913).

MILLAR, Andrew (1707–68). A London publisher and bookseller, of whom Dr. Johnson said: "I respect Millar, sir; he has raised the price of literature." It was he who, with other aid, financed Johnson's *Dictionary* and saw it through the press. Among his notable publications were Thompson's *Seasons*, Fielding's *Tom Jones* and *Amelia*, and the histories of Robertson and Hume. Consult Charles Knight, *Shadows of the Old Booksellers* (London, 1865).

MILLARD', Evelyn (1873–). An English actress, born in London, the daughter of a professor of elocution. She made her début at the Haymarket in 1891 and in the same year played in Sarah Thorne's stock company and in repertoire with Fred Thorne's company. Then she was at the Adelphi (through 1893); played Paula in *Mrs. Tanqueray;* with Comyns Carr as Rosamund in *Sowing the Wind* (1895); at the St. James's (1894–96), playing Cecily Cardew in Wilde's *The Importance of Being Earnest* and Princess Flavia in *The Prisoner of Zenda;* and at Her Majesty's (1896) she created the rôle of Mademoiselle de Belle Isle in 1897. She was Portia in Beerbohm Tree's production of *Julius Cæsar* (1898); Glory Quayle in Hall Caine's *Christian* (1899); Francesca in Stephen Phillip's *Paolo and Francesca* (1902); the Countess de Roquelaure in Doyle's *Brigadier Gerard* at the Lyric (1906); and Joanna Rushworth in *The Beloved Vagabond* at His Majesty's (1908). In 1908 she managed the Garrick. She married Robert Porter Coulter in 1900.

MILLAU, mē'yô', or **MILHAU.** A town in the Department of Aveyron, France, on the Tarn, 74 miles north of Béziers (Map: France, S., G 4). Its chief building is the Romanesque church of Notre Dame, with a sixteenth century tower. There is a large botanical garden and parks. The town is the centre of a cattle-raising and grape-growing section and has a variety of manufactures, particularly of kid gloves, woolen goods, and dyed goods. There are oil wells near by. Millau was the Roman Æmilianum Castrum; during the religious wars it was a stronghold of Calvinism, and Louis XIII destroyed its ancient castle and walls in 1629. Pop. (commune), 1901, 18,701; 1911, 17,673.

MILL'BANK PRISON. A famous London penitentiary in Westminster, facing the Thames. It was built in 1812 (finished in 1821) in accordance with the plans of Howard and Bentham. It could shelter 1100 inmates and was so constructed that from a central room every cell could be seen. The confinement was solitary. Those sentenced to penal servitude served a term here first. The prison was closed in 1890 and the buildings torn down in 1891. Consult G. P. Holford, *Account of the General Penitentiary at Millbank* (London, 1828), and A. Griffiths, *Memorials of Millbank* (2d ed., ib., 1894).

MILL-BOY OF THE SLASHES. A popular nickname of Henry Clay, from a tract of swampy land called the Slashes near his birthplace in Hanover Co., Va.

MILL'BURY. A town in Worcester Co., Mass., 6 miles southeast of Worcester, on the Blackstone River and on the New York, New Haven, and Hartford and the Boston and Albany railroads (Map: Massachusetts, D 4). It has a public library and is extensively engaged in the manufacture of cotton and woolen goods, edge tools, foundry and machine-shop products, loom harness and heddles, linen cloth and thread, and felt goods. From 1743 to 1813, when it was incorporated, Millbury was the north parish of Sutton. The lyceum lecture system is said to have originated here about 1820. Pop., 1900, 4460; 1910, 4740.

MILLE, mēl, Pierre (1864–). A French journalist and author, born at Choisy-le-Roi and educated at the Collège Rollin. He was sent to Madagascar on several missions; was war correspondent for the *Journal des Débats* during the Græco-Turkish War in 1897; and traveled widely. He was created a Knight of the Legion of Honor. Among his writings are: *De Thessalie en Crète* (1898); *Au Congo belge* (1899); *Sur la vaste terre* (1906); *La biche écrasée* (1910); *Caillou et Tili* (1911); *Louise et Barnavaux* (1912).

MIL'LEDGE, John (1757–1818). An American soldier and statesman, born in Savannah, Ga. When the Revolution began he was one of the party which seized Wright, the royal Governor of the Colony. Milledge escaped from Savannah when it was taken by the British in 1778, and he assisted in the unsuccessful siege of the town by the Americans in 1779. In the following year he was made Attorney-General of Georgia. After the war he was several times elected a member of the State Legislature, and was a Representative in Congress from 1792 to 1798 and again from 1801 to 1802, when he resigned to become Governor. In 1802 he was one of the three commissioners who negotiated the cession of Georgia's western territory to the United States. From 1806 to 1809 he was a United States Senator. Milledge took an active part in establishing the University of Georgia, and gave the institution 700 acres of land, upon which the university and a part of Athens now stand. The town of Milledgeville was named in his honor.

MIL'LEDGEVILLE. A city and the county seat of Baldwin Co., Ga., 32 miles northeast of Macon, on the Oconee River, at the head of navigation, and on the Georgia and the Central of Georgia railroads (Map: Georgia, C 2). It is the seat of the Georgia Military College and the Georgia Normal and Industrial College for Girls and of the Georgia State Sanitarium for the Insane, which accommodates 4000 patients. The prison farm, 3 miles northwest of the city, employs some 400 State convicts. The city is the centre of a cotton-growing region and its industrial interests are mainly in the preparation of this staple for market, and in the manufacture of brick, tile, cement, and sewer pipe. The government, under a charter of 1900, is administered by a mayor, elected every two years, and a unicameral council, of which the mayor is a member, chosen on a general ticket. Mil-

ledgeville, named in honor of Gov. John Milledge of Georgia, was laid out in 1803, was chartered as a city in 1836, and was the capital of the State from 1807 to 1867, the government buildings now being utilized by the colleges. Pop., 1900, 4219; 1910, 4385.

MILLENA'RIANS. See MILLENNIUM.

MIL'LENARY (Lat. *millenarius*, containing a thousand, from *milleni*, a thousand each, from *mille*, thousand). A period of a thousand years, specifically the celebration of the one-thousandth anniversary of any event. The most important millenary was that commemorating the death of Alfred the Great, which was held in Winchester, England, Sept. 18–21, 1901, which culminated in the unveiling of a large bronze statue of King Alfred by Hamo Thornycroft.

MILLENARY PETITION. A petition presented by Puritan clergy to King James I in April, 1603, when on his way to London to take his throne. It is so called because it was intended to have 1000 signatures, although as a matter of fact it had only 750. The original of the petition is supposed to be lost, but Fuller gives it in his *Church History* (Book x, 27, ed., London, 1837, vol. iii), and it is thence reprinted by Gee and Hardy, *Documents Illustrative of English Church History* (London, 1896; pp. 508–511). It sets forth in firm but respectful language those points connected with the Church service (cross in baptism, baptism by women, public reading of the Apocrypha, unabridged liturgy, etc.), the Church ministry (illiterate ministers, nonresidency, clerical celibacy), the Church revenue (commendams, pluralities, impropriations), and with the Church discipline (excommunications for trifling causes, extortionate fees, protracted ecclesiastical suits, frequency of marriages without banns asked), which the Puritan party would see removed or modified. The King's answer was the calling of the Hampton Court Conference in January, 1604, which resulted in no redress, but rather the confirmation of the abuses complained of, but which led to the preparation of the Authorized Version of the Bible.

MILLEN'NIUM (Neo-Lat., from Lat. *mille*, thousand + *annus*, year). A period of 1000 years preceding the final judgment (q.v.), during which, according to a widely accepted system of Christian eschatology, the Christ and his saints will reign on the earth. The division of the world's course into periods is found among many peoples. Thus, the Hindus divided the history of the world into *kalpas* of hundreds or thousands of years, and the Incas made four great periods. (See ESCHATOLOGY.) A long national existence and a tradition of certain epoch-making events naturally account for such a partition. The Persians counted 12 periods each of 1000 years. It is likely that this division into 12 parts was derived from the Babylonians, and ultimately goes back to calculations of the sun's course through the 12 signs of the zodiac. It is significant that the third, fourth, fifth, sixth, seventh, and eighth thousand years are attributed respectively to Cancer, Leo, Virgo, Libra, Scorpio, and Sagittarius in *Bundahish* 34. The number 1000 may have a different origin, since the great cosmic year would demand a larger figure. According to the Parsi doctrine, 6000 of the 12,000 years are occupied by the history of man. Zarathustra appears at the beginning of the fourth and the Saoshyant will come at the end of the last to raise the dead and to renew the world. While this doctrine is fully presented only in late Pahlavi writings, such as the *Bundahish* and the *Dinkart*, there are indications of a much higher age, as Mani (c.200 A.D.) was familiar with the Zoroastrian doctrine of a cycle of 12,000 years, and Berosus (c.300 B.C.) seems to have rationalized the doctrine of *Zrvan akarana*, boundless time, and its period. It is altogether probable that the conception that human history would endure 6000 years before the Messianic age came into Jewish thought from a Persian source. The scriptural justification was found in Ps. xc. 4, "A thousand years in thy sight are but as yesterday when it is past," and the length of the Messianic age was inferred from an interpretation of Gen. ii. 2, based on the word of the Psalmist, as is seen by utterances of rabbis living in the second century A.D. (*Midrash Tehillim* to Ps. xc and *Yalkut Shimeoni* to Ps. lxxii.) Before the fall of Jerusalem in 70 A.D. there is no evidence that the expected Jewish world empire, whether with or without a Messiah, was thought of as being of limited duration. That Israel would never yield its supremacy to any other nation was a firm conviction. The Messianic King was probably looked upon as the founder of a dynasty. Towards the end of the first century, however, the conception of the Messiah became more transcendent, and his reign might be thought to last "until the corruption of the world should end," characterized by great prosperity (*Apocalypse of Baruch*, xl. 3, xxix, lxxiii), or, more precisely, 400 years to be followed by seven days of silence, the general resurrection, and the last judgment (q.v.) as set forth in the *Apocalypse of Ezra* (vii. 28, 29). The first mention of the millennium is in the *Slavonic Enoch* (xxxii. 2–xxxiii. 2); but in this book there is no Messiah. A summary of opinions in the Babylonian Talmud (Sanhedrin 97a, 99a) shows that it was comparatively seldom that a Jewish teacher estimated at 1000 years the length of Yahwe's reign, 40, 70, 365, 400, 600, 2000, and 7000 years being suggested by different teachers.

In the New Testament the doctrine of a millennium is clearly taught in Rev. xx. After the returned Messiah has conquered the beast, Satan is cast into the abyss in chains for 1000 years, the martyrs are raised from the dead and reign with Christ as kings and priests during the millennium. At the end of the millennium the powers of evil are let loose again for a short time, whereupon follow the resurrection of the rest of the dead, the last judgment, the destruction of death and Hades, which is the second death, and the new heavens and the new earth. Critical exegesis agrees with the Chiliasts of the early Church and the present premillenarians that the author of this passage no doubt believed that Jesus would return upon the clouds before the millennium to reign with some of his saints for 1000 years in visible form. It cannot be proven, however, that other writers in the New Testament cherished this view, or that they all held the same opinion concerning the world's future. The Gnostics rejected this doctrine and their opposition was continued by such teachers of the Alexandrian school as Clement and Origen. On the other hand, Irenæus informs us (*Adv. Haer.*, v, 33) that Papias, Bishop of Hierapolis, had recorded as a saying of Jesus a remarkable description of the fertility of the vine in the millennium; the epistle attributed to Barnabas describes the millennium as a period of

rest following 6000 years of work to be ushered in by the return of Christ (xv, 5); and Justin Martyr likewise expressed his belief in the premillennial coming of Christ and the thousand years of his reign in Jerusalem (*Apol.* 52; *c. Tryph.* 45, 49, 113). Irenæus, Tertullian, and Hippolytus were also Chiliasts. An ardent expectation of the millennial kingdom characterized the Montanists, who looked for its establishment at Pepuza in Phrygia. The reaction against Montanism led to a more general rejection of the doctrine of a millennium. Dionysius of Alexandria attacked the very foundation of this doctrine in denying the Johannine authorship of Revelation. Such doubts did not disturb the Western Church, and men like Commodian and Lactantius were Chiliasts. Only through the influence of Jerome and especially Augustine, whose *Civitas Dei* identified the Church with the kingdom of God and the millennium with the history of the Church, did Latin Christianity commit itself to an eschatological programme excluding the premillennial advent, the first resurrection, and the visible reign on earth. During the Middle Ages earnest and spiritually minded men, grieved at the many abuses that spread in the Church, could not but look for divine chastisement. While there does not seem to be sufficient foundation for the current statement that the end of the world was generally expected about the year 1000 A.D., there are many indications of the anxiety that at sundry times filled pious hearts as well as guilty consciences. The great hymn *Dies iræ, dies illa* reveals both a fearful looking forward to the impending judgment and the part that the Sibylline Oracles and similar works played in creating this mood. Millenarian views were held by men like Joachim of Floris and Occam and by numerous religious bodies. In the Reformation era the hope of a speedy establishment of the Messianic kingdom was especially cherished by many of the Baptists. They were led to it by their doctrine of the inner light and the continuance of prophecy, by their sympathy with the oppressed, and by their disapproval of the union of church and state. Looking to God alone for the establishment of the truth and the righting of social wrongs, and expecting a direct revelation from Him, some naturally were led astray by their impulses under pressure of circumstances. But the establishment of the millennial kingdom by John of Leyden (q.v.) at Münster was an error regretted and condemned by the great majority of Baptists. The Fifth Monarchy men of Cromwell's time looked upon the millennium as having actually begun with the overthrow of the royal family in England. Many English mystics looked forward to the second advent in the year 1666, and their faith found a curious reflection even in Judaism. (See MESSIAH.) Chiliastic views were embraced by Comenius, who translated into Latin a number of recent prophecies as to the end of the world, Jurieu, Spener, and other pietists. Swedenborg held that the millennial dispensation began in 1757. Bengel calculated that the millennium would commence in 1836; Miller expected it in 1843; Channing in 1867; Baxter in 1881. While some premillenarians devote much attention to prophetic chronology, assuming a double fulfillment of the predictions in Daniel and Revelation, others refrain from all attempts at fixing the date, but are obliged by the natural interpretation of Rev. xx, with their view of biblical infallibility, to affirm the visible coming of Christ before the millennium. Among the latter are many learned theologians of recent times. The opinion that this visible coming of Christ will occur after a long period of universal prevalence of Christianity supposed to be vaguely indicated by the thousand years is more widely accepted, but it is further removed from the conceptions of early Christianity and cannot readily find the scriptural support that it demands. The distinction between premillennialism and postmillenialism is rapidly losing its significance, as modern theology has a tendency to look upon the primitive Christian expectation of the return of Jesus as an illusion, historically necessary, but not of permanent worth; to consider the absolute victory of one system of religious faith and practice less desirable than the ascendancy of what is morally most excellent in all creeds and cults; and to expect a gradual improvement of the social conditions and the character of the human race to be wrought by actually operating forces.

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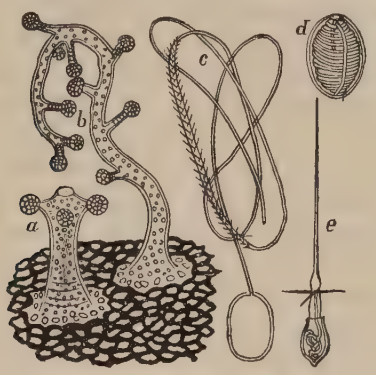
MIL'LEPORE (from Lat. *mille*, thousand + *porus*, passage, pore). A coral-forming hydroid, of the order Hydrocorallina, so named from the numerous minute pores or calicles dotting its surface, which are arranged in irregular circular groups. As the single animal is microscopic, and as it grows in compound coral-like masses on reefs in tropical seas, it was at first confounded with the corals, but was eliminated from the corals first by L. Agassiz and afterward by Moseley. The animal is not a coral polyp, being allied rather to *Hydra*, and especially to *Hydractinia* and *Clava*, common on northern coasts. The coral stocks form irregular branching masses, several inches high and sometimes a

foot or more broad. The mass of the coral incrustation consists of fibres (canals or tubes) traversed in all directions by tortuous spaces forming regular branching systems, like a tree, in which *Millepora* differs from the coral stocks (coralla). The animals are of two kinds. Those inhabiting the central cup or pore are short thick zoöids. (See POLYMORPHISM.) These are the "feelers"—they take in the food. The zoöids in the smaller, outer pores of the circle are the reproductive zoöids. That *Millepora* is a true hydroid is proved by the coral stock being at the base provided with canals by which the several zoöids are kept in union with one another by the form of the zoöids themselves, by the absence of all trace of mesenteries (which characterize coral polyps), and by the presence



MILLEPORE.

Animal of *Millepora nodosa*. *a*, nutritive zoöid; *b*, reproductive zoöid; *c*, lasso cell; *d*, the same coiled up in its cell; *e*, a third form. (All highly magnified.)

of thread cells (see NEMATOCYST) of the form peculiar to hydroids. Finally, the position of *Millepora* as a hydroid has been satisfactorily settled by the discovery, by Duerden in 1899, in Jamaica, of free-swimming female medusæ. (See HYDROZOA.) The Floridian and West Indian species is *Millepora alcicornis*. Consult articles by L. Agassiz, Moseley, Duerden, in *Nature* (London, 1899–1900). See Plate of CORAL.

MILLER, ADOLPH CASPAR (1866–). An American economist, born in San Francisco. He graduated from the University of California in 1887 and from Harvard (A.M.) in 1888 and studied at Paris and Munich in 1895–96. He was instructor in economics at Harvard in 1889–90, assistant professor of history and politics at the University of California in 1890–91, associate professor of political economy and finance at Cornell in 1891–92, professor of finance at Chicago from 1892 to 1902, and Flood professor of economics and commerce at the University of California in 1902–13. In the latter year he became assistant to the Secretary of the Interior at Washington and in 1914 he was appointed by President Wilson a member of the newly created Federal Reserve Board. He published *The Monetary Problem in the United States* (1895).

MILLER, CHARLES (1843–). An American capitalist and philanthropist, born at Oberhoffen, Alsace. He came to the United States in 1854; entered the oil business in 1869; and became president of the Galena-Signal Oil Company and director of the American Locomotive Company, the American Steel Foundry Company, the Railway Steel Spring Company, and about 40 other corporations. He served as mayor of Franklin, Pa., for two terms, as member of the Pennsylvania State Board of Charities for six years, and as major general in the Pennsylvania National Guard in 1900–06. He maintained a night school at Franklin, and was made a Chevalier of the French Legion of Honor.

MILLER, CHARLES HENRY (1842–1922). An American landscape painter, born in New York City. He first studied to be a physician, but gave up this profession for art. After studying in Vienna and Berlin he went to Munich in 1867 and became a pupil of Lier and of the Bavarian Academy. Afterward he settled in New York, where he became an Academician in 1875 and one of the first members of the Society of American Artists. He belongs to the older school of American painters. His best canvases include "Sunset, East Hampton" (1878, Brooklyn Museum); "Bouquet of Oaks" (Metropolitan Museum, New York); "High Bridge" (Democratic Club, New York). He wrote *The Philosophy of Art in America* (1885) under the pen name of Carl de Muldor.

MILLER, CHARLES RANSOM (1849–1922). An American newspaper editor. He was born at Hanover, N. H., and graduated from Dartmouth College in 1872. He served on the staff of the Springfield *Republican* in 1872–75, and then joined the staff of the New York *Times*, becoming an editorial writer in 1881 and editor in chief in 1883. He also became vice president and director of the New York Times Company. In 1913 he was special lecturer at the Columbia School of Journalism. He received the honorary degree of LL.D. from Dartmouth in 1905, and that of Litt.D. from Columbia in 1915. His brilliant leader of Dec. 15, 1914, "For the German People, Peace with Freedom," demanding the overthrow of German militarism, was widely commented on at home and abroad, and, in general, the editorial page of the *Times* was maintained under his direction at a high level of excellence during a long period.

MILLER, CINCINNATUS HEINE, better known as JOAQUIN MILLER (1841–1913). An American author, born in Wabash District of Indiana, Nov. 10, 1841. In 1854 his parents took him to Oregon. Later he became a gold miner in California. He was a volunteer in Walker's Nicaragua expedition of 1855. From 1855 until 1860 he lived among the Indians of the Pacific coast. He studied law for a while, then edited at Eugene, Oreg., a Democratic paper, which was suppressed by the authorities for disunion sentiments. In 1863 he began to practice law and in 1870 he was appointed county judge of Grant Co., Oreg. After visiting the Eastern States Miller went to England, where (and also in Boston) in 1871 he published his *Songs of the Sierras*, which made him a "lion" in London society. In London he lived up to the British conception of the American Western type by appearing on festal occasions and in general in flannel shirt, sombrero, etc. He afterward settled in New York, but left that city in order to do journalistic work in Washington, D. C., and in Oakland, Cal. At his Oakland home, which was a feature of the city, he entertained many visiting celebrities. He died Feb. 17, 1913. In accordance with his wish his body was cremated and the ashes carried up into the Sierras and thrown to the winds. In addition to the *Songs of the Sierras* above mentioned, his

work includes: *Songs of the Sunlands* (1873); *Songs of Italy* (1878); *Songs of the Mexican Seas* (1887); *Building of the City Beautiful* (1893); in prose, *The Danites in the Sierras* (a novel, 1881). Miller's play, *The Danites*, taken from his novel, had considerable success, and his poetry received some favorable notice, more for genuinely romantic content and brilliant if crude color, than for artistic excellence. A collective edition of his verses appeared in 1897. The name Joaquin is supposed to have been taken from Joaquin Murietta, a Mexican bandit, of whom Miller wrote a defense. In the *Poems* (6 vols., San Francisco, 1909–10) will be found (in volume i) an introduction and an autobiography.

MILLER, Edward (1760–1812). An American physician, born in Dover, Del. He graduated from the medical department of the University of Pennsylvania in 1784 and in 1797, associated with Dr. Samuel L. Mitchell (q.v.) and Dr. Elihu H. Smith, he founded the *Medical Repository*, the first American journal of medicine. He was professor of the practice of medicine in the University of the City of New York in 1807–12. His report on "Yellow Fever in New York in 1805" remains a notable contribution to medical science. He enjoyed a high reputation both in the United States and abroad. Consult Samuel Miller, *Memoir and Writings of Edward Miller* (New York, 1814).

MILLER, Ferdinand, Baron von (1842–). A German bronze founder and sculptor. He was born in Munich and studied under his father, Ferdinand von Miller (q.v.), and later with Hähnel in Dresden. For purposes of work and study he traveled extensively in France, Italy, and America. As lieutenant he served in the Franco-German War of 1870–71. In 1900 he was appointed director of the Bavarian Academy of Fine Arts and in 1912 he was made Baron. He cast upward of 70 colossal monuments, scattered throughout the world. His own work in sculpture includes statues of Humboldt, Shakespeare, and Columbus for St. Louis; figures for a large fountain at Cincinnati; the statue of a soldier for the Soldiers' Monument in Charleston; the equestrian statue of Emperor William I at Metz (1892); and, among many others in Bavaria, the army monument in the Feldheerenhalle at Munich and the equestrian statue of King Louis I at Regensburg (1902).

MILLER, Ferdinand von (1813–87). A German bronze founder, born at Fürstenfeldbruck. He studied at the Munich Academy and learned his trade under his uncle, Stiglmayer, and in Paris with Soyer. His reputation was won by his castings from the designs of Schwanthaler, and especially by his monumental works, including the colossal statue of "Bavaria" in Munich and of the "Germania" of the Niederwald monument. His best-known work in America, where he executed over 80 commissions, is the bronze door of the Capitol in Washington. His sons, Ferdinand (q.v.) and Ludwig (1850–1912), also became bronze founders and sculptors.

MILLER, Frank Augustus (1859–). An American art collector and antiquarian, born in Tomah, Wis. He removed in 1872 to California and in 1879 founded at Riverside the Glenwood Mission Inn. This he subsequently enlarged from time to time, using always and with rare artistic taste distinctive architectural features of the mission buildings erected in that region during the eighteenth and early nineteenth centuries by Franciscan padres. The resulting edifice has been considered the most consistent and beautiful example of mission architecture in existence. Here Miller gathered from Spain, and elsewhere in Europe, as well as from California and Mexico, a large and interesting collection of bells and other objects of artistic worth and historic significance, reminiscent chiefly of the old Spanish missions in America.

MILLER, George Abram (1863–). An American mathematician, born at Lynnville, Pa. He graduated from Muhlenberg College (Pa.) in 1887 and from Cumberland University (Ph.D.) in 1893 and studied later at Leipzig and Paris. He was principal of schools at Greeley, Kans. (1887–88); taught mathematics at Eureka (Ill.) College (1888–93), the University of Michigan (1893–95), Cornell (1897–1901), and Leland Stanford (1901–06). In 1906–07 he was associate professor and thereafter professor of mathematics at the University of Illinois. He taught also in the summer schools of the universities of Chicago (1912) and California (1913); became editor of the *American Mathematical Monthly* and of *School Science and Mathematics;* was coeditor of the *Encyclopédie des Sciences Mathématiques;* and is author of *Determinants* (1892) and coauthor of *Mathematical Monographs* (1911).

MILLER, Henry (1800–74). An American physician, born at Lexington, Ky. After a short residence in Glasgow and Harrodsburg (both in his native State) he removed to Louisville upon the organization there of a new school of medicine. In this institution he held the chair of obstetrics and diseases of women and children until 1869. In 1859 he was president of the American Medical Association. Miller is author of *Treatise on Human Parturition* (1849) and *The Principles and Practice of Parturition* (1858).

MILLER, Henry (1860–). An American actor and theatrical manager. He was born in London, but when 11 came to America with his parents and settled in Toronto, Canada, where he received a public-school education and made his first appearance on the stage in 1879. After a brief experience in Modjeska's company he came to New York in 1880 and appeared in minor Shakespearean rôles at the Booth Theatre with Adelaide Neilson. Six years later he joined Daniel Frohman's Lyceum Company and became leading juvenile. His best-known early rôles were Clément Hale in *Sweet Lavender* (1888), Colonel Kerchival West in *Shenandoah* (1889), and Claude Melnotte in *The Lady of Lyons* (1890). In 1893 he became a member of Charles Frohman's Empire Theatre Stock Company and remained there as leading man till 1896, playing among other parts John Worthing in *The Importance of Being Earnest* and Michael Faversham in *Michael and his Lost Angel*. After leaving the Empire company he made his first appearance as a star at the Garden Theatre, New York, in 1897. In 1903 he joined Margaret Anglin in a series of co-star performances, playing Dick Dudgeon in *The Devil's Disciple*, Armand Duval in *Camille*, and (in 1906) Stephen Ghent in William Vaughan Moody's *The Great Divide*. After touring America he made his first appearance in England in this last play in 1909. Thereafter he appeared in vari-

ous plays under his own management, including *The Rainbow* (1912) and *Daddy Long-Legs* (1915). Jointly with J. Hartley Manners (q.v.) he wrote *Zira*, and in it played the leading part (1906).

MILLER, Hugh (1802–56). A Scottish geologist and writer, born in Cromarty. He was brought up by two uncles, his father having been drowned when Hugh was five. From his seventeenth to his thirty-second year he worked as a stonemason and from 1834 to 1840 was a bank accountant. In 1829 he published a volume entitled *Poems Written in the Leisure Hours of a Journeyman Mason*. He also made researches in Scottish antiquities, contributed to John M. Wilson's *Tales of the Borders* (1834), and wrote *Scenes and Legends of the North of Scotland* (1835; 3d ed., 1853). However, his studies were mainly geological. His series of articles in this field, collected as *The Old Red Sandstone, or New Walks in an Old Field* (1841; 7th ed., 1907), first appeared in the Edinburgh *Witness*, a paper of which Miller had become editor a year earlier. These articles discussed the author's discovery of fossils in a formation where they had not been thought to exist. His editorial labors during the heat of the disruption struggle so seriously injured his health that for the larger part of 1845–46 he had to give up all literary activity. He resumed the editorship of the *Witness*, which, from 1845, when Robert Fairby and he became joint owners, ceased to represent the Free church. Miller killed himself while insane. His services to science were important, his observation being keen and exact. He was a pioneer in the popularizing of geology. His principal works, besides those already mentioned, are: *First Impressions of England and its People* (1846; 3d ed., 1853), containing many fine specimens of English descriptive prose; *Footprints of the Creator, or the Asterolepis of Stromness* (1847; 3d ed., 1850), designed as a reply to the *Vestiges of the Natural History of Creation; An Autobiography: My Schools and Schoolmasters, or the Story of my Education* (1852); *Testimony of the Rocks* (1857), an attempt to reconcile the geology of Genesis with that of nature. Consult Peter Bayne, *Life and Letters of Hugh Miller* (2 vols., Boston, 1871).

MILLER, James (1776–1851). An American soldier and politician, born at Peterboro, N. H. He was educated for the bar, but in 1808 entered the United States army as major and took part in the frontier warfare, where he displayed great skill and courage. In 1812 he was brevetted colonel for gallantry in the engagement at Brownstown, where he commanded, and in 1814 took part in the Canadian invasion as colonel of the Twenty-first Infantry. In the battles of Chippewa and Lundy's Lane he did substantial service. A gold medal was presented to him by Congress and he was promoted to the rank of brigadier general. In 1819 he resigned from the army. From 1819 to 1825 he was Governor of Arkansas, then a Territory; and from that time until 1849 was collector of the port of Salem, Mass.

MILLER, Joaquin. See Miller, Cincinnatus Heine.

MILLER, Johann Martin (1750–1814). A German poet, member of the Göttinger Bund. He was born at Ulm, studied theology at Göttingen, and there made the acquaintance of Voss, the idyllist and translator of Homer, and of Hölty, the lyrist. He contributed to the Göttingen *Almanach* poems which became very popular, especially "Was frag' ich viel nach Geld und Gut." But he is better known for *Siegwart, eine Klostergeschichte* (1776), a sentimental novel, the best of the imitations of Goethe's *Werther*, largely autobiographic and very didactic. His other fiction includes: *Beitrag zur Geschichte der Zärtlichkeit* (1776); *Briefwechsel dreier Freunde* (1776–77); *Geschichte Karls von Burgheim und Emiliens von Rosenau* (1778–79). A collected edition of Miller's poems appeared in 1783 and an autobiography in 1803. Consult Kraeger, *Johann Martin Miller* (Bremen, 1893), and Erich Schmidt, *Charakteristiken*, vol. i (2d ed., Berlin, 1902).

MILLER, John Franklin (1831–86). An American soldier and politician, born in South Bend, Ind. He took a course at the New York State Law School, graduating in 1852, and was elected a Republican member of the Indiana Senate in 1860, but resigned in order to enter the army on the outbreak of the Civil War. He was made colonel of the Twenty-ninth Indiana Volunteers and fought in many of the most important battles in the Mississippi region. For gallantry at the battle of Stone River he was made a brigadier general of volunteers. At Liberty Gap he was severely wounded, but he commanded a division at Nashville and was soon afterward brevetted major general of volunteers. Soon after the war he removed to San Francisco and was for four years collector of the port. He then entered business and was one of the originators and also president of the Alaska Commercial Fur Company. He took an active part in politics, was several times a presidential elector on the Republican ticket, in 1879 assisted in framing a new State constitution, and in 1881 was elected United States Senator from California and served until his death.

MILLER, Joseph, or Josias, commonly known as Joe Miller (1684–1738). An English comedian. With slight interruption he was connected with Drury Lane from 1714 to his death. Great favorites with the town were his Teague in Sir Robert Howard's *Committee* and Sir Joseph Wittol in Congreve's *Old Bachelor*. He was also popular in a score of other rôles. So ignorant that he was unable to read, he married that he might have some one to read his parts to him. Though he had no great reputation as a wit off the stage, yet the year after his death appeared a volume of jests ascribed to him under the title *Joe Miller's Jests*. This pamphlet of 72 pages, containing 247 jests, was compiled by John Mottley for the publisher, T. Read. Why it was fathered upon a poor and illiterate actor is not clear; perhaps by mere accident. The jests are taken in part from earlier collections and in part from current witticisms that had not previously found their way into print. Only three are related of Miller himself. As a whole they are flat; their only piquancy is in their coarseness. But they were exceedingly popular, as is shown by the numerous editions that immediately followed (1st, 2d, 3d, 1739; 4th, 1740; 5th, 1742; 6th, 1743; 7th, 1744; 8th, 1745). The original number of jests, which had increased to 587 in the edition of 1745, continued to grow, until by the middle of the nineteenth century it had reached 1546. Consult the facsimile reprint of the first editions by Bellars (London, 1861) and Hazlitt, *Studies in Jocular Literature* (ib., 1890).

MILLER, Joseph Nelson (1836–1909). An American naval officer, born in Ohio. Entering the navy in 1851, he became commander in 1870, captain in 1881, commodore in 1894, and rear admiral in 1897. As executive officer on board the ironclad *Passaic* he was present at the attack upon Fort Sumter in 1863, and for bravery in this and the action against Fort Fisher was highly commended. He represented the Navy Department at the Queen's Jubilee in 1897, in 1898 raised the flag of the United States over Hawaii, and at the time of the Spanish-American War organized the Pacific naval reserves. In November, 1898, he was placed on the retired list.

MILLER, Lewis (1829–99). An American philanthropist and inventor, born at Greentown, Ohio. He invented and manufactured a mower and reaper and other agricultural machines, which brought him a large fortune. He devised an auditorium for Sunday schools and introduced into Sunday-school services new instrumental music, such as that of piano and cornet. His experience and ideas in the development of religious organization in 1873 suggested to Bishop John H. Vincent the plan of the Chautauqua Assembly, which was adopted, and Miller became president of the Assembly after its foundation the next year. He gave largely to the support of the Assembly and to other enterprises.

MILLER, Orest Fedorovitch (1833–89). A Russian literary historian and critic, born in Reval. He studied at the University of St. Petersburg (1851–55) and was professor of early Russian literature there until 1888. His important lectures on *Russian Literature after Gogol* were published in 1874 and his *Slav World and Europe* in 1877. Though a prominent Slavophil, he was less radical than some writers, as is shown by his book on the Slav question (1865). He also wrote *Lomonosov and Peter the Great* in the following year, but became most widely known through his work on the national mythology, entitled *Ilïa Muromets i Bogartyrsvo Kievskoe* (1870).

MILLER, Patrick (1731–1815). A Scottish inventor, who is asserted by some first to have invented the steamboat. He was born in Glasgow, became a banker, and having accumulated a considerable property, interested himself in maritime inventions. In 1785 he bought the estate Dalswinton in Dumfriesshire and there conducted some experiments with a steamboat of his construction which was propelled by a Symington (q.v.) engine. In 1787 he published a description of one of his vessels under the title *The Elevation, Section, Plan, and Views of a Triple Vessel with Wheels, etc.* Miller was a close friend of Robert Burns. Consult Major General Miller, *A Letter to Bennet Woodcroft Vindicating the Right of Patrick Miller to be Called the First Inventor of Practical Steam Navigation* (London, 1862).

MILLER, Richard E. (1875–). An American figure painter. He was born in St. Louis and studied at the School of Fine Arts there (1885–89) and in Paris under Constant and Laurens (1899–1901). The first picture which he exhibited in the Paris Salon (1901) won a gold medal, and he continued to achieve distinction at the Salon. He made Paris his residence; became a Chevalier of the Legion of Honor (1908), a member of the International Society of Painters, Sculptors, and Gravers and of the Society of American Painters, Paris, and was elected an associate of the National Academy of Design, New York. He is represented in the Luxembourg Gallery, Paris, by the "Old Maiden Ladies" and "Portrait of an Old Woman"; in the Metropolitan Museum of Art, New York, by "The Chinese Statuette"; the Gallery of Modern Art, Rome, "Lady with Fan"; Corcoran Gallery, Washington, "The Boudoir"; and also in the permanent collections of St. Louis, the Carnegie Art Institute, Pittsburgh, the Antwerp Museum, Musée du Petit Palais, Paris, Museum of Christiania, and the modern galleries of Florence and Venice. Among his more recent works are "Springtime," "Before the Mirror" (1913), "La Toilette" (1914), "The Open Window" (1914). Miller became one of the most prominent and influential among American painters residing abroad. His highly modern technique shows impressionistic influence, with delightful color schemes and very subtle and interesting treatment of light and shadow. He excels especially in figure compositions, depicted either out of doors or in rooms flooded with light. Quaint eighteenth-century costumes often add to the charm of his paintings.

MILLER, Samuel Freeman (1816–90). An American jurist. He was born in Richmond, Ky., graduated in medicine at Transylvania University in 1838, and afterward studied law and removed in 1850 to Iowa, where he became conspicuous in his profession. He ardently supported emancipation of the slaves and became a prominent member of the newly founded Republican party. In 1862 he was appointed an associate justice of the United States Supreme Court by President Lincoln. His decisions gave him a national reputation, and he was especially noted for his opposition to the encroachments of railroad corporations. In 1877 he was a member of the Electoral Commission and in 1887 was the orator of the Centennial Constitution celebration held at Philadelphia.

MILLER, Warner (1838–1918). An American politician and manufacturer, born at Hannibal, Oswego Co., N. Y. He graduated at Union College in 1860. At the beginning of the Civil War he enlisted in the Fifth New York Cavalry and was promoted to be lieutenant. After leaving the army he became a paper manufacturer at Herkimer, N. Y., and in this business he accumulated a fortune. In 1872 he was elected a delegate to the National Republican Convention, and served as a Republican in the New York Legislature in 1874–75 and in the Forty-sixth and Forty-seventh Congresses (1879–81). He was elected to the United States Senate to fill the place of Thomas C. Platt, who resigned in 1881 as a result of the Conkling-Platt-Garfield fight concerning New York patronage, and served until 1887. As Senator, he was the author of bills granting increased pensions to disabled war veterans, of an eight-hour labor law for letter carriers, and of the "head money" immigration law. He incurred the bitter political enmity of Platt, as was evinced in the Republican National Convention when Harrison was nominated and when Miller was nominated, but defeated, for Governor of New York in 1888. After retiring, Miller gave his attention to his business, becoming an inventor of a wood-pulp process. He was also interested in an effort to construct an interoceanic canal by the Nicaragua route.

MILLER, Willet Green (?1869–). A

Canadian geologist. He was born in the township of North Walsingham, Norfolk Co., Ontario, and was educated at Toronto, Chicago, Harvard, and Heidelberg universities. He was assistant in field geology, Canadian Geological Survey (1891–93); was lecturer and later professor of geology and petrography in Queen's University (1893–1902); and in 1902 was appointed provincial geologist and inspector of mines for Ontario. From 1897 to 1901 he was in charge of the field work in eastern Ontario for the Bureau of Mines. He was elected a member of the Canadian Mining Institute, the American Institute of Mining Engineers, and the Geological Society of America. In 1906 he was a delegate to the International Geological Congress, Mexico City; in 1908–10 he was president of the Canadian Mining Institute; in 1911 he became a fellow of the Royal Society of Canada; and in 1915, for distinguished work, he was awarded the gold medal of the Institution of Mining and Metallurgy, London, England. A large number of his contributions on geological and mining subjects appear in the annual reports of the Ontario Bureau of Mines. He published *Minerals and how they Occur* (1906).

MILLER, William (1782–1849). An American religious leader, founder of the sect called Millerites or Second Adventists. He was born in Pittsfield, Mass., but when he was four years old his parents removed to Low Hampton, N. Y., which continued to be his home during most of the remainder of his life. He served as a captain in the American army during the War of 1812, but soon after its close became deeply interested in religion and devoted himself to the study of the Bible. As early as 1818 he came to the conclusion that Christ's second advent had been prophesied for the year 1843, and during the succeeding years became the author of a creed founded on this basis. In 1833 he was licensed to preach, though never ordained, by the Baptist church in Hampton and Whitehall, and in the same year issued a pamphlet entitled *Evidence from Scripture and History of the Second Coming of Christ about the Year 1843; and of His Personal Reign of One Thousand Years* (1833). Soon afterward he began to lecture on the same subject to large audiences in the New England and Middle States. As the year 1843 drew near his followers awaited the second coming with intense excitement. When the year ended he wrote to them confessing his error and acknowledging his disappointment. Later he set Oct. 22, 1844. Even after this second failure many of his disciples remained faithful to him and continued so till the day of his death. The name Adventist was agreed upon in 1845 as the proper designation of his creed. Consult Sylvester Bliss, *Memoirs of William Miller* (Boston, 1853), and James White, *Sketches of the Christian Life and Public Labors of William Miller* (Battle Creek, 1875).

MILLER, William (1795–1861). An English soldier, born at Wingham, Kent. Entering the British artillery, he served under Wellington in the Peninsular campaigns of 1811–14 and took part in the operations in Chesapeake Bay (1814). Returning to England, he traveled in Europe for two years and then went to Argentina. Later he joined the Patriot army in Chile and distinguished himself in many battles in the struggle for the independence of that country. In 1821 he went to Peru, where he rendered valuable service to the Patriot cause and rose to the rank of general of division. He became intimate with Bolívar, was made Governor of Potosí in 1825, and the following year returned to Europe, where he was received with many marks of distinction. In 1843 he was appointed British Consul General in the Pacific, in which post he served till his death. Consult John Miller, *Memoirs of General Miller in the Service of the Republic of Peru* (2d ed., 2 vols., London, 1829).

MILLER, William (1834–1912). A Canadian statesman, born at Antigonish, Nova Scotia, and educated at the academy there. Called to the bar in 1860, he became queen's counsel in 1872 and took rank as one of the leaders in his profession. He was elected a Liberal-Conservative member of the Nova Scotia Assembly in 1860 and was prominent in the debates on the Confederation of Canada. Although opposed to the financial part of the scheme, he rendered important service by carrying a resolution authorizing Nova Scotia delegates to frame a Confederation plan in London, England. Thus were secured, under Imperial auspices, changes which made the federal union acceptable to the Nova Scotia Legislature at a time when all appearances were adverse. Miller was called to the Senate in 1867, was Speaker thereof in 1883–87, and remained a member of that body until his death. He was chairman of the standing committees on private bills, railways and canals, and banking and commerce, and also of the joint committee of both Houses of Parliament on the codification of the criminal law. In 1891 he was sworn a member of the Queen's Privy Council for Canada.

MILLER, William Hallowes (1801–80). An English mineralogist. He was born at Velindre, near Llandovery, and was educated at St. John's College, Cambridge, where, after graduating in 1826, he became fellow and tutor. In 1832 he was appointed professor of mineralogy and in 1838 was elected a fellow of the Royal Society. In 1838 appeared his famous system of crystal notation in *A Treatise on Crystallography*, the most consistent and adaptable devised up to that time and still in common use. From 1843 to 1854 he was engaged as member of a government commission in replacing the standard of weights and measures, which had been destroyed by fire. In 1870 he served on the Commission Internationale du Mètre and from 1856 to 1873 was foreign secretary of the Royal Society. He contributed frequently to the scientific press and published *The Elements of Hydrostatics and Hydrodynamics* (3d ed., 1843).

MILLER, William Henry Harrison (1840–1917). An American lawyer and cabinet officer. He was born in Augusta, Oneida Co., N. Y., and graduated at Hamilton College in 1861. He removed in the same year to Ohio, taught school at Maumee for six months, and then enlisted as a private in the Eighty-fourth Ohio Volunteers and was promoted to a lieutenantcy. When his term of enlistment was completed he read law for some time at Toledo in the office of Judge Waite, and in 1863 settled in Peru, Ind., as superintendent of schools. There he was admitted to the bar in 1865. In 1866 he removed to Fort Wayne, where he practiced his profession until 1874, when, having established his reputation, he went to Indianapolis to become the law partner of Benjamin Harrison (q.v.). Their association lasted until the death of the latter, continuing throughout Harrison's administration as President, during which period (1889–93) Miller served as Attorney-General of

the United States, retiring to private practice in 1893. Perhaps his most prominent act while in the cabinet was in connection with the famous Terry case, in which he claimed that it was the constitutional duty of the executive to protect the judiciary.

MILLER, WILLIAM LASH (?1866–). A Canadian chemist. He was born at Toronto and was educated at Toronto and Munich universities. For several years he was a demonstrator of chemistry in Toronto University and in 1907 was appointed professor of physical chemistry. He was elected a member of the American Association for the Advancement of Science, vice chairman of the Canadian section, Society of Chemical Industry (1909), and a fellow of the Royal Society of Canada. He published many scientific papers.

MILLERAND, mēl'răN', ALEXANDRE (1859–). A French statesman and for long a Socialist leader, born in Paris, where he was educated at the Lycée Vanves and the Lycée Henri IV and, in law, at the university. He began to practice in Paris in 1881, was counsel to the striking miners of Montceau-les-Mines in 1882; was elected to the municipal council in 1884; and as a Radical Socialist, to the Chamber of Deputies in 1885. In 1889 he became proprietor of *La Voix,* which he made the organ of his personal views. In the Chamber of Deputies Millerand urged many reforms, especially relating to social legislation. He also gained prominence as editor in chief of the *Petite République* (until 1896) and as an impassioned orator. In 1899, as leader of the Parliamentary or Opportunist Socialists, he was made Minister of Commerce in the Waldeck-Rousseau cabinet against the wishes of the Marxian Socialists led by Guesde (q.v.). In this office he did much to pass laws in favor of the working classes. Some of the most important of these were the establishment of one day's rest a week, and a law making 10 hours the maximum day for women and children; he also made many attempts to procure the adoption of compulsory arbitration in industrial disputes. In 1902, just before the cabinet went out of office, a bill was passed making eight hours the maximum day for French miners. Millerand was expelled from the Socialist party because he had taken office in a non-Socialist cabinet. In 1909 he was Minister of Commerce and Postal and Telegraph Service. In the first Briand ministry (1909–10) he held the portfolio of Public Works and in 1912 entered Poincaré's cabinet as War Minister. He won great distinction in this office because of his energy in reorganizing the army and infusing it with enthusiasm. On Aug. 26, 1914, Millerand was again entrusted with the War portfolio under Viviani. On Sept. 23, 1920, he was elected President of France. See SUPPLEMENT.

MIL'LERITE (named in honor of W. H. Miller). A native nickel sulphide that crystallizes in the hexagonal system, has a metallic lustre, and is of a yellowish color. It occurs usually in capillary crystals in cavities with crystals of other minerals, especially in Bohemia, in Saxony, and in Cornwall, England; in the United States it is found at Antwerp, N. Y., in Lancaster Co., Pa., and especially in geodes in limestone near St. Louis, Mo., and Milwaukee, Wis. Millerite has been made artificially in groups of needle-like crystals.

MIL'LERSBURG. A village and the county seat of Holmes Co., Ohio, on Killbuck River, 86 miles south of Cleveland, on the Cleveland, Akron, and Columbus and the Baltimore and Ohio railroads (Map: Ohio, G 4). It has manufactures of foundry and machine-shop products, glassware, flour, brick, lumber, etc. Millersburg is surrounded by a rich agricultural region, carries on a considerable trade in draft horses, and has in its vicinity deposits of coal, iron ore, clay, and shale. The village owns and operates its water works. Pop., 1900, 1998; 1910, 2020.

MILLER'S TALE, THE. One of Chaucer's Canterbury Tales. It is the familiar story of an old husband deceived by a young wife. In this case the husband is a rich old simpleton, a carpenter of Oxford. The source is unknown, but is supposed to be one of the rude jesting stories of the time.

MILLER'S-THUMB (so called from the shape of the head), or RIVER BULLHEAD. A small, spiny-rayed fish (*Cottus gobio*) common in the streams of England and northern Europe and Asia. It rarely reaches 5 inches in length. It is brown above, varying in intensity, as in many fishes, with the color of the bottom, and white beneath. Its disproportionately large, flattened head compared to its body, and the entire absence of scales, give it an ugly appearance. The flesh is reddish when boiled, is said to be of excellent flavor, and is much sought after in some countries. In the United States a related species (*Cottus ictalops*) is sometimes called miller's-thumb. It occurs in all clear streams of the Northern and Middle States. These fishes live on small organisms and on fish eggs and are considered a destructive pest by fish culturists, especially in respect to trout eggs. The English fish is a favorite among anglers. Consult T. N. Gill, *Miller's-Thumb and its Habits, Smithsonian Institution, Miscellaneous Collections* (Washington, 1910).

MILLES, mĭl'lĕs, VILHELM KARL EMIL ANDERSSON (1875–). A Swedish sculptor, born near Upsala and educated in Stockholm and Paris. His father's name was Andersson, Milles being the name of a related family. His works include the Sten Sture monument (near Upsala), the polychrome statue of Gustavus Vasa, seated (Nordiska Museum, Stockholm), portrait busts of J. Kronberg (bronze, Göteborg Museum), O. Levertin (wood, National Museum), Mittag-Leffler (bronze), F. Boberg (bronze, National Museum), and G. Stridsberg (granite, National Museum); studies in animal life, as "Playing Elephants" (National Museum) and "Playing Bears" (granite, entrance to Berzelii Park, Stockholm). Later works are "Vingarna," boy with eagle (1910, bronze, National Museum), and the Scheele statue (1912, Köping). Milles is to be placed in the front rank of Swedish sculptors of his time.—His sister RUTH ANNA MARIA MILLES (1873–), also a sculptor, was born at Vallentuna and studied in Stockholm and (1898–1904) in Paris. She is best known for her statuettes, groups, and reliefs of types from Brittany and later Sweden, as: "Redcap and Wolf," "Fisherman's Wife," "Wild Flower," "Young Mother," "Bouquet-Lisa" (Thiels Gallery), "On the Way from Church," "Yvonne," "After Waiting" (National Museum), and "Wood from the Woods."

MIL'LET (Fr. *millet,* dim. of *mil,* OF. *mil, meil,* It. *miglio,* from Lat. *milium,* millet). A name applied to certain cereal and forage grasses of several distinct genera and species. Millets

are extensively used as forage crops in many countries and it has been estimated that they furnish food for about one-third of the inhabitants of the globe. They are widely cultivated for food in India, Japan, and other parts of Asia. In the United States the cultivated varieties of millet may be divided into three groups, viz., foxtail millets, barnyard millets, and broom-corn millets. The foxtail millets, perhaps the most important group, are of very ancient cultivation. They are believed by some writers to have been included in the order of Chinnong, 2700 B.C., requiring certain plants to be sown each year by the Emperor of China in a public ceremony. De Candolle considers this kind of millet a native of China, Japan, and the Indian Archipelago. The most common varieties of this group all belong to one species, *Setaria italica*, and are grown in North America, Europe, India, China, Japan, and north Africa. The barnyard millets include the cultivated varieties of the widely distributed species *Panicum Crus-galli*, or barnyard grass, and also the varieties belonging to other species of the genus *Panicum*, especially *Panicum colonum* and *Panicum frumentaceum*. The varieties derived from *Panicum Crus-galli* are considered the true barnyard millets, and among them a variety of Japanese barnyard millet and the Ankee grass of the southwestern United States are the most important. Shama or Sanwa millet, or jungle rice (*Panicum colonum*), a tropical plant, closely allied to true barnyard grass, is a valuable food and forage plant in many tropical and subtropical regions and extensively grown in southern and eastern Asia, but little in the United States. The third group, or broom-corn millets, comprises the varieties of *Panicum miliaceum*. This species, universally known to agriculture, has been in cultivation in Europe since prehistoric times and is still the common millet of the Old World. Its origin is very uncertain, but it is probably a native of the warmer regions of Asia. The classification of varieties of this species is based mainly upon the color of the ripe seed—yellow, white, and red. The term Indian or African millet is often loosely applied to certain of the nonsaccharine sorghums, such as durra, Kafir corn, and pearl millet (*Pennisetum typhoideum*), which last is also called Egyptian or cat-tail millet. Efforts have been made to develop the production of the class known as Kafir corn in certain sections of the United States having an insufficient rainfall to insure a reliable maize crop. The quantities produced have been satisfactory but the domestic market has thus far been extremely limited, considerable quantities having been exported to Europe where it is used as food for animals and domestic fowls. See ANDROPOGON; SORGHUM.

Millets are not well adapted to heavy clay or wet soils, but succeed best on fertile friable loams. The preparation of the soil is the same as for other grass crops. In the United States the seed is usually sown late in the spring to prevent the harvest of the millet from interfering with the harvest of the cereals. The seed is usually sown broadcast at the rate of one-half bushel to the acre. It is, however, often drilled. For hay, millet is usually harvested with a mower when the crop has just finished heading, and for the seed with a reaper like cereals a little before it is fully ripe. If harvested when fully ripe there is usually a heavy loss of seed in handling. Where the self-binder is used in harvesting this crop the sheaves are bound loosely and put up in shocks to cure. The yield of cured hay per acre ranges from four to six tons and the yield of seed from 40 to 50 bushels. According to the thirteenth census the United States produced, in 1909, 1,743,887 tons of millet hay and 588,270 bushels of seed, a decrease in the crop of about 25 per cent compared with 1899. This crop is practically free from attacks of insects and plant diseases.

Feeding Value. Millet is valuable principally as hay and as a soiling crop. It is also useful for silage. The ripened seeds are seldom fed to stock, but are much used as food for poultry and birds. If used as stock food they should be crushed or ground. The seed of broom-corn millet has found more favor in the United States as a cattle feed than that of other varieties. German millet cut when the heads are well filled but the seeds still soft has the following percentage composition: water, 71.7; protein, 2.7; fat, 0.5; nitrogen-free extract, 14.3; crude fibre, 9.3; and ash, 1.5. German millet hay: water, 7.7; protein, 7.5; fat, 2.1; nitrogen-free extract, 49; crude fibre, 27.7; and ash, 6. Other millets fresh and cured resemble in composition the examples quoted more or less closely. The average percentage composition of millet seed follows: water, 14; protein, 11.8; fat, 4; nitrogen-free extract, 57.4; crude fibre, 9.5; and ash, 3.3. In the case of barnyard millet hay 57.4 per hundredweight, of the protein 63.7 per hundredweight, of the nitrogen-free extract 51.6 per hundredweight, and of the crude fibre 61.6 per hundredweight were on the average found to be digestible. Millet hay is a useful coarse fodder for cows, but not more than six or eight pounds should be fed daily. When fed to lambs care should be exercised, as millet hay causes scours unless fed in small quantities. It has been observed that when horses were fed millet hay exclusively as coarse fodder, painful conditions called millet disease were induced. It is believed that the trouble may be avoided by using this hay in limited quantities, and not continuously. It is also possible that millet grown in some regions is harmless, while that grown in others is harmful. The plant has been used for farm animals since very early times, and generally speaking has proved a satisfactory feeding stuff. See Colored Plate of CEREALS.

Consult: T. A. Williams, *Millets* (Washington, 1899); C. R. Ball, *Pearl Millet* (ib., 1903); *United States Department of Agriculture, Year Book for 1898* and *Farmer's Bulletin 101*.

MILLET, mē'lā', AIMÉ (1819–91). A French sculptor and painter. He was born in Paris, received his first instruction in painting from his father, and studied sculpture with David d'Angers, and after 1852 gave up painting entirely. For his work in sculpture he won a gold medal at the exposition of 1889. His most ambitious work was the erection for Napoleon III in 1865 of a colossal copper statue of Vercingetorix at Alise-Sainte-Reine. His statues adorn several public buildings in Paris, among them an "Apollo" in bronze at the New Opéra. His mythological statues and groups include "Bacchante" (1885); "Narcissus" and "Ariadne," acquired by the state. Among his portrait statues are those of Denis Papin at Blois, Chateaubriand at St. Malo, Gay-Lussac at Limoges, and Edgar Guinet at Bourg. He executed many portrait busts and statues in marble and bronze. Although realistic in character, his art is theatri-

cal in pose. Consult Dumesnil, *Aimé Millet* (Paris, 1891).

MIL'LET, Francis Davis (1846–1912). An American mural and genre painter, war correspondent, illustrator, and author. He was born at Mattapoisett, Mass., Nov. 3, 1846, took part in the Civil War as a drummer and assistant surgeon, and graduated at Harvard (A.B., 1869; A.M., 1872). He was a pupil at the Royal Academy of Fine Arts at Antwerp (1871–72), and also studied in France and Italy, at the same time writing illustrated articles for American periodicals. During the Russo-Turkish War (1877–78) he was engaged by the New York *Herald*, the London *Daily News*, and the London *Graphic* as war correspondent, attached to General Skobelev's staff. His stories from the front were accompanied by sketches. He was director of the decorations and functions of the World's Fair at Chicago in 1893. The year 1898 saw him in the Philippines as the correspondent of the London *Times* and *Harper's Weekly*. Millet is now best known for the mural paintings to which he devoted the latter years of his life. The greatest of these is probably the "Evolution of Navigation" in the Custom House at Baltimore, Md.; but there are other important examples of his work in this field in the Post Office, Cleveland, Ohio; the Governor's room of the Minnesota State Capitol; the Hudson County Court House, Jersey City; the Essex County Court House, Newark, N. J.; the Supreme Court at Madison, Wis. The same strong synthetic sense, accuracy of detail, and harmonious grouping displayed in his decorative works also distinguishes his highly finished genre paintings of England in the eighteenth century and of classic Rome and Greece, in which costume and interior are studied with much detail, showing the influence of the Dutch school. His chief easel paintings include: "At the Inn," Union League Club, New York City; "A Cozy Corner" and "An Old-Time Melody," both in the Metropolitan Museum; "Between Two Fires," Tate Gallery, London; portraits of Mrs. Millet and President Butler of Columbia University (1906). He was prominently identified (1905–06) with the organization and endowment of the American Academy at Rome (q.v.), of which he was the first secretary. He was elected a member of the National Academy of Design (1885) and of the American Academy of Arts and Letters and an honorary member of the American Institute of Architects; was decorated with Russian and Rumanian military orders and medals for bravery; and received medals for paintings shown at Paris (1889), Chicago (1893), and Buffalo (1901). His literary works include: *Capillary Crime and Other Stories* (1892); *The Danube* (1892); *The Expedition to the Philippines* (1899). Millet lost his life in the sinking of the *Titanic*, April 15, 1912. For many years he had lived in Worcestershire, England. In 1913 a fountain was erected in Washington, D. C., in memory of Millet and of Archibald W. Butt (q.v.). Consult Beckwith, Baxter, Maynard, Blashfield, and Coffin, *Art and Progress*, vol. iii (Washington, 1912).

MILLET, mē'lâ', Jean François (1814–75). A French genre and landscape painter of the Barbizon group, the greatest of all peasant painters. He was born at Gruchy, near Gréville (Manche), Oct. 4, 1814, the eldest son of a Norman peasant. His father, who exercised a great influence upon Millet's life and character, was a man of refined and deeply religious nature and of musical tastes, being cantor in the village church. Under the tuition of the village priest he received an elementary education, even mastering Greek, but his early years he spent on the farm, trying, during hours of rest, to draw the familiar scenery and life about him. His father took him to the neighboring town of Cherbourg, where he studied under Mouchel, a pupil of the school of David, and Langlois. In 1837, aided by a small gift of money from the council general of the department and by a small pension granted by the town council of Cherbourg, Millet went to Paris. He entered the studio of Delaroche, but, unable to endure his master's conventional methods, and constrained by poverty, he soon withdrew. With Marolle, a friend, he opened a little studio, giving his evenings to study and his days to painting cheap portraits and pastel imitations of Boucher and Watteau. He won some recognition with a portrait in the Salon of 1840, but soon returned to Normandy, where he married (1841). There he supported himself by painting signboards, and also produced "Sailors Mending a Sail" and other genre works. In 1842 he returned to Paris and in 1844 attracted the favorable attention of artists by his "Milkwoman" and "Riding Lesson." On the death of his wife he returned to Normandy, but remarried and came again to Paris in 1845. After a series of religious and classical subjects, none of which attained success, he at last found himself in the "Winnower" (1848, Louvre), his first important picture, bought by Ledru-Rollin, the Minister of State during the revolution of 1848, in which Millet took part.

In 1849 he abandoned Paris for the village of Barbizon, which he made his permanent home. Here the Norman peasant, as he called himself, was surrounded by scenes he loved, with incomparable models for the peasant pictures to which he henceforth devoted himself. "The Sower" (1850, Vanderbilt collection, Metropolitan Museum, New York) was followed by "Man Spreading Manure" (1852); "The Reapers" (1853); "A Peasant Grafting a Tree" (1855); "The Gleaners" (1857, Louvre), one of his very best works; "The Angelus" (1857, Louvre); "Death and the Woodcutter" (1859, Copenhagen Gallery); "Woman Feeding her Children" (La Becquée, 1860), in the Lille Museum; and others, all produced while he was hampered by illness and debts. In 1860 he bound himself by contract to give all his work for three years for 1000 francs a month, but the contract was dissolved in six months. To this period belong "The Sheep Shearing" (1860); "Woman Feeding Child," "The Sheep Shearer," "Waiting" (all in 1861); "Potato Planters" (1862); "The Wool Carder" (1863); and "The Man with the Hoe" (1863, San Francisco Museum). From 1860 his reputation was regarded as established, and after 1863 he no longer suffered want. In 1864 he exhibited "The Shepherdess" (Louvre) and "Peasants Bringing Home a Calf"; in 1865 he produced some decorative work. At the Paris Exposition of 1867 he received a medal of the first class and in 1868 the ribbon of the Legion of Honor. Driven from Barbizon by the Franco-Prussian War, Millet repaired to Cherbourg and did not return until late in 1871. He was deeply affected by the death, in 1867, of his friend Rousseau, with whom, of all others, he was most intimate. Although the state of his health,

which had been failing for some time, curtailed the hours of work, he continued to paint until December, 1874, when fever set in and he died on Jan. 20, 1875.

He was one of the artists selected by the government to decorate the Panthéon, but did not live to complete the commission. A number of important works are owned in the United States, among which are: "The Sower" and the "Water Carrier," "The Shepherdess," "At the Well," "The Knitting Lesson," "Hunting in Winter," the water color "Shepherd and Dog," and "Girl Raking Hay," all in the Metropolitan Museum, New York; "The Grafter," "Shepherdess," and "Water Carrier" (all three belonging to William Rockefeller); "The Turkey Keeper" (C. A. Dana, New York); "A Shepherdess Seated," "Homestead at Gréville," "Harvesters Resting," "Portrait of himself," and others in the Bóston Art Museum; the "Planters" (Quincy Shaw collection, Boston); "Potato Harvest," "Sheepfold," "Breaking the Flax," and five other works in the Walters collection, Baltimore. Although Millet's paintings began to increase in value before his death, his family was left in straitened circumstances and was pensioned by the government. His principal pictures have been etched and engraved. Himself a peasant, living the peasant's life, he painted his class as has never been done before or since. Omitting the accidental, he rendered only the typical, and his great shadowy figures seem inevitably a part of the earth. It was the master's custom to paint from memory, using his admirable sketches but no models, and to this is partially due the simplicity and breadth with which he treated his subjects.

Equally famous with Millet's paintings are many of his drawings, such as his own portrait (1848); "Woman Feeding Chickens"; "Shepherd with Flock"; "The Newborn Lamb"; "Laundresses on the Shore"; "First Steps." His pastels, too, are much prized; good examples are the "Vine Dresser Resting" and "Woman Churning." All show a good draftsman, with a fine feeling for form. His color is sad in tone, gray and brown usually prevailing; and he achieved harmony by a masterly treatment of light and atmosphere. The landscape background and the animals of his paintings are the equals of those done by the greatest specialists in these branches. Among the best of his pure landscapes are "Church of Gréville," "Spring," and "Winter"; the first two are in the Louvre, which, since the acquisition of the famous Chauchard collection, contains in all 21 paintings by Millet. He was also an etcher of great power, as is evident from his 13 original plates of subjects of peasant life, as well as from a number of others after his paintings. His designs for woodcuts, generally engraved by his two brothers, show great originality, being executed in bold, coarse outlines, more like those of the old German masters than nineteenth-century etchings. Monuments to Millet have been erected in Cherbourg and Gruchy, and a bronze plaque attached to a rock at the entrance to the forest of Fontainebleau is dedicated to him and Rousseau.

Bibliography. Much the best biography of Millet was written by his friend Alfred Sensier, *La vie et l'œuvre de Jean François Millet* (Paris, 1881; abridged Eng. trans., Boston, 1896). Consult also: Alexandre Piedagnel, *Jean François Millet: souvenirs de Barbizon* (Paris, 1876); C. E. Yriarte, *Jean Frahçois Millet* (ib., 1885); J. C. Van Dyke, in *Modern French Masters* (New York, 1890); Thompson, *The Barbizon School* (London, 1890); E. M. Hurll (ed.), *J. F. Millet: A Collection of 15 Pictures, with Introduction and Interpretation* (Boston, 1900); Cartwright, *Millet: His Life and Letters* (New York, 1902); Walther Gensel, *Millet and Rousseau* (Bielefeld, 1902); Geffroy and Alexandre, *Corot and Millet* (New York, 1902); C. S. Smith, *Barbizon Days: Millet, Corot, Rousseau, and Barye* (ib., 1902); J. C. Ady, *Jean François Millet: His Life and Letters* (ib., 1902); H. Marcel, *J. F. Millet: biographie critique* (Paris, 1903); Romain Rolland, *Millet* (ib., 1903); Edgcumb Staley, *J. F. Millet*, in "Bell's Miniature Series" (London, 1903); Arthur Tomson, *Jean François Millet and the Barbizon School* (ib., 1905); Loys Deltiel, *Le peintre-graveur illustré, XIXe et XXe siècles* (Paris, 1906); L. Soullie, *Jean François Millet*, in "Les Grands Peintres aux Ventes Publiques" series (ib., 1909); P. M. Turner, *Millet* (New York, 1910); Richard Muther, *Jean François Millet* (London, 1910).

MILLET, Pierre (1635–1708). A Canadian pioneer missionary. He was born in Bourges, France, was educated for the Roman Catholic priesthood, and came to Canada in 1667. The following year he went to New York as a missionary to the Onondaga Indians. In 1672 he undertook a mission to the Oneidas in that colony, where he labored devotedly. He returned to Canada, met Governor Denonville at Cataraqui in 1686 and, in consequence of the Governor's expedition against the Iroquois, was suspected, though unjustly, of instigating it. At first the Oneidas, one of the Iroquois tribes, were hostile and sent a war party which captured him at Cataraqui in 1689 and took him back a prisoner to their country. They tortured him and threatened to kill him, but he was finally set free and adopted into their tribe, where he remained until 1694. In that year he returned to Quebec, where he died.

MILLET BEER. See Beer.

MILLI, mēl'lē, Giannina (1825–88). An Italian poetess. She was born at Terama and when but a child of five years is said to have composed verses. When 17 or 18 years of age she became a pupil of the poet Regaldi, the greatest of Italian improvisators, and soon developed considerable power in improvising popular religious and amatory verses. Medals were awarded her, and after her trips through the principal Italian cities (1857–60) a pension was bestowed upon her. She was appointed inspector of elementary schools for girls and superintendent of the normal school for young women in Rome. Her poems appeared in two volumes in 1862–63.

MIL'LIGAN, Ex Parte. The title of an important decision rendered by the Supreme Court of the United States in 1866, growing out of the events of the Civil War. The precise question raised was whether a citizen domiciled in a State where peace prevails, but which is adjacent to the theatre of war, may be deprived of the right of trial by jury and be subjected to trial before a military commission composed of army officers. The case grew out of the arrest of one Milligan, a citizen of Indiana, by a United States military officer in 1864 on charges of conspiracy, disloyal practices, inciting insurrection, and giving aid and comfort to the enemy. He was tried before a military commis-

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"THE GLEANERS," FROM THE PAINTING IN THE LOUVRE, PARIS

sion at Indianapolis, was found guilty, and was sentenced to be hanged. His counsel thereupon filed in the Circuit Court of the United States a petition for a writ of habeas corpus, denying the jurisdiction of the military commission on the ground that the civil courts in Indiana were open and unobstructed in the performance of their duties, that a United States grand jury which was then in session failed to find a bill of indictment, that the plaintiff was a civilian in no way connected with the military service, and that he was not a resident of a rebel State. The case was finally carried to the Supreme Court of the United States, where it was held that a military commission organized during the war in a State not invaded or in rebellion, and where the Federal courts were open and unobstructed, had no jurisdiction to try, convict, or sentence for a criminal offense a citizen who was neither a resident of a State in rebellion nor a prisoner of war nor a person in the military or naval service, and that Congress had no power to confer such authority on it. This opinion was rendered by a bare majority of the court, a vigorous dissenting opinion being delivered by Chief Justice Chase, in which three other justices concurred. The decision is given in *Wallace's Reports*, vol. iv. See MILITARY LAW; MARTIAL LAW.

MILLIGAN, GEORGE (c.1861–). A Scottish biblical scholar, son of William Milligan. He was educated at Aberdeen, Edinburgh, Göttingen, and Bonn; was minister of St. Matthew's, Morningside, and of Caputh; and in 1910 became regius professor of divinity and biblical criticism in Glasgow University. He published: *History of the English Bible* (1895); *The Lord's Prayer* (1895); *The Theology of the Epistle to the Hebrews* (1899); *The Twelve Apostles* (1904); *St. Paul's Epistles to the Thessalonians* (1908), Greek text, introduction, and notes, with special study of syntax and style; *Selections from the Greek Papyri* (1910); *The New Testament Documents: Their Origin and Early History* (1912), the Croall lectures for 1911–12; *The Vocabulary of the Greek Testament* (1914 et seq.), with J. H. Moulton.

MILLIGAN, ROBERT WILEY (1843–1909). An American naval officer. He was born in Philadelphia, entered the United States navy as third assistant engineer in 1863, and was regularly promoted to chief engineer in 1892, commander in 1899, and captain in 1902. During the Civil War he participated in both battles of Fort Fisher, and in the capture of Petersburg and Richmond, and during the Spanish-American War he was chief engineer of the *Oregon* on her famous run from the Pacific to the Atlantic coast and in the battle of Santiago. He served as chief engineer of the Norfolk Navy Yard from 1899 to 1905, when he was advanced to the rank of rear admiral and retired.

MILLIGAN, WILLIAM (1821–93). A minister of the Established church of Scotland, born in Edinburgh. In 1839 he graduated from St. Andrews University. He stood by the "Auld Kirk" at the disruption (1843), and was ordained minister to the Parish of Cameron, Fife, the following year. He studied in Germany from 1845 to 1846 and was placed at Kilconquhar from 1850 until 1860, when he was asked to occupy the newly created chair of biblical criticism in Aberdeen University. He assisted in the revision of the New Testament in 1870 and published works on the *Higher Education of Women* (1878); *The Resurrection of Our Lord* (1881; new ed., 1905); *Commentary on the Revelation* (1883); *Baird Lectures on the Revelation of St. John* (1886); *Elijah* (1887); *The Resurrection of the Dead* (1890); *Aims of the Scottish Church Society* (1892); besides a notable article for the *Encyclopædia Britannica* on the Epistle to the Ephesians (1879). He was sent to the United States Presbyterian General Assembly (1872) as a delegate from the corresponding body in Scotland.

MILLIKIN UNIVERSITY. See JAMES MILLIKIN UNIVERSITY.

MILLIN, mē'lăn', AUBIN LOUIS (1759–1818). A French archæologist, born in Paris. His first literary attempts were translations from the German and English, which were published in the *Mélanges de littérature étrangère* (1785–86). His protest against the excesses of the Revolution made it necessary for him to flee from Paris, and he was imprisoned for a year in St. Lazare on his return. In 1795 he was placed in charge of the cabinet of antiques and medals in the National Library, was instrumental in the creation of a chair of antiquities, and the same year undertook the direction of the *Magazin Encyclopédique*. Much of his voluminous writing on his special subject appeared in this periodical, which, in 1817, became the *Annales Encyclopédiques*, and he published also *Antiquités nationales* (1790–98); *Introduction à l'étude des médailles* (1796); *Monuments antiques inédits* (1802–04); *Dictionnaire des beaux-arts* (1806); *Histoire métallique de la révolution française* (1806). His travels in Italy and the south of France in search of antiques provided material for *Voyage dans les départements du midi de la France* (1807–11); *Peintures de vases antiques* (1808–10; new ed., 1891); *Voyage en Savoie, au Piémont, dans le Milanais* (1816–17).

MILLING MACHINE. See METAL-WORKING MACHINERY.

MILLINOCK'ET. A village in Penobscot Co., Me., 83 miles by rail north of Bangor, on the Bangor and Aroostook Railroad (Map: Maine, D 3). The manufacture of paper constitutes the chief industry. Some timber is found in the surrounding region. Pop., 1910, 3368.

MIL'LIPEDE. A myriapod of the order Chilognatha (or Diplopoda) having a dorsally convex body composed of many segments, all of which, except the first four, bear each two pairs of legs, and lacking maxillipes. See CENTIPEDE; MYRIAPODA.

MIL'LIS, JOHN (1858–). An American officer of engineers, born at Wheatland, Mich. He graduated, with first rank, from the United States Military Academy in 1881, and served at Willets Point, N. Y. (1881–83), and on lighthouse duty, especially in experiments with electric lighting (1883–90). Millis was charged with the preparation of the lighting of the Bartholdi Statue in New York harbor. From 1890 to 1894 he managed Federal improvements in the Mississippi levees and New Orleans harbor; then for four years was chief engineer of the Lighthouse Board; and in 1900 was delegate to electrical, physical, and navigation congresses in Paris during the Exposition, and was sent to Egypt to report on the Assuan Dam. After his return to America he was ordered to Seattle to construct fortifications in Puget Sound and government improvements in Washington, Idaho, and Montana. In 1905–07 he had charge of all

fortification construction in the Philippine Islands, conducted the river and harbor improvements in Indiana and Ohio and on Lake Erie in 1908–12, and was then detailed for special duty under the Bureau of Lighthouses. He was promoted to colonel of engineers in 1910.

MILLÖCKER, mĭl'lē-kēr, KARL (1842–99). An Austrian composer of light opera. He was born in Vienna and received his musical education in the conservatory of that city. In 1864 he was appointed kapellmeister at the Graz Theatre and from 1869 to 1883 occupied a similar position at the Theater an der Wien in Vienna. His music is marked by its spontaneous melodiousness and sprightly instrumentation. The principal published works include: *Der todte Gast* and *Die beiden Binder* (1865); *Diana* (1867); *Die Fraueninsel* (1878); *Der Regimentstambour* (1869); *Drei Paar Schuhe* (1870); *Die Musik des Teufels* (1870); *Das verwunschene Schloss* (1878); *Apajune, der Wassermann* (1880); *Die Jungfrau von Belleville* (1881); *Der Bettelstudent* (1881); *Gasparone* (1884); *Der Viceadmiral* (1886); *Die sieben Schwaben* (1887); *Der arme Jonathan* (1890); *Das Sonntagskind* (1892); *Der Probekuss* (1895); *Das Nordlicht* (1897).

MIL/LOM. A town in Cumberland, England, 9 miles northwest of Barrow. It is situated on the west coast of Duddon estuary and has a shallow tidal harbor. It numbers among its antiquities an early Norman church and the eleventh-century Millom Castle. The most productive mines of red hematite ore in England are worked in the vicinity, and it has numerous blast furnaces. The town owns its markets, water and gas works, and maintains a library, technical schools, recreation grounds, and isolation hospital. Pop., 1901, 10,426; 1911, 8612.

MILLO MAIZE. See ANDROPOGON; SORGHUM.

MILL ON THE FLOSS, THE. A novel by George Eliot (q.v.), published in 1860.

MILLS, ALBERT LEOPOLD (1854–1916). An American soldier, born in New York City. He graduated at the United States Military Academy in 1879, was appointed second lieutenant of the First Cavalry, was stationed at Fort Walla Walla, Washington Territory (1879–82), and engaged in frontier duty elsewhere. He saw active service against the Crows in 1887 and against the Sioux in 1890. He became first lieutenant in 1889. He was professor of military science and tactics at the State Academy, Charleston, S. C., for a year (1886–87), held an appointment at the United States Infantry and Cavalry School, Fort Leavenworth, Kans., from 1894 until 1898, and in the Spanish-American War participated in the Santiago campaign as captain and assistant adjutant general of volunteers. He was voted a medal by Congress in 1898, for his services near Santiago. In August, 1898, he was made superintendent of the United States Military Academy, West Point, with the rank and pay of colonel, and in October of the same year was promoted to the regimental rank of captain. In 1904 he was made brigadier general and in 1906 was detached from the command of the Military Academy, the scope and general efficiency of which had broadened considerably under his administration, and was assigned to duty in the Philippine Islands. In 1909 he returned to the United States to take command of the Department of the Gulf, and in 1912 was for part of a year president of the Army War College. After September of 1912 he served as chief of the division of militia affairs on the general staff.

MILLS, CHARLES KARSNER (1845–). An American neurologist, born in Philadelphia and educated at the Central High School and the medical department of the University of Pennsylvania. He began to practice in 1869; was professor of diseases of the mind and nervous system at the Philadelphia Polyclinic (1883–98) and clinical professor of nervous diseases at the Women's Medical College of Pennsylvania. At the University of Pennsylvania he served as professor of mental diseases and medical jurisprudence (1893–1901), clinical professor of nervous diseases (1901–03), and professor of neurology after 1903. He attained a high reputation as an alienist. Besides monographs on mental and nervous strain, he published: *Practical Lessons in Nursing* (new ed., 1904); *Physiology and Hygiene* (rev. ed., 1904); *The Nursing and Care of the Nervous and Insane* (new ed., 1912); and edited a valuable *Treatise on the Nervous System and its Diseases* (1898).

MILLS, CLARK (1815–83). An American sculptor, born in Onondaga Co., N. Y. In his youth he followed the trade of a plasterer, at the same time modeling ideal heads in clay. Although entirely self-taught and without knowledge of professional methods, in 1846 he completed a marble bust of John C. Calhoun, which was purchased by the city of Charleston for the city hall. In 1848 he furnished a design for an equestrian statue of General Jackson, to be placed in Lafayette Square, Washington. There being no bronze foundry for such work in the United States, Mills erected in Washington an experimental foundry, where in 1852 he succeeded in producing a perfect cast. It was formally accepted Jan. 8, 1853, and, although without artistic value, is interesting as the first equestrian statue in American sculpture. He was next engaged on the colossal equestrian statue of Washington, which was formally unveiled in the national capital Feb. 22, 1860. Mills's last work was the casting (1863) of Crawford's colossal statue of Liberty, which crowns the dome of the Capitol at Washington. Compared with present-day sculpture the work of Mills seems inferior and mechanical, but it marks a stepping-stone in the advance of American art.

MILLS, DARIUS OGDEN (1825–1910). An American financier and philanthropist, born at North Salem, N. Y. He was a clerk in New York City and served as a bank cashier at Buffalo, N. Y., in 1847–49. In 1849 he went to California, where he became a merchant and dealer in exchange at Sacramento and founded the bank of D. O. Mills & Co. In 1864–67 he was president of the Bank of California, San Francisco; and after the failure of that institution under his successor Mills reëstablished it on a sound basis. In 1880 he moved to New York City, where he erected the Mills Building on Broad Street and where he became identified with a variety of interests, as trustee of the Metropolitan Museum of Art, the American Museum of Natural History, and the American Geographical Society, and as president of the New York Botanical Gardens. In 1868–80 he was regent and treasurer of the University of California, in which he endowed a chair of philosophy; and he was also trustee of the Lick estate and Observatory. Mills gave extensively to philanthropic objects. The three Mills hotels

in New York, where poor but self-respecting men may obtain meals and lodgings at a nominal price, stand as a monument to his wise benevolence. They proved especially successful and attracted wide attention among charity workers and social investigators. At the time of his death Mills possessed a fortune of $35,000,000. His daughter married Whitelaw Reid (q.v.).

MILLS, David (1831–1903). A Canadian statesman and jurist. He was born in the township of Orford, Kent Co., Ontario, was educated at the local schools, and graduated in law at the University of Michigan in 1855. After teaching for a time he was school superintendent for Kent County until 1865. Entering political life at Confederation in 1867, he was elected Liberal member for Bothwell in the first Dominion Parliament and, with the exception of one legislative session (1882), retained his seat in the House of Commons until 1896. He edited the London (Ontario) *Daily Advertiser* in 1882–87, was called to the Ontario bar in 1883, and was soon afterward employed by the Ontario government in several important cases. He became an authority on constitutional and international law and in 1888–1900 was professor of these subjects in Toronto University. He was Minister of the Interior (1876–78) in the administration of Alexander Mackenzie (q.v.), was called to the Senate in 1897, and was Minister of Justice (1897–1901) in the administration of Sir Wilfrid Laurier (q.v.). In 1901 he was appointed a judge of the Supreme Court of Canada, which position he retained until his death. As a private member of Parliament (1879–96) Mills advocated measures for better securing the independence of the electorate, and in 1895 made a motion in the House of Commons to reform the Senate. He published: *Report on the Boundaries of Ontario* (1873); *The Canadian View of the Alaskan Boundary Dispute* (1899); *The English in Africa* (1900); and many magazine articles on political and economic subjects.

MILLS, Hiram Francis (1836–). An American hydraulic and sanitary engineer, born at Bangor, Me. After graduating C. E. from the Rensselaer Polytechnic Institute in 1856 he was engaged in engineering work on the Bergen (N. J.) tunnel of the Erie Railroad (1858), on the Brooklyn water works (1859), at Cohoes, N. Y. (1859), and, under the noted hydraulic engineer, James B. Francis, at Lowell, Mass. (1860–63). For the next six years he was employed on important railroad, dam, and water-power works, including the Hoosac Tunnel on the Fitchburg Railroad, Massachusetts. In 1869 he began a long career in the control of water power on the Merrimac River, first at Lawrence and later at Lowell as well. He served as chief engineer of the Essex Company at Lawrence after 1869, and as consulting engineer of the Proprietors' Locks and Canals at Lowell in 1893, becoming chief engineer in 1894. In 1901 he was appointed consulting engineer of the Boston Metropolitan Water and Sewerage Board. From 1886 to its dissolution in 1914 he was engineer member of the Massachusetts State Board of Health, chairman of its committee on water supply and sewerage, and directed the Lawrence Experiment Station investigations of water and sewage purification, known throughout the sanitary world. In 1892–93 he designed and built the slow sand filters of the water works of Lawrence, Mass.; these marked a new era in water purification. After 1868 he served as consulting engineer on various other works in the United States and Mexico.

MILLS, James (1840–). A Canadian educator and railway administrator. He was born near Bond Head, Ontario, and was educated at Victoria University, where he graduated at the head of his class in 1868. He taught successively at Stanstead (1868–69), Cobourg (1869–72), and Brantford (1873–79), gaining high rank in his profession. He was appointed president of the Ontario Agricultural College at Guelph in 1879, in which position he remained for 25 years, bringing the college to a high state of efficiency. As its president and the organizer for 10 years of farmers' institutes he did eminent service for agricultural education in Ontario. He was a member of the San José Scale Commission (1899). In 1904 he was appointed a member of the Board of Railway Commissioners for Canada. He was a member of the board of regents, Victoria University (1890–1910), and was also appointed a senator of Toronto University. With Thomas Shaw he wrote *First Principles of Agriculture* (1890).

MILLS, Lawrence Heyworth (1837–1918). An English Orientalist. He was born in New York City and graduated at the University of the City of New York (now New York University) in 1857. He then studied for orders at the Fairfax County Episcopal Seminary near Alexandria, Va., and was ordained in 1861, after which he held a charge in Brooklyn until 1867. Retiring from the ministry, he went to Europe in 1872, where he devoted himself first to a study of Gnosticism and then to the Avesta, which was to prove his life work. In 1887, at the request of Max Müller, he went to Oxford, where in 1898 he was made professor of Zend philology. Mills's researches were concerned mainly with the older portion of the Avesta texts, the Gâthâs (q.v.), which he studied exhaustively, adhering in the main to the system of the traditional school of interpretation. He also published many contributions on the early phases of Zoroastrianism, and must be regarded as one of the foremost of Iranian scholars. Among his works are: "Zend Avesta, part iii," in Müller, *Sacred Books of the East*, vol. xxxi (Oxford, 1887); *Study of the Five Zarathushtrian (Zoroastrian) Gâthâs* (1894); *Gâthâs of Zarathushtra (Zoroaster) in Metre and Rhythm* (1900); *Dictionary of the Gâthic Language of the Zend-Avesta* (1902–14); *Zoroaster, Philo, the Achæmenids, and Israel* (2 vols., 1904–06); *Avesta Eschatology Compared with the Books of Daniel and Revelations* (1908); *Yasna I*, with Avesta, Sanskrit, Pahlavi, and Persian texts (1910); *Our own Religion in Ancient Persia*, lectures delivered at Oxford (1913); *Lore of Avesta in Catechetical Dialogues* (1914).

MILLS, Robert (1781–1855). An American engineer and architect. He was born in Charleston, S. C., and studied under Benjamin H. Latrobe. He erected several customhouses and marine hospitals, and in 1820 was appointed State architect and engineer of South Carolina. In 1836 President Jackson made him the official architect of the United States government and supervising architect of the Capitol; this office he held until 1851. Under this and the next administration Mills designed and had charge of the erection of the Treasury Building, the General Post Office, the Patent Office Building, and the National Washington Monument.

MILLS, Roger Quarles (1832–1911). An American soldier and statesman, born in Todd Co., Ky. He removed to Palestine, Tex., in 1849, studied law while acting as clerk in the post office, and at 20 was admitted to the bar. He was elected to the Texas House of Representatives in 1859, but entered the military service of the Confederacy at the outbreak of the Civil War and took part in the battles of Arkansas Post (Jan. 11, 1863), Chickamauga (Sept. 19–20, 1863), where he commanded a brigade, New Hope Church (May 27, 1864), and Atlanta (July 22, 1864). In 1873 he was elected to Congress, where he continued as a member of the House until 1892, when he was chosen to fill an unexpired term in the Senate, and the next year was reëlected for the full term. As a Representative, he bitterly opposed the Electoral Commission resolution, claiming that Tilden was constitutionally elected. In 1884–88 he was chairman of the House Committee on Ways and Means, in which capacity he drafted in 1888 the Cleveland administration tariff act, the so-called Mills Bill, which made important reductions in existing rates and was famous as a party measure. Since the Republicans controlled the Senate, it failed of enactment, as was expected.

MILLS, Samuel John (1783–1818). An American missionary. He was born at Torringford, Conn., April 21, 1783, and graduated at Williams College in 1809. While in college he first suggested to a group of students the project of foreign missions, at a meeting for prayer by a haystack near the college. After spending a short time in the study of theology at New Haven he entered Andover Theological Seminary in 1810. With Judson, Hall, Newell, and Nott he united in a memorial to the General Association of Massachusetts (Congregational), which resulted in the formation of the American Board of Commissioners for Foreign Missions. He was licensed to preach in 1812 and spent two years in mission work in the Southern and Western States. He suggested the formation of a national Bible society, which resulted in the organization of the American Bible Society. To him was due the formation of the United Foreign Mission Society. Through his exertions in conjunction with Dr. Finley the American Colonization Society was formed in 1817 and he was appointed with Dr. Burgess to visit England in behalf of the society and to explore the west coast of Africa for a suitable site for a colony of colored people from America. He sailed in November, 1817, and arrived on the coast March 12. He embarked for the United States, May 22, 1818, and died at sea June 16. He is called the "father of foreign missions in America." Consult the memoir by Spring (New York, 1854), and T. C. Richards, *Samuel J. Mills* (Boston, 1906).

MILLS, Sebastian Bach (1838–98). An Anglo-American piano virtuoso and teacher, born at Cirencester in England. He was trained by his father and under Potter and Sterndale Bennett and was regarded as the most precocious child musician in Great Britain. He completed his musical education under Moscheles, Plaidy, and the other distinguished teachers of the Leipzig Conservatory. After leaving Leipzig he studied for a period under Liszt, who held him in high estimation. He returned for a little while to England, where he held the appointment of organist at the Roman Catholic cathedral at Sheffield (1855). Three years later he returned to Germany and played at a Gewandhaus concert (Dec. 2, 1858). The following year he appeared in New York under the auspices of the Philharmonic Society and thereafter made his home in America. He was very successful as a teacher and as a concert pianist was as popular in Germany as in the United States. His compositions are few and comparatively unimportant. He died at Wiesbaden.

MILLS, Thomas Wesley (1847–1915). A Canadian physiologist and educator. He was born at Brockville, Ontario, and was educated at Toronto University, and in medicine at McGill University, afterward studying in England and Germany. At McGill University he was successively demonstrator of (1882–84), lecturer in (1884–86), and professor of (1886–1910), physiology. In 1910 he was made professor emeritus of physiology in the same university. He was one of the founders of the Society for the Study of Comparative Physiology (1885). Among his publications are: *A Text-Book of Animal Physiology, etc.* (1889); *A Text-Book of Comparative Physiology* (1890); *How to Keep a Dog in the City* (1891); *The Dog in Health and Disease* (1892); *The Nature and Development of Animal Intelligence* (1898); *Voice Production in Singing and Speaking on Scientific Principles* (1906).

MILLS COLLEGE. A college for women, with a campus of 150 acres, in the suburbs of Oakland, Cal. It was founded as a seminary in 1865 and chartered as a college in 1885. In May, 1911, the seminary department was discontinued. Its entrance requirements are those of any standard college, and the degrees granted are A.B., B.L., and B.S. In addition to the regular departments of liberal culture it offers special opportunity for work in home economics, physical education, music, and fine arts. In 1914–15 the students numbered 137 and the faculty 32. The endowment of the college is $500,000 and the value of the property $500,000. The president in 1915 was Luella C. Carson, LL.D.

MILL SPRINGS, Battle of. A battle fought at Mill Springs, Ky., about 10 miles west of Somerset, on Jan. 18, 1862, between a Federal force of about 4000 men under Gen. George H. Thomas and an approximately equal Confederate force under Gen. George B. Crittenden. The Confederates attacked with great energy, but were finally driven in some confusion from the field. The engagement is also sometimes called the battle of Fishing Creek and the battle of Logan's Crossroads. On the battleground a national cemetery was subsequently established, where 718 soldiers lie buried, 352 known and 366 unknown.

MILL'STONE. A wheel or circular mass of rock used in grinding wheat and other grains. For good millstones the rock must be tough, hard, and possess a cellular structure so as to maintain a rough grinding surface. Several varieties of rocks have been found to possess these qualities in a greater or less degree and have been extensively employed for millstones. In the United States the rock most commonly used is a coarse granular sandstone, which is obtained in Ulster Co., N. Y., in Lancaster Co., Pa., and in Montgomery Co., Va. The celebrated French buhrstones consist of a cellular chert occurring in the Tertiary of the Paris basin. The German millstones are largely quar-

ried from a sheet of basaltic lava found near Cologne. The foreign stone is imported into the United States in small pieces and is then built up into wheels, while the domestic stone is quarried and dressed to form a solid wheel. The introduction of the roller process for the manufacture of flour has curtailed the use of millstones to a great extent. In 1913 the production of millstones in the United States was valued at $56,163. See ABRASIVES.

MILLSTONE GRIT. A hard siliceous conglomerate with quartz pebbles. Its geological position is at the base of the Pennsylvanian (Coal Measures) series of the Carboniferous system. The beds along the Appalachian Range in Pennsylvania are very coarse and are over 1200 feet thick. The rock here is a light-colored siliceous conglomerate known as the Pottsville Conglomerate, interstratified with some sandstone and thin beds of carbonaceous shells. The formation is represented also in New York and as far south as Alabama. Thin beds of coal are found in it in Pennsylvania, and in the southern Appalachians the coal beds are very important. See CARBONIFEROUS SYSTEM.

MILL'VALE. A borough in Allegheny Co., Pa., on the Allegheny River, opposite Pittsburgh, with which it is connected by bridge, and on the Pennsylvania and the Baltimore and Ohio railroads (Map: Pittsburgh, F 2). It has iron manufactures, saw works, stone works, lumber mills, breweries, etc. The government is vested in a burgess, elected every three years, and a borough council. The water works and electric-light plant are owned by the municipality. Pop., 1900, 6736; 1910, 7861.

MILL VALLEY. A town in Marin Co., Cal., 12 miles north of San Francisco, on the Northwestern Pacific and the Muir Woods and Mt. Tamalpais Scenic railroads (Map: California, C 5). It is situated in a region of remarkable scenic beauty and adapted to fruit growing. Mill Valley owns its water works. Pop., 1910, 2551.

MILLVILLE. A city in Cumberland Co., N. J., 40 miles south of Philadelphia, on the Maurice River, at the head of deep-water navigation, and on the Pennsylvania Railroad (Map: New Jersey, B 5). It has city and high-school libraries, a fine high-school building, a hospital, and a large public park at Union Lake, a beautiful sheet of water 3 miles long and 1½ in width. Millville is essentially a manufacturing centre, having extensive glass factories, iron foundries, cotton mills, wrapper and shirt-waist factories, and bleach and dye works. The city has adopted the commission form of government. Millville was incorporated as a town in 1801 and was chartered as a city in 1866. Pop., 1900, 10,583; 1910, 12,451; 1914 (U. S. est.), 13,246; 1920, 14,691.

MIL'MAN, HENRY HART (1791–1868). An English poet and ecclesiastical historian. He was the youngest son of Sir Francis Milman, physician to George III, and was born in London, Feb. 10, 1791. He was educated at Eton and afterward at Brasenose College, Oxford, where he obtained the Newdigate prize with an English poem on the Apollo Belvedere in 1812 and graduated B.A. in 1814. He published *Fazio, a Tragedy,* which was successfully brought upon the stage at Covent Garden in 1815; took orders in 1817, and in 1818 was appointed vicar of St. Mary's, Reading. In 1818 appeared his *Samor, Lord of the Bright City, an Heroic Poem,* which was followed in 1829 by the *Fall of Jerusalem,* a dramatic poem with some fine sacred lyrics interspersed. In 1821 Milman was chosen professor of poetry at Oxford and held the position for 10 years. He published three other dramatic poems, *The Martyr of Antioch* and *Belshazzar,* both in 1882, and *Anne Boleyn* in 1826. His Bampton lectures on *The Character and Conduct of the Apostles Considered as an Evidence of Christianity* appeared in 1827 and his *History of the Jews* (3 vols.) in 1830. The last of these works did not bear the author's name. Its weak point was a want of adequate learning, especially in the department of biblical criticism, but its fresh, natural treatment of biblical history was a novelty and was severely attacked as heresy. A new edition, greatly improved and more critical, was published in 1863, and another, with further improvements, in 1867. He became a canon of Westminster and rector of St. Margaret's, Westminster, London, in 1835, and the same year he published certain translations of Sanskrit epic poetry. In 1840 appeared a collected edition of his *Poetical Works,* containing some other pieces besides those already mentioned. The same year witnessed the publication of his *History of Christianity from the Birth of Christ to the Abolition of Paganism in the Roman Empire* (3 vols.). In 1849 he was made dean of St. Paul's and discharged the duties of the office in such a manner as to win the title of "the Great Dean." In 1854–56 he published his masterpiece, *History of Latin Christianity, Including that of the Popes to the Pontificate of Nicholas V* (6 vols.), a work whose candid, sympathetic scholarship made an era in the study of ecclesiastical history in England. Milman edited Gibbon (1838) and an edition of Horace (1849), and published translations of the *Agamemnon* and *Bacchæ* (1865). He contributed extensively to the *Quarterly Review.* He died in Sunninghill, near Ascot, Sept. 24, 1868. A posthumous work contains his *Annals of St. Paul's Cathedral* (1868) and another *Essays on St. Paul, Savonarola, Erasmus, etc.* (1870). His historical works were republished in 15 volumes (1866–67). Consult his biography by A. Milman (London, 1900).

MIL'MORE, MARTIN (1844–83). An American sculptor. He was born at Sligo, Ireland, and in 1851 was taken to Boston. His first instruction was in wood carving, but in 1860 he began his studies in sculpture with Thomas Ball in Boston. His first work to receive notice was his ideal alto-relievo "Phosphor" (1863). In the same year he executed the statuette "Devotion" and later an ideal child statue and cabinet busts of Longfellow and Charles Sumner. In 1864 he was commissioned to execute statues of Ceres, Flora, and Pomona for Boston Horticultural Hall (Tremont Street). One of his most effective pieces is his soldiers' monument for Forest Hills Cemetery, Roxbury (1867), which ranks high among American works of art for conception and execution. The Soldiers' and Sailors' Monument on Boston Common, unveiled in 1874, is his greatest and most elaborate work and gives proof of an unusual sense of the monumental. While preparing designs for this work he resided at Rome, where he made busts of Pope Pius IX, Wendell Phillips, and Ralph Waldo Emerson. He died in Roxbury, Mass. Among other works are his life-size bust of Charles Sumner, Metropolitan Museum, New

York City; a statue of General Thayer, West Point, N. Y.; busts of General Grant, Lincoln, Daniel Webster, and others; war monuments at Keene, N. H., Erie, Pa., and Charlestown and Fitchburg, Mass. With his brother he executed the great granite Sphinx in Mount Auburn Cemetery, Cambridge, Mass. It was in commemoration of Milmore that Daniel Chester French modeled his celebrated bronze relief "Death and the Young Sculptor."

MILNE, mĭln, JOHN (1850–1913). An English mining engineer and seismologist, born in Liverpool. He was educated at King's College and the Royal School of Mines in London and subsequently went to Newfoundland and Labrador, where he worked as a mining engineer. Later he was the geologist of Dr. Beke's expedition into northwestern Arabia, and was then for 20 years in the service of the Japanese government. During that period he established the seismic survey of Japan, which comprises more than 900 stations and which may be said to have inaugurated the systematic study of earthquake phenomena. In the course of his investigations he traveled over a great part of the world, visiting the United States, Russia, Siberia, Mongolia, Korea, China, the Kuriles, the Philippines, Borneo, and Australasia, and finally devoted himself to the establishment of a seismic survey of the world. He invented seismographs and instruments to record vibrations on railways, and published important works on seismology and geology, including *Earthquakes and Other Earth Movements* (1883; 6th ed., 1913); *Seismology* (1888); *The Miner's Handbook* (1894; 3d ed., 1902); *Crystallography.*

MILNE-EDWARDS, mĭln-ĕd'wardz, *Fr. pron.* mēl'nā'dwär', ALPHONSE (1835–1900). A French zoölogist, son of Henri Milne-Edwards, born in Paris. Though he took the degree of M.D. in 1860 he devoted his life to the study of zoölogy and, after holding various minor positions, was appointed professor of zoölogy in the Museum of Natural History, Paris, in 1876, becoming director in 1892. His earlier publications were in physiological medicine, but the greater part of his work was done in zoölogy, paleontology, and deep-sea exploration. His work on fossil Crustacea appeared in 1865; an extensive and valuable treatise on the fossil birds of France was published in 1866–72. He also described the extinct birds of the Mascarene Islands and of Madagascar. He worked long and patiently on the Crustacea, preparing elaborate reports on the deep-sea forms. His publications include: *Histoire des crustacés podophthalmaires fossiles* (1865); *Recherches anatomiques et paléontologiques pour servir à l'histoire des oiseaux fossiles de la France* (2 vols., 1867–72); *Expéditions scientifiques du travailleur et du talisman* (1888).

MILNE-EDWARDS, HENRI (1800–85). A French naturalist, born at Bruges. His father was an Englishman. He studied medicine, but after taking his degree in 1823 turned to the study of zoölogy and began his scientific career by publishing, in 1828, his *Recherches anatomiques sur les crustacés.* In 1841 he was appointed professor of entomology at the Museum of Natural History, Paris. In 1862 he succeeded Geoffrey St. Hilaire in the chair of zoölogy and in 1864 became director. From 1837 on he edited the zoölogical portion of the *Annales des sciences naturelles* and contributed extensively to this journal. He was the first to describe the important biological principle of the physiological division of labor. His most important works besides the *Recherches* above mentioned were: *Eléments de zoölogie ou leçons sur l'anatomie, la physiologie, la classification, etc., des animaux* (1834–35; republished as a new edition with the title *Cours élémentaire de zoölogie,* 1851); a completion and revision of Lamarck's *L'Histoire naturelle des animaux sans vertèbres* (1836–45), with Deshayes; *Leçons sur la physiologie et l'anatomie comparées de l'homme et des animaux* (1855–84).

MIL'NER, ALFRED, first VISCOUNT (1854–). An English colonial Governor, born at Bonn, Germany, March 23, 1854. He studied at Tübingen, at King's College, London, and at Balliol College, Oxford, studied law, and from 1882 to 1885 devoted himself to journalism, serving under John Morley and W. T. Stead. His service as private secretary to G. J. (afterward Lord) Goschen, Chancellor of the Exchequer (1887–89), began his public career. He proved an able Undersecretary for Finance in Egypt (1889–92), publishing his observations as *England in Egypt* (1892; 12th ed., 1915), and was chairman of the Board of Inland Revenue in 1892–97. In 1897 Milner was appointed High Commissioner for South Africa and Governor of the Cape of Good Hope. He held the former post through the difficult period preceding and succeeding the South African War; was created Viscount in 1902, and in 1901 was appointed Governor of the Transvaal and Orange River Colonies. He resigned as High Commissioner and Governor in March, 1905, and returned to England. Regarded by many as coauthor with Cecil Rhodes and Mr. Chamberlain of the South African War, he was subjected to much criticism in Liberal circles, especially after the fall of the Unionist ministry in December, 1905. In March, 1906, the House of Commons expressed in an indirect way its disapproval of his action in permitting the flogging of a Chinese coolie in the Transvaal. In reply the House of Lords, by an overwhelming vote, placed on record its high appreciation of Lord Milner's services, and in August he was presented with an address of the same nature signed by more than 370,000 names. He published *The Nation and the Empire* (1913). Consult: E. B. Iwan-Müller, *Lord Milner and South Africa* (London, 1902); W. B. Worsfold, *Lord Milner's Work in South Africa* (ib., 1906); id., *The Reconstruction of the New Colonies under Lord Milner* (2 vols., ib., 1913).

MILNER, JOHN (1752–1826). An English Roman Catholic scholar, born in London. He was ordained priest in 1777; settled at Winchester in 1779; became titular Bishop of Castabala in 1803, and was made Apostolic Vicar of the Midland District in England. In 1804 he moved to Wolverhampton and entered into the agitation which finally led to the removal of the right of veto on appointment of Roman Catholic bishops as part of Peel's Catholic Relief Act passed in 1829. His firmness and courage in the controversy won him the sobriquet "the English Athanasius." He wrote: *Antiquities of Winchester* (2 vols., 1798–1801; 3d ed., with memoir by Husenbeth, 1839); *Treatise on the Ecclesiastical Architecture of England during the Middle Ages* (1811; 3d ed., 1835); *The End of Religious Controversy* (1818). Consult: F. C. Husenbeth, *Life of John Milner* (Dublin, 1862); Ward, *Dawn of the Catholic Revival in England, 1781–1803* (2 vols., ib., 1909).

MILNER, Joseph (1744–97). An English ecclesiastical historian. He was born at Leeds in Yorkshire. He studied at Catharine Hall, Cambridge, where he took the degree of B.A. in 1766, and afterward became head master of the grammar school at Hull. In 1768 he was appointed lecturer at Holy Trinity or High Church, Hull, and later became also vicar at North Ferriby, near Hull. Milner's principal work is his *History of the Church of Christ,* of which he lived to complete three volumes, reaching to the thirteenth century (1794–97); vols. iv and v (1803–09) were edited from his manuscripts by his brother, Dr. Isaac Milner, dean of Carlisle, who also published a complete edition of his brother's works in eight volumes (1810). The principles on which the *History of the Church of Christ* is written are of the narrowest kind of evangelicalism. An improved edition by Grantham appeared in 1847. A life of Milner by his brother Isaac is prefixed to the first volume of Milner's *Practical Sermons* (London, 1804–23).

MILNER-GIBSON, Thomas. See Gibson, Thomas Milner-.

MILNES, miln'z, Richard Monckton, Baron Houghton (1809–85). An English poet and politician, son of Robert Pemberton Milnes, of Fryston Hall, near Wakefield, Yorkshire, born in London, June 19, 1809. He was educated at Trinity College, Cambridge, where he was a member of the famous society called the Apostles, which included Hallam and Tennyson. Soon after receiving the degree of M.A. (1831) he traveled in Germany and Italy and visited Greece. He returned to London in 1835. In 1837 he entered Parliament for Pontefract, which he continued to represent till 1863, when he was raised to the peerage as Baron Houghton. In politics he was at first a Conservative, but on Peel's conversion to free trade he became an Independent Liberal. He was an advocate of public education and religious equality; labored for copyright laws and the establishment of reformatories for juvenile offenders; and took a decided stand on the side of Italy against Austria. A friend of literary men, he secured a pension for Tennyson, helped Hood, and was one of the first to recognize the merits of Swinburne. In 1842–43 he visited the East and in 1875 Canada and the United States. He died at Vichy, Aug. 11, 1885. He is more memorable as a man of influence in the worlds of society and letters than as an original writer, though the delicacy and refinement of his meditative poetry has a narrow appeal. Among Lord Houghton's works are: *Memorials of a Tour in Some Parts of Greece, Chiefly Poetical* (1834); *Poems of Many Years* (1838); *Poems Legendary and Historical* (1844); *Palm Leaves* (1844). He edited *The Life, Letters, and Literary Remains of Keats* (1848). Consult his interesting *Monographs, Personal and Social* (London, 1873); *Collected Poetical Works* (ib., 1876); the character of Vavasour in Disraeli's *Tancred;* T. W. Reid, *Life, Letters, and Friendship of R. M. Milnes* (London, 1890).

MI'LO. A town in Piscataquis Co., Me., 34 miles north-northwest of Bangor, on the Bangor and Aroostook Railroad (Map: Maine, D 3). The town is engaged largely in farming, and there are also manufactories of spools, long lumber, and the repair shops of the Bangor and Aroostook Railroad. Pop., 1900, 1150; 1910, 2556.

MILO. See Melos.

MILO, or **MILON** (Lat., from Gk. Μίλων, *Milōn*) of Croton, in Magna Græcia. A Greek athlete famous for his great strength, who lived, according to Herodotus, about 520 B.C. He won the prize as wrestler in six Olympian, seven Pythian, ten Isthmian, and nine Nemean games. Among other displays of his strength he is said to have on one occasion carried a live ox upon his shoulders through the stadium of Olympia and afterward to have eaten the whole of it in one day; and on another to have upheld the pillars of a house in which Pythagoras and his scholars were assembled, so as to give them time to make their escape when the house was falling. He lost his life through too great confidence in his own strength, when he was getting old, in attempting to rend a tree which woodcutters had partly split with a wedge; as the result of his first effort the wedge fell out, but when he relaxed his muscles for a fresh effort the tree closed upon his hands and held him fast until he was devoured by wolves.

MILO, Titus Annius Papianus (95–48 B.C.). A Roman politician. He was born at Lanuvium and belonged to a distinguished family. Few details of his life are known till his election as tribune of the people in 57 B.C. He was then a partisan of Pompey and attempted to bring about the recall of Cicero from exile. This measure was bitterly opposed by Clodius, who, as tribune of the people, had been instrumental in passing the law condemning Cicero to exile. Milo attempted to have Clodius condemned as a violator of the public peace, but the proceedings were quashed. Both Milo and Clodius now hired a bodyguard of gladiators, and armed collisions between their retainers became almost everyday occurrences. About this time Milo married Sulla's daughter, Fausta, for her fortune. In 56 Clodius was elected curule ædile and accused Milo of being a violator of the public peace by keeping a force of armed retainers. Pompey conducted the defense of Milo, but no decision was ever reached. In 53 Milo offered himself as a candidate for the consulship. Clodius opposed the candidature of Milo, who was defended in the Senate by Cicero in a speech of which some fragments are still extant. On January 18 of the next year Milo was on his way to Lanuvium from Rome, accompanied by 300 persons, many of whom were women and children. Clodius, also with an armed company, met him near Bovillæ. Milo and Clodius passed each other without trouble; but some of Milo's followers picked a quarrel with the slaves of Clodius, who attempted to interpose and was stabbed in the shoulder by one of Milo's men. Clodius was taken to a tavern in Bovillæ, but was dragged out by the slaves of Milo and put to death. The corpse of Clodius was placed on the rostra of the Forum in Rome and a mob set fire to the Senate house. These acts of popular violence created a reaction in favor of Milo, who ventured to return to Rome. He was, however, tried for the murder of Clodius. Cicero defended him, but, intimidated by the violence of Clodius' partisans, failed to do justice to himself or to his client; Milo was condemned to exile and went to Marseilles. Later Cicero rewrote his *Oratio pro Milone;* the latter speech, still extant, has been justly admired both in ancient and in modern times. For a good account of the speech, of the death of Clodius, and the trial of Milo, consult R. W. Husband, "The Prosecution of Milo: A Case of

Homicide, with a Plea of Self-Defense," in *The Classical Weekly*, vol. viii, pp. 146–150, 156–159 (New York, 1915). In his absence he was tried and condemned on charges of violence, of bribery, and conspiracy.

In 48 he went back to Italy, without permission, to join Marcus Cælius, an expelled Senator, who was attempting to excite a rebellion in south Italy.

He was killed before a fort near Thurii. See CLODIUS PULCHER.

MILO, VENUS DI. See MELOS; VENUS OF MILO.

MILORADOVITCH, mē'lō-rä'dō-vĭch, MIKHAIL ANDREIEVITCH, COUNT (1771–1825). A Russian general, born in St. Petersburg. After active service in the war with Turkey and in that with Poland he distinguished himself under Suvarov in the campaign of the Austro-Russian army against the French in Italy (1799) and made the famous passage of the Alps by way of the St. Gotthard Pass into Switzerland. In 1805 he was a division commander at Austerlitz and in 1812 he fought at Borodino. In 1813 he played a prominent part at Lützen. He was made Governor of St. Petersburg in 1819, but six years afterward, as he strove to quell the Decembrist rising, he was shot dead.

MILOSH, mē'lōsh, OBRENOVITCH (1780–1860). A prince of Servia, born in Dobrinia. He was the son of a peasant and spent his youth and early manhood as a swineherd in the service of his rich half brother Milan, who was one of the leaders in the revolt of 1804. Milosh was his lieutenant and his successor (1810), took his patronymic in place of his own, Todorovitch, and became a leader in the opposition against Kara George. After the latter fled into Austria Milosh stood his ground against the Turks for a time, then surrendered, and was made commandant or "knez" of Rudnik (1813). In 1815, as a result of brave fighting and clever diplomacy, he practically made Servia independent. Two years afterward, having killed Kara George, he was named hereditary and supreme Prince of Servia, a title conferred in 1827 by the National Assembly and recognized by the Porte in 1830. Several revolts came to nothing, but in 1839 he was forced to abdicate in favor of his son, Milan. The next nine years he spent in Vienna and later he settled on his estates in Servia. In 1858 he was recalled to power by the National Assembly and recognized by the Porte in 1859. He was a man of no education, energetic, headstrong, and rather cruel; but he gave Servia a place in European politics. For this he is known as the "father of his country." He was succeeded by his son Michael Obrenovitch III.

MILREIS, mĭl'rās, or **MILREA,** mĭl'rā (Portug., from *mil*, thousand + *reis*, pl. of *real*, small coin). Portuguese and Brazilian coins and money of account, containing 1000 *reis*. The Portuguese gold milreis is equivalent to the escudo, the monetary unit of Portugal, of which the value in United States currency is $1.08. The Brazilian milreis, the monetary unit of Brazil, is a gold coin equal to 54.6 cents value in United States currency, but is not in general circulation. There are silver coins and paper currency of the same name, which fluctuate in value, the paper milreis being quoted by the United States Treasury Department in October, 1914, at about 25 cents United States currency.

MIL'ROY, ROBERT HUSTON (1816–90). An American soldier, born in Washington Co., Ind. He graduated at Norwich University, Northfield, Vt., in 1843, and took part in the Mexican War as captain in an Indiana volunteer regiment. While studying law he served as a member of the Indiana Constitutional Convention in 1849–50 and in 1851 was made judge of the eighth judicial circuit of Indiana. At the outbreak of the Civil War he was made captain, in 1861 was made colonel of volunteers, and finally brigadier general in 1862. In the same year he was promoted to be a major general of volunteers after his service in West Virginia under Generals McClellan and Rosecrans. At Winchester, Va., he opposed for three days a large part of Lee's army, then attempted the invasion of Pennsylvania, and lost heavily. Though he claimed that this detention of Lee was of great advantage to General Meade, enabling him to fight at Gettysburg instead of farther north, an investigation was ordered into his conduct. The charges, however, were dismissed; but he resigned from the army. In 1868 he was trustee of the Wabash and Erie Canal, was superintendent of Indian affairs in Washington Territory from 1868 to 1874, was Indian agent from 1875 to 1885, was reappointed in the latter year, but soon lost his position by the accession to power of the opposite political party.

MILTI'ADES (Lat., from Gk. Μιλτιάδης). 1. A prominent Athenian of the sixth century B.C., son of Cypselus, political adversary of Pisistratus. Herodotus states (vi, 36–37) that, at the request of the Doloncians, as an aid to them against their foes, Miltiades conducted a colony to the Thracian Chersonese. Modern scholars, however, have held rather that Pisistratus, seeking trade in Thrace and along the Hellespont, sent out the colony and put Miltiades in charge to remove a rival from Athens. 2. A famous Athenian general, son of Cimon (q.v.). He became "tyrant" of the Chersonesus after his brother Stesagoras, and accompanied Darius Hystaspis in his expedition against the Scythians, about 508 B.C. (See DARIUS I.) He was one of those who were left by Darius in charge of the bridge over the Danube, and, when Darius failed to appear at the expected time, he advised that the bridge be destroyed and Darius left to his fate. This story, told by Herodotus, vi, 40, modern scholars doubt. Consult W. W. How and J. Wells on Herodotus, l.c. (Oxford, 1912). Afterward he took Lemnos from the Persians, but, when the Persian fleet came near the Chersonesus, fled to Athens. Being chosen one of the 10 generals of the year 490 B.C., he defeated the Persians in that year in the great battle of Marathon (q.v.). Later he was intrusted by the Athenians with a fleet of 70 ships, with which he proceeded against Paros for the purpose of avenging a private grudge. The expedition having failed, he was, on his return to Athens, condemned to pay a fine of 50 talents. Being unable to do this, he was thrown into prison, where he died of an injury received at Paros. The biography of this Miltiades by Cornelius Nepos (q.v.) is extant.

MILTIADES, SAINT, less correctly called MELCHIADES. Pope 311–314. He was born in Africa and his pontificate covers the eventful period of Constantine's conversion. Under him a synod was held in Rome in 313 and a decision was rendered against the Donatists (q.v.). His day is December 10.

MIL'TITZ, KARL VON (c.1480–1529). A German ecclesiastic of the Roman Catholic church, the son of a Saxon noble. He was canon at Mainz, Treves, and Meissen before he became papal chamberlain and notary in 1515. Three years afterward he was sent by Pope Leo X to Saxony on the mission to confer with Martin Luther and his protector, the Elector Frederick the Wise, in the matter of indulgences. An able and politic advocate for a compromise, Miltitz so far succeeded that Luther promised future submission, if not recantation; but though later meetings took place between the two at Liebenwerda and Lichtenberg, the hope of reconciliation was definitely abandoned on the arrival of a denunciatory papal bull. Miltitz was charged also with an investigation into the conduct of Tetzel, whom he condemned. Consult his biography by Creutzberg (Freiburg, 1907).

MIL'TON. A town and the capital of Halton County, Ontario, Canada, on the Canadian Pacific and Grand Trunk railways, about 30 miles southwest (direct) of Toronto (Map: Ontario, E 6). It has manufactories of lumber, flour, wire nails, cream, pressed brick, boots and shoes, crushed stone and lime, wood screws and rivets, carpets, nickel and silver plating, and electric motors. The town possesses two parks and owns its electric-lighting and water works. Pop., 1911, 1654.

MILTON. A town, including the villages of East Milton, Lower Mills, and Mattapan, in Norfolk Co., Mass., 7 miles south of Boston, on the Neponset River and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 3). It is an attractive residential suburb of Boston and has a public library, Milton Academy, and other institutions. In proportion to its size it is a very wealthy town, its valuation in 1914 being $31,602,839. The crest of the highest hill (635 feet) of the Blue Hills is the site of a meteorological observatory, conducted by Harvard University. A fine view is afforded. The town has granite quarries and chocolate and cracker factories. The government is administered by town meetings. There are municipal water works. Pop., 1900, 6578; 1910, 7924. Settled in 1637, Milton was a part of Dorchester until, in 1662, it was incorporated as a separate township. It was the home for many years of Jonathan Belcher, a Colonial Governor of both Massachusetts and New Jersey, and of Thomas Hutchinson, the historian and Colonial Governor of Massachusetts. It is also the site of the famous Suffolk Resolves house. Consult Teele (editor), *History of Milton, Mass.* (Milton, 1887).

MILTON. A borough in Northumberland Co., Pa., 50 miles north of Harrisburg, on the Susquehanna River, on the Pennsylvania Canal, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, H 4). Its extensive manufacturing plants include car and woodworking machinery shops, rolling, flour, knitting, planing, and saw mills; washer, nut, and bolt works; and furniture, shoe, couch, nail, fly net, bamboo novelty, and paper-box factories. The borough has a public park with picturesque scenery; and a fine bridge spans the Susquehanna at this point. Settled in 1770, Milton was incorporated first in 1817. It is governed, under a revised charter of 1890, by a chief burgess, elected every four years, and a unicameral council. Pop., 1900, 6175; 1910, 7460.

MILTON, JOHN (1608–74). An English poet. He was born in Bread Street, London, Dec. 9, 1608. His father, also named John Milton, belonged to a Roman Catholic family of yeomen living in Oxfordshire. The elder John Milton was converted to Protestantism while a student at Oxford, and as a result was promptly disinherited by his father, Richard Milton. The poet's father settled in London, where he prospered as a scrivener. The younger John Milton received instruction from his father in music, was taught by a private tutor, and was sent to St. Paul's School (about 1620), where he learned Latin, Greek, French, Italian, and some Hebrew, and read English literature. Spenser's *Faerie Queene* and Sylvester's translation of Du Bartas, which came into his hands at this time, exerted much influence on the formation of his style. In February, 1625, he proceeded to Christ's College, Cambridge. He was of less than the middle height, yet well made, with light brown or auburn hair. In bearing he was courteous and stately, though sometimes sarcastic. Owing to a quarrel with his first tutor he was rusticated for a short time in 1626, but he returned and completed the course, graduating B.A. in 1629 and M.A. in 1632. From childhood Milton had been destined for the Church, but the policy of Laud led him first to postpone taking orders and then to abandon all thought of it. He retired to his father's estate at Horton, Buckinghamshire, where he passed nearly six years (1632–38) in reading the classics and writing at intervals his choicest poems. Believing that he had it in him to write something that would live, he set out for Italy in April, 1638, wishing to fit himself still more for his future work. Probably at Bologna, which he visited in 1639, Milton wrote in excellent Italian five sonnets and a canzone wherein he expresses love for a beautiful lady of Bologna. For some time he stayed in Florence, where he visited in prison the blind Galileo. Thence he went on to Rome and Naples. As he was about to pass over to Sicily and from there to Greece, news reached him of "the civil commotions in England." He turned homeward, reaching England towards the end of July, 1639. He took a house in Aldersgate Street, London, where he received as pupils two nephews, children of an elder sister, and occupied his leisure with plans for future poems. From these pursuits he was drawn into ecclesiastical controversies, writing pamphlet after pamphlet. In June, 1643, he married, after a brief courtship, Mary Powell, then only 17 years old, the daughter of an Oxfordshire squire and Royalist. After a month the bride returned to her father's house. In the summer of 1645 they were reconciled, and he moved to the Barbican, a more commodious house for the increasing number of his pupils. His wife died in 1652, after bearing four children, of whom the one son died in infancy. A fortnight after the execution of Charles I (Jan. 30, 1649) Milton issued a memorable defense of the deed, and this led to other pamphlets which gave him European fame as a controversialist. On the establishment of the Commonwealth Milton was appointed Latin secretary to the Council of State (March 15, 1649). For this office, involving the duty of turning into Latin all foreign dispatches, he was eminently fitted. In 1652 he lost his eyesight, already long impaired, but with the aid of assistants—one of whom was Andrew Marvell—he performed the duties of his

post till the abdication of Richard Cromwell (1659). In the meantime (November, 1656) he had married a Catharine Woodcock, who died in February, 1658. She was honored by one of Milton's most beautiful sonnets (xxiii). The Restoration put an end to his active career. In 1661 he settled in Jewin Street, Aldersgate, from which he removed about two years later to a house in Artillery Walk, Bunhill Fields, his last residence. Here he fulfilled the literary task he had long ago planned and since begun. In 1663 he married a third wife, 30 years his junior, named Elizabeth Minshull. His relations with his daughters were most unhappy. Brought up in ignorance, they revolted from the service that he demanded of them—reading to him Latin, Greek, and Hebrew, which of course they could not understand. Towards the end Milton stood aloof from religious sects and services. He died Nov. 8, 1674, and was buried in St. Giles's, Cripplegate.

Milton's literary career is clearly divided by the outbreak of the Civil War and by the Restoration into three periods: (1) 1626–40; (2) 1640–60; (3) 1660–74.

First Period. Milton began writing English and Latin verse while a schoolboy. The earliest extant specimens of these exercises are paraphrases of the 114th and 136th Psalms, composed at the age of 15, and some Latin verses. To his Cambridge period belong a group of Latin poems (1626–28); "On the Death of a Fair Infant" (1626); "At a Vacation Exercise" (1628); "Hymn on the Morning of Christ's Nativity" (1629); the fragment "The Passion" and "Song on May Morning" (both probably 1630); "On Shakespeare" (1630); and sonnets "To the Nightingale" (probably 1630) and "On Arriving at the Age of Twenty-three" (1631). The Latin verses are undoubtedly the best ever written by an Englishman, and the best of the English poems display high poetical genius. While at Horton, Milton composed four perfect poems: the two descriptive lyrics, "L'Allegro" and "Il Penseroso" (probably written in 1632); "Comus," a masque performed at Ludlow Castle on Michaelmas night, 1634, in honor of Lord Bridgewater's appointment to the wardenship of the Welsh marches; and "Lycidas," a pastoral elegy in memory of his college friend Edward King, drowned on his passage to Ireland (Aug. 10, 1637). Of these poems, which by themselves would give Milton a high place in English literature, only a few had been published. The lines on Shakespeare appeared in the second folio of the dramatist's works (1632); Henry Lawes, who composed the music for "Comus," published the masque anonymously (London, 1637), and "Lycidas" formed one in a collection of memorial poems (Cambridge, 1638). To this period belong five sonnets and a canzone in Italian and Milton's two finest Latin poems: "Mansus" (1638), addressed to the Marquis of Manso, the friend of Tasso, who in his old age hospitably received Milton at Naples; and "Epitaphium Damonis," an elegy on the death of his college friend Charles Diodati.

Second Period. For full 18 years Milton was distracted from poetry by the revolutions in church and state, and doubtless also by his own domestic perplexities. The separation from his wife led to pamphlets on divorce, of which the most important are "The Doctrine and Discipline of Divorce" (Aug. 1, 1643) and "The Tetrachordon" (1645). Against episcopacy he launched, in 1641–42, five tracts, of which the best known is "The Reason of Church Government Against Prelaty." In 1644 appeared the valuable letter "Of Education" and a noble plea for the freedom of the press under the title "Areopagitica." The execution of Charles I and the establishment of the Commonwealth were defended against continental criticism in "The Tenure of Kings and Magistrates" (1649), "Eikonoklastes" (1649), "Pro Populo Anglicano Defensio" (1651), and sequels. These tracts, vehement and often scurrilous in style, contain autobiographical passages of interest. Throughout this period Milton wrote almost no verse. He composed, however, at intervals his magnificent sonnets, as "On his Blindness," "To Fairfax," "To Cromwell," and "The Massacre in Piedmont"; and the first edition of his collected poems was published, probably early in January, 1646, though dated 1645. Besides this he wrote some Greek and Latin verse and made a few translations. In 1648 there appeared a romance in Latin, in mixed prose and verse, and entitled "Nova Solyma," which was translated (New York, 1902) by the Rev. Walter Begley, and by him attributed to John Milton—an attribution which has not been generally sanctioned, however, by scholars.

Third Period. The great epic that Milton now composed is the spiritual summary of his life of lost ideals. As early as his return from Italy, he had meditated the production of some great poem. By 1642 his mind was turning towards a play on the loss of paradise. When he resumed the subject in 1658, it took the form of an epic. "Paradise Lost," in 10 books, completed by 1665, perhaps even by 1663, was first published in 1667. After several reprints with slight changes, it was enlarged to 12 books (1674). For this poem, of which 1300 copies were sold in 18 months, Milton received from his publisher £5 down, and an agreement to pay the poet £15 more in three installments on condition of the sale of a certain number of copies. At the suggestion of Thomas Ellwood, a Quaker friend of the poet, Milton wrote "Paradise Regained," which was published with "Samson Agonistes," a lyrical drama, in 1671.

Once Milton was known mainly as the author of "Paradise Lost." Since the romantic revival, the minor poems, touchstones of poetic taste, have taken a secure place beside this epic. The glow and romance of the imaginative state in which the early lyrics were conceived certainly departed from Milton during the civil conflict. But as years went on his imagination became invested with sublimity. Had "Paradise Lost" been written in 1642, it would have been a perfect mystery play, as "Comus" is a perfect masque. Delayed 20-odd years it became a sonorous epic, which, though barren in places, abounds in the noblest English poetry.

Bibliography. For his biography, consult: Edward Phillips's (Milton's nephew) memoir in his *Letters of State* (London, 1694); David Masson, *Life of John Milton, Narrated in Connection with the Political, Ecclesiastical, and Literary History of his Time* (new and rev. ed., 7 vols., London, 1877–96), exhaustive and authoritative; Mark Pattison, in the "English Men of Letters Series" (New York, 1880); Richard Garnett, in the "Great Writers Series" (London, 1890); Masterman and Mullinger, *The Age of Milton* (ib., 1897); "The Earliest Life of Milton," written by a contemporary of the poet and

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reprinted in *Colorado College Studies* (No. x, Colorado Springs, 1903). For works, consult: *The Poetical Works of Mr. John Milton* (London, 1695), the first complete edition of his poetry; *Poetical Works*, edited by H. J. Todd (6 vols., ib., 1801), by J. Mitford (Aldine edition, 3 vols., ib., 1832); *Prose Works*, edited by St. John, Bohn's Library (5 vols., ib., 1848–53); *Poetical Works*, edited by Keightley (2 vols., ib., 1859); *Poetical Works*, edited by Masson (Cabinet edition, with memoir and excellent and complete editorial equipment, 3 vols., ib., 1890); John Bradshaw (comp.), *Concordance to the Poetical Works of John Milton* (ib., 1894); *Facsimile of Milton's Minor Poems*, from manuscripts in Trinity College, Cambridge, edited by Wright (Cambridge, 1899); *Poetical Works after the Original Texts*, i.e., reprints, edited by Beeching (Oxford, 1900). For estimate, consult: essays by Dr. Johnson (London, 1779), T. B. Macaulay (ib., 1840), J. R. Lowell (ib., 1845); W. P. Trent, *A Short Study* (New York, 1899); Hiram Corson, *An Introduction to Works*, containing the prose autobiographical pieces (ib., 1899); the notable *Study*, by Sir Walter Raleigh (ib., 1900). The student will find of much value C. G. Osgood, *The Classical Mythology of Milton's English Poems* (New York, 1900), and L. E. Lockwood, *Lexicon to the Poetical Works of John Milton* (ib., 1902). A valuable study is that of Robert Bridges, *Milton's Prosody* (London, 1893). Concerning sources and other questions there is good matter in Marianna Woodhull, *The Epic of Paradise Lost* (New York, 1907). In 1908, on the tercentenary of Milton's birth, an exhibition of editions and portraits of Milton was held, and the *Catalogue* (London, 1908) of this exhibition is bibliographically and iconographically valuable. There is matter of interest in S. G. Spaeth, *Milton's Knowledge of Music* (New York, 1913); in J. M. Bailey, *Milton and Jakob Boehme* (Oxford, 1914); and in E. N. S. Thompson, *Essays on Milton* (New York, 1915).

MILTON COLLEGE. A coeducational institution for higher education, founded at Milton, Wis., under the auspices of the Seventh Day Baptists. The college was incorporated under its present name in 1867, and it succeeded Du Lac Academy, founded in 1844 and in 1848 renamed Milton Academy. There are on the campus four buildings devoted to educational purposes, the last of these being a gymnasium, also used as an auditorium, erected in 1911 at a cost of $22,000. The college includes collegiate and academic departments and a school of music. In 1914–15 the total attendance in all departments was 145, with 14 members in the faculty. The value of the property owned by the college was $200,000, the buildings and grounds being valued at $65,000 and the equipment at $12,000. There is an endowment of $135,000, and the annual income is about $12,000. In the library are about 9500 volumes and 500 pamphlets. The president in 1915 was W. C. Daland, A.M., D.D.

MILUTIN, mĭl-yo͞o′tĭn, Dmitri Alexeievitch, Count (1816–1912). A Russian general and military reformer. He was born in Moscow, entered the army in his youth, and was appointed chief of staff in the Caucasus in 1856. In 1862, after submitting his programme for a reform of the Russian army, he was made Minister of War, a place he held till 1881. In 1898 he was made field marshal. Milutin wrote on the campaign of 1839 in northern Daghestan and on Suvarov's campaign of 1799 against France—*A History of the War of 1799 between Russia and France in the Reign of Czar Paul I* (1853). The latter ranks very high among military annals.

MILUTIN, Nikolai (1818–72). A Russian statesman, brother of Count Dmitri. In Alexander II's reforms he took a prominent part, especially in the reorganization of credit, in the introduction of provincial institutions centring on the *mir*, in the emancipation of the serfs, and in agrarian commissions in Lithuania in 1863 and in Poland in 1864. He was Secretary of State for Poland from 1866 to 1868. He wrote on Russian military statistics. Consult Leroy-Beaulieu, *Un homme d'état russe* (Paris, 1884).

MIL'VIAN, or **MULVIAN BRIDGE.** An ancient bridge over the Tiber at Rome, built in 109 B.C. by Marcus Æmilius Scaurus, on the famous Flaminian Way (q.v.). At this bridge, in 63 B.C., Cicero caused the arrest of the ambassadors of the Allobroges, who were conspiring with Catiline, and Maxentius was drowned there after his defeat by Constantine in 312 A.D. On the foundations of the ancient bridge stands the modern Ponte Molle. Consult S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

MILWAUKEE, mĭl-wô′kē. The largest city in Wisconsin, a port of entry, and the county seat of Milwaukee County. It is situated in the eastern part of the State, on the west shore of Lake Michigan, 85 miles north of Chicago, and 82 miles east of Madison, the State capital (Map: Wisconsin, F 5). The city occupies an area of about 26 square miles, trisected by the Milwaukee River and its affluents, the Menominee and Kinnickinnic, all of which have been dredged and widened to permit passage into the heart of the city of large freight and passenger vessels. Much of the residence section of Milwaukee is upon a bluff rising 150 feet above Lake Michigan and 650 feet above sea level. Upon this bluff and ranging northerly and westerly from the business quarter are broad well-paved streets, characterized by shade trees and detached houses. The park and boulevard system, the graceful sweep of the bay with its prongs—North Point and South Point—projecting far into the lake, the city's proximity to well-known health and pleasure resorts, and its cluster of busy and beautiful suburbs all combine to make Milwaukee one of the most attractive of American cities. Among its suburbs are St. Francis, the seat of Pio Nino College and other Catholic institutions; West Allis, containing the State fair grounds and the immense machinery plant of the Allis-Chalmers Manufacturing Company; and Wauwatosa, the seat of a group of county institutions: almshouses, hospital, chronic insane asylum, hospital for the insane, and a children's home; here also is a national soldiers' home, occupying 400 acres of ground. A little further removed are the suburbs South Milwaukee and Cudahy, abounding in large manufacturing establishments. The park and boulevard system is a recent and rapid development. The city owns 940 acres of parks, under the control of commissioners, appointed by the mayor. The largest of these parks are Evergreen (180 acres), Washington (150 acres), Lake (125 acres), Jackson (80 acres), Mitchell (63 acres), Humboldt (46 acres), and Kosciusko (37 acres). All are beautifully laid out,

and most either include or are bordered by bodies of water. They are rendered more attractive by golf links, tennis courts, play grounds, a zoo (in Washington Park), and statues of distinguished men—Goethe, Schiller, Kosciusko, Robert Burns, Leif Ericson, Henry Bergh, and Solomon Juneau, the founder of Milwaukee. There is also a soldiers' monument on a sightly situation on Grand Avenue. Forest Home cemetery abounds in monuments of taste and beauty. Store and residence buildings were formerly constructed for the most part of cream-colored bricks, from which Milwaukee became known as "The Cream City." Vitrified brick, however, is rapidly superseding this type of block, and new and ample structures arise in marble. The Wells, Pabst, Majestic, and First National Bank buildings are instances of the city's handsome business edifices. The Marshall and Ilsley Bank building, occupied in 1913, and the Northwestern Mutual Life Insurance Company building, completed in 1914, are particularly noteworthy—the former of Ionic architecture, and the latter a stately structure with Corinthian columns and pilasters. St. Paul's church (Protestant Episcopal), the Immanuel Presbyterian church, and the Jesuit church of the Gesu are also of great beauty. A Roman Catholic archbishopric and a Protestant Episcopal bishopric have sees in Milwaukee. The United States contributes to the architecture of Milwaukee by means of a large granite post-office building; the county of Milwaukee by a brown sandstone court and records building; and the city by its municipal house or city hall, situated on a triangular plat and surmounted by a commanding tower. Other prominent features are the public library and museum, containing 288,360 volumes, and among other rarities, the notable Nunnemacher collection of fire arms; and the art gallery, founded and endowed by Frederick Layton, and containing a choice collection of modern canvases, including *The Departure of the Mayflower*, by George H. Boughton, R.A. The public schools of Milwaukee are controlled by a board of school directors, 15 in number, elected by popular vote for a term of six years. Connected with the system are schools for the blind and deaf, vocational schools, and a fresh-air school. A fine State normal school is situated in the outskirts of the city. In addition to these there are a number of parochial schools, and Concordia College (Lutheran), established in 1881; Marquette University (Jesuit), founded in 1881; and Milwaukee-Downer College and Milwaukee-Downer Seminary, founded in 1849, both for women. Milwaukee's finest hospital is St. Mary's, with a new and splendidly equipped building, situated upon a sightly bluff of Lake Michigan's shore. In its immediate vicinity is a group of eleemosynary institutions, conspicuous among which are the Wisconsin Industrial School for Girls and the Milwaukee Protestant Home for the Aged. By the water of the lake, near the foot of these buildings, begins the Lake Shore Drive, which is to be a portion of the boulevard and park system, and which will surround practically the entire urban district. Pop., 1840, 1712; 1850, 20,061; 1860, 45,246; 1870, 71,440; 1880, 115,587; 1890, 204,468; 1900, 285,315; 1910, 373,857; 1914 (U. S. est.), 408,683; 1920, 457,147. In population Milwaukee ranks as the thirteenth city in the United States.

Its executive officer is a mayor, its legislative body a board of 37 aldermen, one chosen from each of the 25 wards and 12 at large. A treasurer, a comptroller, an attorney, seven civil judges of limited jurisdiction, and constables are also elected by the voters of the city. Various administrative boards are appointed by the mayor, subject to confirmation by the aldermen. Minor positions are filled upon examination by civil-service boards. The tax assessment is made by ward assessors, who, with the mayor, city clerk, and tax commissioner, constitute a board of review of assessment rolls.

In 1914 the bonded debt of Milwaukee was $10,577,500 and its floating debt $1,714,600. The statutes limit the borrowing power of the city to 5 per cent of the average assessed valuation of property for five years. While the basis of assessment prescribed by law is the full value of real and personal property, practice has fixed it at about 90 per cent of the full value. The rate in 1914 was $13.79. During 1913 the receipts of the city from all sources were $16,881,587. Of this amount, $6,859,937 came from general property taxes and $6,774,437 from sales of investments. The expenditures during the same year amounted to $10,369,505, of which $2,344,697 was expended for schools, $618,142 for the police department, $725,186 for the fire department, $468,968 for interest on the city's debt, and $801,074 for water works. In 1913 the assessed valuation of all property was $460,548,763, of which $368,664,865 was real property and $91,883,898 personal. The water works of the city, begun in 1872, and now including 505 miles of mains, have cost Milwaukee $7,485,000.

Milwaukee is favorably situated with reference to extensive resources of farm, mine, and forest. It enjoys the advantages of water transportation afforded by the Great Lakes, in addition to excellent railroad facilities. Among the railways that enter the city are the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, the Minneapolis, St. Paul, and Sault Ste. Marie, and, by lake ferry, the Grand Trunk and the Pere Marquette. The city has become important both as a collecting and a distributing centre, and is noted also for its manufacturing enterprises. There is an excellent harbor protected by a breakwater. In the shipments eastward there is competition between the lake system of transportation and the railroads, while a considerable traffic crosses Lake Michigan and finishes its transit east by rail. In the lake commerce the shipments far exceed the receipts. The principal commodity received from the East is coal, which reaches Milwaukee by way of the lakes. The following table shows the receipts and shipments of the principal articles for the year 1913.

COMMODITIES		Receipts	Shipments
Flour	barrels	3,161,287	3,490,922
Wheat	bushels	7,372,650	3,986,911
Corn	"	13,140,650	8,956,897
Oats	"	15,972,900	13,599,348
Barley	"	18,897,700	5,017,218
Rye	"	3,081,100	2,397,700
Lumber	feet	*301,830,000	*81,854,000
Coal	tons	*5,860,263	*1,000,599

* Lake traffic only.

With respect to corn and oats the city is primarily a distributing rather than a consuming centre. It will be noted, however, that there is a marked difference between the receipts and

the shipments of barley and wheat, Milwaukee being a large consumer of these products in the milling and brewing industries. Barley is used principally in the manufacture of beer, which is one of the most notable industries of the city. No other American city enjoys so high a reputation for its beer, although the manufacture of this product is not the most important industry. In 1913 the product of Milwaukee's chief manufacturing industries, according to local figures, was valued as follows: iron, steel, and metal products, $46,519,509; leather and shoes, $40,569,000; meat and packing-house products, $30,500,000; beer, $25,381,615; and flour and mill products, $8,412,100. The value of all manufactured products in that year was $420,116,266.

History. Lieut. James Gorrell, an English officer who visited the site in August of 1762, writes of "Milwacky" as an Indian town with an English trader residing there. This trader may have been Alexander Henry, a native of New Jersey, who made yearly visits to Milwaukee from about 1760 to 1765. Henry was followed by Alexander La Framboise, who in 1784 had substantial holdings at the mouth of the Milwaukee River. In about 1789 two French Canadians, Jean Baptiste Mirandeau and Jacques Vieau, visited the place. Mirandeau's stay was practically continuous until his death in March, 1819. Vieau made annual visits until about 1805, when he established himself permanently. On Sept. 12, 1818, Laurent Solomon Juneau (q.v.) arrived in Milwaukee and became Vieau's clerk and later his son-in-law. Juneau is considered the first permanent white settler of Milwaukee and, with his wife, exerted a vast influence over the neighboring Potawatami and Menominee tribes. From the Indians Juneau received extensive grants of land, but in subsequent treaties with the Indians these passed to the general government. The practical extinction of the Indian titles made Milwaukee an attractive place for settlers from eastern States. Moreover, the close of the Black Hawk War in 1832 directed attention to the west shore of Lake Michigan and in 1836 settlers came in considerable numbers. At an election for local officers held Sept. 17, 1835, 39 persons voted. On Jan. 16, 1838, Milwaukee was incorporated as a village by the Territorial Legislature and eight years later was granted a city charter. Juneau was elected the first mayor.

Consult: Wheeler, *Chronicles of Milwaukee* (Milwaukee, 1861), and Buck, *Pioneer History of Milwaukee* (3 vols., ib., 1876–84), the third volume of which is entitled *Milwaukee under the Charter*.

MILYUKOV, mĭl'yo͞o-kôf', Pavel Nikolaevitch (1859–). A Russian historian and political leader, born near St. Petersburg. He studied in Moscow and was tutor in history at the university (1886–95). Banished from Russia because of his liberal views, he served as professor of history at the university of Sofia, Bulgaria, in 1897–98, traveled extensively both in Europe and in America in 1902–05, and from 1901 to 1905 was a member of the faculty of the University of Chicago. There he delivered lectures on historical and political subjects, among them a course on *Russia and its Crisis* (published 1905). He returned to Russia in that year, on the outbreak of the revolutionary movement following the St. Petersburg massacre of January 22, was imprisoned for some time, was active in forming the powerful Union of Unions comprising the professional classes in the Empire, and was elected to the first Duma as a Constitutional Democrat. His election was annulled and he was even arrested while the Duma was in regular session, but was liberated after a month's confinement in prison. Despite this governmental reprobation, he remained the most prominent representative of the Constitutionalist party in that Duma and for long afterward. He was a member of the Balkan Committee of Inquiry which investigated the conduct of the War of 1913. He edited the Constitutional-Democrat organs the *Free Nation* and *Popular Rights* until they were stopped by Russian censorship, and later he became editor of the influential St. Petersburg newspaper *Rêtch*. Milyukov was a prolific writer. Besides contributions to magazines, he published: *Main Currents of Russian Historical Thought* (1893–95); *Sketches of the History of Russian Culture* (1895–96); *Russia and its Crisis* (1905); *Democracy and the Second Duma* (1905); *A Year of Struggle* (1907); *The Balkan Crisis and Politics* (1910).

MILYUTIN, Dmitri and Nikolai. See Milutin.

MILZBRAND. See Anthrax; Malignant Pustule.

MIMAMSA, mē-mäm'sȧ (Skt. *mīmāṁsā*, investigation, discussion). The collective name of two of the six orthodox systems of Hindu philosophy. The two Mimamsa divisions are: first, the *Pūrva-mīmāṁsā*, "Prior Inquiry" or *Karma-mīmāṁsā*, "Inquiry concerning Works"; the second is *Uttara-mīmāṁsā*, "Later Inquiry" or *Brahma-mīmāṁsā*, "Inquiry concerning the Supreme Spirit," or, more commonly, simply *Vēdānta* (see Vedanta). The former deals chiefly with the Vedic ritual and its significance, the latter with speculations as to the nature of the Supreme Spirit.

The reputed founder of the system is Jaimini, and the principles are embodied in a series of *Sūtras*, or aphorisms, in 12 books, discussing the sacred ceremonies of the Veda and the merit accruing from their proper performance. The oldest extant commentary on this obscure work is the *Bhāshya* of Çabara-Svāmin, whose date is placed long after the birth of Christ. This composition in turn was critically annotated, about 700 A.D., by the great Mimamsa authority, Kumārila. An early treatise on the subject was an essay on the Mimamsa by Colebrooke in 1826, reprinted in his *Miscellaneous Essays* (London, 1873). Consult: Cowell and Gough, *The Sarva-Darśana-Samgraha of Madhava Achārya* (London, 1894); R. K. von Garbe, *Philosophy of Ancient India* (2d ed., Chicago, 1889); Max Müller, *The Six Systems of Ancient Indian Philosophy* (New York, 1903); Macdonell, *Sanskrit Literature* (London, 1913).

MIMBAR, mĭm'bär. See Mosque.

MIME, mīm (Lat. *mimus*, from Gk. *μῖμος*, *mimos*, imitator, actor, sort of drama). A species of popular comedy among the ancients, in which scenes of common life were represented with imitative gestures and dancing, and with jocose dialogue more or less freely improvised. It was said to have been invented by Sophron of Syracuse, who wrote in the Doric-Greek dialect. Mimes were a favorite amusement of convivial parties, the guests themselves being commonly the performers. In the hands of such writers as Laberius and Publilius Syrus the mime included much homely wisdom in the shape of

familiar saws and proverbial lines. In the theatres mimes came to be used later as afterpieces. The actors, themselves called mimes (*mimi*), appeared in front of the stage, without buskins or masks, but attired in patchwork cloaks (*centunculi*), as were the harlequins (q.v.) of a later day. Consult: C. J. Grysar, *Der römische Mimus* (Vienna, 1854); Patin, *Etudes sur la poésie latine* (Paris, 1875); Friedländer, *Sittengeschichte Roms*, vol. ii (Leipzig, 1890); Teuffel and Schwabe, *History of Roman Literature* (Eng. trans., London, 1900); Edmond Faral, *Mimes français du XIIIe siècle* (Paris, 1910).

MIM'EOGRAPH. See COPYING MACHINES.

MIME'SIS. See ORTHOGRAPHY, FIGURES OF.

MIM'ETITE. A lead arsenate and chloride closely resembling pyromorphite, occurring in yellow, brown, or white hexagonal crystals.

MIM'ICRY (from *mimic*, from Lat. *mimicus*, mime). A form of protective resemblance by which one species so closely resembles another in external form and coloring as to be mistaken for it, although the two may not be really allied and often belong to distinct families or orders. As early as 1746 Rösei von Rosenhof in his *Insekten-Belustigungen* drew attention to the resemblance which geometric caterpillars, and also certain moths when in repose, present to dry twigs, and thus conceal themselves; and afterward Erasmus Darwin, in his *Zoönomia* (1794), sketched out the subject.

Bates's Theory of Mimicry. These facts received little attention, however, until 1862, when Bates proposed a general theory to account for them. He found during many years' residence in Brazil strikingly colored butterflies belonging to the brilliantly colored family Heliconidæ, and associated with them and indistinguishable, except on close examination, certain butterflies belonging to the structurally very different family of Pieridæ; also certain swallowtail butterflies and day-flying moths. None of the mimicking insects were as abundant as the Heliconidæ they resembled. The Heliconidæ have an offensive taste and odor, in consequence of which they are immune from attacks by insectivorous animals; they fly deliberately, and they make no attempt

MIMICRY IN BUTTERFLIES.

a, *Methona psidii* (Heliconidæ); *b*, *Leptalis orise* (Pieridæ).

at concealment, although their bright distinctive colors permit them to be recognized and avoided as obnoxious. If any other butterflies in the same region were to become indistinguishable from the Heliconidæ they would profit by a corresponding immunity from attack. The theory assumes that some of the Pieridæ happened at the start to resemble the primitive Heliconidæ and received a partial immunity as a result; that such Pieridæ alone survived and produced descendants of like character; and that a selection of the most heliconid-like of these followed. By a continuation of this process the pierids and the other Lepidoptera gained their present close resemblance to the Heliconidæ. The theory is a broad one and accounts for cases of mimicry in other groups of Lepidoptera as well as in other orders of animals. It is not necessary, however, to go to South America for examples of mimicry. In North America, as well as in Asia and Africa, occurs the genus *Danais*, which is also a protected form. The common American species *Anosia plexippus* is closely mimicked by *Basilarchia disippus*, a butterfly of rather remote affinities. Three genera of Danaidæ in tropical Asia, *Euplœa*, *Danais*, and *Hestia*, are very different, but are all protected. In each genus certain species are mimicked with extraordinary accuracy by species of the genus *Papilio*.

MIMICRY IN INSECTS.

a, a leaflike grasshopper (*Phyllium siccifolium*); *b*, a mantis (a *Canthops*) which feeds on insects found among dry leaves and is benefited by resembling them.

But mimicry is not confined to the Lepidoptera. Especially well protected wasps and bees have many imitators, and there are cases of mimicry even in vertebrates.

Müller's Theory of Mimicry. In 1879 Fritz Müller, as the result of many years' observation in southern Brazil, proposed a modification of and addition to the foregoing explanation of Bates. Bates himself, when first describing the cases he observed, had suggested that they might be due to some forms of parallel variation dependent on climatic influences, and Wallace (*Island Life*, p. 255) adduced other cases of coincident local modifications of color, which did not appear to be explicable by any form of mimicry. Müller's theory is founded on the assumption that insect-eating birds only learn when young and by experience to distinguish the edible from the inedible butterflies, and in doing so necessarily sacrifice a certain number of distasteful butterflies. "Now," says Müller, "if two distasteful species are sufficiently alike to be mistaken for one another, the experience acquired at the expense of one of them will likewise benefit the other; both species together will only have to contribute the same number of victims which each of them would have to furnish if they were different. If both species are equally common, then both will derive the same benefit from their resemblance—each will save half the number of victims which it has to furnish to the inexperience of its foes. But if one species is commoner than the other, then the benefit is unequally divided, and the proportional advantage for each of the two species which arises from their resemblance is *as the square* of their relative numbers." Wallace, who fully accepts Müller's theory, in his statement of the theory (*Darwinism*, p. 253) adds: "But if the

two species are very unequal in numbers, the benefit will be comparatively slight for the more abundant species, but very great for the rare one. To the latter it may make all the difference between safety and destruction."

The facts of mimicry are very remarkable; as to causes there is much difference of opinion. The theory of Bates is accepted by many; also that of Müller. Others, like Eimer, Elwes, and Piepers, deny that the mimicry is due to natural selection, but rather to definitely directed evolution, the result of "outward influences such as climate, nutriment, etc., acting on a given constitution." Others, rejecting the Müllerian theory, accept Bates's facts, but ascribe more to the influence of the local environment, such as the action of light, heat, dryness or moisture, etc., yet allowing that in the end natural selection may act as a preservative agent.

The objections to the Müllerian theory are the following: neither Bates nor Wallace himself, though each lived for several years and collected butterflies in the American tropics, ever actually saw a bird chase and devour a butterfly, although insectivorous birds are said by them to be abundant in Brazil and the Eastern Archipelago. Piepers, Pryor, Skertchley, and other tropical naturalists of long and intelligent experience agree that very rarely has any bird been seen even to chase a butterfly; while Judd concludes from an examination of stomachs of insectivorous birds that none of the American birds feeds upon butterflies "during any month of the year to the extent of one-tenth of 1 per cent of its food." Ornithologists confirm this abstinence from eating butterflies. From these and numerous other cases it appears that butterflies enjoy a peculiar immunity from the attacks of birds.

It is sometimes the case that it is difficult to tell which is the model and which the mimic. On the Solomon Islands a dark-brown *Euplœa* and a *Danais*, both inedible, were accompanied by a *Hypolimnas* butterfly, also inedible, all three genera being avoided by birds both in the larva and imago stages. The fact, says Packard, that the mimickers belong to more primitive groups than the models, and that they are as a rule rare and apparently on the verge of extinction, indicates that they are the relics of an earlier geological period, and having been exposed to the same local and modifying changes in the environment as the models, have thus been preserved. Most of the cases of mimicry are really cases of convergence produced by similar conditions of life. Moreover, the ground colors of butterflies are restricted in range to reds, shades of brown, yellow, white, and more rarely blue and green. Also the patterns are limited; nature has repeated them over and over again. It is no wonder that there should be apparent cases of mimicry, in regions so similar as the hot and damp forest-covered plains of Brazil or the upland hot plains of southern Africa and the deep forests of the East Indies. On the other hand, Poulton heads the defenders of the theory and in many ways makes out a most excellent case.

As authorities differ so greatly in their interpretations of the facts, the subject may be considered an open one. That the bad-tasting butterflies are not eaten by birds any more than hairy and bad-tasting caterpillars, is an acknowledged fact; that the edible species mimicking and flying with them are in very rare cases devoured by birds, may be allowed, but its importance as a factor in evolution has been in some quarters unduly magnified. For other cases of mimicry, see PIGMENT; PROTECTIVE COLORATION AND RESEMBLANCE.

Bibliography. H. W. Bates, "Insect Fauna of the Amazon Valley," in *Transactions of the Linnean Society*, vol. xxiii (London, 1862); R. Trunen, "On Some Remarkable Mimetic Analogies among African Butterflies," in *Transactions of the Linnean Society*, vol. xxvi (ib., 1867); "Mimicry in Butterflies Explained by Natural Selection," in *American Naturalist*, vol. x (Salem, Mass., 1876); F. Müller, "Ituna and Thyridia: A Remarkable Case of Mimicry in Butterflies," in *Kosmos* (Leipzig, 1879), translated by Meldola, in *Transactions of the Entomological Society of London* (London, 1879); E. B. Poulton, *Colours of Animals* (ib., 1890); A. R. Wallace, *Darwinism* (ib., 1891); id., *Tropical Nature* (ib., 1891); F. E. Beddard, *Animal Coloration* (New York, 1895); E. B. Poulton, *Essays on Evolution* (ib., 1908); also for the most recent discussions the several papers of Poulton and Punnett in *Bedrock* (London and New York, 1912–14).

MIMIR, mē'mīr. A water giant of Norse mythology, who dwelt beneath the world ash Yggdrasill and guarded a spring, considered the source of memory and wisdom and called Mimir's well. Odin in his wanderings asked for a drink from the well and was obliged in exchange to give one of his eyes, the moon, which Mimir sank deep in the spring.

MIMNER'MUS (Lat., from Gk. *Μίμνερμος*) OF COLOPHON (or Smyrna). A Greek elegiac poet, who lived in the latter half of the seventh century B.C. His work *Nanno*, in two books, was so named from a flute player whom he had loved in vain; it is a collection of elegies that were models for later poets in sustained calmness and tender sentimentality as opposed to the political elegiac verse previously in vogue. Mimnermus is credited with having brought the elegy back to its original design of expressing personal grief, and to have been the first to make the elegy (q.v.) an expression of love; his musical temperament found the elegy a fitting medium. For the fragments, consult: Theodor Bergk, *Poetæ Lyrici Græci* (new ed., Leipzig, 1914); W. C. Wright, *A Short History of Greek Literature* (New York, 1907).

MIMOSA, mī-mō'sȧ (NL., from Gk. *μῖμος, mimos*, imitator). A genus of Leguminosæ (pea family) comprising about 300 species, trees, shrubs, and herbs, with bipinnate leaves, natives of the warmer and more arid regions of America, Africa, and Asia. In general, the species are called "sensitive plants," on account of their motile leaves, the leaflets of which change position rapidly if touched. The motility of the leaves is thought to be related to protection against excessive loss of water, and is an adjustment to dry regions. This remarkable power enables the plant to reduce its leaf exposure according to the needs. The species of *Mimosa* belonging to the United States are chiefly natives of the States bordering upon Mexico. The name is also applied popularly to species of the related genera *Acacia* and *Albizzia*. See SENSITIVE PLANT.

MIMS, FORT. See FORT MIMS, MASSACRE OF.

MI'MUS. The Roman name for the mime (q.v.).

MIN, mēn. An Egyptian deity, the local god

of Panopolis or Akhmim (q.v.) and of Koptos (q.v.). He was the god of agriculture, typifying the generative forces of nature, and annual harvest festivals were held in his honor. He is generally represented as an ithyphallic human figure wearing a headdress of two enormous feathers and holding in his right hand a flail. Behind him is a shrine with trees upon it or near it. His sacred animal was the ram. In later times he was often identified with Ammon-Rê. The Greeks identified him with their god Pan. Consult: Adolf Erman, *Life in Ancient Egypt* (London, 1894); Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); E. A. Wallis Budge, *The Gods of the Egyptians* (London, 1904).

MI'NÅ, or **MINA** (Lat. *mina*, from Gk. *μνᾶ*, *mna*, measure of weight, sum of money, from Heb. *mâneh*, weight, from *mânâh*, to divide, measure out). A Greek weight and denomination in silver money, equal to 100 drachmas (q.v.), and the sixtieth part of a talent (q.v.). The value varied according to the talent used. The Attic mina was worth about $18. It was used for purposes of account, and was never minted as a coin. See NUMISMATICS, *Ancient Coins—Origin—Classification*, first two paragraphs.

MINA, mē'nå, FRANCISCO ESPOZ Y (1781–1836). A Spanish guerrillero and general, born at Idocín (Navarra), uncle of Francisco Javier Mina (q.v.), and a member of the class of yeomen. As such, and because of his democratic and radical principles, he disliked the hidalgos, but he was brave and honest, and conducted his warlike operations in as humane a manner as possible. When his nephew was captured by the French in 1810 Mina took his place as leader of a band of guerrilleros and shortly afterward he was appointed by the Junta de Aragón to the command of all the guerrilleros of Navarra. His first act was to shoot a man who was pretending to be a patriotic guerrillero but was only a bandit. The next year the government at Cadiz recognized him and in 1812 he was made commander in chief in upper Aragon. His position here made it possible for him to confiscate large quantities of war supplies that were imported by the French authorities and to levy duty on all other materials imported. With this money he paid his troops regular wages and avoided levying heavy contributions on the country, while he maintained an excellent morale among his men. In the campaigns of 1813–14 he did good service under the Duke of Wellington and was frequently wounded. Having fallen from favor when Ferdinand VII was restored, he made an unsuccessful attempt at a liberal uprising and went into exile. In 1820 he returned and served the Liberal party throughout northern Spain, offering the only serious resistance to the French, who intervened in Ferdinand's favor. In 1823 the French forced him to capitulate and allowed him to escape. Despite his having made in 1830 another attempt against Ferdinand, when the latter died Cristina recalled Mina to Spain and gave him command against the Carlists in 1835. His health was already broken, however, and he died in December of the next year, after forcing the Regent in August to grant a constitution to the country. Consult his *Memorias*, published by his widow (Madrid, 1851–52).

MINA, FRANCISCO JAVIER (1789–1817). A Spanish soldier. He was born at Idocín, in Navarra, took part with his uncle, Francisco Espoz y Mina, in the guerrilla warfare of 1808–09 against the French, but was taken prisoner in 1810 and detained four years at Vincennes. In 1814 he was in arms against Ferdinand VII, but was forced to flee to France. Thence he went to England, where he interested himself in the cause of the Mexican patriots, and with the aid of some prominent Englishmen organized an expedition and sailed for America. In the United States he received sympathy and substantial support, and took 200 volunteers with him, arriving at Galveston in November, 1816. Soon afterward, crossing over to New Orleans, he obtained more assistance, and after being reënforced by 100 Americans at Galveston, landed at Soto Marina, Province of Tamaulipas, April, 1817. At the head of 300 men he defeated Generals Armiñán and Ordóñez, and took the towns of León and Guanajuato with the fortress of Sombrero. Deserted by most of his followers, he was surprised on October 17 by an overwhelming force, taken to Mexico and shot, Nov. 11, 1817.

MINA BIRD. See MYNA.

MINÆ'ANS. A Yemenite people who played an important part in the early history of Arabia. The native name was *Ma'in;* hence the Greek Μειναῖοι or Μιναῖοι. It is possible that the name was originally *Ma'ān*, which has been identified by some scholars with *Magān*, a country southeast of Babylonia, referred to as early as the inscriptions of Naram Sin of Agade in the fourth millennium B.C. and Gudea of Lagash c.3000 B.C. But the identification is doubtful. There is good reason for supposing that the Minæans are mentioned in Judg. x. 12; in 1 Chron. iv. 41, in connection with the Amalekites against whom the tribe of Simeon made a raid in the time of Hezekiah; in 2 Chron. xxvi. 7, in connection with Philistines and Arabs in the days of Uzziah; and in Job ii. 11, where the Greek rendering suggests that Zophar was a Minæan. While there are many references in the Assyrian inscriptions to Kedar, Nebayoth, Aribi, and Sheba (q.v.), there is no mention of a kingdom of *Ma'in*. Among classical writers, Eratosthenes (c.275–195 B.C.), Agatharchides (c.120 B.C.), Strabo (died c.24 A.D.), Pliny (23–79 A.D.), the *Periplus Maris Erythræi* (c.100 A.D.), and Ptolemy (second century A.D.), speak of the Minæans as one of many peoples in southwest Arabia, but have no knowledge concerning the earlier history of this nation. The fact that there was an extensive and flourishing Minæan kingdom in Arabia is known only through the native inscriptions. These have been secured chiefly through the personal efforts of Halévy, Doughty, Euting, and Glaser. Many of these inscriptions still remain unpublished. Most of them are very brief and are readily interpreted, but a few of the longer ones present considerable difficulty. As to the period from which these inscriptions come there was practical unanimity among scholars until 1889. It seemed impossible that they could be older than the earliest Sabæan inscriptions (see SABÆANS), and it was supposed that the Minæan and Sabæan kingdoms flourished side by side. Such eminent scholars as D. H. Müller, Mordtmann, Hartmann, Eduard Meyer, and Huart still adhere to this view, granting that some may be as old as the ninth century B.C., but maintaining that the bulk of them were written in the following centuries. They point out that while the

earlier inscriptions of the Sabæan officials known as *mukarrib* are written boustrophedon, there is no Minæan inscription thus running both ways; that in the famous inscription, Halévy 535, there seems to be a reference to the Medes which would place it in the sixth century; that Eratosthenes apparently knows of Minæan kings reigning at Karna, and that the name Ptolemy occurs in a Minæan inscription on an Egyptian sarcophagus. Glaser, however, in 1889, presented strong reasons for believing that the Minæan kingdom preceded the Sabæan; and Hommel, Winckler, Schmidt, Derenbourg, Margoliouth, Weber, Grimme, and Caetani have advanced arguments in favor of his position. The silence of the Sabæan inscriptions concerning a Minæan kingdom would be very strange, if these nations were for a long time powerful rivals; and the casual references to Sheba in Minæan inscriptions do not seem to harmonize with the position of this power in the centuries preceding 115 B.C. That the Assyrians make no mention of *Ma'in*, while they are frequently occupied with Sheba, apparently indicates the decline of the former and the rising importance of the latter. In its most flourishing period the Minæan kingdom extended far to the north, as is evident not only from the inscriptions found at El Oela, but also from the mention of the *Ma'inu Muzran* in Halévy 535. So extensive a kingdom with its centre in the South Arabian Jauf, where its great cities Ma'in, Karnawu, and Yathil were, can scarcely have existed side by side with a strong Sabæan kingdom with the neighboring Marib for its capital. A long inscription found at Sirwah, unfortunately not yet published, according to competent testimony, describes the destruction of the Minæan kingdom by a Sabæan makrib about 550 B.C. Sargon's (721–705 B.C.) contemporary Itamar is not yet designated as king. As Müller has clearly proved that the *mukarrib* preceded the kings of Sheba, the inference seems necessary that the Minæan kingdom flourished before the Sabæan mukarrib period and fell before the rise of the Sabæan kingdom. The Minæan system of writing shows in many respects a closer affinity to the earlier than to the later Sabæan script; and the oldest Sabæan inscriptions indicate a long period of development of the South Arabian system of writing. Hence the fact that the earliest Sabæan inscriptions are written boustrophedon does not show that this script has been recently introduced. A comparison of the language clearly manifests the higher age of the Minæan, which has preserved the *s* in the causative and in the pronominal suffixes against the *h* in the Sabæan. The identification of the Madhay as Medes is extremely doubtful; and Grimme's suggestion that it represents the people of Midian seems to possess far more probability. That the Minæans continued to exist as a people long after their power in Arabia had passed to others is evident from the Greek writers. Whether Eratosthenes drew upon older sources accessible to him in Alexandria, was imperfectly informed, or actually knew of petty kings reigning in Karna in his day, no scholar would seriously maintain that the power reflected in the Minæan inscriptions could have been exercised from Karna in the third century B.C. If the sarcophagus inscription is really Minæan rather than Hadramautian and Talmith is Ptolemy, its content shows not more clearly the survival of ancient forms, along with some very late ones, among the Minæans of the period, than the absence of any important Minæan kingdom at that time. It therefore seems exceedingly probable that the 26 kings of *Ma'in* known from the inscriptions reigned before there was any Sabæan king in Marib. As it is scarcely credible that chance should have given us the name of all Minæan kings or that the 26 names represent an unbroken succession, it would be hazardous to infer that the earliest of them cannot have reigned more than four or five centuries before the last. There may have been more than one dynasty. As among the Sabæans, so in the kingdom of *Ma'in* each year seems to have been named after two *mukarrib* or high officials, like the *limmi* in Assyria, the archons in Athens, the ephors in Sparta, or the consuls in Rome. The absolute age of the Minæan kingdom cannot be determined. The early occurrence of numerous place names in southern Syria and northwestern Arabia which seem to have been transferred from Yemen, the raids of Minæans upon Palestine in the period of the Judges, and the essentially Yemenite character of the traditions brought by clans afterward forming a part of the people of Israel, from the land of Midian and the Negeb to Canaan, render it probable that kings of *Ma'in* extended their power to the borders of Palestine as early as the thirteenth century B.C. The Minæans were to a large extent a settled people living in cities, cultivating the soil, worshiping in sanctuaries. Their chief gods were a male deity, Athtar (see ISHTAR), the solar goddess Shamsi, Wadd, and Ankarih. They had priests and priestesses, hierodules and sacred prostitutes, a sacrificial cult, and many rules of taboo. A deeper religious sense is apparent than in the period of skepticism and syncretism preceding Mohammed.

The language of the Minæans is only dialectically different from the Katabanian, Hadramautian, and Sabæan, and is closely akin to the Ethiopic and the classical Arabic. As to the origin of the system of writing used by the South Arabian peoples, it is supposed by Halévy and Lidzbarski to have been formed from the North Semitic alphabet by a modification of certain signs to denote kindred sounds and by changes rendering the signs generally symmetrical. There is indeed good reason to suppose that many new signs were added in Arabia by slight changes in those already existing, and that the characters were given a squarer form. But there are some letters that are so different from those of the North Semitic alphabet as to raise the question whether other extraneous influences may not have been at work. Whatever the relations of the various Egypto-Libyan, Mycenæan, and Anatolian alphabets, the contact of the Minæans with Egypt and the Philistine coast makes it probable that it was in the northwest rather than on the Persian Gulf that this alphabet grew up. A tablet found at Lachish shows that not only cuneiform signs but also the Mycenæan signary was to some extent used in the Philistine cities in the fourteenth century B.C. It may have been from Gaza that the Minæans brought the prototype signs of their alphabet. As our oldest inscriptions in the North Semitic alphabet, dating from the tenth and ninth centuries, show that this system of writing must have been long in use, so our earliest Minæan inscriptions indicate that the South Arabian alphabet already had a long and as yet quite obscure history of development.

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MINAEV, mē-nä′ĕf, DMITRI (1835–89). A Russian poet, born at Simbirsk. He was educated in a military school, and, after brief service as secretary in the Department of the Interior, from which he resigned in 1857, devoted himself to literature. His most important work was as a translator of parts of Dante's *Inferno* and of some of the works of Victor Hugo, and, among English poets, of Shelley, Byron, and Marlowe. His original works include poetry, especially satire, and a comedy, which won a prize from the St. Petersburg Academy.

MIN′AHAS′SAS. The natives of the Province of Minahassa in northern Celebes, called by some authorities Alfuros. A mixture of types certainly exists. Physically, the Minahassas appear to be related to the Tagals and other Philippine tribes, and there is even a suggestion of Japanese features. In point of language they are undoubtedly members of the Malay stock, but differ notably from other divisions of this family in Celebes and again approximate Philippine tribes. Since cultural evidence points in the same direction, the Minahassas may safely be considered alien immigrants from the north. The Malayan language proper has in recent years made considerable inroad upon the native dialects. Among the Minahassas women are on an equal footing with men, although from Mohammedan influences some modifications have been made upon the ancient monogamy of this people. The best account of the Minahassas in English is in Hickson, *A Naturalist in North Celebes* (London, 1889). See ALFURESE; CELEBES; MOLUCCAS.

MINAMOTO YORITOMO, mē′nä-mō′tō yō′rē-tō′mō (1146–99). A Japanese warrior and statesman who played an important part in the struggles for power of the rival military families, the Taira and the Minamoto, to the latter of which he belonged. His father, Yoshitomo, having been treacherously murdered in 1159 at the instance of Kiyomori, chief of the Taira clan and at that time the virtual ruler of the country, Yoritomo fled, but was captured and condemned by Kiyomori to be beheaded. Spared through the pity of the stepmother of Kiyomori, he was banished to Idzu. There he married the daughter of Hojo Tokimasa, one of his guardians in exile. In 1180, calling around him his father's scattered retainers, and securing the assistance of his father-in-law and the monks of Hiyeizan (see KYOTO), he got together an army which he placed under the command of his youngest brother, Yoshitsune, and proceeded against the Taira. Five years later his enemies were utterly annihilated in a great naval battle off Dan-no-ura, near Shimonoseki. He made Kamakura his capital, was created Sei-i-tai-shogun in 1192, laid the foundations of the feudal system in Japan, and became the virtual ruler of the land—nominally under the Mikado—and the office of shogun became hereditary in the Minamoto family. He died in 1199 with his great reputation somewhat sullied by his cruel treatment of his brother Yoshitsune. See MINAMOTO YOSHITSUNE.

MINAMOTO YOSHITSUNE, mē′nä-mō′tō yō′shē-tsōō′nā (1158–1189). A Japanese chieftain. Japanese history in the eleventh and twelfth centuries A.D. is concerned with the struggles of the Taira and the Minamoto clans. In 1159 Yoshitomo, the head of the Minamoto, was killed and his clan defeated. His three sons escaped, and after years of adventure defeated the Taira finally in 1185. Yoshitsune, the youngest of the three, was the lieutenant of his elder brother Yoritomo, and the most efficient warrior in his army. Yoshitsune was in command when the last battle was fought, but his success excited the jealousy of his brother, who sought his death. Escaping with 11 comrades, Yoshitsune was pursued and committed suicide in 1189. His history, with its adventures, triumphs, and tragic end, is the favorite theme of romance, poetry, and drama. In one form of the story the hero escaped with his life and found refuge among the Aino in Yezo, where he is still worshiped as a god. Another legend represents him as going to the continent of Asia and identifies him with Genghis Khan.

MIN′ARET. The tower of a mosque (q.v.). The Mohammedan call to prayer is chanted by the voice of the muezzin, who, five times daily, mounts to its upper balcony to summon the faithful with the prescribed formula. Each mosque has one or more minarets. The normal number for the largest Djami mosques is four, one at each angle of the edifice. Some have as many as six, e.g., the Ahmed mosque at Constantinople. The mosque at Mecca has the exceptional number of seven.

The usual type is a square, polygonal, or cylindrical structure of stone or brick, consisting of several stories marked by balconies, either projecting on stalactite supports or with a receding story above; it is crowned by a pinnacle or small dome. The summit is reached by a winding inner stairway; only the old stone minaret of Tulun at Cairo has an external winding staircase.

The earliest mosques had no minarets. They were first built during the seventh century, the Caliph Omar being said to have erected two, at

Kufa and Medina. Those earlier than the twelfth century were usually heavy square structures of stuccoed brick or stone without much ornament. This type is preserved at the mosque of Sidi Okba at Kairwan in Tunis. This square type persists in north Africa outside of Egypt, and was carried by the Moors into Spain. The Giralda at Seville (q.v.) is one of the largest and richest of this type, though the upper stages are a Renaissance addition. The minarets of Cairo are usually polygonal and highly ornate, with corbeled balconies and receding stages. Among the finest are those of Ibn Tulun, Hassan, Barkuk, Kalaun, Bordeni, and Kaït Bey. The Hassan mosque has two minarets; that of Kaït Bey only one.

The minarets of Egypt, Spain, Syria, India, Persia, and Turkey built between the thirteenth and sixteenth centuries are among the most original and graceful works of Eastern architecture. The Turkish type is the simplest—a cylindrical or fluted shaft with one to three corbeled balconies and a slender conical spire terminating in a gilded crescent. The Persian minarets are also cylindrical, with bulbous tops, and are veneered with brilliant ceramic tiles. Those of India show varied forms, some following Hindu models, others the Persian, but executed in marble or sandstone without tiles, as at Delhi and Agra. The most remarkable is the most ancient—the Kutub Minar at old Delhi (c.1200), a superb tower in four tapering and receding stories, each of a different star-shaped or scalloped plan. Damascus and Bagdad preserve some of their mediæval examples. The minarets of the Constantinople mosques, such as St. Sophia, Ahmed, etc., are exceedingly graceful. Sometimes the colleges, or madrasah, had minarets of style similar to those of the mosques, as in that of Sultan Husein at Ispahan, where the towers are similar to those of the great mosque of Ispahan. The height varies greatly; among the highest are the Giralda (formerly 230 feet, now 308 feet) at Seville, Kalaun (193 feet) and Hassan (280 feet) at Cairo, and the Kutub Minar, near Delhi (242 feet). See MOSQUE; and consult the bibliography of MOHAMMEDAN ART.

MINAS, mē′nȧsh, more properly BELLO HORIZONTE, bĕl′lō ō′rē-zōn′tā. The capital of the State of Minas Geraes, Brazil (Map: Brazil, J 8). It stands on a plateau, at an altitude of 3017 feet, 60 miles northwest of Ouro Preto (q.v.), whence the capital was removed in 1897. It was founded, in 1894, upon modern plans, with wide, well-paved streets and large public gardens. Its public buildings include the post office, Law School, President's palace, Library of Congress, public market, and two theatres. It has also many fine residences. It is lighted by electricity and has an excellent supply of pure spring water. It has made a beginning of industrial life by the establishment of a few factories. Pop., 1912 (est.), 35,000.

MINAS, mē′nȧs. Capital of the department of the same name in Uruguay. It is picturesquely situated 55 miles northeast of Montevideo, with which it is connected by rail (Map: Uruguay, J 4). It is surrounded by well-cultivated grain-producing lands, and there are quarries of marble and granite in the neighborhood. Pop. (municipality), 1900, 8955. The city was founded in 1784.

MINAS DE RIO TINTO, mē′nȧs dȧ rē′ō tēn′to. An important mining town in southern Spain, in the Province of Huelva, situated among the mountains, 32 miles northeast of the city of Huelva (Map: Spain, B 4). The surrounding country contains almost inexhaustible deposits of copper ore, which were exploited by the ancient Phœnicians. In 1873 the mines were taken over by a London company and the methods of obtaining the ore revolutionized. The mines now employ 10,000 workers; in 1911 the quantity of ore produced amounted to 1,603,854 tons. The town, which in 1845 had a population of only 800, numbered, in 1900, 9956, and, in 1910, 12,626.

MINAS GERAES, mē′nȧsh zhȧ-rīsh′. A southeastern state of Brazil, bounded by Bahía on the north, Bahía, Espirito Santo, and Rio de Janeiro on the east, Rio de Janeiro and São Paulo on the south, and São Paulo, Matto Grosso, and Goyaz on the west (Map: Brazil, H 7). It is the fifth state of Brazil in size, having an area of 221,951 square miles. It lies wholly in the Brazilian plateau, with an average elevation of 2000 feet, and is traversed by a number of mountain ranges, which, although the highest in Brazil, are not very prominent, owing to the general elevation of the surrounding country. The principal ranges are the Serra da Mantiqueira, along the southern frontier, and the Serra do Espinhaço, running north and south through the centre of the state. At their junction is Mount Itatiaia, about 9000 feet high and the highest point in Brazil. Only the mountain ranges and the river valleys are forested; between them are extensive steppes covered only with grass and scanty shrubbery. Minas Geraes is watered by numerous rivers, including the São Francisco (with its numerous tributaries which take in the larger portion of the state), the head streams of the Paraná, the Doce, and the Jequitinhonha. All the rivers have numerous cataracts and rapids; only the São Francisco is navigable for any distance, and it has no direct connection with the Atlantic Ocean. The climate, in general, is temperate, averaging 71.6° F. for the whole state. A great portion of the south and centre enjoys a much cooler climate, while the thickly wooded river valleys are very hot and humid. Originally the chief economic interest was centred in gold and diamond mines. These industries, in decline for a long period, have been revived and also the exploitation of mines of iron, of which there are large deposits, manganese, and precious stones has been undertaken. The chief industries are agriculture and stock raising, the leading agricultural products being coffee, corn, beans, rice, potatoes, tobacco, cotton, and sugar cane. Stock raising is carried on extensively, and butter and cheese are produced in large quantities. The chief manufactures are those of cotton, textiles, and cigars. The railway lines traversing the southern part of the state have a mileage of 2700 miles. Minas Geraes had a population of 3,184,099 in 1890, 3,594,471 in 1900; 4,500,000 (est.) in 1911. The inhabitants are largely of mixed origin, and the number of aborigines is still considerable; negroes are also numerous. Minas Geraes was settled at the end of the sixteenth century, immigrants being attracted there by the gold and diamond deposits. It was separated from the Captaincy General of Rio de Janeiro in 1709 and was made an independent captaincy in 1720. In 1788 it was the scene of an unsuccessful insurrection led by Joaquim José da Silva Xavier, "Tiradentes," which had

for its object independence and the establishment of a republic. Other revolts against the central government occurred in 1833, 1842, and 1844, all of which were suppressed. The capital was Ouro Preto (q.v.), up to 1897, when the seat of government was removed to Bello Horizonte or Minas (q.v.).

MINBU, mĭn'bōō. A district of the division of Magwe, Burma. Tillage and fishing are the chief industries. Area, 3302 square miles; pop., 1911, 263,939. Capital, Minbu.

MINCH. An arm of the Atlantic Ocean which separates the island of Lewes in the Hebrides from the northwest of Scotland (Map: Scotland, C 1). Its shores are exceedingly irregular and its average width is about 30 miles. It connects with the Gulf of the Hebrides to the south by the Little Minch, which is about 15 miles wide, and which separates the Isle of Skye from that of North Uist and the neighboring islands in the outer Hebrides.

MINCIO, mēn'chō. A left affluent of the River Po, Italy, which it joins near Governalo, 10 miles southeast of Mantua, after a southeasterly course of about 120 miles. Its source is at Pescheria, where it flows from Lake Garda. It is the ancient Mincius, and during the Austro-Italian wars (1800–14) was an important strategical base, several battles being fought along its banks.

MIN'CIUS. The ancient name for the river Mincio. This stream is celebrated by Vergil in his *Eclogues.*

MINCKWITZ, mĭnk'vĭts, Johannes (1812–85). A German poet and classical scholar, born at Lückersdorf. He was educated at Leipzig, was appointed professor there in 1861, and in 1883 removed to Heidelberg. He first gained fame by his translations into German of Homer, Æschylus, Sophocles, Euripides, Aristophanes, Pindar, and Lucian. He also wrote *Vorschule zum Homer* (1863). In the field of German criticism Minckwitz wrote *Platen als Mensch und Dichter* (1836) and *Leben Platens* (1838), and edited Platen's (q.v.) posthumous papers (1852); and he also published: *Lehrbuch der deutschen Verskunst* (1844); a play, *Der Prinzenraub* (1839); and a volume of popular poems (1847). Consult *Briefwechsel zwischen Platen und Minckwitz* (Leipzig, 1836).

MINCOPIES, mĭn'kō-pīz. The native inhabitants of the Andaman Islands. They are in general of very low stature, averaging 1.49 meters, and are subbrachycephalic with an index of 82.6. They have a very low grade of civilization, living in huts called chongs, which consist merely of a roof on four stakes, and going naked. They live by hunting and use a peculiar bow in the shape of an S, which presents a curious analogue to certain Eskimo bows and also to the bows of some Bantu tribes in East Africa. Linguistically it has been impossible to connect them with any other group, even among peoples of similar physical type. Consult: Man, "Aborigines of the Andaman Islands," in the *Journal of the Anthropological Institute,* vol. xi (London, 1882); Deniker, *Races of Man* (ib., 1901); A. R. Brown, "Notes on the Languages of the Andaman Islands," *Anthropos* (Salzburg, 1914). See Andamans.

MIND (AS. *gemynd,* Icel. *minni,* Goth. *gamunds,* memory, from AS. *munan,* Icel. *muna,* Goth. *gamunan,* to remember; ultimately connected with Lat. *mens,* Gk. *μένος, menos,* mind, Skt. *man,* to think). The collective term for the subject matter of psychology (q.v.). The common-sense view of mind makes it a mind substance, a spiritual agent, a real, simple, and unitary being, sharply opposed to material substance as "thought" is opposed to "extension," yet interacting with the physical universe under some form of the causal law. This conception of mind has its root in primitive reflection upon the phenomena of sleep, dreams, trance, and death, and upon certain types of behavior, especially, we may suppose, upon the behavior which expresses emotion. It received philosophical treatment at the hands of the scholastic psychologists, and, in its current form, is practically a legacy from Descartes. It is doubtless kept alive by its emotional value; it satisfies human aspirations and accords well with the natural anthropocentric notion of the world at large. It is still held by some psychologists: Ladd openly accepts it, and James, while rejecting it for his psychology, yet admits that, for his personal thinking, it appears "the line of least logical resistance." Nevertheless, such a view of mind is wholly foreign to the spirit and to the requirements of modern psychology. In the first place, it is unsupported by psychological evidence. Had there been the same emotional temptation to reject minds as there has been to posit them, we may be sure that the arguments ordinarily urged in their favor would have received but scant attention. Secondly, the assumption of a real mind is superfluous. "The substantialist view of the soul," says James, "is at all events needless for expressing the actual subjective phenomena of consciousness as they appear"; "the substantial soul explains nothing and guarantees nothing."

Numerous difficulties have been encountered, upon the metaphysical side, in the attempt to resolve the dualism of mind and body which is involved in this concept of the substantial mind. (See Substance; Soul; Dualism; Monism.) In consequence there arose, early in the history of psychology, a second view, according to which mind is not substance but active principle; mind is an activity. Aristotle, who first developed the theory, identified mind with the principle of life; mind is the regulative or formative principle of the biological process, and its relation to body is similar to that of form to matter. This view was also that of the neo-Scholastics (see Aquinas, Thomas); and, stripped of biological implications, it furnishes the initial basis of certain definitions of mind which may be found in present-day psychology. It is important, for the understanding of the theory, to distinguish between mind as an activity and the activity of mind. The substantial mind was early thought to be an active mind; feeling, perception, memory, imagination, etc., were all activities of the mind, and it was only through these activities that mind could be known. Furthermore, the attempt to subsume these activities under one or more principal activities or functions gave rise to what is called faculty psychology. (See Faculty.) Aristotle's faculties, on the other hand, were not powers or activities of a mind; they were rather stages in the growth or development of mind; feeling is mind at a lower stage, thinking is mind at a higher stage. A third conception of mind became possible only when metaphysical discussion and logical classification gave way to scientific observation and description. Mind then came to be regarded (1) as

a form of experience or (2) as an aspect of experience. Those who adopt the first view characterize mental experience as that mode of experience which is directed towards an object; e.g., in idea something is ideated, in judgment something judged; and the mental phenomenon, therefore, is the *ideating* or the *judging*. But these are again mental acts; and so we find a return to the "activity" theory of Aristotle, with the difference that the act of seeing, hearing, judging, etc., is now held to be a form of direct experience. Those who adopt the second view deny that the phenomena of mind are a peculiar form of experience; they believe, on the contrary, that mind has to do with the whole world of experience, but only in so far as it is dependent upon an experiencing person. Even here, however, there are differences of opinion. If the experiencing person, otherwise undefined, is conceived as standing in some sort of relation to an object, then it is possible to reach a functional view of mind which in many respects is similar to the "activity" theory. But if the experiencing person is further defined as a physiological individual; if mental experience is regarded as that aspect of experience which is conditioned upon a nervous system, then the sights, the sounds, the warmths, the pains, etc., which we experience are themselves so many items of mind.

In so far, then, as the older theories of mind are concerned, modern psychology is what Lange, the historian of materialism, named it—a psychology without a mind, a *Psychologie ohne Seele*. Even the few writers who still cling to the substantialist view make no use of the assumption in their actual presentation of psychological facts and laws; it is only in their concluding remarks, at the point of transition from psychology proper to metaphysics, that mind, the "unit being," is introduced. At the same time it would be entirely erroneous to apply Lange's phrase, without qualification, to mental science. A psychology without some sort of mind would be impossible. The new psychology keeps the term "mind," but defines it, in functional or existential terms, as the sum total of an individual's mental experience. Just as a plant is a closed group of physiological functions, so is mind the collective name for the closed group of mental functions; or, just as the plant, again, is the organized whole of root, stem, leaves, and flowers, and not something above and behind these parts, so is mind the organized whole of our mental processes (q.v.), and not something above and behind these manifestations of mentality.

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MINDANAO, mĕn'dä-nä'ō. One of the most important and, according to the latest official estimate, the second in size of the Philippine Islands. It is the southernmost of the large islands of the archipelago, between lat. 5° 21′ and 9° 50′ N. and between long. 121° 53′ and 126° 28′ E., about 220 miles northeast of Borneo and 270 miles north of Celebes (Map: Philippine Islands, D 7). It is bounded on the north by the channels and seas separating it from the islands of Leyte, Bohol, Cebú, and Negros, the narrowest of these channels being the Strait of Surigao, 7 miles wide, separating the northeast extremity of the island from Leyte. On the east Mindanao is bounded by the Pacific Ocean, on the south by the Celebes Sea, and on the west by the Sulu Sea.

Area and Configuration. The latest official estimate gives as the area of the mainland, 36,292 square miles, or 4677 square miles less than Luzon, and of the 264 dependent islands, 1165 square miles, making a total of 37,457, which, even excluding the dependent islands, is larger than that of the State of Indiana. Mindanao, like Luzon, is very irregular in outline, having a shore line of nearly 1600 miles in length. It consists of a main body about 300 miles long from north to south and 150 miles broad, with a long irregular peninsula stretching in a semicircle for 180 miles from the centre of the west coast, where it is connected by an isthmus between the Bay of Iligan on the north and the Bay of Illana on the south. There are numerous other large and small bays on all sides of the island, among which the large and deep Bay of Dávao indenting the south coast is one of the finest and largest of the archipelago. Of the dependent islands the principal (with their areas in square miles) are the following: Camiguín (94), off the north coast; Dinágat (309) and Siargao (151), on the northeast; Sámal (147), in the Bay of Dávao; Balut (42) and Sarangani (25), to the southeast; Olutanga (36), south of the western peninsula; and Basilan (478), forming with about 50 small islets a separate province at the extreme southwestern end.

Topography. The coasts as a rule consist of sandy beaches interrupted by numerous rocky headlands. Almost everywhere the forest-covered mountains approach close to the shores, and the interior is in general very mountainous, containing the highest peaks in the Philippines, such as Mount Malindang, 8560 feet high, in the northwestern part, and the volcano of Apo, 10,312 feet, west of Dávao Bay. The mountain system consists of a number of irregular, broken, and roughly parallel chains traversing the island from north to south and inclosing between them large and fertile valleys. The configuration of the mountains in many places bears evidence of having been influenced and even originated by volcanic action. There are several active and a number of extinct volcanoes, while plains of volcanic matter as well as sulphur and hot springs occur, and the island is subject to frequent and violent earthquakes. During the severe earthquake which visited the islands during 1897 the town of Zamboanga was ruined by the shaking and by a great sea wave. Very little is known concerning the geology of Mindanao. Like southern Luzon, volcanic rocks of modern date cover the island.

Hydrography. The two principal river systems lie on either side of the central mountain

range, both of them running almost the entire length of the island. On the east is the Augsan, over 200 miles long, running northward into the Bay of Butûan; on the west is the Río Grande de Mindoro, over 200 miles long and the second river in size on the archipelago, running south, then west into the Bay of Illana, and rivaling in size the Cagayân of Luzon. Both of these systems include several large lakes. Owing to the proximity of the mountains to the coasts most of the remaining rivers of Mindanao are short and torrential.

Climate. Being situated at the southern end of the archipelago, within 10 degrees of the equator, and being less exposed to cooling winds than the northern islands, Mindanao has a hot and humid climate. The warm and moisture-laden south winds are particularly enervating, though the land breezes from the mountains are cool and refreshing. The climate is more equable than that of Luzon and consequently less invigorating, and the island is seldom touched by the typhoons, which rage only among the northern islands. The rainfall is very heavy, often exceeding 100 inches and reaching sometimes 140 inches in a year. Several parts of the island are subject to destructive inundations.

Flora and **Fauna** (for general description see PHILIPPINES). The vegetation of Mindanao, even compared with the rest of the archipelago, is remarkably luxuriant. Almost the whole island is covered with forests so interwoven with canes and vines as to form in many places an impenetrable jungle. The flora partakes of the character of that of Celebes and the Moluccas; cinnamon, nutmeg, and other spices, and betel nuts grow wild, and the forests abound in the most valuable building timber and cabinet woods. The animal life is equally abundant and varied, including, besides the species common to all the islands, many species peculiar to Mindanao. Monkeys are very numerous, and especially characteristic is the white monkey (*Macacus philippinensis*). Reptiles, including venomous snakes, abound, and the rivers are infested with crocodiles.

The population as shown by the last census, 1903, was 499,634, an average of 14 per square mile. Of this population 252,940, or over one-half, were classed as "wild" or noncivilized. About one-third of the total are Christianized Malays, about one-half of the total are Moros (Mohammedan Malays), the remainder Chinese, "mestizos," and uncivilized tribes.

Agriculture and commerce have received little attention, although the agricultural possibilities are very great. Rice, sugar, coffee, hemp, corn, tobacco, and the betel nut are grown, and the quality and quantity both suggest great possibilities if properly managed. At present less than 2 per cent of the island is under cultivation, but there seems no reason why the island should not produce great quantities of sugar, hemp, rice, and copra. Cinnamon, nutmegs, and spices are found in the forests and would probably justify cultivation and care. The natives take no interest in agriculture in excess of that needed to meet their personal requirements. The forests produce valuable woods, but little has been done to find markets for them.

Consult: Julian González Parrado, *Memoria acerca de Mindanao* (Manila, 1893); José Nieto Aguilar, *Mindanao, su historia y geografía* (Madrid, 1894); W. E. Retana y Gamboa, *Bibliografía de Mindanao* (ib., 1894); Francisco Combés, *Historia de Mindanao y Joló* (ib., 1897). See PHILIPPINE ISLANDS.

MIND AND BODY. See BODY AND MIND.

MIND CURE. See FAITH CURE; HYPNOTISM; MENTAL SCIENCE; MESMERISM; PSYCHOTHERAPEUTICS; SUGGESTION.

MIN'DEN. An ancient town in the Province of Westphalia, Prussia, on the left bank of the navigable Weser, 39 miles west of Hanover (Map: Prussia, C 2). It is an old-fashioned town, with narrow, winding streets, but the suburbs are modern. Its fortifications were demolished in 1873. Its public buildings include the thirteenth-century cathedral, a fine early Gothic structure with valuable works of art in its treasury; the town hall, the church of St. Martin, the government buildings, and the Gymnasium. Minden manufactures linen and cotton goods, dyestuffs, cigars, glassware, chemicals, chocolate, leather, lamps, cement, paper, chicory, and iron products. It also builds ships and repairs railway rolling stock. Charlemagne made Minden the seat of a bishopric, which was converted into a secular principality in 1648 and united with Brandenburg. Near Minden an Anglo-Prussian force under Ferdinand of Brunswick defeated a French army under Contades, Aug. 1, 1759. See SEVEN YEARS' WAR. Pop., 1900, 24,327; 1910, 26,454, chiefly Protestants.

MINDEN. A town and the parish seat of Webster Parish, La., 30 miles east-northeast of Shreveport, on the Louisiana and Arkansas Railroad (Map: Louisiana, C 1). Cotton, corn, sugar, and potatoes are raised extensively, and the chief industrial establishments are saw mills, cottonseed-oil mills, and compresses. The water works are owned by the town. Noteworthy attractions include the three parks and the splendid high-school building. Pop., 1900, 1561; 1910, 3002.

MINDONGA. See CHOBI.

MINDORO, mĕn-dō'rō. One of the Philippine Islands, among which it ranks seventh in size. It is situated south of the main body of Luzon, from which it is separated by a sea channel 7½ miles wide (Map: Philippine Islands, C 4). Its extreme length from northwest to southeast is 100 miles, and its greatest width is 58 miles. The area of the mainland is 3851 and of the 26 dependent islands 173 square miles, making a total of 4024 square miles. The island has an oval shape with no large indentations, though there are a number of small bays and several almost landlocked harbors. The coasts, though generally having deep water close to shore, are lined, especially along the west side, with submarine reefs. Mindoro is, next to Mindanao, the most elevated of the Philippine Islands. The whole interior forms a mountainous plateau, reaching in Mount Halcón the height of 8800 feet. Almost the whole of the island, from the mountain summits to high-water mark, is covered with unbroken virgin forests, though in the narrow strip of lowland along the western coast there are some prairie and marshy regions. The rivers are all short and simple streams running down from the edge of the plateau on all sides, there being no large river system. The climate is more variable than that prevailing in the southern islands, and Mindoro is especially exposed to typhoons. The proximity of the forests to the coast towns renders these unhealthful and subject to intermittent and typhoid fevers. The yield of rice was at one time so great that the

island was called the "granary of the Philippines," but the industry was destroyed by Moro pirates.

In spite of the fertility and natural wealth of the island its economic conditions are in a very backward state. A very small portion of it is cultivated, and the yield of agricultural products is scarcely enough for home consumption. The cultivation of sugar, cotton, and hemp is increasing, and a little of the latter is exported. The mineral wealth is believed to be considerable, but only the coal beds and sulphur springs have begun to be exploited. The principal exports are forest products, such as timber and pitch, and the forests also are the basis of the principal industries—woodcutting and rattan splitting. Communication is almost exclusively carried on in coasting vessels, the interior being a rough and pathless wilderness.

The population of Mindoro in 1903 was 28,361, including 7264 savages. The inhabitants are chiefly Tagalogs, who number 18,185, with 7266 Mangyans, 2088 Visayans, and 630 Ilocanos. The inland of Mindoro, together with its dependent islands, forms the Province of Mindoro, which had in 1903 a population of 39,582. The most important tribes were represented as follows: Tagalogs, 26,408; Mangyans, 7268; Visayans, 4962. See PHILIPPINE ISLANDS.

MIND READING. See MUSCLE READING; TELEPATHY.

MIND-STUFF THEORY. A metaphysical theory which explains the relation of matter and mind by affirming their identity under the form of atoms of mind stuff. These atoms are of a nature between physical atoms and psychical monads, representing an indivisible element, as the former, but being qualitatively rather than quantitatively determined, as the latter. Mind and matter, according to this theory, are but forms of composition of the atoms of mind stuff; only under the most rarely favorable conditions does this composition result in intelligence, as in the higher animals, but at the same time no matter is to be conceived as "dead" matter, since it is built up of elements whose essential character is psychical. Mind stuff seen from the inside constitutes what we call mind; seen from the outside it is what is called matter. The theory is expounded by W. K. Clifford in *Mind*, o. s., vol. iii.

MINE. See MINING.

MINE, SUBMARINE. Formerly all explosive devices designed to destroy or injure a ship by blowing a hole in her hull below the water line were called torpedoes. They were divided into two classes, fixed and moving. The fixed class are now called *submarine mines*. Reference should be made to article TORPEDO for the history of submarine mines. Submarine mines are (1) self-acting and (2) controlled, according to the conditions of firing. Self-acting or contact mines are mechanically or electrically fired. The mechanical arrangements are of numerous types, but the most common have pins or levers which are on the exterior of the case. When struck by a passing vessel the pressure, or a spring released by the lever, drives a firing pin against a fulminate primer in contact with the charge. The electrically fired are (1) simple buoyant mines anchored, like all buoyant mines, so as to be held 5 to 20 feet below the surface, and (2) combination ground mines with a buoyant contact held at a similar depth. In both these types the explosion is caused by the completion of the circuit by driving in a pin, depressing a lever, or the operation of some other device, when the mine or contact piece is struck by a ship. Electrically fired mines usually have separate battery boxes connected by a long double conductor wire to the mine. The battery box is thrown over when the mine is launched and lies on the bottom near the anchor.

Controlled mines are (1) automatic and (2) observation. The firing wires for all controlled mines lead to mine stations. For automatic mines this is done to secure safety. When the circuit is broken at the station the channel is safe for the passage of ships, but when it is closed the mine will explode if struck. The combination controlled mine, like the combination self-acting, is a ground mine with a buoyant contact piece; it is made ready in the same manner as an automatic controlled mine. Observation mines are fired by the observers. These are placed in stations so located that their lines of sight at the mine field intersect at angles of 45° or more. Each group of mines has a corresponding contact that is passed over by the sight bar on each observer's switchboard when the sight is directed to the centre of the group. When both contacts of a group are made the mines of the group are fired; this will of course occur when a ship is directly over the group. Observation mines may be of the simple or compound buoyant type or of the ground type. The simple buoyant mine can be exploded only by the observers; the compound type has pins and levers for explosion by contact so that it may be considered as belonging also to the *automatic* buoyant controlled type. Observation ground mines are simple if fitted for explosion by the observers only, and are combination if they also have contact pieces. Drifting mines are always self-acting, and most of them are mechanically fired.

In the accompanying figures many minor details are omitted for the sake of clearness.

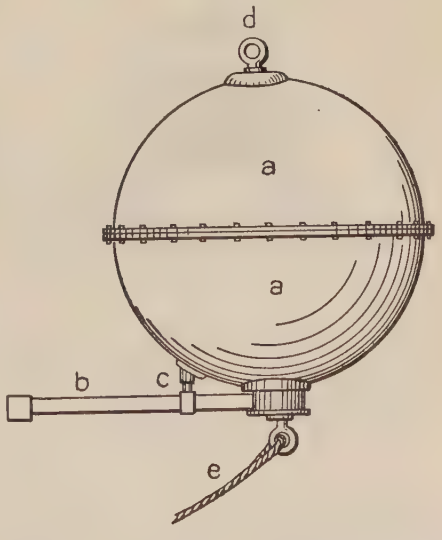


FIG. 1.

Figure 1 is a self-acting, mechanically fired mine, operated by the lever *b*; *a*, *a*, are the halves of the mine case; *c*, a detent which holds

the lever in position until struck; *d*, the transporting lug; *e*, the anchor rope. A similar mine, fitted with an electric primer and switch in place of the percussion primer and firing pin, and with electric wires connecting it to an observing station, would be an automatic controlled mine; if fitted with wires and a battery instead of connected to a station it would be a self-acting, electrically fired mine. *Observation* mines have a similar appearance except as regards the lever, which is omitted. Figure 2

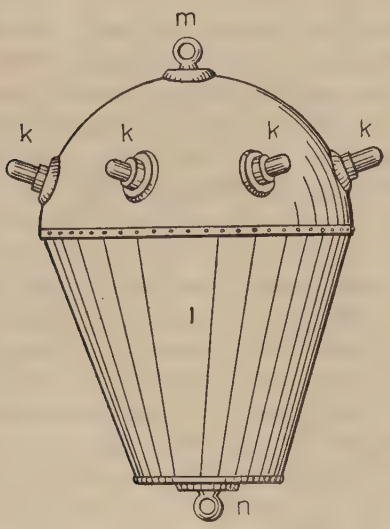


Fig. 2.

is a self-acting, mechanically fired mine, operated by the driving in of one of the pins *k; l* is the shell or mine case; *m*, the transporting lug; *n*, lug for the anchor rope; *k, k, k, k*, firing pins. Figure 3 is one of the many types

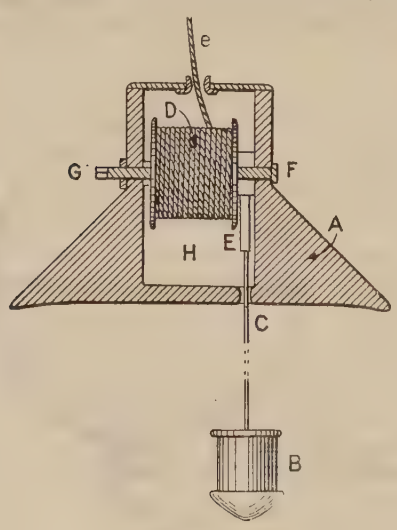


Fig. 3.

of mine anchors; *A* is the cast-iron body; *B*, the distance weight; *C*, the distance rope; *D*, the reel carrying the anchor rope *e; E*, pawl to control the operation of the reel *D; F*, reel axle; *G*, square head of reel axle to take wrench for reeling in. Figure 4 shows the operation of anchoring. The depth of water is assumed to be about 40 feet; the mine to be held at 10 feet below the surface. *a, b, c*, show the position of the mine in the three stages of the process. *A* is the anchor; *B*, the distance weight; *R*, the distance rope; *S*, the anchor rope. Both ropes are of soft, pliable wire. The length of the distance rope is adjusted to the submerged

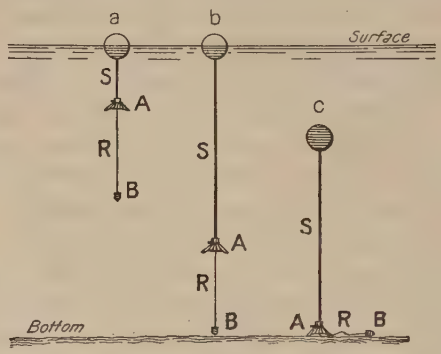


Fig. 4.

distance of the mine, 10 feet. Distance weight, anchor, and mine are dropped from the mine planter when over the selected position. The distance weight (usually of lead or with a lead filling) sinks rapidly until the distance rope is fully extended; the anchor does not sink with the same speed, being of less dense material and having a cavity which has to fill with water slowly. As long as the weight of *B* hangs on the clutch *E* (Fig. 3) the reel *D* is free to turn and unreel the anchor rope, but as soon as *B* reaches the bottom the reel is locked. The weight of the anchor then drags the mine the required distance below the surface.

Mines of all the types mentioned are in common use, their various characteristics fitting them to different local conditions. Self-acting mines have the advantage of (1) being comparatively cheap, (2) can be kept in store ready for immediate use, (3) do not require specially trained men or observation mining stations, and (4) extempore mines can be easily made. But self-acting mines are all (1) rather dangerous to put out or pick up, (2) the condition of the ignition apparatus cannot be tested after the mine is placed in position, (3) they are as dangerous to friend as to foe when once placed, and (4) the contact pins and levers, for mechanical or electrical firing, may become so oxidized, rusted, or overgrown with barnacles or seaweed as to prevent their operation; this condition is quickly reached in the tropics. After being two months in the water the Spanish self-acting torpedoes (in 1898) were so overgrown with barnacles that none was in a condition to explode if struck by a ship; indeed, the United States ships struck them without causing explosion, and one mine was drawn into the propeller and hit repeated hard blows. The objections to this type are evidently such as to preclude their use in important channels where controlled mines can be placed.

Ground mines are only suitable for shallow channels. In deep water buoyant mines must always be used. They are anchored with a submergence of 5 to 20 feet below the surface and at distances apart sufficient to prevent being set off by shock from the explosion of others. For

mines filled with guncotton the extreme destructive range (according to Gen. H. L. Abbott, U. S. A.) is 14.7 feet for a 100-pound charge, 20.5 feet for a 200-pound charge, and 31.7 for a 500-pound charge. The safety interval between mines or groups should be at least eight times the extreme destructive horizontal range. Mines are now commonly filled with trinitrotoluol, which is more destructive than guncotton, but the safety range is believed to be about the same. The necessity for separating mine groups by two or three hundred feet leaves a wide interval through which a ship might pass.* For this reason, and to insure her destruction in case some of the mines should fail to act, mines and mine groups are laid in several lines across the channel, the units of each line opposite the intervals in the adjacent ones. Self-acting mines are usually anchored separately, controlled mines in groups. Self-acting contact mines are frequently anchored in pairs with a line between them. If a vessel strikes the line she draws both mines alongside and explodes them.

The removal of mines is effected by sweeping or countermining. Sweeping or dragging may be effected in various ways, but is most expeditiously performed by two vessels. These steam abreast each other, a few hundred feet apart, dragging a stout wire rope, each having an end on board and the bight sliding along the bottom behind them. When one or more mines are gathered in the bight of the rope they are exploded by gunfire or a detonating charge. The operation of sweeping for mines is manifestly very dangerous unless the draft of the vessel engaged is shallow enough to pass over a mine field without hitting the mines. In the Great War of 1914 steam trawlers were much used by the British for this work, while various devices were employed in the Dardanelles, where much destruction was caused by the Turkish mines. Countermining is the explosion of mines by similar devices called countermines. Countermining is useful in clearing a narrow channel through a mine field. The countermines are laid in two or three rows along the channel to be cleared and close enough together to insure the explosion of any mines lying between them.

Modern submarine mines contain from 200 to 1000 pounds of guncotton or trinitrotoluol. Judging from the destructive force of mines in the European War a large proportion of the German mines had 500 pounds or more of explosive. When such a mine is exploded in contact with the bottom or side of a ship the result is instant destruction of the adjacent part of the hull and the sinking of the ship in a very few minutes.

The submarine mine played a very important part in this great war. It is a well-established rule of international law (q.v.) that no belligerent nation has any control of the high seas, which include all waters more than 3 miles from the coast of any nation. Notwithstanding this, the Germans strewed contact mines over a great part of the North Sea and across the ordinary trade routes. The British followed by mining another considerable area, though they defined the limits of their mines and notified neutral powers. The Germans later defined safe routes past their mines. Whether drifting mines were put out was not known. If not, then many anchored mines broke adrift. The number of neutral vessels and lives destroyed by mines when pursuing presumably safe routes was large. In the first part of the war, up to Dec. 18, 1914, 8 Swedish vessels were sunk with a loss of life between 50 and 60; 6 Danish vessels with 6 lives; 5 Norwegian vessels with 6 lives; and 3 Netherland vessels with 15 lives. As mines are weapons of defense, the naval force acting on the offensive usually suffers most from their operation. In the last Russo-Japan War Japan lost two battleships, the Russians one. In the European War, up to March 20, 1915, the British lost by mines 3 battleships, 1 armored cruiser, 5 cruisers, 4 gunboats and torpedo vessels, 3 submarines, and 4 auxiliaries; the French, 1 battleship; the Japanese, 1 cruiser and 2 torpedo boats; the Germans, 1 armored cruiser; the Austrians, 1 cruiser and 2 torpedo boats; and the Turks, 1 gunboat.

Bibliography. J. S. Barnes, *Submarine Warfare* (New York, 1869); Charles Sleeman, *Torpedoes and Torpedo Warfare* (2d ed., Portsmouth, England, 1889); Sueter, *Evolution of the Submarine Boat, Mine, and Torpedo* (London, 1907); *Proceedings of the United States Naval Institute* (Annapolis, bimonthly); United States Naval Institute, *Ordnance and Gunnery* (Annapolis, Md., 1910); *Scientific American* (New York, 1914–15). See EXPLOSIVES; INTERNATIONAL LAW; TORPEDO; WAR IN EUROPE.

MINE ACCIDENTS, PREVENTION OF. Mining from its nature is one of the most hazardous occupations, but the extent and degree of the dangers depend in large measure upon the precautions taken. The nature of the hazard is shown by the statement that, in 1913, 1,047,000 men were employed in coal and metal mines, and in quarries in the United States, and of this number 3651 were killed, which is at the rate of 3.49 per 1000 men employed. In 1912 the rate was 3.22 and, in 1911, 3.58. Such figures and those in the accompanying tables properly may be studied with a graphical comparison of the death rates of coal mining in the United States and in European coal-mining countries from 1895 to 1913. This indicates that the United States death rate has been much higher in recent years than those of the other countries and shows the need of greater care in American mining.

DEATH RATES IN MINING VARIOUS MINERALS, UNITED STATES *

KIND OF MINES	Rate per 1000 men employed	
	1912	1913
Coal	3.27	3.73
Copper	4.62	4.20
Gold	3.99	3.43
Iron	3.76	3.23
Lead and zinc	3.77	3.31
Miscellaneous minerals	1.52	2.54
Average for metal mines	3.91	3.54
Quarries	1.88	1.72

* Compiled by A. H. Fay, United States Bureau of Mines.

Lessening Accidents in Metal Mines. Investigations indicate that the majority of mining accidents are caused by carelessness of one of the victims, although in many instances they are due to forgetfulness or absent-mindedness. One of the remedies is constantly to set before the miners such reminders, warnings, and safeguards that they will be led to take greater care.

Taking up the classification of accidents in the table herewith it will be observed that the largest number from any one cause in metal

CLASSIFICATION OF FATAL ACCIDENTS IN METAL MINING, UNITED STATES *

CAUSE	1913	
	Number killed	Percentage
By falls of rock or ore	220	32.21
By explosives	77	11.28
By haulage accidents	35	5.13
By falling	52	7.62
By skip or cage	34	4.98
By other causes	265	38.78
Total	683	100.00

* Compiled by A. H. Fay, United States Bureau of Mines.

mines is due to falls of rock from the hanging wall, or overhanging ore. A lessening of the number of such accidents can be obtained by careful inspection of the walls, barring or picking down the loose bowlders, and by systematic timbering. Great improvement has been effected in some mines by employment of special inspectors, but it is inevitable that there will be some accidents from falls, though they can be materially lessened by proper care. Then, in the case of the use of explosives in metal mines, accidents from this source are due almost entirely to carelessness, forgetfulness, or improper methods. Premature firing, drilling into old charges, thawing out of frozen explosives, carelessness in handling these, dangerous magazines, and placing detonators and explosives together, all are prolific sources of accident. Haulage accidents are due to men being squeezed between the car and the side of the passage, to electrocution by touching the trolley wire, to the running away of a car, or a trip on a grade. These are all preventable by the use of proper safeguards.

Accidents classified "by falling" are from men falling down shafts, winzes, or steep stopes. Obviously the remedy is better ladders and landing places and the protection of edges of open areas by fences, gates, and other guards. Skip or cage accidents are generally due to bad design or arrangement, or defective workmanship, or to using worn-out or defective ropes for hoisting. Such accidents should be of the rarest occurrence. Generally speaking, greater care and more intelligent planning will eliminate many accidents classed as miscellaneous as well as those classified here.

Lessening Accidents in Coal Mining. It will be observed that by far the largest number of accidents from any one cause is from falls of roof, being about 40 per cent of the whole, and if falls from the face or pillar coal be included it makes nearly one-half of the total. Such accidents cannot be entirely prevented, but the number may be very greatly lessened by picking and barring down loose roof or coal; by systematic timbering, which consists in placing posts or timber sets at fixed intervals rather than haphazard (although the cost is greater);

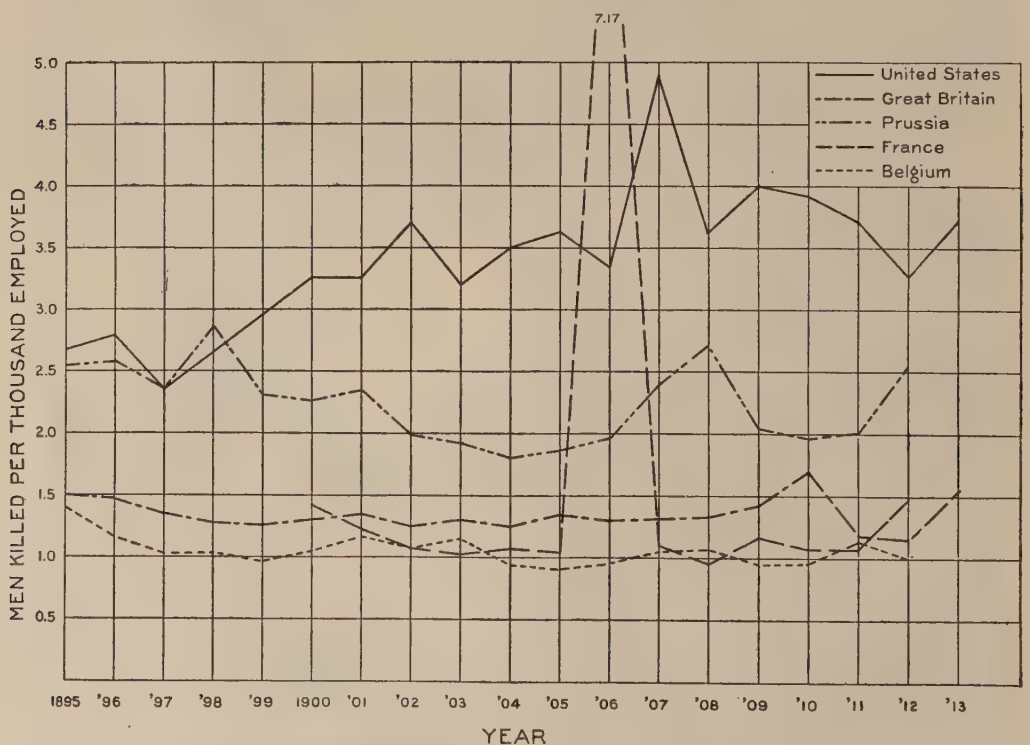
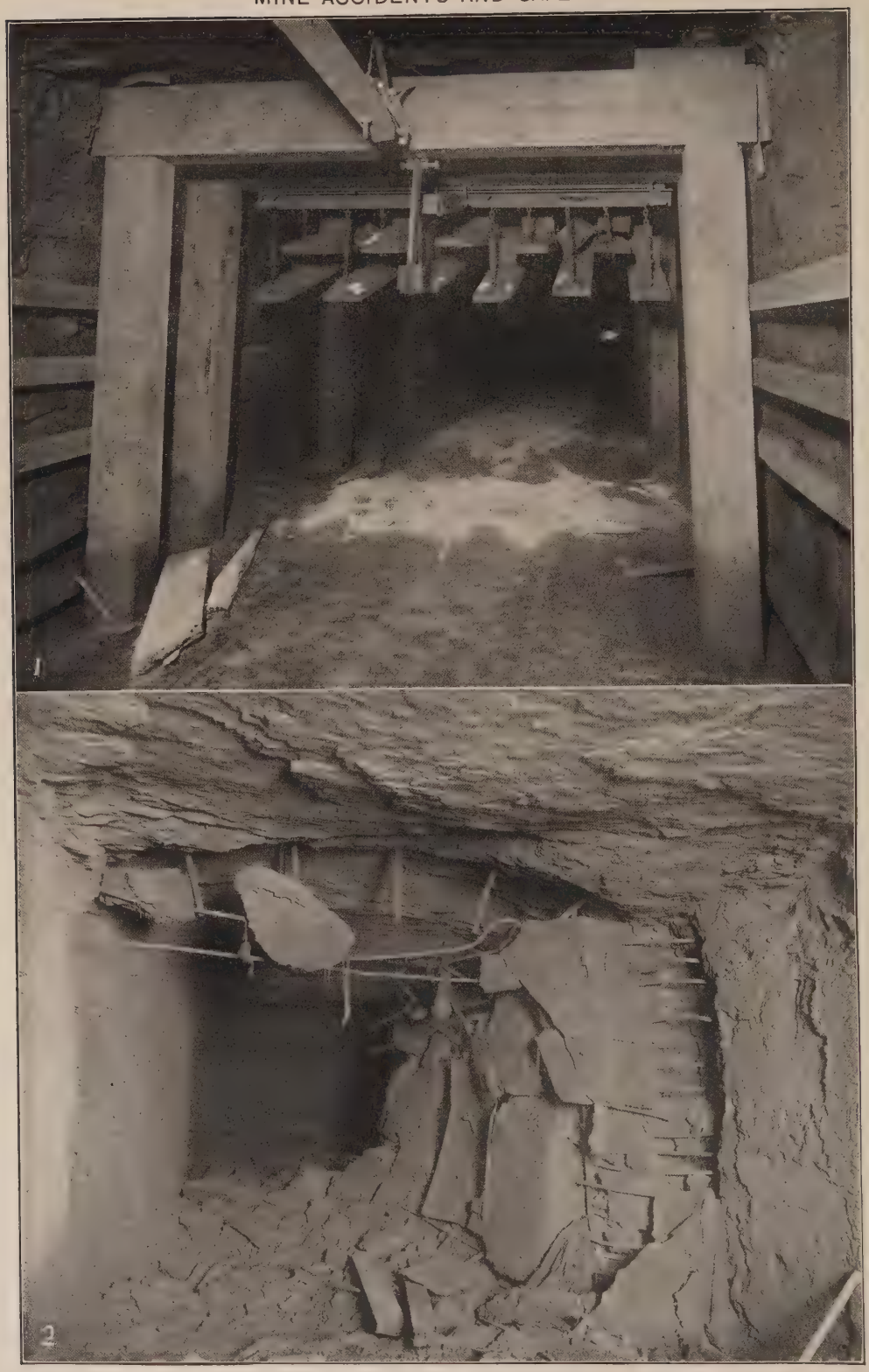


CHART SHOWING FATALITIES IN MINING OPERATION.

better methods of testing roof, which is by the sense of touch rather than by sound, i.e., when the roof is struck with a bar or hammer, if it is loose it will vibrate, whereas whenever a large rock is struck it is difficult to judge by the sound whether the rock is loose or not. Closer

INVESTIGATING MINE ACCIDENTS

1. Smoke projected by an explosion from experimental mine, Bruceton, Pa
2. Rescue party equipped with oxygen apparatus, safety and electric lamps, canary bird, and life line, entering experimental mine of United States Bureau of Mines after an explosion
3. Interior of a United States Bureau of Mines Rescue Car



PREVENTING MINE EXPLOSIONS

1. Rice concentrated rock dust barrier. Appearance after successfully stopping a light pressure, slow moving explosion The shelves have dropped and have been caught by chains, the rock dust having been distributed by the force of the explosion.

2. Reinforced concrete stopping in experimental mine, Bruceton, Pa.. broken by an explosion.

and better supervision of timbering at the face is of great advantage; this is obtained by the employment of district or face bosses, so that every place can be visited several times a day. In some mines an improper system of mining is employed, which increases the hazard of dangerous falls. Excessive charges of explosive shatter the roof. As large charges are employed in shooting off the solid, it is of great advantage to undercut the coal either by hand or machine, thus requiring the use of smaller charges of explosive.

Accidents by haulage are due to runaway trips and cars, to catching men between the car and the side of entry, and to electrocution from touching the trolley wire. The increased use of manways, or nonhaulage roads, serves to prevent haulage accidents, as do also providing greater clearance allowance on one side of haulage ways, the placing of shelter holes at regular intervals, the guarding of trolley and feed wires by sideboards, equipping cars with better brakes, and in dipping places the careful blocking of cars. The formation of systematic rules in regard to haulage and signaling and their enforced observance will reduce the number of accidents from this cause.

Accidents from Use of Explosives other than Explosions. Practically all explosive accidents result from careless handling and distribution of explosives. The making up of cartridges of black powder with an open light on the miner's cap, careless handling of detonators, and drilling into old charges are a few of the most prolific causes. To these may be added the improper storage of explosives underground, i.e., failure to put in boxes by themselves; the detonators should always be stored separately and apart from the explosive proper.

Fire-Damp and Coal-Dust Explosions. Although the total number of deaths due to inflammation of fire damp and explosions for any one year have always been less than those due to falls of roof material, nevertheless, since individual accidents of this nature often cause the deaths of large numbers, public attention is focused by the horror of such disasters. Special attention therefore has been paid in all coal-mining countries to the investigations of explosions with the view to their prevention. There have been a great many explosions in which from 100 to 400 men have been killed at a time. The greatest explosion that ever occurred with respect to the number killed was at Courrières, France, in 1906, when 1099 men were killed.

Cause of Fire-Damp Explosions.—Inflammable gas, chiefly methane (CH_4), is found in nearly all coal mines except those at comparatively shallow depths. Ordinarily the gas is diluted and carried away by an air current, but if the mine-ventilation arrangements are poor, accumulations of fire damp may occur, and if one of these is ignited by a flame or a spark an explosion may result. Explosions of fire damp are caused usually by open lights, but they may be produced by the flame of explosives and sparks or arcs from electric machinery.

Prevention of Fire-Damp Explosions.—To prevent gas explosions it is necessary, first, to cause, by means of fans, the circulation of sufficiently strong air currents through all portions of the mine to dilute and carry away the inflammable gas; second, the use of approved* safety lamps or the recently developed miner's permissible* hand or cap electric lights, instead of open lights; third, the use of short-flame permissible* explosives instead of black powder and dynamite; and fourth, the use of explosion-proof motors* or the withdrawal of electric equipment from the gaseous sections of the mine.

* Officially tested by United States Bureau of Mines and approved as comparatively safe for use in gaseous and dusty mines.

CLASSIFICATION OF FATAL ACCIDENTS IN COAL MINING *

CAUSE	1912		1913	
	Number	Percentage	Number	Percentage
By falls off roof	972	41.19	1,060	38.06
By falls of face or pillar coal	179	7.58	204	7.33
By mine cars and locomotives	362	15.34	424	15.22
By coal-dust explosions	137	5.80	423	15.19
By gas explosions and burning gas	164	6.95	91	3.27
By explosives	133	5.64	138	4.96
By other causes	413	17.50	445	15.97
Total	2,360	100.00	2,785	100.00

* Compiled by A. H. Fay, United States Bureau of Mines.

EXPLOSION DISASTERS' IN AMERICAN MINES IN EACH OF WHICH OVER 100 MEN WERE KILLED

1839	March 18,	Black Heath, Va.	*40
1884	March 13,	Pocahontas, W. Va.	114
1891	January 27,	Mammoth, XXX.	109
1891	February 21,	Springhill Mines, N. S.	125
1900	May 1,	Scofield, Utah	200
1902	May 19,	Coal Creek (Fraterville, Tenn.).	184
1902	May 22,	Fernie, B. C.	125
1902	July 10,	Rolling Mill Mine, Johnstown, Pa.	112
1903	June 30,	Hanna, Wyo.	169
1904	January 25,	Harwick, Pa.	178
1905	February 20,	Virginia City, Ala.	111
1907	December 6,	Monongah, W. Va.	358
1907	December 18,	Darr, Pa.	239
1908	November 28,	Marianna, Pa.	154
1911	April 8,	Banner Mine, Ala.	128
1913	October 22,	Dawson, N. Mex.	258
1914	April 28,	Eccles, W. Va.	181
1914	June 19,	Hillcrest, Alberta	189
1915	March 2,	Layland, W. Va.	111

* First explosion disaster reported.

NOTABLE EXPLOSION DISASTERS IN EUROPEAN COUNTRIES

		Lives lost
1894	Albion, Great Britain	290
1894	Camphausen, Saarrevier, Germany	181
1906	Courrières, France	1099
1908	Radbold, Ruhrrevier, Germany	360
1909	West Stanley, Great Britain	167
1910	Pretoria, Boeton, Great Britain	344
1913	Universal, Great Britain	439

Causes of Coal-Dust Explosions.—Coal dust in a pile or layer is not explosive, but when it is raised into the air in a dense cloud and is then ignited it will explode violently. Two things are therefore necessary to originate a coal-dust explosion—a means of making a dust cloud and a means of igniting it. Both conditions may be caused by a single agency, such as a blown-out shot (i.e., blast) or a small gas explosion. A blown-out shot is so called when the energy of the powder is not used in breaking the coal but blows the stemming or tamping out of the drill hole. After the first cloud of dust is ignited the pressure of the explosion may form clouds beyond, which in turn will be ignited, and the process continues, so that the explosion advances with increasing strength as long as there is fuel available.

Prevention and Stopping of Coal-Dust Explosions.—Plans for prevention comprise decreasing the amount of coal dust made in mining operations, preventing cloud formation by wetting the dust or making it noninflammable by increasing the incombustible content of the dust clouds, eliminating means of ignition by use of safety lamps and permissible explosives, and, finally, confining explosions to small areas by "barriers." The accumulation of coal dust on roads can be greatly decreased by the use of tight cars, so that the fine coal dust cannot fall out, and by loading cars only to the top of sideboards, so that the coal will not be jarred off in transit.

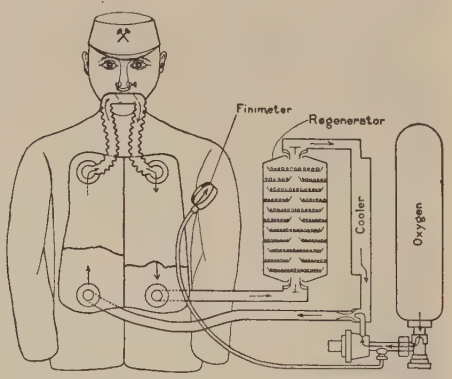
Wet methods of rendering coal dust inert comprise saturating the air current by steam or sprays so that it will not dry out the mine dust, and sprinkling by sprays from water cars or by pipe lines and hose. Calcium chloride and other less deliquescent salts are sometimes used on the roads to keep the road dust wet. Coal dust to be nonexplosive must be wet enough to ball in the hand.

Dry methods of preventing coal-dust explosions comprise covering all surfaces with fine incombustible rock dust artificially ground; then, if the dust is blown up into a cloud, the cloud will contain so much incombustible matter that it cannot explode, the rock dust, if that is used, absorbing heat and separating the coal-dust particles. This method has the advantage over the use of water that the latter evaporates rapidly unless the air current is nearly saturated, while the rock-dust protection remains good for long periods.

As open lights and blow-out shots of long-flame explosives are the most common igniting means of starting explosions, the replacement of them by safety and electric lamps and permissible explosives has greatly decreased the possibility of explosions occurring.

J. Taffanel, a French investigator, developed the first barrier or concentration of rock dust for stopping explosions, in case they start through failure of initial preventive means. It consisted of 10 to 15 boards placed across the mine passages just beneath the roof and loaded with rock dust. If an explosion occurred the dust was blown or upset from the shelves and quenched the flame, thus preventing the passage of the explosion to points beyond. These barriers operated successfully except in rare cases when the explosion was a slow-moving one. To take care of such cases and to protect the rock dust from wetting where wetting methods were employed, closed rock-dust barriers were designed by George S. Rice, chief mining engineer of the Bureau of Mines, and tested at the Bruceton Experimental Mine of the United States Bureau of Mines, successfully extinguishing explosions and meeting the conditions above mentioned. The accompanying illustration shows one type, the "Concentrated Rock Dust Barrier," after extinguishing a very light explosion. It will be noted that the bottom boards have dropped, allowing the dust to sift down. In a violent explosion the whole barrier is smashed and three tons of rock dust immediately launched into the blast.

Rescue Work. Before the discovery of rescue apparatus and the development of modern methods of mine recovery rescue parties sometimes rushed into a mine after an explosion and lost their lives by suffocation from afterdamp, or by igniting gas with open lights and causing secondary explosions. In modern methods exploration is made in advance of bratticing parties by trained rescue crews equipped with the self-contained oxygen breathing apparatus, safety and electric lamps, and canaries. Such exploration hastens the discovery of any who may still be alive and insures the absence of mine fires before the restoration of the air current. The breathing apparatus is so attached to the wearer that he breathes no air or gases



CIRCULATING SYSTEM OF ONE TYPE OF RESCUE APPARATUS WITH MOUTH-BREATHING DEVICE.

from without the apparatus. It furnishes him with air having a high percentage of oxygen and constantly removes the carbon dioxide from the air exhaled by the wearer. The accompanying diagram shows the air circulation of the apparatus.

Safety lamps (q.v.) are carried by the crews to test for inflammable gas and black damp, the latter term being applied to mixtures of carbon dioxide and nitrogen. Portable electric lamps give a strong light, which is necessary for exploration work and, not using oxygen like the safety lamps, furnish illumination in any atmosphere. The actions of the canary indicate the absence or presence of small percentages of carbon monoxide (atmospheres containing only 0.25 per cent are dangerous to breathe), to which it is much more sensitive than small animals and human beings, so that if the canary is not overcome it is safe to permit men without apparatus to advance.

Many thousands of men have now been trained in the use of rescue apparatus and in rendering first aid to the injured by the United States Bureau of Mines, the State rescue stations of

Illinois, and by instructors of private stations maintained by mining companies. There are, therefore, crews in every mining district who are competent to assist in rescue work in time of disaster and alert at other times to do all in their power to prevent accidents or to furnish first aid in case of accident.

Bibliography. Sir F. A. Abel, *Mining Accidents and their Prevention* (New York, 1889); G. M. Bailes, *Modern Mining Practice* (5 vols., Sheffield, England, 1906); H. Schmerber, *La sécurité dans les mines* (Paris, 1910), containing a bibliography; J. H. Dague, *Mine Accidents and their Prevention* (Scranton, 1912); also reports, technical bulletins, and miners' circulars of the United States Bureau of Mines, available upon application or through the Government Printing Office, Washington; also official reports of Pennsylvania, Illinois, and other States.

MINE GAS. Many coal mines contain gas of an explosive nature. The most common of these is marsh gas, CH_4, which is very explosive if mixed with the right proportions of air. This mixture is known to miners as fire damp. Other gases found in coal mines and which may be dangerous in one way or another are carbonic-acid gas, CO_2 (called black damp or choke damp), and carbon monoxide, CO (white damp). Afterdamp is a gas present after an explosion of gas in the mine and is very dangerous. On account of mine gases, miners often have to use safety lamps for illumination, these lamps being so constructed that the flame does not come in contact with the air and gas in the mine workings. The danger of explosion is also minimized by thorough ventilation. Consult bulletins issued by United States Bureau of Mines. See COAL; SAFETY LAMP.

MINEO, mē-nā'ō. A town in the Province of Catania, Sicily, 27 miles southwest of Catania. It occupies the site of the ancient Menæ, founded by Ducetius, 459 B.C., and captured by the Saracens in 840. The ancient walls and castle are still in evidence. In the vicinity is the famous Lago de' Palici, the Lacus Palicorum, of volcanic origin with mineral springs. Pop. (commune), 1901, 9828; 1911, 8728.

MI'NER, ALONZO AMES (1814–95). An American Universalist minister, born at Lempster, N. H. He was educated in the public schools and after teaching for several years was ordained to the Universalist ministry in 1839 and served as pastor in Methuen, Lowell, and Boston, Mass. He was president of, and professor of ethics and political economy in, Tufts College from 1862 to 1875, when he returned to his former pastorate of the Second Universalist Church, Boston. He was appointed a member of the board of overseers of Harvard University in 1863; served 24 years (1869–93) as a member of the State Board of Education and as chairman of the board of visitors to the State Normal Art School (Boston) from 1873; was for 21 years president of the Massachusetts State Temperance Alliance; and stood as Prohibition candidate for Governor in 1878. He was the original projector of the Universalist Publishing House in Boston and became prominent in the antislavery agitation. He edited *The Star of Bethlehem*, contributed to periodicals, and published: *Bible Exercises* (1854); *Old Forts Taken* (1878); *Doctrines of Universalism*. His *Life* was published by G. H. Emerson (Boston, 1896).

MINER, CHARLES (1780–1865). An American journalist, born at Norwich, Conn. At 19 he removed with his family to the Wyoming valley in Pennsylvania, where he became interested in various newspapers, writing under the pen name of John Harwood. He was a member of Congress from Pennsylvania in 1825–29 and was the first to bring to the official notice of that body the possibilities of silk culture and manufacture in the United States. He returned to the Wyoming valley in 1832. The most important of his publications is a *History of Wyoming* (1845), which contains a description of the Wyoming massacre given by eyewitnesses.

MINER, THOMAS (1777–1841). An American physician, born at Middletown, Conn. After graduating from Yale in 1796, he then taught school and studied law, but turned to medicine and established himself in practice at Lynn, Mass. He was one of the founders of the Yale Medical School and was president of the Connecticut State Medical Society from 1834 to 1837. He is the author of *Essays upon Fevers and Other Medical Subjects* (1823), with Dr. William Tally, and *Typhus Syncopalis . . . or the Spotted Fever, etc.* (1825).

MIN'ERAL ACID, IN MEDICINE. An acid not of animal or vegetable origin. The mineral acids most generally used in medicine are sulphuric (oil of vitriol), nitric (aqua fortis), hydrochloric (muriatic), nitrohydrochloric, and phosphoric. In their medicinal action they have many properties in common.

The strong acids are escharotic, abstracting the waters of the tissues, combining with the albumin and other bases, and destroying the protoplasm. They are very diffusible. Sulphuric and phosphoric acid have a strong affinity for water, completely decomposing tissues to which they are applied; they are therefore powerfully escharotic. Sulphuric acid makes a black eschar, while nitric and hydrochloric acid turn the tissues yellow. They are all astringent to the tissues, hydrochloric being the weakest and sulphuric the strongest in this respect.

These acids diluted produce a peculiar metallic taste in the mouth and a sensation of roughness on the teeth. They stimulate the flow of saliva from the parotid and submaxillary glands. They promote the alkaline secretions of the intestines and of glandular organs (bile, etc.), but check the secretions of acid fluids, as the gastric juice. Given before meals, in small doses, they relieve undue acidity of the stomach by checking the production of the acid gastric juice. At first they aid digestion, being helpful to the action of pepsin; combined with stomachics they are useful in dyspepsia with deficiency of the gastric juice. If continued too long they may impair digestion by lessening the production of the gastric juice. They check fermentation and constipate the bowels, except nitric acid, which relaxes them.

Antidotes for poisoning by these acids are: alkalies, such as bicarbonate of soda, lime water; or in an emergency plaster from a wall may be mixed with water to neutralize the acid; oil, albumin, and milk to protect the mucous membranes. For stimulants, opium and ammonia (intravenously) may be used to counteract the resulting depression of the vital powers. See ANTIDOTE.

All these mineral acids, if well diluted, are classed as refrigerants and are useful in fevers, especially in typhoid. Hydrochloric is here preferable. Nitric is the acid generally preferred

as a caustic, its action being effectual and superficial; it may be applied undiluted to phagedenic ulcers and sloughs, warty growths, and indolent sores. Sulphuric acid, dilute, is appropriate in cases of diarrhœa, colliquative sweating, and as a prophylactic against lead poisoning; it is used also as an acid drink in fevers and before meals in acidity of the stomach. Phosphoric acid is considered of special value in tissue waste and in dissolving phosphatic deposits. All these acids act injuriously on the teeth by attacking the enamel. They should always be administered largely diluted, taken through a straw or glass tube, and the mouth should be thoroughly rinsed at once with an alkaline wash. See NITRIC ACID; HYDROCHLORIC ACID.

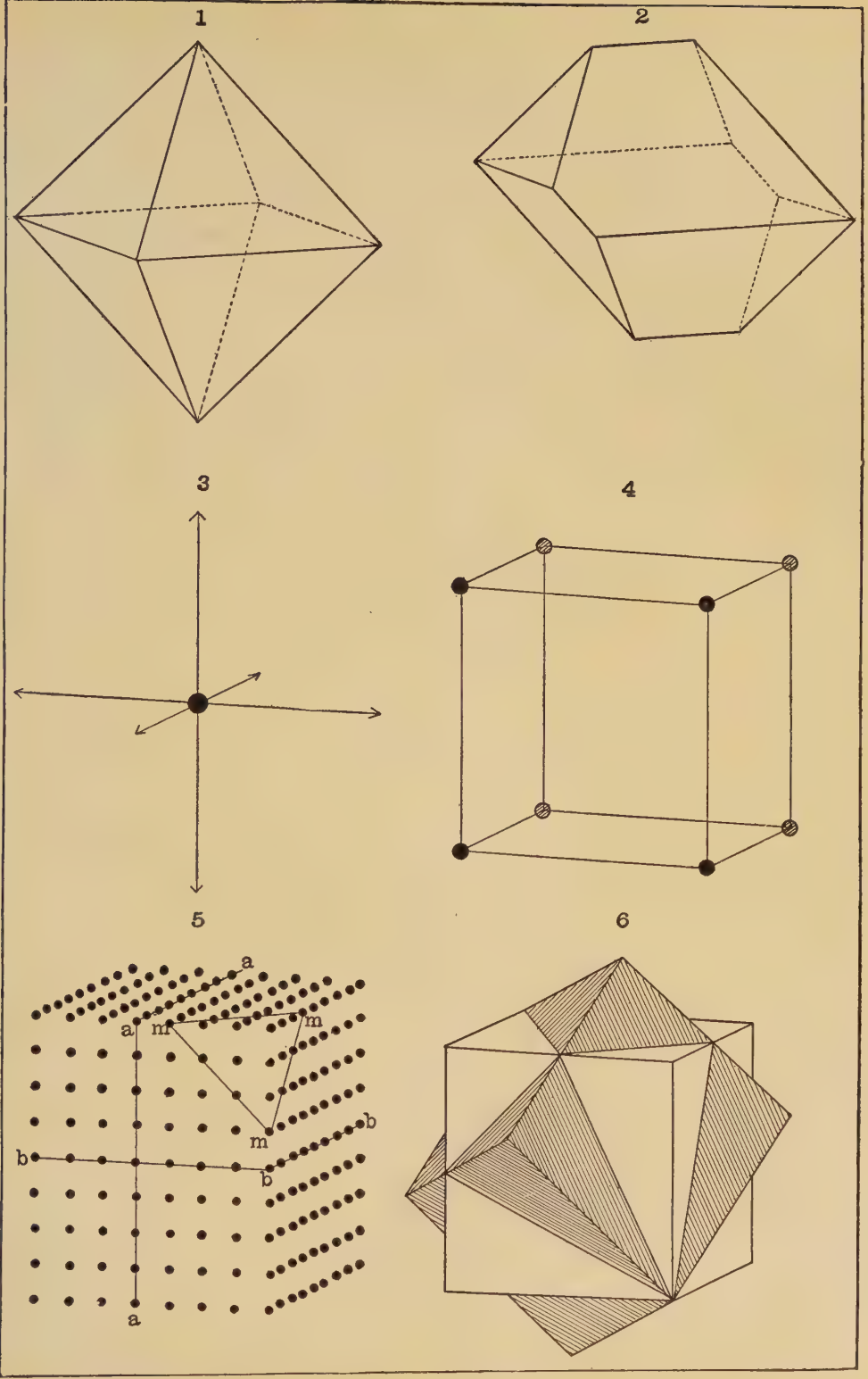
MINERAL COLORS. A term applied to a number of inorganic substances used in the manufacture of paints. The principal mineral colors include the following: *white lead*, consisting chiefly of basic lead carbonate; *zinc white*, or oxide of zinc; *antimony white*, or oxide of antimony; *fixed white* (blanc fixe), artificial or natural barytes, barium sulphate; *mineral white*, or calcium sulphate; *china clay*, or aluminium silicate; *whiting*, or calcium carbonate; native or artificial *yellow ochres*, i.e., earths colored by iron oxide; *litharge*, *massicot*, or oxide of lead; *strontian yellow*, or chromate of strontium; the chromates of cadmium, mercury, and barium; *mineral yellow*, or oxychloride of lead; *Naples yellow*, or antimonate of lead; *orpiment*, or sulphide of arsenic; *rouge*, Venetian and Indian reds or red oxides of iron; *vermilion* and *cinnabar*, or sulphide of mercury; *Derby red*, or basic chromate of lead; *minium*, or orange mineral (red lead), or lead orthoplumbates; *realgar*, or red sulphide of arsenic; *Brunswick green*, or oxychloride of copper; *Scheele's green*, or copper arsenite; *Schweinfurt green*, a mixture of copper acetate and Scheele's green; *cobalt green*, or cobalt and zinc oxide; *umber*, or brown silicate of iron and manganese; native or artificial *brown ochres*, i.e., earths colored by iron oxide; *Berlin blue*, or ferrocyanide of iron; *Thénard's blue*, or aluminate of cobalt; *ultramarine blue*, a compound of aluminium, sodium, silicon, oxygen, and sulphur; etc. The principal mineral colors are described in special articles or in connection with the metals or acids combined in them. See also PAINTS; PAINTERS' COLORS.

MINERAL DEPOSITS. See ORE DEPOSITS; and the articles on the different ores and minerals.

MINERAL'OGY (by haplology for **mineralology*, from *mineral*, OF. *mineral*, Fr. *minéral*, from ML. *minerall*, ore, from *minera*, *mineria*, *minaria*, mine, from *minerarius*, pertaining to mines, from *minare*, to mine, lead here and there, Lat. to drive, from *minari*, to threaten, from *minæ*, threats, from *minere*, to jut out + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The science of those natural substances known as minerals which, together or separately, form the material of the earth's crust and also, as far as our knowledge extends, that of other celestial bodies. A mineral is a substance of definite chemical composition which has been directly produced by the processes of inorganic nature. It must be homogeneous even when submitted to minute microscopic examination and must possess a definite composition capable of being expressed by a chemical formula. Laboratory and furnace products, or such substances as shells and bones of animals, cannot be included in the range of mineralogy. It is the function of the mineralogist to investigate the form, properties, and composition of minerals, their genesis, their relations to one another and to the accompanying rocks, the places where they are found, and the geological conditions under which they are formed. A knowledge of mineralogy is of importance to the geologist in his study of the rock formations, to the mining engineer in his search for metal-producing minerals, and to the metallurgist in the extraction of metals from minerals. Many of the useful arts are directly dependent for their raw materials upon minerals, while some mineral species occur in such brilliancy and beauty of color as to be highly prized as gems.

The Branches of Mineralogy. The general subject of mineralogy may be divided into four sections: 1. *Crystallography*, which includes the description of crystals, their character, classification, the mathematical relations of their faces, and the methods of expressing them graphically and symbolically. (See CRYSTALLOGRAPHY.) 2. *Physical mineralogy*, which describes the physical characters of minerals and deals with the properties related to their molecular structure. 3. *Chemical mineralogy*, which has for its object the determination of the chemical composition of each mineral species and the relation in composition between species in the same chemical group. 4. *Descriptive mineralogy*, which includes the detailed description of each mineral species with respect to its form, structure, physical properties, chemical composition, and geographical and geological occurrence. The division of physical mineralogy is replete with interesting problems of cohesion, optics, heat, and electricity, and suggests to the investigator along physical lines many fields for research. The problems connected with chemical mineralogy, while covering a narrower and less varied field than those of physical mineralogy, are none the less replete with interest. To the chemist working in the field of mineralogy belongs the task of determining the part played by the various elements which enter into the composition of the hundreds of mineral species, many of which are rare and exceedingly complex in composition; the phenomena of isomorphism and dimorphism; and the chemical alteration of mineral species under the action of natural agencies, which is known as pseudomorphism.

Crystallography. With very few exceptions (mercury and water) minerals are limited to solid substances; i.e., they are solid at the present temperature of the earth. In discussing their formation and character we must, however, revert to the period when the mineral constituents of the earth existed in a fluid or semi-fluid state. When a homogeneous substance passes from a fluid to a solid condition, its particles mutually attract each other along certain definite lines and a solid is built up which shows a definite structural relation between all its integral parts, which relation finds expression in its outward form. Such a solid, formed from a nucleus by the piling up of accretions from without, is known as a crystal and is characterized by a regular polyhedral form, bounded by more or less smooth surfaces. A crystal is, then, the normal form of a mineral which has solidified under ideal conditions and, should its formation be uninterrupted by external agencies, its ap-



1. Normal crystal form developed equally in all directions.
2. Same crystal form as 1, distorted.
3. Crystal molecule showing an arrangement of attractive and repellent forces.
4. Network of molecules formed on the lines of crystallizing forces shown in 3.
5. Further development of network shown in 4 to explain cleavage.
6. Twin crystal formed by two interpenetrated cubes.

pearance would be that of a symmetrical geometric solid with smooth faces and sharp edges and angles. Such are the ideal representations, which serve to illustrate the crystallization of mineral species and which are to be found in all textbooks on the subject. But inasmuch as the ideal conditions mentioned above are of comparatively rare occurrence, it is far more common to find minerals in more or less distorted forms. (See Figs. 1 and 2.) Large and well-formed crystals are, in general, produced by a slow process of crystallization, whereas a rapid cooling or concentration of a mineralizing solution tends to form aggregates often resembling the forms of animate nature; such are the frost patterns which form on windowpanes, the coral-like forms of calcium carbonate to be found in some caves, and many other imitative forms described in the terminology of mineralogy. Where individual crystals are entirely lacking, the mineral is said to be massive, although its structure as determined by optical and other methods may be distinctly crystalline.

Regarding the nature of the crystalline units of accretion, there is at present very little knowledge. They are without doubt extremely minute and may possibly consist of a number of chemical molecules. Whatever may be the size or shape of the crystal units or crystal molecules, it is sufficient for the purpose of discussion to regard them as points. A fuller discussion of this subject will be found under CHEMISTRY. The crystal molecules of any chemical substance crystallizing under given conditions are believed to be identical in size and shape. They are never in contact with each other, but are held in equilibrium by attractive and repellent forces acting along lines which differ for each type of crystal molecule. A crystal molecule having these lines of crystallizing force at right angles, as shown in Fig. 3, would attract like molecules, which would arrange themselves as shown in Fig. 4. The theoretical grouping of molecules has been discussed by Sohncke, Fedorow, Schönflies, and Barlow, who have developed 230 possible groupings. These, however, divide themselves into 32 distinct groups identical with the 32 groups mentioned under CRYSTALLOGRAPHY.

If we assume the molecules of a substance to be grouped as shown in Fig. 5, it will be readily seen that the lines of minimum cohesion will be *aa* and *bb* rather than *mm*, because the former planes are further separated from the next adjacent parallel plane. This explains in a measure the fact that crystallized substances often tend to break or cleave parallel to a primary crystallographic face. Assuming a crystal molecule of any given mineral to be held in equilibrium by forces acting in definite directions, it will be readily seen that the crystal built up from accretions of such molecules will, of necessity, present faces which are symmetrically disposed with respect to those lines of crystallizing force. Thus, we have as a fundamental law of crystallization the principle that a mineral can crystallize only in forms whose symmetry is referable to one of the 32 groups mentioned in the foregoing paragraph. This is known as the law of symmetry. The number of planes possible from the grouping together of crystal molecules of a substance is invariably greater than the number occurring on any given crystal, and modifying planes are common, often running to great complexity and under unusual conditions predominating over the commoner types. Hence we frequently find great variety of form in crystals of the same substance, as is the case with the mineral calcite (q.v.). It should, however, be noted that crystals of a mineral from a certain locality, which are presumably formed under the same conditions, show a marked similarity of type and are readily distinguishable from those of the same mineral from a different locality. This variation in type, which is known as crystal habit, is particularly noticeable in large and widely distributed species. Certain mineral species exhibit a tendency to join two crystals or two halves of the same crystal in such a manner that some crystallographic plane or axis is common to both. This juxtaposition, which is ordinarily distinguished by reëntering angles, is known as twinning. (See Fig. 6.)

It will be readily seen from the above that an accurate knowledge of the occurring crystal forms is of primary importance in the investigation of any mineral species. The identification of the faces of the crystal, which is often attended with considerable difficulty, is accomplished by measuring the interfacial angles by means of an instrument called a goniometer (q.v.) and comparing these with the calculated relations obtained from simple mathematical formulas based on spherical trigonometry. The optical properties of minerals as well as their presence and relations in rocks are determined by means of the petrographic microscope. (See MICROSCOPE.) For exhaustive study along the line of physical characters, elaborate and accurate apparatus is required, while a well-equipped chemical laboratory is almost indispensable to the mineralogical investigator.

Minerals and Rocks. One of the most important phases of mineralogical study, and one which is replete with interest to the geologist, is the relation of minerals to rocks. The division known as the crystalline rocks, in particular, presents a wide and varied series of rock-forming minerals. These may be classed as essential and accessory constituents according as they give character in the rock in which they occur or are present only in insignificant proportions. Quartz, the feldspars, the micas, hornblende, augite, enstatite, hypersthene, chrysolite, garnet, leucite, serpentine, calcite, and dolomite are essential constituents of many crystalline rocks, while such minerals as gypsum, salt, limonite, hematite, siderite, kaolin, magnetite, and apatite often occur in such extensive deposits as to constitute rock masses. Among the accessory rock-forming minerals may be mentioned graphite, corundum, vesuvianite, chiastolite, cyanite, tourmaline, zircon, titanite, etc. Many geologists have made use of the mineralogical character of rocks as a basis of classification, particularly in the case of the igneous rocks, and, though open to some objection from the standpoint of geological inquiry, the system as applied to crystalline rocks has much to commend it.

Mineral Chemistry. Comparatively few elements exist in nature uncombined; the great majority of minerals occur as salts of relatively few mineral acids. Minerals crystallizing from a mineralizing fluid, whether it be a solution or a fusion, combine the elements existing in that fluid in strict accordance with the laws of chemistry. The resulting minerals may, however, be somewhat modified by the presence of elements foreign to their typical formulas, as in the case

of the emerald variety of beryl, which owes its brilliant green color to the presence of a small amount of chromium not represented in the normal composition of beryl. Again, certain elements closely related in chemical character frequently replace one another in mineral composition, the relative proportions varying between limits and giving rise to a group of closely related compounds. Such is the columbite-tantalite group, which presents all the gradations from normal columbite ($FeNb_2O_6$) to normal tantalite ($FeTa_2O_6$). Minerals closely related in composition often exhibit a striking similarity in crystal form. When such isomorphous compounds are present in the same magma they are not separable in the process of crystallization, but tend to produce a mineral intermediate in composition, as when the isomorphous carbonates dolomite and siderite grade into the intermediate compound ankerite. An extremely interesting group is that of the triclinic feldspars or plagioclases, which are regarded as isomorphous mixtures of the molecules of the two isomorphous species albite and anorthite. Mineralogy affords several examples of mineral species identical in chemical composition, but crystallizing in forms which are essentially different. This condition, which is known as dimorphism, is represented by the two calcium carbonates calcite and aragonite and by the two iron disulphides pyrite and marcasite. Titanium dioxide, which is trimorphous, occurs as rutile, octahedrite, and brookite.

Classification of Minerals. The most logical and convenient scheme of classification of minerals is that which is adopted by Dana in his *System of Mineralogy* and which is now, with slight modifications, universally used. By this method mineral species of similar composition are placed together in classes which are subdivided into divisions. These in turn are split up as far as possible into isomorphous groups. The principal classes are:

1. Native elements.
2. Sulphides—sulphides, selenides, tellurides, arsenides, and antimonides.
3. Sulpho salts—sulpharsenides, sulphantimonides, and sulphobismuthites.
4. Haloids—chlorides, bromides, iodides, and fluorides.
5. Oxides.
6. Oxygen salts—carbonates, silicates, and titanates; niobates and tantalates; phosphates, etc.; borates and uranates; sulphates, etc.; tungstates, molybdates.
7. Salts of the organic acids.
8. Hydrocarbons.

Uses of Minerals. By far the most important of the uses to which minerals are put is that of producing metals from those of them which contain metal constituents in sufficient quantity to render their mining profitable. The discussion of the distribution and mode of occurrence of metallic ores involves many questions of a purely technical nature and belongs essentially to the province of ore deposits (q.v.). A few metals such as gold, platinum, copper, arsenic, and to some extent silver, antimony, bismuth, and mercury, are found native, i.e., uncombined with other elements. The majority of the metallic ores, however, occur as sulphides, oxides, or carbonates of the various metals, or more rarely as arsenides, tellurides, chlorides, or silicates. Association of metallic minerals in more or less intimate mixtures often gives rise to highly complex ores. Many ores which are essentially compounds of the base metals contain gold and silver in appreciable amounts and are profitably mined for the latter metals, as is the case with the argentiferous galena of Colorado, Montana, and Utah.

The nonmetallic minerals, although of less importance commercially than the metallic ores, are none the less of great and increasing value in the arts. These are grouped, with reference to their application, into: 1. Substances used for chemical purposes, embracing the minerals employed in the manufacture of acids, chemicals, soda, alum, plaster of Paris, etc. 2. Ceramic materials, used in making pottery, bricks, tiling, paving blocks, terra cotta, porcelain, and glass. 3. Refractory materials, used in the manufacture of fireproofing, linings of furnaces, crucibles, and asbestos fabrics. 4. Abrasives, embracing diamonds, emery, garnet, and quartz sand. 5. Graphic materials, embracing chalk, graphite, pencil stone, lithographic limestone, etc. 6. Pigments, including minerals ground for paints, and paint adulterants. 7. Fertilizers, represented by the lime phosphates, marls, and land plaster. 8. Mineral fuels, including coal, petroleum, and natural gas. The use of certain minerals for gems is probably of very ancient origin. The extreme hardness of the diamond, sapphire, ruby, emerald, chrysoberyl, and other precious stones protects them from injury and renders them capable of being highly polished.

Synthetic Mineralogy. Almost all of the important minerals have been successfully produced artificially, and much light has been thrown upon the formation of natural minerals in this way. The methods applied to this line of research involve in the majority of cases a fusion at a high heat for a long period. In a number of instances artificial minerals have been accidentally produced in the course of various metallurgical operations, and the interiors of retorts and furnaces often furnish interesting examples of this phase of mineral genesis. In point of economic importance these experiments, though interesting, have not as yet achieved a marked degree of success in the production of gems, except in the case of the corundum gems, which are now manufactured and sold as synthetic sapphires.

Analysis of Minerals. The determination of minerals is largely a question of experience gained by the study of large and varied collections of specimens. The eye becomes trained by practice to recognize crystallizations even in distorted and imperfectly exposed forms, to associate certain colors, lustre, and structure with definite species, and to associate certain minerals with certain rock matrix. Several physical properties are of considerable aid in identifying questionable specimens, as, e.g., the color of the powdered mineral as shown by rubbing it on unglazed porcelain, the approximate relative hardness as determined by scratching the specimen with a knife point, and the relative weight as roughly determined by weighing the specimen in the hand. These rough determinations, which are of particular value as field methods, may be supplemented, with the addition of some simple and portable apparatus, by determinations of solubility and fusibility. A more detailed examination of the composition of a mineral involves recourse to the blowpipe analysis. Blowpipe analysis, as it is at present

MINERALOGY

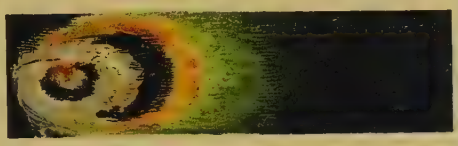
INCRUSTATIONS ON PLASTER OF PARIS SUPPORT

INCRUSTATIONS ON CHARCOAL SUPPORT

2

LEAD IODIDE

1



LEAD IODIDE

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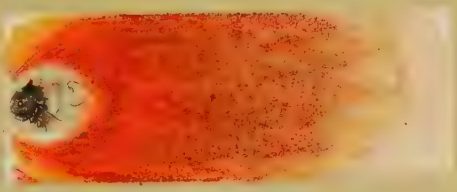
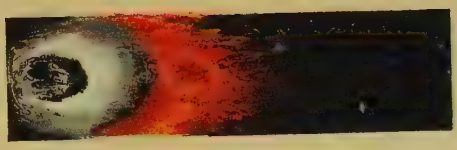


BISMUTH IODIDE

3



BISMUTH IODIDE

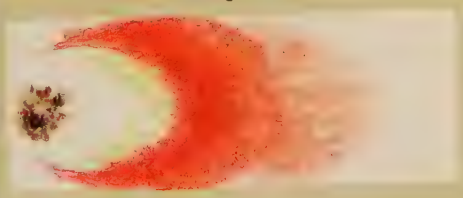
6

ANTIMONY IODIDE

5

ZINC OXIDE IGNITED WITH COBALT NITRATE

8



MERCURY IODIDE

7

TIN OXIDE IGNITED WITH COBALT NITRATE

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BLOWPIPE REACTIONS FOR THE FUSIBLE METALS

practiced, consists of a quantitative chemical analysis on a small scale. For this purpose very small portions of the substance to be examined are used, and most of the chemical reactions involved are effected by means of some form of blowpipe (q.v.). Formerly the methods of blowpipe analysis were extended and elaborated to include quantitative determinations, but the smallness of the samples which could be successfully treated rendered the results of quantitative blowpipe analysis inexact, even when practiced by a skilled and experienced manipulator, and this branch has now been abandoned in favor of the more reliable methods of quantitative analysis (q.v.). Some idea of the results obtained by blowpipe analysis will be gained by an examination of the accompanying plate, which shows the reactions obtained from some of the fusible metals by heating their compounds with suitable fluxes on charcoal and plaster supports. The coatings of iodides are produced by using a flux composed of two parts sulphur and one part each of potassium bisulphate and potassic iodide. Reactions for iron, copper, manganese, nickel, cobalt, chromium, and other metals are obtained by dissolving small portions of their compounds in hot beads of borax or microcosmic salt and subjecting the resulting fusion to the oxidizing and reducing action of the blowpipe flame. The color imparted to the blowpipe flame serves as a test for compounds of calcium, strontium, lithium, barium, sodium, and other elements. These tests as well as others of similar nature merely announce the presence or absence of an element; the relative amount when required must be determined by a systematic quantitative analysis.

History. Although a few mineral species were known to philosophers at an early date in the world's history, it was not until the development of chemistry from alchemy in the sixteenth century that savants approached the subject of mineralogical knowledge in the true spirit of scientific investigation. As a natural outcome of the comparatively advanced state of mathematical knowledge at the period of this scientific awakening, the subject of crystallization early developed a marked importance. In 1783 Delisle, with the aid of a primitive form of goniometer, measured the interfacial angles of a number of crystals and established the law of constancy of interfacial angles. The Abbé Haüy about the same time developed a theory correlating the internal structure of crystals with their outward form. He practically formulated the law of rational indices which constitutes the corner stone of crystallography. Haüy was followed by Hausmann with his application of spherical trigonometry in 1803, Weiss with a development along purely mathematical lines in 1814, Mohs with a division of crystals into six systems in 1822, Naumann in 1823, and W. H. Miller in 1839. In recent years the science has made vast strides, and new methods and lines of research are being constantly developed. Our knowledge of the science of mineralogy is constantly enriched by the discovery of new species, while mining and quarrying operations are continually bringing to light new and interesting crystalline forms and varieties of well-known minerals.

Research in physical mineralogy is being extended, notably in Germany, along a number of lines, and from time to time valuable additions are made to our store of knowledge by careful and exhaustive studies of the optical, thermal, and electrical properties of certain mineral species. A method by which the symmetry of crystallized minerals may be investigated has been developed by Baumhauer, Beck, and others. This method depends upon the development of minute angular cavities upon crystal faces by means of the interrupted action of some dissolving medium. The symmetry of these pits, which are known as etch figures, conforms to the crystallographic symmetry of the mineral experimented upon. Of a similar nature in their bearing upon the question of crystal structure are the percussion figures and solution planes which have been made objects of special study by several authors.

The artificial formation of minerals opens another line of research upon which much valuable work has been done by Daubrée, Fouqué, Michel Lévy, Friedel, Bourgeois, Meunier, and others.

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The Mineral Industry (New York, annually, 1892 et seq.); G. P. Merrill, *The Non-Metallic Minerals: Their Occurrence and Uses* (2d ed., ib., 1910).

In addition to these the reader is referred to the volumes on *Mineral Resources of the United States*, published by the United States Geological Survey (Washington, 1882 et seq.).

MINERAL PAINT. See PAINT, MINERAL.

MINERAL POINT. A city in Iowa Co., Wis., 50 miles west of Madison, the State capital, on the Chicago, Milwaukee, and St. Paul and the Mineral Point and Northern railroads (Map: Wisconsin, C 6). It contains an attractive high-school building, a public library, and a municipal auditorium. The chief industry is the manufacture of oxide of zinc, lead and zinc both being found in the vicinity. The water works are owned by the city. Pop., 1900, 2991; 1910, 2925.

MINERAL TALLOW, or HATCHETTITE. A yellowish-white, soft, flexible mineral wax or tallow that melts at 46° or 47° C. and consists of about 86 per cent of carbon and 14 per cent of hydrogen. It is found in the coal measures in Glamorganshire, Wales; Argyleshire, Scotland; and Moravia, Austria. See OZOCERITE.

MINERAL WATERS. The term usually applied to spring or well waters which have a variable quantity of solid substances in solution, and on this account may exert effects on the human body different from those of ordinary water. Mineral waters have been used as remedial agents from a very early period. The oldest Greek physicians had great faith in their curative power, and the temples erected to Æsculapius were usually close to mineral springs. We are indebted to the Romans for the discovery not only of the thermal springs in Italy, but also of some of the most important springs in other parts of Europe, as those of Aix-la-Chapelle, Baden-Baden, Bath, and Spa in Belgium. In the United States mineral springs have also attracted attention since an early period. At Saratoga Springs, e.g., the High Rock Spring was known to the white people as early as 1767, and the American aborigines seem to have been acquainted with its important properties even before that date. In West Virginia and Virginia seven springs were already noted in 1831, and of these the Bath mineral spring, now known as the Berkeley Spring, was visited as early as 1777, while the White Sulphur Springs were utilized in 1778. The therapeutic action of mineral waters or spas, as they are frequently termed, depends largely on their chemical composition and their temperature, although a variety of other circumstances, such as situation, elevation, climate, mean temperature and, above all, the regular habits of the patient, have no doubt an important bearing on the success of the treatment.

Origin. The origin of mineral waters is often looked upon with much curiosity, and yet there is nothing unnatural about it. The rain water falling on the surface soaks down through the soil into the rocks and may slowly filter through them to a considerable depth, coming out to the surface at a lower level in the form of a spring; or again the water may reach sufficient depths to be subjected to great pressure or even heat, and coming to a fissure or being struck by an artesian-well boring, it will tend to escape to the surface through such an outlet. Many mineral springs are found along lines of faulting, since fault fissures afford a means of escape. The dissolved mineral substances no doubt are obtained from the rocks through which the water has flowed. In some cases the waters in seeping through one type of rock may take up certain acids which later react on basic elements contained in other rocks, thus producing salts. Most waters contain some carbonic acid, which greatly increases their solvent powers in the presence of lime, magnesia, and iron; while, if the waters are alkaline, they may take up substances which are ordinarily rather insoluble, such as silica. The attacking power of the water may be still further increased if it is hot. There seems to be some relation between hot springs and the geological structure of a region, as thermal springs are more abundant in areas where the rocks have been highly faulted or where there has been volcanic activity in comparatively recent geological times. Mineral springs commonly contain more dissolved material in regions of sedimentary rock formation than in igneous or metamorphic areas.

Temperature. Springs are commonly characterized as thermal when they have a temperature of over 70° F. If the temperature is between 70° and 98°, they are called tepid, while all exceeding the latter limit are included under hot springs. The following examples will serve to show the degrees of temperature found in different thermal springs: Sweet Springs, W. Va., 74° F.; Warm Springs, French Broad River, Tenn., 95°; Washita, Ark., 140°–156°; San Bernardino Hot Springs, Cal., 108°–172°; Las Vegas, N. Mex., 110°–140°; Sulphur Springs, Aix-les-Bains, France, 108°; Kaiserquelle, Aix-la-Chapelle, Prussia, 131°; Karlsbad (Sprudel), Bohemia, 162°.

Flow of Springs. The amount of water which a mineral spring may discharge is quite variable; thus, 500 springs in central France, which were tested, yielded 2,628,000 gallons in 24 hours, and the famous Orange Spring in Florida is said to discharge 5,000,000 gallons per hour. The discharge per hour of some of the principal American springs is as follows: Champion Springs, Saratoga, 2500 gallons; Roanoke Red Sulphur Springs, Va., 1278 gallons; Warm Sulphur Springs, Bath, Va., 350,000 gallons; Hot Springs, Ark., 20,100 gallons; Glen Springs, Waukesha, Wis., 45,000 gallons; Horeb, Waukesha, Wis., 1500 gallons.

Classification. A classification of mineral waters may be geographic, geologic, therapeutic, or chemical. The following scheme of classification is one adopted by A. C. Peale, a noted authority on the subject of mineral waters, and more especially those of the United States:

CLASSIFICATION OF MINERAL WATERS

Alkaline			
Alkaline-saline	Sulphated	Sodic	Nongaseous
	Muriated	Lithic	Carbonated
		Potassic	Sulphureted
		Calcic	Azotized
		Magnesic	Carbureted
		Chalybeate	
		Aluminous	
Saline	Sulphated		
	Muriated		
Acid	Sulphated		
	Muriated		
	Siliceous	Sulphated	
		Muriated	

The *alkaline* waters include all those containing alkaline carbonates, such as carbonates of

alkalies, alkaline earths, alkaline metals, or iron. About one-half of the alkaline springs of the United States are calcic alkaline, i.e., containing calcium carbonates or bicarbonates as the predominant ingredient. The water of the Hot Springs of Virginia is a hot, carbonated, calcic alkaline water. The *alkaline-saline* waters include those containing combinations of alkaline carbonates with sulphides (sulphated) or chlorides (muriated), there being in the United States one-third as many as of the saline waters. In the *saline* waters sulphides and chlorides predominate; in the United States there are about one-third more springs of this class than of the alkaline springs. Springs which are classified as purgative or aperient will fall in the subclass of sulphated salines. The salines may be sodic sulphated or muriated, or calcic sulphated or muriated; the sodic muriated constitute about 88 per cent of the muriated saline waters of the United States. The *acid* class includes all waters containing free acid, whether silicic, sulphuric, or hydrochloric. In addition to having free acid a spring may also contain salts of the acid.

Geographical Distribution. There are at the present time probably not less than 10,000 mineral springs in the United States, and of this number 838 were listed as commercial producers in 1913. Most of the mineral springs of commercial value are found in the eastern United States and in the Mississippi valley; west of the 101st meridian they are largely confined to the Pacific coast. No hot springs are known in the New England States. In Maine the springs are slightly alkaline-saline and chalybeated, with a few of carbonic character. Their temperature ranges from 40° to 46° F. Chalybeated springs are abundant in Massachusetts. Many of the springs of the New England States are utilized for commercial purposes, but among the Eastern States as a whole New York stands at the head of the list of producers. The springs at Saratoga have an international reputation and compare favorably with any of the foreign spas; they attract great numbers of tourists and health seekers, and their waters are extensively used throughout the United States. These waters are effectual in diseases of the liver, spleen, and skin, in neuralgia, and rheumatic and dyspeptic troubles. Farther south in the Appalachians are the celebrated Hot Springs of Virginia, including the Berkeley Springs and the White Sulphur Springs. The waters of the former are used chiefly for certain forms of dyspepsia, diseases of the liver and bowels, while those of the latter are of special value in the treatment of chronic diseases, gout, rheumatism, etc. The general character of the springs of Virginia and West Virginia is saline; sulphureted waters are the most numerous, but alkaline and chalybeate and acid springs also occur. The saline springs are found in excess of all others in the South Central States, and thermal springs are few. In this region the States of Kentucky, Tennessee, and Arkansas are the chief producers of mineral waters. The Hot Springs of Arkansas are among the most important thermal springs found in the entire country and are of value for diseases of the blood. The Texas springs are peculiar from the fact that many of them show free sulphuric acid. Owing to the abundance of limestone formations in the North Central States, calcic springs are quite numerous, and in Wisconsin those of Waukesha are widely known. In the Cordilleran region the most noted occurrence of hot springs is that of the Yellowstone Park, but they are not used for medicinal purposes. In New Mexico the Las Vegas Hot Springs are often visited, and in Washington the Medical Lake is the source of one of the best-known mineral waters of the Pacific coast.

ANALYSES OF AMERICAN MINERAL WATERS

CHEMICAL CONSTITUENTS	Congress Spring, Saratoga, N. Y. Saline, carbonated	Excelsior Spring, Saratoga, N. Y. Saline, carbonated	Warm Sulphur Springs, Va. Calcic	Hot Springs, Ark. Thermal, carbonated	Red Sulphur Spring, Sharon Springs, N. Y. Alkaline-saline, sulphureted	Las Vegas Hot Springs, N. Mex. Alkaline-saline	Bethesda Spring, Waukesha, Wis. Alkaline-calcic
	Grains per gallon	Grains per gallon	Grains per gallon	Grains per gallon	Grains per gallon	Parts per 1000	Grains per gallon
Sodium carbonate	.....	.....	....	....	....	5.00	
Sodium bicarbonate	10.77	8.75	....	....	.49	....	1.26
Sodium sulphate	.....	.....	.....	....	....	16.27	.54
Calcium carbonate	.....	.....	5.22	3.17	....	11.41	
Magnesium carbonate	.....	.....	....				
Calcium bicarbonate	143.40	41.32	....	12.66	12.93	....	17.02
Magnesium bicarbonate	121.76	29.34	....	....	.69	....	12.39
Lithium bicarbonate	4.76	.....	....	....	....	Trace	
Iron bicarbonate	.34	3.00	....	2.17	....	....	.04
Magnesium sulphate	.....	2.15	.....	....	18.96		
Potassium sulphate	.89	.....	1.38	....	....	....	.46
Sodium chloride	400.44	166.81	....	....	.33	27.34	1.16
Potassium chloride	8.05						
Potassium bromide	.....	1.57					
Sodium bromide	8.56						
Sodium iodide	.14	4.67					
Silica	.84	.53	1.72	.38	.45	2.51	.74
Calcium sulphate	.....	.....	14.53	2.54	96.64		

Foreign Waters. A number of foreign mineral waters are imported into the United States and find a considerable sale. Chief among these is the Apollinaris water, which comes from Ahrweiler, Germany, and which is largely used as a table water and in cases of nervous irritation attended with dyspepsia. The Friedrichshall bitterwater, from the Friedrichshall Springs, near Hildenburg, Germany, is largely used for habitual constipation, as is the Hunyadi-János water from Budapest, Hungary, which is a remedy also for congestive and gouty disorders. The Kissingen waters from Bavaria, the Vichy

from France, and the Karlsbad Sprudel waters are extensively imported into the United States.

Production. The production of mineral waters in the United States in 1913 amounted to 57,867,399 gallons, valued at $5,631,391. The imports in the same year amounted to 3,364,676 gallons, valued at $955,788.

Chemical Analyses. The table on page 725 shows the important constituents of some of the American mineral waters.

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MINERAL WELLS. A city in Palo Pinto Co., Tex., 55 miles by rail northwest of Fort Worth, on the Weatherford, Mineral Wells, and Northwestern and the Gulf, Texas, and Western railroads (Map: Texas, C 3). It is essentially a health resort, owing to its noted mineral wells, and attracts thousands of visitors annually. More than 1,000,000 gallons of the water are bottled and shipped from here every year, and the drinking pavilions of the city are said to be among the largest in the country. Places of interest in the vicinity are Lake Pinto, Elmhurst Park, and Lovers' Retreat, all of great scenic beauty. Mineral Wells adopted the commission form of government in 1913. Pop., 1900, 2048; 1910, 3950.

MINERS, WESTERN FEDERATION OF. A centralized association of persons working in and around mines, mills, and smelters. Its purposes are the general improvement in the conditions of labor and the abolition of such abuses as the truck system, child labor, the employment of private detectives, importation of labor under contract, government by injunction, etc. The officers of the association consist of a president, vice president, secretary treasurer, and an executive board composed of these officers and one organizer from each of the six districts into which the territory covered by the Federation is divided. The executive board acts as a board of conciliation and arbitration (which are strongly recommended by the Federation), may levy assessments in case of emergency, must approve every strike and joint contract entered into by local unions, and between the annual conventions has full power to direct the workings of the Federation. The Western Federation of Miners officially indorses Socialism and advocates participation of labor organizations in politics with the view of securing to the working classes the ownership and operation of the means of production. It was founded May 15, 1893, largely as an outcome of the notorious Cœur d'Alène strike of 1892. In April, 1899, it again became involved in the Cœur d'Alène strike of that year, and in the later period of the strike controlled and directed it. During this conflict several persons were killed, martial law was declared, and certain county officers were impeached for failure to perform their duties in suppressing violence. A large number of miners were arrested by the temporary authorities and imprisoned in a stockade known as the bull pen. Persons desirous of securing work in the mines at that time were forced to obtain a permit, which was issued only after the applicant had signed a statement denying that he had participated in the riot of April 29, declaring his belief that it was incited and perpetrated by the miners' unions, expressing disapproval of the riot, renouncing membership in the miners' union, and pledging himself thereafter to obey the law. The Western Federation of Miners conducted in 1913 the Michigan copper strike, although the organization had gained no foothold there before the strike, and officially advised the copper miners against inaugurating a strike before establishing a solid organization. In 1913 there were 180 local unions affiliated with the Western Federation, with nearly 45,000 members. The unions were distributed through 22 States, chiefly in the Rocky Mountain and Pacific region and in Canada and Alaska. From 1896 to 1898 the organization was affiliated with the American Federation of Labor; from 1898 to 1905 with the American Labor Union; and in 1905 it took part in organizing the I. W. W., with which it remained connected until 1908. In 1911 it again became affiliated with the American Federation of Labor. The official organ is the *Miners' Magazine*, published monthly at Denver, Colo.

MINERS' ANÆMIA. See ANKYLOSTOMIASIS.

MINERS MILLS. A borough in Luzerne Co., Pa., about 3 miles northeast of Wilkes-Barre, on the Delaware and Hudson, the Central of New Jersey, and the Lehigh Valley railroads (Map: Pennsylvania, K 4). The surrounding region yields a fine grade of anthracite coal, and besides the mining interests, the town contains a flour mill, a brick plant, and ironworks. Pop., 1900, 2224; 1910, 3159.

MI'NERSVILLE. A borough in Schuylkill Co., Pa., 4 miles west of Pottsville, with which it is connected by an electric road, on the west branch of the Schuylkill River and on the Lehigh Valley, the Philadelphia and Reading, Pennsylvania, and the People's railroads (Map: Pennsylvania, J 6). It is in the anthracite coal region and has extensive coal-mining interests and underwear factories. Pop., 1900, 4815; 1910, 7240.

MINER'VA (Old Lat. *Menerva*, from root seen in Lat. *mens*, *memini*, *moneo*, Skt. *man-*, Gk. *μένος*, *menos*, spirit, strength. Minerva is thus the Thinker. The name Athena, Gk. *Ἀθήνη*, has not been satisfactorily explained. *Παλλάς*, *Pallas*, at first an epithet of the goddess, but later used as a name, has been connected with *παλλακή*, *pallakē*, a maiden). A Roman goddess identified with the Greek Athena. Though the two divinities have some resemblance, it will be best to treat them separately.

Greek. Athena, called also Pallas Athena, or, simply, Pallas, was a universally worshiped Hellenic divinity, and there is no satisfactory evidence of a foreign origin for her cult. In the earliest literature we find Athena already a fully developed personality, the favorite daughter of Zeus, wielder at times of his ægis (q.v.), and but little inferior to him in power. In general the goddess was warlike. Hence she was worshiped in the citadel of many towns, and her sacred images, the Palladia, which were often said to have fallen from heaven, were kept with great care, for their possession made the town impregnable. (See PALLADIUM.) She is not, however, connected with the mere lust of battle, but with military wisdom and patient strategy as well as with heroic prowess in actual conflict. Wisdom is, in fact, so prominent in the conception that later she became the patron of learning. Even in early times she is Ergane, the Worker, the goddess of crafts, especially the feminine occupations of spinning and weaving. This conception of her may have arisen from the custom of weaving for the statue of the goddess a peplus or mantle. Athena was also the goddess of smiths, and even of agriculture, so that at Athens the smiths and potters celebrated the *Chalkeia* as a joint festival of Hephæstus and Athena. As a battle goddess, she was worshiped at Athens as Athene Nike, bearing the spear and shield, and wearing the ægis, which is commonly adorned with the Gorgon's head, of petrifying power. As Ergane she carries the spindle; as Nike she carries a pomegranate. Sacred to her were also the snake and the owl, and especially the olive, which she was said to have given to Athens, her favorite city. In the Greek belief she was the pure virgin, but there are plain traces that this was not original.

Athens is for us the great centre of Athena worship, and here there were two ancient shrines, the Palladium in the lower town, the seat of an ancient court for the trial of involuntary homicide, and the Acropolis, where were the house of Erechtheus and the shrine of Athena Polias, Protectress of the City. Here was an ancient temple, burned by the Persians, but possibly rebuilt, at least in part. Close to its site was built, near the end of the fifth century, the somewhat complicated Erechtheum (q.v.), and earlier (437 B.C.) the Acropolis was crowned by the magnificent Parthenon (q.v.), containing the gold-ivory statue of the goddess by Phidias. In her honor were celebrated the Panathenæa (q.v.) and other smaller festivals, at some of which mystic rites were prominent. According to the common legend she was born from the head of Zeus, who produced her by his own power. Other versions told how Zeus had swallowed METIS (Wisdom) when pregnant by him of Athena. In the fullness of time Hephæstus or Prometheus or Hermes, to relieve the pains in the head of Zeus, split it with an axe, whereupon the goddess leaped forth full-armed—a scene frequent in the earlier vases. The nature of Athena is still a matter of dispute. To Roscher (see below) there is much in favor of the view that she is a goddess of the lightning. Farnell rejects this view, and finds mental and moral rather than physical elements predominant in the cult of the goddess from the beginning; he regards her rather as the director of the intellectual life of mankind, in all its varied aspects, peaceful and warlike both.

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Roman. Minerva seems to be an old Italian goddess, patroness of handicrafts of all sorts, whose worship was also common in Etruria. She was not originally one of the leading Roman divinities, for her name is absent from the oldest religious calendars. When her worship was introduced is not known, but it was certainly early, for Minerva is one of the Capitoline triad, and was worshiped with Jupiter and Juno in the great temple of Jupiter Capitolinus, built by Tarquinius Priscus (see CAPITOL). She had also an ancient temple on the Aventine, which was the religious centre for the guilds of craftsmen, whose patron the goddess was. The festival of this temple was celebrated on March 19, the fifth day after the Ides (whence the name of the festival, Quinquatrus, or Quinquatria), and seems to have formed originally part of a festival of Mars. In time Minerva herself became patroness too of the arts of war. This festival was chiefly celebrated by the guilds, including physicians (whence was worshiped a Minerva Medica), dramatic poets, and actors, and was of a distinctly popular character. (For Minerva as patroness of learning, see ATHENÆUM.) On the Capitol Minerva appears in her Greek aspect as protector of the city, but this and her worship as a goddess of battle or victory seem due entirely to foreign influence. In the later Republic and the Empire the Greek conception of Athena almost completely supplanted the earlier Italian belief. Thus the Palladium (q.v.) kept at Rome in the temple of Vesta was believed to be an image of Minerva. Consult: W. W. Fowler, *Roman Festivals* (London, 1899); G. Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

MINERVA MEDICA, TEMPLE OF. The name erroneously given in the seventeenth century to the ruins of a decagonal nymphæum on the Esquiline in Rome, formerly belonging to the Licinian Gardens, or, according to some authorities, to the Thermæ of Gallienus (c.250 A.D.). The name was wrongly based on that of the famous statue in the Vatican Museum miscalled Minerva Medica, which was not found on the Esquiline, but near the church of Santa Maria sopra Minerva. The 10 sides of the nymphæum, once adorned with mosaics and porphyry, are occupied on the lower story by a door and nine niches, with 10 windows above them. It was covered by a dome which was destroyed in 1828 and which was the earliest example of a dome above a drum of windows with buttresses between. When the ruins were excavated in the sixteenth century numbers of statues and architectural marbles were recovered.

MINERVA PRESS. The name of a London printing house, from which issued, late in the

eighteenth and early in the nineteenth century, an immense number of sentimental and trashy novels.

MINERVINO MURGE, mē'nĕr-vē'nō mōōr'jā. A walled town in the Province of Bari delle Puglie, Italy, situated 25 miles southwest of Barletta (Map: Italy, F 4). It produces fruit, vegetables, and oil. There are also large quarries and limekilns. Pop., 1901, 17,353; 1911, 19,325.

MINES, Bureau of. A bureau of mining, metallurgy, and mineral technology in the Department of the Interior of the United States whose general function is to conduct, in the public interest, inquiries and scientific and technological investigations concerning mining, and the preparation, treatment, and utilization of mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development, and the conservation of natural resources, as well as to inquire into the economic conditions affecting these industries, and to disseminate general information having to do with mines and minerals. This bureau was established by Act of Congress, approved May 16, 1910, and became effective on July 1 the same year. The organic act establishing the bureau provided that the Secretary of the Interior should transfer to the Bureau of Mines from the United States Geological Survey the analyzing and testing of coals and other mineral fuel substances, and the investigations as to the cause of mine explosions. The various engineers, chemists, and other employees, also the equipment of the Geological Survey used for this work, were accordingly placed under the direction of the new bureau. It proceeded to carry on a number of important investigations having to do with such subjects as coal-mine explosions, explosives used in mining, especially those which, if properly used, will not ignite coal dust or coal dust and fire damp in small percentages; such explosives are tested and if they meet the rigid specifications are called "permissible" explosives for use in dusty and gaseous coal mines. Other investigations are: the use of electricity in mining, and the testing and approval of safety lamps, mine rescue, and first-aid apparatus. An important function of the bureau's work is the gathering of coal samples in mines and from shipments of coal for use by the navy, the army, the Panama Canal, and for the government buildings. The samples are analyzed, and larger shipments are tested in boiler plants and on vessels belonging to the government. Samples of coal gathered by geologists of the United States Geological Survey in their investigations are analyzed in the bureau's laboratory. The results of all coals sampled and analyzed are published from time to time in bulletins. The scope and purpose of the bureau were widened in a subsequent organic Act, approved Feb. 25, 1913. to include quarrying, metal mining, and metallurgical investigations and mineral fuels; and its work has since been conducted with vigor and valuable researches and publications have followed. The Bureau of Mines is under a director, Joseph A. Holmes, and includes, besides the administrative division, as organized in 1915, five technical divisions: mining, metallurgy, mineral technology, fuels (other than petroleum), and petroleum, including natural gas. The chief technical headquarters is at Pittsburgh, Pa., which is the largest coal-mining and steel-making centre. Extensive testing is done here of mining appliances especially with reference to safety, and an experimental coal mine, chiefly for large explosion tests, is maintained by the bureau at Bruceton, 12 miles southwest of Pittsburgh. At this headquarters, chemical research as well as routine work is carried on. An analytical laboratory for testing fuels for government uses is maintained at Washington, D. C. A chemical laboratory is located at Denver for research work in connection with complex ores and rare metals like radium. Also in coöperation with a philanthropic institute, radium ores are concentrated and radium bromide produced for use in hospitals. At Salt Lake City, Utah, a coöperative laboratory is maintained for smelting and for electrometallurgical investigations. In San Francisco there are maintained laboratories for the investigation of smelter fumes and of methods of their prevention; also here, as well as in Pittsburgh, there are laboratories for petroleum and natural-gas investigations. These various investigations have already produced many valuable suggestions and results. Accounts, together with accident statistical information, have been published from time to time. Up to the end of the fiscal year 1914, 78 technical papers, 15 miner's circulars, and 82 bulletins had been published. Inspection of coal mines on government lands and in Oklahoma on "segregated" Indian lands, also in Alaska, is a function of the bureau. One of the most important parts of the bureau's work concerns the health and safety of workers in metallurgical and mineral concentration plants as well as in mines and quarries; however, as yet, in accordance with the terms of the appropriations, the chief safety and health investigations have been in coal mines. For the rescue of miners who may be entrapped by explosions or fires, mine-rescue corps under the leadership of district mining engineers have been maintained. While these men have assisted in many disasters, their chief function is to train miners in the use of oxygen-breathing apparatus and in first-aid methods. In its mine-rescue work and training work there are maintained mine safety cars equipped with apparatus for mine-rescue work and available to be sent to the scene of any mine accident but which normally travel in and around the principal mining districts, to give instruction to employees at each mine visited. In 1914 eight of such cars were in service, six in the principal coal fields, one in the Lake Superior iron and copper district, and one in the Rocky Mountain districts, while in Pittsburgh, Pa., and Birmingham, Ala., mine-rescue motor trucks able to transport nine rescue men with artificial breathing apparatus and first-aid supplies were available in case of disaster. The mine-rescue work of the bureau is done in coöperation with State officials and with mine operators. In addition to the cars and rescue trucks the bureau maintains six mine safety stations located respectively at Pittsburgh, Pa., Knoxville, Tenn., Birmingham, Ala., Urbana, Ill., McAlester, Okla., and Seattle, Wash., primarily for the purpose of training and instructing miners sent to these stations by operators or who come of their own initiative. Much suffering has been saved through the organization of first-aid crews. See Mine Accidents.

MINES AND MINING, in Law. The law relating to mines in the United States has been almost wholly developed within the last 65

years, or since the opening of the gold fields of California in 1849–50. By the common law of England all mines of gold or silver, wherever found, belong not to the owner of the land, but to the sovereign as an incident of the royal prerogative. There is some doubt as to whether this doctrine was ever generally adopted in the United States. It was, however, undoubtedly recognized by several Eastern States immediately after the Revolution, and in New York a statute, still in force, expressly reserves to the State the right to mines of gold and silver. In general, however, the government of the United States was considered to reserve all mineral rights in public lands conveyed or given to citizens, unless such rights were expressly granted. For a time the government leased mineral lands on royalties or fixed rents, but, owing to the great difficulty of ascertaining and collecting the amounts due, this policy was finally abandoned, and rights to take minerals were granted outright.

The law was in this condition when gold was discovered in California, and thousands of persons, many of them without previous experience in mining and with no knowledge of mining rights, rushed there and discovered and opened up mines. To avoid the frequent shedding of blood and other disagreeable consequences of disputes over the extent of each other's rights, it became the custom for the miners in a new district to meet and pass rules and regulations defining the rights of discoverers and miners, and these were enforced by committees appointed for the purpose. Subsequently, when courts were established in California, they adopted these rules and regulations, which had become so recognized and fixed in mining communities as to become in effect their common law. The claims of the miners were protected on the fiction that they had originally obtained a license from the government, and if they followed the rules of their particular districts they were held to have a property right in their mines, or claims, as they were called. These rights or claims could be conveyed, would descend to the heirs of the holder, and were in every way treated as real property. In July, 1866, Congress passed a law providing that title to public mineral lands might be acquired by payment of a small fee and by complying with certain prescribed formalities. This Act was superseded by the Act of 1873 (Rev. Stat., Tit. xxxii, c. 6), which substantially incorporated the provisions of the former Act and supplemented them with others suggested by the new development in mining practice, and which is the basis of the present mining law.

The Act of 1873 also provided for the judicial recognition of the rules and regulations then prevalent, and such as might thereafter obtain recognition in mining districts, where they were not contrary to its own provisions or the laws of the States in which such districts were situated. One of the important provisions of the last Act was to prescribe the maximum limits of claims. The extent of a lode claim, i.e., one where the ore runs in a well-defined vein, is fixed at 300 feet on either side of the vein by 1500 feet in length; and placer claims, i.e., where the ore is loosely mingled with the surface earth, are not to exceed 20 acres to one individual, or 160 acres to an association of individuals. The areas of both lode and placer claims may be changed by the statutes of the States in which they are situated or by the rules of the mining district, provided they do not exceed the above-defined limits. The owner of a claim may follow a well-defined vein of mineral for 3000 feet from the opening of the shaft in any direction, and he may follow a vein the general course of which is downward through its "dips" and variations indefinitely.

The common-law rule that a man owns everything directly beneath the surface of his land is, therefore, not followed in the modern law relating to mines. It often happens that two lodes intersect, and in such a case the one who first opened his mine is entitled to the ore at the point of intersection; but each is entitled to follow his lode farther, and each has an easement or right to cross the tunnel of the other at that point in the proper working of his mine. Owing to the great difficulty in ascertaining whether a person in following his own vein is or is not trespassing on another's lode, any owner of lands who has reasonable cause to believe that another is doing so may obtain from a court of equity an "order of inspection" to determine whether the latter is encroaching on the land of the complainant or not.

Rights to water, which is so essential in mining operations, vary in different jurisdictions; but in general the one who first appropriates the waters of a stream for his use in mining is conceded the right to use all that is reasonably necessary in his operations. However, when some one else locates on the same stream the first person can continue to take only the amount he was using when the second person located his claim. The owner of a mine must properly support the earth surrounding his tunnels, and is liable for any damage caused to the lands of others by settling of the earth if due to his negligence in this respect. The rules and customs of the miners which were given the effect of law by the Statute of 1873, and those which have since come into existence, are too numerous and complicated to be set forth in the scope of this article. However, it may be said that in the present state of the law the courts, in deciding a case involving mining law, take into consideration, in the order mentioned, the statutes of the United States, the laws of the State in which the property in question is situated, and the rules and customs above referred to.

Any citizen of the United States, or a person who has declared his intention to become such, may locate and obtain a patent for a mining claim on public lands. Before a person can acquire any rights he must have actually discovered the presence of minerals. The first step thereafter is to make a "location" on the land claimed, i.e., to perform certain acts which are deemed to constitute sufficient evidence of an intention to claim the benefits of the discovery. The United States statutes provide that a claim must be "distinctly marked on the ground so that its boundaries can be readily traced." This is usually done by setting up boundary monuments, such as posts or stones, at the four corners of the claim. In most States the locator, as the prospector is called, is required to post a written notice of his claim on some object on the land. This notice consists of a description of the land thus appropriated and a declaration of his intention to occupy it for mining purposes. Such notice of claim must also be filed with a recording officer, usually the register of deeds of the county. After a miner has located his claim

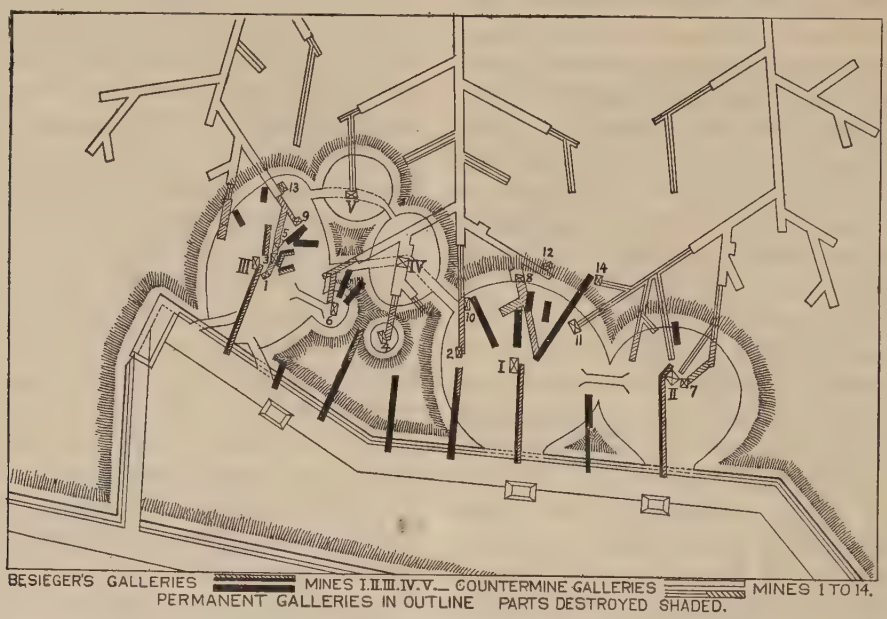
in the above manner he must continue his mining operations or he will be deemed to have forfeited it. The labor may consist in actual mining, or in improvements in the mine for preservation or increased convenience in working it. When a claim is forfeited by a failure to perform labor of the required value it is open to relocation by any one. However, under this statute the claim is not forfeited until the expiration of a year from the time operations ceased. A claim may also be lost by abandonment, which consists in leaving a claim with an intention not to return and work it again.

Where a mining prospector complies with all the formalities required by law to obtain a location he has a good title against every one except the United States. In order to complete his title and make it a matter of record, the locator may obtain a patent, i.e., a grant, of the claim from the Federal government, by having a survey and an abstract of his possessory title made and filing them in the United States Land Office, together with a formal application for a patent and a certificate to the effect that he has expended at least $500 on the claim, either in improving or working it. The application consists of an affidavit to the effect that he has complied with all local mining customs and regulations as well as the statutory requirements to obtain a good possessory title. One copy of this application must be posted on the claim and a notice thereof must be published in the nearest newspaper.

The rules of law in regard to the ownership, conveyance, and descent of real property are, in general, applicable to mining property. A tenant for life or years of mineral lands is entitled, as an incident of his tenancy, to work open mines thereon, but cannot, unless this right is expressly given, open new mines or revive abandoned mines without becoming liable for waste (q.v.). See LAND; REAL PROPERTY; WATER RIGHTS.

Bibliography. H. N. Copp, *United States Mineral Lands* (2d ed., Washington, 1892); Barringer and Adams, *Mines and Mining* (Boston, 1897); C. H. Lindley, *American Law of Mining* (2 vols., San Francisco, 1897); Gilbert Wyman, (comp.), *Public Land and Mining Laws* (Fruitville, Cal., 1898); H. F. Clark, *Miners' Manual* (Chicago, 1898); E. J. White, *Law of Mines and Mining Injuries* (St. Louis, 1903); R. S. Morrison, *Mining Rights* (14th ed., Denver, 1910); H. N. Copp, *American Mining Code* (19th ed., Washington, 1910).

MINES AND MINING, MILITARY. The term "military mining" is used in two senses. The first covers the placing and explosion of charges of explosive underground with a view to destroying men, matériel, and communications. It includes the ordinary use of mines as one of the obstacles to the approach of an attacking force. The other and more specific use of the term is to denote one of the stages in a stubborn siege and in trench warfare. In the discussion of siege and siege works (q.v.) it is shown that when the attacking or besieging troops are no longer able to advance in the open, progress is made by approaches and parallels, in the hope that, if the besieged is not first starved, the besieger may advance close enough under the protection of his own trenches for the delivery of an overground assault. Occasionally, however, the relative force and skill of the combatants are such that the besieged may bring the approach of the besieger by surface trenches to a standstill. This is accomplished by his heavier gunfire or his greater skill, supplemented probably by underground tunnels and countermines which so threaten an overland advance as to make it impracticable. When thus checked the attacker must resort to military mining if he wishes to advance further.

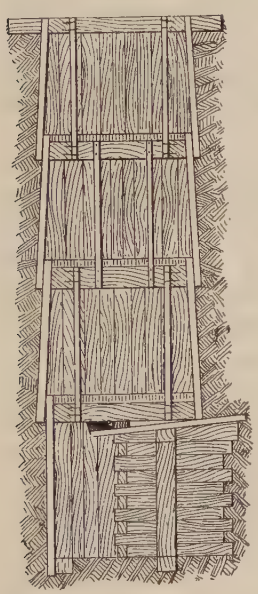


MINING OPERATIONS AT GRAUDENZ, 1862.

From the last advanced open position he has been able to construct the besieger proceeds underground by a system of shafts and galleries. These vary in size. In general the start is made with large galleries gradually ramifying into

smaller but more numerous galleries whose heads are close together. The principal types recognized in the textbooks are *great* galleries with a height of 6 feet and width of 7 feet, *common* galleries with the same height and half the width, *half* galleries with a height of 4½ feet and width of 3 feet, and *branches* with a height of 3½ feet and width of 2½ feet. The accompanying cut indicates the methods in which these branches develop. The shafts and galleries are usually lined with board casings 2 to 4 inches thick, or with heavy frames placed at intervals holding in position thin sheeting. For the work of excavating special tools are provided, shorter than those used aboveground. Provision is made at frequent intervals for ventilating the tunnels sufficiently to permit the miners to work. Passage from one level to another is by shafts or by inclined slopes. Great care is taken in the preparation of a map, corrected to date and showing the position of the various tunnels and branches, and their relations to each other, both in plan and in elevation. A similar system of tunnels is constructed by the besieged. As the two systems approach each other it becomes the object of each combatant to destroy the system of the other. In doing this the besieger is also normally desirous of forming a crater reaching to the ground above which he can occupy with his troops, thus obtaining new points of vantage on the surface. To prevent the formation of such positions the besieged endeavors to effect his explosions without breaking the surface of the ground.

The tendency in surface warfare is also towards a greater use of trenches both for positions and communications. When the trenches approach each other closely resort is naturally had to mining as one of the means of attack. Small branch galleries are run forward well below the surface and mines placed and exploded under important points of the enemy's line, as magazines, batteries, and intersection of crossing trenches.



SHAFT LINING.

The explosives used in mines and mining have been gunpowder, guncotton, dynamite, and mixtures of dynamite with other high explosives. The quantity of explosive to be used depends upon the result desired. A *common* mine is one in which the crater formed has a diameter at the surface approximately twice the depth. Mines with larger charges of powder than will produce this result are known as *overcharged* mines; with less, as *undercharged* mines. When given a charge so small that no crater is produced on the surface they are called *camouflets*. To produce a common mine the charge varies considerably with the nature of the soil. The general rule for them with gunpowder in ordinary earth is that the charge must be equal in pounds to one-tenth the cube of its distance in feet below the surface.

Mining operations were conducted upon a large scale at the siege of Sebastopol in 1854 and 1855, where the Russians, under the lead of the accomplished engineer, General Todleben, were able to withstand the allies a period of 349 days. Mining was carried on in the sieges of Vicksburg and Petersburg in the Civil War, and in that of Port Arthur in the Russo-Japanese War. Military mining has played an important part in past wars at critical times, and it is probable that in a form adapted to the changing conditions it will always be a big factor in large and protracted land wars. The subject of siege works and military mining is treated in Mercur, *Attack of Fortified Places* (New York, 1894), in the Chatham *Manuals*, especially part iv (London, 1883), and in *Engineer Field Manual*, United States War Department. For submarine mines and torpedo defenses, see MINE, SUBMARINE; TORPEDO; TRENCH, MILITARY.

MINETTE, mē'nĕt' (Fr., dim. of *mine*, mine, whence Rhenish Ger. *Minette*, iron ore). An igneous rock of granular or porphyritic texture, composed essentially of orthoclase feldspar and biotite. In contrast with the granites, syenites, and diorites, to which it is related, it is rich in ferromagnesian minerals, and hence has a darker color. Minettes generally occur in dikes, and are quite susceptible to weathering agencies.

MINE WORKERS OF AMERICA, THE UNITED. The largest American labor union, whose declared object is "to unite mine employees that produce or handle coal or coke in or around the mines, and ameliorate their condition by means of conciliation, arbitration, or strikes." The officers consist of a president, vice president, and secretary treasurer, who, together with one delegate from each of the 29 districts into which the jurisdiction of the United Mine Workers is divided, constitute the National Executive Board, which has the power to levy assessments and to order general strikes by a two-thirds vote. The government of the union is thus highly centralized. In organization the United Mine Workers is an industrial union, aiming to unite not only miners, but all skilled and unskilled laborers working about coal mines, except mine managers and top bosses. This policy of industrial organization has brought the union into conflicts with the unions of the stationary firemen and of the blacksmiths. In operation the United Mine Workers is a typical new union of the aggressive type. It maintains no extensive system of fraternal benefits, but devotes the greater part of its revenue to the support of strikes and the organization of new unions. Thus, out of the total expenditures of $2,102,261 in 1913, $1,621,942 were appropriated to aid and $290,764 to salaries and expenses of officers and organizers. The control of local strikes rests partly with the national officers. Any local union may strike provided it obtains the consent of the district officers and the national president, but in case either disapprove, an appeal for the permission "to strike may be made to the executive board. Any local union striking in violation of the above provisions shall not be sustained or recog-

nized by the national officers." This seems to constitute the only penalty for unauthorized strikes. In the bituminous districts of Illinois, Indiana, Ohio, and Pennsylvania strikes have been practically eliminated by the annual joint conference, or collective bargaining, between the miners and operatives, in which a scale of prices for the following year is adopted and the settlement of further differences provided for by local boards of arbitration. The United Mine Workers was organized Jan. 25, 1890, but its membership decreased rather than increased until the great bituminous coal strike of 1897, during which year the average membership was only 9731. Since that time the membership has increased by leaps and bounds, and in 1905 the national union had an average paid-up membership of 264,950, which increased to 377,682 in 1913. For December, 1913, the paid-up membership was 415,142, distributed among 29 districts and about 3000 local unions. The greatest gains were coincident with the anthracite strikes of 1900 and 1902, the latter of which, lasting more than five months and involving 147,000 workmen, is perhaps the most important strike in American history. The official journal is *The United Mine Worker*, published weekly at Indianapolis. Reports of the biennial conventions, published at Indianapolis, offer much valuable information relating to the organization. See TRADE-UNIONS.

MINGHETTI, mĭn-gĕt'tē, MARCO (1818–86). An Italian writer and statesman. He was born at Bologna, Nov. 8, 1818, of a wealthy family, and after a university course in political science made a study of the institutions of France, Germany, and Great Britain. On his return to Italy he published an essay on the great commercial advantages of free trade, as existing in England, and espoused with warmth the economic views of Richard Cobden, for the assimilation of which he had been prepared by a knowledge of the teachings of the Tuscan economist Bandini. In 1846 Minghetti began his political career by starting at Bologna a journal of liberal tendencies, *Il Felsineo;* by 1847 he had made such a name for himself that he was called to Rome by Pius IX to become a member of the *Consulta delle Finanze*, and in 1848 he became Minister of Public Works. After the papal change of front, however, Minghetti withdrew from office and joined the army of Charles Albert in Lombardy, where he was warmly received by the King and appointed to the royal staff with the rank of captain. After the battle of Goito he was made a major and distinguished himself in the engagement of Custozza (July 25, 1848). In the autumn of the same year Minghetti was invited to Rome by his friend Count Rossi as a member of the new constitutional ministry. He arrived the day of Rossi's assassination, and after refusing the Pope's request that he take the place of the murdered Minister he returned to the Piedmontese army. On the disastrous conclusion of the war Minghetti resumed his study of political economy and gained the confidence of Cavour, by whom he was consulted during the conferences of Paris. In 1859 he became Secretary General in the Ministry of Foreign Affairs, but resigned with Cavour upon the conclusion of the armistice of Villafranca. Minghetti became Minister of the Interior under Cavour in 1860 and after the death of Cavour held the portfolios of the Interior under Ricasoli and of Finance under Farini. In March, 1863, he became Prime Minister. He left office in 1864. He went as Ambassador to London in 1868 and was subsequently for a short time at the head of the agricultural and commercial department in the Menabrea ministry (1869). He was Ambassador to Vienna in 1870–73. From 1873 to 1876 he was again at the head of the cabinet, first as Minister of Finance and later as Minister of Foreign Affairs. He spent the last years of his life in study and partial retirement and died at Rome, Dec. 10, 1886. Among his chief writings are: *Del' economia pubblica, etc.* (1859); *Opuscoli letterari ed economici* (1872); *Stato e chiesa* (1878). His speeches in Parliament (Discorsi parlamentari) were published in Rome in 1888–90. He was also a student of the fine arts, and, besides lecturing on Raphael and Dante, he produced a work, *Le donne italiane nelle belle arti al secolo XV e XVI* (1877), and a biography of Raphael (1885). His autobiography, *I miei ricordi* (Turin, 1888), appeared after his death.

MINGO (mĭn'gō) **JUNCTION.** A city in Jefferson Co., Ohio, about 12 miles northeast of Urbana, on the Pennsylvania Company, the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Wheeling and Lake Erie railroads (Map: Ohio, J 5). The Carnegie steel works comprise the only manufacturing plant. Farming, dairying, and fruit growing are carried on, and some coal is found in the vicinity. The city owns the water works. Pop., 1900, 2954; 1910, 4049.

MINGRE'LIA. A former independent feudal state of the Caucasus, bordering on the Black Sea, now included in the Russian Government of Kutais (Map: Russia, F 6). It was a vassal state of Georgia until 1414, when it became independent under its own princes, although tributary to Turkey and Persia. Russia obtained control over it in 1803, but the internal administration was left in the hands of the native chiefs until 1867, when, as a result of a series of peasant uprisings begun in 1857, it was finally annexed by Russia. The inhabitants are mostly Mingrelians, closely allied to the Georgians. Mingrelia is the ancient Colchis.

MINGRE'LIANS. A tribe of the Kutais region, numbering some 250,000 and belonging to the Georgian group of peoples of the Caucasus. (See MINGRELIA.) In stature they are above the average, and, like the Georgians proper, many of them are of great physical beauty. The Mingrelian language varies considerably from the Georgian prototype. Of the character of the Mingrelians many investigators have entertained no high opinions, setting them down as lazy and unprogressive. The Mingrelians, as are the other Georgians, are more or less Christian. They have a folk literature, consisting of legends, songs, etc., the people being fond of music, the dance, etc. Consult: Telfer, *The Crimea and Transcaucasia* (London, 1876); Chantre, *Recherches anthropologiques dans le Caucase* (Paris, 1885–87); Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1887); Bryce, *Transcaucasia and Ararat* (London, 1897); and, for their place among the Caucasian people, A. Dirr, "Anthropologische und ethnographische Uebersicht über die Völker des Kaukasus," in *Petermann's Mitteilungen*, vol. lviii (Gotha, 1912). See GEORGIANS.

MINHO, mē'nyō. A river of the Iberian Peninsula. See MIÑO.

MINHO. A province of Portugal. See ENTRE DOURO E MINHO.

MINIATURE PAINTING. Painting in small dimension and of delicate workmanship, usually in water color on vellum or ivory. The term is derived from *minium*, Latin for red lead, a pigment used in illuminating manuscripts, and it was first applied to the pictures which illustrated manuscripts. (See ILLUMINATED MANUSCRIPTS.) Portrait miniatures appeared in devotional manuscripts as early as the late thirteenth century, one of the earliest being a likeness of St. Louis in the *Credo* of Sire de Joinville (c.1287). They attained their highest excellence in the Netherlands and northern France during the fifteenth and early sixteenth centuries. With the introduction of printing, miniatures in manuscripts disappeared; but the transition to the miniature in the modern sense had already been accomplished. This latter is usually a single portrait, oval in shape and from 2 to 4 inches high. Early German and Netherlandish painters sometimes painted them in oil on copper, but they were most frequently executed in water color on vellum, sometimes on chicken skin or cardboard. The use of ivory for this purpose began in the late seventeenth century, but did not become general until the eighteenth. Its introduction changed the character of miniature painting, as more transparent and delicate colors could thus be achieved. This adapted the art especially to the portrayal of flesh tints and other feminine charms, with the result that women replaced men as the principal subjects of miniatures. Miniatures in enamel became popular from about the middle of the seventeenth century, and the subsequent practice of presenting snuff-boxes, cardcases, and other favors greatly promoted the form of the art, particularly in France. During the eighteenth century the increasing demand for tiny miniatures for use in lockets, bracelets, and the like, led to the practice of stippling, in which the color was applied in minute dots, with fine technical effects, but to the detriment of character and sacrifice of general effect.

History. The great charm of miniature painting consists in the intimate view it affords of the sitters, often persons of historical importance. Princes and rulers have always patronized the art, and it has consequently flourished in the national capitals of England, France, and other north European countries. One of the earliest and greatest representatives of the art was Hans Holbein the Younger (1497–1543), whose miniatures have the same qualities as his larger portraits and contain a remarkable grasp of character, with breadth of treatment, impeccable detail, and clear, strong color. His influence is especially evident in the clear and precise art of his follower, Nicholas Hilliard (1537–1619), and in the more richly colored miniatures of the latter's son Lawrence. Isaac Oliver's (c.1567–1617) art is more strongly characterized and both he and his son Peter gave greater roundness to the figures. The greatest master of the seventeenth century was Samuel Cooper (1609–72), who united Van Dyck's elegance with breadth and dignity, in his remarkable portraits of the men of the Commonwealth. The art declined during the early eighteenth century, but again reached a climax in the work of Richard Cosway (1741–1821), the most popular of English miniaturists, whose gently idealized portraits of women are painted with consummate mastery of delicate color. Of his followers, George Engleheart's art was more virile than his master's; Andrew Plimer was rather insipid, while John Smart united power and refinement. During the nineteenth century, concomitant with a general decline of the art, the so-called large miniature came into vogue, measuring as much as 50 centimeters in height, and characterized by breadth of treatment rather than finish, as may be seen in the works of Andrew Robertson and Sir William Ross. The invention of photography had a disastrous effect on miniature painting, diminishing both the demand for it and the necessity of painting directly from the sitter. The end of the nineteenth century witnessed a general revival.

In France the art was as prolific and important, especially during the eighteenth century, as in England. It was introduced from Flanders by Jean Clouet (died 1540), whose work was continued by his son François and others; but few of these early miniatures can be identified with certainty. The greatest French miniaturist of the seventeenth century was Jean Petitot (1617–91), the first successfully to use enamel. He adopted the style of Van Dyck and invented several new colors, particularly for rendering the flesh tints. His gifted son, Jean Petitot, and numerous followers continued his traditions, which long dominated enamel painting. The most prominent of the stipple engravers was Jean Baptiste Massé (1687–1767). Pierre Adolphe Hall (1739–93), a Swede by birth, excelled all contemporary artists in an art as delicate as it was free and powerful. Many distinguished painters of the eighteenth century practiced also in miniature; such as Largillière, Nattier, and especially Fragonard, who, unhampered by tradition, painted miniatures in a style similar to his canvases. The most popular miniaturists of the Napoleonic era were Dumont, Isabey, and especially J. B. Augustin.

In Germany the art was practiced during the sixteenth century by many early painters, like Lucas Cranach the elder, Ludwig tom Ring, and others. Rosalba Carriera (1675–1757), the talented Venetian, painted miniatures not unlike her pastels, and possessing a certain spiritual quality. Both she and her pupil, Felicitas Sartori Hoffmann, who settled at Dresden, exercised a wide influence upon the German school. This school culminated in the work of Heinrich Friedrich Füger (1751–1818), who practiced chiefly at Vienna, which early in the nineteenth century was an important centre of miniature painting. In the Netherlands, Scandinavia, and Russia the art was also practiced with varying success.

In the United States most of the early painters also attempted miniatures, notably Copley, Gilbert Stuart, C. W. Peale and others of his family, and John Trumbull. But the most important miniaturist of the early period was Edward Greene Malbone (1777–1807), who combined good drawing with an innate feeling for beauty and grace. The general decline of the art during the nineteenth century was followed by an important revival in the late nineties. The American Society of Miniature Painters, founded in 1899, holds annual exhibitions in New York. Its president, William J. Baer, and Laura C. Hills, pioneers in the art, occupy

places of the first rank. Other important artists are Lucia Fairchild Fuller, Martha S. Baker, Florence Mackubin, Virginia Reynolds, L. A. Josephi, W. J. Whitmore and J. W. von Rehling-Quistgaard. American miniature painting is characterized by animation, truth to nature, and the use of clear, bright color.

The most important collections of miniatures are in private possession. One of the finest is that of the late J. P. Morgan (Metropolitan Museum of Art, New York), with examples of nearly all of the prominent English and French miniaturists. Other notable collections belong to the King of England, the German Emperor, the Czar of Russia, King of Sweden, Queen of Holland, and other sovereigns. Among the museums owning good collections are the University Galleries, Oxford; the Wallace collection, London; the Louvre; the Rijks Museum, Amsterdam; and the museums of Dresden and Vienna. There are a number of important private collections in England.

Bibliography. J. L. Propert, *History of Miniature Art* (2 vols., London, 1887), is still valuable from the collector's point of view. Another important work is J. J. Foster, *Miniature Painters, British and Foreign* (2 vols., New York, 1903), and more recent still, Dudley Heath, *Miniatures* (London, 1908), containing a bibliography, and Lemberger, *Portrait Miniatures of Five Centuries* (ib., n. d.). The chief English authority on miniatures is G. C. Williamson, among whose works we cite the brief *Portrait Miniatures from the Time of Holbein* (London, 1897); *Andrew and Nathaniel Plimer, Miniature Painters, their Lives and their Works* (ib., 1903); *History of Painting in Miniature* (2 vols., ib., 1904); *Catalogue of the Collection of Miniatures of J. P. Morgan* (4 vols., ib., 1906), a monumental work. J. W. Bradley, *Dictionary of Miniaturists, Illuminators, Calligraphists, and Copyists* (3 vols., ib., 1887–89), is still valuable as a book of reference; also Ernest Lemberger, *Meisterminiaturen aus fünf Jahrhunderten* (Stuttgart, 1911); F. R. Martin, *Miniature Painting and Painters of Persia, India, and Turkey from the Eighth to the Eighteenth Century* (2 vols., London, 1912); Camille Faust, *Les miniatures de l'Empire et de la Restauration* (Paris, 1913); Fernand de Mély, *Les primitifs et leurs signatures*, vol. i (ib., 1913). See also the bibliography of ILLUMINATED MANUSCRIPTS.

MINIÉ, mē'nyā', CLAUDE ETIENNE (1814–79). A French soldier, ordnance expert, and inventor. He was born in Paris, entered the army as a volunteer, and served in Algeria during several campaigns. He became captain in 1849 and superintendent of the school of ordnance at Vincennes in 1852. In 1858 he was employed by the Egyptian government to superintend a manufactory of arms and a school of gunnery at Cairo. He invented the Minié rifle, which was brought out in 1849 and adopted by the French government, and is especially noteworthy in that it was the first practical introduction of the principle of expansion in the manufacture of projectiles and gave a precision and range previously unknown. The Minié bullet was a conical projectile of lead, hollowed out at the base. When fired the base of the ball expanded, to take the rifling. See SMALL ARMS.

MIN'IM, IN MUSIC. See MENSURABLE MUSIC.

MINIMA. See MAXIMA AND MINIMA.

MIN'IMITES (Lat. *fratres minimi*, least brethren, so called, in token of still greater humility, by contrast with the *fratres minores*, lesser brethren, the original name of the Franciscans). A Roman Catholic religious order, founded by St. Francis of Paola (q.v.). Devout hermits began to gather round him as early as 1435, and in 1444 a convent was founded at Paterno. The order received papal confirmation in 1474. It spread first into France, when the founder was summoned thither by Louis XI. In Paris they were commonly known as *Bons Hommes*, from the popular name of an older community to whose house at Vincennes they succeeded; and in Spain, to which they next spread, they got the name of Fathers of Victory, from the fact that the recovery of Malaga from the Moors was ascribed to their prayers. The Emperor Maximilian invited them to Germany in 1497. Their first definite rule was not drawn up by the founder until 1493; it was exceedingly austere, forbidding the use not only of meat, but of all animal products, such as butter, eggs, cheese, and milk. The order at one time numbered 450 houses, but later fell into decay and is now represented by 17 convents in Italy, Sicily, and Sardinia, and one in Spain. The superior of a convent has the title of corrector, the head of the whole order being the corrector general. Francis also founded an order for women which never had more than 14 convents and is now almost extinct, and a third order (see TERTIARY) for persons living in the world. Consult D'Attichy, *Histoire générale de l'ordre sacré de Minimes* (2 vols., Paris, 1624), and Heinbucher, *Die Orden und Kongregationen der katholischen Kirche* (Paderborn, 1907).

MIN'IMUM DEVIATION, ANGLE OF. See LIGHT.

MINIMUM WAGE. A term employed to designate the lowest level of earnings affording for a given class of laborers and those naturally dependent upon them means of existence adequate to maintenance in full physical efficiency and social decency. This minimum is difficult to define precisely, and varies from place to place, according to cost of food, housing, fuel, etc. In attempting to define the minimum, recourse is usually had to investigations of the physiologists as to the quantity and variety of food necessary to maintain a worker or a workingman's family in normal health. The results of such investigations, translated into money terms by means of tables of retail prices, supplemented by local studies of house rents, clothing costs, etc., afford the basal figures in minimum wage computations. The minimum thus defined for a normal working-class family in American cities varied from somewhat under $1500 to $1800 or a trifle more, according to prices prevailing in 1921.

The minimum wage movement is a concerted effort of workers and social reformers to force wages in the less well-paid trades to a level corresponding with the social minimum as above described. Organized labor in its more successful forms has established a level of wages well above such a minimum. Unskilled laborers often fall far below it, and especially is this true of immigrant labor and the labor of women and children. The discrepancy between wages and a decent minimum of subsistence is most shocking in the case of the sweated trades, where whole populations are sometimes kept in a condition worse than slavery, slowly succumb-

ing to malnutrition and its accompanying maladies.

The first state to undertake seriously to apply political means to the eradication of underpayment was the Australian colony of Victoria. By a law of 1896 boards were constituted in six trades with authority to fix minimum wages. The operation of the law was so satisfactory that it was later extended gradually in scope until in 1915 it covered 141 trades, employing over 150,000 workmen. The success of the Victoria experiment aroused great interest, after 1905, in the United States and Great Britain. Before the close of 1921 twelve American Commonwealths had enacted minimum wage laws. Of these Massachusetts and Nebraska provide for commissions with power to investigate and report on what would be an appropriate minimum wage in specified industries, but have made no provision for forcing employers to pay such wages. California, Colorado, Minnesota, Oregon, Washington and Wisconsin provide for commissions with power, after investigation, to fix rates legally binding upon employers. The State of Utah fixes a legal minimum by statute and makes it a penal offense for employers to pay less than the minimum. All American minimum wage laws, for constitutional reasons, are limited in their application to women and minors. Great Britain, by Act of 1909, established trade boards with power to fix minimum wages in the trades of chain making, machine-made lace finishing, box making and tailoring—notoriously sweated trades. After the great coal strike of 1911 an Act was passed setting up district wage boards in the coal-mining industry.

While the ideal of the minimum wage movement is the establishment of a living minimum in every trade, the practice of trade boards and commissions is much more conservative. Such boards and commissions content themselves with fixing such wages as are practicable, i.e., wages that can be paid without destroying an industry or driving it to another jurisdiction. Thus the minimum is rarely above the level already established by the better-paying establishments. In unorganized trades wages for similar labor vary widely, the establishments ill equipped with machinery or inefficiently managed making up their competitive disadvantage through low wages. The establishment of a minimum wage tends to drive such concerns out of business and thus concentrates production under the control of employers able to pay better wages. In this respect the operation of the minimum wage is similar in its effects to that of the union scale of wages. Like the latter, the minimum wage may become a means of gradually but progressively raising the general level of wages. In the United States the employing classes are, as a rule, though by no means universally, opposed to the introduction of the minimum wage principle. Organized labor also furnishes opponents to the principle, animated by the fear that its application will tend to the disintegration of the organizations. In Victoria, where the plan has passed beyond the experimental stage, opposition on the part of either labor or capital is practically nonexistent.

MINING. The art of working deposits of valuable mineral. The recovery and use of certain of the native metals was practiced by prehistoric peoples. Gold and meteoric iron were appreciated and searched for from very remote times. Native copper from Lake Superior was extensively mined and used by the aborigines of America. With the advance of civilization, the knowledge of metals increased and ores, or metals in combination, were recognized and utilized and mining proper began. Reference to mining is made in the Bible, and other ancient records prove that the Phœnicians navigated the seas as far as Cornwall, England, in order to obtain tin ores for the manufacture of bronze. The Romans had extensive mines for iron ore in the island of Elba. They also worked the great copper deposits of Rio Tinto, Spain. The mines of Laurium, Greece, were famous in ancient times for their yield of silver. From the old mining districts of Cornwall and from the Erzgebirge and the Harz mountains in Germany miners have gone all over the world, and their skill and experience have done much towards developing mining practice as it exists to-day.

The present article will be confined to a discussion of the art of mining as applied to the working of underground ore bodies. For placer mining see the article GOLD; for coal mining see COAL; see also QUARRY; DRILL; WELL SINKING. The handling of the ores immediately preparatory to and during the processes involved in extracting the metals is of a nature different from that of mining proper and is frequently done at places far from the mines. These operations are considered in the articles on ORE DRESSING, METALLURGY, and in the sections devoted to the metallurgy of the various metals and in the adjunct articles there mentioned.

Prospecting. The search for and location of deposits of mineral is called *Prospecting*, and the men performing this work are known as *Prospectors*. The procedure in prospecting a tract of land suspected to contain mineral wealth is thoroughly to traverse it, and to note carefully the familiar indications of the presence of minerals. These indications are often numerous in kind for each mineral and they also vary for different minerals. Generally speaking, coal, gypsum, salt and similar nonmetallic minerals occur in unaltered deposits, i.e., in rocks which have not undergone metamorphism, while the metallic minerals are found in rocks that have undergone metamorphism. These are among the broad indications of the presence or absence of certain minerals.

The geologic age of the rocks is in respect to certain minerals an indication whether these minerals are likely to be found or not. For example, the major portion of the coal deposits of the world have been found in rocks of the Carboniferous age; they exist at times in rocks of subsequent ages but almost never in rocks of preceding ages. The presence of iron is indicated by rustlike staining of earth and rock. The presence or absence of vegetation may also indicate the existence of minerals, e.g., a bed of phosphate rock is commonly indicated by a line of luxuriant vegetation, and the outcrop of a metallic mineral deposit by a lack of vegetation. Beds or deposits of magnetic iron ore and of certain of the nickel ores are frequently located by their attractive influence on the magnetic needle. In prospecting for placers, search is made for existing or ancient watercourses in which deposits of placer material are likely to have been formed. In prospecting for petroleum, natural gas and bitumen, the surface indications looked for are springs of petroleum, oil, or

naphtha; porous rocks saturated with bitumen; springs, pools, or creeks showing bubbles of escaping gas or an iridescent coating of oil. The presence of a mineral deposit of probable economic value having been established, it then becomes necessary to secure title thereto.

Legal Considerations. The laws of the various countries governing this point naturally differ somewhat, and should be carefully studied and complied with. If the deposit is located on government land, a "claim" of variable size, according to the laws of the country or district, is staked out, and when this is opened up sufficiently to have necessitated the expenditure of a certain specified sum of money, a permanent title can be obtained. In the Western States of the United States, claims usually extend 1500 feet along the vein and 300, or less, feet on each side of it. The owner can then follow the vein in depth where it leads him between the vertical planes of his end lines, this irrespective of the vertical projection of his side lines. Because of the irregularity of veins, much litigation has ensued and the law of the United States is open to much criticism. Many authorities consider that it would be better practice to adopt square claims, conveying the mining right to all ore lying vertically beneath them. This is the practice in British Columbia and in Mexico, and is practically so in the eastern United States, where title to the land, unless special reservations are made, carries title to the mining rights. In some States, notably in New York, and in many foreign countries, the State claims peculiar and special proprietary rights to deposits of useful minerals. Much variety also prevails in America in the size of claims other than for deep mines. Gold-bearing placers, i.e., have special sizes depending on local regulations. See MINES AND MINING, IN LAW.

Exploration and Development. Having found a mineral deposit and having obtained a legal hold on its ownership, the next step is its exploration and development. Exploration implies the determination of the extent, the richness, and the physical conditions obtaining. Development implies the confirmation of the results of exploration, and the preparation for subsequent mining operations. As work along both these lines is ordinarily carried on simultaneously, they will be treated under the one heading. The methods which may be employed for the exploration and development of a mineral deposit are: surface excavation; underground workings; churn drilling; and core drilling. It is usually the case that a combination of two or more of these methods will be used.

Surface excavation is strictly a preliminary form of exploration, its object being to determine the surface extent and character of the deposit in order that other methods of exploration may be more intelligently directed. This type of work is extensively used at Cobalt, Canada.

Underground workings, either as shafts or tunnels, may or may not be used as a primary means of exploration. They are, of course, invariably employed in the development stage.

Churn drilling, or the projection of vertical holes of from 6 inches to 9 inches in diameter to considerable depth by means of a special mechanical arrangement (see WELL SINKING), is extensively used in exploring ore bodies of wide area and irregular form. The material recovered from drilling, consisting of mud and gravel, indicates in a very satisfactory way the character and mineral contents of the rock passed through. Practically all of the so-called "Porphyry" copper properties recently opened have been explored in this manner.

Core drilling, or the projection of small holes 1 inch to 4 inches in diameter at any angle, with the recovery of cores of the rock passed through, gives excellent exploratory data. Unfortunately, however, this method is limited to those districts where the rock to be passed through is generally homogeneous in texture. It has been widely used in the Lake Superior copper, in the Michigan iron, and in the Sudbury nickel districts.

Mining. Having determined the extent, value and physical conditions obtaining, and granting that they indicate the mineral deposit to be of commercial importance, mining proper or the working of the deposit may be undertaken. The problems now presented are: magnitude of operations justified; method of working best suited to the conditions; the mechanical requirements.

Magnitude of Operations Justified. The question of the tonnage advisable to mine annually requires a balancing of four conditions, the total tonnage actually shown by the exploration and development work, the possibilities of finding future additional tonnages, the probable working costs, and the capital investment required. The two last mentioned items will naturally vary with the magnitude of the operations, therefore two or three cases within the legitimate possibilities of the property should be worked out. The desideratum is, of course, that scale of operation which will show the greatest ultimate net profit on the whole investment. In some special cases market conditions affecting the sale of the mine product must also be considered.

Method of Working to be Adopted. The successful solution of this problem requires careful consideration of the three main cost-making operations which enter into mining: the actual breaking down of the ore or stoping; the support of the excavated volume; and the transport of the broken ore to the surface. The governing factors in this consideration are: (*a*) the shape of the deposit; (*b*) its location with respect to the surface; (*c*) the physical character of the ore; (*d*) the physical character of the surrounding rock; (*e*) the cost of mine supplies (timber, power, etc.).

Stoping Methods.—The actual breaking down of the ore may be done by: overhand stoping; underhand stoping; side-cut stopes; or caving. Briefly described, the first two methods indicate the position of the workmen with respect to the body of ore to be broken. The third method, "side cut," the breaking of ore over horizontal areas, this usually preparatory to the fourth method or "caving," which implies the breaking down of the ore by its own weight or by the weight of overlying rock. The function of the workmen mentioned above is to drill holes in the rock or ore mass either by hand or by mechanical means. The holes so drilled are later loaded with an explosive which when fired shatters and breaks down the ore or rock.

Support of Mine Workings.—Because of the possible value or nonownership of the surface overlying an ore body it may become necessary to provide for the permanent support of the mined-out areas. Also in order to insure the safety of the workingmen underground and to

facilitate mining operations it is invariably necessary to provide temporary support. The methods which may be employed to this end are grouped as follows: mineral pillars; stull timbering; square-set timbering; waste filling; ore filling.

Mineral pillars were probably the oldest form of mine support and are still used in many mines where the value of the ore left standing as pillars is less than the cost of other methods of support. Working by this method implies the removal of the ore from a number of rooms, leaving ribs of unbroken ore at intervals. The proportion of the ore so left to the ore mined depends upon the thickness of the mineral body, the physical character of the ore, and the strength of the roof-forming rock.

Stull timbering is used in connection with relatively narrow and highly inclined deposits of high-value ore. The procedure is to mine out the entire ore area, placing at intervals timbers at right angles to the walls. The amount and size of timber to be used depend on the inclination of the ore body and the strength of the wall rock. This method is universal, and examples are afforded in almost any precious-metal mine.

Square-set Timbering.—In ore bodies where the width mined is greater than can be conveniently spanned by a single stick of timber and where the values contained in the ore are high, square-set timbering may be used, the supporting timbers being built up either rough or squared and so mortised at the ends that they fit together like the edges of a cube, 6 feet on a side. Others fit in with them, each stick entering into four adjacent cubes, and in the end a framework of timber of great strength is built up. This method of mine support was formerly extensively used at Butte, Mont., and at Bisbee, Ariz. Latterly, because of the excessive cost of timber, this method is being discarded.

Waste Filling.—This method, because of high costs for timber, is now widely used both in narrow and wide veins where the value of the ore warrants its complete removal. The procedure is to fill the worked-out volume with either waste rock or with the crushed rock discarded from ore-dressing operations, the only timber used being for temporary support at the immediate working faces and for the maintenance of passageways at intervals through the fill for the removal of ore.

Ore filling, or *shrinkage stoping*, is used when it is desired to afford a temporary method of support both in those types of ore bodies described as suitable to stull and square-set timbering and in those ore bodies of irregular form which it is intended ultimately to work by caving methods. The system is to break down the ore by overhand stoping and to allow the major portion of it to remain in the stope until mining is completed, only sufficient being drawn off to leave space at the face for the workingmen.

Caving.—As the name implies, in this system of mining provision is made only for the temporary support of the overlying rock or ore. When preliminary mining operations have proceeded sufficiently far the temporary supports are withdrawn or broken down, the overlying unsupported mass caving by its own weight or by the weight of the overlying rock. In this manner a large proportion of the ore may be broken without the use of labor or powder. Also a very material saving is made in not having to support the excavated volume. The conditions which make a caving system possible are an ore body of large area and a surface of no value. The mining and support of the first portions of an ore body which is to be worked by caving will make use of some one method or a combination of methods already described under the heading of mineral pillars, square-set timbering, or shrinkage stoping. Caving is widely used at present in the mining of the so-called "porphyry" copper deposits, in the iron mines of Michigan and Minnesota, and in the Kimberley, South Africa, diamond mines.

Mechanical Requirements. The application and selection of mechanical means to assist in mining operations require careful consideration involving the means which may be employed, the capital investment required, the life of the mine, and the saving in cost per ton to be effected. Many a mine has been equipped with an expensive mechanical outfit which while possibly well thought out from the mechanical engineer's viewpoint has not been justified by the life of the mine. On the other hand, it is frequently the case that a mine may be underequipped, that the investment of capital in proper machinery would effect a saving in the per-ton cost which would mean the difference between a loss and a profit. In no industry does the saying that "the means must fit the end" hold more true than in mining.

The economics of the case having indicated that the use of machinery is justified, the first question is the choice of the primary motive power. This choice lies between the use of steam, as generated by the burning of wood, coal, or oil; gas, as generated and used direct from wood, coal, or crude oil; electricity, as purchased from power companies or as generated from local hydraulic power.

Having decided upon the cheapest, all things considered, prime mover, the next problem is the consideration of the uses to which the machinery may be applied. These may be divided according to location into (*a*) underground mechanical equipment and (*b*) surface mechanical equipment.

Underground mechanical equipment may be further classified into machines facilitating such operations as drilling, transport of broken ore or rock, and pumping.

Mechanical Drilling Machines.—These machines have as their object the drilling of holes in the rock or ore in order that the dynamite or powder used in blasting may be so placed as to obtain the best results. They are in direct competition with hand drilling and, except in prospecting and exploration work, are fast superseding the older method. The requirements of such machines are that they should be mobile, that they should be able to stand the hard usage and unfavorable conditions incidental to underground work, and that they should be as mechanically efficient as is consistent with the previously named conditions. Much ingenuity has been displayed in their design, but the type which has withstood trial and has proved worthy of consideration is that actuated by compressed air. The compressed air, delivered to the machine usually under a pressure of from 70 pounds to 100 pounds per square inch, is ordinarily generated on the surface and conducted underground in pipes, or it may, in the case of isolated individual units used in

development work, be generated underground at a point near the machine, electricity being used as the motive power for the compressor. Air drills are all reciprocating in their action and are of two types—the piston machine, where the reciprocating piston and the drill are joined together, the drill moving backward and forward with the piston, and the hammer machines, in which the piston is of a slightly different design and is not attached to the drill, the piston taking the form of an air-actuated hammer. Drilling machines directly operated by electricity have not proven a success in ore mining, although in mining coal and in quarry work electrically operated "cutters" are widely used. The equipment for generating compressed air will be described hereafter under *Air Compression.* See DRILL.

Transport of Broken Ore.—This problem may be twofold—the haulage of the broken ore from the stopes to the shafts and the hoisting from the shaft station to the surface. The consideration of the haulage facilities to be used is a question of the tonnage to be handled in a given period of time and the length of the haul. Originally the transport of ore underground was done on men's backs, and this method is still in use in Mexico, South America, and China. The next development was the use of wheelbarrows, a method still employed by prospectors. The wheelbarrow in turn was followed by the four-wheeled car running on tracks, actuated by man power, animals, or mechanical means. The use of the mine car operated by man power is practically universal in small-tonnage mines of to-day. In the larger mines where considerable tonnages must be handled and where the distances to be hauled are great it becomes necessary to use a more economical motive power. To that end rope haulage, compressed-air locomotives, storage-battery locomotives, electric trolley motors, and gasoline motors have been developed. The question of a choice between these various types of machines is purely a question of economics and flexibility of service desired.

Pumping Equipment.—In practically all mines some mechanical provision must be made for removing accumulating water, and in many mines the question of handling the water is all-important. The problem of water removal is met in two ways: if the flow is light or if the operations are of a very temporary nature, the water may be removed by bailing or the use of the hoist with a special bucket; if the flow is large or if the work is of a permanent nature, pumps will be installed at suitable locations underground.

Pumps may be classed according to the character of motive power into steam driven, compressed-air driven, and electrically driven. The first two types are practically identical in design for the smaller units; those of larger capacity may be so modified as to give greater mechanical efficiency. As used underground practice indicates that steam and air driven pumps be reciprocating in action and direct connected. Electrically driven pumps, now coming into wide use, are rotary in action and connected either directly or by gears to the motor. The prime requisite of mine-pumping machinery is reliability of action, mechanical efficiency being of secondary importance.

In this connection it may be well to make mention of the Cornish pump, the first pumping engine to handle large quantities of water successfully. Pumps of this type have been largely superseded by the types described above. There are still, however, places where it is in use and even where it is being installed. The Cornish pump consisted of a steam cylinder located near the shaft mouth, the piston being connected to and actuating a walking beam, the outboard bearing of which was directly above the pumping compartment of the shaft. Through this outboard bearing a line of timber rods passing down the shaft operated an encased plunger at the bottom. The operation of the plunger was similar to that of our deep-well pumps of to-day. On its down stroke the water barrel was filled, on its up stroke the water was lifted and forced into the water line leading to the surface, a corresponding quantity being displaced and discharged. See PUMPING MACHINERY.

Surface mechanical equipment must provide for some or all of the following operations: compression of air; hoisting; ventilation; generation of electric power.

Air compression is performed in either one or two stages in units of any size, in specially constructed machines which may be driven by any of the prime movers given. In this operation air at atmospheric pressure is taken into the compressor and compressed to pressures of from 70 pounds to 120 pounds per square inch with a proportional decrease in volume. The air so compressed is piped to the point of use—either the hoist, the pump, or the drilling machines. While it may be successfully argued that the use of a prime mover to generate compressed air which in turn is used to actuate other machinery is accompanied with a loss in efficiency, yet the conditions under which mine machinery must work more than offset this apparent lack in economy. The transmission of compressed air over long distances does not result in transmission losses as high as would be the case were steam piped under similar conditions. Furthermore, in underground workings it would be impossible to allow steam to exhaust into the air, while on the contrary an air exhaust is a benefit. See AIR COMPRESSOR.

Hoisting.—In those mines worked through shafts provision must be made for elevating the ore and men to the surface and for lowering men and supplies. This function is performed by machines variously known as hoisting engines, hoists, or winding engines. These engines, usually located near the shaft collar, consist of a drum or reel which may be rotated by means of a steam engine, a compressed-air engine, an electric motor, or a gasoline engine; the engine and drum are erected on the same bedplate, the driving power of the engine or motor being applied either by direct connection, gears, or friction drives. The rotation of the drum or reel winds or unwinds a wire cable which, passing over a sheave wheel supported on a suitable framework, variously known as a head gear, head frame, or gallows frame, directly above the shaft collar, is connected to the carrying receptacle (skip, cage, or bucket) and raises or lowers it at will. The whole operation is analogous to the use of elevators in our present high buildings.

Ventilation.—The problem of providing quantities of fresh air to underground workings has been a very essential part of the development of the coal-mining business. In the smaller metal mines, however, dependence is had on natural

ventilation, except possibly in isolated workings, and upon the exhaust from air drills and pumps. In the larger ore mines, and especially in those in which sulphide ores are found, the present practice is to follow the lead of the coal miner and mechanically to force ventilation, it having been demonstrated that the efficiency of the workman is increased if he has an adequate supply of good air. The blowers used are usually located close to the shaft collar or mine entrance, and are operated, either by direct connection or through gears or belts, by any convenient form of motor. These blowers are employed either to blow air into the workings or to exhaust air from them. They consist of a rotary fan incased in sheet metal and connected with the mine workings by large-diameter sheet-metal pipes. In the case of positive blowers the air taken in by suction at the centre of the fan is discharged at the periphery at a slight pressure into the pipe, which conducts it underground, usually to the lower workings, where it is discharged, the vitiated air being forced upward and out through the shafts or raises. Suction fans operate in the reverse manner, the vitiated air being taken into and carried to the surface through the pipes, while its place is taken by fresh air entering at the shaft collar.

Electric Power.—As has been indicated, electricity as a motive power for mining machinery has a wide range of usefulness. Perhaps the one factor which more than any other has caused its wide use is the ease, efficiency, and cheapness with which it may be conveyed from the point of generation to the place of use. The production of the electric power in the first place is a function of the surface mechanical equipment. The type of generating machine or dynamo will depend on the character of the current desired, which in turn is determined by the use to which it is to be put.

Closely associated with the surface mechanical equipment above described are the shops which must be provided for the repair and maintenance of the mechanical plant. The magnitude and equipment of these shops will depend upon the size of the mine and upon its distance from supply centres. In any event there must be provided a blacksmith shop, whose function it is to sharpen and maintain drills used underground, be they hand or machine. The normal small mine ordinarily has a combination blacksmith and machine shop, whose equipment will include a drill press and small lathe, in addition to a drill-sharpening and blacksmithing outfit.

Organization. The active life history of any mineral deposit can be divided into two periods —that of exploration and development and that of working or operating. During the first period there should be employed a consulting engineer to advise regarding the potential resources of the deposit and to outline the scheme of exploration and development to be followed. The man chosen for this work should have a thorough knowledge of mining geology, of practical mine management, and should have common sense. Needless to say he must be honest. The requirements are such that it is safe to say that no man with less than 10 years' active mining experience is likely to qualify. Under the direction of the consulting engineer will be the field manager or superintendent, whose chief qualifications should be getting work done under any and all conditions cheaply and quickly. On small operations he will probably act as his own bookkeeper, chemist, and surveyor. Under the superintendent will be foremen and shift bosses, who are directly in charge of the various squads of workmen.

During the operating or working period the organization will be divided into departments as follows: mining, mechanical, chemical, engineering, clerical, and metallurgical. The heads of each department report to the superintendent. It may be that on small properties the chemical and engineering departments will be merged and will be represented on the pay roll by one man or two men only. On such a property it is probable that the mechanical department would consist of not more than three or four men. On the other hand, large properties naturally mean enlarged departments with superintendents and foremen in each. Whether the work be large or small, it is imperative that there shall be an absolute placing of authority and responsibility.

Economics. Good business principles should apply to mining, although this does not seem to be realized by most business men investing in and operating mines. To use an analogy, a mineral deposit should be likened to a manufacturing enterprise in which the quantity of raw material is limited. If looked upon in this light there immediately present themselves three main items for consideration: (1) the sale value of the possible product; (2) the cost of production; and (3) the capital investment needed. The first item, the sale value of the product, requires an inquiry into what is a fair average selling price and what is the breadth of the market. The second, the cost of production, requires a special knowledge of mine and metallurgical operations and is best answered by specialists in the business and by inquiry as to what other people have done under like conditions. The third, or capital investment required, should likewise be answered by a specialist. With these three considerations investigated and answered it is a simple problem to figure the net returns to be expected, both annually and in total, and, applying this to the capital investment called for, to figure a percentage return on money invested. It should be remembered, however, that the profits resultant from mining investments must provide not only for interest on money expended but also for amortization of the investment itself within the life of the mine. Unfortunately the average mining investor misses this last point and forgets entirely that his dividend has such a twofold nature. It is because of this fact that the dividends paid or anticipated from an investment in a mining enterprise, in order to be at all attractive, must be greater than those paid by other industrials.

The question of what constitutes a proper and attractive return on such investments necessitates a consideration of the chances to be taken, which chances are dependent upon the degree of development and upon the geological and mineralogical character of the mineral deposit. Based on their degree development, mining properties may be broadly classed under two headings—prospects, or properties showing little or no ore developed, and mines, or properties having developed ore. In the first class, or prospects, it will be seen that any investment therein must be considered as purely speculative, for not only are the possible profits from the working of the ore, should it be found, a matter of estimate, but also the finding of ore in com-

mercial quantities is problematical. The only safeguards for such a speculative investment are the recommendation of an honest and able mining engineer, the assurance that sufficient cash has been raised to carry out development work as outlined, and that the management be honest and efficient. To assume such chances the investor is warranted in insisting that possible profits should be several times his investment.

In the second class, or mines, the question of a proper return on money invested is dependent on the size of the deposit and the character of the ore. In the case of some of the larger mining companies operating extensive deposits of iron, copper, lead, or gold ores where the life of the deposits can be safely calculated to run for many years, the elements of chance incidental to mining are so far eliminated that the investor would be justified in investing on the basis of 10 per cent annual profit in addition to the return of his capital within the life of the mine. In those companies operating mines where the ore bodies are small, as is the case in most of the precious-metal mines, and "where the profit in sight (the only guarantee in mine investment) is below the price of investment, the percentage of annual return should increase in proportion."

In any event the prospective investor should have submitted to him a written or printed statement covering the following points: name of company or property; location of holdings; area and character of holdings; status of ownership; classification of property, whether a prospect or a mine; character of product. In addition to the above general data there should be submitted, if the property is a prospect, the recommendations of a reliable engineer both as to the possible future of the property and the probable expenditures necessary for exploration and development work. If the property is a mine the statement of the engineer should indicate the amount and character of development work done; the amount and value of the ore developed; the operating costs, either as at present or as estimated; the justified working scale; the life of the developed ore; the probable total and annual profits; and the possibility of finding additional ore. In the case of the owner being a corporation a formal financial statement should be made.

With this information in hand the possible investor is in a position to form some opinion himself regarding the merits of the proposition and intelligently to seek advice of his own engineer, who will advise as to whether or not the purchase should be made, an option taken, or the proposition turned down, as the case may require.

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MINING, PLACER. See GOLD.

MINING CLAIM. See MINES AND MINING, IN LAW.

MINING ENGINEERS, AMERICAN INSTITUTE OF. A society founded in 1871 for the promotion of the arts and sciences connected with the economical production of minerals and metals, the discussion of professional papers, and the circulation of information connected with mining interests. It had a membership at the beginning of 1915 of over 5000, made up of honorary, elected, and associate members. The annual meeting of the institute is held in February, with other meetings during the year as authorized by the council. The institute publishes three volumes of *Transactions* annually and a monthly *Bulletin* which appears on the first of each month. The headquarters of the institute are in the Engineering Building in New York City.

MINING LOCOMOTIVES. See ELECTRIC RAILWAYS; LOCOMOTIVE; COMPRESSED-AIR LOCOMOTIVE; STEAM ENGINE.

MIN'ISTER (Lat., servant). A public functionary who has the chief direction of any department in a state government. (See MINISTRY.) Also the delegate or representative of a sovereign at a foreign court to treat of affairs of state. Every independent state has a right to send public ministers to any other sovereign state with which it desires to preserve relations of amity. Semisovereign states have generally been considered not to possess the *jus legationis* unless when delegated to them by the state on which they are dependent. The right of confederated states to send public ministers to each other, or to foreign states, depends on the nature and constitution of the union by which they are bound together. The constitution of the United Provinces of the Low Countries and of the old German Empire preserved this right to the individual states or princes, as do the present constitutions of the German Empire and Swiss Confederation. The Constitution of the United States either greatly modifies or entirely takes away the *jus legationis* of the individual States. Every sovereign state has a right to receive public ministers from other powers, unless where obligations to the contrary have been entered into by treaty. Diplomatic usage recognizes four orders of public ministers. These, as defined by the Congress of Vienna (1815), supplemented by that of Aix-la-Chapelle (1818), are the following: (1) ambassadors and papal legates or nuncios; (2) envoys and

ministers accredited to sovereigns; (3) ministers resident; (4) chargés d'affaires. Ministers of the first order possess the representative character in the highest degree, representing the state or sovereign sending them not only in the particular affairs with which they are charged, but in all other matters of state; they may claim the same honors as would be accorded their sovereigns if present in person. A principle of reciprocity is recognized in the class of diplomatic agents sent. States enjoying the honors of royalty send to each other ministers of the first class; so also in some cases do those states which do not enjoy them; but it is said that no state not possessed of such honors is entitled as matter of right to the acceptance by a royal or Imperial state of a minister of the first class.

Besides these orders of ministers there are other diplomatic agents occasionally recognized —as deputies sent to a congress or confederacy of states and commissioners sent to settle territorial limits or disputes concerning jurisdiction. These are generally considered to enjoy the privileges of ministers of the second and third orders. Ministers mediators are ministers sent by two powers between which a dispute has arisen to a foreign court or congress where a third power, or several powers, have, with the consent of the two powers at variance, offered to mediate between them.

Ministers sent to a congress or diet have usually no credentials, but merely a full power, of which an authenticated copy is delivered into the hands of a directing minister, or minister mediator.

The title "excellency" has since the peace of Westphalia been accorded to all diplomatic agents of the first class; and in some courts it is extended to ministers of the second class, or at least to those sent by the Great Powers.

By the American system ministers to exercise diplomatic functions at foreign courts are appointed by the President and confirmed by the Senate. See AMBASSADOR; ENVOY; CONSUL, MERCANTILE; DIPLOMACY; DIPLOMATIC AGENTS; INVIOLABILITY. See also CABINET. Consult the authorities referred to under the last three of these titles.

MINISTE'RIAL OFFICER. An officer whose functions consist in executing the command of a superior, or in performing a duty definitely prescribed by law. Its propriety is not left to his judgment or discretion. He is legally bound to perform it; and for a failure to do his duty he is liable in damages to the person in whose favor the duty was to be discharged. A policeman, sheriff, or marshal having a writ for the arrest of a designated person is liable for false imprisonment if he arrests any other person than the one named. Or, he may have arrested the wrong person because of mistaken information, yet having acted with due caution in making his inquiries. In both cases he is liable. As a rule the ministerial officer acts at his peril. Perhaps the harshest application of this rule is seen when he enforces legal process under an unconstitutional statute. If, on appeal, the statute is declared unconstitutional by the highest court of the state, the judges of the lower court are not civilly responsible for their blunder, but the sheriff who seized and sold property under the execution must respond to the owner for its value.

Oftentimes a judicial officer or a legislative body is required to act in a ministerial or executive capacity. Generally speaking, a judge acts ministerially when an application for a writ of *habeas corpus* is made to him. The law does not leave the granting or withholding of this writ to his discretion. A justice of the peace who has rendered judgment in a case before him is under a peremptory duty to issue an execution thereon at the request of the judgment creditor. In issuing or refusing it he acts ministerially, not judicially. If a statute charges a county judge with the duty of selecting jurors for the various courts sitting in the county, his acts under the statute are ministerial. Whether an act required by law of an officer is judicial or ministerial depends upon its character, and not on the rank of the actor. See OFFICER, and the articles there referred to.

MINISTER'S WOOING, THE. A story by Harriet Beecher Stowe, published as a serial in the *Atlantic Monthly* (1859).

MINISTRY. A body consisting usually of the heads of the chief executive or administrative departments of a government, and constituting an advisory council of the sovereign. In several European countries there is a chief minister who has a certain precedence in rank and authority over his colleagues and who is known as the premier or prime minister. In several others the chief minister bears the title of minister president and enjoys a certain precedence in dignity over his colleagues, but exercises no authority over them. Everywhere the right of selecting the members of the ministry belongs to the chief executive. In those countries, like England, where the crown is only the nominal executive, the head of the state selects only the prime minister and intrusts the selection of the others to him. In the German Empire, the Kingdom of Prussia, the Empire of Japan, and the American republics, where the ministers are not responsible to the legislature for their political policy, they are all appointed directly by the chief executive without being restricted to acknowledged party leaders. It is a general rule in European countries that members of Parliament may, with the approval of their constituents, serve as ministers. But, whether members of Parliament or not, ministers are entitled to sit in either House and to participate freely in the discussion of measures in which they are interested.

In general, the term "ministry" is synonymous with the term "cabinet" (q.v.), but there are exceptions. Thus, in Great Britain, the ministry includes, in addition to members of the cabinet, all those political undersecretaries who have seats in Parliament (at present about 40 in number) and who are expected to resign when their policy is defeated in the House of Commons; while the cabinet consists of a certain number of ministers (22 in 1915) who control the policy of the government and preside over the chief administrative departments. Thus it will be seen that not all the ministers are members of the cabinet. On the other hand, it may happen that some members of the cabinet will have no administrative duties. Such members are known as ministers without portfolios. Departments of administration over which ministers are generally placed are: foreign affairs, war, finance, justice, public education, public worship, navy, commerce, post and telegraphs, and colonies. In those countries where ministers are responsible to the chief executive they

act independently of one another in the conduct of their administrative departments, and their responsibility is individual rather than collective.

MINITARI, mē'nē-tä'rē, or HIDATSA, hē-dät'sä. A tribe of Siouan stock (q.v.), closely related to the Crow (q.v.). Since known to the whites they have resided nearly in their present position on the Missouri River in North Dakota in close alliance with the Mandan and Arikara (q.v.). They call themselves Hidatsa, their popular name being of Sioux or Mandan origin and said to signify "people who have crossed over the water." Both they and a detached band of Arapaho were known to the French as Gros Ventres (q.v.). They occupied permanent stockaded villages of circular earth-covered log houses along the bluffs of the Missouri, where they had fields of corn, pumpkins, and sunflowers and made periodic excursions into the open plains to hunt the buffalo, at which times they lived in tepees. Like their allied tribes, they had elaborate ceremonials and social organization. They have been uniformly friendly to the whites. In 1804 they were estimated at 2500, but have decreased rapidly, first from the smallpox of 1837 and later from the diminished food supply consequent upon the destruction of the buffalo. They number now about 547 and live with the Mandan and Arikara upon the reservation at Fort Berthold. Consult Washington Matthews, *Ethnology and Philology of the Hidatsa Indians* (Washington, 1877), and R. H. Lowie, "Societies of the Crow, Hidatsa, and Mandan Indians," in *American Museum of Natural History, Anthropological Papers*, vol. xi (New York, 1913).

MIN'IUM, or RED LEAD. A beautifully scarlet crystalline substance consisting chiefly of lead orthoplumbate, $2PbO{:}PbO_2$. It is made by cautiously heating massicot or white lead in a reverberatory furnace or in special barrel-shaped ovens open at both ends. If heated, minium gradually changes its color, becoming violet and ultimately black; but it regains its original color on cooling. If ignited in the air, minium is converted into the monoxide of lead. Minium is used as a mineral color, yielding a fine paint. It is also employed in the manufacture of flint glass. See LEAD.

MIN'IUS. The Roman name for the river MIÑO.

MIN'IVET. One of a group of about 20 species of small shrikelike birds of the Oriental region. The males are, in general, black and rose, while the females are gray and saffron. Consult Blythe, *Mammals and Birds of Burma* (London, 1875), and other authorities on Oriental ornithology cited under BIRD.

MINK (probably from Swed. *mänk*, mink). Any of several species of weasel-like animals of the genus *Putorius*, family Mustelidæ, distinguished from the martens, stoats, etc., by their semiaquatic habits and certain peculiarities of dentition. Very recently *Putorius* has been considered as a subgenus of *Mustela*. The American mink (*Putorius vison*) is found throughout North America, but especially in the northern and mountainous parts. The European mink (*Putorius lutreola*), usually called norz or mänk, occurs in Finland, Poland, Scandinavia, and Russia and formerly extended as far west as central Germany. The mink of Siberia (*Putorius sibirica*) is a quite distinct but little-known species. The American mink is somewhat larger than the European species (15 to 18 inches long, besides the tail, 9 inches) and is further distinguished by the black upper lip; in the European mink the upper lip is white.

Minks are inhabitants of well-watered areas, haunting the banks of streams and borders of ponds in search of their food and making their homes in burrows which open near the water. They are excellent swimmers, having the feet partially webbed, and spend much time in the water. Although, like other Mustelidæ, they eat birds, small mammals, and eggs, the principal food of minks comes from the water; thus, fish, frogs, salamanders, crayfish, and even mollusks form their chief diet, and muskrats and other water-loving mammals also fall prey to their voracity. The fur of the mink is of great value commercially, though the price varies much with color and quality. (See FUR AND THE FUR TRADE.) Minks are usually brown, sometimes rather light, but more often very dark, especially along the middorsal line. The darker the animal the more valuable it is. The fur is made up of a dense undercoat and an outer coat of long, shining hairs, and the skins from the coldest regions are usually the most valuable. Like all its near relatives, the mink is bloodthirsty and cruel. It is very courageous, and when cornered is savage. The young are born in the early spring, usually in a hole in the bank of some body of water, where plenty of food is easily obtained. The number of young is about six in a litter. The mink is second only to the skunk in the strength, penetrating power, and nauseousness of the odor of the secretion in the anal glands, but fortunately it is only when the animal is greatly enraged that the odor becomes very disagreeable. Minks are said to be easily tamed if taken young, and to enjoy being petted, but their temper is capricious, and as they grow old they become dangerous. Civilization seems to have little effect upon them, there being few districts so completely cleared or densely settled as not to afford them some sort of refuge.

Consult: Audubon and Bachman, *Quadrupeds of North America* (New York, 1851); Elliott Coues, *Fur-Bearing Animals* (Washington, 1879); Stone and Cram, *American Animals* (New York, 1902); E. T. Seton, *Life-Histories of Northern Animals* (ib., 1909); Ned Hollister, "A Synopsis of the American Minks," in *United States National Museum, Proceedings*, vol. xliv (Washington, 1913). See FUR-BEARING ANIMALS.

MINK FROG, HOOSIER FROG, or NORTHERN FROG. A small frog (*Rana septentrionalis*) of the northwestern United States. It is 2¼ inches long from nose to vent, dark olive green above, with sooty-brown bars and blotches, and pure white underneath. Its hazel iris, minky color, and quiet solitary habits distinguish it from others. A detailed account of its features and ecology was given by J. H. Garnier in the *American Naturalist*, vol. xvii (Philadelphia, 1883).

MIN'KOPIS. The inhabitants of the Andaman Islands. See MINCOPIES.

MINKOWSKI, mĭn-kôf'skĭ, HERMANN (1864–1909). A mathematician, born at Alexoten, Russia, but a resident of Germany. He was educated at the universities of Berlin and Königsberg (Ph.D., 1885) and served as a lecturer (1887–93) and assistant professor of mathematics (1893–94) at Bonn and as professor of mathematics at Königsberg (1894–96), at the Zurich Polytechnic (1896–1902), and at Göttingen (1902–09). His publications include: *Geometrie der Zahlen* (1896); *Diophantische Approxima-*

tionen, eine Einführung in die Zahlentheorie (1907); *Gesammelte Abhandlungen* (1911).

MINNA VON BARNHELM, mĭn'nà fŏn bärn'hĕlm. A comedy by Lessing, produced at Hamburg in 1767.

MIN'NEAP'OLIS. A city and the county seat of Ottawa Co., Kans., 128 miles by rail west of Topeka, on the Solomon River and on the Union Pacific and the Atchison, Topeka, and Santa Fe railroads (Map: Kansas, E 4). It derives considerable trade from the adjacent farming and stock-raising country and has grain elevators, flour mills, carriage shops, a foundry, etc. Building stone is quarried in the vicinity. There are a public-school library and municipally owned water works. Pop., 1900, 1727; 1910, 1895.

MINNEAPOLIS. The largest city of the State of Minnesota and the county seat of Hennepin County, situated at the Falls of St. Anthony, on the Mississippi River, above St. Paul, the suburbs of which join those of Minneapolis, the two municipalities being termed Twin Cities (Map: Minnesota, D 6). The river, which divides the city into unequal portions, the main portion being on the right bank, is crossed by a number of massive highway and railroad bridges. The Falls of St. Anthony are in the heart of the manufacturing district.

Minneapolis stands on a gently undulating plateau, 800 feet above sea level, in a picturesque lake region much frequented as a place of resort. There are several lakes within the city limits, and of others in the immediate vicinity, Lake Minnetonka is the largest and most popular. The city is about 10 miles long by 6 in width and has an area of 53 square miles. Its streets are broad and regular. An extensive park system (3783 acres) has been developed, embracing several lakes, 50 parks, and 50 miles of parkway, almost all of which are skirted by a wide boulevard known as the Grand Rounds. Of particular note are Kenwood Boulevard (150 feet wide), Loring and Gateway parks, in the centre of the city, and Minnehaha Park, containing the Falls of Minnehaha, 50 feet in height. Adjoining the park are the beautiful grounds of the State Soldiers Home. Minneapolis has many handsome public and business edifices, besides a number of attractive churches. Among these are the cathedrals of the Immaculate Conception and St. Mark; Central High School; Minneapolis Institute of Arts; the county courthouse and city hall building, erected in 1900 at a cost of $3,500,000 and offering from its main tower, 345 feet high, a superb view of the city; the public library and post office, both fine Romanesque structures; Raddison, Dyckman, and Andrews hotels; and the Plymouth, Andrus, Palace, McKnight, Security Bank, and Soo First National Bank buildings.

Commerce and Industry. The conditions which have contributed most to the industrial development of Minneapolis are the advantages afforded by the Falls of St. Anthony and their convenient location in relation to the abundant grain and timber of the Northwest. Excellent transportation facilities give the city command over these supplies and over the markets of the country, its jobbing trade in 1914 having amounted to about $300,000,000. Twenty-two lines of railway, operated under 10 systems, enter the city, and a complete system of interurban electric lines has been effected. With these advantages Minneapolis has developed into the foremost city of the Northwest, being noted particularly for its manufacturing and wholesale interests. The first manufactory in the State was established at the Falls of St. Anthony. It was used first as a saw mill and then as a flour mill. The power afforded by the Falls has been utilized more and more, until Minneapolis has become the largest flour and lumber market in the world. The water power at the Falls of St. Anthony was developed, previous to 1879, to yield 30,000 horse power, and in 1897 a new dam, giving 10,000 horse power, was completed. The United States government is (1915) constructing a system of locks and dams below the Falls which will add 40,000 horse power and which will place Minneapolis at the head of navigation. For a number of years the lumber industry was most important, but after the introduction of improved processes of flour milling in the seventies, the latter industry surpassed lumber manufacturing and has since rapidly outstripped it. The flour mills in the Falls district are now the largest in the world. The value of their output in 1905 was $62,700,000, while in 1914 this was increased to $90,000,000. Lumber products worth $12,000,000 were made in the same year, and an equal value each of machinery, linseed oil and meal, and food and clothing. Other manufactures brought the total value of the city's industrial output in 1914 to $165,000,000, on an invested capital of $90,000,000. Minneapolis was the first city in the United States definitely to plan a combined factory and residence district wherein industries are guaranteed the trackage and transfer facilities that they need and where workmen may make their homes among natural woods and gardens. In 1914 there were received in the city 200,000,000 bushels of grain, of which 90,000,000 were wheat. Fifty elevators, with a capacity of 40,000,000 bushels, stored and cleaned this grain.

Finance. According to the Minnesota law, assessment is made on a 40 per cent valuation. The assessed valuation of the city in 1914 was $196,303,280. This, at a rate of 35.77 mills, yielded a revenue of $6,644,866.08. Of this amount there was spent: for schools, $2,037,831; for police and fire protection, $1,019,000; for interest on debt, $850,000. The city owns and operates its water works, which, with a recently installed filtration plant, are valued at $1,500,000. Another municipal enterprise is a garbage consumer, from which enough current is obtained to light a considerable portion of the city. The bonded indebtedness is $22,237,200, offset by a sinking fund of $4,087,203 for the retirement of bonds. The city is the home of the Federal reserve bank for the ninth district. Its 25 banks have a capital of $8,000,000 and a total deposit of $120,000,000.

Education. Minneapolis sends 50,000 children to the public schools, and of these 6000 are in the five high schools. The city is coöperating with the Dunwoody Institute, a vocational school for boys, and is itself conducting a similar school for girls. The University of Minnesota (q.v.) is situated here, while other institutions include Stanley Hall, Graham Hall, and St. Margaret's Academy, for girls; Blake School and De La Salle Institute, for boys; Augsburg Seminary (Lutheran), Minnesota College; the Johnson School of Music and the Northwestern Conservatory of Music; the Handicraft Guild and the Minneapolis School of Fine Arts. More than 10,000 pupils attend these schools and the

nine commercial colleges. There is a public library, with 290,000 volumes for circulation from its main building and from 35 branches and stations.

Within the last 10 years the city has made wonderful progress in the arts. The Minneapolis Symphony Orchestra (q.v.) is recognized as one of the best organizations of its kind in America, and the Minneapolis Institute of Arts, dedicated in 1915, together with the private gallery of T. B. Walker, makes the city conspicuous as a music and art centre. The interest in music is manifest in the many choral and orchestral clubs, and the interest in art in the fine sculptural works to be seen in different parts of the city. Notable among these are French's statue of Governor Pillsbury, on the university grounds, and Jacob Fjelde's figure of Ole Bull, in Loring Park, and of Hiawatha, in Minnehaha Park.

Government. Minneapolis is governed under what is known as the Federal plan. A council, consisting of two aldermen from each of the 13 wards, legislates. Its powers, however, are limited by the State to such an extent that the city has endeavored to secure a new charter that will give home rule and result in greater efficiency. The mayor, treasurer, and comptroller are the executive officers. The mayor is in charge of the police. He has the power of veto on all council measures, subject to the usual two-thirds overruling vote. In addition to these officers there are the school, park, and library boards, the members of which are elected; a board of corrections and charities, consisting of the mayor and four of his appointees; and the board of tax levy, composed of the mayor, the presidents of the council, school, park, and library boards, and one county commissioner. This board meets each year to determine the rate. Two elected judges preside over the municipal court. Elections are held biennially. A civil-service commission examines applicants for positions in city offices and on city works. Other special features of the government are the patrol-limits system, by which saloons are confined to a small area in the centre of the city, and a public-morals board, which advises the mayor and the council as to the moral condition of the city.

History. The first white man known to have visited the site of Minneapolis was Father Hennepin. In August of 1680, while on his way to rejoin La Salle, he passed the falls and named them St. Anthony. Various French fur traders followed Hennepin, and Jonathan Carver (q.v.) in 1766 made a journey up the Mississippi and Minnesota rivers. Upon his return he published a glowing account of the country, emphasizing its "exceeding beauty" and its great commercial possibilities. In 1805–06 Lieut. Zebulon Pike was sent into the country of the Sioux to induce them to make peace with the Chippewas and to assert the right of the United States against that of the English traders established on the upper Mississippi. In the treaty that Pike concluded with the Sioux was a clause ceding to the United States a strip of territory extending from the confluence of the Mississippi and Minnesota rivers northward for 9 miles on each bank of the Mississippi. This included the Falls of St. Anthony and the site of Minneapolis. In 1819 the United States government, following the suggestion of Major Long and in compliance with the request of the Astor fur interests, sent Colonel Leavenworth to build a fort at the mouth of the Minnesota. Leavenworth's successor, Col. Josiah Snelling, placed the fort, named for him, on the near-by bluff. In 1823 the government built a mill (where a great mill now stands) for the manufacture of lumber and flour for the fort. Before the land on the east bank of the river had been opened to settlement several of the fort's officers had squatted on claims from which they proposed to control the water-power rights. Franklin Steele held the choice site in 1848, when settlement was legalized. He platted a village, St. Anthony, in that year and built the first commercial saw mill. Maine lumbermen soon hurried to the new village, and it grew rapidly. Shortly afterward a university was established. Like the soldiers, however, the newcomers squatted on government land embraced in the Fort Snelling reservation on the west bank of the Mississippi. Col. John Stevens, holding for Steele a claim facing his town site, built the first house in Minneapolis proper in 1850, on the site of the Union Station. Before the claims were legalized in 1855 a village of considerable importance had developed, but after that date it grew more rapidly than St. Anthony. The settlement, having previously borne several names in succession, was incorporated in 1856 as the town and in 1867 as the city of Minneapolis. In 1872 the city of St. Anthony, directly across the river, which had been settled in 1837 and incorporated in 1855, was annexed. After 1860 the growth of the city was exceedingly rapid. From 1886 to 1893 a large Industrial Exposition was held here, and in 1892 the Republican National Convention met in the Exposition Building. Pop., 1870, 13,066; 1880, 46,887; 1890, 164,738; 1900, 202,718; 1910, 301,408, including 85,938 persons of foreign birth; 1914 (U. S. est.), 343,466; 1920, 380,582. Consult: Isaac Atwater, *History of the City of Minneapolis* (New York, 1893); W. W. Folwell, *Minnesota, the North Star State* (Boston, 1908); H. B. Hudson, *A Half Century of Minneapolis* (Minneapolis, 1910); E. Dudley Parsons, *The Story of Minneapolis* (Minneapolis, 1913).

MINNEAPOLIS SYMPHONY ORCHESTRA. In 1903 a number of music lovers of Minneapolis formed the Orchestral Association of Minneapolis. Having raised a guarantee fund of $10,000, they established the Minneapolis Symphony Orchestra of 60 performers, with Emil Oberhoffer as conductor. Immediately the organization took its place among the foremost symphony orchestras of the United States, and a new fund was subscribed for five years. In 1915 the guarantee fund amounted to $65,000. The number of players was gradually increased from 60 to 90, Mr. Oberhoffer being retained all the time as conductor. At present the orchestra plays about 40 concerts a season in its home town and an average of 130 concerts on tours extending all over the United States. It owns an extensive library.

MIN'NEDO'SA. The chief town of Marquette electoral division, Manitoba, Canada, on Little Saskatchewan River and on the Canadian Pacific Railway, 125 miles west-northwest (direct) of Winnipeg (Map: Manitoba, C 3). Its industrial establishments include five grain elevators, three lumber yards, and a sash and door factory. The town has an electric-light and telephone system. Pop., 1901, 1052; 1911. 1483; 1915 (local est.), 2000.

MINNEHAHA, mĭn'nĕ-hä'hà. The heroine of Longfellow's Indian poem, *Hiawatha,* who is

represented as the daughter of an old arrow maker. The name Minnehaha (Sioux *Mini-haha*, curling water) is borne by a picturesque cascade, about 50 feet high, in the Minnehaha River, a small stream emptying into the Mississippi at Minneapolis, Minn. It may be mentioned that in Longfellow's work the hero has an Iroquois name, the heroine a Sioux name, while the poem itself is based upon the Ojibwa legends published in Schoolcraft's *Algic Researches*.

MIN'NESING'ER. The common name for mediæval German lyric poets, preceding the meistersinger (q.v.), and especially for German court lyrists of the twelfth and thirteenth centuries, because their principal theme was *minne*, or love. Among other subjects of minnesong were nature, religion, patriotism, politics, and homage to princely patrons. Heinrich von Veldeke (q.v.), one of the earliest minnesingers, was also an epic poet. Minne poetry has three epochs. In the first, a little after 1150, with Der von Kürenberc as its earliest-named poet, lyric poetry begins to free itself from the epic; the second is its brilliant period, with Walther von der Vogelweide (q.v.) as its most brilliant example; the third, beginning about 1300, with Oswald von Wolkenstein as its last representative, marks its decline and the rise of the meistergesang, cultivated by the meistersinger (q.v.). The metrical form of these lyrics was at first simple, though somewhat varied, with rhyme and, with decreasing frequency, assonance. Der von Kürenberc's four-line stanza with one extra beat in the last half line became so popular on the Danube that it was adopted by the writers of the Nibelungenlied (q.v.). Under French influence the form became more artificial. Each minnesinger felt a proprietorship in such metrical forms as he had originated. The ditties of early singers such as Dietmar von Aist, Der von Kürenberc, Meinloh von Seveningen, and the burgraves of Regensburg and Rietenburg are marked by simplicity of thought and by absence of repining. The minnesingers, like the troubadours (q.v.), throve in the heyday of chivalry. How deeply each of the minnesingers was influenced by the troubadours, and to what degree they drew upon the traditions and customs of their own land, or finally to what extent they imitated once genuine emotions or spoke from their hearts, is often extremely problematical. Certainly the oldest poems utter true experience and represent the lover as wooing with ardor but proud self-respect; but later, under Provençal influence, he appears as the cringing vassal of his lady love. Some of the most ancient German poems are put into woman's mouth, but we can scarcely conclude that women were therefore among the minnesingers, though several ladies, as, e.g., the Countess of Dia, wrote love poems in Provençal.

With the more artful verses of the Burgrave Rietenburg, Provençal influence becomes clear. To all people *minne* meant love, but to the lordlier poets or to those who sang in their halls *minne* had an exalted significance. The older and far more genuine sentiment between men and women becomes either Platonic affection or sensual desire. We shall find that the minnesingers were merely doing what had been done a little sooner by the troubadours, but the minnesong was not so brilliant, though it was almost as artificial as the poems written in the best period (1100–1260) of Provençal literature (q.v.). The Germans cultivated such forms as were popular in southern France, as the love poem proper, the *sirventes* (q.v.), and the *tenzon* (q.v.). Like the troubadour, the minnesinger sang the praises of his lady, who was often his patron's wife. Of her he made an earthly angel, and whatsoever boon she might grant him was his bliss. The minnesingers whose dialect puts them on the western boundary of Germany first show French influence. Provençal influence is earliest perceptible in Friedrich von Hausen, a Franconian from the Rhine. The dactylic rhythm bears witness also to a romantic origin. Minnesingers who used it were, besides Friedrich von Hausen, Heinrich von Veldeke, Heinrich von Morungen, Hartmann von Aue, Walther von der Vogelweide, Hildbold von Schwangau, and Ulrich von Liechtenstein.

With Friedrich von Hausen we first meet the Crusading song. Walther von der Vogelweide gave the fullest utterance to the minnesong. In him we find both courtly and popular elements. Walther also modeled poems after romantic patterns. Austria was the centre of court poetry. There Reinmar had lived and there Walther had learned his art. Neidhart had first composed for peasants songs and dances, but his ambitious tendencies displeased them and he turned to the court. With Walther and Neidhart the road goes in twain, and each had his followers. Princes had been among the troubadours. So it was in Germany, where Henry VI and Conradin were singing in the south, while farther north were Duke Henry II of Anhalt, Margrave Otho IV of Brandenburg, and Henry III of Meissen.

The most important manuscripts are the Weingarten, the small and the large Heidelberg collections. The last contains 7000 strophes from 140 poets.

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MIN'NESO'TA. One of the North Central States of the American Union. It lies around the headwaters of the Mississippi River, between lat. 43° 30′ and 49° 25′ N. and long. 89° 29′ and 97° 5′ W. It is bounded on the north by the Canadian provinces of Ontario and Manitoba, on the east by Lake Superior and the State of Wisconsin, on the south by Iowa, and on the west by the Dakotas. It has an extreme length north and south of about 400 miles, and east and west of 380 miles, but its average width is only 240 miles. It comprises an area of 84,682 square miles, of which 3324 square miles are water. It ranks tenth in size among the States.

Topography. Minnesota may be said to be divided into three areas which slightly overlap. First, the highland district, which is popularly known as the Height of Land, 1750 feet above sea level, which slopes off in all directions, thus forming the watershed for three great river systems—the Red, the St. Lawrence, and the Mississippi. These highlands include the famous Vermilion, Mesaba, and Cuyuna iron ranges, and are covered with dense forests of pine, hemlock, spruce, and other evergreens, which originally extended southward to within 25 miles of the twin cities, but were terminated on the west by the slope of the Red River valley. Second, the hardwood belt, which fringes the west edge of the evergreen district, but spreads out on the south border to a width of 50 miles, ending in what was called by the Sioux "the Big Woods," a forest of immense maples, elms, oaks, and other varieties that the farmer has not wholly conquered after 50 years of constant cutting. The remainder of the State, including the fertile Red River valley, the counties on the upper Minnesota River, and those of the two southern tiers, is the prairie, treeless save only for the wooded slopes of the streams and the groves planted by the settlers, many of which, however, are now yielding crops of merchantable timber. In the southwest portion of this district the surface is broken by the coteaux des prairies, but these never attain any great height. The lowest parts of the State are the region around the head of Lake Superior and the southeastern section, where the land falls to a height of 600 feet; the very highest part is the Mesabi district, 2200 feet above sea level. The surface of the State shows the glacial action characteristic of the neighboring States, but has retained more of the moraine lakes, which are scattered thickly over the whole surface, whether forest or prairie land, to the total number of over 10,000.

Drainage. The three large river systems referred to provide an adequate drainage for the State, except in a limited area in the region of Red Lake, now drained artificially. The Mississippi receives as its chief tributaries the St. Croix, which makes the Minnesota-Wisconsin boundary line, and the Minnesota, besides innumerable smaller streams, before it leaves the State. Thus it drains over one-half the area. Although the Red River rises in Lake Traverse, less than 2 miles from the source of the Minnesota, and flows northward to Lake Winnipeg in Canada, it receives its chief supply from the west slope of the divide. Along the north boundary the Rainy River, fed by short streams from the Height of Land, finds its way to Lake of the Woods; and into Lake Superior pours the flood of the St. Louis River from the south slope of the divide. Although the Minnesota and Red rivers are reputed "navigable," the Mississippi is the only one of these streams that is much used commercially, except for the power that many of them furnish.

In the south the lakes are often broad and shallow. Three-fourths of them occupy hollows left in the moraines, or deposits of the glacial age, which cover the greater portion of the State. Others, such as Lakes Pepin, Traverse, Big Stone, and Rainy, are river expansions. The lakes vary in size from mere ponds to Red Lake, the area of which is 340 square miles. The other more important bodies are Leech and Winnebigoshish in the plateau region, Mille Lac, and Minnetonka, a popular summer resort for the twin cities. Rainy Lake, on the north border, which has been made accessible to tourists since 1900, is fast becoming the most famous of resorts. In the glacial period an immense lake 700 miles wide was formed in the valley of the Red River. At first it was drained by way of the Minnesota River into the Gulf of Mexico, but as the ice disappeared the lake was drained northward into the Nelson River, leaving a wonderfully rich plain, marked on its east border by successive beach lines. Upon this plain Minnesota farmers have raised great crops of wheat for over 30 years. This ancient basin is known as Lake Agassiz.

Climate. Minnesota lies in the middle of the north temperate zone and in the geographical centre of the continent. This gives it a climate which, although subject to great extremes, maintains an average temperature that makes certain the annual production of a great diversity of grasses, vegetables, and fruits. The average temperatures for January are 15° F. at the southeast corner and 1° F. at the northwest corner. For July it is 70° F. in the south and 65° F. in the north. The temperature has risen to 100° in the shade on occasions in the past 25 years, and on occasions it has fallen to 40° below zero. These extreme temperatures never last more than a day or two at a time. The annual rainfall ranges from 20 inches in the northwest to over 30 inches in the southeast. The rainfall is characterized by a scant precipitation in the winter season and moderately heavy rains during the crop season. There is an annual snowfall of 20 inches in the southwest and nearly 80 in the extreme north. The southern counties have an average relative humidity of less than 70 per cent; the northern counties 75 per cent. The prevailing wind is west in the northern half and southwest in the southern half. Nights are always cool, tempering the heat of summer, and the air is always dry, counteracting the cold of winter. Because of this evenness of summer, as well as for the many advantages that the State offers to those seeking recreation, Minnesota has always been a favorite summer resort. Every year great numbers of campers and excursionists scatter over the State.

Soils. The soils are wholly glacial, and since the outcropping stratified rock is largely limestone, most of the soil derived from this source is very rich—a fine black loam. On the older drift in the southeastern counties, for 30 or 40 miles back from the Mississippi River, there is a coating of loess, a loam of exceptional fertility. Where the Cambrian sandstone outcrops in the east-central part of the State, considerable areas are covered with a light, sandy soil that until recently seemed not at all encouraging for agriculture; but, with improved methods of tilling and with a better understanding of the chemistry of soils, these areas are being brought under cultivation. It is in this part of Minnesota that a great part of the potato crop, that reached a total of 15,000,000 bushels in 1914, is produced. In the old land of the northeast and north-central districts there are areas almost denuded of soil, or covered with a scanty coating of granite drift. In 1914 the people voted to give the forestry board the power to reforest this land and so cause it to produce once more the pine that it has in the past abundantly borne, the only crop that it will

MINNESOTA
SCALE OF STATUTE MILES
0 10 20 30 40 50 60
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80 90 100
County Towns
Railroads
DOMINION OF CANADA
MANITOBA
LAKE OF THE WOODS
KOOCHICHING
BELTRAMI
MARSHALL
KITTSON
ROSEAU
PENNINGTON
RED LAKE
POLK
NORMAN
CLAY
BECKER
HUBBARD
CASS
ITASCA
LAKE OF THE
SAINT LOUIS
LAKE
COOK
LAKE SUPERIOR
Thief River Falls
Crookston
Red Lake Falls
Bemidji
Moorhead
Detroit
Hibbing
Virginia
Ely
Duluth
Two Harbors
Lake of the Woods
Rainy L.
Rainy R.
Red River
Red Lake R.
Lower Red Lake
Upper Red Lake
Big Fork R.
Littlefork
Sturgeon R.
Pelican L.
Vermilion L.
Trout L.
Crane L.
Loom L.
Namakan L.
Kabetogama L.
Pipestone L.
Crow L.
Manitou L.
Whitemouth L.
Turtle R.
Seine R.
La Seine R.
Long L.
Kwetiko L.
Agnes L.
Arrow L.
Brule L.
Burntside L.
White Iron L.
Birch L.
Sand L.
Greenwood L.
Leech L.
Cass L.
Winnibigoshish L.
Pakekama L.
Big Rice L.
Mississippi R.
Grand Portage
Grand Marais
Schroeder
Tofte
Lutsen
Beaver Bay
Knife River
Lakewood
Bayfield
OUTER I.
APOSTLE ISLANDS
PRESQUE I.
MADELINE I.
BEAR I.
SAND I.
Hovland
Arrowhead R.
Pigeon River
Ind. Res.
Nett Lake Ind. Res.
Vermilion Lake Ind. Res.
Cass Lake Ind. Res.
Leech Lake Ind. Res.
White Earth Ind. Res.
Red Lake Ind. Res.
Fond du Lac Ind. Res.
Grand Rapids
Hibbing
Virginia
Ely
Duluth
Two Harbors
Bemidji
Crookston
Thief River Falls
Red Lake Falls
Moorhead
Detroit
Brainerd
Aitkin
Cloquet
Carlton
Superior
Wisconsin
Minnesota
Iowa
North Dakota
South Dakota
Canada

Minneapolis
St. Paul
Duluth
Fergus Falls
Brainerd
Mille Lacs
Little Falls
Sauk Center
Melrose
Alexandria
Morris
Willmar
Litchfield
Hutchinson
Glencoe
Redwood Falls
Marshall
Montevideo
Benson
Ortonville
Watertown
Hastings
Red Wing
Lake City
Wabasha
Winona
Rochester
Austin
Albert Lea
Owatonna
Faribault
Northfield
Le Sueur
New Ulm
Mankato
St. Peter
Fairmont
Jackson
Worthington
Windom
Pipestone
Luverne
Sioux Falls
Aberdeen
Wahpeton
Fargo
Grand Forks
Crookston
Thief River Falls
Bemidji
Park Rapids
Detroit
Wadena
Staples
Long Prairie
St. Cloud
Sauk Rapids
Elk River
Anoka
Stillwater
Hudson
Chisago City
Isanti
Cambridge
Princeton
Mora
Hinckley
Grantsburg
Shell Lake
Spooner
Rice Lake
Barron
Chippewa Falls
Eau Claire
Menomonie
Durand
Fairchild
Neillsville
Black River Falls
Tomah
Sparta
La Crosse
Winona
Whitehall
Alma
Wabasha
Lake City
Red Wing
Hastings
Shakopee
Chaska
Glencoe
Hutchinson
Litchfield
Willmar
Montevideo
Benson
Ortonville
Watertown
Redwood Falls
Marshall
Tracy
Lake Benton
Pipestone
Luverne
Worthington
Windom
Jackson
Fairmont
Albert Lea
Austin
Owatonna
Faribault
Northfield
Le Sueur
New Ulm
Mankato
St. Peter
Rochester
Dodge Center
Kasson
Chatfield
Preston
Houston
Caledonia
Fillmore
Spring Valley
Wykoff
Lanesboro
Rushford
Peterson
Mabel
Canton
Harmony
Ostrander
Spring Grove
Hokah
Brownsville
Freeburg
Genoa
Viroqua
La Farge
Cashton
Sparta
Tomah
Black River Falls
Neillsville
Fairchild
Eau Claire
Chippewa Falls
Menomonie
Durand
Mondovi
Strum
Merrillan
Pray
Whitehall
Alma
Minneiska
Millville
Plainview
Elba
Altura
Winona
Homer
Dover
Eyota
Stockton
Lewiston
Witoka
Dakota
Pickwick
Dresbach
Minnesota City
Rolling Stone
Utica
Saint Charles
Fremont
Hart
Crescent
Bangor
Houston
Brownsville
Freeburg

bear. In the valley of the Red River the silts of old Lake Agassiz occur. On this is raised the immense wheat crop that annually brings to Minnesota great wealth from all parts of the world. Finally, in the Red Lake region there are swamps, once believed to be waste land.

By drainage, however, this land is being opened to cultivation.

In time it will be likely to rival the other soils of the State in productiveness. The formation is of peat, decayed vegetable matter, underlain by clay.

Geology. The northwest corner of the State is Archean, and its east-central portion was once occupied by a large island. These areas now consist of granites and gneisses, which also have been uncovered in the upper valley of the Minnesota River, where there are valuable granite quarries. Shore deposits and lava flows of the earliest age of the Huronian period outcrop in the old lands, cutting into the latter in deep tongues and bands, some of which contain iron-bearing beds of great wealth. The broad Huronian belt, extending southwestward from the Minnesota River, contains the Sioux quartzite, a most beautiful and valuable building stone, and beds of ancient red mud, changed by heat into the far-famed red pipestone of the Indians. The Lake Superior slope is underlain by what is known as Cambrian sandstone, or that formed during the first age of the third period; and the Ordovician rocks, the creation of which immediately followed the Cambrian, occur in the southeastern part of the State. These rocks, referred to as St. Peter sandstone and Trenton limestone, make a combination that has given rise to the bluffs along this part of the Mississippi and to the Falls of St. Anthony. Silurian rocks occur in the valley of the Red River and in some of the southeastern counties, and slight deposits of the Cretaceous are found in various parts of the State. In the Pleistocene came the great ice invasion that, in three successive waves, swept over the northern part of the United States and is most largely responsible for the present surface. The State was almost entirely covered by ice by the first two of these waves, but in the third epoch two great lines of ice met at the centre of the State and flowed southward in a tongue to Iowa.

Mining. The importance of Minnesota as a mineral producer, ranking ninth among the States, comes almost entirely from its iron mines. In its output of iron ore Minnesota far outranks all the other States and contributes both in quantity and value considerably more than half of the iron ore produced and marketed in the United States. By far the largest part of the production is from the Mesabi Range, now the most important iron-producing district in the world. It lies entirely within Minnesota and is the youngest of the great iron ranges. It was opened in 1892 with a production in that year of less than 30,000 tons; in 1894 it produced nearly 2,000,000 tons, in 1902 over 13,000,000 tons, or nearly one-half of the total output of Lake Superior iron ore, and reached its highest producing point in 1913 with 36,378,671 long tons. The Vermilion Range, of the older producing districts, is also entirely within the State, but its production in 1913 (1,536,115 tons) was not quite 5 per cent of the output of the Mesabi Range. Its maximum production was attained in 1902—a total of 2,057,273 tons. The iron-ore production is primarily the output of St. Louis County, whose production approximates 75 per cent of the total output. The iron ore produced in 1913 was 38,658,793 long tons. The production marketed in 1913 was valued at $80,789,025.

Exclusive of iron ore, the value of the mineral products in 1913 was $5,025,508. Of these less important industries the principal products were from the quarries and clay pits, and these were almost equal in value. In 1913 the clay products, exclusive of pottery, were valued at $1,781,017 and the stone products at $1,952,686. The chief quarry products are granite, limestone, and sandstone, while the principal clay product is common brick, with smaller quantities of sewer pipe, fireproofing, front brick, drain tile, pottery, etc. The other commercial products are cement, feldspar, occasional gems, lime, mineral waters, sand and gravel, and sand-lime brick. The total value of the mineral products in 1913 was $85,814,533.

Agriculture. Over one-half of the entire land area is in farms, the proportion of farm land showing a gradual increase from the northern to the southern part of the State. Of an approximate land area of 51,749,120 acres, in 1910, 27,675,823 acres were in farms, of which there numbered 156,137. The improved land in farms amounted to 19,643,533 acres. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was in 1910, $1,476,411,737. Of the total number of farms in 1910, 79 per cent were operated by owners and managers. The percentage operated by tenants is, however, steadily increasing, having been in 1880, 9.1 per cent, in 1890, 12.9 per cent, in 1900, 17.3 per cent, and in 1910, 21 per cent. In 1910 more than 70 per cent of the farms in Minnesota were at least 100 acres in size.

The native white farmers in 1910 numbered 74,710 and the foreign-born white farmers 81,134. Negro and other nonwhite farmers numbered 293. It will be noted that Minnesota is one of the few States in which the foreign-born white farmers outnumber the native white. Of the foreign-born farmers, 22,011 were born in Germany.

The following table shows the acreage, production, and value of important crops as estimated by the United States Department of Agriculture in 1914. The total value of crops in 1909 was $193,451,000, and the combined acreage was 14,731,464, representing 75 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that about three-fourths of the total value of crops in 1909 was contributed by the cereals and about one-eighth by hay and forage. The remainder, representing 13.4 per cent of the total value, consisted mostly of potatoes and other vegetables and of forest products. The

PRODUCTS	Acreage	Prod. bu.	Value
Corn	2,600,000	91,000,000	$47,320,000
Wheat	4,050,000	42,975,000	43,834,000
Oats	3,040,000	85,120,000	34,048,000
Barley	1,378,000	31,694,000	16,798,000
Rye	279,000	5,245,000	4,668,000
Potatoes	270,000	30,780,000	9,850,000
Hay	1,743,000	*3,294,000	20,093,000
Flaxseed	315,000	2,930,000	3,750,000

* Tons.

production of wheat in 1909 amounted to 57,094,412 bushels, valued at $56,007,435. The acreage devoted to this crop was 3,276,911. Oats, the second important crop, had an acreage of 2,977,258 in 1909, the production amounting to 93,897,717 bushels, valued at $34,023,389. Corn and hay and forage came next, with productions of 67,897,051 bushels and 6,036,747 tons, valued at $30,510,145 and $26,724,801 respectively. The acreage was 2,004,068 and 3,946,072 respectively.

The total acreage of potatoes and other vegetables in 1909 was 269,713 and their value was $11,044,391. Excluding potatoes, the acreage of vegetables was 46,021 and their value $3,359,000.

The soils in several portions are admirably adapted to the growing of apples, and these are the most important of the orchard fruits produced. There were grown, in 1909, 1,044,156 bushels, valued at $769,114. Orchard fruits next in importance were plums and prunes. The total value of orchard fruits in the year named was $801,112. In addition to this there were grown 293,805 pounds of grapes, valued at $11,021. The most important of the small fruits is the strawberry, of which 2,730,099 quarts, valued at $268,772, were grown in 1909. The growing of sugar beets is an industry of some importance. There were devoted to this product, in 1909, 2238 acres, and the product was 24,140 tons, valued at $118,625.

Live Stock and Dairy Products. The total value of live stock on the farms in 1910 was $156,771,855. The cattle on the farms on Jan. 1, 1915, according to the estimates of the United States Department of Agriculture were as follows: cattle other than milch cows, 1,208,000, valued at $29,838,000; milch cows, 1,186,000, valued at $63,451,000; horses, 872,000, valued at $101,152,000; sheep, 564,000, valued at $2,594,000; swine, 1,716,000, valued at $21,450,000; mules, 6000, valued at $744,000. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $29,219,406. The milk sold amounted to 53,181,785 gallons, valued at $6,146,512. Butter made amounted to 34,708,669 pounds, valued at $8,593,233. The number of all fowls on the farms in 1910 was 10,697,000, valued at $4,646,960.

Fisheries. In 1908 there were 934 persons engaged in fisheries, the capital invested was $129,000, and the value of products, $192,000. The products present a large variety, but lake herring, German carp, buffalo fish, and catfish are the principal species caught.

Forest Products. The production of rough lumber (in which it ranked twelfth among the States) in 1909 was 1,561,508 M feet B. M. The production of lath was 478,008 M in 1909, and that of shingles, 74,818 M. Of the total output of lumber very nearly five-sixths was white pine, Minnesota supplying slightly more than one-third of the total quantity of this variety of lumber produced in continental United States in 1909. The most important of the other varieties of lumber cut were spruce, tamarack, and hemlock. Minnesota is the leading State in the production of lath, with 12.9 per cent of the total for the United States in 1909. In addition to the foregoing, there were produced on the farms in 1909 forest products valued at $5,181,508.

Manufactures. Minnesota is of less importance as a manufacturing than as an agricultural State. Its large mineral output contributes little to its manufactures, as most of the products are shipped out of the State, but its extensive forests and large wheat fields furnish raw material for the two most important industries. The value of manufactured products per capita in 1909 was $197. In that year Minnesota ranked thirteenth among the States in the gross value of products.

The table on page 749 gives the most important figures relative to manufactures in 1909 and 1904.

Minnesota is the leading State in the Union in the value of the products of flour and grist mills, contributing 15.7 per cent of the total in 1909. Its importance in this industry is due to its large production of wheat, to its advantageous geographic location, particularly with respect to the adjoining grain-growing States, and to the excellent and modern facilities afforded for handling grain both by rail and by water. In both 1904 and 1909 Minnesota ranked first in the quantity and value of its wheat-flour products milled, third in respect to its barley and oat products, and fourth in respect to its rye products. In 1909 there were produced 22,712,534 barrels of white flour, or more than one-fifth of the total output of this cereal product in the United States. Second in value of products are the industries connected with the manufacture of lumber and timber. In addition to the logging plants, these include saw mills, planing mills, and wooden packing box factories. For further statistics in regard to this industry, see *Forest Products*, above. Pork is the most important product of the meat and slaughtering industry, while butter forms the chief output of the dairies. (See *Live Stock and Dairy Products*, above.) Radical changes in the methods of agriculture and the rotation of flax with other crops have made it more profitable to raise flax, thereby stimulating the manufacture of linseed oil. The growth of this industry has been remarkable, for while in 1899 there were only three establishments manufacturing this oil and its output was valued at only $1,548,000, the output in 1909 was valued at $11,037,000. In the manufacture of malt liquors the State takes high rank. Other important industries not shown separately in the table are those engaged in the manufacture of belting and hose, leather, iron and steel, millinery and lace goods, pottery and fireclay products, and steam packing.

The total number of wage earners in 1909 was 84,767, of whom 73,259 were males. For the great majority of wage earners the usual hours of labor ranged from 54 to 60 a week, only 16.7 per cent of the total being employed in establishments where the hours were less than 54 and only 4.1 per cent in establishments where they exceeded 60 a week.

In 1909 the eight cities of over 10,000 population produced 64 per cent of the total value of manufactured products and had 66.9 per cent of the average number of wage earners. The most important manufacturing city is Minneapolis (q.v.), which had, in 1909, 26,962 wage earners and manufactured products valued at $165,404,680. The most important industries of the city are those connected with the manufacture of flour. St. Paul (q.v.) is the second city in value of manufactures. There were here, in 1909, 19,339 wage earners, and the value of its manufactured products was $58,990,025.

Transportation. The State has very favorable facilities for both water and rail transportation. St. Paul and Minneapolis form one of the most important centres for transcontinental railway traffic, while Duluth, at the west end of Lake Superior, has larger shipments by water than any other city on the Great Lakes, and ranks as one of the important ports of the United States. Transportation on the Mississippi River was formerly very important, but has decreased on account of the development of the railroads. On the St. Lawrence system, however, it has greatly increased. The availability of lake transportation has been one of the greatest factors in the development of the

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	5,561	104,406	84,767	$275,416	$47,471	$409,420	$127,798
	1904	4,756	83,301	69,636	184,903	35,843	307,858	97,304
Boots and shoes, including cut stock and findings	1909	18	2,949	2,664	5,729	1,290	7,568	2,633
	1904	17	1,937	1,714	2,432	719	4,170	1,538
Butter, cheese, and condensed milk	1909	784	1,971	1,184	4,752	829	25,287	2,580
	1904	771	1,563	1,041	3,305	634	12,871	1,731
Cars and general shop construction and repairs by steam-railroad companies	1909	28	8,681	8,232	13,183	5,586	12,631	6,137
	1904	24	6,139	5,767	6,961	3,300	7,380	3,664
Flour-mill and gristmill products	1909	322	6,890	4,345	38,595	2,782	139,136	14,919
	1904	363	5,733	4,481	34,857	2,651	122,059	12,998
Foundry and machine-shop products	1909	247	7,273	6,002	16,873	3,904	15,609	8,424
	1904	188	4,799	4,022	8,578	2,416	9,509	5,094
Liquors, malt	1909	65	2,238	1,653	20,733	954	10,568	8,225
	1904	76	1,368	1,035	13,552	670	6,178	4,439
Lumber and timber products	1909	525	22,304	20,704	49,128	10,918	42,353	21,488
	1904	332	21,878	20,471	34,884	10,309	42,033	24,235
Oil, linseed	1909	6	433	374	4,764	250	11,037	1,352
	1904	5	387	353	3,201	204	7,018	929
Printing and publishing	1909	950	9,078	5,641	13,905	3,507	15,982	11,886
	1904	919	7,410	4,613	8,807	2,633	11,564	8,777
Slaughtering and meat packing	1909	30	2,452	1,921	7,881	1,129	25,754	3,598
	1904	29	1,691	1,376	3,437	788	17,589	2,485

mining industry. The southern and western parts of the State are well supplied with railroads. The total mileage of main line in 1914 was 9002. The most important lines and their total mileages are: the Great Northern, 2100; the Chicago, Milwaukee, and St. Paul, 1230; the Northern Pacific, 1039; the Chicago and Northwestern, 650; the Chicago, St. Paul, Minneapolis, and Omaha (Chicago and Northwestern), 431; the Chicago Great Western, 399; the Minneapolis and St. Louis, 378; the Duluth, Messabe, and Northern, 363; the Duluth and Iron Range, 291; the Chicago, Rock Island, and Pacific, 236; and the Chicago, Burlington, and Quincy, 24. The State has a railroad and warehouse commission, which hears and passes judgment upon complaints. The efforts of this commission to regulate railroad rates on interstate railroads resulted in several important decisions in regard to railroad rates by the State courts and by the United States Supreme Court. For a discussion of these matters, see RAILWAY.

Banks. The first banking law of Minnesota was passed in 1858, at the first session of the Legislature; the law was amended in 1878, placing the banks under the control of the Public Examiner, who is ex-officio superintendent of banks. The law was amended and made more stringent in 1881, 1889, and 1895. Banking business in the State was unprofitable at first and all the State banks organized in 1858–68 were discontinued. In 1878 there were 17 and, in 1898, 161 banks in operation. Savings banks are regulated by the Law of 1879, which placed them under the jurisdiction of the Bank Commissioner. On Sept. 12, 1914, there were 274 national banks, with an aggregate capital of $26,121,000; surplus, $16,373,455; cash, etc., $6,491,927; loans, $214,532,714; and deposits, $218,559,741. On June 30, 1914, there were 818 State banks, with capital of $16,024,878; surplus, $5,153,878; cash, $5,709,005; loans, $135,990,834; and deposits, $146,899,883.

Government. The present constitution was adopted on Oct. 13, 1857, and succeeded the organic Act providing for a territorial form of government passed on March 3, 1849. Amendments to the constitution may be made by a majority of both Houses of the Legislature, becoming a part of the constitution when approved by a majority vote of the people. A convention to revise the constitution may be called whenever two-thirds of the members of each branch of the Legislature think it necessary and the

proposition shall have been favorably voted upon by the electors.

Legislative.—The Legislature consists of a Senate and a House of Representatives, which meet biennally. No session must exceed 90 legislative days. The number of members who compose the Senate and the House of Representatives is prescribed by law, but the members of the Senate shall never exceed one member for every 5000 inhabitants, and in the House of Representatives one member for every 2000 inhabitants. The House of Representatives has the sole power of impeachment. Representatives hold office for two years and Senators for four years.

Executive.—The executive power consists of a Governor, Lieutenant Governor, Secretary of State, Auditor, Treasurer, and Attorney-General. The term of the Governor and Lieutenant Governor is two years. Each must have attained the age of 25 years and have been a resident of the State for one year next preceding his election. The term of the Secretary of State, State Treasurer, and Attorney-General is two years. The term of the State Auditor is four years. The Lieutenant Governor is ex-officio president of the Senate.

Judiciary.—The judicial powers are vested in a supreme court, district courts, courts of probate, justices of the peace, and such other courts, inferior to the supreme court, as the Legislature may from time to time establish by a two-thirds vote. The supreme court consists of one Chief Justice and four associate justices, elected for a term of six years, and two commissioners appointed by the court. The State is divided into judicial districts, which are composed of contiguous territory. In each district one or more judges, as the Legislature may prescribe, are elected for a term of six years. There is a probate court in each organized county, and its judge is elected for a term of two years. Justices of the peace are elected in each county for two years.

Suffrage and Elections.—Every male person of the age of 21 years and upward who is a citizen of the United States and who has resided in the State six months next preceding any election is entitled to vote. This includes mixed and pure Indians who have adopted the customs and habits of civilization. Women may vote for school officers and members of library boards, and are eligible to hold any office pertaining to the management of schools or libraries. General elections are held biennially, on the first Tuesday after the first Monday in November, dating from 1884. In accordance with the amended election laws of 1912, a State-wide primary is held on the Tuesday seven weeks preceding any election, for the selection of party and other candidates for all elective State offices and those of cities of the first and second class. There are nonpartisan primary ballots for the judiciary and other offices. Candidates for office are chosen at primary election by voters of the several political parties and not otherwise. Candidates are limited in the character of personal expenditures incurred in connection with their campaigns, and the total of all expenses must not be above limits specified for the various offices. All campaign literature must bear the name of its author, and the inducing of persons to become or not to become candidates for office is prohibited. Wagering on elections is a violation of the law. Candidates must make itemized statement of all disbursements. Corporations are prohibited from making political contributions. The Legislature of 1911 passed an Act providing for the direct nomination of United States Senators. By a law passed in 1912, Minneapolis, St. Paul, and Duluth are required to have nonpartisan primaries for municipal officers. The Legislature of 1913 enacted a measure providing for presidential primaries, and the nonpartisan primary was extended to members of the Legislature.

Local and Municipal Government.—The Legislature may from time to time establish and organize new counties; but no new county shall contain less than 400 square miles, nor shall any county be reduced below that amount. The Legislature may organize any city into a separate county, when it has attained a population of 20,000 inhabitants, without reference to geographical extent, when a majority of the electors of the county in which such city is situated shall be in favor of a separate organization. Cities and towns have the power to adopt a home-rule charter. Cities of the first class with home-rule charters may regulate the sale of liquor in hotels.

Miscellaneous Constitutional and Statutory Provisions.—No corporation may be formed under special acts except for municipal purposes. Married women retain the same legal existence and personality as before marriage, may sue or be sued, and, with the exception of voting, receive equal protection of all their rights. Combinations to monopolize the markets for food products, or restrict the freedom of such markets, are criminal conspiracies. The sale of cigarettes in the State is forbidden. There are restrictions in the character of employment of children. The maximum hours of employment for children are 8 per day and 48 per week; for women, 10 hours per day and 58 per week for certain occupations and 9 hours per day and 54 per week for others. County boards are authorized to appropriate money to prevent the spread of tuberculosis. Five-sixths of a jury may return a verdict in civil cases after 12 hours' deliberation. There is a "blue-sky" law relating to insurance companies only. The Legislature of 1913 passed a workmen's compensation act and created a minimum-wage commission to regulate the wages of women and minors. The Legislature of 1913 also enacted a measure providing for mothers' pensions in the State. Minnesota is under local-option law.

Finance. By the constitution of 1857 the State was prohibited from incurring debts for public improvements above $250,000. An amendment adopted in 1858, however, permitted the issuing of $5,000,000 of 7 per cent bonds to lend to the railroads under guaranty of first-mortgage bonds. Less than half of these bonds were sold, the railroads defaulted the interest on their mortgage bonds, and the State acquired their property by foreclosure. The State was unable to meet the interest payment, and in 1860 the debt on these bonds was repudiated. In 1881 the obligations were resumed, when the old bonds were exchanged for new ones at the rate of 50 per cent. This gave the State a debt of $4,253,000, which was gradually reduced. In 1912 it amounted to $900,000. This consists entirely of certificates of indebtedness, held largely by the school fund. The floating debt in 1912 consisted of outstanding warrants

amounting to $445,290. The funds and investments in 1912 amounted to $30,265,400. The per capita debt in that year was 63 cents. The total receipts from all sources for the fiscal year ending July 31, 1914, amounted to $22,680,208. The disbursements for the same period amounted to $20,714,746. There was a balance at the beginning of the year of $1,842,367 and at the end of the year of $3,807,830. The chief sources of revenue are railroad taxes, general taxes, the twine plant at the State prison, and permanent trust funds.

Militia. In 1910 the males of militia age, between 18 and 44 years, numbered 491,113. The organized militia consisted, in 1914, of three regiments of infantry and one of field artillery. There were 217 officers and 2706 enlisted men.

Population. In 1910 Minnesota ranked nineteenth in population among the States. The population by decades since its organization as a Territory is as follows: 1850, 6077; 1860, 172,023; 1870, 439,706; 1880, 780,773; 1890, 1,310,285; 1900, 1,751,394; 1910, 2,075,708. The est. pop. on July 1, 1914, was 2,213,919; 1920, 2,387,125. In 1910 the population per square mile was 25.7. The urban population in places of 2500 or over was 850,294 in 1910. The native white population numbered 578,081; the foreign-born white, 543,010; and the negro, 7084. There were also 9053 of Indian parentage. Of the foreign-born white those of Swedish, German, and Norwegian origin predominated, in the order named. These three nationalities contributed about 62 per cent of the total foreign-born population, which was about equally divided among them. By sex the population was divided into 1,105,511 males and 967,197 females. Males of voting age numbered 642,069.

There were but eight cities in 1910 that had populations of 10,000 or over. These, with their populations in 1910 and as estimated in 1914, are: Minneapolis, 301,480 and 343,466; St. Paul, 214,744 and 236,766; Duluth, 78,460 and 89,331; St. Cloud, 10,600 and 11,425; Virginia, 10,473 and 13,671; Mankato, 10,365; Stillwater, 10,108; Winona, 18,583. (There were no estimates for 1914 for the last three cities named.)

Education. The high standards of education in Minnesota are reflected in the relatively small portion of illiterates. In 1910 there were 49,336 persons of 10 years of age or more who were illiterate, a proportion of 3 per cent of the entire population. Among the whites of native parentage the percentage was four-tenths of 1 per cent and among foreign-born whites 7.6 per cent. The school population, ages 6 to 20 years, in 1910 was 648,775; of this number 443,761 attended school. According to the report of the State Superintendent of Education the total enrollment in public schools in 1914 was 457,041; the total number of teachers was 16,920, of whom 7966 were in high and graded districts and 8954 in rural districts. The average monthly salary of men teachers in rural districts was $58 and of women teachers $49. The total disbursements for educational purposes in public schools in 1914 was $19,396,782. The State gives special aid to schools which maintain training and agricultural departments, and to high and graded schools, consolidated schools, and rural schools. There were, in 1914, 26 vocation training schools, in which were enrolled 2927 pupils. The Legislature of 1913 enacted a law which requires definite training of all persons who enter upon teaching in the public schools.

The Legislature of 1911 enacted a compulsory-education law which is unusually comprehensive. The same Legislature passed a law regulating prices of textbooks, which, on the vote of the district or of the school board, may be supplied free or sold at cost.

Normal schools are maintained at Winona, Mankato, St. Cloud, Moorhead, and Duluth. The total enrollment in these schools in 1914 was 4166. The University of Minnesota, which is part of the educational system of the State, is at Minneapolis. Other institutions of collegiate rank are Carleton College and St. Olaf College at Northfield, Hamline University at St. Paul, Macalester College at St. Paul, and Gustavus Adolphus College at St. Peter. These are all coeducational. Albert Lea College at Albert Lea is the only women's college. St. John's University (Roman Catholic), at Collegeville, and Augsburg Seminary, at Minneapolis, are colleges for men only.

Charities and Corrections. The charitable and correctional institutions are in the hands of the State Board of Control, created in 1901. It consists of three members appointed by the Governor and Senate for the term of six years, and has full power to manage and control the State charitable and penal institutions, with authority in financial matters in certain State schools, including those for the deaf and blind. The State institutions include asylums for the insane at Anoka, Hastings, Fergus Falls, Rochester, and St. Peter; the Institution for Feeble-Minded and Epileptic, the Institution for the Blind, and the Institution for the Deaf at Faribault; the State Public School at Owatonna; Training School for Boys at Red Wing; Training School for Girls at Sauk Centre; the State Reformatory at St. Cloud; the Penitentiary at Stillwater; the State Sanatorium, for tuberculosis, at Walker; the Inebriate Hospital at Willmar; the State Hospital for Crippled and Deformed Children at St. Paul. The total number of inmates at these institutions on July 31, 1913, was 9212. The expenditure for their maintenance was $1,860,484. A new State prison at Stillwater was erected in 1913–14. The chief industry at the prison is the manufacture of twine. The product in 1913 was 18,000,000 pounds, and the profit was $372,354. Since the twine system was established the profits have aggregated $2,158,601. The manufacture of farm machinery has also been carried on successfully in the prison. The State hospital for the care of inebriates and persons addicted to the drug habit was opened in December, 1912. The Legislature in 1911 provided for the indeterminate sentence of prisoners convicted of any crime except treason and murder, and for a State board of parole. Life imprisonment was substituted for death as a punishment for murder in the first degree.

Religion. The noteworthy characteristic of the religious situation in Minnesota is the great predominance of the Roman Catholic and the Lutheran churches. The strongest of the other denominations represented are the Methodists, Baptists, Presbyterians, Congregationalists, and Protestant Episcopalians.

History. Radisson and Groseilliers, Frenchmen, visited, probably in 1660, what is now Minnesota. About 1678 Daniel Du Luth built a fort at the mouth of the Pigeon River, on the north

shore of Lake Superior. In 1680 the Falls of St. Anthony were discovered by Louis Hennepin, a Franciscan priest. Before 1700 there were trading posts on Lake Pepin and on the Minnesota River. A part of Minnesota was included in the extensive territory ceded by France to Great Britain in 1763. In 1766 it was explored by Capt. Jonathan Carver, of Connecticut. In 1783 it became a possession of the United States. The part of the State east of the Mississippi belonged at different periods to the Territories of Indiana, Michigan, and Wisconsin, Northwest Territory, and Illinois Territory. The region west formed part of the Territories of Missouri (earlier District of Louisiana), Michigan, Wisconsin, and Iowa. The government in 1805 bargained with the Indians for tracts of land at the mouths of the St. Croix and Minnesota as sites for military posts. The exploring expedition of Lieutenant Pike in 1805 was followed by many others within the succeeding 40 years; and with an increased knowledge of the country came the first important beginning of immigration. Fort St. Anthony (Snelling) was built in 1819–21; in 1822 a clearing was made at the Falls of St. Anthony and a mill was built, and in 1823 the first steamboat ascended to the falls. The next settlements made were by a colony of Swiss, near Fort Snelling in 1827, and at Stillwater in 1843. Two years before this latter date Father Galtier had erected a log chapel a little southeast of the Falls of St. Anthony and dedicated it to St. Paul. This was the nucleus of the present city of that name. The Indian titles to the lands east of the Mississippi were not extinguished until the year 1838, and it was not until March 3, 1849, that the Territory of Minnesota was organized, with the Missouri River as its west boundary. In 1851 the Indian titles to the lands (except reservations) between the Mississippi and the Red River of the North were extinguished and immigration increased rapidly. On May 11, 1858, Minnesota was admitted as a State. The educational institutions for which the State is noted took their rise early in the history of the Territory. Hamline University, at St. Paul, was founded in 1854, and St. John's University, at Collegeville, was established three years later. In 1862 the Sioux Indians, under Little Crow, dissatisfied with the settlers' treatment of them, attacked and destroyed many of the frontier settlements. Over 500 white settlers and soldiers were killed and 25,000 people were driven from their homes. The Indians were decisively defeated at Wood Lake on Sept. 22, 1862, and after engaging in sporadic raids in 1863 were removed west of the Missouri. In spite of the horrors of Indian war, immigration continued undiminished; it was stimulated by the activity of immigration agents in the Eastern States and Europe, and was encouraged by the enactment of liberal homestead laws. From the sale of its extensive public lands the State obtained a very large school fund, which it employed in building up an admirable school system.

Minnesota was consistently Republican in State politics from 1860 to 1898, when the Democrats, Populists, and Silver Republicans defeated the Republicans and elected their candidate for Governor. The Republicans regained power in 1901 and held it until 1905, when the personal popularity of the Democratic candidate, John A. Johnson, secured his election. The Republicans, however, controlled the other State offices. Governor Johnson was reëlected for three successive terms. In 1908 he had become so prominent a national figure that he was one of the leading candidates for the Democratic presidential nomination and the delegates from Minnesota were instructed to vote for him in the National Convention.

In the presidential election of 1908 Taft carried the State with 155,416 votes compared with 109,504 for Bryan. Governor Johnson was reëlected, but died on Sept. 20, 1909, and was thereupon succeeded by Lieutenant Governor Eberhart, a Republican. Governor Eberhart was elected in 1910. In 1911 Moses E. Clapp was reëlected United States Senator.

A new primary law providing for the nomination of State officers and delegates for the National Convention went into effect in 1912. The Progressive party developed great strength in that year, and in the presidential election Roosevelt received 125,856 votes compared with 106,426 for Wilson and 64,644 for Taft.

In 1914 the Democrats regained power, electing W. S. Hammond Governor with 156,304 votes compared with 143,730 for W. E. Lee, Republican. The Progressive vote fell from 128,856 in 1912 to 3553 in 1914. The State has 12 votes in the Electoral College. The capital is St. Paul.

The following is a list of Governors of Minnesota since its organization as a territory:

TERRITORIAL

Alexander Ramsey		1849–53
Willis A. Gorman		1853–57
Samuel Medary		1857–58

STATE

Henry H. Sibley	Democrat	1858–60
Alexander Ramsey	Republican	1860–64
Stephen Miller	"	1864–66
William R. Marshall	"	1866–70
Horace Austin	"	1870–74
Cushman K. Davis	"	1874–76
John S. Pillsbury	"	1876–82
Lucius F. Hubbard	"	1882–87
Andrew R. McGill	"	1887–89
William R. Merriam	"	1889–93
Knute Nelson	"	1893–95
David M. Clough	"	1895–99
John Lind	Democrat-Populist	1899–1901
Samuel R. Van Sant	Republican	1901–05
*John A. Johnson	Democrat	1905–09
Adolph O. Eberhart	Republican	1909–15
William S. Hammond	Democrat	1915–17
Joseph A. A. Burnquist	Republican	1917–21
J. A. O. Preuss	"	1921–

* Died in office.

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MINNESOTA, UNIVERSITY OF. A coeducational State institution of higher learning in Minneapolis, Minn., established by an Act of the Territorial Legislature in 1851 and confirmed by the State constitution adopted in 1857. The present charter was adopted in 1868, and the first collegiate work was begun in the following

year. Its government is vested, since the death in 1901 of the life regent, John S. Pillsbury, in a board of 12 regents, nine appointed by the Governor of the State and holding office for six years, and three ex-officio members—the Governor, the State Superintendent of Public Instruction, and the president of the university. The university comprises the following colleges, schools, and departments: 1. The Graduate School, with advanced courses in all branches. 2. The College of Science, Literature, and the Arts, offering four-year courses, largely elective, leading to the degree of bachelor of arts, courses in which the senior work is offered conjointly with the Schools of Law, Medicine, Dentistry, and Chemistry, leading to the same degree; a four-year course in arts and music, leading to the degree of bachelor of arts and music; also a four-year course in science and medicine, leading to the degree of bachelor of science. 3. The College of Engineering and the Mechanic Arts, offering five-year courses in civil, mechanical, electrical, and architectural engineering and architecture, leading to the degrees of civil, mechanical, electrical, and architectural engineer and architect. The degrees of bachelor of science in engineering and in architecture are conferred at the end of the fourth year. 4. The Department of Agriculture, embracing (*a*) the Colleges of Agriculture and Forestry, offering four-year courses, leading to the degrees of bachelor of science in agriculture, in home economics, and in forestry; (*b*) the Schools of Agriculture, offering three-year courses adapted especially to the needs and opportunities of farm boys and girls; (*c*) short courses in dairying, farm management, and traction engineering; (*d*) the experiment stations, offering research advantages; (*e*) extension work in agriculture. 5. The Law School, giving a three-year course, leading to the degree of bachelor of laws. 6. The Medical School, with a five-year course, including one year of hospital interneship, leading to the degree of doctor of medicine. 7. The College of Dentistry, with a three-year course, leading to the degree of doctor of dental surgery. 8. The College of Pharmacy, offering a two and a three year course, leading to the degrees of graduate in pharmacy and pharmaceutical chemist respectively. 9. The School of Mines, offering three five-year courses, leading to the degrees of engineer of mines, engineer of mines in geology, and metallurgical engineer. 10. The School of Analytical and Applied Chemistry, with two five-year courses, the Applied Course leading to the degree of chemical engineer, the other, offered conjointly with the College of Science, Literature, and the Arts, leading to the degrees of bachelor of arts and bachelor of science in chemistry; and a four-year course in analytical chemistry, leading to the degree of bachelor of science in chemistry. 11. The College of Education for the training of teachers and supervisors, with a two-year course, leading to the degree of bachelor of arts in education. 12. The University Extension Service, offering educational opportunities to the people of the State through (*a*) correspondence courses, (*b*) evening classes, (*c*) lecture courses, (*d*) field debates on public questions, (*e*) a reference bureau. The university also has charge of the geological and natural history survey. The degrees conferred for graduate work are the master's degree in arts, science, and pharmacy, and the doctor's degree in philosophy and medicine. No honorary degrees are conferred. The departments of law, medicine, and education require two years of collegiate preparation. In all other departments students are admitted on examination or on certificate from accredited schools of the State. Tuition ranges from $30 to $150 a year. In 1913–14 the faculty numbered 608 and the attendance was 8992, of whom 3529 were women. Of this number 4155 were of college grade, 3209 subcollegiate, and 1628 extension. The general library contained 175,000 volumes, and there were special libraries in connection with the various departments of instruction. The laboratories are extensive and well equipped. There is an herbarium with 400,000 specimens. There are dormitories for the School of Agriculture, and one dormitory accommodating 90 women on the main campus. The main university grounds comprise about 109 acres, valued at $2,000,000. The 32 buildings are valued at $3,463,000, and their equipment at about $1,805,000. The State experimental farm, located between Minneapolis and St. Paul, consists of about 420 acres, and is valued at $413,000. The buildings and equipment of the Department of Agriculture are estimated at $1,480,000. The university is supported by the income of its permanent endowment, a State tax of $\frac{2.3}{100}$ mill, and special legislative appropriations for support, buildings, and equipment. The gross income for 1913–14, exclusive of special appropriations, was $2,445,491. The endowment was $1,605,356.62, and the value of all the university property, $12,112,000. George Edgar Vincent has been president since April, 1911. Consult E. E. Slosson, *Great American Universities* (New York, 1910).

MINNESOTA RIVER. An affluent of the upper Mississippi (Map: Minnesota, D 6). It rises on the east slope of the Dakota foothills (Coteau des Prairies) in the northeastern part of Marshall Co., S. Dak., at an elevation of about 1896 feet above sea level. It flows southeastward to the State line, where it enters Bigstone Lake, which is 26 miles long, from 1 to 1½ miles wide, and shallow. This upper reach of the river often runs dry. The river leaves the lake at Ortonville and flows southeast to Mankato (225 miles), where it turns abruptly and thereafter flows northeast to its junction with the Mississippi, a few miles below the Falls of St. Anthony and between the cities of Minneapolis and St. Paul. Its total length is about 470 miles, and its drainage basin of 16,600 square miles extends nearly across the southern part of the State. It is by far the largest confluent of the Mississippi in Minnesota. Its chief tributaries are Pomme de Terre and Chippewa rivers from the north, and Lac qui Parle, Redwood, Cottonwood, and Blue Earth rivers from the south. It is navigable for steamers 45 miles, and at high water small vessels can ascend it 295 miles, beyond which it is obstructed by falls and rapids.

MINNEWAUKON, mĭn'nē-wą'kŏn, Lake. The largest lake in North Dakota, more frequently known as Devil's Lake (Map: North Dakota, G 1). It is situated in the northeastern part of the State and is 40 miles long and from 2 to 12 miles broad.

MINNEWIT, Peter. See Minuit, Peter.

MINNOW (ME. *menow*, from AS. *myne*, minnow, probably from AS. *min*, Icel. *minnr*, Goth. *minniza*, OHG. *minniro*, Ger. *minder*, Lat. *minor*, less, Gk. *μινύθειν*, *minynthein*, to lessen, Skt. *mī*, to diminish). The name popularly ap-

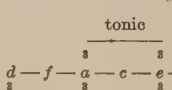
plied to almost any small fish. More technically it applies to members of the family Cyprinidæ, which includes the roach, dace, carp, etc.; specifically, in England, *Leuciscus phoxinus*. This is a small fish about 3 inches long; abundant in gravelly bottomed streams. It is, of course, unimportant as food except for larger fishes. In the United States the name usually belongs to various small cyprinodonts, mainly of the large genus *Notropis*, living in the lesser streams and frequently called shiners. The largest and best known of these is the golden shiner (*Notropis hudsonius*), which has a very small head, but is sometimes a foot in length. (See DACE.) These fishes are mostly bottom feeders, are oviparous, carnivorous, and devour much spawn of their own and other kinds of fishes. The top minnows are of a different group, being killifishes (q.v.) of the genus *Gambusia*, and take their name from their surface-feeding habits. Along the eastern and southern coasts the common minnow of brackish water is the mummichog (q.v.). Consult D. S. Jordan, *Fishes* (New York, 1908), and id., *Manual of the Vertebrates of the Northern United States* (11th ed., rev. and enlarged, Chicago, 1914). See Plates of CARPS AND THEIR EUROPEAN ALLIES; DACE AND MINNOWS; KILLIFISHES AND TOP MINNOWS.

MIÑO, or in Portuguese **MINHO,** mē'nyō (Lat. *Minius*). The principal river of Galicia, in northwest Spain (Map: Spain, B 1). It rises in the mountains of the Province of Lugo and flows in a southerly and southwesterly direction, forming a part of the boundary between Spain and Portugal, until it enters the Atlantic through a wide estuary. Its total length is 211 miles, for the last 25 of which it is navigable for small vessels, but it is much obstructed by reefs, islands, and shifting sand banks. Its banks are very fertile, and salmon and lamprey abound, yielding a considerable industry.

MINO'AN CIVILIZATION. See ARCHÆOLOGY, II, *Minoan, or Ægean, Period;* CNOSUS; CRETE; EVANS, SIR ARTHUR; GOURNIA.

MINO DA FIESOLE, mē'nō dȧ fyā'zō-lȧ (1431–84). A Florentine sculptor of the early Renaissance. He was born at Poppi in the Casentino valley. While employed as a stonemason at Florence he became the friend and pupil of Desiderio da Settignano. His home was at Florence, but there is documentary evidence to show that he was employed at Rome in 1454, 1463, and 1464. In 1473 he was working upon the monument to Pope Paul II, of which there are fragments in the Grotte Vaticane, under St. Peter's Church, and from 1475 to 1480 he executed various commissions under Sixtus IV. He died at Florence, July 11, 1484. His work possesses great charm and delicate finish, but is lacking in originality. Its high reputation is due to rich decoration and to a certain naïveté of expression, especially in his numerous portrait busts, which were executed under the influence of Desiderio da Settignano and are his best work. Besides these his chief works are monuments, altars, and tabernacles in the churches of Florence, Fiesole, and Rome. His most important achievements in Florence are in the church of La Badia: the monuments of Bernardo Giugni (1466) and the Margrave Hugo of Tuscany (1481). There are several tabernacles by him in Santa Croce, and in the Museo Nazionale are busts of Piero de' Medici (1453), Giuliano de' Medici, and Rinaldo della Luna (1461). One of his best works, if not his most important, belongs to his early period: the monument of Leonardo Salutate, Bishop of Fiesole (died 1466), in the cathedral of that city; it is surmounted by a fine bust. The altar in the cathedral, which is also by Mino, shows plainly the limitations of his art. A beautiful piece of Renaissance decoration is the tabernacle at Santa Maria in Trastevere, Rome, in which city are also his monument of Cardinal Forteguerri in Santa Cecilia and the monument of Francesco Tornabuoni in Santa Maria sopra Minerva, his latest Roman work and one of his happiest inspirations. His other works include busts of Niccolò Strozzi, in the Museum of Berlin, which also possesses his only female bust, that of a young girl, and San Giovannino, in the Louvre; and reliefs, including numerous Madonnas, from his altars and monuments, to be found in many museums and private collections. Consult: Semper and Barth, *Hervorragende Bildhauer-Architekten der Renaissance* (Dresden, 1880); C. C. Perkins, *Handbook of Italian Sculpture* (New York, 1883); Wilhelm Bode, *Denkmäler der renaissance Skulptur Toscanas* (Munich, 1892–1905); Angeli, *Mino da Fiesole* (Florence, 1905).

MI'NOR (Lat., less). A term in music applied to intervals and modes. (1) The interval between any note and another is named according to the number of degrees between them on the scale, both notes included. The interval between C and E is called a third; that between E and G is also a third; but these intervals are unequal, the one consisting of four semitones, the other of three; the former is therefore distinguished as a major, the latter as a minor interval. (2) There are two modes in which a musical passage may be composed. Whereas the major mode makes use of but one form of scale, which is the same whether *ascending* or *descending*, the minor mode recognizes *two* forms of scale, the *harmonic* and *melodic*. Modern music conceives a mode as a system of three fundamental chords, which contain all the tones proper to the scale of that mode. These chords are the tonic, dominant, and subdominant. Arranging the tones of the *pure* minor scale as elements of these three chords we have the following:



where all three chords present themselves as *minor* (because having the *minor* third), just as the corresponding chords are *major* in the *major* mode. (See MAJOR.) Arranging these tones in this diatonic order as a *descending* scale, beginning with the highest tone of the tonic chord (e), the following results: e, d, c, b, a, g, f, e. Here we have a *pure* minor scale which is identical with the Dorian mode of the Greeks. (See GREEK MUSIC.) Comparing this *descending* minor with the *ascending* major scale, we find each to be the exact opposite of the other, thus establishing the polarity of major and minor already known to Zarlino and Tartini, but fully developed only in 1853 by Hauptmann. Where the *ascending major* has the major third (on third degree) and semisteps (3–4, 7–8) the *descending minor* has the *same* in the *same place:*

c, d, e, f, g, a, b, c.
e, d, c, b, a, g, f, e.

For practical composition, however, the scale always begins with the tonic. In the progression a, b, c, d, e, f, g, a, the whole step from 7 to 8 was found unsatisfactory to the ear, which imperatively demanded a semistep. By raising g a semistep this leading tone was obtained, but the step from 6 to 7 was augmented. It was only during the nineteenth century that this form of the minor scale a, b, c, d, e, f, g♯, a, which is known as the *harmonic* minor scale, was proclaimed as the *normal* form. Before that theorists had been afraid of the augmented second from 6 to 7 (a dissonance) and had overcome the difficulty by also raising the sixth degree a semitone, so that *ascending* the minor scale had this form: a, b, c, d, e, f♯, g♯, a, while *descending* the 7th and 6th degrees were restored to their original pitch. Thus, what is known as the *melodic* minor scale has two forms, one when ascending, the other when descending. Now, considering the *harmonic* form as the normal minor scale, modern musical theory establishes the dominant chord of both the major and minor modes as a *major* triad. Thus, the three fundamental chords of the modern minor mode present themselves as two minor triads (tonic and subdominant) and one major triad (dominant). See INTERVAL; MODES.

MINOR. In law, a person who has not attained the age of full legal capacity or the age of legal capacity with respect to the performance of certain acts. The term "minor" belongs strictly to the civil law, in which a person of full legal capacity is called major; but generally the term "minor" is used in English as synonymous with infant, under which title the statement of the general law of the subject will be found. In Scots law, minor is sometimes specifically used of an infant above the age of a pupil (12 years for females, 14 for males) and under the full age (21 years) of majority. See INFANT; PARENT AND CHILD.

MINOR, mē'nôr, JAKOB (1855–1912). An Austrian scholar in Teutonic philology and literature, born at Vienna. He studied at the universities of Vienna (1874–78) and Berlin (1878–79), became a lecturer at the former (under Scherer, 1880), in 1882–84 held a chair in the Accademia Scientifico-letteraria of Milan, and in 1884–85 was professor of the German language and literature in the University of Prague. In 1885 he was appointed professor of Germanic philology at Vienna. His numerous publications include many editions of texts, such as volumes 73 (*Fabeldichter, Satiriker, und Popularphilosophen des achtzehnten Jahrhunderts*), 145 (*Tieck und Wackenroder*), and 151 (*Das Schicksalsdrama*), with introductory essays and annotations, in the "Deutsche National-Litteratur" series, and the Archduke Ferdinand's *Speculum Vitæ Humanæ* (1889); *Neuhochdeutsche Metrik* (1893), a valuable manual of German prosody, based on lectures given at Vienna in 1882; and important works in literary history and criticism, such as *Die Schicksalstragödie in ihren Hauptvertretern* (1883), *Goethes Faust* (*I. Teil*), *Entstehungsgeschichte und Erklärung* (2 vols., 1901); and an uncompleted study of Schiller, *Schiller, sein Leben und seine Werke*, vols. i and ii (1890), ranked, so far as it extends, among the best on the subject. He also edited the works of A. W. and F. Schlegel, A. von Arnim, C. Brentano, L. Tieck, and others.

MI'NOR, LUCIAN (1802–58). An American lawyer and author, born in Louisa Co., Va. He graduated at William and Mary College in 1823 and five years later became Commonwealth attorney for his native county, an office which he held until 1852. In 1855 he was appointed professor of law in William and Mary. He wrote a part of John A. G. Davis's *Guide to Justices* (1838) and contributed the notes to Daniel Call's *Virginia Reports*. A tract of his, *Reasons for Abolishing the Liquor Traffic*, had a large sale, and after his death his *Travels in New England* were edited by James Russell Lowell for publication in the *Atlantic*.

MINOR, ROBERT CRANNELL (1840–1904). An American landscape painter, born in New York City. He studied under Díaz at Barbizon, France, and under Van Luppen and Boulanger in Antwerp, and traveled in Germany and Italy. He was elected to the Society of American Artists and the National Academy of Design. He exhibited not only in the United States, but at the Royal Academy, London, and at the salons of Paris and Antwerp. His choice of motives was restricted. He preferred subdued yet richly colored light effects, particularly the glow of sunset and the mystery of twilight, and followed Díaz in his massing of light and shade. His paintings include "Dawn," "Sundown," "The Stream," "October Days," "The Vale of Kennet," "Edge of the Wood," "Interior of the Forest," "Morning in June," "Sunrise on Lake Champlain," "Cradle of the Hudson," "Cloudy Moonlight."

MINOR BARONS. The term applied in the twelfth and thirteenth centuries in England to those tenants in chief of the King who did not receive a special summons to council and to military service, but were summoned by a general proclamation of the sheriff given in the county courts. The term was not used in England after the thirteenth century.

MINOR'CA (Sp. *Menorca*). The second largest of the Balearic Islands (q.v.). It is the easternmost of the group and lies 20 miles northeast of Majorca (Map: Spain, G 3). Area, 264 (with adjacent islets, 293) square miles. Its north half consists of rather low, rolling hills, generally arid and covered with heath; the south half is an undulating plateau cut by deep, fertile valleys. There are numerous bays on the northeast coast, in one of which is the harbor of Port Mahón (q.v.), the principal town. This harbor is one of the best in the entire Mediterranean. Though minerals are found on the island, agriculture is the chief occupation, the principal products being wine, oil, grain, flax, and sweet potatoes. Pop., 1900, 37,512; 1910, 41,939. Minorca was taken by the British in 1708 and held by them, with several intermissions, until 1802, when it was finally secured to Spain by the Treaty of Amiens. Consult: Sir C. R. Markham, *Story of Majorca and Minorca* (London, 1908); J. E. C. Flitch, *Mediterranean Moods: Footnotes of Travel in the Islands of Mallorca, Menorca, Ibiza, and Sardinia* (New York, 1911); H. W. Richmond, *Papers Relating to the Loss of Minorca in 1756* (London, 1913).

MINORCA. A class of domestic fowls resembling leghorns, but of more length of body and heavier mold. Their flesh is good for table purposes, but their chief value is as egg layers, in which they excel, producing very large white eggs. They are hardy, active in hunting for their food, and generally commendable. A Minorca cock should weigh eight pounds; a hen

six and a half pounds. This breed should be long-bodied and stand high upon strong, slate-black legs; the comb is larger than that of the leghorn; the wattles thin and pendulous; and the ear lobes pure white. Two varieties are recognized—the black and the white. In each case the color must be absolutely pure; the comb, face, and wattles bright red; eyes dark hazel or red. See Colored Plate of FOWLS, under POULTRY.

MINORIES, mī'nō-rīz, THE. A London parish and street leading northward from the Tower to Aldgate, now forming with Houndsditch the Jewish quarter of the city. The name is derived from the nuns of St. Clare, called Sorores Minores, or Minoresses. The church of the Trinity, once belonging to a nunnery of the order, still exists in the Minories.

MINORITES. See FRANCISCANS.

MINORITY REPRESENTATION. See CUMULATIVE VOTING; REPRESENTATION.

MINOR PROPHETS. A common designation for a group of 12 prophetical books in the Hebrew canon, which in the English Bible form the close of the Old Testament. It was employed as early as the time of Augustine and Rufinus, who are careful to explain that its use is occasioned by the brevity of the books and does not characterize their merit or importance. The corresponding designation, major prophets, is applied to the longer books of Isaiah, Jeremiah, Ezekiel, and Daniel. The Hebrews called this group of writings the Twelve, and this nomenclature was followed by the Greeks. (See BIBLE.) The first reference to the collection is in Ecclus. xlix, 10, a section probably written in the time of John Hyrcanus. The books included in the collection, in the order in which they are arranged in the Hebrew Bible, are Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi. This order is retained in the English Bible. In the Greek version the arrangement is as follows: Hosea, Amos, Micah, Joel, Obadiah, Jonah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi. Both arrangements no doubt were intended to be chronological. There is a general advance from the Assyrian to the Chaldæan and Persian periods. The three prophets of the Chaldæan period (Nahum, Habakkuk, Zephaniah) and the three of the Persian period (Haggai, Zechariah, Malachi) are given in the same order. On the other hand the earlier prophets seem to have formed two groups in the Greek, viz., Hosea, Amos, Micah, and Joel, Obadiah, Jonah. It is significant that of these six only the first group of three can be assigned to the Assyrian period in the light of modern criticism. It would appear, therefore, that the late books, Joel, Obadiah, and Jonah, once were appended to the others, but subsequently were copied after the prophets of the Assyrian period on account of the reference to Jonah in 2 Kings xiv. 25. The same consideration may have led to the placing of Jonah before Micah as in the Hebrew recension. For the dates of the books and further information, consult the articles upon the individual books.

Bibliography. Many commentaries have been written upon the 12 minor prophets as a whole. The following are the more recent: Rosenmüller, *Prophetæ Minores* (2d ed., Leipzig, 1827); E. B. Pusey, *The Minor Prophets* (2 vols., London, 1860); E. Henderson, *Commentary on the Twelve Minor Prophets* (ib., 1860–61); G. H. A. von Ewald, *Propheten des alten Bundes* (2d ed., Göttingen, 1867); Reuss, *La Bible*, vol. ii (Paris, 1876); Ferdinand Hitzig, *Die zwölf kleinen Propheten* (4th ed., Leipzig, 1881); Knabenbauer, *Commentarius in Prophetas Minores* (Paris, 1886); F. W. Farrar, *The Minor Prophets*, in "Men of the Bible Series" (London, 1890); Deane, *Minor Prophets* (ib., 1893); Robertson Smith, *Prophets of Israel* (2d ed., 2 vols., ib., 1895); Nowack, *Die kleinen Propheten* (Göttingen, 1897); Julius Wellhausen, *Die kleinen Propheten* (3d ed., Berlin, 1898); Marti, *Dodekapropheton* (Tübingen, 1904); Horton-Driver, in *Century Bible* (London, 1906); Hoonacker, *Les douze petits prophètes* (Brussels, 1908); H. K. von Orelli, *Kleine Propheten* (3d ed., Munich, 1908; Eng. trans. of 1st ed., New York, 1893); G. A. Smith, *Book of the Twelve Prophets* (new ed., 2 vols., New York, 1912).

MĪ'NOS (Gk. *Μίνως*). According to Greek story, a king of Crete, son of Zeus and Europa, brother of Rhadamanthus and Sarpedon, and father of Ariadne, Deucalion, and Phædra. In the ordinary version he appears as a just and wise ruler, governing Crete and the adjacent islands three generations before the Trojan War and giving them a code of laws received from his father, Zeus. He was a powerful monarch, establishing the first fleet and clearing the Ægean of pirates. He thus exercised a sway over the Greek coast lands. After his death his reputation for justice led the gods to make him a judge in the lower world, where with Rhadamanthus and Æacus he passed sentence on the souls of the dead. In contradiction to this character is the group of legends which gather about the Minotaur, where he appears as at first depriving Poseidon of his due offering, the bull sent by the god from the sea in answer to his prayer. From this bull and Pasiphaë, wife of Minos, sprang the Minotaur (q.v.), for whose keeping Dædalus (q.v.) built for Minos the Labyrinth (q.v.). When his son Androgeos was slain by the Athenians, Minos made war upon them and compelled them to pay the tribute of seven youths and seven maidens to be food for the Minotaur, until Theseus (q.v.) released them by killing the monster. The cruel character of Minos in this legend led later writers to distinguish two kings, the elder, a son of Zeus, who was just, and his grandson, who was cruel. The recent discoveries of a splendid palace at Cnosus and the evidences of a very powerful and splendid kingdom in Crete during the Mycenæan age warrant the belief that the story of Minos contains reminiscences of an early Cretan supremacy in the Ægean. Consult H. R. Hall, *Ægean Archæology* (New York, 1915). See ARCHÆOLOGY, *Mycenæan Period;* CNOSUS; CRETE; EVANS, SIR ARTHUR; GOURNIA.

MINOT, mī'nŏt. A city and the county seat of Ward Co., N. Dak., 200 miles west-northwest of Grand Forks, on the Mouse River and on the Great Northern and Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: North Dakota, C 2). It is the seat of a State normal school and contains a public library, attractive courthouse, post office and Federal buildings, and Riverside Park, which is crossed by the river three times. Minot is a distributing centre for a wide area and is engaged in lignite coal mining, flour milling, and the manufacture of briquettes. Ample water power is available, the Mouse falling 10 feet here. The water works are owned by the city. Minot has adopted the

commission form of government. Pop., 1900, 1277; 1910, 6188; 1920, 10,476.

MINOT, Charles Sedgwick (1852–1914). An American anatomist, born at Roxbury, Mass. He graduated at Massachusetts Institute of Technology in 1872, studied biology at Leipzig, Paris, and Würzburg, and took the degree of S.D. at Harvard in 1878. At Harvard Medical School he taught from 1880 till his death, becoming James Stillman professor of comparative anatomy in 1905 and director of the anatomical laboratories in 1912. In 1912–13 he served as Harvard exchange professor at Berlin and Jena. He made important investigations and discoveries in the fields of muscular physiology, respiration, and human embryology. He was president of the American Society of Naturalists in 1894, of the American Association for the Advancement of Science in 1901, and of the Association of American Anatomists in 1904–05, and was corresponding member of various important foreign societies. Honorary degrees were conferred on him by Yale, Toronto, St. Andrews, and Oxford. In addition to many papers and monographs, his publications include: *Human Embryology* (1892), which has been translated into German and is one of the most valuable works on the subject; *A Laboratory Text-Book of Embryology* (1903; 2d ed., 1910); *Age, Growth, and Death* (1908); *Die Methode der Wissenschaft* (1913); *Modern Problems of Biology* (1913; also in French).

MINOT, George (1817–56). An American jurist, born in Haverhill, Mass. He graduated at Harvard in 1836 and at the law department of that institution in 1838, studied under Rufus Choate, and was admitted to the bar in 1839. He practiced in Boston, took high rank in his profession, and was for many years counsel for the Boston and Maine Railroad. He edited, in association with Richard Peter, Jr., eight volumes of the *United States Statutes at Large* and was sole editor of that work from 1848 to 1856. He published *A Digest of the Decisions of the Supreme Court of Massachusetts* (45 vols., with supplement, 1844–52) and edited *English Admiralty Reports* (9 vols., 1853–54).

MINOT, George Richards (1758–1802). An American jurist. He was born in Boston, graduated at Harvard in 1778, and soon afterward was admitted to the bar. From 1781 to 1791 he was clerk of the Massachusetts House of Representatives. He was secretary of the convention called to ratify the Federal Constitution. In 1792 he was appointed judge of probate for Suffolk County, in 1799 he was made Chief Justice of the Court of Common Pleas, and from 1800 until his death was judge of the Municipal Court of Boston. Besides editing three volumes of the *Collections of the Massachusetts Historical Society*, of which he was one of the founders, he published a *History of the Insurrection in Massachusetts in 1786* (1786) and a *History of Massachusetts Bay* (1798–1803). The latter work is in continuation of Hutchinson's *History of Massachusetts Bay.*

MINOT, Laurence (?1300–?52). An English lyric poet, born and bred probably in the northeast midlands of England. He was no doubt a layman. Professor Herford agrees with other scholars in thinking that Minot was probably a soldierly minstrel, who sang also at court. Minot wrote in haste, with the warlike or political events that he describes still fresh in his mind. His style is rough. He is preëminently a war poet and a patriot, full of love for a united England, though he was himself in all likelihood of Norman origin. He wrote 11 spirited political songs (in the Northern dialect) celebrating the military events of the time. They begin with the *Battle of Halidon Hill* (1333) and close with the *Capture of Guisnes* (1352). Among the best is *How Edward Came to Brabant* (1339). They exist in only one manuscript (British Museum), discovered by Tyrwhitt. The best editions are *Laurence Minot's Lieder*, edited by William Scholle, in *Quellen und Forschungen* (Strassburg, 1884), and *The Poems of Laurence Minot*, edited by Hall (Oxford, 1887).

MIN'OTAUR (Gk. Μινώταυρος, *Minōtauros*). The bull of Minos (q.v.), according to the Greek legend, son of the wife of Minos, Pasiphaë, and a bull sent by Poseidon. For it she conceived a passion which the skill of Dædalus (q.v.) enabled her to gratify. Her offspring, a human body with a bull's head, was shut up by Minos in the mysterious Labyrinth (q.v.) at Cnosus, where he was fed on human victims. Yearly (or every three or nine years, according to other versions of the story) the Athenians, who had been conquered by Minos, were compelled to send seven youths and seven maidens for this monster, till Theseus (q.v.) slew him. The origin and nature of this story have as yet received no adequate explanation, but the frescoes of the palace at Cnosus showing men and girls performing gymnastic feats upon wild bulls suggest that the origin of the legend is to be sought in dim reminiscences of the Mycenæan bull ring. Some scholars connect the Greek name Λαβύρινθος, *Labyrinth*, with Gk. λαβρύς, *labrys*, a double axe, a hieroglyphic or sacred sign of Zeus, which appears everywhere in the palace at Cnosus (consult R. H. Hall, *Ægean Archæology*, pp. 152–153, New York, 1915); in this view the Labyrinth is the Place of the Double Axe. The bull was sacred in Crete to Zeus. See Minos.

MINOT'S LEDGE. See Lighthouse.

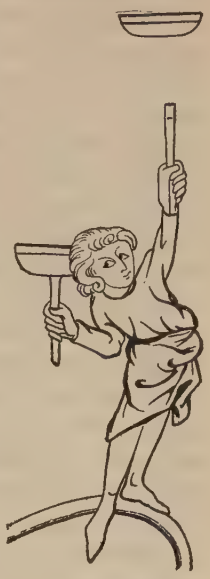
MINOTTO, Agnes Mito. See Sorma, Agnes.

MINSK, mĭnsk. A government of west Russia, in Lithuania, bounded by the Government of Vitebsk on the north, Mohilev and Tchernigov on the east, Kiev and Volhynia on the south, and Grodno and Vilna on the west (Map: Russia, C 4). Area, 35,293 square miles. The northwestern part, about one-fifth of the entire area, is somewhat elevated. It forms the watershed between the Dnieper and the Niemen. The remainder of the government is low, marshy, thickly wooded, and very sparsely inhabited, forming the larger portion of Poliessie (q.v.). Minsk is watered chiefly by the Berezina, the Pripet, and the Niemen; lakes abound in the southern part, and the climate is unhealthful. By the nature of its surface Minsk is not well fitted for agriculture, hence this industry is in a primitive state. Stock raising is favored by the abundance of pasture land. The forests, mostly pine, occupy over one-third of the total area and form one of the chief natural resources of the region. Large quantities of timber are floated to Prussia by the Berezina, the Pripet, and the canal which connects the Dnieper with the Bug, a tributary of the Vistula. Considerable quantities of wood for fuel are exported also to Kiev and used on the local railroads. The extent of this industry may be judged from the fact that about 70,000 people are employed an-

nually in the transportation of the timber down the rivers. Yeast, flour, and wooden products of all kinds are the chief manufactures. The shipbuilding industry deserves special mention. The government is traversed by two important railways, one connecting Warsaw with Moscow and the other running from the Baltic Provinces to southern Russia. Pop., 1909, 2,755,900; 1913, 2,963,700, composed chiefly of white Russians, Poles, Jews, and Lithuanians. Over 70 per cent of the population belong to the Greek Orthodox church. The government was formed out of part of the territory passing over to Russia on the second partition of Poland in 1793. It consisted till 1843 of 10 districts, but since then nine compose this government. Capital, Minsk.

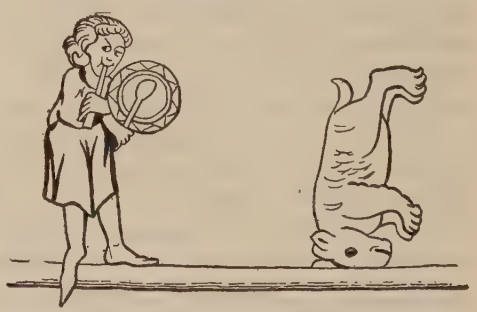
MINSK. The capital of the Government of Minsk, Russia, situated in a hilly region on the Svislotch, a tributary of the Berezina, 468 miles by rail southwest of Moscow (Map: Russia, C 4). It is an old and irregularly built town, with two cathedrals, of which that of St. Catharine (1611) is especially worthy of mention. Among its educational institutions are two classical Gymnasia and one Realgymnasium, a theological seminary, a museum, and a theatre. Minsk manufactures leather, agricultural implements, soap, tobacco products, etc. The commerce is mostly in agricultural and forest products and leather. A yearly fair is held in March. Minsk is the seat of a Greek Orthodox and of a Roman Catholic bishop. The municipality maintains a pawnshop. Pop., 1904, 97,997; 1910, 105,441, of whom over 50,000 were Jews, about 21,000 Greek Orthodox, 15,000 Roman Catholics, and over 1700 Mohammedans. The town is first mentioned in 1066 as a dependency of the princes of Podolsk. After a short existence as the capital of a separate principality, it fell at the end of the twelfth century into the hands of Lithuania. In 1499 it obtained Magdeburg rights and in 1793 passed to Russia. During the Polish uprising in 1831 several engagements took place in the vicinity of the town, which is the headquarters of the Russian Fourth Army Corps.

MIN'STREL (OF. *menestrel, menesterel, menestral*, Fr. *ménestral*, It. *ministrello, menestrello*, from ML. *ministralis, ministrel*, retainer, Lat. *minister*, attendant, retainer, minister, from *minor*, less). The term first used in the late thirteenth century to designate a retainer who amused his lord with music and song. It has now come to be the generic name for the poet musician, the verse reciter, the mountebank, merry Andrew, juggler, and acrobat of the Middle Ages, as well as for certain modern entertainers. (See below.) Before the Norman Conquest the professional poet was known in England as a *scôp* (shaper or maker). "Maker" sometimes signified a poet in Shakespeare's time. The scôp shaped or composed his own poems, and chanted or sang them to the accompaniment of a rude harp. *Widsith* (i.e., Long Travel), perhaps the oldest of extant English poems (for it is earlier than the Angles' inroad of Britain), is an account of the scôp's wandering and reception among the Huns, Goths, Danes, and other peoples. For the tales he recited in the mead hall the scôp was rewarded with many treasures, including golden rings and bracelets. The scôp was not commonly a wanderer. He was rather attached to the household of some chief, by whom he was maintained, and in some cases rewarded with gifts of land. The scôp was held in great honor. He composed his poems in solitude and recited them in the hall where his master feasted. The recitation was doubtless accompanied by gesture as well as by music. The scôp was first of all a poet, differing from the modern poet mainly in the fact that he not only shaped but also recited his compositions. His theme was the glorious deeds of his chieftain or of some hero of his race. To him we are indebted for our primitive and narrative poems like *Beowulf*. The spread of Christianity in England broke up the old tribal relation and therefore the standing of the scôp was changed. In a rank much beneath the scôp were the gleemen, who, though they no doubt sometimes improvised songs and modified the matter that came to them, were satisfied for the most part to render what others had composed. They had no settled abode, but strolled far and near, earning what they could by their minstrelsy. (The accompanying illustrations, derived from mediæval manuscripts, give some notion as to the strolling minstrels' looks and demeanor.) Among their accomplishments were tumbling, ropewalking, and feats of jugglery. Some of them chewed stones or appeared to swallow knives or fire. Others had performing animals, such as bears, goats, marmots, dogs, and monkeys.



A ROPEWALKER AND JUGGLER.

The Normans brought many *jongleurs* (see JONGLEUR) and *troubadours* (q.v.) to England. The minstrels of the Middle Ages were in part descendants of the Teutonic scôpas and gleemen who took root in Gaul with the invasion of the Franks, or of those who went along with the Teuton invaders into Italy, England, and elsewhere, in part of the *mimi* and *scurræ* who had once overrun the Roman Empire. With the Celtic bards they have probably no kindred. At the battle of Hastings, Taillefer, minstrel and warrior, rode before the Norman chivalry, tossing his shield aloft, and stirring their courage with the Song of Roland, and there bravely met his death. By the fourteenth century the poet and the performer in England were usually dis-



MINSTREL WITH DRUM, FLAGEOLET, AND PERFORMING BEAR.

tinct. The scôp and the troubadour were transformed into poets like Chaucer and Gower. True, there still survived in the structure of their tales several devices of the singers, such as the address to an audience, but the audience was wholly imaginary. The gleemen and jongleurs

MINSTREL PLAYING A REBEC.

were then known as minstrels, of whom the more reputable were still held in great honor. At feasts and festivals they swarmed in great numbers with harps, fiddles, bagpipes, flutes, flageolets, citterns, and kettledrums. Such an occasion is described by Chaucer in the Squire's Tale: As Cambuskan dines, the "minstralles" play "beforn him at the bord deliciously." When he goes out he is preceded by "loude ministralcye,"

> Ther as they sownen diverse instrumentz
> That it is lyk an heven for to here.

But the decline of minstrelsy had already set in, as we know from Langland's *Piers Plowman*, the best single source of information for England. Minstrels as a class Langland severely satirized, calling them prattlers and buffoons, foul and scurrilous of speech, indeed the very children of Satan. Yet in England minstrels may have had a closer connection with genuine poets than they had on the Continent, where from the outset these sons of the Roman *mimi* and *scurrie* (cf. "scurrilous") and of the old bards of the North were abhorred by the Church. Mass and absolution were denied them; indeed, they were under perpetual excommunication and were assured that they would spend eternity at the bottom of hell. Nor had they—on the Continent, at all events—any standing before the secular law. Those who harmed them went unpunished; yet if a minstrel was ill handled he had the privilege of beating the shadow of his offender. As early as 1321 the minstrels of Paris were formed into a guild, and in 1469, in England, a guild of royal minstrels was organized, which minstrels throughout the realm were compelled to join, if they were to ply their trade (or their art) legally.

Most minstrels were itinerant; others were retained by lords as jesters. Not sĕldom they were women, or, at all events, women followed many a band of minstrels and lived their hard and dissolute life. The very name of minstrel was a byword, but everywhere they were welcome. After the invention of printing there was little place for the minstrel as an intermediary between author and public. He gradually found his main occupation as a ballad singer at street corners or at the wassails of the more ignorant barons. Musicians still continued, it is true, to be retained at court, and ample provision was made for their maintenance. But by an act of Parliament in the thirty-ninth year of Elizabeth's reign "ministrels abroad" were classed as "rogues and vagabonds," and were ordered to be punished as such.

In spite of new social conditions, minstrelsy was slow in dying out. George II maintained a company of 24 musicians, who were employed in the service of the Chapel Royal and in rendering odes on birthdays and New Year's. Scott, as is well known, collected the minstrelsy of the Scottish border, consisting of traditional ballads that were still recited; and in the *Lay of the Last Minstrel* is described a wandering harper who is supposed to have lived at the close of the seventeenth century. Recently, too, W. B. Yeats has discovered "the last gleeman in Ireland," a certain Michael Moran, blind almost from birth. "He was," says Yeats, "a true gleeman, being alike poet, jester, and newsman of the people."

A KING MINSTREL.
Head of a minstrel troupe.

The descendant of the old gleeman, it is said, is still not unknown in the Orkneys.

American Minstrels. Towards the beginning of the nineteenth century a new type, the Southern negro, appeared on the American stage. At first he was accepted merely as a comic character, but gradually his songs and eccentricities overshadowed his personal characteristics and he began to be looked upon as a "feature" in the performance. Before the advent of Thomas D. Rice, the reputed founder of negro minstrelsy, there had been a score of actors who, as negro comedians, had sung and danced their way into popular favor; but Rice was the first minstrel whose performance received universal recogni-

tion. His most famous character, Jim Crow, was drawn from life, its original being an old Louisville slave. In 1836 Rice went to England, where he duplicated his American successes. Individual negro minstrels now became very numerous, and in 1843 the first company, the Virginia Minstrels, was formed. It consisted of "Dan" Emmett, Frank Brower, "Billy" Whitlock, and "Dick" Pelham. The style of performance adopted by them has remained much the same ever since, for they danced, sang, played their instruments, and carried on a running dialogue of jokes. Among the more famous bands of minstrels may be mentioned: White's Kitchen Minstrels, his Virginia Serenaders, his New York Minstrels; Christy's Minstrels, which made a tremendous sensation; Bryant's Minstrels, Wood's Minstrels, and the companies formed by "Tony" Pastor, Thatcher, Primrose, Dockstader, West, Buckley, Backus, Birch, and Bailey. Minstrel performances are usually of one general character. The performers, who are always men and who number from 15 to 40, sit in a semicircle. At either end sit the "end men," or "bones," while in the middle of the line is the "interlocutor," who gravely asks his companions, especially the "end men," such questions as shall bring out their stock of jests. Each member of the troupe takes some part in the performance. The minstrel's characteristic instruments are the guitar, the banjo, tambourine, and the "bones," which are two pairs of ebony sticks, about 1 inch wide and 6 inches long, and are clapped together in the performer's fingers.

Bibliography. Wilhelm von Hertz, "Die Spielleute," an essay in his delightful *Spielmannsbuch* (2d ed., Stuttgart, 1900); Thomas Percy, *Reliques of Ancient Poetry*, vol. i (new ed., London, 1886); Joseph Ritson, *Ancient English Metrical Romances*, vol. i (ib., 1802); William Chappell, *Popular Music of the Olden Time* (2 vols., ib., 1859); Langland's *Piers Plowman* (the C text passus i and xvi, and the *Prologue* of the A text). For the scôp, consult: Henry Morley, *English Literature*, vol. ii (New York, 1888); Stopford Brooke, *English Literature from the Beginning to the Norman Conquest* (ib., 1898); Alwin Schulz, *Das Höfische Leben* (2d ed., 2 vols., Leipzig, 1889); J. J. Jusserand, *English Wayfaring Life in the Middle Ages* (4th ed., London, 1892); L. Gautier, *Epopées françaises* (2d ed., Paris, 1892), passim; W. G. Courthope, "The Decay of English Minstrelsy," in *A History of English Poetry*, vol. i (New York, 1895); E. K. Chambers, *The Mediæval Stage* (London, 1903), on the whole the most satisfactory account; Edmondstoune Duncan, *The Story of Minstrelsy* (New York, 1907), a popular historical sketch of the subject, including a useful bibliography. See also MINNESINGER; SKALD; TROUBADOURS.

MINSTREL, HENRY THE. See HENRY THE MINSTREL.

MINSTREL BOY, THE. A favorite song in Moore's *Irish Melodies*. The music is that of "The Moreen," an old Irish air.

MINT (AS. *mynet, mynit, mynyt*, from Lat. *moneta*, mint, epithet of Juno, whose temple at Rome was the mint, from *monere*, to warn). An establishment for making coins or metallic money. See MONEY.

The earliest regulations regarding the English mint belong to Anglo-Saxon times. An officer called a reeve is referred to in the laws of Canute as having some jurisdiction over it, and certain names which, in addition to that of the sovereign, appear on the Anglo-Saxon coins, seem to have been those of the moneyers, or principal officers of the mint. Besides the sovereign, barons, bishops, and the greater monasteries had their respective mints, where they exercised the right of coinage, a privilege enjoyed by the archbishops of Canterbury as late as the reign of Henry VIII and by Wolsey as Bishop of Durham and Archbishop of York.

After the Norman Conquest the officers of the royal mint became to a certain extent subject to the authority of the exchequer. Both in Saxon and Norman times there existed, under control of the principal mint in London, a number of provincial mints in different towns of England; there were no fewer than 38 in the time of Ethelred, and the last of them were only done away with in the reign of William III. The officers of the mint were formed into a corporation by a charter of Edward II; they consisted of the warden, master, comptroller, assay master, workers, coiners, and subordinates.

The seigniorage or coining charge at one time formed a considerable item in the revenues of the crown. It was a deduction made from the bullion coined, and comprehended both a charge for defraying the expense of coinage and the sovereign's profit in virtue of his prerogative. In the reign of Henry VI the seigniorage amounted to 6d. in the pound; in the reign of Edward I, 1s. 2½d. The seigniorage on gold was abolished during the reign of Charles II and has never since been exacted. The shere, or remedy, as it is now called, was an allowance for the unavoidable imperfection of the coin.

A new mint was erected on Tower Hill in 1810. In 1815 some alterations were made in the constitution of the mint, and in 1851 a complete change was introduced in the whole system of administration. The control of the mint was vested in a master and deputy master and a comptroller. The mastership, which had in the early part of the last century become a political appointment held by an adherent of the government, was restored to the position of a permanent office, the master being the ostensible executive head of the establishment. Further changes were made in the administration of the mint in 1869. The mastership was added to the duties of the Chancellor of the Exchequer, without any addition of salary, and the offices of deputy master and comptroller were amalgamated.

Colonial branches of the mint were established at Sydney in 1853, at Melbourne in 1869, and at Perth in 1899 to coin the gold so largely found in Australia, but the silver currency for the Australian Commonwealth has been imported from the Royal Mint, London. Arrangements were made for a silver coinage to be struck in the Commonwealth. A branch of the Royal Mint has been maintained at Ottawa, Canada, since 1908.

The first mint in the United States was established at Philadelphia by the Coinage Act of April 2, 1792; the first production of the new mint was the copper cent of 1793. Silver dollars were first coined in 1794 and gold eagles in 1795. In 1915 there were three coinage mints, located at Philadelphia, San Francisco, and Denver, respectively, and also a mint at New Orleans, where, however, there had been no coinage after 1909 although bullion is received

upon the same terms as at the assay offices. Assay offices are located at New York, Carson City, Helena, Boise, Charlotte, St. Louis, Deadwood, and Seattle. The Act of April 1, 1873, put all the mints and assay offices on the same footing as a bureau of the Treasury Department, under the superintendence of the Director of the Mint, who is appointed by the President for a term of five years and is subordinate to the Secretary of the Treasury. The Philadelphia mint has an engraver who supervises the manufacture of the dies used in all the United States mints.

Processes of Coining. Down to the middle of the sixteenth century little or no improvement seems to have been made in the art of coining from the time of its invention. The metal was simply hammered into slips, which were afterward cut up into squares of one size and then forged round. The required impression was given to these by placing them in turn between two dies and striking them with a hammer. As it was not easy by this method to place the dies exactly above each other, or to apply proper force, coins so made were always faulty and had the edges unfinished, which rendered them liable to be clipped. The first great step was the application of the screw, invented in 1553 by a French engraver named Brucher. The plan was found expensive at first, and it was not till 1662 that it altogether superseded the hammer in the English mint.

The following description of the method of coining money is based on a pamphlet, *Mint Processes of the United States,* issued by the Treasury Department. The processes required for converting the crude metal into money are: (1) assaying; (2) refining or parting, which reduces the material into ingots or bars of standard purity; (3) reducing the bars to coinage ingots by mixing with them the proper amount of copper alloy; (4) coining, or transforming the coinage ingots into money. The gold and silver which are brought to the mint may be in a crude or manufactured condition and are of varying degrees of fineness. The initial process, therefore, is to assay the metal, in order to determine both its value and the subsequent minting operations necessary to refine it. This process and the succeeding one of refining are described in the metallurgical articles on GOLD and SILVER and under ASSAYING. The bullion thus purified is reduced to bars, a gold bar usually weighing 400 ounces, worth about $8000. It is now ready to be used for industrial purposes, or for the next stage in the coinage process.

The consumption of gold and silver in the arts and industries is very great. During the fiscal year 1914 the Director of the United States Mint reported that gold bars for industrial use were manufactured in the various mints and assay offices, principally those of Philadelphia and New York, to the coinage value of $39,767,944. Private refineries furnished $3,455,841 more. These bars are 0.999 fine. In the same year the government institutions issued 2,033,780 fine ounces of silver bars as compared with 28,903,010 fine ounces from private refineries for use in the industrial arts. A depositor may bring crude gold bullion in any quantity, of $100 or more in value, and receive either fine gold bars or coin, at his option, a charge of not more than five cents an ounce being made for assaying and refining. For the silver alloy in the gold the owner will be paid at the market value of silver.

If the gold or silver is to be coined into money the pure bars must be mixed with copper alloy; standard coin is composed of 900 parts of gold (or silver) and 100 parts of purest copper in 1000. The law allows a slight variation from this standard, but in actual practice a single gold coin rarely varies more than 0.03 per cent from the standard, either way, and a silver coin, not more than 0.1 per cent, while the average is almost exactly correct. Weighed quantities of gold and copper, or of silver and copper, are melted together in a black-lead crucible, the molten metals thoroughly stirred together, and then poured into cast-iron molds to form ingots. These vary in size according to the denomination of the coins to be made from them. The following table gives the sizes and approximate weights of gold ingots:

DENOMINATIONS	Approximate weight in ounces	Length in inches	Thickness in inches	Width in inches
Double eagles	80	12⅝	½	1½
Eagles	62	11⅛	½	1⅜
Half eagles	40	12	7/16	⅞
Quarter eagles	33	12½	7/16	11/16

The ingot for silver-dollar coinage is 1⅝ inches wide, ½ inch thick, and 12½ inches long. The ingots are passed repeatedly between heavy rollers to form them into strips, a process which is called "breaking down." After each passage the rollers are screwed tighter, the amount of pressure being regulated exactly by a clock dial. Having been reduced to the proper thickness, the strips are cut into planchets by means of a steel punch working into a matrix. (See DIES AND DIE SINKING.) These planchets are now cleaned and carefully sorted, all that are not perfect or are under the standard weight being set aside to be remelted, while those that are above weight are filed down. The standard weight for gold coins is as follows: Double eagle, 516 grains; tolerance allowed by law, 0.50 grain. Eagle, 258 grains; tolerance, 0.50 grain. Half eagle, 129 grains; tolerance, 0.25 grain. Quarter eagle, 64.5 grains; tolerance, 0.25 grain.

Next comes the process of milling, or producing a raised rim around the edge of the coin, to prevent abrasion. This is accomplished in a milling machine, into which the blanks are fed automatically. The blanks rotate in a horizontal plane in a groove formed on one side by a revolving wheel and on the other by a fixed segment of corresponding groove. Each piece, as it passes through this narrow groove, has its edges forced up into an even rim. After annealing and cleaning, the coins are now ready for the final process of stamping. The planchet, fed to the press through a vertical tube, is automatically placed in a steel collar, whose inner surface is reeded to produce the fluted surface on the milled edge of the coin. Here it is firmly held while the dies close upon it

with enormous force, producing impressions on both sides of the coin. (This process and the preparatory one of engraving and stamping the dies are described under DIES AND DIE SINKING.) The pressure required to produce a clear, sharp impression on the various gold coins is as follows: double eagle, 175 tons; eagle, 120 tons; half eagle, 75 tons; quarter eagle, 40 tons. Double eagles and eagles are struck at an average rate of 80 per minute; half eagles and quarter eagles at a rate of 100 per minute. The pressure required for stamping silver coins is: dollar, 150 tons; half dollar, 110 tons; quarter dollar, 80 tons; dime, 40 tons. The first three are struck at an average rate of 80 per minute, and dimes at the rate of 100 per minute.

The total coinage of gold by the mints of the United States from 1792 to June 30, 1914, was $3,337,566,310.50.

The domestic coinage for the fiscal year 1914 in the mints of the United States amounted to 199,934,493 pieces, having a value of $36,047,386.24. The seigniorage on the coinage of silver dollars, subsidiary and minor coins during that year amounted to $5,661,266.58. (See SEIGNIORAGE.) During 1914 the coinage in the mints of the United States was: gold, $26,625,810; silver, $6,240,219.45, and minor coins of nickel and bronze, $3,181,356.79. In comparison with the coinage of the United States it may be stated that in 1913 Canada coined $1,986,480 of gold and $1,327,139 of silver; Great Britain, £27,586,817 of gold, equivalent to $134,251,245, and silver valued in United States money at $8,240,094. France in the same year coined 246,281,160 francs of gold, valued in United States money at $47,532,234, and silver valued in United States money at $4,179,250. Germany coined 143,525,760 marks in gold, valued at $34,173,483, and silver valued in United States money at $12,168,426. The total gold coinage for the world in 1913 was valued at $318,773,474, of which $3,372,866 was recoinage. The total coinage of silver in the same year was valued at $178,301,517, representing 158,557,652 fine ounces, and of this amount $21,415,372, or 19,324,926 fine ounces, was recoinage. Consult the annual reports of the Director of the Mint and also the various pamphlets on coinage issued by the Treasury Department at Washington. See COINAGE; MONEY.

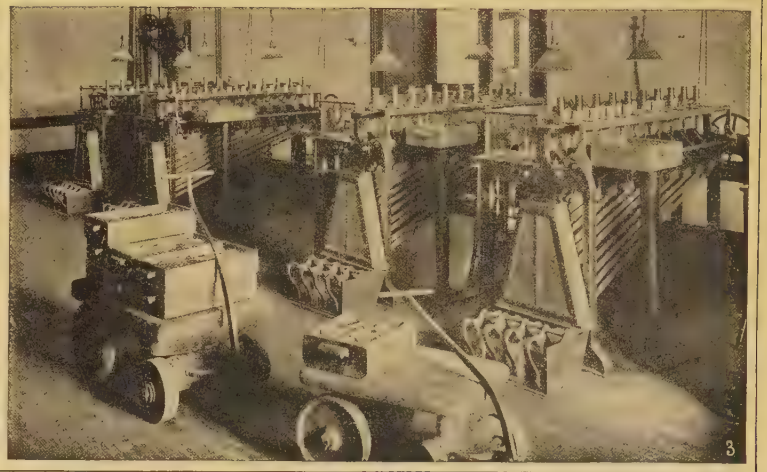
MINT (AS. *minte*, Icel. *minta*, OHG. *minza*, *munza*, Ger. *Minze*, *Münze*, from Lat. *menta*, *mentha*, from Gk. *μίνθα*, *mintha*, *μίνθη*, *minthē*, mint), *Mentha*. A genus of plants of the family Labiatæ. The species are perennial herbs, varying considerably in appearance, but all with creeping rootstocks. The flowers are whorled, the whorls often grouped in spikes or heads. The species are widely distributed over the world; some of them are very common. Water mint (*Mentha aquatica*) grows in wet grounds and ditches, and corn mint (*Mentha arvensis*), which abounds as a weed, in European fields and gardens. These and most of the other species have erect stems. All the species contain an aromatic essential oil, in virtue of which they are more or less medicinal. The most important species are spearmint, peppermint, and pennyroyal; spearmint or green mint (*Mentha spicata*), a native of almost all the temperate parts of the globe, has erect, smooth stems, from 1 foot to 2 feet high, with the whorls of flowers in loose cylindrical or oblong spikes at the top; lanceolate, acute, smooth, serrated leaves, destitute of stalk, or nearly so. It has a very agreeable odor. Peppermint (*Mentha piperita*), a plant of equally wide distribution in the temperate parts of the world, is very similar to spearmint, but has stalked leaves and flowers in short spikes, the lower whorls somewhat distant from the rest. It is very readily recognized by the peculiar pungency of its odor and of its taste. Pennyroyal (*Mentha pulegium*), also very cosmopolitan, has ovate, stalked leaves, a much-branched prostrate stem, which sends down new roots as it extends in length, and the flowers in distant globose whorls. Its smell resembles that of the other mints. All these species, in a wild state, grow in ditches or wet places. All are cultivated in gardens. The American pennyroyal is *Hedeoma pulegioides*. It grows in dry soils. Mint sauce is generally made of spearmint, which is also used for flavoring soups, etc. A kind of mint with lemon-scented leaves, called bergamot mint (*Mentha citrata*), is found in some parts of Europe, and is cultivated in gardens. Varieties of peppermint and horsemint (*Mentha longifolia*), with crisped or inflated rugose leaves, are much cultivated in Germany under the name of curled mint (*Krauseminze*); the leaves are dried and used as a domestic medicine and in poultices and warm baths. All kinds of mint may be easily propagated by division of the roots or by cuttings.

Peppermint, pennyroyal, and spearmint are used in medicine. The pharmacopœias contain an *aqua*, *spiritus*, and *oleum* of each of them, the officinal part being the leaves and stems, which should be collected when in flower. Peppermint is extensively used to flavor candy and in mixtures to cover the taste of drugs. Nearly one-half of the oil of peppermint and spearmint now used in the world is produced and distilled in Michigan, the great seat of this industry being in St. Joseph County.

MINT FAMILY. A family of plants. See LABIATÆ.

MIN'TO, GILBERT ELLIOT, first EARL OF (1751–1814). A British diplomat and administrator. He was educated in Paris and at Edinburgh and Oxford and was called to the bar in 1774. In 1776 he entered Parliament as a Whig. From 1794 to 1796 he was Viceroy of Corsica. In 1797 he was created Baron Minto, and he was Ambassador to Vienna (1799–1801). On his reappearance in the House of Lords he became an advocate of the union of Ireland with England, and afterward strenuously opposed Roman Catholic emancipation. He was Governor-General of India from 1807 to 1813; did much to suppress internal disorder in the regions under his government; annexed the island of Amboyna in 1809, the Molucca Islands in 1810, and Java in 1811; and he captured the isle of Bourbon and the island of Mauritius from the French in 1810. Consult: *The Life and Letters of Lord Minto*, edited by the Countess of Minto, his great-niece (3 vols., London, 1874); id., *Lord Minto in India* (ib., 1880).

MINTO, GILBERT JOHN, fourth EARL OF (1847–1914). A British administrator. He was educated at Eton and at Trinity College, Cambridge, and entered the Scots Guards as an ensign in 1867, resigning in 1870. He served with the Turkish army (1877), in the Afghan War (1879), and was private secretary to Sir Frederick Sleigh (afterward Earl) Roberts in Cape Colony (1881). He was a volunteer in



UNITED STATES MINT AT PHILADELPHIA

1. Coining Press
2. Milling Machines
3. Automatic Weighing Machines

1. NEW JERSEY TEA (Ceanothus Americanus).
2. SPEARMINT (Mentha spicata).
3. TALL MEADOW-RUE (Thalictrum polygamum).
4. FOUR-LEAVED MILKWEED (Asclepias quadrifolia).
5. VIRGINIA GOAT'S-BEARD (Krigia Virginica).

the Egyptian campaign conducted by Sir Garnet (afterward Field Marshal Lord) Wolseley; was military secretary to the Marquis of Lansdowne, Governor-General of Canada (1883–85); and was chief of staff to Sir Frederick Middleton during the second Riel rebellion (1885). He returned to England and in 1886 was an unsuccessful candidate for the House of Commons. Later he was Governor-General of Canada (1898–1904) and Viceroy of India (1905–10).

MINTO, WILLIAM (1845–93). An English literary critic. He was born at Alford, Scotland, and graduated at Aberdeen in 1865. He edited the London *Examiner* from 1874 to 1878 and in 1880 became professor of logic and English literature at Aberdeen. He wrote three stories, *The Crack of Doom* (1886), *The Mediation of Ralph Hardelot* (1888), and *Was she Good or Bad?* (1889), but is chiefly known as a critic. In this latter field he published many well-known works, including: *Manual of English Prose Literature, Biographical and Critical* (1872); *Characteristics of English Poets from Chaucer to Shirley* (1874); *Daniel Defoe,* for the "English Men of Letters Series" (1879). There appeared posthumously *University Extension Manual on Logic* (1893); *Plain Principles of Prose Composition* (1893); *English Literature under the Georges* (1894). Original in method, he ably defended many novel hypotheses.

MIN'TON, THOMAS (1765–1836). An English pottery manufacturer, originally an engraver, who worked for Spode in London and in 1791 established a plant of his own at Stoke-upon-Trent, where he made principally majolica and reproductions of the works of Della Robbia and Palissy. The business was continued by his son, Herbert (1793–1858), and was incorporated in 1883. During the latter half of the nineteenth century, under the artistic direction of Leon Arnoux of the old family of French potters, Minton porcelain compared favorably with that produced at Sèvres. See POTTERY; PORCELAIN.

MINUCIUS FELIX. See FELIX, MARCUS MINUCIUS.

MINUET, mĭn'ū-ĕt' (Fr., small, dim. of *menu,* from Lat. *minutus,* small, p.p. of *minuere,* to diminish, from *minor,* less; connected with Gk. *μινύς, minys,* small, Skt. *mī,* to make small, Goth. *minniza,* OHG. *minniro,* Ger. *minder,* AS., archaic Eng. *min,* less; so called because of the small steps taken in the dance). A graceful and stately dance of French origin. It is supposed to have originated in Poitou and was introduced into Paris in 1650. The first-known minuet tunes were written by Lully (q.v.) in 1653. The minuet was a favorite at the court of Louis XIV and in the reign of Charles II was carried over into England, where it continued popular until the time of George II. In Russia it flourished during the reigns of Peter the Great and Catharine II. At first the minuet was in three-quarter time and consisted of two eight-bar phrases, each of which was repeated. Mozart's minuet in *Don Giovanni* shows the form of the early dance. It was soon, however, extended by the addition of a second movement (written in three-part harmony and hence called trio) and by increasing the number of bars. Bach and Handel often introduced the minuet into their suites. Those of the former are especially famous, and Handel also used it as a concluding movement for operatic and oratorio overtures. The minuet is of particular importance because of the position it occupies in the history of the symphony, which is an evolution of the suite. Haydn was the first to employ it in the symphony, but he changed its character by quickening the time and making it vivacious rather than stately. Mozart used Haydn's form, retaining the rapid *tempo,* but gave it a tender, graceful significance. With Beethoven its history practically ceases, for he transformed it into the *scherzo,* thus making it an integral part of the symphony. Its use by later composers, Schumann, Mendelssohn, and others, is comparatively rare. See DANCING; SUITE; SYMPHONY.

MINUIT, mĭn'ū-ĭt, PETER (1580–1641). An early governor of New Netherland. He was born in Wesel, on the Rhine; was a deacon for a time in the Protestant or Walloon church there; removed to Holland early in the seventeenth century; and in December, 1625, received from the Dutch West India Company the appointment of Governor and Director General of New Netherland. He reached Manhattan Island May 4, 1626, and soon afterward purchased the island from the Indians, obtaining it for the sum of 60 guilders (about $24). He built Fort Amsterdam, defended with great courage and determination the claim of the Dutch to rightful possession of the island, and administered the affairs of his office judiciously and to the general satisfaction of the colony. The fact that the patroons were successful in establishing titles to enormous tracts of land became objectionable to the Dutch West India Company, who placed the responsibility on the shoulders of Minuit. In 1631 he was accordingly recalled by the company, and sailed for Holland in the following spring, but was driven into Plymouth, England, by a gale. Here he was charged with having prosecuted illegal trading within English dominions, and his vessel was attached on complaint made by the Council for New England. In May, however, his vessel was released. Minuit made every effort to reëstablish himself in the favor of the Dutch West India Company, but without success, and finally offered his services to the government of Sweden. Through the influence of Oxenstiern, then Chancellor, a Swedish West India Company was organized and Minuit was commissioned to establish a Swedish colony in America. He accordingly gathered together a sufficient number of Swedes and Finns for this purpose, sailed from the port of Gothenburg, Sweden, in 1637, and early in 1638 built Fort Christiana, near where the city of Wilmington, Del., now stands. The Swedish colonization scheme was bitterly opposed by the Dutch, who threw every obstacle in the way of its success, and eventually captured the colony and annexed it to their possessions in 1655. Consult Kapp, "Peter Minnewet aus Wesel," in *Historische Zeitschrift,* vol. xv (Munich, 1866), and J. J. Mickley, "Some Account of William Usselinx and Peter Minuit," in the *Delaware Historical Society Papers* (Wilmington, 1881).

MINUSINSK, mē'nu-sĕnsk'. A town of southern Siberia, in the Government of Yeniseisk, situated on the Yenisei, 300 miles southeast of Tomsk. It has a high school for girls, a good museum and library, and considerable trade in grain, cattle, and placer gold. The neighboring country is rich in coal, iron, and salt lakes. Pop., 1897, 10,255; 1911, 15,584. Minusinsk is also the capital of a district bear-

ing the same name, with an area of 43,388 square miles and a population in 1912 of 257,800.

MINUTE, mĭn'ĭt (OF., Fr. *minute*, from Lat. *minutum*, small portion, from *minuere*, to make small). A term applied to the sixtieth part of an hour and to the sixtieth part of a degree of a circle. In architecture the term "minute" is applied to the sixtieth part of the diameter of the shaft of a classic column, measured at the base; it is used as a measure to determine the proportions of the order.

MINUTEMEN. In American history, those civilians, in Massachusetts and several other colonies, who, on the approach of the Revolutionary War, pledged themselves to take the field at a minute's notice. In Massachusetts they were enrolled in pursuance of an Act of the Provincial Congress passed Nov. 23, 1774.

MINUTOLI, mē-nōō'tō-lē, HEINRICH, BARON MENU VON (1772–1846). A Prussian officer and archæologist. He was born in Geneva of an old Italian family, early entered the Prussian army, and distinguished himself in 1793 in the Rhenish campaign against France, being severely wounded at Bitsch. After his recovery Frederick William III promoted him to be major general, and in 1820 made him head of the Prussian archæological expedition to Egypt. In 1822 he was made a member of the Academy of Sciences. His valuable Egyptian collection was bought for the Berlin Museum by the King of Prussia. Minutoli's last years were spent in retirement at Lausanne. He wrote: *Ueber antike Glasmosaik* (1814), with Klaproth; the important *Reise zum Tempel des Jupiter Ammon und nach Oberägypten* (1824–27); *Ueber die Anfertigung und Nutzanwendung der färbigen Gläser bei den Alten* (1837); *Betrachungen über die Kriegskunst* (1816); *Beiträge zu einer künftigen Biographie Friedrich Wilhelm III.* (1838–44); *Der Feldzug der Verbündeten in Frankreich, 1792* (1847).

MIN'YAS (Gk. Μινύας, *Minyas*). A legendary hero connected with the Bœotian city Orchomenos (q.v.). He is called son of Poseidon in the earlier writers, but in Pausanias his father is Chryses, and he is famed for his riches and as builder of the first great treasury—really the domed tomb of Orchomenos. His fame in legend is connected with the fate of his three daughters, Leucippe (or Leuconoë), Arsippe (or Arsinoë), and Alcathoë, who, refusing to take part with the Mænads in the orgies of Dionysus, were visited by the god with Bacchic madness, in which they tore to pieces the young son of Leucippe. Their story was acted at the festival of the Agrionia, where the priest of Dionysus, with a drawn sword, pursued women of the family of the Minyadæ. The Argonauts from Iolcos in Thessaly were also called *Minyæ*, but the original connection with Minyas is very doubtful, and the statements of the ancients are obviously mere attempts to explain the identity of name. Consult Ovid, *Metamorphoses*, iv, 1 ff., 389 ff., and W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. ii (Leipzig, 1890–97).

MI'OCENE EPOCH (from Gk. μείων, *meiōn*, less + καινός, *kainos*, new). A division of geologic time following the Oligocene and preceding the Pliocene epochs of the Tertiary period. It is represented along the Atlantic coast of North America by a belt of unconsolidated sands and clays that begins in Marthas Vineyard but is concealed in the interval between there and New Jersey. From that State southward to Florida the beds are continuous and also extend to the west along the Gulf coast into Texas, where they attain a thickness of 1500 feet. In the south they include compact limestones and conglomerates. In California extensive gravel beds were laid down along the streams that flowed west from the Sierras and these gravels form the so-called "deep" and "bench" gravels which are worked for gold. The coasts of California, Oregon, and Washington were still largely submerged and marine deposits were formed in that section. In the interior region are found fresh-water strata of Miocene age, including the John Day beds of eastern Oregon, which contain also volcanic tuffs and ashes and which are from 3000 to 4000 feet thick, and the Loup Fork stage of Montana, South Dakota, and the region southward as far as Mexico. Miocene time was characterized by extensive geographical changes through volcanic activity and regional upheaval. Near the close of the epoch North and South America were finally joined together by the upraising of the Isthmus of Panama, the West Indies were elevated, and the coastal lands of the United States were increased by the emergence of the belt from New Jersey to Texas. Notable changes likewise took place in Europe, such as the joining of Spain and Africa and the final severance of connection between the Mediterranean and the Indian Ocean.

The life of the Miocene included many forms of very modern aspects. Among the larger mammals are mastodons, camels, rhinoceroses, and early forms of the ruminants, from the fresh-water beds of the western region. The horse family was represented by *Protohippus* and *Hippotherium*, larger than the Eocene horses but still possessing three toes. In the marine beds are found whales, dolphins, and numerous invertebrates. Consult: "Correlation Papers—Neocene," in *United States Geological Survey, Bulletin, No. 84* (Washington, 1892); Report on "Miocene," *Maryland Geological Survey* (Baltimore, 1904); Chamberlin and Salisbury, *Geology*, vol. iii (New York, 1907). See GEOLOGY; TERTIARY SYSTEM.

MIOGA, mē-yō'gȧ. See ASABABACCA; GINGER.

MI'OHIP'PUS (from Eng. *mio-cene* + Gk. ἵππος, *hippos*, horse). A name sometimes used to designate the Upper Miocene stage of evolution of the horse, represented by the genus *Anchitherium*. See HORSE, FOSSIL.

MIOLAN, myō'lăN', FÉLIX. A name sometimes used by the French singer Marie Caroline Félix Carvalho (q.v.).

MIONNET, myō'nȧ', THÉODORE EDME (1770–1842). A French numismatist, born in Paris, where he studied in the Collège du Cardinal le Moine and in the Ecole de Droit. After four years of legal practice and a short term in the army, from which he retired because of illness, he became assistant in 1800 in the numismatic cabinet in the Bibliothèque Nationale, and there began to catalogue the collections. He traveled in Italy, made many valuable numismatic finds, and in 1830 was elected to the Academy of Inscriptions. His great works, which still have a distinct scientific value, are *Description des médailles antiques, grecques et romaines* (17 vols., 1806–30) and *De la rareté et du prix des médailles romaines* (1815; 3d ed., 1847). Consult C. A. Walckenaer, *Notice historique sur la vie et les ouvrages de M. Mionnet* (Paris, 1846).

MIOT DE MÉLITO, myō de mȧ'lē'tō', ANDRÉ

François, Count (1762–1841). A French statesman and writer, born at Versailles. Entering the administration of the French War Department, he remained there when the Revolution broke out, although he upheld the principles of constitutional monarchy. In 1793 he was made Secretary General for Foreign Affairs and two years later was sent as French Envoy to Florence. In the following year he went to Corsica to aid Joseph Bonaparte in the pacification of that island after its evacuation by the British. Returning to Paris in 1798, he was Secretary General of the War Department and a councilor of state under the Consulate. From 1806 to 1813 he served with Joseph Bonaparte in Italy and in Spain. In 1814 he was created Comte de Mélito. He served with Napoleon during the Hundred Days and then retired from public life. His translation of Herodotus (3 vols., 1822) and Diodorus (7 vols., 1835–38) gained him admission to the French Academy. His *Mémoires sur la consulat, l'empire, et le roi Joseph* (3 vols., 1858) appeared in an English translation by Mrs. C. Hoey and J. Lillie in 1881.

MIOT'ICS. Those drugs which produce contraction of the pupil of the eye. They act by stimulating the terminal filaments of the third or motor oculi nerve and paralyzing the filaments of the sympathetic nerve. The principal miotics are eserine and pilocarpine, used locally by eye surgeons, and morphine, and nicotine, which produce miosis when taken internally in poisonous doses. Drugs which produce dilatation of the pupil are called mydriatics (q.v.).

MIQUEL, mē-kĕl′, Johannes von (1828–1901). A German statesman, born in Neuenhaus, Hanover, of a family of French émigrés, and educated for the bar at Heidelberg and Göttingen (1846–50). In his student days he was a rabid revolutionist and something of a Socialist, but when the period of reaction set in he soon forsook his earlier sentiments. His practice in Göttingen was very successful, and in 1864 he was elected a member of the Lower House of the Hanoverian Diet and in 1865 burgomaster of Osnabrück. Removing to Berlin in 1870, he was a director of the Diskontogesellschaft until 1873, and then president of its advisory board until 1876. Then he was again made chief burgomaster of Osnabrück and in 1880 of Frankfort-on-the-Main. But his greater field of usefulness was in the Prussian House of Deputies (to which he was elected in 1867) and in the Imperial Diet (1887–90). There, as in the Prussian House of Lords, of which he was ex officio a member as chief burgomaster of Frankfort, he was a leader of the National Liberal party and one of Bismarck's most able and forceful lieutenants. In 1890 he became Prussian Minister of Finance, and was hailed as the "Emperor's man," no doubt to reassure the country in face of its fear that the new Imperial policy was to be reactionary. In this office, which Miquel held up to a few months before his death, he showed himself an able financier and a bold reformer in his attempt to liberate the Imperial treasury from depending on the contributions of the various states. As a politician he was an opportunist and sacrificed his convictions in the hope that he might be made Chancellor. But if he was unsuccessful in his programme of Imperial finance, in his more proper sphere of Prussian finance, by playing somewhat into the hands of the Agrarian party, he secured the adoption of a new tax system which greatly benefited the working classes and at the same time tremendously increased the revenue. He was ennobled in 1897. On his Prussian policy, consult Zedlitz und Neukirch, "Miquel als Finanz- und Staatsminister," in *Preussische Jahrbücher* (Berlin, 1901).

MIQUELON, mĭk′e-lŏn′ *or* mē′k'lôn′. An island near Newfoundland. See Saint Pierre and Miquelon.

MIR, mēr (Russ., OChurch Slav. *mirŭ*, union, peace, world, Lith. *mers*, Alb. *mir*, peace). The name of the civil communities of the Russian peasants. All land is held in common and is divided, usually according to the number of males at the last census, being redistributed whenever necessary. Each family receives meadow, forest, and arable land, the meadow being sometimes kept in common and only the grass divided. The mir, or village commune, as a body is assessed for taxes by the central government, and the burden of taxation is distributed among the heads of families, according to the amount of land occupied by each. Each mir is self-governing, with elected officers, and adjoining mirs may be grouped in volasts, or small cantons. The system is very old, but is gradually changing, as a mir may now go over to private ownership of land and inheritance of property on vote of two-thirds of its members. Consult Keussler, *Zur Geschichte und Kritik des bäuerlichen Gemeindebesitzes in Russland* (St. Petersburg, 1876–87), and D. M. Wallace, *Russia* (new ed., New York, 1905).

MIRABEAU, mē′rà′bō′, Gabriel Honoré Riqueti, Count de (1749–91). A French orator and statesman. He was the second son of Victor Riqueti, Marquis de Mirabeau, a celebrated economist, and was born at Bignon, near Nemours, March 9, 1749. After several years of private instruction the young Mirabeau was placed (1767) in a fashionable military school in Paris, where he became proficient in languages and in the accomplishments of good society. In 1767 he joined the Berry cavalry regiment and the next year he received a second lieutenant's commission, but his freaks of conduct and his love affairs, one of which brought him into rivalry with his colonel, caused his imprisonment in the citadel of the island of Ré, from which he was released, at his father's request, in March, 1769. The condition of his release was that he should join the expedition to Corsica, and as a member of the Legion of Lorraine he served with credit in the subjugation of that island. In 1771 he was commissioned captain of dragoons and in 1772 he was married at Aix to Marie Emilie de Covet, only daughter of the Marquis de Marignane. Of this union one son, Victor, was born in 1773, but he died in 1778. Debts, quarrels with his father and wife, and an altercation with the Marquis de Villeneuve-Monans led to his imprisonment by *lettre de cachet* in the castle of If in 1774. Mirabeau even during his imprisonment managed to fall violently in love with the young Marquise de Monnier; trouble ensued, and he finally escaped to Switzerland, where he was joined by Sophie, as he called his mistress, and in October, 1776, they settled in Amsterdam, where Mirabeau gained a livelihood as a hack writer. In the meantime the French courts passed sentence upon the runaway lovers, who were arrested in May, 1777, and brought to

Paris, where Sophie was kept under close surveillance, while Mirabeau was imprisoned at Vincennes. For three years and a half he was kept in close confinement, but through his guard, a brother Freemason, he was able to carry on his famous correspondence with Sophie. As a prisoner he devoted himself to the translation of numerous classics and to the production of various original works, some of which were later published. After his release in December, 1780, he forsook Sophie, who, after another love affair, committed suicide in 1789. Then he returned to Pontarlier, secured the revocation of the death sentence, which had been passed on him for the seduction of Sophie, and later went to Aix, where, after a trial in which he ably conducted his own suit, he separated from his wife in 1783.

Because of his suits at Pontarlier he found it advisable to leave France for a few months, which he spent at Neuchâtel, where he met the Genevese Liberals Clavière and Duroveray and where he published his *Des lettres de cachet et des prisons d'état*, the best known of his earlier writings. From September, 1783, to August, 1784, he was in Paris, where he seems to have begun his lifelong intimacy with Henriette van Haren, a young woman of 19, known as Madame de Nehra, whose influence over Mirabeau was exerted entirely for his good. In August, 1784, he withdrew to London to allow another storm to blow over. In England he met his old schoolfellow, Sir Gilbert Elliot (later first Earl of Minto), Mr. (later Sir) Samuel Romilly, Lord Lansdowne, and other well-known men. He there wrote the *Considérations sur l'ordre de Cincinnatus*, which caused a sensation in the United States. After nine months in England the intercessions of Madame de Nehra enabled him to return to Paris, where he entered into intimate relations with the Genevese exiles and other Liberals, like Brissot, and wrote numerous pamphlets on financial questions, published during 1785. These were followed (1787–89) by his attacks on stockjobbing and his criticisms on Necker's administration of the finances. In the meantime he had twice visited Prussia, once on a secret mission for the government. On his first visit (December, 1785, to May, 1786) he was received by Frederick the Great, whose death occurred during his second visit at Berlin (July, 1786, to January, 1787). In 1787 he failed in an attempt to secure the position of Secretary to the Assembly of Notables, and his attacks on Necker drove him to take refuge in Prussia. Returning from this third visit to Berlin, he published in 1788 his most famous work, *De la monarchie prussienne sous Frédéric le Grand* (8 vols. and atlas, London, 1788).

In October, 1788, Mirabeau once more was reconciled with his father, and in January, 1789, he arrived at Aix to participate in the elections to the States-General. In April, having been rejected by his own order, the nobility, he was elected by the Third Estate both of Aix and of Marseilles to the States-General, and he chose to represent the former city. He was in Paris in time to publish on May 2, 1789, the first number of his newspaper, which, after some changes of title, finally took the name of *Courrier de Provence*, and a few days later to be present at the opening of the States-General at Versailles. He never had a following upon whom he could depend in the States-General, where his success was always a result of his ability to take advantage of temporary enthusiasm or excitement—by his fluent oratory and the power of his personality. The true greatness of Mirabeau was not revealed until the publication of his works, and especially his correspondence with La Marck, many years after his death. From the first Mirabeau saw that the royal and ministerial scheme of financial reform would be insufficient to cure the existing evils, but he thought that reforms could be successfully carried out only by a strong and moderate government. He was the most powerful supporter of the idea of a limited or constitutional monarchy. From the opening of the States-General until his death two years later Mirabeau was the most important figure in public life in France, and the story of his life is that of the Revolution in its earlier stages. He took part in the debates concerning the status of the members of the Third Estate, and his attitude as their spokesman at the royal session of June 23 marked him as the champion of the Third Estate in the struggle which ended in the reorganization of the States-General as the National Assembly. He protested vigorously against the attempt to overawe the Assembly by the mobilization of troops around Paris, but his father's death on July 13 prevented his participation in the stirring events of the following day when the Bastille was stormed and destroyed by the populace of Paris. The protracted debates on the rights of the individual, and the radical measures for the destruction of the old order taken by the Assembly on August 4, called forth his protests. Still he recognized the importance of the proposed Declaration of the Rights of Man and took an active part in framing it. One by one he brought forward his favorite constitutional measures and defended them with all his powers of logic, eloquence, and persuasion, only to see them voted down. Nevertheless, there was hardly an important law passed by the National Assembly which did not show the influence of Mirabeau's views. After the failure of his proposition to choose the royal ministers from the members of the National Assembly, on Nov. 7, 1789, Mirabeau strove earnestly to put his great abilities at the service of the King, whom he had attempted to advise as early as October 15. He tried to work with Lafayette and Necker, but everywhere he was viewed with suspicion, his advice was never followed, and his assistance was rejected entirely or accepted with ill grace. Finally in May, 1790, he abandoned his attempts to coöperate with Necker and Lafayette, and, through La Marck, entered into regular relations with the King and Queen, for whom he wrote his famous series of notes of advice. This change was marked in the Assembly by his speech in favor of the royal prerogative, especially in questions of peace and war, which directed suspicion towards him, and caused a temporary outburst of popular indignation against him. He was largely responsible for Necker's resignation in September, 1790, and for the appointment of Clavière in his place. In July he had been placed on the Diplomatic Committee of the Assembly and, in coöperation with his old friend Montmorin, the Minister of Foreign Affairs, had dealt with the perplexing questions of foreign relations, such as the annexation of Avignon and the maintenance of the Family Compact with Spain. He insisted that

no other country should interfere in the internal affairs of France; that other countries must keep their agreements with France; and that France must respect her agreements with other countries. On Nov. 30, 1790, he was elected president of the Society of the Friends of the Constitution, popularly known as the Jacobin Club, and on Jan. 29, 1791, he received the coveted honor of election as president of the National Assembly. His last note to the court, through La Marck, was sent on February 3. His last appearance in the Assembly was on March 27. On April 2, 1791, he died in the Rue de la Chaussée d'Antin in Paris. He was buried in the church of Ste. Geneviève (the Panthéon), but three years later his remains were removed to make room for those of Marat.

The greatness of Mirabeau has been generally recognized, but in estimating the details of his life and policy there has been the widest divergence of opinion. French republicans have condemned him unsparingly for his monarchical sympathies, but most of all because in return for his services the court paid his debts and supplied him with funds. In his defense it must be said that Mirabeau regarded himself as de facto prime minister, charged with the duty of saving France, a task to which he felt he alone was equal. The keynote of his advice to the court was that the King should transfer the court and the Assembly from Paris to Fontainebleau, or Compiègne, or some other small town of central France, where the influence of the mob of Paris would cease to control the Assembly and the King and the Assembly would be free to give France a strong monarchical constitution. Mirabeau had great power over men and made those who came under his fascination willing to merge their personalities in his and allow him to take all the credit for their labors. The *Souvenirs* of Etienne Dumont, one of his collaborators, first showed fully Mirabeau's methods of work and the way in which he made regular use of the services of Dumont, Reybaz, Pellenc, and even better-known persons like Clavière and the Abbé Lamourette. In Mirabeau everything was on a colossal scale; in personal appearance and moral character he was almost a monster; in intellect and powers of endurance he was a Titan. In his personality all that was noblest and best of the French Revolution seemed combined with the greatest of its characteristic evils. Some historians have mourned Mirabeau's death, because they believed that had he lived he would have saved France from the excesses of the Reign of Terror through his gift of practical statesmanship and his freedom from the doctrinaire vagaries that obsessed some of the later leaders of the Revolution.

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MIRABEAU, Sibylle Gabrielle Antoinette de Riqueti de, Comtesse de Martel de Janville. See Martel de Janville, Gabrielle, Countess.

MIR'ACLE PLAY (OF., Fr. *miracle*, from Lat. *miraculum*, miracle, from *mirari*, to wonder, from *mirus*, wonderful; connected with Gk. *μειδᾶν*, *meidan*, Skt. *smi*, to smile). Strictly, the second stage in the development of the modern drama under religious auspices, though it is sometimes confounded with the first, for which, and for a general account of this development, see Mystery. The distinction between the two, where it is made, is based on the fact that whereas the mysteries proper took their subjects from the Scripture narrative, centring about the life of Christ and the great mysteries of the Christian faith, the miracle plays were taken rather from the lives of the saints. The significant features of this change were that by getting away from the sacred text of the Scriptures greater latitude was gained and a greater range of characters; a nearer approach to a representation of contemporary life was thus also permitted, and a freer introduction of the comedy element than reverence would allow in the earlier form. Matthew Paris mentions a miracle play, *Ludus de Sancta Katharina*, that was performed at Dunstable about 1110, under the direction of a certain Geoffrey, afterward abbot of St. Albans. Again, William Fitz-Stephen, in his *Life of Thomas Becket* (about 1182), writes approvingly of London plays on

the miracles and sufferings of martyrs and confessors. Other miracle plays, based on the lives of St. Fabian, St. Sebastian, St. Botolph, St. George, and St. Crispin, were performed in the fourteenth, fifteenth, and sixteenth centuries. Very few texts of English miracle plays have been preserved; but from numerous continental specimens it may be inferred that they were in aim and structure similar to the mysteries. At the end of the nineteenth century and at the opening of the twentieth something like a revival of this dramatic form, or of this form blended with the mystery play, was attempted with some success in France, in England and Ireland, and in Germany, the efforts of Maeterlinck and Yeats being worthy of note. For bibliography, see MYSTERY.

MIRACLES (Lat. *miraculum*, wonder). An event or an effect in the physical world not explicable by known natural law and therefore assigned to a supernatural cause. Thus defined, an event which is a miracle in one age is not in another, when its natural causes have come to be understood. The conception of the direct action of the gods in certain events goes far back of the idea of natural law into the earliest history of the race. The unusual event was a wonder and challenged attention. It was naturally explained as the action of some invisible, superhuman power. The meaning of miracles still preserves the memory of this primitive conception. The next step was to regard this wonder as a sign of the presence or power of the divine being who caused it; so miracles came to be looked for especially at the shrines of the gods or on the occasion of sacrifices. The temple of Æsculapius in Greece was filled with the crutches and staffs of the lame who had been healed by the god, and religious story contains many tales of how the gods verified their presence at a sacrifice by some striking event. Aside from this, however, unexpected and startling occurrences might always be assigned to the gods. Certain classes of events which seemed to have no visible causes were quite uniformly assigned to the direct will of the gods—like thunder, which the Psalmist calls "the voice of God," and dreams, trances, and waking visions, when vivid and inexplicable. The Hebrew race shared with all the ancient world a ready belief in the abundant direct activity of God in the world. In fact, natural and supernatural is not the proper antithesis to use of ancient ideas, but rather usual and unusual, expected and unexpected. A worshiper might demand such a proof of the presence and approval of God as did Gideon in the matter of the fleece. (Judg. vi. 36–40.) The Old Testament represents, in its consideration of miracles as well as in other things, the primitive point of view. One may say that the conception of miracles, as understood by Christian theology, had not yet arisen. Dreams and their interpretation are believed to come from God, and even the life of the beasts is the direct gift of breath from God. (Ps. civ. 29, 30.) At the same time, unusual events are taken as signs from God and as verification of the words of his prophets. (1 Sam. xii. 16–18.) In this evidential use of the unusual in nature lies the beginning of the later Christian conception of a miracle as an event not explicable by natural law and having a religious purpose. The New Testament expresses various ideas of the significance of such events in its various terms for them—wonders, powers, signs, works; but the chief value of miracles to the writers of the New Testament lies in their use as evidence of the presence and power of God. Though Christ himself never based the authority of his teachings on the evidence of miracles, yet it is plain that the feeling both of the populace and of the early Church is expressed by the saying of Nicodemus: "We know that thou art a teacher come from God; for no man can do these signs which thou doest except God be with him." (John iii. 2.) The apostolic church also believed that miraculous events occurred among them and were tokens of the working of the spirit of God. (Acts xi. 15–18; 1 Cor. xii. 4–11.) Even in the subapostolic church the divine power was held to be manifested, especially in the name of Jesus. (Heitmuller, *In Namen Jesus*, Göttingen, 1903.) Clement of Rome, Irenæus, Origen, Athanasius, Augustine, and Jerome all bear witness to the belief in contemporaneous miracles. So far the belief in miracles created no particular problem, but was a natural inference from the belief in any supernatural power actively interested in the affairs of the world.

The problem of miracles arose in Christian theology in the time of the schoolmen with the sharp demarcation between the natural and the supernatural. A philosophical conception of miracle arose as that which is apart from nature. The popular interpretation was an event contrary to nature, and the popular inference was that the more opposed to nature a miracle might be, the more it was evidence of the supernatural. These ideas passed into Protestantism and have colored much of the use of miracles as Christian evidence. The Church of the Middle Ages held that miracles still took place, though some of the schoolmen, as Abélard, freely criticized accounts of particular miracles. This belief in the continuance of the power of miracle has continued in the Roman Catholic church, which has always held evidence of miraculous power to be a prerequisite to the canonization of a saint. The Protestant church has usually rejected postbiblical miracles, regarding the function of miracle to be the attestation of the divine truth of the special revelation of God in the biblical periods.

In the history of the discussion, different definitions of miracle have been given.

1. That it is a violation of a law of nature by a volition of the Deity. This is the definition which Hume used. Hume's famous argument against miracles is that all knowledge rests upon experience; but experience confirms the order of nature, and miracles are so contrary to all experience that it is more reasonable to disbelieve any testimony about them than to believe a miracle. John Stuart Mill, *Essays on Theism*, asserts that, if a miracle could happen, it would be impossible to prove it. The common answer to this position has been that the possibility of events is not limited to usual past experience, and therefore that it is impossible to prove that miracles cannot take place. Spinoza held that "nothing happens in nature which is in contradiction to its universal laws," and, since miracles are contradictions to law, they are impossible. This has been met by saying that miracles are contrary to nature only if nature is taken as a mechanism.

2. The definition of a miracle as contrary to nature is neither biblical nor in accord with the best theological thinking. Augustine held that

miracles are not against nature, but only against nature as we know it. Miracles have been defined as events not explained by the known laws of nature. It is in accordance with this that various fields, once considered miraculous, have been removed from the field of miracle by the fuller understanding of natural law—dreams, the thunder, eclipses, trances and visions, many kinds of healings. This definition admits the reality of the biblical miracles and says that, if we knew the laws of nature better, we should doubtless find explanation for them all. This position is sometimes taken from a religious point of view, conceiving that an all-wise God, in constructing the universe, must have so arranged things that all events which happen fall into their place as parts of an ordered and harmonious whole.

3. An element of religious purpose has nearly always entered into the Christian definition of miracles. A mere wonder is not a miracle. It must have a religious significance. If, to use Arnold's illustration, the pen should turn into the penwiper, it would be a very strange event, but its religious significance is not obvious, and it would not be a miracle. On the other hand, if the crossing of the Red Sea were effected by means of a wind, at the will of God, for a religious purpose, it would still be a miracle. Whenever God so orders affairs that an extraordinary event fulfills a religious purpose in life, that event may be called miraculous, even if its immediate cause is the operation of natural law.

4. A definition of miracle is sometimes given which extends it beyond the biblical miracles, or those in ecclesiastical history, to all direct spiritual action of God. Miracle is God's direct action in the world of matter or of mind. On this basis it is held that the Christian religion is miraculous, not merely because of events in Christ's life, but because it is the field of the direct action of God. Conversion, the life of prayer, the communion of God with man, the grace which enables man to combat sin, are all miraculous. It is certainly true that the historic doctrines of grace and redemption make Christianity an essentially miraculous religion.

In the modern world there have been two stages of the discussion of miracles: one under the influence of the growing sense of a natural order, which produced the objections to miracles raised by the English deists, Hume, and the French and German rationalists; the other under the influence of the modern scientific conception of the uniformity of law, expressed by the doctrine of evolution and the historical study of religion. The older objections of Hume and his contemporaries are no longer of importance. The conceptions upon which both these objections and the answers rest have been displaced by modern science. The insight into the inexhaustible complexity of nature has made men more modest in asserting what may or may not be possible, or to be sure that all the causes of any event have come into view. At the same time the sense of an ordered universe has become stronger, and the older idea of a miracle as the action of God thrusting His hand into the moving machinery of His world seems to debase the conception of God. A growing spiritual sense has also led to the emphasis on the moral and religious as evidence of the revelation and power of God. The value of miracles as evidences of the divine character of the biblical revelation because they were events only explicable by the power of God has been very much diminished. Miracles merely as acts of power have no religious significance. They are external; modern religion demands evidences within the personal experience. The result is that, while 100 years ago miracles were considered one of the great proofs of the Christian religion, they are to-day rather burdens than helps. Theology holds the possibility of miracles; for the most part it holds that some at least of the biblical miracles happened; it holds that they were evidences for religion at the time they occurred, but that they belong to the lower grade of evidences, and that the moral and spiritual proofs of religion are higher and more valuable.

But to assert that miracles may happen is not to claim that they did happen. The critical study of the Bible has introduced a new problem: how far are the narratives of miracle in the Bible to be taken as statements of fact? Certain classes of miracles will be set aside: those in books held to be fiction; those in apocalyptic literature, where miraculous visions are a part of the literary form; those told in legendary folk tales; and those where a miraculous cause is assigned for what we now see may have been a natural event. The principles of criticism must be allowed the same play in the New Testament as in the Old, but the nearly contemporaneous character of the writing of the New Testament and the abundant evidence they contain of belief in a large body of miraculous healings forbid the treatment of them as wholly legend. Many who are critical of the Old Testament narratives and of certain accounts in the New yet hold that Christ had a unique power which manifested itself naturally in miracles of benevolence, like healings and even raising from the dead. To such persons Christ himself is the great miracle, and his miracles are not mere wonders, but manifestations of his own character. The present tendency, however, is to remove attention from the miracles and centre it upon Christ's character. Historical criticism even claims the right to question, and if necessary to reject, the narratives of Christ's miraculous birth and resurrection without disloyalty to the essential principles of his religion; a claim, however, which is not always acknowledged by conservative theology. Christian thought is not entirely at one regarding the place of miracles in Christian belief. Some hold that the belief in miracle is a necessary and fundamental part of Christian doctrine; others that it is unessential, that it belongs to the interpretation of nature rather than to the realm of spiritual truth, and that Christian belief does not require the acceptance of miracles as the term is understood in historic theology.

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MIRACLE WORKER. See GREGORY THAUMATURGUS.

MIRA DE AMESCUA, mē'rȧ dȧ ȧ-mȧs'kwȧ, ANTONIO (?1578–1644). A Spanish dramatist. Born at Guadix, he took orders, obtained a canonry in his native town, and settled in Madrid early in the seventeenth century. In 1610 he had become archdean of Guadix. He accompanied the Count of Lemos to Naples, and on his return in 1619 was appointed chaplain to the Cardinal Prince Ferdinand of Austria. He early attained distinction as a dramatist, for he is mentioned as such by Rojas Villandrando in his *Loa* (Madrid, 1604), which was written late in 1602 or early in 1603. Mira de Amescua's plays are few, but of even execution, a combination not often found among Spanish writers and one which invites comparison with Alarcón. They were influential at home and abroad. The lack of a good edition of Mira's complete works is responsible for his not being better known to-day.

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MIRAFLORES, mē'rȧ-flō'rȧs, MANUEL PANDO FERNÁNDEZ DE PINEDO MACEA Y DÁVILA, MARQUIS OF (1792–1872). A Spanish statesman and historian, holding also the title of Count of Villapaterna. He was born at Madrid, was sent as Ambassador to London in 1834, and was Ambassador at Paris in 1838–40. In 1846 he was Premier and in 1863 again filled the same office. He was Ambassador to Vienna in 1860 and was several times President of the Senate. He wrote a number of works which are of value for the political history of Spain in the nineteenth century. The most important is the *Memorias para escribir la historia de los siete primeros años del reinado de doña Isabel II* (1843). In addition to many of the most highly esteemed of the Spanish decorations for distinguished service he was Grand Officer of the French Legion of Honor. He was also elected a member of the Royal Academy of History at Madrid.

MIRAGE, mĭ-räzh' (Fr., from *mirer*, to gaze). A phenomenon extremely common in certain localities and due to conditions existing in the atmosphere. As a result of a deviation of the rays of light caused by refraction and reflection, objects seen with the eye appear in unusual positions and often multiple or inverted. One cause of mirage, such as occurs in a desert, is a diminution of the density of the air near the surface of the earth, often produced by the radiation of heat from the earth, the denser stratum being thus placed *above* instead of, as is usually the case, below the rarer. Now, rays of light from a distant object, situated in the denser medium (i.e., a little above the earth's level), coming in a direction nearly parallel to the earth's surface, meet the rarer medium at a very obtuse angle, and (see LIGHT) instead of passing into it they are reflected back to the dense medium, the common surface of the two media acting as a mirror. The image produced by the reflected rays will appear inverted and below the real object, just as an image reflected in water appears when observed from a distance. If the object is a cloud or portion of sky, it will appear by the reflected rays as lying on the surface of the earth and bearing a strong resemblance to a sheet of water; also, as the reflecting surface is irregular and constantly varies its position, owing to the constant communication of heat to the upper stratum, the reflected image will be constantly varying and will present the appearance of a water surface ruffled by the wind. This form of mirage is of common occurrence in the arid deserts of Lower Egypt, Persia, Turkestan, etc. In the case of mirage at sea the denser layers of air are next to the surface of the water, and the reflection takes place from the rarer atmosphere above. Consequently we have the object appearing in the air suspended and inverted. Sometimes images of objects are seen not above one another, but side by side, caused by the existence of bodies of air of different densities in proximity.

In particular states of the atmosphere reflection of a portion only of the rays takes place at the surface of the dense medium, and thus double images are formed, one by reflection and the other by refraction—the first inverted and the second erect. The phenomena of mirage are frequently much more strange and complicated, the images being often much distorted and magnified and in some instances occurring at a considerable distance from the object, as in the case of a tower or church seen over the sea or a vessel over dry land, etc. The particular form of mirage known as looming is very frequently observed at sea and consists in an excessive apparent elevation of the object. Consult Müller, *Lehrbuch der kosmischen Physik* (Brunswick, 1896).

MIRAMAR, mē'rȧ-mär'. An Imperial palace and public pleasure resort on the Gulf of Triest, 6 miles northwest of Triest (q.v.).

MIRAMICHI (mĭr'ȧ-mē-shē') **RIVER.** The

second largest river in New Brunswick, Canada. It is formed by the junction of the northwest and southwest Miramichi (Map: New Brunswick, C 2). It flows, after a course of about 100 miles, into the Bay of Miramichi, a part of the Gulf of St. Lawrence. Pine woods abounding with game line the banks of the river, which is navigable for vessels of modern size for a distance of 40 miles from its mouth. The fishing is excellent, salmon and trout abound, and there is a state fish-breeding establishment on one of the tributaries.

MIRAMÓN, mē′rȧ-mōn′, MIGUEL (1832–67). A Mexican general, of French descent, born in the city of Mexico. He was educated for the army and fought against the United States at Molino del Rey and Chapultepec. He saw much active service during the fifties and was promoted to be a lieutenant colonel in 1855. He was one of the leaders of the opposition to Comonfort (q.v.) in 1856 and supported Zuloaga, the representative of the clerical and reactionary party, in the movement which forced Comonfort to retire to the United States in 1858. Later in the same year he was chosen acting President by a *Junta de Notables*, but, contrary to the expectations of the junta apparently, he turned the office over to Zuloaga and assumed the conduct of the campaign against the Liberals, led by Juárez. Returning to the capital, he was again installed as acting President, exercising its duties until December, 1860, when his defeat by Juárez at Calpulalpam forced him to leave the country. He spent some time in Europe and advocated foreign interference in Mexican affairs. He reappeared in Mexico in 1866, after the announcement that the French army was to leave the country, and offered his services to Maximilian. Raising an army in the West, he joined the Emperor at Querétaro, where he was wounded during the final struggle with the republican forces. He was tried and condemned to be shot with the Emperor on June 19, 1867. As they were lined up for the execution, Maximilian insisted that Miramón should take the place of honor in the centre, as a tribute to his bravery.

MIRANDA, mē-rän′dȧ. A Portuguese poet. See SÁ DE MIRANDA, FRANCISCO DE.

MIRAN′DA, mī-rän′dȧ. In Shakespeare's *Tempest*, Prospero's daughter and the ladylove of Ferdinand.

MIRANDA, mē-rän′dȧ, FRANCISCO (?1756–1816). (Miranda's own statements would indicate that he was born in 1752; his lawyer Chauveau Lagarde asserts the date was 1754; a baptismal certificate published by Blanco bears the date 1756.) A Spanish-American revolutionist, who was born in Venezuela and entered the Spanish army, rising to the rank of captain. He resigned in order to serve with the French in the United States. He was then sent to Cuba, where he engaged in illegal trade and was obliged to take refuge in Europe. The French Revolution called forth his enthusiastic admiration. He served in the French Republican army and gained the rank of major general. The defeat at Neerwinden (1793) was attributed largely to his treachery, and the suspicion led to his arraignment before the Revolutionary Tribunal, which unanimously acquitted him. Later in the same year he was again arrested and placed in prison, where he was kept without trial for a year and a half. After the fall of the Girondists he fled to England and endeavored in vain to induce William Pitt to aid him in an attempt to free Venezuela from the Spanish dominion. In 1803 he went to New York, where he found means to fit out two vessels and some 200 volunteers, with whom he sailed for South America in 1806. The great popular demonstration in his favor which he had expected was entirely lacking. In 1810 he organized another expedition and took possession of Valentia, Puerto Cabello, and nearly the whole of New Granada. Miranda organized a revolutionary government, proclaimed a constitution, made himself Vice President, and entered Carácas in triumph in April, 1812. The members of the government were not able to act in harmony. Miranda was taken prisoner by the opposition faction of revolutionists in July and shortly afterward fell into the hands of the Spanish authorities, by whom he was sent to Spain. He died in the dungeons of the Inquisition at Cadiz three years later. Consult: Biggs, *History of Miranda's Attempt in South America* (London, 1809); Marqués de Rojas, *El General Miranda* (Paris, 1884); id., *Miranda dans la révolution française* (Carácas, 1889); the Spanish edition of this latter work (ib., 1889) contains a few additional source materials; also W. S. Robertson, *Francisco de Miranda and the Revolutionizing of Spanish America* (Washington, 1909).

MIRANDOLA, mē-rän′dō-lȧ. A town in the Province of Modena, Italy, 19 miles north-northeast of the city of Modena (Map: Italy, C 2). The little town is regularly laid out. The old Ducal Palace of the Pico family, the cathedral, and the church of Gesù are the most important buildings. It has a gymnasium, a technical school, and a library. The principal industries are cattle raising and the production of silk and rice. Pop. (commune), 1901, 13,731; 1911, 16,740.

MIRANDOLA, GIOVANNI PICO DELLA. An Italian humanist. See PICO DELLA MIRANDOLA.

MIRANHA, mī-rä′nyȧ. See MARANHA.

MIRAT, mē′rŭt. See MEERUT.

MIRAVAL, mē′rȧ′vȧl′, RAIMON DE (c.1190–1216). A Provençal poet. His poverty compelled him to subsist on the favor of the great lords at whose courts he seems to have passed most of his time. His chief patron was Raimon VI of Toulouse, addressed in his poems by the name Audiart. Consult Andraud, *La vie et l'œuvre du troubadour Raimon de Miraval* (Paris, 1902).

MIRBACH, mēr′bäg, JULIUS, COUNT VON (1839–). A German politician, born in Sorquitten, East Prussia. He studied law at Königsberg, Bonn, and Berlin and served as officer in the German army, resigning in 1865. In 1874 he entered the Prussian House of Lords and in 1878–81 and 1886–98 was a member of the Reichstag and a prominent figure in the German Conservative party, taking a foremost part in economic and agrarian reforms, acting as leader of the *Steuer-und Wirtschaftsreformer* (1879 et seq.). He was created Count in 1888.

MIRBEAU, mēr′bō′, OCTAVE (1850–1917). A French novelist and playwright, born at Trevières (Calvados). After a stormy journalistic career he published his first novel, *Jean Marcelin*, in 1885, but gained note with *Lettres de la chaumière* (1886), a tale of his native Normandy. There followed *Le Calvaire* (1886); *L'Abbé Jules* (1888; in Russian, 1912); *Sébastien Roch* (1890); *Le jardin des supplices* (1899); the exceedingly unsavory and very

popular *Les mémoires d'une femme de chambre* (1901; in English, *Experiences of a Lady's Maid*, 1911); *Les vingt-et-un jours d'un neurasthénique* (1902); *Le jardin des supplices* (1902); *Dans l'antichambre* (1905). He was successful on the stage with *Les mauvais bergers* (1897), and still more with *Les affaires sont les affaires* (1903), produced with great success in New York in 1905 as *Business is Business*. A number of one-act plays are contained in *Farces et moralités* (1904). In 1909 he wrote *Le foyer*, which was suppressed by the censor, and in 1913 *Dingo*.

MIRBEL, mĕr'bĕl', CHARLES FRANÇOIS BRISSEAU DE (1776–1854). A French botanist, born in Paris. In 1800 he began a botanical course at the Athénée and in 1803 he was made intendant of the Malmaison Gardens. In 1806 he was made a councilor of state at the Dutch court of Louis Bonaparte, and as director of fine arts he was charged with the mission of organizing a school in Paris for Dutch artists. In 1808 he became a member of the Institute. He was professor of culture at the Botanical Garden (1828) and at the Museum of Natural History (1829). His great contributions to structural botany are recorded in his works: *Traité d'anatomie et de physiologie végétale* (1802); *Exposition de la théorie de l'organisation végétale* (1809); *Eléments de botanique et de physiologie végétale* (1815); *Histoire naturelle des végétaux classés par familles* (18 vols., 1802–26).

MIRBT, mĕrpt, CARL THEODOR (1860–). A German Church historian, born at Gnadenfrei in Silesia. He was educated at the universities of Halle, Erlangen, and Göttingen; was docent at Göttingen for a year; and then was professor of ecclesiastical history at Marburg from 1889 to 1912, when he went back to Göttingen. His published work, which deals with the Roman Catholic church and with the history of Protestant missions, comprises: *Die Wahl Gregors VII.* (1892); *Die Publizistik im Zeitalter Gregors VII.* (1894); *Der deutsche Protestantismus und die Heidenmission im 19. Jahrhundert* (1896); *Quellen zur Geschichte des Papsttums und des römischen Katholizismus* (1895; 3d ed., 1910); *Ultramontanismus im 19. Jahrhundert* (3d ed., 1903); *Mission und Kolonialpolitik in dem deutschen Schutzgebieten* (1910); *Die Frau und die deutsche Kolonialmission* (1912); *Geschichte der katholischen Kirche von der Mitte des 18. Jahrhundert bis zum Vatikanischen Konzil* (1913).

MIRÉS, mē-rā', JULES (1809–71). A French financier and speculator. He was born at Bordeaux. In company with Moïse Millaud he began to buy up the press of Paris; he purchased the *Chemins de Fer* and afterward the *Constitutionnel* and *Le Pays*. He published independently the *Conseiller du Peuple*. Swaying public opinion in this manner, he organized the *caisse générale des chemins de fer*, or railway bank, began to build railroads in Spain and elsewhere, negotiated municipal and national loans, and acquired an immense fortune. During the last four years of his career his speculations amounted to 1,500,000,000 francs. Arrested for fraud in 1861 he was condemned to imprisonment, but was acquitted in 1862 after an appeal. He resumed banking operations, but people came to distrust his promises of magnificent possibilities. He was a man of infinite resources, quick to plan, daring to act, carrying out his immense coups by gigantic combinations, overcoming all opposition by the plentiful use of money and with the help of his hired journalists and politicians. He published in 1870 *Un crime judiciaire*, and carried on a lively war of pamphlets with his enemies.

MIRFIELD, mĕr'fēld. A manufacturing town and urban district in the West Riding of Yorkshire, England, 5 miles northeast of Huddersfield, on the Calder, one of the chief railway centres in the country. It has manufactures of woolen and cotton goods, carpets, and blankets. There are coal mines near by. Pop., 1901, 11,341; 1911, 11,712.

MIR'IAM. The sister of Moses and Aaron. She is called a "prophetess" and is represented as celebrating the deliverance of the people from Egypt as the leader of a female choir (Ex. xv). Apart from this, she is mentioned again only in connection with Aaron's rebellion against Moses, in which Miriam stands on Aaron's side. She is smitten with leprosy as a punishment (Num. xii), but after seven days' isolation (Lev. xiii. 5) is healed by Yahwe at Moses' solicitation. Her death takes place at Kadesh (Num. xx. 1). Miriam, though not expressly named, is thought to be the sister referred to in the story of Moses' infancy (Ex. ii), who acts as a nurse and protector to him. The name may be connected with Merari, one of the sons of Levi (Ex. vi. 16). It has been suggested that Aaron and Miriam represent priestly families vying with that of Moses, that the latter prevailed, but that a compromise was effected, showing itself in the later tradition. The association between Moses, Aaron, and Miriam once established is supposed to have given rise to further elaboration which was adjusted to the general priestly narrative in the Pentateuch. The allusion in Micah vi. 4 to "Moses, Aaron, and Miriam" as the forerunners in the redemption of Israel is thought by some scholars to be a valuable indication of the period at which the combination of the three in popular tradition and legend had taken place.

MIRIBEL, mē'rē'bĕl', MARIE FRANÇOIS JOSEPH DE (1831–93). A French general. He was born at Montbonnot, studied at the Ecole Polytechnique and at the Military Academy of Metz, and in 1853 was commissioned a lieutenant of artillery and sent to the Crimea. He fought in Italy in 1859 and in Mexico (1862–65); served on the international commission dealing with the use of explosive bullets; and in 1868 was appointed military attaché in St. Petersburg. Miribel fought bravely at Champigny and Buzenval in the Franco-Prussian War; commanded a corps of artillery against the Commune; and from 1877 to 1879 was chief of the general staff. His reappointment by Gambetta to this post in 1881 created great excitement, and he resigned after the fall of Gambetta's ministry. In 1888 he was commanding general of the Sixth Army Corps. In 1890 he was once more made chief of staff with greater powers than before, and showed himself an able administrator.

MIRIM, mē-rēN'. A lake or lagoon in the extreme south of Brazil, on the boundary of Uruguay (Map: America, South, D 6). It is 130 miles long and from 5 to 25 miles wide, and is separated from the Atlantic Ocean by a low sandy tract from 15 to 40 miles wide, containing several true coast lagoons. It receives a number of small rivers from the west, and,

though its shores are low and marshy, it is not in direct communication with the ocean, but discharges its waters northward into the Lagôa dos Patos (q.v.). Like the latter, it was evidently formed through the cutting off by sand bars of a large bay of the ocean. The water of Lake Mirim is fresh, and there is no rise or fall of the tides in it.

MIRITI (mē-rē'tē) **PALM.** See MAURITIA.

MIRKHOND, mēr-kŏnd', HAMAN ED DIN (1433–98). A distinguished Persian historian, born of Sayyid descent from a Bokharan family probably near Nishapur. About 1474, under the patronage of Mir Alishir, Mirkhond began his historical work, entitled *Rauẓat-uṣ-ṣafā* (Garden of Purity). It is of great value and, on the whole, is a very remarkable compilation, being, save for the seventh volume, which deals with the latter part of the fifteenth century and must have been by Mirkhond's son, Khondamīr (1475–1535), the work of a single man. Beginning with mythical times, the *Garden* contains biographical notices of the leading Persian notables down to 1523. The part on the early kings was translated by Shea (London, 1832); that on the Sassanids, into French by S. de Sacy (Paris, 1793) and Jaubert (ib., 1843); on the Samanids, into Latin by Wilken (Berlin, 1808) and into French by Defrémery (Paris, 1845); on the Seljuks, by Vullers into German (Giessen, 1837); and the story of Mohammed by Rehatsek into English (5 vols., London, 1891–94) and from English into French by Lamairesse (Paris, 1894).

MIRMILLO'NES. The name given by the Romans to a kind of gladiator (q.v.).

MIR'ROR (OF. *mireor, mirour,* Fr. *miroir,* It. *miratore, miradore,* from Lat. *mirari,* to look, from *mirus,* wonderful; connected with Gk. *μειδᾶν, meidan,* Skt. *smi,* to smile). An object having a smooth or polished reflecting surface by which virtual or real images of an object are produced, and the direction of light or heat waves changed according to the laws of reflection. Mirrors are used largely for toilet and decorative purposes, and also in scientific apparatus and in numerous other practical devices to concentrate, scatter, or divert rays of light or heat, as in practical illumination. The action of the mirror depends on the law of reflection where it is stated that the angle of reflection must equal the angle of incidence and be in the same plane. This optical principle was well known to the ancients and was doubtless long preceded by an actual practical knowledge of the instrument. Probably for ages after the civilization of man commenced the still waters of ponds and lakes were the only mirrors. We read in the Pentateuch of mirrors of brass being used by the Hebrews, while it is known that mirrors of bronze were in very common use among the ancient Egyptians, Greeks, and Romans, and many specimens are preserved in museums. Praxiteles taught the use of polished silver for mirrors in the year 328 B.C. and polished mirrors of obsidian or natural glass were used by the Romans.

Mirrors of glass were first made at Venice in 1300; and judging from those still in existence they were very rude contrivances compared with those of modern make.

It was not until 1673 that the making of mirrors was introduced into England, and the industry has since developed in Europe and America to a point where it is a very important manufacture; and mirrors can be produced of any size to which plate glass can be cast.

For many centuries mirrors were made according to the process originally introduced at Venice—by backing a sheet of glass with an amalgam of mercury and tin. The surface was overlaid with sheets of tin foil, rubbed down smooth, and the whole covered with quicksilver, which immediately formed an amalgam with the tin. The superfluous mercury was then run off and a woolen cloth held firmly over the surface by means of iron weights. After this pressure had been continued 24 hours, more or less, the weights and cloth were removed and the glass placed on a table with a movable top, which was gradually inclined until the unamalgamated quicksilver had entirely drained away and only the surface of perfect amalgam remained adhering to the glass. This process, which was long used, was open to many objections, not least of which was its extreme unhealthfulness for the workmen. The process was also long and tedious, and at best made an unsatisfactory mirror, reflecting less than half the rays of light.

The first attempt to back the glass with silver was made by Liebig in 1836, and different solutions were proposed by other chemists, all of which produced mirrors that were satisfactory for a short time but finally became spotted. In 1855 Pettijean patented a process which, with various modifications, is the one now in general use. The method of mirror manufacture common in America may be described as follows: The raw stock or plain plate glass reaches the factory carefully packed in cases of immense size. The glass is first thoroughly inspected and all defects marked. It then goes to the cutters' department, where it is cut into the proper sizes. Thence it is moved to the beveling department, where it is beveled and polished on rapidly revolving emery wheels of varying degrees of smoothness, the plates—some of them of enormous size—being lightly held against the wheel by the workmen. After both surfaces, including the beveled edge, have been reduced, as nearly as possible, to a condition of perfect smoothness, the glass is passed on to the silvering department. Here it must be thoroughly cleansed, and so delicate is this operation that a specially distilled water is often required for the purpose. The glass is now ready for the essential process of silvering. The nitrate of silver is dissolved in water, to which ammonia is then added, and is precipitated by a solution of Rochelle salts or tartaric acid. The glass is placed on warm tables and the solution poured over it. The heat helps the silver to precipitate and adhere to the glass. The silver back receives a coat of shellac and then of paint or of asphaltum varnish containing white lead, which completes the process. Silvered mirrors reflect from 20 to 25 per cent more of light than those backed with quicksilver.

The optical considerations involved in reflection will be found fully discussed together in the article on LIGHT, but brief mention may here be made of mirrors whose reflecting surfaces are other than plane. In a concave spherical mirror we have distant rays of light or heat brought to a focus and a real image formed. Conversely, if a point source of light is placed at the focus of the mirror, a parallel beam of light results. The first idea is made use of in the reflecting telescope (see TELESCOPE), while the

latter is employed in the searchlight (q.v.), recent types of which have been made with a gold reflecting surface.

A *parabolic mirror* is one "in which every section through the principal axis cuts the surface in a parabola, so that rays from a light placed at the focus are all reflected parallel to the axis and, conversely, parallel rays are brought to the focus." The reflector of a locomotive headlight is thus constructed. See ABERRATION, SPHERICAL; LIGHT.

Cylindrical mirrors do not play as important a part in optics and optical instruments as those of spherical and parabolic cross section, but their effects are sometimes interesting. By using a glass that is curved instead of flat the reflected shape of the object will become distorted, a *concave* cylindrical mirror lengthening it at the expense of width and a *convex* mirror producing the opposite effect.

As heat is reflected as well as light from the surface of a mirror, a concave mirror may be used to bring rays of light to a focus. In this way combustible substances may be set on fire at a distance from the reflector whence they receive their heat. The *Archimedean mirror* was made on this plan. A series of mirrors set in a concave curve concentrated the rays of light upon an enemy's ship, causing it, according to the story, to burn.

MIRROR CARP. An artificial variety of carp (q.v.) with very large scales in two or three rows along the sides of its body, which is otherwise bare.

MIRROR FOR MAGISTRATES, A. A long series of poems on incidents in English history showing the tragedies in the lives of great men. The plan was suggested by Boccaccio's *Falls of Illustrious Men* and Lydgate's *Falls of Princes*, and was devised by William Baldwin, George Ferrers, and Sackville, who wrote a general introduction called the "Induction." It was partly printed in 1555, when it was stopped by Lord Chancellor Gardiner. It was licensed, however, in 1559, and then contained 19 metrical biographies, beginning with Tressillian in Richard II's reign. New editions, with additional lives by various writers, appeared in 1563, 1574, 1578, 1587, and 1610, and a reprint of the whole by Haslewood in 1815. Some of the best-known contributors are Michael Drayton, Thomas Churchyard, John Skelton, and Thomas Sackville, whose "Induction" and "Complaint of Stafford, Duke of Buckingham," are the most valuable parts of the work.

MIRROR OF KNIGHTHOOD, THE. A translation of a Spanish romance, *Cavallero del Febo* (The Knight of the Sun), which tells the adventures of Febo and his brother Rosiclair. It belongs in a sense to the Amadis cycle of romance, as the father of the Knight of the Sun was related to Amadis. The Spanish version was evidently the work of several and was left unfinished. The translation of the romance into English was printed in 1578. See Dunlap's *History of Prose Fiction.*

MIRTOV. See LAVROV, P. L.

MIRYACHIT, mēr-yä'chĭt. An Oriental nervous affection, the chief peculiarity of which is mimicry. The patient imitates words and actions said or done by his immediate neighbor. In Java the disease is called lata. The jumpers of Canada and Wales are thought to be afflicted with a similar disease. See JUMPERS.

MIRZA, mēr'zȧ (Pers. *mirzā*, contracted from *Amīr Zādeh*, son of the prince). A Persian title. As a prefix preceding the surname of the individual it is a common Persian title of honor, but when annexed to the surname it designates a prince or a male of the blood royal.

MIRZAPUR, mēr'zȧ-pōōr'. The capital of a district of Benares, in the United Provinces, British India, on the right bank of the Ganges, 30 miles southwest of Benares (Map: India, D 4). It is a well-built city, the river front is lined with a series of fine landing places, and there are many mosques, temples, and residences of rich European merchants. It is noted for its manufactures of carpets and rugs and has large brass and shellac factories. Prior to the opening of the railway to Allahabad it was the largest cotton and grain trading centre on the Ganges and the converging market of north and Central India. Pop., 1901, 66,071; 1911, 32,332.

MIRZA SCHAFFY, mĭr'tsȧ shȧf'ê. See BODENSTEDT, FRIEDRICH MARTIN VON.

MISANTHROPE, mê'zäN'trôp', LE. A comedy by Molière (1666) based on a study of character rather than on incidents. It is considered Molière's masterpiece and shows his style at its highest development.

MISCAR'RIAGE. In the broadest sense, a breach of legal duty. This is the signification of the term as employed in the fourth section of the English Statute of Frauds and in similar statutory provisions in the United States, which, in order to make a person liable to answer for the debt, default, or miscarriage of another person, require a special promise in writing.

In medical jurisprudence the term "miscarriage" is sometimes employed as the equivalent of abortion as denoting the premature expulsion of the fœtus before it becomes capable of an independent life. The act of causing miscarriage or abortion in a pregnant woman except for the purpose of preserving her life is a crime at common law and by modern statutes. See ABORTION.

MISCEGENATION, mĭs'ê-je-nā'shŭn (from Lat. *miscere*, to mix + *genus*, race). Mixing of races; usually restricted to amalgamation of Caucasian and African races in America. The expression came into common use in discussions of negro slavery in the United States towards and after the middle of the nineteenth century, when certain publicists advocated the gradual absorption of the blacks by intermarriage with whites. The expression is seldom employed in scientific discussion of racial problems, such collocations as mixing of races, blood blending, etc., taking its place. The process so denoted is of much importance—indeed, one of the primary factors of human development, as is shown by the fact that the most advanced peoples are those whose blood is most mixed. The process of racial assimilation is going on in every part of the world and with progressively increasing rapidity. Even in the United States, despite the most strenuous opposition on both national and sentimental grounds, the admixture of whites and blacks has gone so far that among the 9,000,000 enumerated as colored in the census of 1900, the population of pure-blooded Africans is comparatively small, while the admixture of red and white races has affected a proportion of the population which may be estimated at 30 to 60 per cent of the element reckoned as Indian. The data are too meagre to indicate the vital value of the mestizo type in the United States,

though the experience of Mexico suggests that the value is high. The more general aspects of racial blending are discussed under MIXED RACES. Consult C. B. Davenport, *Heredity of Skin Color in Negro-White Crosses*, Carnegie Institution (Washington, 1913). See CROSS BREEDING IN MAN.

MISCHIANZA, mĭs'kê-ăn'tsà, THE. An elaborate fête or entertainment given at Philadelphia, May 18, 1778, during the Revolutionary War, by officers of the British army, in honor of Sir William Howe, who, having been superseded in the command of the British army in America by Sir Henry Clinton, was about to sail for England. The entertainment, which was given at Walnut Grove, the country seat of Thomas Wharton, lasted 12 hours and comprised a regatta, a mock tournament between the Knights of the Blended Rose and the Knights of the Burning Mountain, a dance, and a dinner. Captain (later Major) André was prominent in planning and directing the entertainment and wrote a detailed description, which may be found in Winthrop Sargent, *Life of Major André* (New York, 1902). Consult also J. F. Watson, *Annals of Philadelphia* (Philadelphia, 1856).

MISCHIEF, MALICIOUS. See MALICIOUS MISCHIEF.

MIS'DEMEAN'OR (from *mis-* + *demeanor*, from *demean*, from OF. *demener*, *deminer*, to manage, from Lat. *de*, down + *minare*, to lead, drive). The name given by English common law to every crime below the grade of felony (q.v.). By the common law, the offense of greatest enormity is treason, and the least is misdemeanor. The original distinction between felony and misdemeanor consisted in the consequences of a conviction. A party convicted of felony, if capital, forfeited both his real and personal estate; if not capital, his personal estate only. A party convicted of misdemeanor forfeited none of his property. The distinction is not kept up between the two classes of crimes by any greater severity of punishment in felony, for many misdemeanors are punished as severely as some felonies. But it has been the practice of the Legislature, when creating new offenses, to say whether they are to be classed with felony or misdemeanor; and when this is done, the above incidents attach to the conviction accordingly, in the absence of legislation to the contrary.

Misdemeanor, in the United States, does not include, in its legal application, offenses against police regulations, city by-laws, and the like, though, in common language and in some statutes it may extend to any misbehavior. It is evident that what is a statute felony in one State may be a misdemeanor in another, and it is therefore impossible to give a complete classification of such offenses. They may be crimes against public justice, peace, health, or trade; against personal or property rights of individuals; or may be mere attempts and solicitations.

In some States it is provided that upon acknowledgment of satisfaction by the injured party, in such cases as assault and battery or malicious mischief, the criminal proceeding shall, with the consent of the magistrate, be dropped —a course which, obviously, would be improper in dealing with felonies. Misdemeanors are usually punishable by fine or by imprisonment for a comparatively short term, as from a month to a year, or by both, and are not rated as infamous crimes. See CRIME; FELONY; CRIMINAL LAW.

MISENO, mê-zā'nô (Lat. *Misenum*), CAPE. A promontory projecting into the Bay of Naples on the northwest and connected with the mainland by a narrow strip of coast, 9 miles southwest of Naples, 3 miles from the ancient Baiæ (Map: Italy, F 1). On the outskirts of the promontory are the scanty ruins of the ancient city of Misenum, including the Piscina Mirabilis, a huge reservoir with a well-preserved vaulted roof, supported by pillars, the Grotto Dragonara, a subterranean vaulted structure, of uncertain use, a theatre, baths, villas, and inscriptions. Misenum was made by Augustus the naval station for a division of the Roman fleet, and for that purpose a great harbor with three basins was constructed, of which the inner is now a lagoon, the Mare Morto. The town was destroyed by the Saracens in 890 A.D. Consult J. Beloch, *Campanien* (2d ed., Breslau, 1890).

MISE'NUM. The ancient name of MISENO.

MISE OF AMIENS, mēz ov ä'mê'ăn' (OF., Fr. *mise*, putting, expense, judgment, from Lat. *mittere*, to send). The name given to the decision of Louis IX of France, delivered as arbitrator between Henry III of England and his barons on Jan. 23, 1264. All points in dispute were decided in favor of Henry, and the Provisions of Oxford (q.v.) were specially annulled. See MONTFORT, SIMON DE; HENRY III.

MISE OF LEWES, lū'ĭs. The name given to the capitulation of Henry III of England after the battle of Lewes, in which on May 14, 1264, the barons defeated and captured him. This treaty greatly limited the royal power, and upon it Simon de Montfort sought to establish a new constitution for England. See MONTFORT, SIMON DE; HENRY III.

MISÉRABLES, mê'zā'rā'bl', LES. A noted romance by Victor Hugo, begun in 1846, but interrupted by the author's political activity. It was completed during Hugo's stay in St. Peter's, Guernsey, and was published in 1862, the first part appearing simultaneously in Paris, Brussels, London, New York, Madrid, Berlin, St. Petersburg, and Turin. It formed 10 volumes, divided into five parts, entitled *Fantine*, *Cosette*, *Marius*, *L'Idylle rue Plumet*, and *Jean Valjean*. The interest centres throughout on Jean Valjean, a fallen man who achieves his own rehabilitation after long physical and mental suffering and degradation. The saintly Bishop Mynil or Bienvenu is modeled on De Miolles, Bishop of Digne; Marius represents the author's idea of himself in his youth, and the Baron Pontmercy is intended as a sketch of Hugo's father.

MISERERE, mĭz'ê-rē'rê (Lat., have mercy). The name, taken from its first word, of the Psalm which is the fiftieth in the Vulgate and the fifty-first in the Authorized Version; the principal one of the seven penitential Psalms. It is used on numerous penitential occasions in the Roman Catholic church and forms part of the service for Ash Wednesday in the Anglican Prayer Book. Some of the musical settings of it are famous, especially three which are repeated annually in the Pope's Chapel during the Tenebræ.

MISERERE. A projection on the under side of the seats of the stalls of mediæval churches, chapels, and other ecclesiastical buildings. They are usually ornamented with carved work and are so shaped that when the seats proper are raised they form a support at a higher level to

a person resting upon it. Aged and infirm ecclesiastics were allowed to use these during long services.

MISFEA'SANCE (OF. *mesfaisance*, wrong, from *mesfaire*, *mesferre*, Fr. *méfaire*, to do wrong, from *mes-*, from Lat. *minus*, less + *faire*, from Lat. *facere*, to do). The doing of a lawful act in an improper or negligent manner; contrasted with malfeasance, the doing of a wrongful act, and with nonfeasance, the failure to perform an act which one is under a duty to perform. When misfeasance results in legal damage to a person, it amounts to an actionable tort, although the same act may be a breach of contract also, as when a common carrier injures a passenger by the negligent use of its property or improper conduct of its servants. See TORT.

MISHAWAKA, mĭsh'ȧ-wą'kȧ. A city in St. Joseph Co., Ind., 4 miles east of South Bend, the county seat, beautifully situated on the St. Joseph River and on the Grand Trunk and the Lake Shore and Michigan Southern railroads (Map: Indiana, E 1). It has good water power from the river and is noted as a manufacturing centre, the products including knit boots, windmills, rubber goods, plows, veneer, ladders, beer, pipe organs, cement blocks, machine-shop products, automobiles and supplies, aluminium castings, iron beds, curtain stretchers, pearl buttons, felt shoes and slippers, cigars, and leather goods. Among the prominent features of the city are the Orphans Home, hospital, public library, high school, and three fine parks. Three concrete bridges span the river at this place. The government is administered under a charter of 1899, which provides for a mayor, chosen every four years, and a unicameral council. The city operates the water works and electric-light plant. One of the oldest cities in northern Indiana, Mishawaka was settled in 1828 and was incorporated in 1834 as "St. Joseph Iron Works," the change to its present name being authorized by a special Act of the Legislature in 1838. Pop., 1900, 5560; 1910, 11,886; 1914 (U. S. est.), 14,579; 1920, 15,195.

MISH'MIS. The natives of the Mishmi Hills in the valley of the Brahmaputra in northeastern India. By language they are related to the adjacent peoples of Indo-China (Chins, Shans, Lushai, etc.). These primitive tribes are very interesting from a sociological point of view. Among them the custom that the favorite child (without respect to age) inherits prevails. They are herdsmen rather than agriculturalists. Consult: Cooper, *The Mishmee Hills* (London, 1873); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Crooke, *Natives of India* (1907).

MISH'NA (Heb., teaching, from *shānah*, to repeat, to teach, to learn). A juridico-political, civil, and religious code of the Jews, embodying what is regarded as the oral Law in distinction from the written Law. As such it forms a kind of complement to the Pentateuchal codes, which it explains, amplifies, and immutably fixes in accordance with traditional usage, enforced by the application of the peculiar exegetical methods developed in the rabbinical schools. The Mishnaic laws were subsequently submitted to a process of exposition similar to that which the biblical enactments underwent, and hence there arose, as a supplement to the Mishna, the Gemara (q.v), embodying the discussions on the Mishna by the rabbis, first of Palestine and then of Babylonia, from the third to the sixth century, when the Mishna and the Gemara had been brought together in the final compilations known as the Palestinian and Babylonian Talmuds. The rabbis whose opinions are given in the Mishna are called Tannaim. They lived at different periods from the Hasmonæan age to the end of the second century A.D. The Mishna, to which again there are apocryphal supplements known as Tosephtas (additions) and Baraithas (extras), which often are of great value, was finally edited, after some earlier incomplete collections, by Rabbi Jehudah, called ha-Nasi (c.200 A.D.) at Tiberias. It is mostly written in late Hebrew, sometimes designated as Neo-Hebraic, and is divided into six portions, or orders (Sedarim): (1) *Zeraim* (seeds), on benedictions, agriculture, tithes, etc.; (2) *Moed* (feast), on the Sabbath, festivals, and fasts; (3) *Nashim* (women), on marriage, divorce, laws on the Nazirship, and vows; (4) *Nezikin* (damages), chiefly civil and penal laws, though containing also the ethical treatise Pirke Aboth; (5) *Kodashim* (sacred things), sacrifices, etc., description of the temple of Jerusalem, and various other subjects; (6) *Teharoth* (purifications), on pure and impure things and persons. (See further TALMUD.) These are subdivided into 63 tracts or treatises. The Hebrew text of the Mishna was first published in Naples in 1492 with the Hebrew commentary of Maimonides, then at Venice in 1549 with the commentary of Obadiah Bartinoro, and often since. The following editions with translation into Latin or modern languages should be mentioned: Surenhusius, *Mischna* (Amsterdam, 1698–1703), containing the Hebrew text of the Mishna, with a Latin translation, and Latin translations of the commentaries of Maimonides and Bartinoro; Jost, *Mischna* (Berlin, 1832–34), containing the text, with a German translation in Hebrew characters, and notes; Sammter, *Mischnajoth* (Berlin, 1886 et seq.), vocalized text with German translation and commentary; Hoffmann and Baneth, *Die Mischna* (Berlin, 1900 et seq.), vocalized text with German translation; Albrecht, Holtzmann, Meinhold, Fiebig, Windfuhr, *Die Mischna, Text, Uebersetzung und ausführliche Erklärung* (Giessen, 1913 et seq.); single treatises by Strack with German translation. A German translation was published by Rabe at Onolzbach (1760–63); an Italian translation by Castiglione is in course of publication (1904 et seq.); and 18 treatises of the Mishna were translated into English by De Sola and Raphall (London, 1843) and under the title "The Talmud" by Barclay (ib., 1878). The treatise Pirke Aboth was translated by Taylor, *Sayings of the Jewish Fathers* (Cambridge, 1877). Consult also the Introductions to the Talmud by M. Mielziner (2d ed., New York, 1903) and H. L. Strack (Leipzig, 1911); Bacher, *Die Agada der Tannaiten* (vol. i, 2d ed., Strassburg, 1903; vol. ii, 1890); *The Mishna on Idolatry*, edited with translation, vocabulary, and notes by W. A. L. Elmslie (Cambridge, 1911); Emil Schuerer, *Verzeichnis der Personennamen in der Mischna* (Leipzig, 1913).

MISILMERI, mē'zēl-mā'rē. A town in the Province of Palermo, Sicily, 10 miles south of Palermo. The castle, situated on a hill overlooking the town, commands a magnificent view of the surrounding country. The inhabitants are chiefly engaged in agriculture, the produc-

tion of oil and wine. Pop. (commune), 1901, 12,819; 1911, 11,876.

MISIONES, mē′sē-ō′nās. A territory of Argentina, situated at the northeast end of the Republic, between Paraguay and Brazil, and bounded on the southwest by the Department of Corrientes (Map: Argentina, H 3). Its area is estimated at 11,285 square miles. It has a subtropical climate and is watered by numerous small affluents of the Paraná and the Uruguay. The soil is very fertile and the varied flora comprises more than 1500 species. Most of the territory is very densely wooded, only a small portion of its area being under cultivation. The chief products and articles of export are cabinet woods, sugar, *yerba maté,* or Paraguay tea, tobacco, corn, rice, cotton, fruits, and hides. In the seventeenth century the Jesuits planted in and around the present territory over 30 missions. With the expulsion of the Jesuits their missions fell into decay. The population of the territory in 1900 was 32,521; in 1912 (est.), 45,174. The capital of the territory is the thriving town of Posadas on the Paraná, with a population of about 15,000.

MISKO′A. A remarkable order of the Chætopoda, discovered by Walcott in the Middle Cambrian rocks of British Columbia, where the fossils are preserved with all details of structure. They are Polychæta, having similar segments and parapodia throughout the length of the body, with a retractile proboscis and straight enteric canal. Their primitive structure is shown in that their body is not distinctly specialized into sections. Striking types of the order include Miskoia and Wiwaxia (qq.v.). They are named after Misko Pass in British Columbia.

MISKOLCZ, mĭsh′kôlts. The capital of the County of Borsod, Hungary, situated in the valley of the Szinva, 88 miles northeast of Budapest (Map: Hungary, G 2). It has several interesting ecclesiastical buildings, among them the thirteenth-century Reformed church of St. Stephen, a Minorite convent, a merchants' hall, a Protestant Gymnasium and two lower Gymnasia, a fine hospital, and a Hungarian theatre. It is lighted by electricity and has a fine municipal bath. The trade in wine, agricultural products, and cattle is considerable. The local manufactures consist of flour, shoes, pottery, porcelain and majolica wares, and machinery. There are large wine cellars in the neighborhood. Pop., 1900, 43,096; 1910, 51,459, chiefly Protestant Magyars.

MISNO′MER (OF. *mesnomer, mesnommer,* dialectic Fr. *ménomer,* misname, from *mes-,* from Lat. *minus,* less + *nomer,* name, from Lat. *nominare,* to name, from *nomen,* name), An error in naming a person in a pleading, deed, or other written instrument. Under the common-law rules of pleading a party intended as the defendant in an action can take advantage of a mistake in designating him by an incorrect name by a plea in abatement which simply alleges the error and states his true name. However, in England and the common-law jurisdictions in the United States this defect may now be cured by amendment if the person so served appears in the action, even though he pleads the misnomer. Where a person is served with a process intended for him but not designating him by his correct name, he may disregard it, and a valid judgment cannot be entered against him. Under modern codes of procedure the same rules apply, except that if a person is served with a summons incorrectly naming him, and he desires to appear and object, he must make a motion to set aside the service on the ground of mistake. In such a case the plaintiff will be allowed to amend his summons and complaint, usually upon terms, such as the payment of costs. The term "misnomer" is less frequently but correctly applied to a mistake in a name in written instruments other than pleadings. See INTERPRETATION; EQUITY; MISTAKE; NAME; PLEADING; WILL; ETC.

MISPICK′EL (Ger.). See ARSENOPYRITE.

MISPRISION, mĭs-prĭzh′ŭn (OF. *mesprision, misprison,* mistake, from *mesprendre,* to mistake, from *mes-,* from Lat. *minus,* less + *prendre,* from Lat. *prendere, prehendere,* to take). In its general sense, a crime under the degree of a capital offense but graver than an ordinary misdemeanor (q.v.). In the early English law it was more frequently employed in a negative or passive sense, to describe the omission to perform some important legal duty, as concealment of the felonious acts of another. It is also applied to certain positive acts in the nature of contempts against the dignity and peace of the King and his officers. Misprision of treason was the most serious offense to which the term applied, and consisted in the concealment of any knowledge which a person might have of treasonable acts or utterances against the King, and did not necessarily imply that the person was himself otherwise implicated or involved in the crime. It was formerly punishable with forfeiture of goods and imprisonment for life, but by statute forfeiture of goods has been abolished, and penal servitude for life remains the maximum statutory penalty. Misprision of felony is concealment of a felony by one who did not participate in its commission by act or encouragement, but who has learned of it in some way. It is still an offense in the English law, but is rarely prosecuted. The various acts and omissions, other than the above, which were formerly included in the rather vague term "misprision," have been mostly classified with the crimes with which they were associated, under the name of accessory acts.

The term "misprision" is seldom employed in the United States except in regard to treason, and by an act of Congress misprision of treason is punishable by a fine not exceeding $1000 and imprisonment not exceeding seven years. See ACCESSORY; CRIME.

MISREP′RESENTA′TION. An untrue representation, by words or by conduct, which induces another to act to his injury. When deliberately or recklessly made by one party to a business transaction concerning a matter of fact and relied on by the other party to his damage, it amounts to fraud (q.v.), or deceit (q.v.). A false representation, if made by an honest mistake, never subjects the maker to an action in tort. Whether it will afford the party to whom it is made a ground for relief of any kind depends upon the circumstances of the case. As a rule, an innocent misrepresentation will not affect the validity of a contract in connection with which it is made, unless it was the very basis of the contract or one of its material terms.

In certain classes of contracts, notably those of marine and fire insurance (q.v.), any misrepresentation or concealment of a material fact, however innocent, renders them void. This is

due largely to the fact that such contracts have come into English law from the law merchant, and that early mercantile usage put an absolute legal duty on the insurer to state correctly all facts relating to the thing insured, which would ordinarily affect the insurer's decision in taking the risk. Courts of equity deal somewhat differently with innocent misrepresentation from courts of common law. They will generally refuse a decree for specific performance in favor of one whose claim rests upon a misrepresentation, although it is an honest one; and in some cases they grant a rescission of a contract induced by such statements when in a court of law the contract would be enforceable. Consult: Anson, *Principles of the Law of Contract* (Oxford, 1900); Burdick, *The Essentials of Business Law* (New York, 1902); Kerr, *A Treatise on the Law of Fraud and Mistake* (London, 1902).

MISRULE, Lord of. A mock dignitary who presided over the Christmas revels of the Middle Ages. He was assisted by a staff of from 20 to 60 officials, and furnished with musicians, dragons, hobbyhorses, and other paraphernalia of fun. In Scotland the Lord of Misrule was sometimes known as the Abbot of Unreason, and in France as l'Abbé de Liesse. See Abbot of Joy.

MIS'SAL (ML. *missale*, from *missalis*, relating to the mass, from *missa*, mass). The book which contains the prayers, lessons, and rubrics of the mass in the Roman Catholic church. Until the Middle Ages the various parts of the service were distributed in separate books, according to the part taken by the assistants; the parts which the celebrant alone recited in the mass and other sacraments were contained in the *Liber Sacramentorum*, or sacramentary. But when low masses became more frequent, and the celebrant had to say practically the whole service, the parts were collected into one book called *Missale Plenarium*. These complete missals have been in use since the sixth century. By the twelfth the Roman liturgy was in use generally throughout western Europe, but a number of provinces and dioceses had their own missals. The disadvantages of this diversity in liturgical use caused numerous requests to be made to the Council of Trent for a reform in the matter. The Council appointed a commission on the subject in 1562, and as they had not concluded their labors by the last session, left the decision in the hands of the Pope. The commissioners, among whom was Thomas Goldwell, Bishop of St. Asaph in Wales, were not instructed to compile a new missal, but by examination of ancient manuscripts to reconstruct the Roman missal according to the rites and customs of the fathers. Pius V authorized the missal which was the result of their work by the bull *Quo Primum* of 1570, commanding its universal use in places which could not show a prescription of 200 years for their local uses. Thus the older orders, such as the Carthusians and Dominicans, preserved their traditional rites; and the Ambrosian missal held its ground in the diocese of Milan. Further revisions took place under Clement VIII in 1604 and Urban VIII in 1634; later revisions, as by Leo XIII in 1884 and 1898, have touched merely matters of detail, principally in the rubrics. Besides these and the tables which are in the beginning of the book, it includes the proper of the seasons, i.e., the service for the Sundays and greater festivals; the proper of saints, arranged in the order of the civil calendar from St. Andrew's Day, which regulates the beginning of Advent and thus of the ecclesiastical year; and the common of saints, the services for those days which have no special mass. The central and invariable parts, known as the *Ordo* and *Canon Missæ*, come before the service for Easter Day. The older local missals, especially the French and English, are of great interest to liturgical students. No new attempts have been made to construct such books in the Catholic church except by some French bishops under Jansenist influence about the end of the seventeenth century; these held their own in certain places even as late as the middle of the nineteenth century, when they were all laid aside, largely through the influence of the celebrated scholar Dom Guéranger. Consult William Maskell, *The Ancient Liturgy of the Church of England, according to the Use of Sarum, York, Hereford, and Bangor* (3d ed., Oxford, 1882). See also Liturgy, and references given there; Mass.

MISSEL THRUSH. See Mistle Thrush.

MIS'SI (Lat., those sent). Officials sent out by the Frankish kings for special purposes. Under Charles the Great the *missi dominici* were the Emperor's special representatives. The Empire was divided into a number of districts; into each district each year two *missi*, one a lay noble, the other an officer of the Church, were sent to hold court, hear complaints, redress grievances, and make a special report to the Emperor. By this means Charles sought to control the courts and to centralize the government. The *enquêteurs*, employed by St. Louis, had similar functions. Consult Dobbert, *Ueber das Wesen und den Geschäftskreis der Missi Dominici* (Heidelberg, 1861), and J. W. Thompson, *Decline of the Missi Dominici in Frankish Gaul* (Chicago, 1903).

MISSING LINK. A term used to designate the stage assumed to intervene in evolution between the ape and man, and in a more general sense any hypothetical form intermediate between two actual forms of life.

MISSION (Lat. *missio*, a sending, from *mittere*, to send). In the singular, a term used by Roman Catholics and Anglicans to designate a series of special services lasting usually for at least a week, intended to call sinners to repentance and to deepen the spiritual life of the faithful; somewhat analogous to the revival services in some other churches. In the Roman Catholic church such work was constantly carried on by some of the most famous saints, such as Francis of Assisi, Dominic, Carlo Borromeo, Francis de Sales, Vincent de Paul, and Alfonso Liguori. The last two especially founded their congregations (see Lazarists; Redemptorists) for such a purpose. In modern times the means employed and the order of exercises have become more systematic. Fervent preaching by the missioners, who are usually members of some religious order, is the salient feature; it deals largely with sin, repentance, death, judgment, heaven and hell, and its purpose is to bring the hearers to a devout reception of the sacraments and an earnest Christian life. It usually closes with a solemn service of renewal of baptismal vows, thanksgiving, and consecration, and with the proclamation of a special indulgence. In the last third of the nineteenth century similar missions were held with increasing frequency in the Anglican communion, especially in High Church parishes.

MISSION, Congregation of the. See Lazarists.

MISSIONARY RIDGE, Battle of. See Chattanooga, Battle of.

MISSION INDIANS. A collective term for the surviving remnants of the tribes civilized and Christianized by the efforts of the Spanish Franciscan missionaries in southern California in the latter part of the eighteenth century. They were originally of many various dialects and stocks, chiefly Shoshonean and Yuman, roving over the desert and mountain region stretching from the lower Colorado River to the Pacific, and in almost the lowest stage of culture. By the heroic and persistent labor of Father Junípero Serra and his successors, beginning in 1776, they were gathered into civilized communities, where they supported themselves by farming and simple mechanical arts and, under the kindly supervision of the fathers, reared those magnificent mission structures which are the glory of old California. For half a century the missions grew and flourished, until in 1831 they contained 19,000 civilized Indians, but with the overthrow of the Spanish power by the Mexican revolutionary government came oppression, spoliation, and finally confiscation and destruction in the period from 1835 to 1840. The missionaries were banished, the missions plundered and left to fall into ruin, and the Indians driven into the desert and the mountains. Under the later American rule the remnants of the mission Indians continued to be regarded and treated as outcasts until, chiefly by the endeavor of Helen Hunt Jackson (q.v.), public attention was so forcibly directed to their neglected and unfortunate condition that the government took steps for their relief by setting aside some small reservations for their occupancy and appointing an agent to look after their affairs, together with a good school equipment. Since then some progress has been made towards bringing them up to the standard to which they had attained under the mission system more than a century ago. The two great barriers in the way are the uncertain tenure of their lands and the monopoly of the water supply by white claimants. At present they occupy a number of small reservations in southern California. The total population is about 2000. They are best known as the makers of fine baskets. Consult: Jackson and Kinney, *Report on the Condition and Needs of the Mission Indians of California* (Washington, 1883); C. A. Wetmore, *Report on Mission Indians of Southern California* (ib., 1895); Zephyrin Engelhardt, *Missions and Missionaries of California*, vol. i (San Francisco, 1908); "A Mission Record of California Indians," in *University of California, Publications: American Archæology and Ethnology*, vol. viii (Berkeley, 1908).

MISSIONS, Christian. The term "missions" as used in this article signifies Christian missions among the peoples of non-Christian countries. The history of missions may be divided into three periods: 1. The early period, embracing the first seven centuries of our era, until the rise of Islam. In this period missionary activity was generally unorganized and individual. 2. The middle period, including nine centuries, from the beginning of the eighth to the end of the sixteenth century. Here the Church as an organization originated and directed foreign-missionary activity. 3. The modern period, from the beginning of the seventeenth century until the present time. In this period occurred the rise of Protestant foreign missions, chiefly conducted by voluntary societies.

I. The Early Period

The energy of the Apostles in winning men to believe in Jesus Christ is a characteristic feature of the New Testament narrative of the beginnings of Christian history. Early traditions give ground for belief that their missionary operations were extended. Yet excepting in the case of Paul and his companions details are meagre. The explanation of the rapid spread of Christianity seems to be that individual believers taught it wherever they went, whether for business, for safety from enemies, or as slaves to heathen masters. Great importance was attached also to translating the Bible into the language of every people at this period. Examples of this automatic spread of Christianity may be seen in its appearance in Antioch before any Apostle went there, its entrance into Italy before Paul's visits, into Britain by way of Gaul from Smyrna during the second century, along the ordinary routes of trade, and into the bivouacs of the Goths in the third century through captives taken in war. By the time of Constantine the Great, early in the fourth century, groups of Christians were found in all parts of the Roman Empire, from Britain to Persia. Christians formed but a small percentage of the population. But they had a high ideal and the energy of aspiration. This produced unflagging activity in missions in the West and in the East. The monasteries now performed great services for religious culture in out-of-the-way places. In the fifth century the centre of missionary initiative for the West seems to have been in central Gaul. Thence bishops went over into Britain to help the Christians settle doctrinal difficulties, and thence Patrick took his new-found knowledge into Ireland. For the East at the same time the centre of missions seems to have been in Mesopotamia, at places like Edessa and Nisibis, with a long chain of advance posts reaching into central Asia and India, and with a training school at Samarkand. Towards the north at the same period Ulfilas (q.v.) went on a mission to his heathen kin in the region of the Danube, giving them an alphabet and a Bible in their own tongue. In the sixth century the initiative in the West was from the British Islands eastward and from France northward. Desire to teach Christ brought Columba from Ireland to Iona, which became a wonderful centre of Christian culture and of missionary zeal in behalf of Scotland, North Britain, and central Europe. As to the East, the line of foreign missionary advance was among the Tatars and in China, and was carried on by Nestorians in relations with the Church in Mesopotamia. At the very end of the sixth century the beginning of a missionary policy in the Church as an organization appeared in the dispatch of Augustine (q.v.) and his helpers from Rome to England, where the Saxon invasion had nearly crushed out Christianity. Augustine's mission from the Pope was to evangelize the pagans and to win the assent of the English Christians to Roman ecclesiastical control. The method of operation of these independent missions was an adaptation of the monastic system. A band of Christians under a leader would form a settlement in a wild and savage

region, where they labored for their own support. By kindness some of the barbarians would be drawn to settle near the monastery. After the favor of emperors began to give the Church numerical preponderance, power, and wealth, these gains led to spiritual loss, and missions were left to the chance ability of simple-minded believers in remote regions. At the beginning of the seventh century Christianity was still an Oriental religion. In Europe its northern bounds were, in general, marked by the Danube and the Alps, although during the century missionaries made ineffectual attempts at a lodgment in Denmark, and Columban, going forth from Iona with his associates, began a fiery and successful propaganda among the barbarians of central Europe. The narrow limits of European Christendom at this time should be borne in mind if we would realize the full meaning to the Christian Church of the Mohammedan irruption. The Eastern church had one momentous mission to its credit in the ninth century in its dispatch of Cyril and Methodius to work among the Slav races. In the Far East the Nestorians also continued their operations until the Tatars finally cast in their lot with Islam, and Tamerlane in the fourteenth century destroyed the last vestiges of the Central Asian church. But with regard to the Church in general, from the end of the seventh century onward for 900 years the only Christian foreign missions were remote from the touch of the Mohammedan power and belonged to the Western or Latin section of the church.

II. THE MIDDLE PERIOD

1. In Germany. The wanderings of the Germanic nations and the inroads of the Huns had destroyed along the Rhine and the Danube the flourishing Christian communities of the fifth century. It was only after the rise of the Frankish state that efforts were made to restore the former condition of Christianity and to spread its influence over all central and northern Europe. From the conversion of the Bavarians to that of the Saxons (500–800) stretches a period filled with spiritual heroism on the one side and with tenacious resistance on the other. The missionaries are mostly Irishmen in the first half of the period, Anglo-Saxons in the other. The memory of the famous St. Severin (died 482) worked favorably in Bavaria; early in the sixth century the royal family of the Agilulfings was Catholic. Irish missionaries worked in the land throughout the seventh and eighth centuries. The Frankfort saints Rupert, Emmeran, and Corbinian continued and perfected their labors. The Irishman St. Gall (Callech) was the apostle of Swabia and Helvetia; from his monastery by Lake Constance went out the missionaries of these lands. At the same time his superior and long-time companion, Columban (died 615), converted the German Lombards of Italy to the Catholic faith. Southern Germany owes the knowledge of the Christian faith to other Irish missionaries—St. Fridolin, once abbot at Poitiers and then founder of the island abbey of Säckingen; St. Trindpert, founder of the abbey of that name in the Breisgau; St. Pirmin (died 753), founder of Reichenau, Murbach, and Hornbach. The Irishman St. Kilian (died 689), with his companions Coloman and Totnan, evangelized Thuringia, and founded the see of Würzburg. Contemporaneously St. Willibrord came from the monastic schools of Ireland to preach the faith to the fierce Frisians and to found the archbishopric of Utrecht, with the authorization of Pope Sergius I (695). Before Willibrord there had worked along the Rhine and the Moselle the holy man Goar in the sixth century, and among the Frisians St. Amand of Maestricht (660) and the goldsmith St. Eloi (Eligius) of Noyon (659). All of these men came under the influence of the Columban monastery of Luxeuil and were filled with missionary zeal.

The real apostle and founder of German Christendom is the Anglo-Saxon Wynfrith, or Boniface (q.v.). In 716 he attempted to evangelize the Frisians. In 719 he received at Rome from Gregory II (715–731) the authority to preach among the degenerate Christians and the pagan inhabitants of Germany. In turn he labored throughout Bavaria, Hesse, and Thuringia, and along the Rhine, founded the oldest and principal sees of those regions, established monasteries like Fulda, and gathered about himself some of the noblest spirits of the age. The Carolingians were always friendly and helpful. In union with them he held, between 740 and 750, four national synods that laid the basis of German mediæval Christian life. He suffered martyrdom June 5, 755 (?754), at the hands of heathen Germans, near Dockum in West Friesland, whither he had gone with 52 companions to confirm some newly baptized converts. The solid mass of Saxon paganism had been attacked by the two Ewalds, surnamed the Black and the White, like Willibrord, disciples of the Irish monastic schools. They sealed their hopes with their blood in 695. The long wars of the Carolingians with the Saxons soon took on a religious character. Compulsory baptism and swift apostasy were the rule throughout the eighth century. A cruel slaughter of 4500 Saxons at Verden in 782 stains the fair fame of Charlemagne. The conquered Saxons were exiled, transplanted, oppressed by laws of Draconian severity; in 785 the dauntless chiefs, Witikind and Alboin, finally yielded, and by 804 the land was entirely Christianized. Missionaries soon overran Saxony, and by their virtue, beneficence, organizing skill, and their monasteries, soon established the Christian faith on a firm basis. The abbey of Corvei (822) was soon the centre of their activity.

2. Among the Northern Nations. Another period of 300 years (800–1100) was necessary for the winning of the northernmost Germanic tribes. In 826 political necessity made Harald, King of Denmark, a suitor at the court of the Carolingians. On his return he took with him Ansgar, a monk of Corvei, eventually the apostle of the North. His chief deeds were the establishment of the see of Hamburg-Bremen (832), the partial evangelization of Sweden (850), the building of churches, schools, monasteries, and hospitals throughout his own vast diocese. He died in 865 and is buried at Bremen. The devastations of the pagan Northmen and the onslaught of the Hungarians withheld from the northern missions the political influence of Christian Germany; after the battle of Merseburg (933) the conversion of Denmark went on, not without interruption, from the see of St. Ansgar. The Danish conquests in England helped this process; in 1017 both kingdoms were ruled by Canute the Great; in 1026 he was a pilgrim to Rome, whence he wrote to his people a noble Christian letter. In 1086

another Canute was enrolled among the Christian saints. In 1104 Lund was made a metropolitan see. Sweden was slowly won over to the faith of Jesus Christ, chiefly in the course of the eleventh century, and with many a reaction to pagan life and belief. In 1162 Upsala became the Christian metropolis of Sweden. Long ere this Norway possessed a metropolitan see at Trondhjem (1035). The land was thoroughly Christian before Denmark and Sweden, although it received the visits of missionaries after both of these kingdoms. Haakon the Good (c.934–960) was an earnest Christian King, but another did not arise until Olaf Tryggvason (995–1000). Olaf Haraldson (1016–28) sent German and English priests through the Kingdom; his overstern and cruel policy created a reaction, but the still harder yoke of Denmark favored the cause of Christianity. From 1035 Norway may be styled a Christian kingdom. Iceland was temporarily inhabited by Irish monks before the year 800; their books, altar plates, and staves were found by the first Norwegian settlers. After 981 Christianity penetrated the masses of the colonists and by 1016 they had accepted the Gospel. Under its impulse this gifted little people became a living source of learning and piety. The scattered islands of the northern seas were held during the ninth century in the grip of the pagan vikings, but in the course of the tenth century were made Christian. Before the epoch of the Danish invasions of Ireland monks of the Irish nation had visited these islands, chiefly out of ascetic fervor and the desire to lead hermit lives. They were the first to bring Christianity to the dwellers of the Orkneys, the Hebrides, and the Shetland and Faroe islands. In the twelfth century Greenland was evangelized and the see of Gardor established on the coast; the land was inhabited by Christians until the fifteenth century.

3. **Conversion of Eastern Europe. Slavs and Magyars.** As the Slavs had been, since the sixth century, a serious menace to both the East and the West, so the efforts to Christianize them went out from East and West. The Irishman St. Columban, of Luxeuil and Bobbio, had once hoped to begin the work; it was certainly set on foot from the German see of Salzburg in Bavaria, and a beginning made (797) with the Avars, who at this time disappear from history. In the course of the ninth century the principal Slavic principality was that centred along the river Morava, hence called Moravia. Both Germans and Byzantines sought to reserve this sphere of influence and action for themselves. In 862 the Byzantine Emperor, Michael III, was able to send two missionaries to the Moravians. They were brothers, known to history as St. Cyril (originally Constantine) and St. Methodius. They introduced among the Slavs an alphabet, translated the Scriptures, and wrote for them a Slavic liturgy. To these two men the Slavic world owes its first permanent elevation from idolatry, ignorance, and serious moral corruption. Moravia's chief see, Olmütz, dates from 1063.

Bohemia was fully opened to Christian influences only about 871, when its King, Borzivoi, gave his daughter in marriage to Svatopluk of Moravia and, together with his Queen, Ludmilla, was baptized. Of his grandsons, Boleslas cruelly persecuted the Christian faith; while Wenceslas remained faithful; the latter fell by the hand of his brother (938), and is honored as a martyr. In the long reign of the second Boleslas (967–999) Christianity triumphed. The see of Prague was created in 973. The second Bishop, St. Adalbert, went to preach the gospel among the heathen Prussians, and was put to death by them.

Poland received the missionaries of Christianity through the marriage (965) of its Duke Miecislas with the Christian daughter of Boleslas II of Bohemia, who soon won over her husband to the faith. The see of Posen was established in 968. From 992 to 1025 Boleslas Chrobry, son of Miecislas, completed the conversion of his country by the founding of the archiepiscopal see of Gnesen (1000), to which were made subject Posen, Kolberg, Breslau, and Cracow.

The Wends were a Slavic race, established in Holstein, Mecklenburg, between the Elbe and the Oder, the Oder and the Vistula, and elsewhere in Saxony and Lusatia. They were made Christians by the creation of the border marches in the time of Henry I and Otho I (919–973) and the foundation of the sees of Havelberg, Oldenburg, Brandenburg, Magdeburg, and others (946–968). The Wend Prince, Gottschalk, was after 1045 a zealous protector of Christianity, but was treacherously slain in 1066 by a heathen Wend. In the twelfth century the Wends fell under German sway and many German Christian colonists took their lands and houses. The Wends of Pomerania owe their conversion to the Polish Duke Boleslas III (1122) and to his agent, Bishop Otho of Bamberg (1124–28). Kamin, Stettin, Julin, were made Christian cities and Saxon colonists entered the territory; but only in 1168 were the last remnants of heathenism abolished on the island of Rügen.

The Scandinavian Rurik founded the Russian state in 862; soon Christian missionaries from Constantinople found their way thither. The widowed Princess Olga was baptized at Constantinople in 955 and thenceforward labored zealously for the conversion of her people. Her grandson, Vladimir the Apostolic (died 1015), completed the work. The metropolitan see of Kiev was established by him and made the centre of the religious and educational life of Russia. The primacy was transferred to Moscow in 1328, which in turn was subject to the jurisdiction of Constantinople until 1589, when Jeremias II, the patriarch of the latter see, was induced to install the patriarchate of Moscow.

Bulgaria became Christian, 864–866. The Khan, Bogoris, first introduced Greek missionaries and then appealed to Pope Nicholas I. The latter sent him the famous "Replies to the Consultations of the Bulgarians." Nevertheless, Bulgaria soon came under the sole jurisdiction of Constantinople; the land was subjected by the Byzantine emperors, and in 1388–93 the new Bulgarian realm was conquered by the Turks.

The heathen Magyars had taken possession after the end of the ninth century of what is now Hungary. All attempts at their conversion were fruitless until the victory of Otho the Great of Germany on the Lech in 955. Duke Gejza (972–997), married to a Christian Princess of his own race, asked Otho II for missionaries; the bishops Pilgrim of Passau and Wolfgang of Regensburg were sent to him. Gejza's

son, St. Stephen of Hungary (997–1038), was married to Gisela, the daughter of Henry II. He created the hierarchical system of Hungary by founding (1000) the archiepiscopal see of Gran with 10 suffragan sees, as well as many Benedictine monasteries. Pope Sylvester II (Gerbert) gave him the title of "Apostolic" King, and is said to have sent him a golden cross and crown (crown of St. Stephen).

4. **Missions in Northeastern Europe. Political Conversions.** The power of Christendom was now too great to be longer resisted by the outlying heathen peoples. From Sweden went out at the same time the political subjection of Finland and its conversion to Christianity. It was only in 1293 that the work could be looked on as accomplished. Esthonia, Livonia, and Courland saw Christian missionaries during the twelfth and thirteenth centuries follow in the tracks of the German merchants of Bremen and Lübeck. Here the heathen were fierce and reluctant; fortified monasteries protected the German Christians and the newly converted, until, in 1202, was founded the military order of the Brothers of the Sword (*Schwertbrüder*) or Knights Sword Bearers. Its founder, Bishop Albert of Buxhöwden, built the city of Riga and set up therein his see. In 1237 the Brothers of the Sword were united with the Teutonic Knights of Jerusalem, and for 60 years both orders carried on an unceasing warfare against the pagan inhabitants of the Baltic shore. Their most difficult conquest was that of the Prussians. This most stubborn of the northern heathen folk gave way only before the organized and experienced knights of German Christendom and the moral and financial support of the Empire. In 1243 the Prussian territory was divided into four sees—Kulm, Pomerania, Ermland, Samland; in 1255 they were placed under the jurisdiction of the archiepiscopal see of Riga. The Lithuanians, temporarily converted in 1252, relapsed into heathenism. Their Grand Prince, Jagello, married in 1386 the Polish Queen Hedwig, by which act Poland and Lithuania were shortly made one politically. Jagello was baptized, assuming the title of Ladislas II. Vilna was made an episcopal see, and at a diet held there Christianity was declared the state religion.

5. **Missions in the Sixteenth Century.** (*a*) *In the Orient.*—The Portuguese sailors and the merchants were always accompanied by missionaries. As early as 1533 Goa was made an episcopal see. The unworthy conduct of the Europeans was no small obstacle for the missionaries when confronted with such religious systems as those of the Brahmans, Buddhists, and Mohammedans. At the request of the King of Portugal St. Ignatius of Loyola destined for the East Indies in 1540 Rodriguez and St. Francis Xavier. The latter actually sailed in 1541 from Lisbon, and after some time spent in evangelizing the Europeans of Goa, turned his attention to the people of southern India. He preached in the Kingdom of Travancore, and went thence to Malacca and the Moluccas, meeting everywhere with great success. Soon his zeal urged him to undertake the conversion of Japan, where he spent two years (1549–51). In the hope of hastening the conversion of Japan, he turned his attention next to China, but died on the way on the island of Sancian, in November or December, 1552. His labors in the East Indies were continued by his Jesuit brethren, especially by Robert Nobili, after 1606. The latter made himself one with the Indian aristocracy, accepted its prejudices, habits, and customs, so far as seemed consistent with Christianity, and enjoyed a large measure of success.

The Nestorian missions in China during the seventh and eighth centuries and the Franciscan missions of the thirteenth and fourteenth had no lasting results. In 1583 the Jesuits obtained entrance, and for over a century exercised a moral supremacy in the Flowery Kingdom. Matteo Ricci (1552–1610) rose to the highest official position. His teaching, surveys, and maps were the admiration of all China.

Adam Schall of Cologne (1622) and Ferdinand Verbiest of the Low Countries (1659) won great fame for their order as successors of Ricci. Under cover of their reputation for scholarship they labored zealously for the spread of Christianity, quite in the spirit and manner of Robert Nobili. The opposition to this system of "accommodation" grew so strong that it was condemned in 1704, and the condemnation was confirmed 40 years later (1744) by the holy see. The Christian communities of Japan were grievously persecuted in 1587 and again from 1596 to 1637, when the Empire was strictly closed against all foreigners, with the exception of Dutch traders.

(*b*) *In America.*—The original Spanish conquistadores were very inhuman towards all nations with whom they came in contact. The first Catholic priest ordained in the New World was a young Spanish lawyer, Bartolomeo de las Casas. He soon gave himself entirely to the work of saving the Indians from their barbarous oppressors; and before his death, in 1566, he had compelled the legislation which saved the remnants of the aboriginal tribes, at least on the mainland. Similarly, St. Peter Claver (died 1654) was tireless in the service of the unfortunate negro slaves of South America. Throughout the sixteenth century Dominicans, Franciscans, Capuchins, and Augustinians labored with boundless zeal in all the Spanish colonies. The Jesuits were already in Brazil (1549), and soon had their missionaries in all parts of South America. The famous "Reductions of Paraguay" are perhaps their greatest triumph. One of the most picturesque figures of that period is the Limerick Irishman, Thomas Filde, a Jesuit, who died at Asunción in 1626, after spending 40 years among the savages of Paraguay. In North America the French missionaries followed the flag of France and worked unremittingly after 1611 throughout all the dominions over which it floated. In 1634 Jesuit missionaries accompanied the first colonists of Maryland.

III. THE MODERN PERIOD

A. Protestant Foreign Missions. 1. *State Missionary Enterprises.*—At the time of the Reformation Christendom was still beleaguered by armed Islam. Up to the very end of the seventeenth century a great part of Hungary was in the possession of Turkey, and in 1683 Vienna barely escaped falling into the hands of the Mussulmans. Missionary access to eastern north Africa and western Asia was barred by the sword of Islam. At the same time transmarine heathen lands were so distant that Imperial resources alone could reach them. Such resources were all in the hands of the great Roman Catholic powers. The conditions under

which the Reformation developed left to the reformers no place for planning foreign-missionary enterprise. Luther and his associates appreciated the essentially missionary quality of the Church of Christ, but limited its sphere of action to their own surroundings. They deemed that in any case the Church was helpless regarding foreign missions, since such vast undertakings could be dealt with by governments alone.

The first Protestant foreign missions, then, were state enterprises. In 1555 Admiral Coligny induced the Council of Geneva to send missionaries to Brazil in connection with a Huguenot colony, but both mission and colony soon ended in bloody disaster. In 1559 Gustavus Vasa of Sweden sent missionaries to labor for the pagan Lapps of his own dominions, but this mission came to naught. After the conquest by Holland of several Portuguese colonies in the East Indies the Dutch East India Company was formed in 1602, and the governors of the various islands were ordered to do all in their power to Christianize the natives. Clergymen were sent out to Ceylon, Formosa, and the Malay Archipelago as missionary chaplains, whose duty included the Christian instruction of natives. But the governors of the colonies obeyed their orders literally and "Christianized" the natives without waiting for the missionaries to instruct them. Consequently, when Dutch government came to an end in Ceylon, some 300,000 officially converted natives returned to their former faith. In Formosa Christianity was extinguished by the Chinese when they drove the Dutch from the island in 1661. In Java, however, the missionary chaplains slowly translated the Scriptures into Malayan. The second of modern Bible translations into pagan languages (John Eliot's Indian Bible, printed in 1683, being the first) was thus produced by the initiative and published (in 1701) at the expense of the Dutch government. With all its defects this state mission enterprise had permanent results. In Java, the Moluccas, and Celebes has grown up a native Christian church, numbering nearly 250,000 adherents, with over 350 pastors and preachers, supported by the Dutch government. Of these probably not more than half are the fruit of later missionary efforts. A similar mission undertaken by Holland in Brazil, through the West India Company, about the year 1621, came to an end with the expulsion of the Dutch about the middle of the century. Such missionary enterprises undertaken for reasons of state, manned by official appointment, and supervised by colonial bureaus and chambers of commerce, were foredoomed to failure. The next of the state missionary enterprises originating on the continent of Europe illustrates this fact. In 1705 a woman whose husband had been killed by natives in the Danish colony of Tranquebar, in South India, petitioned King Frederick IV of Denmark to send missionaries to teach the people there. The petition was effective. The King endowed the mission, and, no fit men being found in Denmark, two Germans were appointed to go to India. They were of the disciples of Francke, the German pietist, who saw that the highest form of Christian fruitfulness includes foreign as well as home missions, and whose energy formed schools at Halle to prepare men to serve Christ in the ends of the earth. The two young men, Ziegenbalg and Plutschau, taught singleness of purpose at Halle, and sent out by King Frederick IV in 1706, began the first serious Protestant mission enterprise in India. Before his death, in 1719, Ziegenbalg had made a translation of the New Testament into the Tamil language, which became the basis of the existing Tamil Bible, and the third modern translation of the Scriptures into heathen languages. Other missionaries from the same home surroundings followed the two pioneers of this Danish mission, notably Schultze and his later associate, Schwartz. Each of these men made a permanent impression upon the people of the country. Fifty thousand Tamils became Christians before the end of the century. After the death of King Frederick IV the English Society for the Promotion of Christian Knowledge assumed the whole support of the Danish mission in India until 1824, when the enterprise was passed over to the Society for the Propagation of the Gospel. Another mission maintained by King Frederick IV was that commenced by Hans Egede in Greenland in 1721. It was later transferred to the Danish Missionary Society, and the whole Eskimo population in the neighborhood of the numerous Danish trading stations was long ago Christianized.

The British government took steps early in the seventeenth century for the Christianizing of its colonies. The Virginia Company, whose enterprise began in 1584, was directed by its charter to teach Christianity to the Indians, and Sir Walter Raleigh subscribed £100 to that object. The same duty was laid upon the Massachusetts Colony by charter in 1628. In 1646 the Legislature of Massachusetts passed a law for missionary work among the Indians. This gave State support to the efforts of John Eliot of Roxbury, Thomas Mayhew of Marthas Vineyard, and others. In 1648 Cromwell induced the English Parliament to consider the organization of a government foreign-missionary enterprise. The renewal of civil war, however, put an end to the scheme. But the Corporation for the Propagation of the Gospel in New England, formed in England in 1649, received a grant from Parliament and aided Eliot's mission. It still exists under the name of the New England Company, and expends the revenue from its endowment funds for the education of Indians in the Dominion of Canada. All these efforts resulted in the formation of several villages of converted Indians in New England before progress was arrested by war. In the East Indies, on the renewal of the charter of the British East India Company in 1698, the duty was imposed upon the company of maintaining chaplains at its stations, and later the obligation to see that its native servants were instructed in Christian doctrine. Discussions regarding religious conditions in the company's stations led to the organization in 1698 of the Society for the Promotion of Christian Knowledge (S. P. C. K.), designed to provide Christian schools and books for neglected English communities. This was followed three years later by the organization of the Society for the Propagation of the Gospel in Foreign Parts (S. P. G.), designed to provide chaplains for the religious culture of Englishmen in foreign lands. Neither of these societies aimed at Christianizing the heathen. But the S. P. C. K. saved the Danish mission in South India from dying with its founder, and supported it for 100 years. It has also issued

Christian literature in the languages of various non-Christian peoples. As to the S. P. G., it gradually took up work among the pagans, and in 1913 it had 1291 missionaries and 3000 native workers in India, China, Japan, Malaysia, Africa, and the West Indies. In view of their later history, these two societies may be regarded as the earliest of the voluntary foreign-missionary societies of Great Britain.

2. *Protestant Voluntary Missionary Societies.* —In 1709 the state of the North American Indians led to the formation, in Scotland, of a Society for the Promotion of Christian Knowledge. The chief present importance of this society was its employment as a missionary (in 1744) of David Brainerd of Connecticut. The story of his brief life had persuasive influence on both sides of the Atlantic in stimulating similar devotion. A more powerful influence of the same nature was exercised by the writings and the example of the Moravian Brethren, who called themselves the Unity of Brethren. A remnant from persecution, this little people migrated from Bohemia and in 1772 found asylum in Germany. They were allowed to settle on the estates of Count Zinzendorf, who was himself a pupil of Francke of Halle and who became their leader. The Brethren established missions among the slaves of the West Indies, in Greenland, among the Indians of the North American Colonies, in South Africa, in South America, and in Labrador before the end of the eighteenth century. More recently they have opened missions in Australia, Alaska, and on the borders of Tibet. In 1900, all the Eskimos at their four stations in Greenland having become Christians, they transferred their Greenland mission to the Danish church. In their other fields they had in June, 1914, 367 European and American missionaries, 111 native missionaries, and 2059 native workers.

Through such influences and through the writings of Spener and Francke in Germany and the earnest exhortations of Whitefield and Wesley in England (who had themselves been deeply affected by the writings of Francke and Zinzendorf), and of Jonathan Edwards in America, a resuscitation of personal religion was brought about. At about the same time the travels of Captain Cook revealed the immense extent of the heathen world, while occurrences like the trial of Warren Hastings and the antislavery agitation of Wilberforce brought home to the minds of the English people their responsibility for outrages perpetrated by purely selfish men professing the name of Christians. The time was ripe for action to benefit the sufferers from such outrages. As early as 1779 the English Wesleyans sent a number of missionaries among the North American Indians, and in 1786 they began a mission in the West Indies. In 1814 these beginnings were followed by the organization of a society which has supervised the mission work of that church up to the present time. Its missions lie in Ceylon, India, South Africa, Oceanica, and China. In 1913 this society had in the field 695 missionaries of both sexes, aided by 4826 native workers. In addition there is the Wesleyan Methodist Women's Association, with 108 women missionaries aided by 320 native workers. In general, however, the sudden development of foreign-mission enterprises about the beginning of the nineteenth century did not come from any Church organization. It sprang from the awakening of isolated individuals whom the Church opposed as unsteady enthusiasts. In 1786 William Carey, a cobbler and a Baptist minister in England, surprised a ministers' meeting by proposing discussion of the duty of foreign missions. He was frowned down by his elders. In 1792, however, he commanded attention and won support. The duty had become plain. In that same year 12 men united to form the Baptist Missionary Society, sending Carey and Thomas as their first missionaries to India. The East India Company would not tolerate missionaries, but they found a safe residence in the Danish colony of Serampore, near Calcutta. The influence of the mission was immediate. Carey's greatest work was that of Bible translation; and the Serampore press, under his direction, added to the slender list then existing translations of Scripture in 34 languages. The Baptist society extended its work in India and added to its field Ceylon, the West Indies, West Africa, and China. In 1913 it had in the field 363 missionaries, men and women, with 905 native workers. The Baptist Women's Missionary Association had (1913) 90 women missionaries and 450 native workers. The example of the English Baptists had effect in all Protestant countries. The reading of Carey's first letters from India led in 1795 to the formation of the London Missionary Society (L. M. S.), in which Independents, Presbyterians, Methodists, and Episcopalians united. Since the other denominations have undertaken missions of their own, this society is now composed substantially of Independents alone. Its present fields are Oceanica, South and Central Africa, Madagascar, India, and China. In 1914 it had in the field 294 missionaries, men and women, and 7480 native workers. Nott, John Williams, Morrison, Medhurst, Rice, Moffat, and Livingstone are names which give special lustre to its roll. In 1796 two similar societies were formed in Scotland, which served at first as auxiliaries to the London society. Later they did good work by themselves in South Africa and the West Indies, and afterward became merged in the missionary societies of the Established church and the United Presbyterian church of Scotland. The formation of a society in Holland in 1797 (called the Netherlands Missionary Society), to aid in the work of the London society, illustrates the solidarity of Christian feeling which underlies the modern missionary movement, and also the failure at first to appreciate the extent of the work committed to a single board of directors by Christians of different denominations and nationalities. The Netherlands Missionary Society furnished several missionaries to the L. M. S., and afterward chose its special field in the Dutch East Indies, where in 1913 it had 65 missionaries and 135 native workers. From this beginning a score of other societies in Holland have sprung for direct and indirect foreign-missionary work. Meanwhile the claims of freed slaves at the Sierra Leone colony were pressed upon the Church of England. Pious men in the employ of the East India Company, like Brown and Grant, urged that church to labor among the people of India. Nothing being done by the church in 1799, 26 of its spiritually minded members, among whom were William Wilberforce, John Venn, and Charles Simeon, organized the Church Missionary Society (C. M. S.), at first known as the Society for Missions to

Africa and the East. They at once encountered opposition on the ground that such enterprises should be directed by the bishops, which made it difficult for them to find fit ministers to go out. Hence the society drew its early missionaries from Germany. Altogether more than a hundred of its missionaries have been Germans, many of them of the highest ability, like Krapf, Rebmann, Rhenius, and Pfander. Nearly half a century passed before the C. M. S. won recognition from the episcopate. The fields of the C. M. S. are in India, Ceylon, China, Japan, West Africa, East Africa and Uganda, Mauritius, Arabia, Persia, Palestine, Egypt, Sudan, and the northern and western parts of British North America. In 1914 it had in the field 1340 missionaries, men and women, and 10,325 native workers, of whom 454 are ordained clergymen. The growth of English interest in missions, combined with the successes of the Halle missionaries of India, led in 1800 to the establishment at Berlin of Jannicke's Missionary School. This school during the next quarter of a century furnished some 80 missionaries to the English and Dutch societies, and served to arouse further interest in missions in Germany. Meanwhile the same ideas were working in America. They found expression in foreign missions through the devotion of Samuel J. Mills and other students at Williams College, who agreed together to give their lives to preaching to the heathen. The earnestness of these young men led to the formation, in 1811, of the American Board of Commissioners for Foreign Missions (A. B. C. F. M.), an interdenominational society. The first missionaries of this society, Newell, Judson, Hall, Rice, and Nott, were sent to India, and were instantly ordered out of the country by the East India Company. Judson and Rice joined the Baptists at Serampore, and the others after some trouble succeeded in getting a footing in Ceylon and at Bombay. Within 10 years the society had occupied other fields in India, in Hawaii, and in Turkey. After some 40 years of existence as an interdenominational society it relinquished some of its fields in India, Persia, Syria, and West Africa to the American Dutch Reformed and Presbyterian churches, who wished to conduct separate missions of their own. It is now supported chiefly by Congregationalists. The A. B. C. F. M. has missions in China, India, Ceylon, South Africa, West Africa, Japan, Turkey, and Oceanica. In 1912 the number of its missionaries, men and women, was 615, with 4999 native workers. Judson and Rice, of the first group of missionaries sent to India by the A. B. C. F. M., changed their views on baptism before entering upon their work, and chose Burma for their field of labor. This occurrence led in 1814 to the formation of the American Baptist Missionary Union (A. B. M. U.) to assume the support of the two pioneers in Burma. Its present fields are in Burma, Siam, Assam, India, China, Japan, the Philippines, and the Congo Free State. In 1913 it had in the field 701 missionaries of both sexes, with 8589 native workers.

The success of the early missionaries of these English and American societies aroused an interest which extended to the Protestants of the continent of Europe and led in 1815 to the establishment of a missionary institute at Basel in Switzerland. The training school for missionaries with which this institute began its operations provided valuable men for the English societies. A magazine for missionary intelligence, published by the institute, deepened missionary interest in Germany and other Protestant countries. In 1822 the Basel institute began to send out missionaries, one of the earliest of whom, Zaremba, labored effectively in Russian Armenia until expelled by the Russian government in 1835. Its present fields are in West Africa, India, and China, and graduates of its school are pastors of evangelical churches in Turkey. In 1913 it had in the field 442 missionaries, men and women, with 1911 native workers. The land of Luther had already contributed men and means for foreign missions during many years before its first foreign-missionary society was formed at Berlin in 1824 by 10 men of mark, among whom were Neander and Tholuck. Following the conservative usage of the continental Protestants, the first work of the Berlin Missionary Society was to establish a training school for missionaries. It began to send men abroad in 1834. Its present fields are in South Africa, German East Africa, and China. It has also done much to draw Christian colonists to the German colonies. In 1912 it maintained 181 men as missionaries in its various fields, with 1339 native workers. During the first part of the nineteenth century a considerable number of little missionary associations had been formed in different parts of Germany to aid existing societies at Basel and elsewhere. Later these developed into the Rhenish, the North German, the Leipzig, the Gossner, and the Hermannsburg Missionary Societies, and have finally won the support of the official representatives of the Church to what is now a large and important missionary enterprise in Africa, India, China, Malaysia, and Australasia. The foreign missions of the Protestants of France began in 1818 with a missionary magazine intended to give information of the work of missionaries of other nations. This was followed in 1824 by the organization of the Evangelical Missions Society of Paris, designed at first to aid existing missions. Since 1825 it has sent missionaries of its own to Central Africa and Senegambia, besides replacing, in consequence of French national prejudices, missionaries of the L. M. S. in Tahiti and Madagascar and American missionaries in the French Congo region. It had, in 1914, 119 European missionaries in its service. The roots of the existing missionary societies in Denmark, Norway, and Sweden also lie in the first quarter of the nineteenth century. These Scandinavian societies expanded during the last quarter of the century, and in 1913 they had 287 men and 395 women missionaries, assisted by 2858 native workers, in Africa, Madagascar, India, China, and Chinese Turkestan. The intimate relations of some of the Scandinavian societies with German, English, and American enterprises, however, make it certain that some of these missionaries are also reported by societies in other countries. In 1824 the Established church of Scotland undertook missionary work in India and among the Kaffirs in Africa, one of its early missionaries being Alexander Duff, the father of educational missions. The disruption in 1843 caused the resignation of all the Scotch church missionaries in India and Kaffraria, they preferring to join the Free church, which has since carried on extended missionary operations. In

1900 the Free church joined with the United Presbyterian church in forming the United Free church of Scotland. This body has missions in India, Africa, Arabia, Syria, Turkey, China, West Indies, and the New Hebrides. It had, in 1913, 545 missionaries, men and women, and its force of native workers is 2842. As to the Established church of Scotland, after recovering from the effects of the disruption, it pressed its missionary enterprises, and in 1913 it had in India, Central Africa, China, and Turkey 116 missionaries of both sexes, with 244 native workers. These Scottish mission enterprises are carried on by the Church organizations, and not by independent missionary societies.

The Bible societies grew out of the same religious quickening which gave rise to the voluntary missionary societies (the British and Foreign Bible Society, 1804, the American Bible Society, 1816, the Netherlands Bible Society, the Scottish National Bible Society, and others). So far as concerns their publications in the languages of non-Christian peoples these societies do foreign-missionary work in the very highest sense, since no Protestant foreign mission can exist without the Bible in the language of the people among whom it is working. The Bible societies work in harmony with each other and with the missions. Indeed, missionaries have made the greater part of the translations of the Bible now in circulation. The Bible or parts of it existed in 1914 in almost 600 different forms of speech. The British and Foreign Bible Society has a list of 474 different languages. The Religious Tract Society of London (1799) and the American Tract Society of New York (1820) have done a similar work for foreign missions in aiding to provide general Christian literature in the languages of non-Christian lands.

While our survey indicates the origin of the Protestant missionary movement in the spiritual enlightenment of the Christian Church, it cannot detail its expansion since the first quarter of the nineteenth century. In the second quarter of the century the Methodist church and the Presbyterian church in the United States, previously occupied with missions among the American Indians, began their great missionary enterprises abroad. In many other denominations in the United States, Great Britain, and Europe, foreign-missionary undertakings have been organized. Since the middle of the century foreign-missionary societies have been formed in the colonial churches in Canada, the West Indies, India, Australia, New Zealand, South Africa, and other Protestant colonies. Since 1861, when the first Woman's Foreign Missionary Union was formed in New York, Christian women in all lands have entered upon the work, organizing women's missionary societies, commonly more than mere auxiliaries to the older enterprises. Educational and medical missionary enterprises have been established in considerable number. Interdenominational missionary societies, like the Christian and Missionary Alliance of America and the China Inland Mission and the North Africa Mission of England, have undertaken extensive enterprises in non-Christian countries. To some extent Christian communities which are themselves the fruit of missions have undertaken foreign missions; as in India, Africa, the Fiji Islands, the Hervey Islands, and Hawaii. In India, Ceylon, and South Africa the Salvation Army has established itself, seeking to forward the evangelization of the heathen by methods peculiar to itself. The Student Volunteer Movement, organized in 1886 in America, but now found in many other lands has done much for the increase of mission interest among students. In 1914 the various missionary societies united in the formation of a Board of Missionary Preparation. Missions have fostered a sense of Christian unity. In India, China, and Japan, and in some other countries, interdenominational conferences of missionaries are regularly held. In south India and Japan union churches have been formed. In the Netherlands, in Germany, in the United States, and to some extent in Great Britain, conferences between the various Protestant missionary societies are held at regular intervals. General and international missionary conferences have been held, of which the last and most important was held at Edinburgh in 1910.

3. *Methods and Problems of Foreign-Mission Work.*—As to the methods used in the presentation of the gospel experience has developed certain principles, almost attaining to the quality of a science of missions. Preaching in the language of the people is the first and most important method of evangelization; and the establishment of a permanent preaching place, to which all may come if they choose, is a first concern in every missionary station. Need at once appears to place the Bible in the hands of the people. This fixes literary work as another method of evangelization. Qualified missionaries translate the Bible, set up presses and print it, prepare helps to its study, tracts, and general Christian literature, and in short apply the enormous influence of the printing press to the enterprise of making Christ known. In 1913 the British and Foreign Bible Society published 1,170,000 Bibles and portions in India and Ceylon, 2,183,000 in China, 300,000 in Africa, and 633,000 in the Japanese Empire. The American Bible Society in the same year printed 29,579 Bibles, 134,689 Testaments, and 2,573,120 portions abroad. Desire that the people shall read requires not only the printing of primers, but the establishment of schools. But every school gives unsurpassed facilities for moral and spiritual culture, and this in proportion to the importance of its general training. Hence educational work has an importance as a method of evangelization which is immeasurable where the quality of instruction is of the best and the spiritual power of the teachers is of the highest. In 1910 there were, under the direction of Protestant missionaries, 30,300 primary schools and kindergartens, with 1,295,954 pupils of both sexes, and 2624 higher educational institutions, with 204,128 students; 86 of the last-named institutions are universities and colleges attended by 8628 students of both sexes. Theological and normal schools and training classes had 12,761 enrolled in 1910; boarding and high schools, 166,447; industrial training institutions and classes, 16,292. Medical work is another powerful method of evangelization. Protestant foreign missions in 1910 possessed 576 hospitals and 1077 dispensaries, in which 4,235,375 individuals received treatment during the year. A most pervasive method of evangelization is consistent Christian living. This includes not only Christian family life, which in itself is an object lesson for non-Christians, but also social intercourse with the people and a

wide variety of works of philanthropy, both in times of famine and pestilence and in the daily contact of ordinary life.

As soon as converts have been won, there arises the problem of their organization and culture as a body having self-control, initiative, and the power of expansion. The results of missionary work cannot be permanent unless the Christian Church becomes indigenous on the foreign field. Hence the members of native churches must early be accustomed to manage their own affairs and to support their own church institutions and their schools. Missionaries rarely become pastors of the local churches, and in general avoid settling local ecclesiastical questions except in conjunction with the local ministers.

Whatever the ability and common sense of the missionary, attack is probable upon him by vested interests represented in the religion of the country where he would preach. The murder, during 1900, of 135 British, Swedish, and American missionaries in China was a tragedy of missions more than once paralleled in quality, though not recently in degree. In this connection a problem arises as to the right of missionaries to ask government protection. It is generally held that missionaries should not depend upon such protection; that they go among savage tribes at their own peril, and that in lands where laws and treaties exist they must obey the laws. On the other hand, a government jeopardizes the right of all its people residing in any foreign country when it neglects to defend such of them as are maltreated while engaged in lawful occupations.

4. *Results of Missions.*—General statistical tables of Protestant foreign missions are seldom perfect. Nevertheless, the following figures may be taken as a fairly accurate statement of the activities of the various missionary societies operating from the countries named for the year 1914.

COUNTRIES	Stations and outstations	Men and women missionaries	Native laborers	Communicants	Added last year	Under instruction	Income
United States	14,802	6,282	39,825	972,655	110,194	†450,158	$11,549,390
Canada *	461	509	796	15,582	1,061	6,969	563,998
Great Britain and Ireland	19,495	7,158	43,002	720,572	36,355	844,848	9,615,032
Continental Europe	6,917	3,411	15,753	542,482	20,685	304,473	3,374,956
Total	41,675	17,360	99,376	2,251,191	168,295	1,606,448	25,103,176

* For 1910.

† Including teachers.

Again, foreign missions have not merely planted Christianity in all the principal non-Christian lands of the world; they have added the Bible to the literature of all the great languages of the earth, placing before the eyes of the people the principles of true manhood and its model in the peerless figure of Jesus Christ. The British and Foreign Bible Society in 1913 issued a total of 8,958,233, the American Bible Society 5,251,176, and the National Bible Society of Scotland a total of 2,697,886 Bibles, Testaments, and other parts of Scripture. Results of missions visible to the eye in non-Christian lands, but not capable of record in statistics, are the overthrow of degrading superstitions, the limitation or extinction of immoral and cruel customs, the modification of non-Christian religious teaching, the gradual elevation of the standing of woman, the quickening of general intelligence, and the wide introduction of education among illiterate and degraded races, together with the addition of great territories to the area of the world's commerce. To this must be added the work done by missions in charitable care for the sick, the blind, the lepers, and outcasts of every class.

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B. **Roman Catholic Foreign Missions.** 1. *Central Administration. The Congregation of the Propaganda.*—In a general way the direction of all Roman Catholic missions is vested by the holy see in the Roman congregation De Propaganda Fide, established in 1622 for Roman Catholic missions by Gregory XV. It consists to-day of 25 cardinals, with a cardinal prefect as their head, and a number of prelates and consultors in charge of the various details of administration. The congregation has at Rome its own palace or bureau, a college, a library and museum, a polyglot printing press, and certain fixed revenues, chiefly from domestic or Italian sources. The various missions are distributed by it according to the character of its subjects and the nature of the religious orders to which they belong. It settles finally all disputes between missionaries, whether they regard territorial jurisdiction or the conduct of the missionary work. The regular reports made by missionary bishops or superiors to the holy see pass through the congregation, and in general it acts as agent for missionaries in all matters that regularly pertain to other Roman congregations; e.g., questions of Tridentine law, marriage and divorce, criminal questions, and the like. Its principal meeting is on the first Monday of every month. A weekly meeting is regularly held for minor matters. Among the most important attributes of this congregation is the selection of bishops. Where there is a regularly established hierarchy, a list of three names is submitted to the Propaganda with all the documents pertaining thereto. These candidates are discussed in the regular monthly assembly of all the resident cardinals, and he who seems the most worthy is proposed to the Pope. This privilege of recommendation, in whatever way it be exercised, differs entirely from the election of a bishop, which belongs to cathedral churches by virtue of the regular canon law. In some countries, as in Canada, and formerly in the United States, the provincial bishops alone recommend the three candidates. In other countries, as in England, Scotland, and Ireland, the clergy or the chapter (i.e., the canons of the cathedral), as the superior part of the clergy, draw up a list which the bishops of the province confirm with their approbation or reject with animadversion on one or the other or all of the candidates. Elsewhere, as in the United States since 1884, and in Australia, the clergy or representative part of the clergy recommend three names to the bishops of the province, who in turn recommend these or others to the holy see. When there is no regular hierarchy vicars apostolic are appointed, with episcopal character, from a list of three names drawn up by the superiors of the religious institute or order to which the care of the faithful has been already committed. In the absence of such action the Pope appoints a vicar apostolic on recommendation of the Propaganda. On account of the rapid growth of Catholicism, chiefly in English-speaking countries, the office of Cardinal Prefect of the Propaganda has become one of the most important and responsible of the great curial offices; he is often called the Red Pope.

The College of the Propaganda is an institution attached to the congregation for the purpose of training its missionaries from their very youth. It owes its first beginnings to the Spaniard John Baptist Vivés, who bequeathed to it his palace at Rome and made it his heir. Since 1622 the original foundation has been greatly enlarged. Urban VIII was a notable benefactor of the work (1641); hence it bears the name of Collegium Urbanum. Some canons of the Lateran Church were the first teachers of the young missionaries, but the college soon passed into the complete control of the new congregation. It was endowed with many privileges by the popes. They exempted it from all ordinary ecclesiastical and civil jurisdiction, and several special distinctions were granted it, among others the right of giving degrees in theology and philosophy. Its present quarters were designed by Bernini, and the chapel is the work of Borromini. Seven months after their entrance the candidates for the missions are required to take an oath of obedience to the congregation; among other things they promise to go directly to their respective missions after ordination. Those who remain as missionaries in Europe (e.g., in the British Isles, the northern kingdoms, Switzerland) are required to report annually to the prefect of the congregation; those whose missions are elsewhere must write to him biennially. Not a few candidates, especially from the Orient, come at an early age. Such youths do not take the missionary oath until after they have reached their fourteenth year. In this college the training is the usual seminary training. Only, for the beginners, Greek and Latin, and especially the suitable Oriental languages, make up the curriculum. The college owns near Rome its own country seat or villegiature, whither the students go during the heated season. On Pentecost one of the students of the college preaches before the Pope and the cardinals. Its students at the end of the eighteenth century were about 140; at present they do not exceed 120. The French Revolution caused it to close its doors; but since 1809–17 it has been opened for its former work, and many distinguished men have graduated from its classes. From 1836 to 1848 the teaching and discipline were under the control of the Jesuits. Since then they are provided for directly by the congregation itself, which names a rector and vice rector with other officials, and provides for the programme of studies. Several national colleges attend the lectures of its professors—thus, the North American, Canadian, Irish, Greek, Ruthenian, and other national ecclesiastical schools frequent its classrooms. Yearly an Accademia Polyglotta is held on the first Sunday after Pentecost. Discourses, poems, and addresses are then read in a great variety of languages, chiefly Oriental, and the ceremony is graced by the presence of many dignitaries of the Roman court. Lately new and commodious quarters have been secured for the academic needs of the college.

The congregation has long owned and managed a printing press that is unique on account of the many kinds of type it possesses for the Oriental languages. In the last two centuries a multitude of Oriental texts have come from its offices—liturgical, ascetic, literary, theological, patristic, historico-religious. There is perhaps no-

where else in the world an Oriental printing press so well equipped and so scientifically conducted. It issues regularly a catalogue of its publications, and is officially known as the Stamperia de Propaganda Fide.

The Congregation of the Propaganda governs all Catholic missions according to the general law of the church, the decrees of the Council of Trent, the decisions of other Roman congregation, the papal rescripts, and the conciliar legislation. But over and above the ordinary law there is a certain amount of special legislation for the missions and missionaries. As early as 1669 the Propaganda issued its *Advice to Missionaries*, that has been lately reprinted (*Monita ad Missionarios*, Rome, 1874). The details of its extensive legislation are to be found in the collection of its document known as the *Bullarium* of the congregation (Rome, since 1839, 5 vols., folio; with an index, 1858). Another collection is that of Raphael de Martinis (7 vols., folio, Rome, 1889–1900). The particular legislation of the Propaganda affecting the Oriental missions is found in the work entitled *Collectanea Constitutionum, etc.* (Paris, 1880) and in the *Apparatus Juris Ecclesiastici* of Zephyrin Zitelli (Rome, 1886). Occasionally the congregation issues a legislation that modifies the regular canonical procedure in justice, e.g., in the trial of matrimonial cases, clerical delicts, and other judicial processes. Such documents then become norms of ecclesiastical government in the land for which they are issued. The current public documents of the congregation may be easily found in the Roman canon law periodical entitled *Acta Sanctæ Sedis*, and those of the Pope in the annual series of pontifical documents respectively known as *Acta Pii IX, Acta Leonis XIII, etc.*

Usually the establishment of a remote and difficult mission begins with the sending of a prefect apostolic by the Pope, at the suggestion of the Congregation of the Propaganda. As a rule this missionary is only a priest, but he receives certain special authorizations from the holy see, e.g., the right to administer confirmation. As soon as the conditions of the mission warrant, a vicar apostolic is appointed to take charge of its interests. Such a missionary is made a titular bishop, i.e., he is given the "title" of some see extinct or suppressed. No specific seat of residence is fixed for him; he organizes the mission as best he can. In time sees are established with territorial limits, and canonical obligation of residence for the bishop; thus a quasi-normal condition arises in which the administration of spiritual affairs gradually grows quite like that of the older Catholic states of Europe, and the regular ecclesiastical law tends to obtain as against the temporary and opportunist administration of an earlier date. Nevertheless, for various reasons, the holy see often continues to govern such well-developed churches through the Congregation of the Propaganda, instead of incorporating them in the ordinary system of its administration. The Propaganda is thus one of the busiest of the Roman congregations. There come before it all questions that arise in missionary lands concerning the creation of dioceses, their dismemberment, division, union, and transformation; the nominations to episcopal office; the relations, in last resort, of bishop and clergy; all questions between bishops and religious orders, and between orders themselves in matters of their mission work; the discipline and supervision of national missionary colleges, theological seminaries in missionary lands; the regular reports of its bishops, their special needs or plans, and similar things. It is in close contact with all other Roman congregations, to which it acts as a kind of clearing house for the missions and missionaries. Its juridical decisions are final, authoritative, and reversible only by the Pope, to whom they are always submitted beforehand when the gravity of the occasion or the nature of the problem in question warrants. The congregation has a permanent secretary, generally an archbishop, who goes weekly to the Vatican with the proceedings of the congregation, to submit them to the approval of the Pope and give such explanations as are needed. This office is looked on as "cardinalitial," i.e., as leading directly to the dignity of cardinal—hence it is always filled by an ecclesiastic of learning and experience.

A large and valuable library is connected with the congregation, for its own use and for the needs of the college and the printing press. It is especially rich in ancient theology and philosophy, and in all kinds of Orientalia, both printed and manuscript. It is accessible to students and writers. The archives of the congregation are kept with care, and are of great value for the ecclesiastical and civil history of the missionary lands. They are partially accessible under certain conditions, and are now being used by historians of the sixteenth, seventeenth, and eighteenth centuries, especially for the period of the Counter Reformation in Germany, Switzerland, and the Netherlands.

Until 1862 the affairs of all the missionary churches, East and West, were treated in one and the same Congregation of the Propaganda. In that year Pius IX established a special section of the congregation for the administration of the Oriental churches (Sacra Congregatio pro Negotiis Ritus Orientalis). It has its own chief, a Cardinalis Ponens, and its own officials and counselors. To each curial (resident) cardinal of this section is allotted the conduct of the religious affairs of some one of the Oriental rites united with the holy see; he is called the Cardinalis Relator.

2. *National and Particular Direction.*—The principal national missionary enterprises of Roman Catholics are carried on from Paris and Lyons in France. The most venerable of them is the Seminary for Foreign Missions (Missions Etrangères), founded at Paris, 1658–63, and located in the Rue du Bac. Its missionaries are under the guidance of local superiors (bishops) throughout China, Chosen (Korea), Tibet, Turkey, Siam, Burma, and Hindustan. In the seminary is a curious and touching Musée des Martyrs. The annual departure of its missionaries from Paris gives occasion for a remarkable popular ceremony and demonstration. The Society for the Propagation of the Faith (Œuvre de la Propagation de la Foi) was founded in Lyons in 1822 by a few pious lay persons. Its object is not to train or send out missionaries, but to collect and distribute for missionary purposes funds received from private generosity. This distribution is carried out without distinction of location or nationality, a principle which from the beginning differentiated this organization from previous enterprises of a similar nature. The receipts for the year 1822 were scarcely $4000. In 1898 the association collected nearly seven millions of francs and the total

amount raised by the society in the various countries (France being always far in advance of the others) from the beginning down to 1912 was $80,349,653. By 1915 it had amounted to $83,634,380. The society was established in the United States in 1840, and down to 1912 had collected $3,031,129. Up to 1915 the society had spent $6,478,714 in the United States. The means adopted for the raising of funds is the payment of five cents per month by the members enrolled in the association. The Work of the Holy Childhood (Œuvre de la Sainte Enfance), a related enterprise, has collected and spent about $10,000,000. Other French associations for missionary help are the Work of the Oriental Schools, the annual collection on Good Friday for the Holy Land, the Work of the African Missions, the Anti-Slavery Association, the White Fathers, the Fathers of the Holy Ghost —all works established originally in France and extended to different parts of the world.

There are many religious orders and institutes in France which send numerous members to the mission fields; thus, there are some 800 French Jesuits in the Orient, and they carry on excellent colleges at Beirut, Cairo, and Alexandria. Similarly Lazarists, Dominicans, Assumptionists, and others have numerous missionaries scattered through the Orient. The Christian Brothers have many well-attended schools in Egypt, Syria, Asia Minor, at Constantinople, and in the Levant. Owing to colonial expansion, Catholic Germany has shown more interest in missions during the last three decades, though the earlier French "Works" always found sympathy in Germany. The Bonifacius-Verein (1849) for home missions has spent in the 65 years of its existence over $7,000,000. The Ludwigs-Verein (1839), the Leopolds-Verein (1839), the Afrika-Verein (1894), the Association for the Holy Land (1893), and other enterprises have kept alive the zeal of German Catholics for the conversion of the heathen. A large number of the German Catholic missionaries are Jesuits. Within the last decade an increasing German missionary activity is manifest, especially in China and Brazil, in which latter country the German colonists increase at a rapid rate.

The French "sisterhoods" give generously of their members to the Oriental missions. Most of the missionaries to the credit of Catholicism are Frenchmen; a still larger proportion of the Catholic "sisters" on these missions is made up of Frenchwomen. Perhaps 10,000 is not too high a number. Of the entire number of congregations of men and women that labor in Catholic missionary fields, over 80 are of French tongue or have their home in France.

While the Spanish missionaries have nearly all taken their way to the Philippines, the Italian missionaries carry on, in an hereditary way, certain lines of work in the Orient, notably in the Levant. Statistics of their number and work are not easily reached. The Salesian Fathers (Turin) of Don Bosco turn their energy towards South America, and the society founded by Bishop Scalabrini, of Piacenza, is especially interested in the Italian population of South America and the North American cities. Holland has had a house for foreign missions at Steyl since 1875, with about 120 missionaries. At Mill Hill, in England, the English Catholics support a seminary for missions among the blacks. The College of All Hallows at Dublin draws its missionaries from Ireland; many of them come to the United States and merge into the American clergy; Ireland makes provision also for a few missions in Africa and India.

As to the civil relations of the Catholic missions in the Orient, France was their official intermediary with the local governments until the separation of church and state in France, Dec. 9, 1905. This ancient privilege was recognized by late acts of the Prefect of the Propaganda and the Holy Father. It was also recognized anew by the Chinese Emperor in March, 1899. Among the notable acts in the history of Oriental Catholic missions was the establishment by Leo XIII of a regular hierarchy in India (1886) and in Japan (1891).

The support of Catholic missions comes almost entirely from private sources. The money salary of each missionary is a very modest one. The Work of the Propagation of the Faith at Lyons allots annually from $100 to $120 to each missionary that it supports. Nearly all the money comes from small contributions, but through a well-organized system of collection.

There are in all some 55 Catholic orders and societies engaged in missionary work, ranging in date of foundation from the Benedictines in 529 to the Foreign Missionary Society of Turin in 1900. Among those most prominently engaged in missionary activities are the Benedictines, Cistercians (Trappists), Dominicans, French Foreign Missions, Minor Franciscans, Capuchin Franciscans, Jesuits, Lazarists, Mazarists, and Oblates of Mary Immaculate. In addition there are over 30 orders of brothers and 175 orders of sisters engaged in mission work as auxiliaries to the missionary priests. There are some 12,000 priests, 4000 teaching brothers, and 40,000 sisters. The entire force of workers in the Catholic missions field now numbers over 60,000.

3. *Some Important Events and Facts in the History of Modern Roman Catholic Missions.*— As a result of the loss of its East Indian possessions the crown of Portugal became involved, during the last century, in long and serious conflict with the holy see. From 1834 to 1838 the latter cut off from the original Portuguese archdiocese of Goa four vicariates apostolic, that coincided with English territory. Though absolutely just and necessary, this act of Gregory XV was resented by Portugal. A schism followed which lasted more or less acutely and continuously until 1886, when peace was brought about by Leo XIII. Goa was made a titular patriarchate with four suffragans, Damão, Archbishop also *ad honorem* of Crangaror, Cochin, St. Thomas of Meliapur, and Macao. Elsewhere in India the former vicariates apostolic of Agra, Bombay, Varapoli, Calcutta, Madras, Pondicherry, and Colombo (Ceylon) were raised to the archiepiscopal rank and freed from all subjection to the archbishopric of Goa.

During the whole nineteenth century the Catholic missions in Tongking and Annam suffered very frequently from popular uprisings and government persecution, until the establishment of the French civil protectorate in 1885–86.

Until 1880 the Catholic missions in Korea were almost continuously the object of similar maltreatment; nevertheless, there was in 1912 a total of 52,109 native Catholics, with 129 chapels and churches, 35 foreign and 10 native priests, and 7 foreign lay brothers. There were also 10 foreign and 57 native sisters. The present religious toleration in Korea under Japanese rule

was unknown in early days. In 1839 three French bishops were put to death as martyrs, and in 1860 nine bishops suffered the same fate.

The modern Catholic missions in Japan began tentatively in 1832–58. An impetus was given by the discovery of a number of crypto-Catholics (1858–72), who had retained some souvenirs of the faith as preached to their ancestors in the sixteenth and seventeenth centuries. With the gradual enlargement of religious liberty since 1872, the disestablishment (1886) of Shintoism and Buddhism, and the proclamation of a constitutional monarchy (1889), the conditions have been more favorable for the Catholic missions. In 1891 Leo XIII established a regular hierarchy in Japan, with one archbishop at Tokio. The three suffragans are at Nagasaki, Osaka, and Hakodate. In Japan (including Korea) in 1912 there were 202 foreign and 48 native priests, 140 lay brothers, 303 sisters, 400 churches and chapels, and 144,984 Catholics.

The labors of the Catholic missionaries in China during the last century were largely directed to gathering back into the Christian fold the families scattered by the former persecutions. The opium war, the Taiping Rebellion, political manœuvres, the weakness of the central authority, and the native hatred of the Chinese for "foreign devils" caused the destruction of many promising Christian communities in spite of the treaties of 1844 and 1850. One cause of the Boxer Rebellion of 1900 was fear of the political activities of the Catholics, especially the French orders, who were more or less supported by the French government. The present constitution of the Chinese Republic grants absolute freedom to all religions. In 1912 there were in China (including Manchuria, Mongolia, and Tibet) 1365 foreign and 721 native priests, 247 foreign and 86 native lay brothers, 743 foreign and 1429 native sisters, 9214 churches and chapels, 7131 schools, 134,057 scholars, and a native Catholic population of 1,406,659.

In Central Africa the most important events have been the labors of Father Libermann and his society (Fathers of the Holy Ghost) since 1840 and the foundation of the Pères Blancs of Cardinal Lavigerie. The African missions have been helped lately by the formation of anti-slavery societies. Among the most remarkable of Catholic missionaries in Africa was Father Daniel Comboni. In Ethiopia the central figure has been the late Cardinal Massaia, a venerable Capuchin, who devoted 30 years of his life to the work. In French Africa the see of Algiers was founded in 1838, and in 1867 became an archbishopric, with Constantine and Oran for suffragans. The French protectorate over Tunis (1881) brought with it, in 1884, the restoration of the famous ancient see of Carthage. Since 1885 the French protectorate over Madagascar has affected somewhat favorably the Catholic missions among the Malagasies.

According to Streit, *Atlas Hierarchicus*, the statistics of Africa for 1912 are as follows: for northeast Africa, 266 foreign and 80 native priests, 400 brothers, 1067 sisters, 190 churches and chapels, 180 schools, 20,557 scholars, and 138,018 Catholics. For northwest Africa, 427 foreign and 5 native priests, 141 brothers, 339 foreign and 27 native sisters, 334 churches and chapels, 564 schools, 40,992 scholars, and 125,300 Catholics. For Central Africa, 810 foreign and 3 native priests, 361 foreign and 14 native brothers, 446 foreign and 31 native sisters, 2426 churches and chapels, 3306 schools, 125,449 scholars, 6410 European and 332,696 native Catholics. For South Africa, 387 foreign and 4 native priests, 360 brothers, 1672 foreign and 22 native sisters, 358 churches and chapels, 363 schools, 28,042 scholars, and 103,880 Catholics. For the African Islands, 188 foreign and 2 native priests, 109 brothers, 195 sisters, 1267 churches and chapels, 182 schools, 32,499 scholars, and 15,300 Europeans and descendants and 223,504 native Catholics. Total for Africa, 2074 foreign and 94 native priests, 1385 brothers, 3819 sisters, 4575 churches and chapels, 4595 schools, 247,589 scholars, and 945,088 Catholics out of an estimated total population of 140,868,051.

As regards British India, the same authority from whom all of these statistics are taken gives the number of foreign priests as 1268, with 1230 native priests, 638 lay brothers, 3592 sisters, 5891 schools and chapels, 3362 schools, 211,035 scholars, and 2,215,632 Catholics. For Asia Minor the figures for 1912 were 527 foreign and 59 native priests, 595 foreign lay brothers, 1187 sisters, 447 churches and chapels, 823 schools, 60,114 scholars, and 138,200 Catholics. For the Philippine Islands the Catholic population is given as 7,455,714, with 963 parish priests, 782 other priests, 29 houses with 559 priests and 195 brothers, 43 houses with 696 sisters, 1339 churches and chapels, 14 seminaries, 32 higher schools, and 10,040 scholars of all kinds. As regards the East Indian islands, in 1912 there were 101 foreign and 2 native priests, 41 brothers, 425 sisters, 112 schools, 9707 scholars, and 37,707 converts, with 180 churches and chapels. In Indo-China the foreign priests numbered 517, with 689 native priests, 149 brothers, 2841 sisters, 4018 churches and chapels, 2986 schools, 73,894 scholars, and 986,597 Catholics. In the Turkish Empire in 1912 the Armenian Catholics numbered 106,000, with 367 bishops and priests; the Syrians 22,200 Catholics and 84 priests, the Syrian Chaldean 64,000 with 251 and the Syrian Maronites 414,600 Catholics with 1517 bishops and priests.

In South America there are nearly 10,000,000 Indians in the various Catholic missions, with some 3,000,000 more unconverted. The separation from Spain, the abolition of slavery in Brazil (1888), the frequent violent expulsion of various religious orders, the movement of immigration from Europe, and the Patagonian missions of the Salesian Fathers since 1875, have been among the principal events that affected the missionary work.

Throughout the islands of Polynesia there were, in 1912, 427 European and 8 native priests, 227 European and 29 native lay brothers, 418 foreign and 120 native sisters, 900 churches and chapels, and a total Catholic population of 193,293.

In 1885 Archbishop Moran, of Sydney, was made a Cardinal and in the same year he held the first council in Australia. There was in Australia in 1912 a total of 828,111 Catholics, 1505 churches and chapels, 1436 various priests, 478 brothers, 5574 sisters, 1181 schools, and 115,178 scholars. In Tasmania and New Zealand there were for the same year 184,876 Catholics, 419 churches and chapels, 388 priests of various kinds, 75 brothers, 164 sisters, 195 schools, and 17,465 scholars.

The most active missionary body of the Roman Catholic church is the Society of Jesus. A quasi-

official statement found in the *Lettres des missionnaires jésuites* (Paris, 1903) gave the number of Jesuit missionaries at that time as 3249. In 1912 they included in their organization 1 cardinal, 11 bishops, 7 apostolic vicars, 7311 priests, 4229 scholars, and 3977 lay brothers. They are active in almost the entire field of missionary work. They are no longer officially sanctioned in France since the separation of church and state, Dec. 9, 1905.

4. *Mission Work in the United States.*— Home-missionary activity in the United States aims chiefly at supplying the spiritual needs of the Indians and negroes. These missions are almost exclusively in the hands of religious orders. In 1885 a special commission was organized to collect and distribute funds for the maintenance of missionaries and schools in the various reservations. Statistics of 1912 claim 64,741 Catholic Indians, with 306 churches, 163 priests, 101 schools, and 7357 scholars; 103,436 Catholic negroes, with 109 churches, 162 priests, 173 schools, and 14,181 scholars.

Another phase of missionary endeavor in the United States is that of missions to non-Catholics inaugurated by the Paulist Fathers in 1893. It consists in explaining by public conference Catholic belief and practice to those non-Catholics who may desire to be enlightened thereon. The idea was soon taken up in various localities, many bishops setting apart a few preachers to carry on this work in their respective dioceses. The movement soon led to the formation of a legal corporation known as the Catholic Missionary Union, and in 1903 to the erection of the Apostolic Mission House in Washington, D. C. This institution is one of the group of those connected with the Catholic University, and its aim is to train young clergymen in missionary methods with a special view to this diocesan work.

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well as the numerous writings of Father de Smedt, a Belgian missionary among the Indian tribes of the Far West. Their bibliography is to be found in J. D. G. Shea, *Western Missions and Missionaries* (New York, 1878); also, T. O'Gorman, *History of the Roman Catholic Church in America* (ib., 1895); Francis Parkman, *The Jesuits in North America* (ib., 1902); De Courcy, *History of the Catholic Church in the United States* (ib., 1904); and Zephyrin Engelhardt, *Missions and Missionaries of California* (3 vols., San Francisco, 1908–13).

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MISSISAGA, mĭs'sĭ-sä'gà *or* -są'gà. An Algonquian tribe of North American Indians residing east and south from Lake Ontario, Ontario, Canada. They are closely connected with the Ojibwa, of whom they are an offshoot. The name is said to mean "great mouth," referring to the mouth of the Missisaga River. When first known to the French, early in the seventeenth century, the Missisaga were living upon the lower part of the river which bears their name and upon the adjacent Manitoulin Island. Soon afterward they moved east and south into the country left unoccupied by the dispersion of the Huron and Ottawa and soon spread over the whole peninsula of Lower Ontario. At the close of the Revolution they even had one village on the south side of Lake Erie in what is now Ohio. The land on which the Iroquois are now settled on Grand River, Ontario, was bought from the Missisaga. On account of the former loose distinction between the Missisaga and Ojibwa, it is impossible to give exact figures of population. Those now officially classed as Missisaga number about 750, on small reservations at New Credit, Alnwick, Mud Lake, Rice Lake, and Scugog, Province of Ontario, Canada. They are all members of the Methodist church and support themselves by farming, fishing, trapping, gathering wild rice, basket making, and outside labor.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME XVI

NEW YORK
DODD, MEAD AND COMPANY
1926

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Printed in the U. S. A.

The University Press, Cambridge, U.S.A.
Boston Bookbinding Co., Cambridge, U.S.A.

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the KEY TO PRONUNCIATION in Vol. I.

ā as in ale, fate.
â " " senate, chaotic.
å " " glare, care, and as *e* in there.
ă " " am, at.
ä " " arm, father.
ȧ " " ant, and final *a* in America, armada, etc.
a " " final, regal, pleasant.
ą " " all, fall.
ē " " eve.
ė̄ " " elate, evade.
ĕ " " end, pet.
ē̇ " " fern, her, and as *i* in sir, etc.
e " " agency, judgment.
ī " " ice, quiet.
i̇ " " quiescent.
ĭ " " ill, fit.
ō " " old, sober.
ȯ " " obey, sobriety.
ô " " orb, nor.
ŏ " " odd, forest, not.
o " " atom, carol.
oi " " oil, boil.
o͞o " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
u̇ " " unite.
ŭ " " cut, but.
u " " full, put, or as *oo* in foot, book.
û " " urn, burn.
y " " yet, yield.
B " " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.
ch as in chair, cheese.
D " " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g " " go, get.
G " " German Landtag = *ch* in Ger. ach, etc.
H " *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw " *wh* in which.
K " *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̲ " in sinker, longer.
ng " " sing, long.
N " " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh " *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā'b'l (table), kăz''m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on PRONUNCIATION.

A PARTIAL LIST OF THE LEADING ARTICLES IN VOLUME XVI

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Dr. E. N. Lowe; Honorable Henry Yeiger; Honorable J. N. Power; Honorable H. E. Blakeslee; Mr. Allen Leon Churchill; Mr. Charles Vernon Katz; Professor Alvin Saunders Johnson.

MISSISSIPPI RIVER.
Mr. John W. Woerman; Mr. W. G. Burroughs.

MISSOURI.
Honorable Cornelius Roach; Professor C. F. Marbut; Honorable C. P. Evans; Mr. Allen Leon Churchill; Professor Alvin Saunders Johnson; Mr. Charles Vernon Katz.

MISSOURI COMPROMISE.
Professor J. E. Winston.

MITE.
Mr. C. William Beebe.

MITRE.
Professor Irving F. Wood.

MOBILIZATION.
Major LeRoy S. Lyon, U.S.A.

MODERNISM.
Dr. Patrick A. Halpin.

MODES.
Professor Alfred Remy.

MOHAMMED.
Professor Nathaniel Schmidt.

MOHAMMEDAN ART.
Professor A. D. F. Hamlin.

MOHAMMEDANISM.
Professor Morris Jastrow; Professor Richard J. H. Gottheil; Professor Nathaniel Schmidt.

MOHAMMEDAN SECTS.
Professor Richard J. H. Gottheil.
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MOLE.
Mr. C. William Beebe.

MOLECULES, MOLECULAR WEIGHTS.
Professor Martin A. Rosanoff.

MOLIÈRE.
Dr. Benjamin Willis Wells.
Mr. E. J. Fortier.

MOLTING.
Mr. C. William Beebe.

MONASTIC ART.
Dr. George Kriehn.

MONASTICISM.
Dr. James J. Walsh.
Professor Irving F. Wood.

MONETARY CONFERENCES.
Professor Alvin Saunders Johnson.

MONEY.
Dr. Roland P. Faulkner.
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MONGOL DYNASTIES.
Dr. Louis Levine.
Professor J. Salwyn Schapiro.

MONGOLIA.
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MONOPOLY.
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MONORAIL.
Mr. Herbert Treadwell Wade.

MONROE, JAMES.
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MONROE DOCTRINE.
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MONSTROSITY.
Dr. David Gilbert Yates.

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MONTENEGRO.
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MONTESSORI SYSTEM.
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MONTREAL.
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Professor Harold Jacoby.
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MORAVIANS.
Professor J. Taylor Hamilton; Dr. D. W. N. Schwarze; Mr. Allen Leon Churchill.

MORGAN, J. P.
Professor Alvin Saunders Johnson.
Dr. George Kriehn.

MORMONS.
Professor Paul Leland Haworth; Professor Levi Edgar Young; Senator Reed Smoot.

MOROCCO.
Professor Robert M. Brown; Mr. Edward L. Engle; Major LeRoy S. Lyon; Professor Dana Carleton Munro; Mr. George E. Holt.

MORPHOLOGY OF PLANTS.
Professor John M. Coulter.

MORTGAGE.
Dr. Harlan F. Stone.
Professor George W. Kirchwey.

MORTMAIN.
Professor George W. Kirchwey.

MORTUARY CUSTOMS.
Dr. W J McGee.*
Dr. Robert H. Lowie.

MOSAIC.
Professor Arthur L. Frothingham.
Dr. George Kriehn.

MOSCOW.
Mr. David A. Modell; Dr. Louis Levine; Professor J. Salwyn Schapiro.

MOSES.
Professor Nathaniel Schmidt.

MOSQUE.
Professor A. D. F. Hamlin.

MOSQUITO.
Dr. Leland Ossian Howard.
Mr. C. William Beebe.

MOTOR BOAT.
Mr. Herbert L. Stone.

MOTOR VEHICLE.
Mr. Frederick R. Hutton.

MOUNTAIN.
Mr. David Hale Newland.

* Deceased.

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Professor Charles Ernest Fay.
MOVEMENT.
Professor John M. Coulter.
MOVING PICTURES.
Mr. Reginald Gordon.
MOZART.
Mr. Gustav Kobbé.
Professor Alfred Remy.
MUNICH.
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MUNICIPAL ARCHITECTURE.
Professor A. D. F. Hamlin.
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MUNICIPALITY.
Dr. James Wilford Garner.
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MUNICIPAL OWNERSHIP.
Mr. Moses Nelson Baker.
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MURAL DECORATION.
Dr. George Kriehn.
MUSCLE SENSE.
Professor Edward Bradford Titchener.
MUSCULAR SYSTEM, EVOLUTION OF.
Professor Charles B. Davenport.
Mr. C. William Beebe.
MUSEUM.
Dr. Frederick Augustus Lucas; Mr. C. William Beebe; Dr. George Kriehn.
MUSHROOM.
Dr. Edwin West Allen.
MUSIC.
Mr. James G. Huneker.
Professor Alfred Remy.
MUSIC, HISTORY OF.
Professor Alfred Remy.
MUSIC, PSYCHOLOGY OF.
Professor Edward Bradford Titchener.
MUSICAL INSTRUMENTS.
Professor Alfred Remy.
MUSICAL NOTATION.
Professor Alfred Remy.
MUTATION.
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NASHVILLE.
Mr. John H. De Witt.
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Mr. George S. Hodgins.
NATIONAL EDUCATION.
Mr. Ernest Norton Henderson; Mr. Isaac Leon Kandel; Mr. John W. Russell.
NATIONAL FLAGS.
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NATURALIZATION.
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NATURAL SELECTION.
Professor Alpheus Spring Packard.*
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NATURE WORSHIP.
Professor A. A. Goldenweiser.
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Captain Lewis Sayre Van Duzer, U.S.N., Ret.
NAVAL AËRONAUTICS.
Colonel Cornélis DeWitt Willcox.
NAVAL RESERVE.
Captain Lewis Sayre Van Duzer, U.S.N., Ret.
NAVAL SCHOOLS OF INSTRUCTION.
Captain Lewis Sayre Van Duzer, U.S.N., Ret.
NAVIES.
Captain Lewis Sayre Van Duzer, U.S.N., Ret.
NAVIGATION.
Captain Lewis Sayre Van Duzer, U.S.N., Ret.
NEBRASKA.
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Professor Francis M. Burdick.
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Dr. Robert H. Lowie.
NEGRO EDUCATION.
Dr. Hollis Burke Frissell.
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NEOLITHIC PERIOD.
Professor George Grant MacCurdy.
NERVOUS SYSTEM AND BRAIN.
Dr. Frederick R. Bailey; Dr. David Gilbert Yates; Dr. F. T. Haneman.
NETHERLANDS.
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NEUTRALITY.
Professor Albert de Lapradelle.
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Honorable George A. Cole; Honorable E. H. Walker; Honorable J. W. Legate; Mr. Allen Leon Churchill; Professor Alvin Saunders Johnson; Mr. Charles Vernon Katz; Professor John C. Jones.
NEWARK.
Mr. Alfred C. Stevens.
NEW BRUNSWICK.
Mr. John W. Russell; Professor Robert M. Brown; Mr. Irwin Scofield Guernsey; Professor J. Salwyn Schapiro.
NEW CALEDONIA.
Professor Robert M. Brown; Mr. William Churchill; Mr. M. A. Raynes.

* Deceased.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

MISSISSIPPI, mĭs'ĭ-sĭp'ĭ. One of the South Central States of the American Union. It takes its name from the river which forms its west boundary for a distance of about 300 miles and separates it from the States of Louisiana and Arkansas. It lies between Tennessee on the north and Louisiana on the south, being separated from the former by the thirty-fifth parallel of north latitude and from the latter by the thirty-first parallel from the Mississippi River to the Pearl River, a distance of 110 miles. Thence following the Pearl River southward the boundary line is completed on the south by the Gulf of Mexico. The Tennessee River cuts off a small portion from the northeast corner, but the east boundary separating the State from Alabama runs southward in a nearly straight line to the Gulf. Mississippi has an extreme length of 330 miles and an extreme width of 188 miles, and comprises an area of 46,665 square miles, of which 303 square miles is water. Mississippi includes, in addition to the mainland territory, the islands Ship, Horn, Cat, Petit Bois, and others, separated from the mainland by the Mississippi Sound.

Topography. The highest ridges in the northeast reach an altitude of about 700 feet. Throughout most of the State elevations range from 350 to 500 feet to about 150 feet a few miles from the Gulf. A moderate uplift of the region has allowed the rivers to carry the work of dissection to maturity, all gradients now being low, nearly or quite at base level. The streams have their lower courses in valleys opened wide, from a few hundred yards to several miles, and wandering in sinuous courses upon silted bottoms. These river bottoms cover a total of 7560 square miles, or over one-sixth of the entire State. Of this the Yazoo bottoms occupy the greater part. The flood plains of the Yazoo and Mississippi rivers are lined on the east by bluffs from 100 to 300 feet in height, caused by the lateral corrosion of the swinging meanders of the great river. These bluffs are capped throughout with a deposit of loess. Extending through the middle of the Yazoo bottoms is a flat ridge standing above flood level. This and the banks of the various streams are available for cultivation, being the best cotton land in the world. The bottom is being steadily reclaimed for plantations. The swamp and marsh area is occupied by cypress trees, very valuable as lumber, while the drier lands are covered with cane brakes and rich forests of many species of timber trees.

Hydrography. The principal rivers are the Mississippi, flowing the entire length, the Tombigbee, Big Black, and Pearl. The Yazoo River is a distributary of the Mississippi and the whole area of its bottom is a mesh of interlacing streams, bayous, and oxbow lakes. About one-half the area of the State drains directly into the Mississippi. The Pascagoula drains most of the southeastern quarter. The bottom lands of the Mississippi and other rivers are liable to overflow when the rivers are flooded. To guard against this, levees, or artificial banks, are built to restrain them. See LEVEE; MISSISSIPPI RIVER.

Flora. The result of the rather large annual rainfall and of the equable distribution through the year is best seen in the luxuriant forests, largely of deciduous trees. Over 125 species of forest trees are known. There are 15 species of oak, including the live oak. Cypress predominates on the bottom and swamp lands. The long-leaved pine is the chief forest tree of the southern half of the State. Tupelo, sycamore, persimmon, magnolia, holly, cucumber tree, sweet gum, black walnut, and various species of hickory, elm, and maple are also present.

Climate. Mississippi lies in the warm temperate climatic belt and its climate is strongly influenced by reason of its proximity to the Gulf. The average January temperature is 55° F. in the islands off the coast, 50° F. in the southern part of the mainland, and 40° F. near the north boundary. The average July temperatures range from 80° F. to 87° F. The average maximum shade temperature is 100°, while occasional anticyclones of winter bring a minimum temperature of 10° F. to the southern portion and zero weather to the portions below the northern quarter. Such cold weather is, however, very infrequent. The frost-free growing season lasts seven months in the north and ten months in the south. This is of the very greatest importance to many of the crops, especially cotton. The average annual rainfall for the whole State is over 50 inches. The southern quarter has over 60 inches, this distribution being largely due to the prevailing southwest winds and to the influence of the Gulf. The heaviest rains occur in late winter or early spring, when the warm Gulf winds meet the cold winds, but on the whole the precipitation is quite evenly dis

tributed through the year. There is a slight snowfall as far south as Natchez. The atmosphere is humid at all seasons, the average annual relative humidity being not far from 70 per cent in the northern half and from 70 to 75 per cent in the southern half. The average wind velocity for the whole year is seven miles per hour. The prevailing wind for January is north, while it is south for July. The cyclonic belt lies far to the north and generally does not touch the State.

Soils. The soils are pretty closely correlated with the geology. In the northeastern corner cherty and gravelly soils are common. The Selma Chalk or Rotten Limestone, the most extensive division of the Cretaceous, gives rise to a very fertile calcareous clayey soil, now mostly under cultivation. A narrow belt at the inland edge of the Tertiary formations, extending from the Tennessee line to the Alabama line, known as the post oak flatwoods, is characterized by stiff clay soils of very little agricultural value. In the eastern central part of the State reddish loams prevail. A little south of the centre there is another calcareous strip, formed by the Jackson and Vicksburg formations, and south of that sandy soils, rather poor, but easily tilled and responding generously to proper fertilization.

The brown loam and loess in the western half of the State, extending from about Holly Springs, Jackson, and Brookhaven to the river bluffs, make a very fertile soil, and the alluvium of the delta is one of the richest soils in the world. Much of the last is as yet too swampy for cultivation, but it is being gradually drained by levees and ditches. The loess is very easily eroded, and large areas of it have been so cut up by gullies since the country was first settled as to make the land almost worthless.

Geology. The Cumberland Ridge just reaches the northeast corner of the State with its outlying undulations, thus bringing a small outcrop of Devonian and Subcarboniferous rocks into its borders. From this corner as a focus the younger strata dip away gently to the west and south. Cretaceous beds cover a belt radiating about 25 miles west and 75 miles south of the northeast corner. The four prominent members of the Cretaceous outcrop, in series from the oldest up, are the Tuscaloosa, Eutaw, Selma Chalk, and Ripley. The total thickness of these beds is 2000 feet. At the close of Cretaceous time there was a deep gulf extending north to Cairo, Ill., which was slowly filled by fluvial and offshore deposits. These beds are the Eocene and Neocene outcrops, covering the greater part of the State and extending from the Cretaceous on the northeast to the Yazoo bottoms and almost to the Gulf on the south.

Mineral Products. The only activities of Mississippi as a mineral-producing State are the output of clay, sand, and gravel, and the production of mineral waters. Some iron ore and sand-lime brick have been worked, but are of no importance. The clay products in 1913 were valued at $691,271. In the same year there were produced 1,891,663 short tons of sand and gravel, valued at $430,401. The production of commercial mineral waters in 1913 was 346,652 gallons, valued at $81,800. The total value of the mineral production in 1913 was $1,143,472.

Agriculture. Mississippi is preëminently an agricultural State. Of the approximate land area of 29,671,680 acres, in 1910 there were 18,557,533 acres in farms, of which there numbered 274,382. Improved land in farms included 9,008,310 acres. The average number of acres per farm was 67.6 in 1910. The total value of farm property, including land, buildings, implements, machinery, domestic animals, and poultry, was, in 1910, $426,314,634. There were, in 1910, 274,382 farm operators, of whom 92,891 were owners, 825 managers, and 181,491 tenants. The share of the farms operated by tenants increased from 43.8 per cent in 1880 to 66.1 per cent in 1910. The land in farms owned and operated by white farmers in 1910 was 12,100,106 acres, with 4,520,927 acres improved land, and by negroes 6,457,427 acres, with 4,487,383 acres improved. Acreage operated by white owners was 9,489,280 and by negro owners 21,227,194. The average acreage per farm operated by white farmers was 110.4 in 1910 and for negroes 39.2. More than three-fourths of all the farms were between 10 and 99 acres in size. The native white farmers in 1910 numbered 108,909 and foreign-born white farmers numbered 736. Negro and other nonwhite farmers numbered 164,737, or 60 per cent of the total number. The acreage, production, and value of crops shown in the following table are estimates for 1914 made by the United States Department of Agriculture.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	3,150,000	58,275,000	$42,541,000
Oats	160,000	3,680,000	2,392,000
Potatoes	12,000	960,000	912,000
Sweet potatoes	50,000	4,500,000	2,835,000
Hay	210,000	*304,000	3,648,000
Rice	1,000,000	30,000	26,000
Cotton	3,120,000	†1,275,000	41,512,000

* Tons. † Bales.

The total value of crops in 1909 was $147,316,000 and the acreage 6,158,719. The leading crops in the order of their importance are cotton, corn, cottonseed, hay and forage, and sweet potatoes and yams. The acreage of cotton in 1909 was 3,400,210. The production was 1,127,156 bales, valued at $83,148,805. The chief acreage of cotton is found in that section described as the Yazoo delta or bottoms. In acreage of cotton Mississippi ranked fourth in 1914, being surpassed only by Texas, Georgia, and Alabama.

Corn is the leading cereal produced; its acreage in 1909 was 2,172,612. The production was 28,428,667 bushels, valued at $26,030,376. Of the remaining cereals only oats are important. In 1909, 97,085 acres were harvested, producing 1,268,675 bushels, valued at $822,932. The acreage of hay and forage in 1909 was 229,705, producing 279,236 tons, valued at $3,363,647. The growing of peanuts is given considerable attention. The total acreage in 1909 was 13,997, and the production amounted to 284,791 bushels, valued at $317,236. A small quantity of tobacco is grown, and this in 1909 amounted to 18,600 pounds, valued at $3390. The total acreage of potatoes and other vegetables in 1909 was 125,610, and their value $9,483,576. Excluding potatoes and sweet potatoes and yams, the acreage of vegetables was 61,223, and their value $5,868,000. There were grown, in 1909, 1,634,305 bushels of orchard fruits, valued at $1,325,506. Of these the most important in quantity and value were peaches. Second in product and value were apples; third, plums and prunes. There were also grown, in

1909, 760,563 pounds of grapes, valued at $44,-262. Of the small fruits grown the most important is the strawberry, of which 1,345,013 quarts, valued at $101,882, were produced. Among tropical fruits, figs, oranges, and pomeloes are grown. The production in 1909 was 1,949,-301 pounds, valued at $107,609. Mississippi is one of the most important sugar-cane-producing States. There were grown, in 1909, 222,600 tons, from which were made 1665 pounds of sugar and 2,920,519 gallons of sirup, the latter valued at $1,494,696.

Live Stock and Dairy Products. The total number of cattle of all kinds in 1910 was 1,012, 632, with a value of $15,269,264. On Jan. 1, 1915, the estimated number of cattle other than milch cows was 514,000, with a value of $7,350,-000; milch cows, 434,000, valued at $15,190,000; horses, 241,000, valued at $20,726,000; mules, 292,000, valued at $31,536,000; sheep, 208,000, valued at $458,000; swine, 1,540,000, valued at $11,088,000. The total value of the milk, cream, and butter fat sold and butter and cheese made in 1909 was $6,003,465. The milk produced amounted to 79,079,293 gallons, the butter made to 28,730,685 pounds, valued at $5,571,011. Fowls of all kinds in 1909 numbered 5,070,000, valued at $1,846,750. The production of eggs was 17,700,000 dozen, valued at $3,151,000.

Fisheries. Biloxi is the centre of the wholesale fishing industry. It is the shipping point of large quantities of canned and prepared oysters and shrimps. Mollusks and crustaceans are the principal products of the fisheries, of which oysters are by far the most important. In the year 1908 the valuation of the fish caught was $295,000. Buffalo fish, sea trout, white mullet, catfish, and paddlefish are, in the order named, the principal species. In that year there were 2037 persons engaged in fisheries, and the capital invested was $522,000. The total production was valued at $556,000. The industry seems to be declining in the number of persons engaged and the value of products. This is probably due to a decision of the United States Supreme Court transferring the jurisdiction of the Pear Island oyster and fishing grounds to Louisiana. The chief fishing grounds are the Gulf of Mexico and the Mississippi River.

Forest Products. In 1908, 17,500,000 acres, about 59 per cent of the total area, were covered by forests. As noted in the section on *Manufactures*, the lumber industry is the most important single manufacturing industry in the State. In the production of rough lumber, 2,610,581 M feet B. M., Mississippi ranked third among the States. By far the greatest percentage of the cut was yellow pine. The other principal varieties sawed, in the order of their importance, were oak, gum, cottonwood, cypress, poplar, hickory, ash, tupelo, and elm. There were manufactured, in 1909, 151,303 thousands of shingles and 90,-926 thousands of lath. In the same year there were produced 1.589,000 gallons of turpentine valued at $732,000, and 27,020 tons of resin valued at $740,000. There were, in 1913, 908 active saw mills. The lumber produced in 1914 was valued at $42,793,000. In addition to the figures of lumber given above, there were taken from the farms in 1909 forest products valued at $6,602,943.

Manufactures. While Mississippi is not essentially a manufacturing State, its industrial importance has kept pace with its growth. In 1909 the gross value of products per capita was $45. The table on page 4 gives the most important figures relative to manufactures for 1909 and 1904. The most important single industry is that connected with lumber and timber products. This is treated in detail under *Forest Products.* The manufacture of cottonseed oil and cake ranks second in value of products. In 1909, 559,357 tons of cottonseed were crushed, and from it were manufactured 24,386,289 gallons of cottonseed oil, 244,738 tons of meal and cake, 181,797 tons of hulls, and 24,237,536 pounds of linters. Mississippi has shared in the remarkable development of cotton manufactures in the Southern States. The manufacture of cotton goods ranks fourth. The principal material used in these manufactures is domestic cotton, of which there were consumed, in 1909, 16,371,192 pounds. The principal product is bleached and unbleached sheetings and shirtings, the output of which amounted to 17,-225,461 square yards in 1909. The number of producing spindles was 153,804 in 1909, and the number of looms, 4733. The manufacture of fertilizers is an important industry and ranks fifth. There were made, in 1909, 59,902 tons of superphosphates from minerals, bones, etc., 78,-193 tons of complete fertilizers, and 1006 tons of other fertilizers. In addition to these a considerable quantity of fertilizers was produced by cottonseed-oil mills. In the production of turpentine and rosin Mississippi is one of the most important States, although this industry has shown a decline in recent years. Mississippi in 1909 ranked fourth among the States in the output of these products.

The total number of wage earners in 1909 was 50,384, and of these 47,898 were males. The wage earners of 16 years of age and under numbered 1058, of whom 611 were males. The prevailing hours of labor for nearly half the wage earners employed were 60 a week.

The State has five cities having a population of over 10,000—Hattiesburg, Jackson, Meridian, Natchez, and Vicksburg. These cities contained in 1910 only 4.9 per cent of the total population and produced 14.8 per cent of the total value of its manufactures. The most important manufacturing city is Meridian (q.v.), in which there were, in 1909, 1524 wage earners and which had a product valued at $4,237,476. The cottonseed-oil industry is the most important, followed by the manufacture of fertilizers, steam-railroad repair shops, and lumber mills.

Transportation. Mississippi has excellent transportation facilities. It has direct connection with several large railroad systems of the South and Middle West and is bordered for practically its entire length by the Mississippi River. The proximity to the port of New Orleans by means of this river places it in a favorable position for domestic or foreign shipments. The total railway mileage on Oct. 30, 1913, was 4279. The principal railroads with their main-line mileage in 1913 were as follows: Illinois Central, 679; Yazoo and Mississippi Valley, 1144; Mobile and Ohio, 315; New Orleans, Mobile, and Chicago, 370; Southern Railway, 236; Mississippi Central, 164. The mileage of electric railways on Jan. 1, 1913, was 107. There were 12 companies operating such railways in that year. Pearl River is a customs district and has a small foreign trade.

Banking. The Bank of Mississippi at Natchez was chartered in 1809. In 1818 it was created a State bank, with a capital of $3,000,-

000, the State participating in its management and pledging a monopoly of its banking business until 1840. In 1830, with the hope of getting more direct control of banking operations, the Legislature broke its pledge by establishing the Planters' Bank of Mississippi, with a capital of $3,000,000, and making it the financial agent of the State. This forced the first bank into liquidation. For a few years the Planters' Bank had a practical monopoly of the banking, but from 1835 new banks followed in rapid succession. The most daring venture was the organization of the Mississippi Union Bank in 1838, with a capital of $15,500,000, which made it the largest State bank in the United States at that time. These bold undertakings in the very midst of a financial crisis could lead to only one result. In 1841 the repudiation of the charter granted to the Union Bank was the chief political issue in the State. The repudiators won, and the bonds were canceled in 1842. In 1853 the Planters' Bank bonds were also canceled. These acts were upheld by the constitution of 1890. There were numerous failures in 1838–45; in 1855 there was but one chartered bank. A revival came in the eighties, when national banks were introduced. Stringent banking laws have given to the State banks the confidence of the people, and their number has increased. On Sept. 12, 1914, there were 38 national banks with a combined capital of $3,835,000; surplus, $1,777,456; cash, etc., $391,649; loans, $14,897,834; and deposits, $16,037,548. On June 30, 1914, there were 266 State banks with a total capital of $8,604,330; surplus, $2,003,081; cash, etc., $1,787,074; loans, $33,453,505; and deposits, $34,416,264. There were 22 loan and trust companies with an aggregate capital of $1,803,150, and 17 savings banks with a combined capital of $485,600.

Government. The present constitution was adopted in 1890, and it is the fourth instrument under which the State has been governed. The constitution of 1890 had for its special purpose the preservation of the supremacy of the white vote. (See *Suffrage and Elections* below.) The constitution may be amended by a two-thirds vote of both Houses indorsed by the vote of the people.

Executive.—The chief executive officer is the Governor, who holds office for four years and is not eligible for immediate reëlection. Other executive officers are: Lieutenant Governor, Secretary of State, Treasurer, Auditor, Attorney-General. The Treasurer and Auditor may not be candidates for two successive terms.

Legislative.—The Legislature includes the Senate and the House of Representatives. In 1912 the system of sessions once in four years, with a special session between, was changed to biennial sessions in even years. The Lower House includes (1915) 138 members and the Senate 45.

Judiciary.—The judiciary is the supreme or appellate court of the State, which, by constitutional amendment adopted in 1914, consists of six members; a chancery court of equity jurisdiction and a circuit court of common-law jurisdiction in each county. The chancery and circuit judges have heretofore been appointed by the Governor, but are now elective. The coun-

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY: Total	PERSONS ENGAGED IN INDUSTRY: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	2,598	56,761	50,384	$72,393	$18,768	$80,555	$43,629
	1904	1,520	42,966	38,690	50,256	14,819	57,451	31,650
Bread and other bakery products	1909	79	417	285	287	128	878	362
	1904	57	237	160	184	69	499	238
Cars and general shop construction and repairs by steam-railroad companies.	1909	10	2,709	2,572	1,412	1,558	3,233	1,811
	1904	15	2,755	2,653	1,337	1,421	2,886	1,554
Cotton goods, including cotton small wares	1909	14	2,720	2,645	5,336	695	3,102	1,060
	1904	14	2,225	2,161	4,520	518	2,463	814
Fertilizers	1909	10	524	449	2,607	141	2,125	740
	1904	5	371	348	1,049	79	1,082	225
Foundry and machine-shop products	1909	50	711	583	1,682	295	1,088	616
	1904	35	622	516	875	260	920	564
Ice, manufactured	1909	51	477	341	1,851	189	866	653
	1904	37	376	274	1,266	119	603	458
Lumber and timber products	1909	1,647	37,118	33,397	39,455	12,583	42,793	28,586
	1904	664	24,415	22,431	24,819	9,242	26,162	19,157
Oil, cottonseed, and cake	1909	87	3,014	2,503	10,133	833	15,966	3,797
	1904	91	2,956	2,499	8,552	732	12,587	2,517
Printing and publishing	1909	225	1,132	736	1,173	387	1,308	1,008
	1904	211	861	549	733	254	916	721
Turpentine and rosin	1909	64	2,811	2,573	1,251	582	1,475	1,126
	1904	124	3,036	2,633	598	737	2,366	1,972

MISSISSIPPI
SCALE OF STATUTE MILES
0 10 20 30 40 50 60
SCALE OF KILOMETERS
0 10 20 30 40 60 80 100
County Towns
Railroads
TENNESSEE
ARKANSAS
LOUISIANA
ALABAMA
DE SOTO
MARSHALL
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TALLAHATCHIE
YALOBUSHA
CALHOUN
CHICKASAW
MONROE
BOLIVAR
GRENADA
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LEFLORE
WEBSTER
CARROLL
MONTGOMERY
OKTIBBEHA
LOWNDES
WASHINGTON
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NOXUBEE
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Halstead
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Relfe
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Shellmound
Jonesville
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Glendora
Philipp
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Eskridge
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Walthall
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Big Bayou

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Hattiesburg
Laurel
Ellisville
Columbia
Brookhaven
McComb
Gloster
Magnolia
Woodville
Centerville
Liberty
Port Gibson
Harrisonburg
Marksville
Winnsboro
Columbia
Tallulah
Rayville
Newellton
Jonesboro
Monroe
Ruston
Minden
Shreveport
Natchitoches
Alexandria
Opelousas
Lafayette
Plaquemine
Baton Rouge
Springville
Covington
Franklinton
Greensburg
Clinton
Newroads
St. Francisville
Lake Maurepas
Lake Pontchartrain
Bay St. Louis
Gulfport
Biloxi
Ocean Springs
Pascagoula
Moss Point
Mobile
Mobile Bay
Mississippi Sound
Grants Pass
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PETIT BOIS I.
SHIP I.
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Pearlington
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Waveland
Kiln
Lumberton
Purvis
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Poplarville
Perkinston
Lucedale
Leakesville
Waynesboro
Quitman
Stonewall
Enterprise
Meridian
Marion
Bonita
Russell
Collinsville
Stratton
Decatur
Newton
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Tombigbee R.
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Okatoma Cr.
Leaf R.
Chickasaw Cr.
Tallahala Cr.
Bowie Cr.
Bogue Homo
Cypress Cr.
Bogue Falaya
Bayou Sara
Bayou Teche
Lake Catahoula
Vicksburg
Warren
Hinds
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ties are divided into chancery and circuit districts, a chancellor and a circuit judge being chosen for each district. There are in addition two or more justices of the peace elected for each of five districts in a county.

Suffrage and Elections.—Every male citizen 21 years of age who has resided in the State for two years, in the district in which he offers to vote for one year, who has registered and paid taxes for two preceding years, and who is able to read or understand the Constitution of the United States, is eligible to vote. The last qualification, which election officers are given discretion to interpret, was designed chiefly to eliminate a large portion of the negro vote. All voters must pay a poll tax of $2 for the support of the common schools.

All nominations for the State, district, and county officers and United States Senators are made at primary elections. Each political party pays the expenses of its primaries, and the candidates may be assessed for expenses. General elections are held on the first Tuesday after the first Monday of November.

Local and Municipal Government.—Cities may adopt a commission form of government including the charter providing for the recall and initiative at an election held on petition by 10 per cent of the voters. Any city may vote to abandon its charter after six years under commission government. Each county is divided into five districts, in each of which a resident freeholder is selected as a member of the board of supervisors. The boards of supervisors regulate the fiscal affairs of the county, make all contracts, equalize assessments, levy the taxes, and have exclusive control of roads, ferries and bridges, etc.

Miscellaneous Constitutional and Statutory Provisions.—Women are placed on an equality with their husbands in acquiring and disposing of property and the making of contracts. A divorce may be granted only to one who has lived for one year at least in the State. A public-service corporation which may remove a suit from a State to a Federal court forfeits its right to carry on intrastate commerce in the State. Nine or more jurors may agree on a verdict in civil suits. Contributory negligence does not bar recovery for injuries or death. The giving of tips in hotels is forbidden. As a result of a statute passed in 1908, the State is under prohibition. The Legislature of 1914 passed a measure restricting the intrastate shipment of intoxicating liquors and prohibiting the keeping of liquor in any locker of any social club or any other organization. There are strict regulations for railroad companies delivering intoxicating liquors shipped from outside the State.

Finance. The early financial history of the State is closely connected with the organization of its banks. A large State debt of $2,000,000 was created in 1830 in order to acquire shares in the Planters' Bank and, in 1838, $5,000,000 for shares of the Union Bank of Mississippi. These banks were later brought to insolvency as a result of the financial crisis of the thirties. This involved the State in an enormous debt. In the floating of this debt infringements were made upon the constitution, and it was repudiated by a popular vote in 1852. The debt was finally disposed of by a clause in the constitution of 1875. The State was again involved in serious financial difficulties during and after the Civil War. The "carpet-bag" régime greatly aggravated the situation. The expenditures increased from about $500,000 in 1867–69 to more than $1,500,000 in 1871–75, and the tax rate increased from 1 mill to 14 mills. The taxpayers organized a protest in 1874, and a gradual decrease of the State's debt, expenditures, and rate of taxation followed. The total debt in 1880 was $3,324,084, of which $530,615 was bonded debt. On Sept. 30, 1912, the total debt was $4,460,519, of which $1,506,899 was bonded debt. The funded debt consisted on that date of several series of bonds and of special debt obligations to public trust funds. The latter represent obligations to several educational funds the principal of which, amounting to $2,344,674, has been used by the State, for which it pays an annual interest of 6 per cent in perpetuity. The bonded debt on Sept. 30, 1913, was $3,923,752. The per capita debt in 1912 was $2.41. There is no sinking fund. The total receipts from all sources for the fiscal year 1913 amounted to $4,501,447 and the disbursements to $4,426,591. The balance at the beginning of the fiscal year was $250,999 and at the end $325,855. The chief sources of revenue are State taxes, and the chief expenditures are for educational and State institutions.

Militia. The males of militia age in the State in 1910 numbered 345,745. The organized militia consists of one brigade of infantry, comprising the second and third regiments, and a sanitary troop and a field hospital. The total strength of enlisted men in 1914 was 1116 and of officers 104.

Population. The following figures show the growth of the population at various periods: 1800, 8850; 1830, 136,621; 1850, 606,527; 1860, 791,305; 1870, 827,922; 1880, 1,131,597; 1890, 1,289,600; 1900, 1,551,270; 1910, 1,797,114. The est. pop. on July 1, 1914, was 1,901,882; 1920, 1,790,618. In 1910 Mississippi ranked twenty-first among the States. There is a very small foreign-born population, but it has a larger percentage of colored population than any other State. The white population in 1910 was 786,111, and the negro population was 1,009,487. The white population, however, is increasing at a faster rate than the negro. The foreign-born whites in 1910 numbered 9389. The urban (cities of 2500 or more) population is comparatively small. In 1910 this amounted to 207,311. The rural population in 1910 was 1,589,803. The negroes are most numerous in the western or Mississippi valley counties, in some of which they are five times as numerous as the whites. There are about 1250 Indians, who are descendants of the Choctaw tribes which inhabited the State at the time of its settlement. A large number of these Indians have removed to Oklahoma and have become members of the Choctaw nation. In the State in 1910 there were 905,760 males and 891,354 females. The males of voting age numbered 426,953. There were in 1910 only nine cities having a population of 8000 or over. The largest city, Meridian, had a population in 1910 of 23,285 and, in 1914, 21,806 (estimate). The other large cities with their populations in 1910 and as estimated for 1914 are as follows: Jackson, 21,262 and 26,990; Vicksburg, 20,814 and 22,090; Hattiesburg, 11,733 and 14,952; Greenville, 9610 and 10,448; Columbus, 8988 and 10,053; Biloxi, 8049 and 9147; Natchez, 11,791.

Education. Education in Mississippi is car-

ried on under some disadvantages, caused by the large and widely scattered rural population. This fact and a negro population that amounts to more than half of that of the State accounts for the large percentage of illiteracy. The total illiterates in 1910 numbered 290,235 (persons of 10 years and over), a percentage of 22.4. South Carolina and Alabama were the only States with higher percentages. Of the total illiterates the native whites numbered 28,344, or 5.3 per cent, and the negroes 259,438, or 35.6 per cent. Conditions, however, are greatly improving, and the percentage of illiterates is steadily decreasing. In 1910 the total school population was 644,805, of which 265,767 were native whites of native parentage and 372,331 were negro.

According to an enumeration made in 1912 the total number of children of school age in that year was 740,856; of these 311,389 were native white and 429,467 were negro. In addition there were 407 Indian children of school age. There is no compulsory-education law.

The administration of the schools is in the hands of the State Board of Education, composed of the Secretary of State, the Attorney-General, and the Superintendent of Education. The latter is the chief executive officer. There is a superintendent for each county, and there are separate districts for white and for negro children. The districts have the power to tax themselves for the support of the schools. The common-school fund amounts to about $3,500,000. For a long time the legislatures were somewhat indifferent to the importance of improvement in educational matters, but beginning with 1910 several laws of great importance have been passed. These included a measure permitting the consolidation of two or more weak schools into one stronger school; the establishment of agricultural high schools; the creation of a textbook commission and of a supervisor of elementary rural schools. The Legislature of 1911–12 enacted several important measures which have had good results.

There is a normal school at Hattiesburg, established in 1911. The Shelby Normal Institute at Shelby is for colored students. The institutions of collegiate rank include the University of Mississippi at University, the Mississippi Agricultural and Mechanical College at Agricultural College, Mississippi College at Clinton, Millsaps College and Meridian Male College at Meridian. Colleges for women are Hillman College at Clinton, Mississippi Industrial Institute and College at Columbus, Grenada College at Grenada, Meridian Women's College at Meridian, and the Port Gibson Female College at Port Gibson. Rust University at Holly Springs is for colored students. Other colleges for colored students are the Alcorn Agricultural and Mechanical College at Alcorn, the Southern Christian Institute at Edward, the Mississippi Industrial College at Holly Springs, Campbell College at Jackson, Jackson College at Jackson, Kosciusko Industrial College at Kosciusko, Lincoln School at Meridian, Tougaloo University at Tougaloo, Utica Normal Industrial Institute at Utica, Vicksburg Industrial School at Vicksburg, and Granada-Scion College at Winona. There are also several normal schools for colored persons.

Charities and Corrections. The charitable and correction institutions under the control of the State include the State Charity Hospital at Jackson, the State Charitable Hospital at Vicksburg, the State Charitable Hospital at Natchez, the Beauvoir Home at Beauvoir, the State Insane Asylum at Asylum, the Eastern Mississippi Insane Asylum at Meridian, the State Penitentiary at Jackson, the Deaf and Dumb Institution and the Institution for the Blind at Jackson. State convicts are employed on several State farms and plantations, white and negro convicts being assigned to different farms. These farm penitentiaries are controlled by a board of trustees elected by the people. The hiring out of prisoners by counties is prohibited. Public farms must be secured for them to work on by the county authorities or they must be employed on the public roads.

Religion. Over half of the Church population of the State belong to the Baptist church, and the majority of the remainder to the Methodist. Of the lesser denominations the more important are the Presbyterian, Roman Catholic, Christian, and Protestant Episcopal.

History. In 1539 Hernando de Soto, with a band of Spanish adventurers, crossed the northeastern part of what is now the State and in the early part of 1541 reached the Mississippi River, near the present site of Memphis, Tenn. In 1673 the French explorers Joliet and Marquette, passing down the Mississippi, sailed as far as the mouth of the Arkansas. In 1681–82 La Salle sailed down the river to its mouth and, taking formal possession for the King of France, Louis XIV, named the country Louisiana after him. The first attempt to found a colony was made in 1699 by Iberville, who brought 200 immigrants from France to Biloxi, on the east shore of the Bay of Biloxi. This was the germ of the subsequent settlement of New Orleans (1718). In 1716 Iberville and Bienville, with a large body of immigrants and a military force, ascended the Mississippi to the present site of Natchez, where they founded a settlement named Rosalie, in honor of the Countess of Pontchartrain. Attempts to plant colonies were soon after made at St. Peter's (on the Yazoo), at Pascagoula, and elsewhere. The small colonies in Mississippi, however, grew but slowly, New Orleans attracting many of the settlers. Under Bienville, who was Governor of Louisiana from 1718 to 1724, friendly relations with the Indians were preserved; but under his successor, Perriez, the hostility of the Natchez Indians was awakened. In 1729 a sudden assault was made on the line of French posts. At Fort Rosalie 200 persons were killed and more than 500 were taken prisoners. In the smaller settlements many of the inhabitants were butchered. Retribution followed swiftly. Aided by the Choctaw tribes, the French succeeded in defeating the Natchez, the greater part of whom fell in battle, while most of the survivors were sold as slaves. When Bienville became Governor again, in 1733, he found the colony at war with the Chickasaws, allies of the English, and the conflict continued for several years. There was a peace, followed in 1752 by another Indian war, instigated, it was said, by English adventurers. The French commander sought to retaliate, but without much success. Under French rule the country failed to prosper. In 1763 France ceded its possessions east of the Mississippi to Great Britain, which received also Florida from Spain. Immigrants flocked thither in considerable numbers from the English colonies on the Atlantic coast as well as from Scotland.

That part of the territory south of a line drawn through the mouth of the Yazoo River eastward to the Chattahoochee had been erected into the Province of West Florida soon after the establishment of English rule in 1763. In 1781 West Florida was conquered by Spain and passed under Spanish rule. By the Peace of Paris, in 1783, the thirty-first parallel of latitude was recognized as the southern boundary of the United States, and Spain was therefore considered as an intruder in that part of Mississippi to the north of the line. By the Treaty of 1795 between the United States and Spain, Spain ceded her claims to the disputed territory, but continued to occupy it until 1798. In 1798 the Territory of Mississippi was organized, and in 1804 it was extended to the present boundary of Tennessee. In 1813 the district south of 31° and east of the Pearl River, taken from Spain, was annexed. At first a Governor and three judges appointed by the President were the chief authorities for the government of the Territory, but in 1800 provision was made for a legislature, the Lower House consisting of nine members representing the three counties into which the Territory was then divided. In 1802 Washington became the capital of the Territory. In the Creek War Mississippi took a conspicuous part, several hundred inhabitants of the Territory being massacred at Fort Mims (q.v.). In the War of 1812 the Territory was well represented at the battle of New Orleans. In March, 1817, Congress passed an enabling Act for the admission of Mississippi to the Union, and the State was formally admitted Dec. 10, 1817. The most notable features of the first constitution of Mississippi were the high property qualifications for holding office, the short tenures of offices, and the large appointing power of the Governor and Legislature. The first Governor was David Holmes, and during his administration the capital was permanently located at Jackson, near the headwaters of the Pearl River.

By the treaties of 1830 and 1832, with the Choctaw and Chickasaw Indians, who inhabited all the northern part of the State, the lands occupied by those tribes were incorporated into the State, subjected to its jurisdiction, and thrown open to settlement by the whites. In 1832 a new constitution was adopted for the State. Its most notable features were the abolition of property qualifications for officeholding, the requirement that all officers, both State and county, including the judges, should be chosen by the people. It also created a high court of errors and appeals and abolished the office of Lieutenant Governor. During the "flush times" of this period Mississippi, like many other Southern and Western States, fell a victim to financial extravagance and speculation, one of the results of which was the repudiation by the State of $5,000,000 in bonds which it had issued for the purpose of acquiring stock in the Union Bank. The supreme court of the State decided in favor of the liability of the State for the payment of the bonds, but the people, in an election in which this was the main issue, decided otherwise, and the Legislature refused to make any appropriation for the purpose. A little later $2,000,000 of the Planters' Bank bonds were repudiated under similar circumstances. Upon the outbreak of the Mexican War Mississippi was called upon to furnish one regiment of volunteers, but more than enough men for two regiments responded. The first regiment was commanded by Col. Jefferson Davis, who won great distinction at the battle of Buena Vista. In 1851 occurred the first important struggle in Mississippi over the slavery question, which had become serious on account of the enactment by Congress of the so-called Compromise Measures of 1850. The Democratic party in Mississippi adopted a platform favoring secession and nominated Jefferson Davis for Governor, while the Whigs declared their attachment to the Union and nominated United States Senator Foote as their standard bearer. The Union party won a substantial victory, and the slavery question rested until 1856, when the question of secession was again agitated on account of the fear that Frémont would be elected President. The news of John Brown's raid in 1859 led the Legislature to appropriate $150,000 for the purchase of military supplies and for the organization of the militia. It was left, however, for the election of Lincoln to bring the secession movement to a head. An ordinance of secession was passed on Jan. 9, 1861, by a convention, by a vote of 84 to 15, and the State constitution was amended to bring it into conformity with the constitution of the Confederate States. During the Civil War the people of Mississippi suffered greatly, and in 1863 and 1864 especially a large part of the State was devastated by the contending armies. Almost all semblance of government had disappeared. (For the military operations in Mississippi, see CIVIL WAR; CORINTH; IUKA; VICKSBURG.) In June, 1865, Governor Clarke was removed, and a provisional Governor was appointed by President Johnson. On July 21 slavery was abolished by a State convention, and on the following day the ordinance of secession was repealed. In December the State government was given over into the hands of the duly elected officers, who proceeded to reorganize the State militia for the public defense, a course in which they were upheld by the President. Limited civil rights were conferred on the freedman, but the Fourteenth Amendment was rejected in January, 1867, and in March the State came under military government.

In January, 1868, a convention framed a new constitution, conferring the suffrage on negroes. The conservative element vehemently opposed the constitution because of the severe penalties it imposed on members of the government and armies of the Confederacy, and brought about its rejection at a popular election. Resubmitted in November, 1869, with the test oath and disfranchisement clauses to be voted on separately, the constitution was adopted almost unanimously, while the independent clauses were as unanimously rejected. In January, 1870, the Fourteenth and Fifteenth amendments were ratified, and on Feb. 17, 1870, the State was readmitted into the Union. The period before 1875 was marked by a spirit of bitter hatred between the old Democrats and the newly enfranchised negroes, together with their leaders, the white Republicans. The feeling of animosity was intensified by the unhappy financial condition of the State and by the dishonesty and incapacity of its officers, very many of whom were ignorant negroes, the tools of scheming politicians. Bloody collisions between whites and negroes were frequent in 1874 and 1875, in one of which, at Vicksburg, 29 negroes and several whites were killed. The desperate attempts of the "conservatives" to restore the supremacy of the white population proved finally successful

in 1875, when the Democratic party captured the Legislature. The Republican Governor and Lieutenant Governor and the Superintendent of Education were driven from office by impeachment or threats of impeachment, and since then the Democratic party has retained an overwhelming predominance. The 20 years after 1865 were a period of economic depression, the result of the havoc wrought by the war and of the difficulties encountered in readjusting production to the new conditions of labor, but later the rise of manufactures marked the beginning of a bright era. The racial problem assumed a momentous aspect in 1844, when a vast migration of colored men into the swamp lands of Mississippi seemed to threaten the rise of a negro State within the State of Mississippi. The policy of fortifying the white race in power was continued. By the constitution of 1890 the suffrage was restricted to those able to read a section of the Constitution or to interpret any passage if read aloud, a provision aimed against the negro voter and sufficiently successful in attaining its aim. (See *Government*, above.) In national elections Mississippi has been a Democratic State with the exception of the year 1840, when it voted for the Whig candidate, and of 1872, when its vote was given to Grant. In 1864 and 1868 its vote was not counted. While the Democratic party is practically the only political organization, there was from the first years of the twentieth century a condition of political turmoil which was hardly surpassed in other States where the great political parties have strong rival organizations. In 1904 James K. Vardaman was elected Governor. His chief political tenet was the disfranchisement of the negro, not only in the State but in the nation, by means of the repeal of the Fourteenth Amendment of the Constitution. During his term, 1907, it became necessary to elect a United States Senator for the term beginning March 4, 1911. In Mississippi the Senators take their seats four years after election. Governor Vardaman was a candidate for the Senate and was opposed by John Sharp Williams, then a Representative in Congress. The contest was one of great bitterness, and among its features was a series of joint debates between the two candidates. At the primary election held in August, 1907, Mr. Williams received a majority of about 1000 votes. On November 5 of that year E. F. Noel was elected Governor. The Legislature of 1908 passed a statutory prohibition bill which became operative on Jan. 1, 1909. An attempt made to pass a measure for constitutional prohibition was defeated. In the election for President in 1908 Bryan received 60,876 votes, Taft 4505, and Watson 1057. On Dec. 26, 1909, Senator A. J. McLaurin died, and Col. James Gordon, a Confederate veteran of the Civil War, was appointed by the Governor to fill the vacancy until a successor to Senator McLaurin could be chosen by the Legislature. This election by the Legislature in 1910 resulted in a fierce and prolonged factional battle. After the deadlock lasting seven weeks Le Roy T. Percy was elected. He was opposed by Mr. Vardaman, who, shortly after Senator Percy had taken his seat in the Senate, caused charges to be made that the latter's election had resulted from bribery and corruption. After an investigation Senator Percy was entirely exonerated. In 1911 another senatorial election was held for the term beginning March, 1913, when Senator Percy's term expired. He was a candidate for reëlection and was again opposed by Mr. Vardaman. In this election the latter was successful. Earl Brewer was chosen Governor. Mr. Vardaman was elected by the Legislature in 1912. On March 5 of that year the Legislature, which was controlled by friends of Mr. Vardaman, demanded the resignation of Senator Percy on the ground that he had promised to resign if he were defeated in the primaries for nomination, a procedure altogether unprecedented in the history of American politics. Senator Percy denied that such a pledge had been made and continued to serve out his term. In the presidential election of 1912 Wilson received 57,227 votes, Roosevelt 3645, Taft 1595, and Debs 2161. In 1912–13 the State suffered much from floods of the Mississippi River. In 1914 several amendments to the constitution were adopted. The number of supreme court judges was increased to six, and their term of office was made eight years. The Governors follow:

TERRITORIAL

Winthrop Sargent		1798–1801
John Steele (acting Governor)		1801
William C. C. Claiborne		1801–03
Cate West (acting Governor and Governor ad int.)		1804
Robert Williams		1805–09
David Holmes		1809–17

STATE

David Holmes	Democrat-Republican	1817–20
George Poindexter	Democrat	1820–22
Walter Leake	"	1822–25
Gerard C. Brandon (ad int.)	"	1825
David Holmes (ad int.)	"	1826
Gerard C. Brandon	"	1827
Gerard C. Brandon	"	1828–32
Abram M. Scott	"	1832–33
Charles Lynch (ad int.)	"	1833
Hiram G. Runnels	"	1833–35
John A. Quitman	Whig	1835
Charles Lynch	Democrat	1836–38
Alexander G. McNutt	"	1838–42
Tilghman M. Tucker	"	1842–44
Albert G. Brown	"	1844–48
Joseph W. Matthews	"	1848–50
John A. Quitman	"	1850–51
John J. Guion (ad int.)	"	1851
James Whitfield (ad int.)	"	1851
Henry S. Foote	Union Democrat	1852–54
John J. McRae	Democrat	1854–58
William McWillie	"	1858–60
John J. Pettus	"	1860–62
Jacob Thompson	"	1862–64
Charles Clarke	"	1864–65
W. L. Sharkey (provisional)		1865
Benjamin G. Humphreys	Democrat	1865–68
Adelbert Ames (provisional)		1868–70
James L. Alcorn	Republican	1870–71
Ridgley C. Powers (acting)	"	1871–74
Adelbert Ames	"	1874–76
John M. Stone	Democrat	1876–82
Robert Lowry	"	1882–90
John M. Stone	"	1890–96
Anselm J. McLaurin	"	1896–1900
A. H. Longino	"	1900–04
James K. Vardaman	"	1904–08
Edward F. Noel	"	1908–12
Earl Brewer	"	1912–16
T. G. Bilbo	"	1916–20
L. M. Russell	"	1920–

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Cardle, *History of Mississippi* (ib., 1891); Duval, *History of Mississippi* (Louisville, Ky., 1892); Winsor, *The Mississippi Basin* (Boston, 1895); Muckenfuss, *History of Scientific Industries in Mississippi* (Jackson, 1900); Owen, "Bibliography of Mississippi," in *American Historical Association Report for 1899* (Washington, 1900); publications of Mississippi Historical Society (Oxford, 1900–14); Garner, *Reconstruction in Mississippi* (New York, 1901); Montgomery, *Reminiscences of Mississippi* (Cincinnati, 1901); Crider, "Geology and Mineral Resources of Mississippi," in *United States Geological Survey, Bulletin No. 283* (1906); Crider and Johnson, "Underground Water Resources of Mississippi," in *United States Geological Survey, Water Supply, Paper No. 159* (1906); Rowland, *Encyclopedia of Mississippi History* (Madison, Wis., 1908); Ellett, *Outline of Mississippi History* (Hattiesburg, 1913); reports of Department of Archives and History; annual and biennial reports of other State departments.

MISSISSIPPI, UNIVERSITY OF. A State university chartered in 1844 and opened in 1848, at Oxford, Miss., and maintained until 1880 by annual grants by the Legislature. From 1861 to 1865 exercises were suspended, owing to the resignation of the faculty. In 1870 the policy of separate schools, with optional studies and with courses leading to other degrees besides that of B.A., was adopted. There are seven undergraduate courses, partly elective, leading to the bachelor's degree in arts, science, pedagogy, philosophy, mining, and civil and electrical engineering. The university also maintains a law school, a medical department, and a summer school and confers the degrees of M.A. and Ph.D. In 1892 the preparatory education was discontinued at the university. The requirements for admission are those adopted by the Association of Colleges and Preparatory Schools of the Southern States, of which the university is one of the original members. Students from approved high schools are admitted without examination. Since 1882 women are admitted. The faculty consisted in 1915 of 35 instructors, and the students numbered 528. The library contained 25,000 volumes. The total endowment was about $700,000, with a gross income of $138,226. The buildings and grounds were valued at $500,000, the total value of the property being $1,300,000. The president in 1915 was Joseph N. Powers, LL.D.

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE. An institution for agricultural and scientific education, established by an Act of the Legislature in 1878 at Agricultural College, Miss. The curriculum includes a two-year training course and four courses of instruction—agricultural, mechanical, industrial education, and general science—with provisions for graduate work and summer sessions. The degrees conferred are bachelor and master of science. There is also an honorary degree of master of progressive agriculture. The bona-fide residents of Mississippi receive free tuition; other students are required to pay a fee of $50 per session. Instruction in military government is given by an officer of the United States army, and all students are required to wear a prescribed uniform within 5 miles of the college campus. During the regular sessions of the college the attendance of women is not permitted. The total enrollment in all departments in the session of 1914–15 was 1140. This does not include the Summer School. The faculty, teaching force, and officers of administration numbered 105. The value of the property at the end of the collegiate year 1913–14 was $1,329,776; the income was $537,580, of which $246,008 was from State appropriations and $60,817 from Federal appropriations. The library contains about 33,000 bound volumes and 65,000 unbound volumes. The president in 1915 was G. R. Hightower.

MISSISSIPPI BUBBLE. See MISSISSIPPI SCHEME.

MISSISSIP'PIAN SERIES. A group of limestones outcropping in the upper Mississippi valley and also in Arkansas and Texas. It is the equivalent of the Lower Carboniferous in the Appalachian States. See CARBONIFEROUS SYSTEM.

MISSISSIPPI CATFISH. The largest of North American catfish (*Ameiurus lacustris*, or *Ictalurus ponderosus*), which may reach 150 pounds in weight, is sold in all the markets of its region and is regarded by many as good food. It inhabits the Great Lakes and all the larger waters of the Saskatchewan, Mississippi, and Missouri valleys. In color it is greenish slate, growing darker with age, the sides paler, without spots. (See CATFISH.) Among its many local names in the South are flannel mouth and mud cat.

MISSISSIPPI COLLEGE. An institution of learning at Clinton, Miss., founded in 1826. It has a preparatory and a collegiate department with an attendance in 1914 of 462 students and a faculty of 18 instructors. The library contained about 4000 volumes. The college buildings are valued at $225,000, and the property of the institution at about $700,000. The endowment is $125,000, and the gross income $25,000.

MISSISSIPPI RIVER (Algonquin, *Missi Sepe*, great river; lit., father of waters). The principal river of the North American continent, discovered by De Soto in 1541 (Map: United States, Eastern Part, H 4). In 1673 Marquette and Joliet descended it almost to its mouth, and in 1682 La Salle passed through it to the Gulf of Mexico and took possession of the country in the name of the King of France. Counting as a part of it the longest branch of the drainage system, the Missouri, which far overtops the central stem, it is the longest river in the world. The entire system lies within the United States, excepting the headwaters of a few tributaries of the upper Missouri, which extend a short distance beyond the northern boundary of Montana into Canada.

Location and Climate. The headwaters of the main north and south stem are in lat. 47° 09′ N., long. 95° 13′ W., and its central mouth in lat. 28° 59′ N., long. 89° 08′ W. Although well within the temperate zone, there is a wide range in climate, particularly in winter temperatures. In northern Minnesota the extreme range in temperature is from — 50° F. to + 100° F., while at New Orleans it varies from + 20° F. to + 100° F. These temperatures do not occur every year, but are likely to occur three years out of ten. The mean annual temperature at Duluth is 39° F.; at New Orleans, 69° F. The principal cities situated on the banks of the river are Minneapolis, St. Paul, La Crosse, Dubuque, Moline, Davenport, Rock Island, Burlington, Quincy, St. Louis, East St.

Louis, Cairo, Memphis, Vicksburg, Natchez, Baton Rouge, and New Orleans. The chief agricultural products in the north are wheat, barley, and potatoes; in the central States corn, oats, and rye; and in the south cotton, sugar cane, and tobacco. Fruits are grown throughout the valley, apples better in the north, and peaches more successfully in the south.

Source. Popularly Lake Itasca, since its discovery by Schoolcraft in 1832, has been considered the source of the Mississippi, and this is not far from being precise. Later explorers announced Nicollet Creek, Elk or Glazier Lake, Gagwa Dosh or Deer Creek, and Hernando de Soto Lake as the headwaters. According to an accurate contour map of Itasca State Park, issued by the Mississippi River Commission about 1910, Little Elk Lake is the ultimate source. It empties into Lake Itasca through Elk (or Excelsior) Creek and Elk Lake. Lake Itasca is surrounded by such an intricate network of smaller glacial lakes, more or less obscured by reeds and water grass, that it is easy to understand why this question was a matter of so much controversy until the whole Itasca basin was covered by a careful geodetic survey. Lake Itasca at its outlet is 2459 miles from the Gulf of Mexico, and Little Elk Lake about 7 miles farther. Lake Itasca is about 4 miles long, 30 feet deep, and about 1470 feet above sea level. Little Elk Lake is about half a mile long, 600 feet wide, and about 100 feet higher than Lake Itasca.

General Description. The Mississippi as it flows from the north end of Lake Itasca is ordinarily less than 20 feet wide and 2 feet deep. It flows swiftly over shoals and bowlders in a northwesterly direction for a distance of 62 miles by river, or 32 along the axis of the valley, to Lac Travers or Lake Bemidji, covering about 20 square miles, surrounded by forested hills. The Mississippi as it flows from the east side of Lake Bemidji is at the most northern point of its course. Seventeen miles farther on it enters Cass Lake, and 12 miles beyond Cass Lake it enters Lake Winnibigoshish. From Lake Winnibigoshish the river flows southeastward for 24 miles and unites with Leech Lake River, which is nearly as large as the Mississippi and furnishes the outlet for Leech Lake, which covers about 250 square miles and is the largest of the lakes constituting the headwaters of the Mississippi. Forty miles farther is found the first rock in place, a bed of sandstone, where the Falls of Pokegama have been submerged by two dams. Eighty miles below Pokegama the waters of Sandy Lake empty into the Mississippi through a storage dam, and 82 miles below Sandy Lake enters Pine River, which is dammed a short distance above its mouth to regulate the outflow from Whitefish Lake. Twenty-two miles below Pine River is located the town of Brainerd (q.v.), with a water-power dam with a 15-foot head. Between Brainerd and Minneapolis occurs a series of dams and rapids having a total fall, with the Brainerd Dam, of 444 feet. The Crow Wing River, which is nearly as large as the Mississippi, enters 11 miles below Brainerd. At the Sauk Rapids, 60 miles below the Crow Wing and at the entrance of Sauk River, begin the first rocky banks of Potsdam sandstone, which are in frequent evidence from this point down to the head of the Rock Island Rapids, 350 miles below St. Paul.

The entire drainage basin of the Mississippi above Minneapolis is covered with a blanket of glacial drift, 100 to 300 feet thick, consisting of a mixture of clay and gravel. Its surface is very irregular and is broken by thousands of glacial pot holes, resulting in a vast multiude of lakes and swamps, estimated by some at 5000 to 6000 in number. At the Falls of St. Anthony, in Minneapolis, the river pitches down a vertical falls and rapids amounting to 80 feet in half a mile, leaving the clay banks for a channel that lies between vertical bluffs of sandstone, gradually increasing to a height of 300 to 500 feet as the bed sinks below the general level of the prairie. Below St. Paul the distance between the bluffs rapidly increases, so that from St. Paul to Rock Island the usual distance between bluffs is 2 to 3 miles, except at the head of the Rock Island Rapids, where they are only 1 mile apart. Their height varies from 200 to 600 feet. The débris from centuries of degradation has built up slopes at the foot of the bluffs and on all projecting ledges which are now covered with grass and trees. For more than 200 miles below St. Paul the oaks, elms, beeches, and maples are interspersed with cedars and pines. This fact, together with the greater height of the bluffs, makes this section even more beautiful than the bluffs farther south. The river flows first against one bluff and then the other in its meanderings back and forth across the valley.

Seventy-seven miles below St. Paul the vast quantities of sand brought down by the Chippewa River have choked the valley so that the river fills the entire space from bluff to bluff, forming Lake Pepin, which is approximately 25 miles long and 2 to 3 miles wide. At the Rock Island Rapids the bed of the river consists of stratified limestone in a series of folds or steps, creating 11 chains or rapids with a total fall of 21 feet in 15 miles. From this point down to Cape Girardeau, 132 miles below St. Louis and 460 miles from Rock Island, the formation is Carboniferous and the river winds back and forth between picturesque rocky bluffs 100 to 400 feet high and from 3 to 8 miles apart. The bluffs are usually partially covered with grass and trees, as above Rock Island; but from Grafton to Alton, a distance of 18 miles, and for shorter distances below St. Louis, the bluffs rise vertically from the river, forming palisades of rugged beauty. From Cape Girardeau down to Grays Point, a distance of 5 miles, the river passes the low land which constitutes the head of the St. Francis basin, through which the flood waters of the Mississippi formerly escaped in great volumes. From Grays Point to Commerce, a distance of 7 miles, the river flows through a gorge, where the water is closely confined between vertical bluffs one-half to three-fourths of a mile apart. This geological landmark is said to be a spur of the Ozark Mountains, which cross the southern part of Missouri.

The rock bluffs between which the river meanders for more than 1000 miles and the vast northern upland, mainly elevated rock with a moderate covering of soil, both terminate at Commerce, 144 miles below St. Louis and 38 miles above the mouth of the Ohio. The vast alluvial valley of great fertility extending from Commerce to the Gulf, about 1100 miles by river or 600 miles in a direct line, has been created from the river's own silt. Commerce is at the head of an ancient arm of the ocean into

which the silt-laden river poured its deposits as the present river does into the Gulf, leaving a valley as fertile as that of the Nile in its palmiest days and four times as large.

From Cairo to the Gulf the surface of the river is normally above the lands lying back from the river. The ground slopes away from the river with a gradient of about 7 feet in the first mile, decreasing gradually to 6 inches per mile at the outer edge, where the overflow from the Mississippi naturally drained away towards the Gulf through numerous bayous running parallel to the main river.

Between Cairo and Memphis, 230 miles, the river does not get far from the low bluffs on the east side of the valley and at several points impinges upon them. The river then zigzags diagonally across the wide valley and strikes the west bluff at Helena, 306 miles below Cairo. The St. Francis basin, which is 45 miles wide just below Cairo and 35 miles wide at Memphis, tapers out at Helena, where the St. Francis empties into the Mississippi. The Yazoo basin, which starts at Memphis on the east side of the river, increases in width as the St. Francis decreases, having a width of 22 miles at Helena and 60 miles opposite the mouth of the Arkansas River, which is 402 miles below Cairo. At Arkansas City, 438 miles below Cairo, the Yazoo basin reaches its maximum width, 65 miles, and the Tensas basin begins on the west bank. The Yazoo basin terminates in a wedge at Vicksburg, 600 miles below Cairo, where the Yazoo enters the Mississippi, and the latter again strikes the east bluffs, which at this point are about 200 feet high. The Tensas basin, which is from 20 to 35 miles in width, terminates at the mouth of the Red, of which the Tensas is a tributary. There is no diminution in the width of the basin, however, only a change in the name, which from this point to the Gulf is known as the Atchafalaya basin, after the Atchafalaya River, which not only carries the discharge of the Red River, but also at flood times an immense volume from the Mississippi. A narrower basin on the New Orleans side is known as the Pontchartrain basin.

Islands, Lakes, and Tributaries. Between St. Paul and the mouth of the Missouri, 658 miles, there are about 540 islands of sufficient size to be dignified with a name or number. They occur singly, in pairs, and in chains, the lower ones covered with willows, and the higher ones with cottonwoods, maples, and oaks or else cleared for cultivation. Between the mouth of the Missouri and the Ohio there are, or were, about 60 islands large enough to be designated by name. Most of them are from 2 to 3 miles long. Nearly all of these 600 islands have been connected with the mainland by wing dams or hurdles, and the channels or chutes behind them have become silted up, so that they no longer appear as islands during low water. This is particularly true below St. Louis, where most of the islands have already lost their identity except to those familiar with the river. Between Cairo and the mouth of Red River, a distance of 765 miles, there are 147 islands, usually 2 to 4 miles in length. From this point to the Gulf, 309 miles, there are only three islands, and except at these points the river sweeps along majestically in a single deep channel.

A great number of large horseshoe lakes lie adjacent to the river, particularly from Memphis to the mouth of Red River, where, in a distance of 534 miles, there are 31 of these crescent-shaped lakes, most of them from 5 to 10 miles long. These are former channels of the river which were abandoned as the result of cut-offs, described in a later paragraph. The number of tributaries, and tributaries of tributaries, which are shown in ordinary atlases aggregates about 250, of which more than 50 are navigable. The more important of the tributaries in the order of their entry, proceeding downstream from Minneapolis, are the Minnesota, St. Croix, Chippewa, Black, Wisconsin, Galena, Rock, Iowa, Des Moines, Salt, Illinois, Missouri, Kaskaskia, Ohio, St. Francis, Arkansas, Yazoo, Big Black, and Red.

Floods. The Mississippi valley receives little rain from either the Atlantic or the Pacific coast. A small percentage comes from the Great Lakes, but the heavy rains which produce great floods come from the Gulf of Mexico. In winter and spring the surface of the ground is cooler than the waters of the Gulf, and as the moisture-laden winds sweep northward they become cooled and create snow and rain. A wind from the southwest will sweep across the Ohio valley; one from the south up the Mississippi; one from the southeast across the valleys of the Red, the Arkansas, and the Missouri; but in all cases the greatest rainfall will occur near the Gulf and gradually decrease as the winds travel inland. Floods do not arise from mean conditions, but from heavy rainfalls of long duration; if the ground is frozen or saturated, the run-off is proportionately greater. The maximum discharge of the upper Mississippi is 450,000 cubic feet per second; the Missouri, on account of its great length, 900,000; the Ohio, 1,400,000; the Arkansas, 450,000; and the Red, 220,000. There is also a large discharge from the St. Francis, Yazoo, White, and Tensas. Below Cairo the river overflows its banks when the discharge exceeds 1,000,000 cubic feet per second. The flood of 1912 was the greatest below Cairo of which we have definite knowledge and amounted to about 2,000,000 cubic feet per second at Cairo and 2,300,000 flowing into the Gulf. This flood was due to the coincidence of moderately high floods from the Missouri, upper Mississippi, Ohio, Wabash, Tennessee, and Cumberland rivers, supplemented by excessive rains covering the alluvial valley and the watersheds of the southern tributaries.

The alluvial valley having been built up by floods, it follows that they must have always occurred. Naturally only the more disastrous floods are remembered and recorded, and the older ones are gradually forgotten as those of more recent date attract the attention. The floods of 1785, 1828, and 1844 were of abnormal height and did great damage, and stirred the people in the valley to renewed efforts at levee construction. Then came the great floods of 1851 and 1858. The latter was regarded as the greatest which had ever come down the river and overtopped practically all of the levees in existence at that time. Active repair work and extensions were followed by other great floods in 1862, 1865, and 1867, which supplemented the havoc of the war and did millions of dollars' worth of damage. Active reconstruction was followed by the great flood of 1874, which in many parts of the valley proved to be the most disastrous of all. Then in 1882, 1883, and 1884 the valley was visited for the first time by three

excessive floods in three successive years. In 1882 there were 284 crevasses; in 1883, 224; in 1884, 204: 712 crevasses in three years! A large part of the lands reverted to the States on account of the inability of the owners to pay the heavy levee taxes, and in 1882 the Federal government came to the rescue and began its coöperation with State and local organizations, as stated in the section on *Levees*. The greatest activity ever witnessed on the levees followed, and the results were most encouraging.

Floods of greater volume than that of 1874 also occurred in 1886, 1887, 1892, and 1893, but, on account of the greatly improved levee system, these were all safely passed without material damage except that due to erosion. But in 1897 came another of unusual severity, causing 47 crevasses and flooding 20,000 square miles. This was followed by even greater activity in levee construction, and after the flood of the following year the Mississippi River Commission reported: "This is the first time in the history of the river since the commencement of the continuous levee system that a flood reaching the height of 49.8 feet on the gauge at Cairo has been carried to the Gulf without a single break in the levee." For five years the levees successfully held back the floods, but in 1903 another great flood came, and the levees were again breached, doing enormous damage. In 1907 the flood was only a trifle lower than that of 1903. The next year was remarkable for four moderate floods in succession, beginning in February and ending in June, followed by another in 1909. The latter was about as large as that of 1874, but all were carried through to the Gulf without any break in the levees.

In 1912 came the greatest flood on record (as measured by the volume of water) causing 14 crevasses below Cairo and a loss in property estimated at $42,000,000. There was some loss of human life, but the number of lives lost was never ascertained. The army officers reported that 272,000 people were furnished food and shelter.

In 1913 two distinct and excessive floods passed Cairo, the first in January and the second in April. The second exceeded in height all previous records for nearly the entire distance from Cairo to the Gulf. Like that of the preceding year it was caused by excessive rains throughout the valley. The precipitation at a number of Weather Bureau stations in Ohio exceeded all previous records for a like period of time. At Cincinnati the Ohio rose 21 feet in one day. The flood of January was kept within the levees except at Beulah, where a break of the previous year had not yet been completely closed. This crevasse attained a width of 1000 feet and overflowed about 2100 square miles. During February and March it was closed successfully at great cost by means of a trestle, using 1374 cars of rock and 145,000 cubic yards of earth. During the April flood six crevasses occurred, overflowing 2568 square miles, but in addition 6756 square miles were overflowed by water coming through various unleveed sections.

An important contributory cause of repeated failures after so many years of levee building is the fact that, as the areas formerly subject to overflow are more and more protected from overflow, the channel left for the flood waters has become more and more restricted and the water surface has steadily risen. The former flood width of 20 to 80 miles by 1915 had been reduced to about 5 miles and the flood height increased about 10 feet. This was anticipated and correctly computed 20 years previously, but the funds available were not sufficient to enlarge the levees to the full cross section required. The waters of the upper Mississippi, Missouri, and Ohio having been combined at Cairo, the gauge at that point is an accurate index of the relative volumes of different years, particularly since it is not so much affected by breaks or extensions in the levee system as the gauges farther down. However, two floods passing Cairo at the same stage do not always remain of the same proportions throughout the lower valley, as they are affected to some extent by the discharge from the tributaries below Cairo.

FLOOD HEIGHTS ON THE CAIRO GAUGE*

Year	Day	Feet
1858	June 21	49.53
1859	May 7	46.49
1862	May 2	50.76
1865	March 19	47.90
1867	March 21	50.97
1874	April 26	47.37
1876	April 6	46.38
1882	February 26	51.87
1883	February 27	52.17
1884	February 22	51.79
1886	April 19	51.02
1887	March 9	48.50
1892	April 28	48.29
1893	May 9	49.33
1897	March 25	51.72
1898	April 6	49.78
1899	April 2	46.24
1903	March 16	50.57
1904	April 5	49.10
1906	April 9	46.90
1907	January 27	50.33
1908	March 19	45.55
1909	March 16	47.27
1912	April 6	53.94
1913	January 28	48.89
1913	April 7	54.69

*Extreme low water is —1.0.

Watershed. The area drained by the Mississippi River and its tributaries extends from the Alleghany Mountains to the Rocky Mountains and from the St. Lawrence basin to the Gulf of Mexico—1,240,050 square miles, or 41 per cent of the mainland of the United States, exclusive of Alaska. The areas of the principal river basins which form this immense watershed are as follows:

DESIGNATION	Area, sq. miles	Percentage of whole
Missouri	527,150	43
Upper Mississippi	165,900	13
Ohio	201,700	16
Middle and lower Mississippi	69,000	6
Arkansas	186,300	15
Red	90,000	7
Total	1,240,051	100

Divisions and Length. For purposes of investigation and improvement the Mississippi River is divided by the government engineers as shown in the districts tabulated on page 13. These distances are measured along a line midway between the banks. Distances measured along the steamboat channel are more than 10 per cent greater. In volume of sediment and

other characteristics the Missouri River is the main stream and should have been named the Mississippi. Measuring from the headwaters of the Missouri River to the Gulf, it has a total length of 4200 miles, the longest river in the world.

Slopes, Water Power, Locks, and Dams. From Lake Itasca, which is 1472 feet above sea level, to Bemidji there is a fall of 130 feet in 32 miles. At Bemidji there is a power dam with a head of 22 feet. From this point to Brainerd, a distance of 300 miles, the river flows through

DISTRICT	Length miles
Little Elk Lake to St. Paul	534
St. Paul to mouth of Missouri River (upper Mississippi)	658
Mouth of Missouri River to mouth of Ohio River (middle Mississippi)	200
Mouth of Ohio River to head of passes (lower Mississippi)	1,060
South Pass	14
Total	2,466

Reservoirs and Capacities. Near the headwaters of the Mississippi a series of lakes have been dammed by the government in order to create a system of storage reservoirs for increasing the low-water flow and depth of navigable channel of the upper river. The capacities of these reservoirs are given in the accompanying table; together they constitute the largest reservoir system in the world.

NAME	Storage capacity, cu. ft.
Lake Winnibigoshish and Cass Lake	43,992,000,000
Leech Lake	33,094,300,000
Pokegama Lake	5,260,000,000
Sandy Lake	3,157,900,000
Pine River	7,732,900,000
Gull Lake	4,910,100,000

Widths, Natural and Artificial. From Lake Itasca to Minneapolis the width of the river increases gradually from less than 50 to more than 400 feet at ordinary stages. Under the adopted project for the deepening of the river the low-water width is contracted to 300 feet at St. Paul. As the volume is increased by various tributaries this width is increased by degrees to 600, 700, 900, 1000, 1200, and 1400 feet, the latter width being for the reach between the mouths of the Illinois and Missouri. On the Rock Island Rapids the width between contraction works is 250 to 400 feet. Where the Des Moines Rapids formerly existed there is now a beautiful artificial lake about a mile wide and 50 to 60 miles long, created by the new concrete power dam at Keokuk. The natural width from St. Paul to the mouth of the Missouri is from two to three times these project widths, except in Lake Pepin, where the natural width of 2 miles has not been disturbed.

From the mouth of the Missouri to the mouth of the Ohio the project width is 2500 feet, although the widths in the unimproved sections vary from 800 to 5000 feet. The widths in this reach at a bank-full stage vary from 1600 to 7000 feet. The flood width, before the construction of levees, extended from bluff to bluff, an average distance of 5 miles.

Below Cairo the project width is 3000 feet, the natural low-water width 1000 to 7500 feet, and the bank-full width 2000 to 10,500 feet. Previous to the construction of levees the area subject to overflow had an average width of 40 miles. In 1915 the average restricted flood width was 5 to 10 miles, decreasing to about 1 mile below Baton Rouge.

a country which is largely swampy, but the flat slopes of the river are interrupted by the storage dams at Lake Winnibigoshish and Pokegama Lake, by a power dam at Grand Rapids, and by several smaller rapids farther downstream. The crest of the Brainerd power dam is 1172 feet above sea level. From this point to Minneapolis, a distance of 150 miles, there is a fall of 444 feet, 80 of which is in the falls and rapids of St. Anthony. About 135 feet of this 444 is utilized by six power dams; the remainder is wasted.

Between Minneapolis and St. Paul the United States government in 1915 completed a large lock and power dam, with a lift of 30 feet, which permits the packets from St. Louis to reach Minneapolis. From this point to Le Claire, at the head of the Rock Island Rapids, the average slope is about 0.4 foot per mile, except in Lake Pepin, where the river has a fall of less than 0.2 foot in 24 miles. At the Rock Island Rapids there is a fall of 21 feet in 15 miles. From this point to the head of Cooper Lake at Burlington, a distance of 84 miles, there is an average slope of 0.35 foot per mile.

Cooper Lake, named after the civil engineer who designed and built the hydroelectric power plant at Keokuk, is 50 to 60 miles long and nearly level. The head on the dam and the lift in the new government lock will vary from 30 to 40 feet, according to the amount of water stored in the pool. From Keokuk to Grafton, at the mouth of the Illinois River, a distance of 150 miles, there is a slope of 0.5 foot per mile; from Grafton to the Eads Bridge at St. Louis, 0.66 per mile, although the maximum at the Chain of Rocks above St. Louis is 1.3 and the minimum, in the St. Louis harbor, 0.2 per mile. Low water at this point is 378 feet above Gulf level.

From the Eads Bridge to Cairo the average slope is 0.6 foot per mile; from Cairo to Vicksburg, 600 miles by river, 0.38 per mile; from Vicksburg to the mouth of Red River, 154 miles, 0.24 per mile. This point is over 300 miles from the Gulf and only 3 feet above Gulf level. Practically all of this head is used up in the next 70 miles, so that at Baton Rouge, 240 miles from the Gulf, low water is only 0.2 foot above mean Gulf level. Although the tides at the mouth of the river amount to only 1 to 2 feet, their effect extends up the river to Baton Rouge, and below this point there is a slight negative slope during high tide. In other words, contrary to popular opinion, water does run "up hill" under certain conditions.

Depths, Prior and Subsequent to Improvement. Between St. Paul and St. Louis, prior

to improvement, the depths on the bars or crossings at low water did not exceed 2 to 2.5 feet, especially in the upper sections and on the Rock Island and Des Moines Rapids. About two-thirds of this division has now been improved to a low-water depth of 6 feet. Where the improvements have not been completed, depths of not less than 4 feet are maintained by dredging. From St. Louis to Cairo the minimum depths, previous to improvement, did not exceed 3.5 to 4 feet at low water. At present, by means of improvement works and dredging, a depth of 8 feet is maintained. From Cairo to the Gulf the minimum depths, prior to improvement, did not exceed 4.5 to 6 feet at low water. At the present time, by means of improvement works and dredging, primarily the latter, a minimum depth of 9 feet is maintained from Cairo to Vicksburg. Below Vicksburg no dredging is required, the least depths being 11 feet from Vicksburg to Baton Rouge, 35 feet from Baton Rouge to New Orleans, 62 feet from New Orleans to Quarantine Station, and 30 feet to the Gulf through either the South Pass or the Southwest Pass.

NATURAL DISCHARGE OF MISSISSIPPI RIVER

NAME OF STATION	Distance from Gulf, miles	Ordinary low-water discharge, cubic feet per second	Maximum flood discharge, cubic feet per second
Above Cass Lake	2,370	100	2,000
Grand Rapids, Minn.	2,278	500	10,000
Brainerd, Minn.	2,107	1,500	40,000
St. Paul, Minn.	1,934	3,000	110,000
Winona, Minn.	1,814	6,000	130,000
Clayton, Iowa	1,711	12,000	200,000
Keokuk, Iowa	1,447	18,000	372,000
Grafton, Ill.	1,295	20,000	425,000
St. Louis, Mo.	1,257	35,000	1,146,000
Columbus, Ky.	1,052	70,000	2,015,000
Helena, Ark.	768	77,000	2,041,000
Arkansas City, Ark.	636	92,000	2,007,000
Vicksburg, Miss.	475	97,000	1,783,000
Red River Landing, La.	309	94,000	1,595,000
New Orleans, La.	110	94,000	1,358,000
Mississippi + Atchafalaya + crevasses		100,000	2,300,000

Velocity of Current. The velocity of the current is a function of the depth as well as of the slope. It varies greatly, therefore, between low and high water at every point on the river. The velocity at low water, however, does not differ greatly on the upper and lower river, as the greater depths on the lower river are largely counterbalanced by the flatter slopes. Roughly speaking, the velocity at low water, from St. Paul to St. Louis, except on the rapids, varies from 1 to 2 feet per second, and from St. Louis to New Orleans from 1 to 2.5 feet, while the high-water velocities vary from 3 to 6 feet on the upper river and from 6 to 8 feet on the lower river. The greatest velocity that has been noted on the river occurred under the Merchants Bridge at St. Louis during the flood of 1892, when a mean velocity of 12.2 feet per second was measured. The excessive contraction of the waterway under the bridge caused the bottom to scour out to a depth of 86 feet on this occasion. To obtain the velocities in miles per hour multiply the preceding figures by 0.7.

Discharge. The ordinary or normal low-water discharge and the maximum flood discharge of the river at typical points are shown in the accompanying table. By ordinary or normal low water is meant the lowest stage which occurs during the navigation season. Occasionally in midwinter, when the tributaries above St. Louis are all frozen over, the discharge at and above St. Louis may be 25 per cent less than is shown in the table. Since the opening of the Chicago Drainage Canal in January, 1900, about 5000 cubic feet per second have been taken from Lake Michigan through the Chicago River, the Chicago Drainage Canal, the Des Plaines and Illinois rivers and discharged into the Mississippi at Grafton. At and below Grafton, therefore, the present low-water discharge is 5000 cubic feet per second greater than the natural discharge shown in the table.

These low-water discharges do not occur every summer, but only once in five to ten years. The low-water discharge shown for St. Louis corresponds to a zero stage on the St. Louis gauge, while "standard low water," which is approximately the average annual low water during the navigation season, corresponds to a discharge of 63,000 cubic feet per second.

Just above Red River Landing is the mouth of the Red River, which also serves as the mouth, or rather as the headwaters, of the Atchafalaya River, because ordinarily the latter takes all of the discharge from the Red River and also some from the Mississippi River, as indicated in the table. The reduction in flood discharge below Helena is due to crevasses or breaks in the levees, as described further on under LEVEES.

Caving Banks. In the volume of its caving banks the Mississippi probably surpasses every other river that man has yet attempted to improve. In the superficial area of its caving banks it is exceeded by the Missouri, but on account of the higher banks and greater depths of water on the Mississippi the volume of earth falling into the river is greater along the latter. Previous to revetment some caving occurred on the upper Mississippi as far north as Keokuk, but caving on a large scale really begins at the mouth of the Missouri River and increases in extent downstream, reaching a maximum in the vicinity of Vicksburg. Below the mouth of Red River the caving gradually diminishes until at Donaldsonville it practically ceases.

From Cairo to Red River the extent of the caving banks was measured in 1907 and 1908, and it was found that 411 miles of bank were caving at low water and 708 miles at high water, or, deducting for the banks which were caving at both low and high water, a total of 749 miles in 754 miles of river. In other words, caving is taking place on one bank or the other or on some island practically the entire distance. A

similar survey in 1892, before much revetment work had been done, showed 921 miles of caving banks in the 885 miles from Cairo to Donaldsonville. The same survey showed that the average annual caving in this distance amounted to 38,991,000 square yards, or 12.6 square miles in area by 66 feet in depth, or more than 1,000,000 cubic yards per mile of river. Similar measurements between Cairo and St. Louis show that from 1879 to 1889 the average annual amount of caving was 64,000,000 cubic yards, while from 1889 to 1907 the average annual amount was 48,000,000, the diminution being due to the extensive revetment work executed in the meantime.

Caving banks have been classified as eroding banks, slumping banks, sinking banks, and sliding or slipping banks. As most of the damage is done by the first method, no further reference will be made to the others. A typical eroding bank is one whose soil is not cohesive enough to withstand the scouring and dissolving action of the ordinary river currents. As the velocity of the current increases with the stage, the erosion increases correspondingly, provided the direction of the current remains the same. As the direction of the current is frequently different at high water, caving, while much more extensive, does not always occur at the same places. In erosion the bank is undercut or undermined below the water surface until the weight of the portion above the water causes it to break away and fall into the river. A recession in the shore line of 300 to 600 feet in a single season is a common occurrence.

Sinuosities. Experiments on a large scale show that a running stream in an alluvial bed will not remain straight. Owing to variations in the cohesive strength of the soil, irregularities begin to develop, and the resulting curves are gradually enlarged by the centrifugal action of the currents thereby inaugurated. The resulting radius of curvature is determined largely by the volume of discharge. For example, below St. Paul the radius of curvature is 1600 to 4500 feet, while in the bends below Arkansas City it is from 8000 to 15,000 feet. When the river changes from its low-water flow to a flood discharge, it attempts to adjust its sinuosities to its increased flow. In other words, at a flood stage the current does not follow the deep bends in which it flowed during low water, but tends to flow in flatter curves, thereby shortening and changing its main channel to the confusion of the navigator.

The greatest danger to the regimen of a river occurs, however, when the erosion in one bend approaches the cutting bank in the second bend below. If left to itself, the peninsula or narrow neck of land will be eventually cut through, thereby forming a cut-off. As this disturbs the regimen of the river for many miles above and below, it is always prevented by bank revetment. If not prevented, it may require 20 to 25 years before this reach becomes as stable as it was before the cut-off took place. The last cut-off occurred in 1884, before improvement work was well organized, at Waterproof, 20 miles above Natchez, shortening the river about 12 miles.

Erosion in the bends does not widen the river because the convex bank is built out as rapidly as the other caves away, but it takes many years before the new accretion becomes high enough and fertile enough to be valuable for agricultural purposes.

The Movement of Sediment. Material is carried down the river in three ways, viz., in solution, in suspension, and by rolling along the bottom. The second is by far the greatest in volume. The material carried in suspension by the Mississippi is received almost entirely from the Missouri River. At low water the proportion of sediment in the Missouri River is about 1 part in 1000, by weight, while at a flood stage it amounts to 10 parts in 1000, or 1 per cent of the weight of water. This means that a flood of 500,000 cubic feet per second carries with it into the Mississippi about 120 cubic yards of sediment per second, or more than 10,000,000 cubic yards per day. It is estimated that 400,000,000 cubic yards per annum are carried into the Mississippi from the Missouri, and approximately the same amount passes out into the Gulf. A volume, therefore, equal to that produced by the river's own caving banks is deposited as accretions along the banks of the river and on the areas subject to overflow. A deposit or accretion occurs whenever the velocity of the current is checked, as, e.g., below a hurdle or permeable dike, where the fill frequently amounts to 10 feet during a single flood. One case is on record of a maximum deposit of 64 feet in a single year.

The movement of sand along the river bottom results in the formation of sand waves, a phenomenon similar to the formation and movement of sand dunes or snowdrifts by the wind. Sand waves on the lower river vary from 400 to 1000 feet in length, from 8 to 22 feet in height, and have a daily movement of 20 to 40 feet. They have the least dimensions and slowest rate of travel during low water and the greatest during high water.

Bars and Crossings. Concurrently with the erosion and accretion in each bend occurs another process which is equally typical of all alluvial streams, viz., the formation of a bar or submerged dam across the channel at the lower end of each bend. These do not lie normal to the banks, but extend diagonally across the river, having a length at least double the width of the river. In this way the deep water in the upper pool usually extends downstream past the head of the next pool, and the main body of water, in passing from one pool into the next, passes over this bar or natural weir in a comparatively thin sheet of water. The deepest water in a bend is always found near the concave bank, and the pilot of a vessel, in passing from the deep water in one pool to the deep water in the pool below, must make a crossing in a diagonal course from one side of the river to the other.

One of the most interesting characteristics of these bars, and a most troublesome one to the navigator, is the fact that the top or crest rises and falls with the water surface. Repeated measurements show that below St. Louis the available depth across a bar increases only about one-half foot for every foot rise in the water surface.

After a high stage, if the river falls slowly, say 0.2 or 0.3 foot per day, the current will have time to cut down the bars fast enough to maintain a good channel; but if the river falls rapidly, the result is most disastrous, as there will be bad water on the crossings until the current has time to cut them down or the hydraulic dredges to dredge a channel through them. For the guidance of the pilots the cross-

ings are indicated by lights and day marks maintained by the Lighthouse Service.

Bank Revetment. When the permanent improvement or regulation of a river like the Mississippi is undertaken, the first work necessary is the revetment or protection of its caving banks, giving the channel a fixed location and incidentally conserving the fertile bottom lands along the river and reducing the amount of sediment to be disposed of by the stream. This can be accomplished the most economically by the use of brush and stone revetment, constructed during the low-water season. Below the water the sloping bank is covered with a mattress or carpet of willow brush, covered with a single layer of rubble stone, while above the water level, where the willows would soon rot, stone alone is used in a heavier layer. The width of the mattress varies with the depth of the river and the friability of the soil. On the upper river the width varies from 25 to 35 feet; between St. Louis and Cairo the standard width is 125 feet; and below Cairo, 250 to 400 feet. On the upper and lower river the mattress is made up of fascines, or bundles of willows, fastened together with poles and wire cables, while on the middle Mississippi the mattress is made by weaving light willows under and over heavier poles, placed about 6 feet apart, parallel to the bank. The willows are 20 to 30 feet long and from 2 to 4 inches thick at the butt, except the poles, which are longer and heavier. The mattresses are made on skids supported on barges, the barges being gradually withdrawn downstream as the mattress is formed, leaving a continuous floating mattress, which is then sunk from the upstream end by loading it with stone.

Above the water level the bank is first graded by a hydraulic grader to a slope of 1, vertical, to 2.5 or 3, horizontal, and covered with rubble stone placed by hand. Where stone must be transported long distances, as on the lower Mississippi, it has been found more economical to use concrete, provided gravel may be found within a reasonable distance. The height of the banks above standard low water varies from 10 to 20 feet on the upper river, from 20 to 30 feet on the middle Mississippi, and from 40 to 60 feet on the lower river.

Contraction Works. As indicated by the name, these are built for the purpose of contracting the cross section of the river where its natural width, at low water, is too great and its depth too shallow to afford a good navigable channel. The widths to which the river is being contracted are given in the section on *Widths, Natural and Artificial.* The contraction of the entire flow within a restricted width results in scouring out the bottom to the required depth. On the upper river, where these works are called wing dams, they are built up of alternate layers of brush and stone—about two-thirds brush and one-third stone—to a height of 6 feet above mean low water. The first or lowest course projects downstream about 10 feet beyond the others so as to protect the dam from underscour.

On the middle Mississippi the contraction works consist of permeable pile dikes, locally called hurdles, the piles being driven through a brush mattress having a width of 60 to 100 feet to protect it from underscour. The piles are driven in clusters of three to four each, and each hurdle consists of two to three rows of clusters. The rows are about 3 feet apart, and the clusters 8 to 10 feet apart in the rows and staggered with those in adjoining rows. Long slender piles are then laid horizontally between rows, thereby bracing the upper row against the adjoining row. The tops of the piles are left 15 to 20 feet above low water at the channel end and 20 to 25 feet at the bank end. The piles vary from 30 to 60 feet in length, according to the depth of the water, and have a penetration of about one-third their length. On the lower river no contraction works are being built as the funds appropriated are needed more urgently for levees, bank revetment, and dredging.

Dredging and Snagging. Dredging is carried on extensively to maintain the project depth where improvement works have not yet been constructed and to supplement the scouring action of the contraction works when the river falls rapidly after a high stage. Most of this work is done by hydraulic or suction dredges, of which in 1915 there were eight on the upper river, four on the middle division, and nine on the lower river. The size of the discharge pipe is 12 to 18 inches in diameter, 28 to 32 inches, and 32 to 36 inches respectively on the three divisions of the river. The largest suction dredges have a capacity of 1000 to 2000 cubic yards of sand per hour, and the cost varies from five to ten cents per cubic yard. In addition to the suction dredges, seven dipper dredges are in use on the upper Mississippi excavating rock and other hard material, principally on the Rock Island Rapids. See DREDGE.

One snagboat above and two below the mouth of the Missouri patrol the river during the navigation season to remove snags and other obstructions which are a menace to navigation. To dispose of a snag it is hoisted on deck with machinery, the portions which will float away are sawed off in short lengths, and the heavy mass of roots is dropped in a deep pool, deposited below a wing dam, or hauled out on the bank.

Levees. The main area originally subject to overflow, amounting to 29,790 square miles, begins at Cairo on the left bank and at Cape Girardeau, 51 miles above Cairo, on the right bank. The entire levee system includes about 1570 miles of levee, of which all but 70 miles were under construction in 1915, affording protection during moderate floods to 26,570 square miles. Between Cape Girardeau and Rock Island there are additional levee lines aggregating 337 miles in length, but the area protected probably does not exceed 1000 square miles. The following remarks refer to the main area below Cairo.

The first levee was built at New Orleans about the beginning of the eighteenth century. In 1828 the State of Louisiana took up the matter quite actively and up to the time of the Civil War had expended about $18,000,000, while Mississippi was a close second with $14,000,000. The total expenditure by individuals, parishes, and States up to that time is estimated by C. G. Forshey, of New Orleans, at over $41,000,000. During the war and the years immediately following many breaks occurred, many miles fell into the river, and the remainder became badly deteriorated. Work was gradually resumed, but was not pushed actively until the United States began its coöperation in 1882. The volume in place at that time is estimated at 32,000,000 cubic yards. The total volume in the projected

system is estimated at 434,000,000 cubic yards, and the total volume in place in 1915 about 290,000,000 cubic yards, leaving a balance of about 144,000,000 cubic yards to be completed. In 1915 about 20 to 25 million cubic yards of new work were being added each year, and from 3 to 5 million cubic yards of old work lost by caving banks.

The standard levee cross section has a top width of 8 feet and side slopes of 1, vertical, to 3, horizontal. All levees over 12 feet in height are reënforced by a banquet, the top of which is 8 feet below the top of the main levee. The width of the banquet varies from 20 feet for a levee 12 feet high to 40 feet for a levee 20 feet high. The height of the levees, as a rule, varies from 15 to 25 feet, decreasing to 10 feet near the Gulf and increasing frequently to 30 feet where they cross old sloughs. The total amount expended on levees by the United States up to 1915 was about $35,000,000, and by State and local organizations about $100,000,000, or a total of about $135,000,000. The amount of money necessary to complete the system was estimated at $60,000,000 to $75,000,000.

Passes and Jetties. At the head of the passes, 96 miles below New Orleans, the river divides into three main outlets: Pass à Loutre, which takes about 50 per cent of the discharge and subdivides into three smaller passes; Southwest Pass, which takes about 40 per cent of the discharge; and South Pass, which receives only about 10 per cent. Much work was done on the bars at the mouths of these passes in attempting to maintain ship channels across them. From 1836 to 1878 about $2,500,000 were expended on various unsuccessful devices and plans. In 1875 Congress authorized James B. Eads to construct jetties and auxiliary works to develop a deep channel in the South Pass. He secured a 30-foot channel and was paid the contract price of $5,250,000 and $100,000 per annum for maintaining it from 1881 to 1900 inclusive. These are described and illustrated under JETTY.

The dredged channel in 1915 was about 75 per cent completed, about 25,000,000 cubic yards having been removed, giving a minimum width of 130 feet and a depth on the bar of 30 feet where there was originally only 9 feet. The length of the jetties is 4.5 miles, and the total length of the Southwest Pass, 19.5 miles.

Cost of Improvement. The total expenditures by the United States to June 30, 1914, on the improvement of the Mississippi River, including construction, maintenance, and operation of reservoirs, locks, and dams, are approximately as follows:

Snagging, St. Paul to New Orleans	$4,400,000
Improvement works and dredging:	
Above St. Paul	4,300,000
St. Paul to mouth of Missouri River	21,100,000
Mouth of Missouri River to Cairo	16,200,000
Cairo to head of passes	46,700,000
Passes	20,300,000
Levees	33,500,000
Total	$146,500,000

The amounts expended by the several States and local interests are not so well known, but are roughly estimated at about $100,000,000 for levees and $10,000,000 for docks and revetment works at the larger cities. The hydroelectric-power development at Keokuk represents an investment of $25,000,000. Smaller water-power plants at Rock Island, St. Paul, and points farther upstream have cost many millions more.

Commerce. On account of the hard labor involved in paddling, poling, warping, or cordeling against the current, the commerce downstream, at first carried in flatboat, pirogue, Mackinaw boat, keel boat, and barge, was always greatly in excess of that upstream. Cheap boats were built on the upper waters of every large river, floated downstream with their produce, and then sold with their cargoes or abandoned. Previous to the year 1817 the whole commerce from New Orleans to the upper country was carried in about 20 barges, averaging 100 tons each and making but one trip in each year.

The first steamboat built in the Mississippi valley was the *New Orleans*, built at Pittsburgh in 1811. She was 138 feet long, had a capacity of 300 or 400 tons, and cost $38,000. The sixth boat, the *Zebulon M. Pike*, built in 1815, was the first to ascend the Mississippi above the mouth of the Ohio and the first to touch at St. Louis (1817). By 1819, 63 boats had been built, and this indicates the rapidity with which the new form of navigation was being developed. The boats varied in size from 25 to 700 tons, but most of them ranged from 80 to 300 tons, the most popular size being 150 tons. The Cincinnati and Louisville Mail line, the first line of steamboats organized in the Mississippi valley, was established in 1818. Details of the first 63 boats built on the Mississippi and its tributaries are given in Scharf's *History of St. Louis* (Philadelphia, 1887).

On Jan. 1, 1834, an official list gave the total number of steamboats as 230, with an aggregate tonnage of 39,000. The capital invested was estimated at $3,000,000. Of this number, 36 steamboats of over 200 tons plied between New Orleans and Ohio River points with an aggregate tonnage of 12,686; 4 in the St. Louis trade with an aggregate tonnage of 1002; 7 in the cotton trade with an aggregate tonnage of 2016; 57 boats, not in established trades, from 120 to 200 tons, aggregated 8641 tons; 126, under 120 tons, in various trades, aggregated 14,655 tons; grand total, 39,000 tons. Besides the steamboats it was estimated that 4000 flatboats annually descended the river, having an aggregate tonnage of 160,000. The total number of steamboats built from 1811 to Jan. 1, 1834, was 573; the difference between that number and the 230 in service represents the number worn out and lost, principally the latter.

In 1842 the number of steamboats employed in navigating the Mississippi and its tributaries was estimated at 450 with an average capacity of 200 tons each, making an aggregate of 90,000 tons. The cost of these boats was estimated at $7,000,000, and the number of men operating them at 35,000. The first company organized to operate a line of steamboats on the upper Mississippi was established that year. The number of steamboat arrivals at St. Louis during the year 1842 was 2412, with 467,824 tons, besides 801 flatboats and exclusive of the daily packets to Alton. At New Orleans the number of arrivals was smaller, but the tonnage was larger—550,500 tons, valued at $50,000,000. The number of steamboats lost each year was surprisingly large. In 1846, 36 vessels were lost, of which 24 were sunk by snags and submerged rocks and the remainder by fire, explosion, and collision. During the same year 108 new boats were built with a tonnage of 51,660 at a cost of $1,450,000.

The transportation of coal down the Ohio and

Mississippi, which was destined to develop into such large proportions, began in a small way in the early forties. In 1844 it amounted to 737,000 bushels; in 1845, 4,605,000; in 1850, 12,298,000; in 1860, 37,948,000; in 1870, 57,596,000; in 1880, 84,048,000; in 1886, 109,895,000.

The official returns of St. Louis for the year ending June 30, 1853, show 3307 arrivals with a tonnage of 45,401. This was exceeded only by the tonnage of New Orleans and New York. In consequence of an unusual low-water season in 1860, freight rates on the upper Mississippi, Missouri, and Illinois ruled very high, and the number of marine disasters reached the astounding total of 299. This was followed by a general paralysis of all industries and commerce during the next four years, so that after the Civil War it was necessary to start all over again. In this rebuilding most of the steamboats and barges were built of larger proportions than before the war.

The rise and decline in river traffic is well shown in the accompanying extracts from the annual reports of the Merchants Exchange of St. Louis.

PORT OF ST. LOUIS

YEAR	ARRIVALS				DEPARTURES	
	No. of boats	No. of barges	Tons of freight received	Tons of lumber rafted	No. of boats	Tons of freight
1860	3,580	1,600	*450,000	No record	3,600	*400,000
1865	2,767	1,141	*910,000	" "	2,953	*865,000
1870	2,796	1,195	*930,000	" "	2,782	*824,000
1875	2,201	743	663,525	" "	2,223	639,095
1880	2,871	1,821	893,860	198,315	2,866	1,038,350
1883	2,240	1,185	629,225	231,285	2,140	677,340
1885	1,878	1,030	479,065	217,860	1,828	534,175
1890	1,927	1,274	530,790	132,940	1.910	617,985
1895	2,007	1,126	410,145	98,685	1.904	303,355
1900	1,622	595	438,670	73,340	1,605	245,585
1902	1,465	451	386,045	30,875	1,448	224,261
1905	1,074	385	288,640	1,210	1,057	80,575
1910	559	209	143,540	None	537	48,425
1914	698	38	88,655	"	694	48,935

* Approximate.

There was a decline in river commerce from 1870 to 1877, followed by a revival for a few years, since which there has been a steady decline. The decline on the Ohio and lower Mississippi has also been quite marked, but not to so large a degree as at St. Louis. The freight delivered at New Orleans by river in 1909, expressed in tons, was as follows: coal, 740,000; lumber, 110,000; gravel, 150,000; cotton, 60,000; oil, 40,000; provisions, 38,000; iron and steel, 15,000; passengers, 5000.

The cause of the decline in river commerce is a mooted question. Primarily it has been due to the more efficient service rendered by the railroads, combined with rate cutting by the railroads in favor of river towns. The latter practice was stopped by the Interstate Commerce Commission, but the damage was already done. To the above must be added (1) uncertainty and irregularity of service; (2) instability of rates; (3) short life of the individual steamboat; (4) lack of effective line organization; (5) extravagance engendered by early prosperity. The likelihood of a revival of river commerce is also a mooted question. If it is accomplished, as many hope and believe it will be, it will no doubt be along the lines successfully adopted in Europe: (1) ample and efficient river terminals maintained by the municipalities for the use of all boats; (2) the operation in each line of a large number of boats by companies with ample capital working in coöperation with the railroads; (3) the separation of freight and passenger traffic, using fast steel packets with modern accommodations for passenger service and powerful and efficient towboats with covered steel barges for freight traffic.

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MISSISSIPPI SCHEME. A gigantic banking and commercial scheme projected in France by the celebrated Scottish financier John Law (q.v.), at the beginning of the reign of Louis XV. The primary object of the scheme was to resuscitate the French finances by removing some of the debt and disorder which had followed on the wars of Louis XIV. Money was to flow into France by developing the resources of the Province of Louisiana and the country bordering on the Mississippi—a tract at that time believed to abound in the precious metals. The company was incorporated in 1717, under the designation of the Compagnie d'Occident, and started with a capital of 100,000,000 livres. Two hundred thousand shares were placed on the market and eagerly bought up. The company obtained exclusive privileges of trading to the Mississippi for 25 years, of farming the taxes, and of coining money. In 1718 the company changed its name to the Banque Royale, and the King guaranteed the notes. In 1719 it obtained a monopoly of trading to the East Indies, China, the South Seas, and all the possessions of the French East India Company, and the brilliant vision opened up to the public gaze was irresistible. The Compagnie des Indes, as it was now called, created 50,000 additional shares; but there were at least 300,000 applicants for these, and consequently shares rose to an enormous premium. The public enthusiasm became absolute frenzy, and while confidence lasted, a fictitious impulse was given to trade in Paris; the value of manufactures was increased fourfold, and the demand far exceeded the supply. The population of Paris is said to have been increased by hundreds of thousands, many of whom were glad to take shelter in garrets, kitchens, and stables. But the Regent Orléans had meanwhile caused the paper circulation of the national bank to be increased as the Mississippi scheme stock rose in value, and paper currency to the face value of 2,700,000,000 livres flooded the country. The result was that many wary speculators, foreseeing a crisis, secretly converted their paper and shares into gold, which they transmitted to England or Belgium for security. The increasing scarcity of gold and silver in France becoming felt, a general run was made on the national bank, which in February, 1720, had been incorporated with the Compagnie des Indes. On May 21 the government issued an edict which reduced the value of bank notes and of shares in the company by one-half. Law was now Comptroller General of the Finances, and he made several unavailing attempts to mend matters. Those suspected of having more than a limited amount (fixed by a law passed at the time) of gold and silver in their possession, or of having removed it from the country, were punished with the utmost vigor. The final crisis came in July, 1720, when the bank stopped payment, and Law was compelled to flee the country. A share in the Mississippi scheme now with difficulty brought 24 livres. An examination into the state of the accounts of the company was ordered by the government; much of the paper in circulation was canceled; and the rest was converted into stock.

MISSISSIPPI SOUND. A lagoon-like strait, 5 to 10 miles wide, washing the coasts of Alabama and Mississippi from Mobile Bay to the entrance of Lake Borgne, a distance of about 70 miles (Map: Mississippi, H 10). It is formed and separated from the Gulf of Mexico by several long and narrow islands or sand bars, one of which is fortified. It is generally tranquil, has a depth of from 6 to 10 feet, and is navigated chiefly by the steamers and coasting vessels running between Mobile and New Orleans by way of Lake Pontchartrain.

MISSOLONGHI, mĭs'sō-lŏn'gē, or MESOLONGHI. One of the principal towns of western Greece, the capital of the Nomarchy of Acarnania and Ætolia (Map: Greece, C 5). It is situated on the north shore of the Gulf of Patras, in a marshy and unhealthful locality. The harbor is shallow and inaccessible for large vessels. The town is the seat of an Archbishop. It has a statue of Lord Byron, who died here in 1824, and a mausoleum which contains the heart of the poet. The town is famous as the chief western stronghold of the Greek patriots during the war of liberation (1822–26). Under Markos Bozzaris it withstood a siege by the Turks in 1822, and again from 1825 until April, 1826, when the survivors of the garrison destroyed the town and cut their way through the Turkish lines. Outside the gates stands the *Heroon*, or burial place of those who died during the defense. In May, 1829, the town was evacuated by the Turks and restored to Greece. Pop., 1896, 8394: 1907, 10,702.

MISSOULA, mĭ-zōō'lȧ. A city and the county seat of Missoula Co., Mont., 125 miles by rail west by north of Helena, on the Missoula River and on the Northern Pacific and the Chicago, Milwaukee, and St. Paul railroads (Map: Montana, C 3). It is the seat of the State University, contains Fort Missoula, and has a Carnegie library, attractive Federal building, high school, and two hospitals, one maintained by the Northern Pacific Railroad. The city is in a farming and fruit-growing, lumbering, and mining region, for which it is an important distributing centre, and controls a considerable trade in grain, fruit, and produce. There are large lumber mills, a brewery and bottling works, and railroad shops of the Northern Pacific. Founded in 1864, Missoula was first incorporated in 1887, and has adopted the commission form of government. Pop., 1900, 4366; 1910, 12,869; 1914 (U. S. est.), 16,492; 1920, 12,668.

MISSOURI, mĭ-sōō'rĭ *or* mĭ-zōō'rĭ; *locally*

often mĭ-zo͝o′rŭ. A State of the American Union occupying a central position in the great interior lowland drained by the Mississippi and its tributaries. It lies a little to the east of the geographic centre of the country. It is separated from Iowa on the north by the parallel of 40° 30′ N. and from Arkansas on the south by that of 36° 30′ N. Its most easterly point lies in long. 89° 53′ W. Its east boundary is an irregular line marking the middle of the Mississippi River channel as it was at the time the boundary was defined, even though this is not in all cases the middle of the channel at the present time. This boundary separates the State from Illinois, Kentucky, and Tennessee. North of Kansas City the west boundary is formed by the Missouri River channel, with exceptions as just noted along the east boundary, and south of that point by the meridian of 94° 43′ W. This line separates the State from Kansas and Oklahoma. Its land area is 68,727 square miles.

Topography. The area of the State includes portions of three of the great topographic provinces of the United States, which may be designated as the prairie plains, the Ozark region (Appalachian province), and the coastal plain. These provinces are differentiated on the basis of existing topography and of history of natural evolution. The prairie plains occupy all of the northern part of the State except a narrow belt along the Missouri River east of Glasgow and one along the Mississippi in Marion, Pike, and Lincoln counties. They occupy the western part of the State west of a line running approximately from Glasgow through eastern Pettis, western Cedar, the southeastern corner of Barton, and the middle of the west boundary of Jasper counties.

Along their eastern border their upland surface lies at elevations ranging from 750 to 900 feet. Westward, leaving out of consideration the valleys, the elevation across the northern tier of counties increases gradually to about 1100 feet in Mercer County, west of which there is a very gradual decline to about 950 feet along the Missouri River bluffs. Westward along the southern counties, however, the elevation remains constant to a north-south line through Richmond, Braymer, Trenton, and Ravanna, along which there is an abrupt rise of about 100 feet. West of this there is a slight decline to the Missouri River bluffs. Along the Mississippi there is a narrow belt of sharply dissected country, best described as hilly. West of this and east of the Wabash Railway through Moberly, Macon, and Kirksville the topography consists of rather broad flat or undulating plains on the watersheds with belts of low hills bordering the valleys. West of the Wabash Railway all of the northern part of the State is essentially a rolling to undulating plain. Areas of flat upland are few and small. South of the Missouri River the prairie plains consist of a smooth to undulating eastern belt and a rolling western belt. The boundary between them runs approximately from Lexington through Odessa and Pleasant Hill and across the northwest corner of Bates County. Along this line there is a rise of about 150 feet from the lower eastern to the higher western belt. North of the Missouri River the surface of the prairie plains has a thin veneer of glacial material which does not occur south of the river. It does not, however, change the essential features of the topography from what they would be if the veneer were removed. The Ozark region occupies all that part of the State not occupied by the prairie plains except the area south of Cape Girardeau and Poplar Bluff. It is essentially a plateau which slopes gently and almost imperceptibly to the surrounding country. Its upland surface ranges in elevation, except around the border, from about 1200 feet in the eastern and central part to 1700 feet in the southwestern part. Its typical plateau surface is interrupted in Iron and adjoining counties by a number of low blunt peaks and short rounded ridges of hard igneous rocks known as the St. Francis Mountains. The plateau surface would be smooth but for the great number of valleys that traverse it. These have made of it a hilly country as a whole. The portions with the greatest number of, the deepest and most sharply cut, valleys are the White and Current River basins, the lower Niangua, and the Central Osage and Gasconade basins. The valleys reach a maximum depth of about 500 feet in the White and part of the Niangua basins and 350 feet or more in the others. In other basins besides those mentioned the valley depths are less, but usually the valley borders are very hilly. There are several rather small areas, however, that are not yet invaded by valley-making forces. The most important of these are the Salem-Rolla, the Lebanon, the Eldon, the Owensville, and the Springfield areas. The coastal plain in Missouri lies in the extreme southeastern part. It barely exists as a true coastal-plain area, most of it having been converted long ago into broad, level river valleys. The true coastal plain exists only in a narrow ridge broken into two parts known as Crowley and Benton ridges. The former runs southward through Stoddard and Dunklin counties, the latter lies in Scott County. The coastal-plain ridges are less than 150 feet high and have a rolling upland surface. The rest of the area in the State south and east of the Ozark boundary, running through Cape Girardeau, Mingo, Poplar Bluff, and Naylor, is flat alluvial land. From the foregoing it will be seen that the topography of the State, leaving the valleys out of consideration, is of plains varying in elevation. Their original surfaces have been almost completely destroyed by the cutting of valleys in them. The later, except the short ravines, are almost invariably flat-bottomed and floored with alluvial deposits. They are broadest in the coastal-plain region, reaching a maximum width of about 40 miles. In the Ozark region they are rarely more than half a mile wide, and in the prairie region they range up to a maximum, along the large rivers, of about 5 miles.

Hydrography. The State is drained by streams flowing eastward into the Mississippi River either directly or through the Missouri and Arkansas. The river systems are well developed and reach effectively practically all the upland area of the State. Swamps due to imperfectly developed river systems like those in the recently glaciated areas of the Northern States do not exist. The nearest approach to such conditions occurs on the nearly flat watershed ridges, or plains remnants, in the northeastern part of the State. They are not swampy, however.

Geology. In age the consolidated rocks underlying the area of the State are Archean, Paleozoic, and Cenozoic. In mineralogical character

96°
A
95°
B
94°
C
93°
I O W A
N E B
K A N S A S
O K L A H O M A
A R K
Missouri R.
Kansas R.
Osage
Neosho R.
Verdigris R.
ATCHISON
NODAWAY
WORTH
HARRISON
MERCER
PUTNAM
SULLIVAN
HOLT
ANDREW
GENTRY
DAVIESS
GRUNDY
DEKALB
LIVINGSTON
LINN
BUCHANAN
CLINTON
CALDWELL
CHARITON
PLATTE
CLAY
RAY
CARROLL
HOWARD
LAFAYETTE
SALINE
JACKSON
JOHNSON
PETTIS
COOPER
CASS
HENRY
BENTON
MORGAN
BATES
ST. CLAIR
HICKORY
CAMDEN
VERNON
CEDAR
DALLAS
POLK
BARTON
DADE
GREENE
WEBSTER
JASPER
LAWRENCE
CHRISTIAN
NEWTON
STONE
BARRY
TANEY
McDONALD
St. Joseph
Kansas City
Independence
Topeka
Leavenworth
Lawrence
Sedalia
Springfield
Joplin
Carthage
Nevada
Chillicothe
Warrensburg
1
2
3
4
5
40°
39°
38°
37°
L. L. POATES ENG'R CO., N.Y.
Longitude
West

MISSOURI
SCALE OF STATUTE MILES
0 10 20 30 40 50 60 70
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80 90 100
County Towns
Railroads
92° E 91° F 90° G 89° H
1
2
3
4
5
40°
39°
38°
37°
ILLINOIS
Springfield
Quincey
Hannibal
St. Louis
Cape Guardeau
Jefferson City
Mississippi R.
Missouri R.
Ohio R.
Des Moines R.
Kaskaskia
CLARK
LEWIS
MARION
RALLS
PIKE
LINCOLN
ST. CHARLES
WARREN
FRANKLIN
JEFFERSON
WASHINGTON
CRAWFORD
PHELPS
DENT
IRON
REYNOLDS
SHANNON
CARTER
WAYNE
RIPLEY
BUTLER
STODDARD
SCOTT
MISSISSIPPI
NEW MADRID
PEMISCOT
DUNKLIN
OREGON
HOWELL
TEXAS
MADISON
ST. FRANCOIS
STE. GENEVIEVE
PERRY
CAPE GIRARDEAU
BOLLINGER
OSAGE
GASCONADE
MARIES
MONTGOMERY
CALLAWAY
AUDRAIN
MONROE
SHELBY
ARKANSAS
TENN.
KY.
Greenwich

they have a relatively wide range. The rocks of the Ozark region are predominantly limestones. The small area of the St. Francis Mountains is underlaid by igneous rocks consisting of granites and fine-grained eruptives mainly acidic. At one point, the extreme summit of Pilot Knob in Iron County, there is an area of slates, conglomerates, and iron ores that may be Algonkian in age. At a few points and in small areas sandstones occur among the predominant limestones in the Ozark plateau. The Ozark limestones are almost invariably cherty. The rocks underlying the prairie region are predominantly shales, interbedded with limestone and sandstone beds, all of Paleozoic age. The coastal-plain rocks, only partially consolidated, consist of shales, clays, and sands, presumably of Tertiary age. The unconsolidated rock material of the State is of Glacial age north of the Missouri River, of recent but undetermined age south of the same stream, and of recent age in the valleys. The glacial material is predominantly a sandy clay with a layer of silty material overlying it, the origin of which is yet undetermined. The unconsolidated material in the prairie region south of the Missouri consists mainly of clays and silts derived from the decay of rock in places similar to those on which it lies. In the Ozark region it consists mainly of red clay and silt filled with fragments of stone, mainly chert. The alluvial material ranges from clay to sand.

Climate. Missouri lies in the milder half of the warm temperate zone. Being far inland, the State is subject to the extremes of a continental climate, which are all the more accentuated by the fact that it is in the path of frequent cyclonic storms. The average January temperature ranges from 35° F. in the southeastern to 20° F. in the northwest corner. For July the temperature is 80° F. in the extreme south and 75° F. in the extreme north. The average date of the last killing frost in spring is about the middle of April, though it may occur as late as the middle of May. The average date of the first killing frost in the fall is about the middle of October, though it may occur as early as September 25. The average length of the growing season is about 180 days, with a minimum of about 130 days. The different parts of the State do not differ widely in these respects, though the southeastern lowlands are considerably milder than the rest of the State. In summer the mercury sometimes rises to 105° F., while the anticyclones of winter carry the minimum of 10° below to the southern border and 20° below to St. Louis, thus giving that city an annual range of 125°. The southeastern extremity of the State has not a day in the year with the average temperature below freezing, but the record rises rapidly northward, there being 30 such days in Springfield, 60 at Jefferson City, and 90 at Rockport. The summers are pleasantly tempered in the Ozark plateau.

The rainfall ranges from 35 inches per year in the north to 50 inches at the Arkansas line. While this is well distributed through the year, there is a marked minimum in the winter season and maximum in the summer season. Droughts lasting 30 days sometimes occur. Snow falls on the average to the depth of 20 inches in the latitude of St. Louis and less than 10 inches at the Arkansas line, though it rapidly disappears and seldom covers the ground many days. The average relative humidity for the year is less than 70 per cent over the whole State. The prevailing winds are west and northwest in January and south in July. There are on the average 30 thunderstorms in the year, with a maximum frequency in June.

Soils. The soils vary with the underlying character of the rock, the topography, and the drainage. In the Ozark region they are gray, brown, or red in color, rarely black, and are well drained in both soil and subsoil. The texture of the fine material is usually fine grained, silt loams predominating in the soils and silty clays in the subsoil. They are rather stony, and occur, as a rule, on a rolling to rather rough topography, the stone content being predominantly chert. The gray soils are usually deficient in lime while the red soils and the subsoils carry a fair amount. In the prairie region the soils are rather light in color in the eastern part, becoming darker westward and northward. They are, as a rule, somewhat heavier than the Ozark soils, are practically stone free, have good surface drainage except on flat areas, and have a moderate lime content except the soils on the flat areas in the eastern part. The subsoils, except the Missouri River belt, are heavier than the soils. In most of the prairie region the soils are dark enough to be called black. In the southern part, the soils are mostly alluvial and, like these soils in all other parts, are fertile. They are predominately brown in color and range from clays to sands in texture.

Large areas need artificial drainage, and this is rapidly being furnished. The soils in Crowly and Benton ridges are brown silt and clay loams, much like the river bluff soils farther north.

Vegetation. See *Forest Products*, below.

Mining. The principal mineral products of Missouri are spelter (zinc) and lead, in which it ranks first among the States. It leads in the production of barytes and tripoli and ranks second in the production of mineral paints. The combined value of spelter and lead represents about 60 per cent of the entire mineral output of the State. From 40 to 45 per cent of both the spelter and the lead produced in the United States comes from Missouri. The lead ores of Missouri carry very little silver, and the lead produced is known as "soft lead." The principal lead-producing counties are St. François and Madison. The southeast Missouri lead region has made the greatest gains in production of all the lead-producing districts of the United States and since 1908 has annually exceeded the production of the Cœur d'Alene region in Idaho, which formerly held first rank. The ore of the southeast Missouri region is almost wholly lead ore, although, particularly in the southern portion, there are in many places considerable copper, nickel, and cobalt mixed with the lead. The total output of lead concentrates in 1913 was 255,723 short tons, valued at $11,444,935. The recoverable lead content of Missouri ores amounted to 176,116 short tons, valued at $15,498,208. Nearly all the production of sphalerite ores is in the Joplin district, in southwestern Missouri. The recoverable zinc content of the ores produced in 1913 amounted to 124,963 short tons of metal, valued at $13,995,856. The mining of coal ranks third among the mineral industries. Missouri was the first State west of the Mississippi River to enter this field, and in 1840 produced 9772 short tons.

The industry, however, has shown little progress as compared with neighboring States, owing to the competition of the oil and gas fields of Kansas and Oklahoma and the more cheaply mined coal of Illinois and other States. The coal-producing area lies entirely north and west of a line drawn from the northeastern to the southwestern corner. The coal production in 1913 was 4,318,125 short tons, valued at $7,468,308. The occurrence of coal in Missouri appears to have been known as early as 1806, when it was noted by Zebulon M. Pike on the banks of the Osage River. Clay products are fourth in value of the mining industries. While ranking seventh among the States in the total value of its clay products, it ranks second in the manufacture of fire brick. The chief centre of this industry is the immediate vicinity of St. Louis. The refractory brick made in Missouri are of especially high grade, and the average price of its fire brick is higher than that of any other State with the exception of New Jersey. The total value of clay products in 1913 was $6,602,076. Portland cement is another of Missouri's important mineral products. In 1913 the production amounted to 4,485,820 barrels, valued at $4,556,822. Cement plants are located near St. Louis and Kansas City and also at Hannibal and Cape Girardeau. The quarry products, chiefly limestone, were valued at about $2,538,699. A comparatively large quantity of lime is produced. This in 1913 amounted to 161,770 short tons, valued at $734,009. Sand and gravel are also important mineral products. Other mineral products are copper, occasional gems, iron ore, mineral waters, natural gas, pyrite, and silver. The total value of the mineral products in 1913 was $54,001,088.

Agriculture. Of an approximate land area of 43,985,280 acres in 1910, 34,591,248 acres were in farms, of which there numbered 277,244. The improved land in farms amounted to 24,581,186 acres, or 56 per cent of the total area. The average acres per farm were 124.8 in 1910, and the total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $2,052,917,488. The average value of all farm property was $7405 in 1910, and the average value of land per acre $41.80, an increase per farm of $21.34 over 1900. Of the total number of farms in 1910, 194,286 were operated by owners and managers. There were, in 1910, 259,111 native white farmers, 14,467 foreign-born white, and 3666 negro and other nonwhite. Of the foreign-born white farmers 8453 were born in Germany.

The following table shows the acreage, production, and value of some of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	7,200,000	158,400,000	$107,712,000
Wheat	2,549,000	43,333,000	42,466,000
Oats	1,200,000	25,800,000	11,352,000
Rye	17,000	238,000	207,000
Potatoes	87,000	3,915,000	2,858,000
Hay	2,600,000	*1,820,000	24,752,000
Tobacco	4,100	†4,920,000	640,000
Cotton	122,000	‡75,000	2,336,000

*Tons. † Pounds. ‡ Bales.

The total value of crops in 1909 was $220,664,000 and the combined acreage was 14,335,588, representing 58.3 per cent of the total improved land in farms. The general character of agriculture is indicated by the fact that about two-thirds of the total value of crops in 1909 was contributed by cereals and 15.3 per cent by hay and forage. The remainder consisted chiefly of potatoes and other vegetables, forest products, and fruits and nuts. The leading crops in 1909 in order of their importance as judged by value were corn, hay and forage, wheat, oats, potatoes, and cotton. Corn, the most important crop, had an acreage of 7,113,953 in 1909. The production was 191,427,007 bushels, valued at $107,347,033. Hay and forage had an output valued at $33,845,000, the acreage being 3,628,348. In that year wheat, the third important crop, had an acreage of 2,017,128 and an output valued at $29,926,000. The acreage of cotton in 1909 was 96,527, from which were produced 54,498 bales, valued at $3,392,440. The total acreage of potatoes and other vegetables in 1909 was 233,767 and their value $13,305,829. Excluding potatoes and sweet potatoes and yams, the acreage of vegetables was 129,570 and their value $8,268,000.

The production of orchard fruits, chiefly of apples, is an important agricultural industry. The total quantity grown in 1909 was 11,957,399 bushels, valued at $6,582,578. Of the total production apples contributed 9,968,977 bushels, with a value of $4,885,544. Other important orchard fruits are peaches and nectarines, pears, plums, prunes, and cherries. The production of grapes in 1909 was 17,871,816 pounds, valued at $488,765. Of small fruits the most important is the strawberry, of which 15,171,034 quarts, valued at $1,122,784, were grown in 1909. The total production of small fruits was 23,696,221 quarts, valued at $1,761,409. Sorghum cane is produced in important quantities. This in 1909 amounted to 201,206 tons, and from it were made 1,788,391 gallons of sirup, valued at $876,970. Tobacco is an important product in some portions of the State. In 1909, 5433 acres were planted to tobacco, and the production was 5,372,738 pounds, valued at $636,479.

Live Stock and Dairy Products.—The total value of domestic animals of all kinds on the farms in 1909 was $273,366,662. Missouri has always been noted for the quantity and value of its mules. On Jan. 1, 1915, it was estimated that there were 1,414,000 cattle other than milch cows, valued at $53,591,000; milch cows numbered 747,000, valued at $43,436,000; horses, 1,095,000, valued at $96,360,000; mules, 329,000, valued at $32,242,000; sheep, 1,490,000, valued at $7,450,000; swine, 4,250,000, valued at $34,425,000. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $13,685,318. There were sold 15,733,185 gallons of milk and 14,646,771 pounds of butter. The total number of fowls of all kinds in 1910 was 20,897,208, valued at $11,870,972.

Forest Products. The timber lands north of the Missouri River are restricted mostly to the river valleys, while the Ozark region south is normally a forest area of largely mixed hardwoods, thinning out westward. The forest area in 1908 was 28,600 square miles, or 42 per cent of the total. The logging and milling operations are confined largely to the wooded Ozark region of southern Missouri, while many of the planing mills and box factories are located in the larger cities. With the exception of the boot and shoe factories the

lumber industry gives employment to more persons than any other industry. The fertility of the soil gives the hardwoods a decided advantage over evergreens in most parts of the State. There is only one pine (short-leaf, *Pinus echinata*), and that is chiefly confined to the Ozark region. One other evergreen, the cedar, is widely distributed over the State, but not very abundant, and cypress, a deciduous conifer, is found in considerable quantities in the alluvial bottoms in the southeast. The remainder of the forest is made up of hardwoods. The thirteenth census reports 2076 saw mills in Missouri, with the following production of lumber, lath, and shingles for 1909, in M feet, B. M.: *Conifers*—pine, 142,271; cypress, 32,891; cedar, 2984. *Hardwoods*—oak, 271,623; red gum, 83,905; hickory, 33,259; elm, 27,913; cottonwood, 17,987; ash, 12,685; sycamore, 10,526; maple, 10,376; tupelo gum, 4351; walnut, 4314; yellow poplar, 1791; birch, 1115; basswood, 1990; all others, 1078. Total, 660,159 M feet, valued at $10,041,472. The total value of manufactured products in 1909 was $23,261,000. In addition to the figures above there were produced on the farms of the State in 1909 forest products valued at $8,406,823.

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	8,375	185,705	152,993	$444,343	$80,843	$574,111	$219,700
	1904	6,464	156,585	133,167	379,369	66,644	439,549	187,291
Boots and shoes, including cut stock and findings	1909	59	18,665	17,396	15,838	8,164	48,751	14,211
	1904	37	10,949	10,451	8,290	4,349	23,541	8,588
Bread and other bakery products	1909	954	6,797	4,743	17,043	2,487	18,524	7,695
	1904	614	4,962	3,764	7,416	1,816	12,672	5,391
Clothing, men's, including shirts	1909	84	8,667	7,994	8,109	2,994	15,407	6,336
	1904	73	6,500	6,070	5,037	2,098	10,329	4,786
Coffee and spice, roasting and grinding	1909	40	1,376	730	5,273	342	12,062	2,870
	1904	26	960	554	3,129	268	7,264	2,119
Flour-mill and gristmill products	1909	680	3,602	2,198	17,066	1,040	44,508	5,682
	1904	582	3,555	2,345	14,834	1,091	38,026	5,098
Foundry and machine-shop products	1909	329	9,051	7,443	20,870	4,860	19,975	10,819
	1904	256	8,331	7,155	14,102	4,274	14,692	8,619
Liquors, malt	1909	31	6,348	5,646	44,662	3,908	27,447	19,879
	1904	50	6,202	5,568	43,620	3,408	24,154	17,902
Lumber and timber products	1909	1,098	15,814	13,522	18,930	5,897	23,261	12,647
	1904	495	14,057	12,664	13,688	5,542	18,349	11,932
Printing and publishing	1909	1,322	15,792	10,790	21,998	6,610	29,651	21,024
	1904	1,253	13,912	9,757	16,358	5,330	24,412	17,611
Slaughtering and meat packing	1909	45	5,529	4,674	18,787	2,673	79,581	7,383
	1904	38	4,862	4,236	16,449	2,381	60,110	6,011

Manufactures. Missouri's prominent industrial position is due largely to the activity of the industries of St. Louis and Kansas City. It ranked well in manufactures as early as 1849, in which year it was tenth in value of products. In 1909 it held the same relative position. In that year the gross value of products per capita was $174. Its abundant mineral supply has resulted in the development of such industries as smelting and refining copper, lead, and zinc, marble and stone work, iron and steel blast furnaces, kaolin and ground earths, glass, and paints. Extensive timber areas have provided abundant material for the development of the lumber and timber industries. The location of the cities in the midst of a great agricultural region and their proximity and access to raw materials, as well as their excellent shipping facilities, are factors favorable to the growth of their manufacturing industries.

The table below gives the most important figures relative to the 10 leading industries in 1909 and 1904.

The most important industry is that connected with slaughtering and meat packing. Missouri is located in the centre of a hog-raising area; it is one of the great corn-growing States and has extensive feeding and grazing areas for cattle in the prairies of the north and for sheep in the Ozarks of the south. These features have been very important factors in the development of this industry. The total number of hogs slaughtered in 1909 was 2,471,658, valued at $36,911,941. In addition there were 530,356 beeves slaughtered, valued at $24,332,919; 81,551 calves, valued at $821,829; and 546,649 sheep, valued at $2,659,215. The manufacture of boots and shoes, which was second in importance in 1909, measured by value of product, has shown a remarkable development. As a result of this pronounced growth Missouri became second in the industry in 1909. The industry gave employment to more wage earners than any other in 1909, and is not confined to the larger cities, but exists in many small cities and towns. In 1909, 24,657,160 pairs of boots and shoes were made. The manufacture of flour-mill and gristmill products occupied third place in value of products in 1909. Most of the mills are small and are located in the rural districts, but there are several very large mills in the cities. There were produced, in 1909, 5,661,379 barrels of white flour, valued at $29,995,104. The manufactures of graham flour, corn meal and corn flour, and feed are also important. One of the distinctive industries of the State is the manufacture of smoking pipes. The world's supply of corncob pipes is manufactured largely in Missouri.

There was in 1909 an average of 152,993 wage earners, of whom 122,266 were males. The wage earners 16 years of age and under numbered 3818, of whom 2286 were males. For

nearly three-fourths of the wage earners employed the prevailing hours of labor range from 54 to 60 a week. The most important manufacturing city is St. Louis. There were in this city, in 1909, 87,371 wage earners, and the value of its manufactured products was $328,495,313. St. Louis (q.v.) held in 1909 fourth place in the value of manufactured products among the cities of the United States and third place in the manufacture of boots and shoes. All of the tanneries, the baking-powder establishments, and practically all of the soap works of the State are located here. There were in Kansas City (q.v.), in 1909, 14,643 wage earners, and the value of its manufactured products was $54,704,510. St. Joseph (q.v.), the third city in manufacturing rank, had, in 1909, 5390 wage earners and a product valued at $17,625,682.

Transportation. Missouri is one of the leading States in mileage of navigable rivers. It is also well equipped with transportation facilities by land. The northern half is covered by a network of railroads. In the southern half, however, the mileage is small and a number of counties have no railroad communication. The northern half has the advantage of lying in the course of some of the great transcontinental lines and is less broken than the southern part. St. Louis, Kansas City, and St. Joseph on the western border are large railroad centres. The railway mileage was 8153 in 1913. The chief lines are the Missouri Pacific, the Atchison, Topeka, and Santa Fe, the St. Louis and San Francisco, the Kansas City Southern, the Chicago, Burlington, and Quincy, the Chicago and Alton, the Wabash, and the Missouri, Kansas, and Texas. Railroad rates are in charge of the Board of Railroad Commissioners, who hear and determine complaints against the railroads, but their decision is subject to revision by the courts. There is a large amount of water traffic between St. Louis, the terminal for the larger steamers, and the Gulf. Competition of the railroads, however, is tending to decrease this. The grain and animal produce of the West reaches its market in great part by way of Missouri. The mileage of electric railways in 1912 was 852. The total number of companies operating electric roads in that year was 19.

Banks. The Bank of St. Louis, chartered in 1813 and opened in 1816, was the first in the State. It went into liquidation in 1819. Next came the Bank of Missouri, which opened in St. Louis in 1817 and failed in 1822. This left the State without any chartered banks until 1829, when the United States Bank opened a branch in St. Louis. The branch was discontinued in 1833. The Bank of the State of Missouri, chartered in 1837, was a large institution with five branches in the State and was a bank both of issue and of discount. For 20 years it had almost a monopoly of the banking business, but its circulation was insufficient and in 1857 seven more banks of issue were chartered. Many more followed. All were forced to conform to the law which allowed the issue of only three dollars for every dollar specie. The law of 1857 provided also for a bank commissioner, who should visit and examine the various institutions. This office was soon abolished and there sprang up a number of small speculative banks, all of which collapsed in the panic of 1873. The system of national banking extended very slowly, but the largest institutions sooner or later became the national banks. In 1868 the St. Louis Clearing House Association was organized with 35 members. Trust companies were first formed in 1889 and became very popular. There always have been many banks bearing the word "savings" in their titles, but none of them conformed to the general plan of a savings bank. In September, 1914, there were 130 national banks, with an aggregate capital of $35,570,000. Their combined surplus was $15,986,118; cash, etc., $7,832,484; loans, $306,486,630; and deposits, $143,165,947. The State banks on June 30, 1914, numbered 1250. Their combined capital was $34,845,350; surplus, $18,552,198; cash, etc., $11,245,644; loans, $208,877,432; and deposits, $207,570,909. Bank clearings at St. Louis in 1914 amounted to $4,051,000,000 and at Kansas City to $3,015,810,567. In 1914 Federal Reserve Banks were located at these cities.

Government. The present constitution, which has been amended in important details, was adopted in 1875. Amendments must be passed by a majority of the members of each House of the General Assembly, after which they are submitted separately to the people at the next general election. The General Assembly may also at any time authorize a vote of the people to be taken upon the question whether a constitutional convention shall be held.

Legislative.—The legislative power is vested in a Senate and a House of Representatives, called the General Assembly. The House of Representatives consists of members chosen every second year, who are apportioned according to the population of the counties. A representative must have attained the age of 24 years and have been a qualified voter for at least two years. The Senate consists of 34 members, chosen from districts of approximately equal population. Senators must be at least 30 years of age and qualified voters for three years. The initiative and referendum were adopted by a constitutional amendment in 1908.

Executive.—The executive department consists of a Governor, Lieutenant Governor, Secretary of State, State Treasurer, State Auditor, Attorney-General, and Superintendent of Public Schools, all of whom, except the Lieutenant Governor, must reside at the seat of government during their term of office. The supreme executive power is vested in the Governor. He must be at least 35 years of age at the time of his election, have been a citizen of the United States 10 years and a resident of the State seven years next before his election. The Governor and Treasurer are ineligible for reëlection. The term of all the executive officers is four years.

Judiciary.—The judicial power is vested in a supreme court, courts of appeals, circuit courts, and others of minor importance. The supreme court consists of seven judges and is divided into two divisions. The courts of appeals consist each of three judges who are elected by the qualified voters of the appellate district for a term of four years. Separate and district courts exist in each county, presided over by a circuit judge, although his circuits may comprise several counties. Judges of the circuit court are elected and hold offices for terms of six years. Each county has a probate court and a county court.

Suffrage and Elections.—Persons qualified to vote are males over 21 years of age who are

citizens of the United States or who have declared their intention of becoming such not less than one year nor more than five years preceding the election and who have resided in the county 60 days immediately previous to the day of election. General elections in the State are held biennially on the Tuesday next following the first Monday in November, dating from 1876. All elections must be by ballot. The Legislature of 1913 made important changes in the general election and primary laws. These amendments were embraced in 10 separate acts, the most important relating to primary elections. There is a stringent corrupt-practices act.

Local and Municipal Government.—The General Assembly has no power to establish any new county with a territory of less than 410 square miles. Municipalities are not permitted to subscribe to the capital stock nor aid corporations or institutions. Townships may be organized whenever a majority of the legal voters of the county shall so determine. Cities having a population of more than 100,000 may form a charter for their own government. These charters must provide for a mayor or chief magistrate, and two houses of legislation, one of which at least shall be elected by a general ticket. Provision is also made for adoption by cities and towns of a commission form of government.

Other Constitutional and Statutory Provisions.—Imprisonment for debt is not permitted. Corporations cannot be created by special laws. Railroad companies may not charge for the transportation of freight or passengers a greater amount for a less distance than the amount charged for any greater distance. There is a blue-sky law, patterned after the Kansas statute. There is a white-slave act, conforming in its essential features to the Mann Act. The State is under local-option law, which permits the liquor question to be settled by a vote of the people in each county, excepting only from its operation cities containing a population of 2500 or more and permitting these to vote as separate units.

Finance. Missouri's first public debt was acquired in 1835, when it bought stock in the banks of the State. This amounted to $1,397,000. Quite unlike many other States, it was not involved in financial difficulties due to its banking enterprises and was free from extensive debt up to 1850. Then began the era of speculative railroad construction, and within the next eight years many railroads were chartered, receiving from the State loans in the shape of guaranteed bonds amounting to about $24,000,000. The railroads failed to pay the interest, and the State had to assume the entire debt, which amounted to $27,370,000 in 1862. The debt remained above $20,000,000 until 1880, but has been reduced, and in 1915 it was $7,308,339. This is divided among the State school fund ($3,159,000), the State seminary fund ($1,239,839), and the capitol building fund ($2,909,500). For the year ending Dec. 31, 1914, the total receipts were $10,540,264, the disbursements were $9,618,813, and the balance in the Treasury was $4,942,011.

Militia. The males of militia age in the State in 1910 numbered 721,866. The organized militia in 1914 consisted of a division of infantry, including the first, second and third, fourth and sixth regiments, a cavalry troop, two field artillery troops, a signal troop, and sanitary troop.

The strength of enlisted men was 3320 and of officers 256.

Population. The population at different periods is as follows: 1810, 20,845; 1820, 66,586; 1840, 383,702; 1850, 682,044; 1860, 1,182,012; 1870, 1,721,295; 1880, 2,168,380; 1890, 2,679,184; 1900, 3,106,665; 1910, 3,293,335. The estimated population on July 1, 1914, was 3,372,886; 1920, 3,404,055. In 1910 Missouri ranked seventh in population. The white population was 3,134,932 in 1910. The foreign-born white population was 228,896, and the negro population, which is confined largely to the Missouri and Mississippi River counties, was 157,452. Of the foreign-born white the most numerous are Germans, followed by Irish, Russians, Italians, and Austrians. St. Louis was an early centre of German immigration, and the Germans still constitute over one-half of the total foreign-born population of that city.

Of the total population in 1910, 67.4 per cent were born in the State. Of the remainder 5.6 per cent were born in Illinois, 2.3 per cent in Kentucky, 2 per cent in Kansas, 2 per cent in Ohio, 1.9 per cent in Indiana, 1.8 per cent in Tennessee, 1.7 per cent in Iowa, nearly 1 per cent in Pennsylvania, less than 1 per cent in each of the other States, and 6.9 per cent in foreign countries. The population in places of 2500 or more in 1910 was 1,398,817. The rural population was 1,894,513. In 1910 there was an average of 47.9 persons per square mile, a greater density than is shown in any other State west of the Mississippi. There were, in 1910, 15 cities with a population of 8000 or over. The largest city, St. Louis, had in 1910 a population of 687,029 and in 1914 an estimated population of 734,667. Kansas City had in 1910 a population of 248,381 and in 1914 an estimated population of 281,911. Other large cities with their populations in 1910 are: St. Joseph, 77,403; Springfield, 35,201; Joplin, 32,073; Hannibal, 18,341.

Education. Educational problems of Missouri are in general those of other Southern States which have a large rural population. Persistent efforts have resulted in material improvement of conditions. The percentage of illiteracy among all classes was 4.3 in 1910, the number of illiterate persons of 10 years of age or over being 111,116. The percentage of illiteracy among native whites of native parentage was 3.4, among native whites of foreign or mixed parentage 1.2, among foreign-born whites 10.1, and among negroes 17.4. The improved condition of the colored population as regards illiteracy is particularly encouraging. In 1890, 41.7 per cent of the colored population was illiterate. According to the thirteenth census the total school population, ages 6 to 20 years, in 1910 was 993,998. Of these, 646,868 attended school in that year. The total school population of native parentage was 798,833, and the negro school population was 41,682. According to the report of the State Superintendent of Education the total school population in 1913 was 954,699, the total enrollment 690,484, and the average daily attendance 494,309. Female teachers numbered 14,148 and male 4706. The average salary of male teachers was $497.60 per year and of female teachers $484.44. On June 1, 1914, there were 165 first-class high schools, 55 second-class, and 141 third-class, making a total of 361 approved schools.

The General Assembly of 1909 provided county supervision of schools and a compulsory eight months' term in each school district. In 1911 a

teachers' certificate law was passed and provisions made for the transportation of pupils.

Agriculture is taught in the high schools. The total enrollment in the high schools in 1913 was 42,266. The average length of the school term in 1913 was 160 days. The estimated value of the school property for sites and buildings was $41,829,767 and for school equipment $3,605,681. The total expenditure for educational purposes in 1913 was $16,402,780. There are normal schools at Cape Girardeau, Kirksville, Warrensburg, Springfield, and Maryville. Washington University is at St. Louis, the University of Missouri at Columbia, Missouri Wesleyan College at Cameron, Christian University at Canton, Central College at Fayette, Pritchett College at Glasgow, Missouri Valley College at Marshall, Scarritt-Morrisville College at Morrisville, Park College at Parkville, Drury College at Springfield, Tarkio College at Tarkio, and Central Wesleyan College at Warrenton. These are all coeducational. Colleges for men exclusively are Westminster College at Fulton, William Jewell College at Liberty, St. Louis University at St. Louis, and Christian Brothers College at St. Louis. The last two are Roman Catholic institutions. Colleges for women are Stephens College at Columbia, Howard-Payne College at Fayette, Synodical College at Fulton, Central College for Women at Lexington, Lexington College for Young Women at Lexington, Hardin College at Mexico, Cottey College at Nevada, Lindenwood Female College at St. Charles, and Forest Park University at St. Louis. Special schools include the State School for the Deaf at Fulton, Missouri School for the Blind at St. Louis, Missouri Training School for Boys at Boonville, and Missouri Training School for Girls at Chillicothe.

Charities and Corrections. The charitable and correctional institutions are under the control of the State Board of Charities and Corrections. This board, in addition to its other duties, serves as a bureau of information for those seeking knowledge of social questions. It employs a secretary, who devotes all his time to the study of social work and acts as an official agent for the board. The charitable and correctional institutions under the supervision of this board include hospitals at Fulton, St. Joseph, Nevada, and Farmington, the Industrial School for Girls at Chillicothe, Training School for Boys at Boonville, Colony for Feeble-Minded and Epileptic at Marshall, Missouri School for the Deaf at Fulton, Missouri School for the Blind at St. Louis, Federal Soldiers Home at St. James, Confederate Soldiers Home at Higginsville, State Sanatorium at Mount Vernon, and State Penitentiary at Jefferson City. Prior to 1911 convicts were employed under contract, although their work was confined to the prisons. In some of the counties male prisoners within the county jails were worked on the public roads or at quarrying stone. In the year mentioned a measure was passed forbidding the farming out or selling of convict labor. Convicts are allowed to work in the binding-twine plant and in manufacturing supplies for State institutions. These cannot be purchased elsewhere if they can be supplied by convict labor. The same Legislature passed a measure permitting counties with a population of 250,000 to 500,000 which have a juvenile court to appropriate not more than $12,000 a year for the support of mothers of children under 14, who are widows or whose husbands are prisoners and who would otherwise have to work away from their children. The only city to which this applies is Kansas City. Cities of 500,000 or more inhabitants are permitted to create a board of children's guardians to manage public institutions of the city for delinquent, dependent, or defective children. In counties with a population of 50,000 or more juvenile courts for children under 17 are established.

Religion. The two leading denominations, the Methodist and the Baptist, are of almost equal strength. The Roman Catholics also have a strong representation. Probably the most rapidly developing denomination is that of the Disciples of Christ. It ranks third among Protestant denominations. The largest of the remaining denominations are the Presbyterians, Lutherans, Protestant Episcopalians, and Congregationalists.

History. Missouri was part of the vast area of Louisiana claimed by the French on the ground of the discoveries of La Salle, who descended the Mississippi to its mouth in 1681–82. A few years before La Salle, in 1673, Marquette and Joliet had sailed down the river as far as the mouth of the Arkansas. The territory included within the present State was traversed before 1720 by parties of French explorers in search of mines of lead and silver, and in 1723 a certain Lieutenant Renaud received the grant of a large tract of land in that region. The foundation of St. Genevieve is sometimes placed in the year 1735. The second settlement within the State was St. Louis, established as a trading post in 1764, a year after the cession of Louisiana to Spain by the Peace of Paris. Many French residents removed from the villages east of the Mississippi to St. Louis, which became, under the French and the Spanish, a prosperous little capital. The colonization of the region was greatly accelerated by the Ordinance of 1787, which, in excluding slavery from the Northwest Territory, diverted the stream of southern immigration to Missouri. The Spaniards also encouraged immigration by the offer of liberal bounties to settlers. In 1800 Louisiana was retroceded to France, which, however, retained it only three years. After the acquisition of Louisiana by the United States, in 1803, the entire territory was divided in two by the line of the thirty-third parallel of latitude, the northern part being known as the District and Territory of Louisiana till 1812, and subsequently as the Territory of Missouri. At that time the population was over 20,000, and the chief occupations of the inhabitants were agriculture, fur trading, and mining. The mass of the people were sturdy and unrefined; the rough backwoodsman and the fighting Mississippi River boatman were picturesque types of the society of the period. After 1815 immigration increased markedly. In 1820 there were 66,000 inhabitants within the present limits of the State, of whom about 10,000 were slaves. The Indian titles to the land were extinguished rapidly. Between 1800 and 1824 the Osages and Sacs and Foxes ceded almost all their lands, though it was not till 1837 that the area of the State was rounded out by the so-called Platte Purchase.

In 1817 the Territorial Legislature applied to Congress for permission to prepare a State constitution. (For the struggle in Congress concerning Missouri, see UNITED STATES and

MISSOURI COMPROMISE.) In June, 1820, a convention framed a constitution which sanctioned slavery and forbade any free negro or mulatto to take up his residence in the State; but Missouri was admitted (Aug. 10, 1821) only after the Legislature had taken a pledge that the antifreedmen clause should never be enforced. The period after 1820 was one of rapid, if not entirely sound, development. An era of wild speculation in lands set in, accompanied by the usual inflation of the currency (the Bank of St. Louis had been established in 1816) and the inception of an elaborate system of internal improvements. Within 20 years after 1835 the State pledged its credit for $28,000,000 to various railroad companies and found itself saddled with a debt of over $20,000,000. The system of public education was quite inefficient before the Civil War, though St. Louis University had been incorporated in 1832 and the State University at Columbia eight years later. Respect for the law was often sadly wanting in the western part of the State, as was shown in the history of the Mormons. They had settled at Independence in Jackson County and had made the beginning of a prosperous community, when they were driven out by mob violence, for which it is probable they were less responsible than their enemies. They established themselves anew in Caldwell County; but there, too, they came into conflict with the authorities and the inhabitants, who forced them to depart once more in a destitute condition, leaving valuable farms and other property behind them. See MORMONS.

In the first half of the nineteenth century Missouri, though a slave State, was not an ardent defender of slavery, and a very large proportion of its citizens were interested in movements looking towards the gradual emancipation of the slaves. With the rise of the Abolitionists, however, Missouri became decidedly a proslavery State. It favored the annexation of Texas in 1845 and took a very prominent share in the Mexican War, General Kearny's army of invasion consisting largely of Missourians. In 1849 the Legislature adopted the so-called Jackson resolutions, in which the right of Congress to regulate slavery in the Territories was trenchantly denied, and the principle of squatter sovereignty was asserted. The Jackson resolutions, however, did not represent the unanimous feeling in the State when they covertly threatened secession. In the election of 1860 the vote in the State for Douglas and for Bell was nearly equal, while Breckenridge and Lincoln received a far smaller vote than the others. The Legislature thereupon issued a call for a convention to consider the relation of the State to the Union. In the elections for the convention the secessionist delegates were defeated by a popular majority of 80,000, and when the convention met—February to April, 1861—it declared that it could find no cause to dissolve the connection between the State and the Federal Union, and expressed the hope that some compromise might be effected between the North and the South. In reply to President Lincoln's call for troops, Governor Jackson, who, with the rest of the State government, was in favor of secession, refused to participate in the "unholy crusade" and summoned the State militia to arms. Between the State militia and the Federal troops, under Colonel Lyon, aided by the volunteer bands which the loyalists of St. Louis had organized, civil war ensued. The Governor, together with a majority of the Legislature, fled to the southern part of the State, and the supreme power was assumed by the convention which declared all the offices vacant and proceeded to install a provisional government. The fugitive Legislature responded by declaring Missouri a member of the Southern Confederacy. (For military operations in Missouri, see CIVIL WAR IN AMERICA.) In 1863 the convention passed an ordinance of emancipation of doubtful legality, to go into effect in 1870. With the fall of the Confederate power in Missouri the regular State government was reorganized (1864), and in January, 1865, a constitutional convention controlled by the radical union party assembled in St. Louis. The new constitution provided for the immediate emancipation of the slaves and imposed severe political disabilities on all who had participated in the Rebellion; all teachers, physicians, lawyers, and ministers were required to take a searching oath of loyalty. The qualifications for the franchise deprived a vast proportion of the citizens of the right to vote and continued in force till 1871, when a more liberal registration law was adopted. A third constitution went into effect in 1875.

From 1824 to the Civil War Missouri was always Democratic. From 1864 to 1872 the Republicans were in power, but the defection of a large body of Liberal Republicans who were opposed to the policy pursued against those who had participated in the Rebellion led to the reëstablishment of Democratic supremacy. In 1894, however, the Republicans secured a majority in the Legislature and the congressional delegation. In 1904 Roosevelt carried the State. In 1905 Joseph W. Folk (Democrat), who had become a national figure, from his successful exposure and conviction of corrupt city officials in St. Louis, was elected Governor, although in the same year the Republican national ticket carried the State by 25,000 plurality. The Legislature of 1907 passed many severe measures for the regulation of railroads and corporations; these resulted in much litigation in the succeeding years. (See RAILWAYS and STATE RIGHTS.) In 1908, as a result of a suit brought by Attorney-General Herbert S. Hadley, the Standard Oil Company of Indiana and the Republic Oil Company of New York were forbidden to do business in the State. In the elections of that year Mr. Hadley defeated the Democratic candidate, William H. Cowherd, for Governor, and William J. Stone was nominated for the United States Senate. The carrying of the State by the Republicans in the presidential election was one of the surprises of the campaign of 1908. Taft received 347,202 votes, Bryan 246,574. In January, 1909, the United States Supreme Court upheld the decision of the State courts against the Standard Oil Company of Indiana and its subsidiary companies. Missouri took a conspicuous part in the political campaign of 1912. The leading candidate for the Democratic nomination put at the head of the national convention was Champ Clark, one of the State's Representatives in Congress and Speaker of the House. Governor Hadley was one of the foremost Progressive leaders in the Republican preconvention campaign and was one of the seven governors who signed a letter urging Mr. Roosevelt to be a candidate during

the first days of the convention. He was leader of the Republican forces. With the nomination of Mr. Taft, however, Governor Hadley did not join the movement for a new party, but gave his support to President Taft. At the election on November 5, Wilson received 339,497 votes, Taft 207,491, and Roosevelt 123,111. Elliott W. Major, Democrat, was elected Governor. A senatorial election was held in 1914 in which Senator Stone was reëlected. The most notable feature of this election was the falling off of the Progressive vote, which was reduced from 327,371 in 1912 to 27,614 in 1914. The following is a list of the Governors of the State:

Alexander McNair	Democrat	1820–24
Frederick Bates	"	1824–25
Abraham J. Williams (acting)	"	1825
John Miller	"	1825–32
Daniel Dunklin	"	1832–36
Lilburn W. Boggs	"	1836–40
Thomas Reynolds	"	1840–44
M. M. Marmaduke (acting)	"	1844
John C. Edwards	"	1844–48
Austin A. King	"	1848–52
Sterling Price	"	1852–56
Trusten Polk	"	1856–57
Hancock Jackson	"	1857
Robert M. Stewart	"	1857–61
Claiborne F. Jackson	"	1861
Hamilton R. Gamble	(Provisional)	1861–64
Willard P. Hall (acting)		1864–65
Thomas C. Fletcher	Republican	1865–69
Joseph W. McClurg	"	1869–71
B. Gratz Brown. Liberal Republican and Democrat		1871–73
Silas Woodson " " " "		1873–75
Charles H. Hardin	Democrat	1875–77
John S. Phelps	"	1877–81
Thomas T. Crittenden	"	1881–85
John S. Marmaduke	"	1885–87
A. P. Morehouse	"	1887–89
David R. Francis	"	1889–93
William J. Stone	"	1893–97
Lon V. Stephens	"	1897–1901
Alexander M. Dockery	"	1901–05
Joseph W. Folk	"	1905–09
Herbert S. Hadley	Republican	1909–13
Elliott W. Major	Democrat	1913–17
F. D. Gardner	"	1917–21
Arthur M. Hyde	Republican	1921–

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MISSOURI, mĭ-sōō′rĭ *or* mĭ-zōō′rĭ. A small tribe of Siouan stock. When first known to the whites they occupied the territory about Grand River, a northern affluent of the Missouri, in what is now the State of Missouri, and contiguous to the Iowa and Oto (q.v.) on the north and west, all three tribes speaking the same language. Their popular name is of Algonquian origin, and is said to mean "great muddy," referring to the Missouri River. They call themselves *Niutachi* or *Nudacha*, "those who come to the mouth" (of the river). The Missouri are named upon Marquette's map of 1673, and some years afterward a French fort was established in their territory. In 1725 a number of their chiefs visited France and attracted much attention. At one time in the eighteenth century they were estimated at from 1000 to 1200; but, after being greatly reduced by smallpox, they were attacked by the Sauk, who compelled them to abandon their territory about 1798 and take refuge west of the Missouri. In 1805 they were living near the mouth of the Platte River and numbered about 300. In 1823 they were again so decimated by smallpox that the remnant, about 80 persons, incorporated with the kindred Oto.

MISSOURI, University of. A State institution for higher education, founded in 1839 at Columbia, Mo. It is coeducational. The university in 1915 was organized into 11 divisions: the colleges of arts and sciences, and agriculture, including an experiment station; schools of commerce, education, engineering, including an experiment station, journalism, law, medicine, mines and metallurgy; graduate school, and the extension division. The school of journalism was founded in 1906 and the school of commerce in 1914. These divisions, with the exception of the school of mines and metallurgy, which is located at Rolla, are at Columbia. For admission to the division of arts and agriculture four years' high-school work is required, while for admission to professional schools there are required two years of college work or its equivalent. The master's degree is conferred in the graduate school and the bachelor's degrees in the colleges of arts and sciences and agriculture, schools of commerce, education, journalism, law, and mines and metallurgy; the degrees of M.E. in mines and metallurgy, and C.E., E.E., M.E., and Ch.E. in engineering. The honorary degree of doctor of laws is also conferred. The enrollment in all the departments in 1914–15 was 3816. This includes the enrollment in the summer schools. The faculty numbered 186, including 84 assistants. The campus at Columbia contained about 70 acres, and the university owns a farm containing nearly 800 acres. The campus at Rolla contains 27 acres. The total value of the grounds, buildings, and equipment at the end of the collegiate year 1913–14 was $3,646,010. The endowment was $1,505,339. The university is supported largely by State and Federal appropriations. The library contains nearly 200,000 volumes and 100,000 pamphlets. The president in 1915 was Albert R. Hill, LL.D.

MISSOURI COMPROMISE. In American history, an arrangement between the free and slave States, embodied chiefly in an Act of Congress approved March 6, 1820, which provided for the admission of the State of Missouri into the Union with a constitution which allowed slavery, but which forever prohibited slavery in all the rest of the Louisiana territory lying north of lat. 36° 30′ N., that being the southern boundary line of Missouri. To balance the admission of Missouri as a slave State, Maine was admitted as a free State at the same time. In February, 1819, in the debate in Congress on the bill to admit Missouri into the Union, James W. Tallmadge, of New York, moved to amend the Missouri bill to the effect "that the further introduction of slavery or involuntary servitude be prohibited, and that all children of slaves born within the State after the admission thereof in the Union shall be free at the age of 25." The admission of Alabama in the same year without any prohibition against slavery made

the number of "slave" States and of "free" States equal. The admission of Missouri as a "free" State, therefore, would disturb the equilibrium. The bill with the Tallmadge amendment passed the House Feb. 7, 1819, by a vote of 87 to 76. On March 2 the Senate passed the bill without the Tallmadge amendment. Two days later Congress adjourned and the question of Missouri went over to the next session. In December, 1819, another bill for the admission of Missouri was introduced, whereupon John W. Taylor, of New York, on Jan. 26, 1820, offered an amendment in the House which provided that as a condition of admission the State should be required to adopt a constitution forever prohibiting slavery within its limits. This gave rise to a prolonged and vigorous debate on the power of Congress to impose conditions upon the admission of a State into the Union. Those who upheld the power of Congress in the premises based their argument on the provision of the Constitution which empowers Congress to admit new States, the implication being that it may admit under any conditions which it may see fit to impose. Their opponents relied chiefly upon the doctrine of the equality of the States in the Federal system, and declared that Congress had no constitutional power to destroy that equality by attaching onerous conditions to admission of the new States. Meantime the situation was complicated by the application of Maine to be admitted with a constitution prohibiting slavery. The House of Representatives promptly passed a bill for this purpose, and when this bill came up for discussion in the Senate in January, 1820, the friends of slavery in Missouri, who were in a majority in the Senate, coupled the Maine bill with the bill to admit Missouri with slavery, and the Senate steadily refused to disconnect the two measures. In this situation the substance of the compromise was proposed by Senator Thomas, of Illinois, in an amendment which provided that Missouri should be admitted with a constitution allowing slavery, but that in all the rest of the Louisiana territory north of lat. 36° 30′ N. slavery or involuntary servitude should be forever prohibited. The bill with this amendment finally passed the Senate, Feb. 18, 1820, by a vote of 34 to 10. The bill thus amended was coupled with the bill to admit Maine, and in this shape was sent to the House for concurrence. The House refused to agree to the combination, and the matter was then referred to a conference committee of the two Houses, which recommended that the Maine bill be passed separately, and that the Missouri bill should be passed with the Thomas amendment. To this report the House agreed. The separation of bills as distinct subjects was thus secured, and recognition was given to the claim of the Southerners that Congress had no power to impose such limitations as it saw fit upon any State as a condition of its admission to the Union. President Monroe approved the Maine bill on March 3, and the Missouri bill on March 6, 1820. Henry Clay, who was Speaker of the House, exerted his influence to bring about this result, and for his work in these compromises was called the "Pacificator." In the next session the constitution of Missouri, including a paragraph making it the duty of the Legislature to prevent the immigration of free negroes into the State, was presented to Congress for approval. This provoked a heated debate concerning the duty of the Federal government to protect the citizens of each State in the exercise of their civil rights of citizenship in every other State. After protracted negotiation, a bill was finally introduced providing that Missouri should be considered admitted as a State only after its Legislature had declared that no law would ever be passed, nor any construction placed upon the obnoxious paragraph which would justify any law which might abridge within Missouri the rights guaranteed to all citizens by the Federal Constitution. The bill involving this second compromise was approved March 2, 1821, and in accordance with its terms Missouri became a Commonwealth. The compromise of 1820 was important as the first precedent for the congressional exclusion of slavery from public territory, and also as a clear recognition that Congress had no right to impose upon a State asking for admission into the Union conditions which do not apply to those States already in the Union. "The Missouri Compromise was the work of moderate men, chiefly those who lived in the Middle States and in the northern tier of Southern States." The Missouri Compromise was specifically repealed by the Kansas-Nebraska Bill of 1854, and was pronounced unconstitutional and void by the famous Dred Scott decision.

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MISSOURI RIVER. The principal affluent of the Mississippi and the longest river of the United States (Map: United States, G 2). It is formed in southwest Montana by the confluence of the Jefferson, Madison, and Gallatin rivers, which unite at Gallatin City, Mont., at an elevation of 4032 feet above sea level. The longest branch, the Jefferson, has its farthest source in Red Rock Creek, which rises on the slopes of the Red Rock Range of the Rocky Mountains, on the border between Montana and Idaho, west of the central portion of Yellowstone Park. The Madison and Gallatin rivers rise within the Yellowstone Park near the source of the Yellowstone River. From the junction of the three forks the Missouri flows north and east across Montana into North Dakota. Here it is joined by its largest affluent, the Yellowstone River, which at the point it empties into the Missouri is about 800 yards wide. From this place the Missouri describes a long curve towards the southeast and then crosses the whole width of South Dakota. After reaching the Nebraska boundary it divides this State from Iowa and Missouri, forms the northeast boundary of Kansas, and finally takes an easterly course across Missouri, joining the Mississippi River 3 miles below Alton, Ill., and 20 miles above St. Louis. Its length to the source of the Jefferson is about 2950 miles and to the source of the Madison about 2910 miles. With the lower Mississippi the river has a total length

of about 4200 miles, which is equaled by no other river in the world. The Missouri is a swift and turbid stream, navigable only by flat-bottomed steamboats. In the flood period in early summer it can be ascended nearly to Great Falls, Mont., about 2300 miles from the mouth, but during low water, which occurs in summer and early autumn, navigation is suspended above the junction of the Yellowstone. At Great Falls the Missouri passes over a series of cataracts, descending a vertical distance of 350 feet in 16 miles. The highest falls are 87 feet. About 145 miles above this point is the Gate of the Rocky Mountains, a narrow rock gorge 5 miles in length, whose perpendicular walls rise 1200 feet above the river. The lower course of the Missouri, lying within the great plains, has been graded so as to offer no interruptions. In this part it is often a mile or more wide. The chief tributaries are the Milk and Yellowstone, in Montana; Little Missouri, in North Dakota; Cheyenne, James, White, and Big Sioux, in South Dakota; Niobrara and Platte, in Nebraska; Kansas and Osage, in Kansas and Missouri. It drains the greater part of the territory between the Mississippi and the summits of the Rocky Mountains. The Arkansas and Red rivers are the only other large streams in this region that contribute their waters directly to the Mississippi. The area of the basin drained by the Missouri is about 600,000 square miles, and the average quantity of water discharged by the Missouri in a second is about 120,000 cubic feet. A number of thriving cities are located on the Missouri, including Kansas City, Leavenworth, Atchison, Omaha, Sioux City, Pierre, Bismarck, and Great Falls, the last being the centre of a great copper-smelting industry which utilizes the power of the falls.

MISSOURI SUCKER, or GOURDSEED. See BLACK HORSE, and Plate of SUCKERS.

MISSOURI VALLEY. A city in Harrison Co., Iowa, 21 miles north of Council Bluffs, on the Chicago and Northwestern Railroad (Map: Iowa, B 3). It has a Carnegie library, and the fair grounds of the county agricultural society. The industrial interests are represented by extensive railroad machine shops, stockyards, grain elevators, and manufactories of flour, machine-shop products, bricks, tiles, cement blocks, and creamery products. Fruit growing and stock raising are carried on in the vicinity. The water works are owned and operated by the municipality. Pop., 1900, 4010; 1910, 3187.

MIST. See FOG; HAZE.

MISTAKE'. In law, an erroneous mental conception affecting the will or intention and hence leading to an unintended act or preventing a contemplated result. The importance of the mistake in legal contemplation is its effect upon the act. In general a mistake of law produces no legal effect upon an act influenced or induced by it. Thus, one is without remedy who has entered into a contract without knowing or understanding its legal effect, or who has voluntarily and with full knowledge of the facts paid a claim not well founded in law. The full acceptance of the doctrine is due to a misapplication of the maxim, *Ignorantia juris non excusat* (Ignorance of the law is no excuse), which is applicable only in the criminal law or under statutes imposing quasi-criminal penalties where sound policy requires that ignorance of law should not excuse one charged with a crime. (See INTENT.) Mistake of fact has a direct legal effect on many acts, and the law in many cases affords a remedy to one who has done a prejudicial act induced by mistake of fact.

The effect of mutual mistake as to a material term of a contract is to prevent the meeting of the minds and thus prevent the formation of a contract (q.v.). The effect of mutual mistake of fact in case of sale is to prevent passing of title, and one who has given up the possession of personal property under mistake, preventing the passing of title, may recover the specific property by an appropriate action, or its value in an action of trover. In general, whenever money or property is delivered to another under material mistake of fact, its value may be recovered in an action based on the theory of quasi contract (q.v.).

In the law of tort the effect of mistake of fact varies considerably with the different branches of the subject. In the law of trespass one is required to know his own, and he interferes with the property of another at his peril.

Equity has jurisdiction to relieve one from the consequences of his mistake of fact, by compelling a re-formation or rescission of a contract.

Consult Kerr, *A Treatise on the Law of Fraud and Mistake* (3d ed., London, 1902).

MISTASSINI, mĭs'tăs-sē'nē. A large lake near the north boundary of the Province of Quebec, lat. 50° N., long. 72° to 74° W. (Map: Canada, Q 6). In 1672 French Jesuit missionaries visited it. The Indians claimed an extravagant length for the lake, saying that three days were employed in crossing the narrowest part from island to island, but an estimate based on surveys gives the length at 120 miles and the actual width at 20 miles in the widest parts. From the northeast and southeast it receives the drainage of a chain of smaller lakes, and discharges its own surplus into James Bay, by the Rupert River, 120 miles long. The Hudson's Bay Company has a post on Lake Mistassini, 333 miles north of Montreal. The lake is of great depth and abounds in fish; the surrounding country is level and well fitted for agriculture, while the woods are full of game. The winters are clear and cold and the summers warm and short.

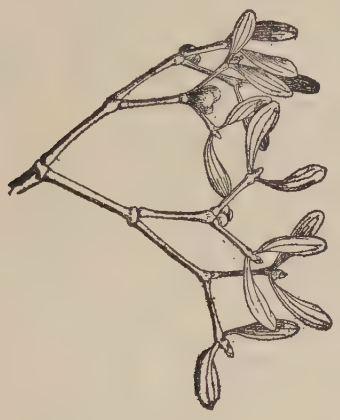
MISTEC. See MIXTEC.

MISTELI, mĭs-tā'lē, FRANZ JOSEF (1841–1903). A Swiss philologist. He was born at Solothurn; studied at Zurich and Bonn; taught at Saint-Gall and Solothurn; and in 1874 became professor of comparative linguistics at Basel. A follower of Steinthal, whose *Characteristik der hauptsächlichsten Typen des Sprachbaues* he re-edited in 1893, Misteli contributed to Kuhn's *Zeitschrift* and to the *Zeitschrift für Völkerpsychologie,* and wrote *Ueber griechische Betonung* (1875) and *Erläuterungen zur allgemeinen Theorie der griechischen Betonung* (1875). He was an authority on the dialects of the Ural and Altai.

MISTLE (mĭs'l) **THRUSH,** or **MISSEL THRUSH.** One of the most familiar and admired of European thrushes (*Turdus viscivorus*), named from its fondness for mistletoe berries, which are rejected by the majority of small birds. It is the largest and one of the most numerous of British thrushes, and is also well known throughout the Mediterranean region and western and northern Asia. Everywhere it is migratory, and is noted for its loud and pleasant song, which begins first of all bird notes in the spring and lasts far into the sum-

mer; its habit of cheerfully singing on cold or rainy days, when most other birds are quiet, has given it the sobriquet "stormcock." Its plumage is soft grayish brown above and white below, the breast and abdomen thickly and sharply spotted. See THRUSH.

MISTLETOE, mĭs″l-tō (AS. *misteltān, mistiltān*, Icel. *mistilteinn*, from AS. *mistel*, birdlime, mistletoe, basil, Icel., OHG. *mistil*, Ger. *Mistel*, mistletoe + AS. *tān*, twig). A genus (*Viscum*) of small shrubs of the family Loranthaceæ. This family contains more than 500 known species, mostly tropical and parasitic. The leaves are entire, almost nerveless, thick, fleshy, and without stipules. The flowers of many species are showy. The European mistletoe (*Viscum album*), a native of the greater part of Europe, grows on many kinds of trees, particularly on the apple, and its close relatives, the service and hawthorn; sometimes, also, on sycamores, limes, poplars, locust trees, and firs, but rarely on oaks (contrary to the common belief). It is very plentiful in some parts of the south of England, its evergreen leaves giving a peculiar appearance to the orchards in winter, when the clusters of mistletoe are very conspicuous among the naked branches of the trees. The stems divide by forking; the leaves are opposite, of a yellowish-green color, obovate-lanceolate, obtuse. The flowers are inconspicuous, and grow in small heads at the ends and in the divisions of the branches, the male and female flowers on separate plants. The berries are about the size of currants, white, translucent, and full of a very viscid juice, which serves to attach the seeds to branches, where they germinate, and take root, the radicle always turning towards the branch, whether on its upper or under side. The mistletoe derives its nourishment only partly from the juices of the tree on which it grows, and from which it seems to spring as if it were one of its own branches. The green coloring matter, chlorophyll, permits the parasite to elaborate its food. The mistletoe was intimately connected with many of the superstitions of the ancient Germans and the British Druids. In the northern mythology, Balder is said to have been slain with a spear of mistletoe. Among the Celts the mistletoe which grew on the oak was in peculiar esteem for magical virtues. Traces of the ancient regard for the mistletoe still remain in some old English and German customs, as kissing under the mistletoe at Christmas. The mistletoe was at one time in high repute as a remedy for epilepsy and convulsions, but it seems to possess no decided medicinal properties. *Loranthus europœus*, a shrub very similar to the mistletoe, but with flowers in racemes, is plentiful in some parts of the south of Europe, and very frequently grows on oaks. *Loranthus odoratus*, a Nepalese species, has very fragrant flowers. In the United States the mistletoe is *Phoradendron*, a genus of plants closely allied to and greatly resembling *Viscum*. The common species in the Eastern States is *Phoradendron flavescens*. It occurs upon various species of hardwood trees from New Jersey to Missouri and southward and is used for Christmas decorations like the European one. In the southwestern part of the United States and in California are still other species. *Arcenthobium pusillum*, or *Razoumofskya pusilla* is a leafless mistletoe about an inch long, parasitic on spruce and tamarack trees from Maine to Michigan. A larger species of the same genus grows in the Northwest. See Colored Plate of PARASITIC PLANTS.



VISCUM ALBUM.

MISTLETOE BOUGH, THE. A pathetic song by Thomas Haynes Bayly, based on a legend connected with various localities.

MISTRAL, mē′strȧl′, or **MAESTRAL**, mȧ′strȧl′ (Prov., master wind). The Provençal name for the cold northwest wind on the southern coast of France and in other parts of the Mediterranean coast region. This wind is identical in origin with the bora (q.v.) of the Caspian Sea and of Austria, Turkey, and southern Russia. It is also perfectly analogous to the strong northwest winds of the United States. In both cases the atmosphere over a great extent of country is circulating about a region of low pressure or a so-called storm centre, moving along over the surface of the earth usually towards the east or northeast. When such a storm centre passes over southern Europe, the cold winds from Russia sweep southward with great force towards it. The warm southerly siroccos give place to cold northerly boras and mistrals, which are very dry; the cloudy hazy skies are replaced by cloudless transparent air. During the first few hours the wind seems to come in descending and violent gusts; afterward it becomes more moderate, but is still very strong. When it descends over mountain slopes upon the water, as it does along the coast of France, Italy, and Austria, it makes navigation difficult and even dangerous to small craft.

MISTRAL, FRÉDÉRIC (1830–1914). A French poet, the leader of the modern Provençal revival in southern France. He was born at Maillane, Bouches-du-Rhône, Sept. 8, 1830, and went to school in Avignon. Here he came under the influence of Joseph Roumanille (q.v.), who had already conceived the idea of raising the native speech to higher uses. Roumanille's Provençal poem *Li Margarideto* fired the youth's enthusiasm, and when he returned to Maillane, at the end of his school days, he wrote a poem in four cantos, *Li Meissoun*, the best parts of which he has preserved by insertion into his riper works. His father, seeing his intellectual superiority, had him study law at Aix. Mistral, however, did not practice law, but gave himself up heart and soul to the work of creating a literature in Provençal. With six friends he founded the society of the Félibres in 1854 and contributed to their annual organ *L'Armana Prouvençau*. The publication in 1859 of *Mirèio* is the most important

event in Mistral's life and in the history of the movement. It was a revelation to the Félibres, and through the enthusiastic praise of Lamartine it obtained a national success. *Mirèio* is a narrative pastoral poem in twelve cantos, a wonderful expression of what is most characteristic and best in the rural life of Provence. The language is the dialect of Saint-Remy, raised to the dignity of a literary language by a process of purification and enrichment strictly in accord with its genius. At this time also Mistral published some of his best lyrical poems, notably one called *The Countess*, a vigorous protest against the centralization prevailing in France. In 1867 he published a second long poem, *Calendau* (French, *Calendal*); it treats of mediæval legends and traditions, and abounds in symbolism. In 1875 appeared his only volume of lyrics, *Lis Isclo d'or*. In 1876 the Félibrige (q.v.) was formally organized into a great association with Mistral as *Capoulié* or chief. He next published *Nerto*, a fantastical tale in verse. Later he brought out his monumental dictionary of all the dialects of the *Langue d'oc, Lou tresor dou Félibrige*. In 1890 appeared *La Rèino Jano* (Queen Joanna), which he called a Provençal tragedy. It is brilliant in language, but of little dramatic power. In the same year he founded the quarterly *L'Aióli*. In 1897 appeared a third long narrative poem, *Lou pouèmo dou rose*, his best work after *Mirèio*. It is a felicitous combination of fanciful legends and realism. In 1904, with Echegaray, Mistral was awarded the Nobel prize for literature. He published in 1906 *Mes origines, mémoires et récits*, in 1910 he made a Provençal translation of Genesis, *La Genèsi traducho en provençau*, and in 1913 appeared his *Oulivado*, a collection of lyric poetry written at different times in his life. The best English translation of *Mirèio* is that of Harriet Preston (Boston, 1872); it appears also in Warner's *Library of the World's Best Literature*. There are prose translations in French by Mistral of all his works. He died March 25, 1914. Consult: Gaston Paris, *Penseurs et poètes* (Paris, 1896); Welter, *Frédéric Mistral, der Dichter der Provence* (Marburg, 1899); C. A. Downer, *Frédéric Mistral, Poet and Leader in Provence* (New York, 1901); *Memoirs of Mistral*, rendered into English by C. E. Maud: Lyrics from the Provençal by Alma Strettel (London, 1907).

MISTRETTA, mē-strĕt'tȧ. A town in the Province of Messina, Sicily, 50 miles northwest of Catania (Map: Italy, E 6). It is situated in one of the most fertile sections of the island, 3200 feet above the sea and but a short distance from it. The chief industries are farming and cattle raising. Lignite is mined in the vicinity. Pop. (commune), 1901, 13,481; 1911, 13,608.

MISTRI'AL. In law, an invalid or illegal trial of an action, the result of which is without legal effect on the cause of action, and which leaves the parties in the same position as if there had been no trial of the case. A mistrial may result from a variety of causes, as a defective plea, the failure of the parties to form a triable issue, the incompetence of the judge to act in a given case, the drawing of a jury from the wrong county, the withdrawal or death of a juror, or any other event which affects the legal validity of the proceedings. Where the prosecution of a person charged with a crime results in a mistrial the accused may be again tried, and cannot plead the constitutional defense that he has been twice in jeopardy, as that plea is valid only where the proceedings are legal and the issue is tried to a conclusion. See NONSUIT; TRIAL.

MITANI, mē-tä'nē. See AMARNA LETTERS; CUNEIFORM INSCRIPTIONS.

MITANNIANS. The name of a people living in Mesopotamia in the second millennium B.C. Our knowledge concerning them is derived chiefly from the Tel el Amarna and Boghaz Keui tablets. The Mitannians seem to have belonged to the Hittites in the wider sense of this term, but were apparently distinct from the Hatti, or Hittites, whose capital was at Boghaz Keui in the days of Subbiluliuma and his successors. (See HITTITES.) Among the leading kings of the Mitannians who are known to us were Saushshatar, Artatama I, Sutarna I, Tushratta, Artatama II, Artashshumara, Mattuaza, and Sutarna II. Tushratta was a contemporary of Subbiluliuma, and father-in-law of Amenhotep III of Egypt (1411–1389 B.C.). His three predecessors consequently reigned during the fifteenth century. This dynasty, however, does not seem to have belonged to the native Mitannian race, but to the Harri, an Aryan people, as their worship of Mitra, Varuna, Indra, and the Nashatya indicates. Winckler has suggested that these Harri first took possession of Armenia and then imposed their authority on the Mitannians. The Mitannians themselves may have been the Hittites (Hatti) who in 1932 B.C. made an end to the Amoritish dynasty of Babylon. (See BABYLONIA.) In the weakness of Assyria following Samsi Adad II (c.1870–1840) they established themselves in Mesopotamia, and the new dynasty of the Harri was able to take possession of Assyria itself, or at any rate the territory around Nineveh, so that Tushratta could send Ishtar of Nineveh to Amenhotep III in his last illness. It was evidently by an alliance with Egypt that Tushratta was able to maintain his independence of the great King of Hatti, while it is not improbable that another independent Harrian kingdom existed north of his realm adjoining the Arzawa in Armenia. As to the ethnic relations of the native Mitannians, their language seems to point to a kinship, not only with the Hittites in Asia Minor, but also with other Asianic and Caucasian peoples. Among the letters of Tushratta in the Tel el Amarna collection one is written in the Mitannian language, though in cuneiform characters. It is a square tablet whose longest side is 3 feet in length, containing two columns of text on each side, each of which has 100 lines. This letter is now in Berlin, and it was first published by Winckler in *Mitteilungen aus den k. Museen zu Berlin* (Berlin, 1890). Attempts at interpreting it were made by Brünnow, Sayce, Jensen, and Messerschmidt, but the most exhaustive study of its language has been made by Bork, who compares it throughout with the Georgian, Mingrelian, and other Caucasian tongues, and also with the Chaldian (see CHALDIANS) and the Elamitish (see ELAM), finding no similarities between it and the Aryan, Semitic, or Uralo-Altaic languages. It has been plausibly conjectured that the name Mitani occurs in the bilingual inscription on the so-called Tarkondemos boss, showing that both Hittite hieroglyphics and cuneiform script were used among the Mitannians. In the religion of this people Teshub, Nergal as sun god, and Ishara, corresponding to Ishtar, seem to have been the chief deities. Aryan divinities, possibly at that time

Iranian, were introduced by the Harri; and the worship of Akkadian, Assyrian, and Amoritish gods no doubt flourished among the Mitannians.

Bibliography. The editions of the Tel el Amarna tablets by Winckler and Knudtzon; Brünnow, Sayce, and Jensen in *Zeitschrift für Assyriologie* (Leipzig, 1890–91); Messerschmidt, "Hettiter," in *Der alte Orient* (ib., 1903); Ferdinand Bork, "Mitanninamen aus Nippur," in *Orientalistische Literatur-Zeitung* (Berlin, 1906); Winckler, in *Mitteilungen der deutschen Orientgesellschaft* (ib., 1907); M. A. S. Oppenheim, "Der Tell Halaf und die verschleierte Göttin," in *Der alte Orient* (Leipzig, 1908); Ferdinand Bork, *Die Mitannisprache* (Berlin, 1909); Winckler, *Vorderasien im zweiten Jahrtausend* (Leipzig, 1913).

MITAU, mē'tou. The capital of the Government of Courland, Russia, situated in a flat and fertile district on the left bank of the navigable Semgaller Aa, 25 miles southwest of Riga (Map: Russia, B 3). It has an immense palace erected by Biron in 1738 on the site of an older ducal palace, used as a government building. Two Gymnasia, a provincial museum with a library, and a theatre are the principal educational establishments of the town. The industries of Mitau are unimportant; the chief manufactures are flour, chocolate, oilcloth, ink, and iron products. The trade in grain and lumber is rather extensive. Pop., 1897, 35,011; 1913, 39,200, consisting of Germans (95,000), Jews (6500), Letts (6000), Russians, and Poles. The majority of the inhabitants are Protestants, and the town is the seat of a General Superintendent of the Lutheran church. The castle of Mitau was founded by the Knights Sword Bearers in the second half of the thirteenth century, and became a city in 1435. In 1561 it became the capital of the Duchy of Courland and in 1795 it was annexed to Russia. In 1812 it was occupied by the French and Prussians.

MITCH'AM. An important railway junction and suburb of London, England, on the river Wandle, in Surrey, 4 miles northwest of Croydon (Map: London, G 6). It is noted for its extensive gardens, the soil of which is especially adapted for the cultivation of roses, lavender, peppermint, and other medicinal herbs, from which an excellent quality of essential oil is extracted. Mitcham Common, covering 480 acres, is a favorite recreation ground for golfers. Pop., 1901, 14,904; 1911, 29,606.

MITCH'EL, John (1815–75). An Irish Nationalist agitator. He was born at Camnish, County Londonderry, Ireland; was educated at Trinity College, Dublin; and studied and practiced law. Through his *Life of Hugh O'Neil, Prince of Ulster* (1845), he gained a reputation as a writer and a Nationalist. He became a contributor to the Irish *Nation*, and, after the death of Thomas Osborne Davis, was its chief editor. He withdrew from the *Nation* in 1848 and established the *United Irishman*. In the same year he was arrested under the Treason-Felony Act, was convicted and sentenced to transportation for 14 years, and was sent to Bermuda for one year and then to Tasmania. Escaping from the convict colony in 1853, he came to the United States, and in the following year established at New York the *Citizen*. He removed to Knoxville, Tenn., in 1857, started the *Southern Citizen*, and advocated in it the revival of the African slave trade. He lived in Paris in 1860–62, then returned to America, and for a time edited the Richmond *Enquirer*, a semiofficial organ of the Confederate government. He afterward went back to New York and in 1867 started the *Irish Citizen*, which had only a short career, being discontinued in 1872. He visited Ireland in 1872, and in 1875 he was elected to Parliament from Tipperary, but was declared ineligible and denied his seat on the ground that he was a convicted felon. He was elected a second time, but died before his case could be tested. His three sons were all in the Confederate army in the American Civil War. Besides the work already mentioned he published *The Last Conquest of Ireland (perhaps)* (1860) and *History of Ireland from the Treaty of Limerick* (1868); and edited *The Poems of Thomas Osborne Davis* (1856) and of *James C. Mangan* (1859), with biographies. Consult W. Dillon, *John Mitchel* (London, 1888).

MITCHEL, John Purroy (1879–1918). An American mayor, born at Fordham, N. Y. He studied in St. John's College; graduated from Columbia University in 1899 and from the New York Law School in 1901. Admitted to the bar in the latter year, he was special counsel for the city of New York in 1906–07. His rapid rise in politics was due to his success as an investigator and prosecutor of grafters while commissioner of accounts of New York in 1907–09. To this office he had been appointed by his friend, Mayor McClellan. The trial and conviction of the grafters gave Mitchel standing with the good-government advocates of New York, and he was elected on a fusion ticket as president of the board of aldermen for the term 1909–13. Mitchel was acting mayor and demonstrated ability as an executive officer. A Democrat in politics, he was appointed collector of the port of New York by President Wilson in 1913. In that year, also, he became a candidate for the nomination for mayor on the fusion ticket, contesting for the place with District Attorney Whitman. The citizens' committee gave him the nomination, and in the regular election he defeated the Tammany ticket headed by Edward F. McCall. The issue most prominent was Tammany control, which had been sharply criticized because of alleged graft and the Sulzer impeachment. His administration was characterized by economy and efficiency. Defeated for reëlection in 1917, he joined the U. S. Air Service and was killed in an airplane accident July 6, 1918 at the Gerstmer Aviation Camp, Lake Charles, La.

MITCHEL, Ormsby McKnight (1810–62). An American astronomer, educator, and soldier. He was born in Union Co., Ky., was a clerk for some time in a country store, and graduated at West Point in 1829. From 1829 to 1831 he was assistant professor of mathematics at West Point and in 1832 he resigned from the service. He practiced law in Cincinnati from 1832 to 1834 and for the next 10 years was professor of mathematics, philosophy, and astronomy in the Cincinnati College. In 1836–37 he was chief engineer of the Little Miami Railroad and was consulting engineer to the Ohio and Mississippi Railroad in 1848–53. He was adjutant general of Ohio in 1847. He was an enthusiastic student of astronomy and took an important part in procuring the erection of an observatory in Cincinnati, of which, when it was completed, he became the director, combining with this position in 1859 the directorship of the Dudley Observatory in Albany. On the outbreak of the Civil War he entered the Federal army, was com-

missioned a brigadier general of volunteers in August, 1861, and from September 19 to November 15 commanded the Department of the Ohio. In April, 1862, he was promoted to a major-generalship of volunteers in recognition of a brilliant movement into northern Alabama whereby he secured the control of 120 miles of railway. On Sept. 17, 1862, he was placed in command of the Department of the South, but before he had time to begin active operations he was attacked by yellow fever and died at Beaufort, S. C. He made several important astronomical discoveries, including, with exactness, that of the period of rotation of the planet Mars. He edited the *Sidereal Messenger*, which he founded, from 1846 to 1848, and published a number of works on astronomical subjects, including *The Planetary and Stellar Worlds* (1848); *The Orbs of Heaven* (1851); *Popular Astronomy* (1860), which, with *The Orbs of Heaven*, was reissued at London in 1892. *The Astronomy of the Bible* was published posthumously in 1863. Consult the biography by F. A. Mitchel (Boston, 1887).

MITCHELL. A city in Lawrence Co., Ind., 61 miles northwest of New Albany, on the Baltimore and Ohio Southwestern and the Chicago, Indianapolis, and Louisville railroads (Map: Indiana, E 7). Fruit growing and the manufacture of Portland cement are the chief industries. Of interest in the vicinity are numerous caves, notably Donaldson and Hamer's. The electric-light plant is owned by the city. Pop., 1900, 1772; 1910, 3438.

MITCHELL. A city and the county seat of Davison Co., S. Dak., 72 miles west by north of Sioux Falls, on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads and on the James River (Map: South Dakota, F 4). It has Dakota University (Methodist Episcopal), established in 1888, a Carnegie library, city hall, opera house, and St. Joseph Hospital. The city maintains a beautiful corn palace, where a splendid exposition, attracting a large number of visitors, is given each year. The centre of a fertile agricultural region, Mitchell exports grain and live stock; it has a creamery, railroad and machine shops, cigar and candy factories, grain elevators, brick and lumber yards, wholesale fruit houses, etc. Settled in 1879, Mitchell was incorporated in 1883 and is governed under a charter, secured by general legislative act of 1890, which provides for a mayor, elected every two years, and a city council of which the executive is a member. The water works are owned by the municipality. Pop., 1900, 4055; 1910, 6515.

MITCHELL, Alexander (1817–87). An American financier and railroad president, born near Ellon, Aberdeenshire, Scotland. In 1839 he came to the United States at the request of George Smith, a Scotchman who was interested in the development of the West, and was made president of the Wisconsin Marine and Fire Insurance Company, at the new town of Milwaukee. Mitchell settled in Milwaukee, and his name is inseparably connected with the development of that city and region. In 1861, appointed head of the Milwaukee debt commission, he labored effectively to restore the city's impaired credit. In 1864 Mitchell effected a combination of several roads into the Chicago, Milwaukee, and St. Paul Railroad Company, of which he was president from its organization until his death. He was a Republican until after the war, but left the party on the reconstruction issue, in 1868 was elected to Congress as a Democrat, and served until 1875.

MITCHELL, Alexander Ferrier (1822–99). A Scottish divine and scholar, the historian of the Westminster Assembly. He was born at Brechin in Forfarshire, Sept. 10, 1822, and after graduating from the University of St. Andrews he became minister at Dunnichen (1847–48). He resigned to accept the professorship of Hebrew in the University of St. Andrews. In 1868 he was transferred to the chair of ecclesiastical history and divinity. He held some of the highest offices in the Church of Scotland and was an active member of the Scottish Text and History societies. Among his publications are: *The Westminster Confession of Faith* (1866); *Minutes of the General Assembly 1644–49* (1874); *The Westminster Assembly: Its History and Standards* (1883; new ed., 1895); *Catechisms of the Second Reformation* (1886); *Reprint, with Introduction, of the First Protestant Treatise in Scottish Dialect* (1888). He died March 22, 1899.

MITCHELL, Donald Grant (1822–1908). An American author, well known by his pseudonym Ik Marvel. Born in Norwich, Conn., he graduated from Yale College (1841), and for three years worked on a farm near his native town. In 1844 he went to Europe, living for ten years on the island of Jersey, and bringing out on his return *French Gleanings, or a New Sheaf from the Old Fields of Continental Europe* (1847) and in 1849 *The Battle Summer*, sketches reminiscent of the outbreak in Paris two years before. In 1850 he produced *The Lorgnette, or Studies of the Town*, a series of mildly satirical papers in the manner of Irving's *Salmagundi*. The same year and the following year he wrote the books most popularly associated with his pseudonym, *A Bachelor's Reveries* (more recently renamed *Reveries of a Bachelor*) and *Dream Life*. These gained him admission to the American Academy of Arts and Letters. In 1853 Mitchell was appointed United States Consul at Venice. On his return, in 1855, he bought a farm (known as "Edgewood") near New Haven, Conn. There he wrote books dealing, in an agreeable mixture of philosophy, farming, and anecdote, with the joys of country life: *My Farm of Edgewood* (1863); *Wet Days at Edgewood* (1865); *Dr. Johns* (1866), a novel of religious type; *Rural Studies, with Hints for Country Places* (1867); and several books of travel and sketches, such as *Seven Stories, with Basement and Attic* (1864); *English Lands, Letters, and Kings* (4 vols., 1889); *American Lands and Letters* (2 vols., 1898–99). Consult P. E. More, *Shelburne Essays* (5th series, New York, 1908).

MITCHELL, Edward Page (1852–). An American newspaper editor. He was born at Bath, Me., and in 1871 graduated from Bowdoin College, which conferred on him the honorary degree of Litt.D. in 1907. He joined the staff of the Boston *Advertiser* in 1871, but after 1875 was on the editorial staff of the New York *Sun*, of which he became editor in 1911. In 1913 he was a special lecturer at the Columbia School of Journalism. In 1909–11 he was president, and thereafter was vice president, of the Sun Printing and Publishing Company. Mitchell's writing gave the *Sun's* editorial page the reputation of being one of the most brilliant in the country. He contributed stories and sketches to the magazines.

MITCHELL, Elisha (1793–1857). An American scientist, born at Washington, Conn. He graduated at Yale in 1813 and was ordained into the Presbyterian ministry in 1821. After teaching in Yale he became professor of mathematics and natural philosophy at the University of North Carolina in 1817, and in 1825 professor of chemistry, mineralogy, and geology at the same institution. In the capacity of State surveyor he ascended a number of the North Carolina mountains, and was finally killed by a fall from a precipice on a mountain which he had just ascertained to be the highest in the United States east of the Rockies. On this summit, called Mount Mitchell (see Black Mountains), the discoverer's body is buried. His works include a series of reports on the geology of North Carolina (1826–27); *Elements of Geology, with an Outline of the Geology of North Carolina* (1842); and various articles which he contributed to scientific publications.

MITCHELL, Henry (1830–1902). An American hydraulic engineer, brother of Maria Mitchell. He was born in Nantucket, was educated in private schools, and early devoted himself to the study of tides and river currents, being first employed by the United States Coast Survey to report on the waters about Nantucket and Marthas Vineyard. After assisting the commissioners on harbor encroachments in New York City and discovering the underflow of the Hudson (1859), Mitchell was consulting engineer to the United States Commission on Boston Harbor (1860–67) and member of the commission; in 1867 was sent to study the decline of Greytown harbor, Nicaragua; and in 1874 was appointed a member of the board of engineers to improve the mouth of the Mississippi. In 1879 he visited the Suez Canal and reported on it. Mitchell was elected to the National Academy of Sciences in 1885 and in 1888 retired from active business. His papers on physical hydrology mostly appeared in the United States Coast Survey Reports.

MITCHELL, Hinckley Gilbert (1846–). An American theologian, born at Lee, N. Y. He graduated at Wesleyan University (1873) and at the Divinity School of Boston University (1876), and after studying at Leipzig, preached in the Methodist Episcopal church at Fayette, N. Y. (1879–80); taught at Wesleyan (1880–83); and thereafter until 1905 was professor of Hebrew and Old Testament exegesis at Boston University. For denying the historicity of the early chapters of Genesis he was refused confirmation by the Board of Bishops of the Methodist Episcopal Church in 1905. From 1906 to 1910 he was engaged in exegetical studies, and then became professor of Hebrew and Old Testament exegesis at Tufts College. He was director of the American School for Oriental Study and Research in Palestine in 1901–02. His publications include: *Hebrew Lessons* (1884, 1897); *Amos* (1893), a translation of Piepenbring's *Theology of the Old Testament* (1893); *Isaiah: A Study of Chapters i–xii* (1897); *Genesis* (1909); *Ethics of the Old Testament* (1912).

MITCHELL, John (?–1768). An Anglo-American botanist and geographer, a physician by profession. He settled at Urbana, Va., about 1700. It was after him that the *Mitchella repens* was named by Linnæus. He wrote *Nova Plantarum Genera* (1741) and an *Essay on the Causes of Different Colors of People in Different Climates* (1744); but his name is best known in connection with *A Map of the British and French Dominions in North America* (1755).

MITCHELL, John (1870–). An American labor leader, born at Braidwood, Ill. He attended night schools as a boy and later studied law for a year. Afterward he made a private study of economics. He became a coal miner in 1882; worked and traveled in the West from 1885 to 1890; was made a subdistrict secretary and treasurer of the United Mine Workers of America in 1895; and from 1899 to 1908 was president of the organization. During his administration the union was substantially enlarged, and he effectively gave his influence and efforts to securing increase of wages and an extension of the benefits of the eight-hour law. Mitchell served as fourth vice president of the American Federation of Labor in 1898–1900 and as second vice president from 1900 to 1914. He directed the successful strikes of the anthracite miners in 1900 and 1902; the latter was brought to a close largely as a result of Mitchell's offer as the representative of the miners to accept the decision of a commission of arbitration to be appointed by the President of the United States (Roosevelt). From the first he exerted his influence in behalf of good faith on the part of labor unions in all dealings with employers. From 1908 to 1911 he was chairman of the Trade Agreement Department of the National Civic Federation, and thereafter was a member of numerous industrial commissions in New York State. Mitchell, in company with Gompers and Morrison (qq.v.), was involved in the famous Buck Stove case. The American Federation of Labor had been publishing a list of manufacturers whom they regarded as unfair in their dealings with organized labor, and advised that the organization boycott their production. Among these names was that of the Buck Stove and Range Company. In 1907 this company secured, in the court of the District of Columbia, an injunction against the officers of the federation. The publication of the name on the black list continued, however, and Mitchell and his colleagues were, in 1908, adjudged in contempt of court and sentenced to a term of imprisonment. Although the case was later dismissed on technical grounds by the Supreme Court, it was important in that it gave much impetus to the movement against injunctions in labor questions—a movement which secured prohibition of such use in the Clayton Antitrust Act of 1914. In 1914 Mitchell was appointed by Governor Glynn of New York to the State Workmen's Compensation Board for a four-year term, and when, in 1915, a new Industrial Commission took over the functions of the Board, he became a member of this. He is author of *Organized Labor: Its Problems, Purposes, and Ideals* (1903) and *The Wage Earner and his Problem* (1913). Consult H. W. Laidler, *Boycotts and the Labor Struggle* (New York, 1914). See Injunction.

MITCHELL, John Ames (1845–1918). American editor and author, born in New York City and educated at Exeter, N. H., and at the Lawrence Scientific School, Harvard, after which he studied architecture (1867–70) in Boston and at the Ecole des Beaux-Arts, Paris. He returned to practice for six years in Boston, but in 1876 went again to Paris, this time to study drawing and painting. From 1880 to 1883 he was active in New York as an artist,

illustrator, and writer. In 1883 he founded the comic weekly *Life*, perhaps the best periodical of its kind in the United States—an American *Punch* or *Fliegende Blätter*. From the time of its founding Mitchell gave the periodical his closest attention both as to general policy and as to detail. In addition to his work as artist and editor he published: *Croquis de l'Exposition* (Paris, 1879); *The Summer School of Philosophy at Mount Desert* (1881); *The Romance of the Moon* (1886); *The Last American* (1889); *"Life's" Fairy Tales* (1893); *Amos Judd* (1895); *That First Affair* (1896); *Gloria Victis* (1897); *The Pines of Lory* (1901); *The Villa Claudia* (1904); *The Silent War* (1906); *Dr. Thorne's Idea* (1910); *Pandora's Box* (1911).

MITCHELL, John Kearsley (1798–1858). An American physician, born in Shepherdstown, Va. He graduated at the Medical College of the University of Pennsylvania in 1819. Before he went to Philadelphia in 1822 to practice his profession he made three voyages to the Far East as ship's surgeon. In 1826 he became professor of medicine and physiology at the Philadelphia Medical Institute and in 1833 professor of chemistry at the Franklin Institute. From 1841 to 1858 he was professor of the theory and practice of medicine in Jefferson Medical College. His works include: *St. Helena* (1821), a poem; *On the Wisdom, Goodness, and Power of God as Illustrated in the Properties of Water* (1834); *Indecision, a Tale of the Far West, and Other Poems* (1839); *On the Cryptogamous Origin of Malarious and Epidemic Fevers* (1849); the posthumous *Five Essays on Various Chemical and Medical Subjects* (1858), brought out by his son, S. Weir Mitchell (q.v.).

MITCHELL, Langdon Elwyn (1862–). An American playwright, son of S. Weir Mitchell. Born in Philadelphia, he studied in Dresden and Paris, attended the Harvard and Columbia law schools, and was admitted to the New York bar in 1886. He wrote under the pen name of John Philip Varley, and his plays include: *In the Season*, produced in London, 1893; *Becky Sharp*, produced in 1899, a dramatization of Thackeray's *Vanity Fair; A Kentucky Belle; Step by Step; The New Marriage; The New York Idea*, produced in London, 1907; *The Kreutzer Sonata*, adapted from the Yiddish of Jacob Gordin (1907). He is also author of *Sylvian and Other Poems* (1884); *Poems* (1894); *Love in the Backwoods* (1896). Mitchell became a member of the National Institute of Arts and Letters.

MITCHELL, Margaret Julia (popularly known as Maggie Mitchell) (1832–1918). An American actress, born in New York. She made her first regular appearance as Julia in *The Soldier's Daughter* at the Chambers Street Theatre, New York, in 1851. The parts in which she was best liked were Jane Eyre, Mignon, Little Barefoot, and Fanchon the Cricket. She was married first to Henry Paddock, her manager, in 1868, and later to Charles Abbott, and retired from the stage to live in New York.

MITCHELL, Maria (1818–89). An American astronomer, born Aug. 1, 1818, at Nantucket, Mass. She was of Quaker ancestry. Her father, William Mitchell, a teacher and then a bank cashier, gave much attention to astronomy as an avocation and made meteorological observations for the government; her brother was the hydraulic engineer Henry Mitchell (q.v.). Miss Mitchell early became greatly interested in using her father's observatory, poorly equipped though it was, and devoted herself especially to the study of nebulæ and comets. During this period she was also librarian of the Nantucket Athenæum library, where before 1855 she had introduced a system of card indexing. After 1847, when she announced the discovery of a new telescopic comet and was awarded therefor a gold medal by the King of Denmark, Maria Mitchell's position was recognized throughout the scientific world. From 1849 to 1868 she was one of the computers for the *Nautical Almanac*. During her travels in Europe in 1857–58 she was the guest of noted foreign astronomers, and soon after her return the women of America presented to her a large equatorial telescope. At Lynn, Mass., whither she and her father removed, she built an observatory and continued her investigations until 1865, when, on the establishment of Vassar College, she was called to the chair of astronomy. This position Miss Mitchell held until ill health forced her retirement in 1888. Her resignation was not accepted, but she was granted an indefinite leave on full salary. A member and later a fellow of the American Association for the Advancement of Science and a fellow of the American Academy of Arts and Sciences, she was the first woman to be admitted to the latter body. Columbia gave her the degree of LL.D. in 1887. Her later studies were of the sun and of Jupiter and Saturn. Miss Mitchell died at Lynn, June 28, 1889. An observatory in her memory was dedicated at Nantucket in 1908. Her numerous scientific papers have not been published in collected form. Consult: M. W. Whitney (associate and successor of Miss Mitchell at Vassar), *In Memoriam* (Poughkeepsie, N. Y., 1889); Henry Mitchell, in the *Proceedings of the American Academy of Arts and Sciences*, vol. xxv (Boston, 1889–90); P. M. Kendall, *Life, Letters, and Journals of Maria Mitchell* (Boston, 1896); M. K. Babbitt, *Maria Mitchell as her Students Knew her* (Poughkeepsie, N. Y., 1912).

MITCHELL, Mount. See Black Mountains.

MITCHELL, Peter (1824–1899). A Canadian statesman. He was born in Newcastle, New Brunswick, was educated there, and in 1848 was called to the bar. He was a Liberal member of the New Brunswick Legislative Assembly in 1856–60 and in 1860 was appointed a member of the Provincial Legislative Council. In 1858 he became a member of the New Brunswick administration, firmly supported responsible government, and in 1865 suffered defeat with his government on the question of a federal union of all British North America, which he strongly favored and worked for. He was Premier of New Brunswick in 1865–67, taking office in order to test the opinion of the province on the question of confederation. When the vote was taken, confederation was carried by 33 to 8. He was a delegate to the Charlottetown and Quebec conferences on confederation in 1864 and a delegate to London in 1866 to consult in that behalf with the British government. In 1867 he was appointed Senator, but in 1874 resigned. He was Minister of Marine and Fisheries in the coalition cabinet of the Dominion government in 1867–73, was the original organizer of that department, and in 1882 was elected to the Dominion Parliament for Northumberland County, New Brunswick. In 1885 he purchased the Montreal *Herald* and for some years was

its editor. He was in 1897 appointed inspector of fisheries for the Atlantic provinces. His publications include *A Review of President Grant's Recent Message to the United States Congress, Relative to the Canadian Fisheries and the Navigation of the St. Lawrence River* (1870) and *Notes of a Holiday Trip* (1880).

MITCHELL, Peter Chalmers (1864–). A British zoölogist. He was born in Dunfermline, Scotland, the son of a clergyman; was educated at Aberdeen and at Christ Church, Oxford; and was assistant in zoölogy at Oxford in 1888–91. He lectured on biology at Charing Cross Hospital in 1892–94 and in 1903 became examiner in zoölogy to the University of London and secretary to the Zoölogical Society of London. Besides contributions to technical periodicals he wrote: *Outlines of Biology* (1894); an excellent critical sketch of Huxley (1900); *The Childhood of Animals* (1912).

MITCHELL, Samuel Alfred (1874–). An American astronomer. He was born at Kingston, Ontario, where he graduated M.A. at Queen's University in 1894. In 1898 he took his Ph.D. at Johns Hopkins. At Columbia he was tutor in astronomy (1899–1905), instructor (1905–08), and adjunct professor (1908–13), and at the Yerkes Observatory (Williams Bay, Wis.) research associate in the summers of 1907 and 1909–11. In 1913 he became professor of astronomy and director of McCormick Observatory at the University of Virginia. He was a member of the United States eclipse expeditions to Georgia in 1900, to Sumatra in 1901, and to Spain in 1905.

MITCHELL, Samuel Augustus (1792–1868). An American geographer. He was born in Bristol, Conn., but removed to Philadelphia. He prepared textbooks of geography for the use of schools, as well as maps and treatises. His books had a very extensive sale. His publications included: *American Traveler* (1843); *General View of the World* (1846); *Geographical Reader* (1849); *Traveller's Guide through the United States* (1850); *Universal Atlas* (1851); and many other works.

MITCHELL, S(ilas) Weir (1829–1914). A distinguished American neurologist and man of letters. He was born in Philadelphia, Feb. 15, 1829, the son of John Kearsley Mitchell (q.v.). Although ill health prevented graduation with his class at the University of Pennsylvania, he later entered Jefferson Medical College, Philadelphia, and took his degree in 1850. After a few years spent in general practice, Mitchell turned his attention almost entirely to diseases of the nervous system, a field in which he early achieved eminence. His special title to fame is derived from his elaboration of the system of rest treatment which has borne his name for many years and has been adopted, with modifications, the world over. His earliest work of importance consisted of researches upon the chemical composition and physiological action of the venom of snakes, in 1866 and later. He was assistant surgeon to the United States Hospital for Nervous Diseases during the Civil War and thereafter was a prolific contributor to medical literature. Besides scores of essays and monographs upon toxicology, comparative physiology, and clinical medicine, his publications include the following books or pamphlets on medical subjects: "Researches upon the Venom of the Rattlesnake," in *Smithsonian Contributions to Knowledge* (1860); *Injuries of Nerves and their Consequences* (1864); *Wear and Tear, or Hints for the Overworked* (1873); *Rest in the Treatment of Disease* (1875); *Fat and Blood, and how to Make them* (1877); *Doctor and Patient* (1888); *Clinical Lessons on Nervous Diseases* (1895). Among his later papers may be mentioned *A Clinical Reëxamination of the Motor Symptoms of Chorea* (1898) and *The Medical Department in the Civil War* (1914).

Dr. Mitchell first turned his attention to fiction and general literature during the Civil War, when he wrote *The Children's Hour,* to be sold during the great fair of the Sanitary Commission in Philadelphia. Among other pieces of juvenile fiction was *The Wonderful Stories of Fuz-buz, the Fly, and Mother Grabem, the Spider* (1867). His first novels were *Hephzibah Guinness, Thee and Thou,* and *A Draft on the Bank of Spain* (all published in 1880). Other books followed, including: *In War Time* (1882); *Roland Blake* (1884); *Characteristics* (1892); *Collected Poems* (1896); *Hugh Wynne, Free Quaker* (1898), a story of the American Revolution which ranks among the best of American historical novels; *The Adventures of François* (1898); *Dr. North and his Friends* (1900); *Circumstances* (1901); *The Youth of Washington* (1904); *Constance Trescot* (1905); *A Diplomatic Adventure* (1906); *The Red City* (1908); *John Sherwood, Ironmaster* (1911); *Westways* (1913); *Complete Poems* (1914).

Dr. Mitchell's eminence in science and letters was recognized by honorary degrees conferred upon him by several universities at home and abroad and by membership, honorary or active, in many American and foreign learned societies. In 1887 he was president of the Association of American Physicians and in 1908–09 president of the American Neurological Association. He died Jan. 4, 1914. Consult, for bibliography of Dr. Mitchell up to 1894, *A Catalogue of the Scientific and Literary Work of S. Weir Mitchell* (Philadelphia, 1894). Critical and biographical matter of interest will be found in the following: Talcott Williams, "Dr. S. Weir Mitchell," in the *Century Magazine,* vol. lvii (New York, 1898); in several articles in the *Book News Monthly,* vol. xxvi (Philadelphia, 1907); E. P. Oberholtzer, "Personal Memories of Weir Mitchell," in the *Bookman,* vol. xxxix (New York, 1914); B. R. Tucker, *S. Weir Mitchell* (Boston, 1914).

MITCHELL, Sir Thomas Livingstone (1792–1855). A Scottish explorer. He was born in Stirlingshire, Scotland, began his service in the British army in the Peninsular campaign of 1808, and in 1826 was promoted to be major. He was then sent to make surveys and plans of the Peninsular battlefields. In 1827 he published *Outlines of a System of Surveying for Geographical and Military Purposes* and was made Deputy Surveyor-General of New South Wales in 1828. Besides attending to the routine work of this office he led four exploring expeditions into the interior of Australia. In 1835 he traced the course of the river Darling, which he followed, in 1836, as far as the Murray River, with which it unites. In the same expedition he followed the Glenelg River to the ocean. He gave the world the results of his explorations in his *Three Expeditions into the Interior of Eastern Australia* (2 vols., 1838). He went to England in 1839, and on his return to Australia in 1840 conducted a fourth exploring expedition, which is described in his *Journal of an Expedition*

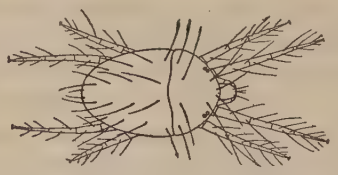
into the Interior of Tropical Australia in Search of a Route from Sydney to the Gulf of Carpentaria (1848). In addition he published *Australian Geography* (1850) and *The Lusiad of Camoens Closely Translated* (1854).

MITCHELLA. See PARTRIDGE BERRY.

MITCH'ILL, SAMUEL LATHAM (1764–1831). An American scientist, born at North Hempstead, Long Island, N. Y. He graduated in medicine at the University of Edinburgh in 1786 and from 1792 to 1801 was professor of chemistry, natural history, and philosophy in Columbia College. In 1796 he made a geological and mineralogical tour of the State of New York, and his report thereon gave him an international reputation in scientific circles. Jointly with Dr. Edward Miller and Elisha H. Smith he established the quarterly *Medical Repository,* of which he was for 18 years the editor. He several times represented his district in the State Legislature and in Congress, and in 1804 was elected a Democratic United States Senator. In 1808–20 he was professor of natural history and in 1820–26 professor of botany and materia medica in the College of Physicians and Surgeons. In 1818 he was appointed surgeon-general of the New York State militia. He was called the "Nestor of American science." His researches embrace a wide variety of scientific and philosophical subjects, and he published a large number of papers and several larger works. Consult "Memorable Events and Occurrences in the Life of Samuel L. Mitchill, of New York, from the Year 1786 to 1827," by himself and Dr. Francis, contained in S. D. Gross, *Lives of Eminent American Physicians and Surgeons of the Nineteenth Century* (Philadelphia, 1861).

MITE, mīt, (AS. *mīte,* OHG. *mīza, mizza,* Ger. *Miete;* probably connected with Goth. *maitan,* OHG. *meizan,* to cut). Any one of the Acarina, an order in the class Arachnida. They may be distinguished from other arachnids by their small size; by the unsegmented body, without a constriction between the anterior portion or cephalothorax and the posterior portion or abdomen; and by the lack of median eyes. There are exceptions, however, to all these characteristics, and certain forms have been misplaced even by naturalists. The mouth segments have become united to form a beak or rostrum, but this character is not easily recognized. The young mite, on hatching from the egg, is not provided with eight legs as are other arachnids, but with only four or six, except in the case of *Pteroptus.* In size mites vary from tiny creatures, invisible to the naked eye, to certain tropical forms fully half an inch long.

Typically, mites have four pairs of legs, arranged more or less definitely in two groups. The two hinder pairs are apparently attached to the abdomen, while the anterior pairs are close to the mouth parts, which consist of mandibles of varied character, palpi, and maxillæ. The mandibles are typically chelate, but in several families they are reduced to needle-like piercing organs. In the case of certain gamasid mites the mandibles are nearly as long as the entire animal, and can be wholly retracted within the body, or suddenly extruded to seize the prey. The palpi are of four kinds. Simple, filiform palpi, which have a tactile function, are found in many families. In some parasitic forms the palpi are reduced in size and united to the rostrum. In many predatory mites the palpi are modified for raptorial organs. In some of the water mites the palpi have become organs for holding the mite to other objects. The legs of mites are composed of from five to seven segments, and commonly terminate in from one to three claws. In many genera a



A MITE OR RED SPIDER (*Tetranychus bimaculatus*).

cup-shaped sucking disk or ambulacrum is attached to the tarsus or last segment. The reproductive organs, as in other arachnids, open on the underside of the abdomen near its base. The body and legs are more or less thickly clothed with bristles, hairs, or scales, which are of characteristic nature and arrangement in each species. In many of the soft-bodied species there are chitinous plates or shields, sometimes so large or numerous as almost completely to cover the mite. In the ticks the body is flat and of a tough, leathery consistency.

The sense organs are few and of simple nature. Many mites have no eyes, but in some there are one or two ocelli-like spots on each side of the cephalothorax. A few families have what are considered organs of hearing. With the ticks this organ is a membrane-covered pit in the anterior tarsi; in the beetle mites it is a pore on the posterior margin of the cephalothorax, from which arises a bristle. The sense of touch is supposed to reside in some of the hairs of the body or legs. In many mites there is a considerable difference in appearance between the two sexes, although there is not often much difference in size.

Centralization is the peculiar characteristic of the anatomy of mites. The various organs are more crowded together than in other arachnids. The digestive system, when complete, consists of the pharynx or sucking organ, the œsophagus, the ventriculus or stomach, with its cæca, the hind-gut, and the Malpighian vessels. The œsophagus is a long, simple tube extending through the centre of the brain. The stomach is of varied size, according to food habits; in some forms it is very small, while the cæca are numerous and long. The hind-gut or intestine is a short tube ending in the rectum. The Malpighian vessels, when present, are two in number and enter the intestine near its end. In some mites there is a well-developed dorsal pulsating organ or heart, but in others it is not present. The nervous system consists of one ganglionic mass surrounding the œsophagus, from which all the principal nerves arise. Many mites have an elaborate system of tracheæ by which they breathe and which open in various parts of the body, in many common species near the mandibles, but in the ticks and gamasids they open by stigmata near the hind legs. A great number of mites, however, have no internal respiratory system whatever. In these the skin is soft and they absorb oxygen by osmosis.

Life History. Nearly all mites deposit eggs, frequently of large size. In a few forms the larvæ issue from the parent, but in some cases it is rather from the egg within the body of the dead mite. In many cases the hard external skin or chorion of the egg splits into halves and

exposes the lining vitelline membrane; this permits the maturing egg to increase in size, which is then called a deutovum. The young larvæ on hatching commonly have six legs, but the gall mites have but four. During the nymphal stage the mite feeds until it attains adult size. In many cases the nymph molts directly into the adult mite, but in several families the nymph often transforms into a creature entirely different from both the nymph and the adult—the hypopial stage, or hypopus, long supposed to be a distinct genus of mites. On its ventral or under surface is an area of sucking disks, by which the hypopus attaches itself to an insect or small mammal and is transported to some new and suitable locality, where it falls from its carrier, molts into an octopod nymph, begins feeding, and in due time becomes an adult mite. The hypopus is, therefore, not a parasite, but a commensal, making use of the carrier only for transportation; and in certain gamasids (*Uropoda*) the mite in this migratorial stage is attached by a thread of hardened excrement to its host.

In some families (as the Trombidiidæ) the larval and nymphal stages are attached to various insects and feed thereon, while the adult is free. In some of the beetle mites the nymph carries on its back old molted skins, eggshells, and other débris. In these mites there is a considerable resting period while the nymph is changing to the adult, a period when much of the internal anatomy is entirely changed; and it has been observed that when the adult emerges its legs are not withdrawn from the legs of the nymph but from beneath the body. In the bird mites there is a transition form between the nymph and the adult female, known as the nymphal female. The adult male mates with this nymphal form, and when the real adult emerges, an egg, already of considerable size, is seen in her body. Parthenogenesis has been observed in a number of mites. As a rule, mites possess no special accessory sexual organs, comparable to those of spiders, but in some male gamasids the mandibles carry the globule of sperm cells and insert it in the female vulva. In many species the males have one pair of legs enlarged and modified to act as claspers for holding the female. The eggs are usually deposited singly, but many gall mites and harvest mites place them in clusters.

Habits. The habits of mites are very diverse. Most mites ordinarily move quite slowly and deliberately; very few mites are fitted for leaping. The spinning mites, or "little red spiders" (*Tetranychus*), produce a tiny thread wherever they go, the accumulated threads of many individuals making a whitish mesh or web. More than one-half of the known mites are parasitic, at least during part of their life. The ticks are well known to infest various mammals, birds, and even snakes and turtles. They have mouth parts especially fitted for cutting into the skin of the host and sucking up the blood. (See TICK.) One group of the gamasids is parasitic on bats, birds, and small mammals. The bird mites live upon the skin and feathers of birds, but as they feed upon epidermal scales and loose bits of feathers, they do not injure their hosts, but are rather of service in keeping the skin and feathers clean. The itch mites burrow within the skin of man and other mammals. Other species live in the cellular tissue of birds. A few occur in the tracheal passages of seals, and one has been found living in the lung of a monkey. Many species feed on living plants, and the gall mites produce deformations on the leaves and twigs of plants. Since these gall mites are invisible to the unaided eye, the deformations were formerly supposed to be fungi. Many of the beetle mites feed on fungi, lichens, and other low vegetation. A large number of mites are predacious and attack other mites and small insects. There is a large family, the water mites, living in fresh water, sometimes as commensals within the gills of bivalve mollusks; another group lives in the ocean, even at a considerable depth. In recent years investigators have found a number of mites associated with ants.

Injuries. The injuries caused by mites are arranged in two classes—injuries to man and domestic animals and injuries to cultivated plants and stored food. The most notable of the former class are the ticks. The famous miana bug of Persia is a tick of the genus *Argas*, which inhabits houses, and the early travelers in those regions declared that its bite or puncture would produce convulsions, delirium, and even death. Specimens kept in Europe, however, have proved to be comparatively harmless. The moubata bug of Africa is a similar tick with a similar reputation. An allied species, the chicken tick (*Argas miniata*), does considerable damage to poultry in the Southern States. The cattle tick (*Boöphilus bovis*) is the most injurious of all mites, as it occurs in nearly all warm countries and is the means of spreading the Texas or Southern cattle fever. The itch mites, that cause a disgusting scaling of the skin, were formerly not uncommon, but modern cleanliness has largely abolished them in the case of man. A species known as the sheep scab mite (*Psoroptes communis*) is the cause of much injury to sheep, both in flesh and wool. The red

CLOVER MITE (*Bryobia pratensis*).

spider (*Tetranychus*) is a perennial source of trouble to greenhouse and outdoor plants, while the clover mite is a pest of fruit trees in the West, and a related form (*Stigmœus*) injures pineapples in Florida. To the family of cheese or flour mites (Tyroglyphidæ) belong a number of injurious species. The true cheese or flour mites (*Tyroglyphus* and *Aleurobius*) feed on a great variety of stored products—cheese, flour, hams, cereals, drugs, seeds, and dried fruits. Although they are very small, they multiply so rapidly that attacked materials are completely overrun with them in a few days. Some species infest mushrooms and are a serious hindrance to their cultivation. The bulb mite or eucharis mite (*Rhizoglyphus*) burrows within bulbs and the roots of plants, thereby giving entrance to destructive fungi; the bulbs of lilies and orchids are particularly subject to their ravages. A few species of gall mites are of great economic

importance, especially the pearleaf blister mite (*Eriophyes pyri*), which is a notorious enemy of pear culture in the United States. Certain species of Tarsonemidæ, living in enormous numbers in the heads of grasses, are known to cause a whitening of the grass, called silvertop.

Comparatively few mites are beneficial to man. One of the harvest mites is known to destroy the eggs of grasshoppers, and various species of *Cheyletus* prey on the flour mites and other injurious forms. Several species have been found feeding on scale insects.

Classification. The mites, formerly all kept in one family, have, in recent years, been divided into from 10 to 30 families, according to the author. The leading families are the following:

Trombidiidæ and Rhyncholophidæ, or harvest mites; many of large size and bright-red color.

Eupodidæ, consisting of many small, soft-bodied species that occur on moist soil.

Tetranychidæ, spinning mites, red spiders, and clover mites.

Bdellidæ, or snouted mites, from the long, projecting mandibles; predacious.

Cheyletidæ, mites with stout, spiny palpi; predacious or parasitic.

Oribatidæ, or beetle mites; so called from their hard and often shining bodies; very numerous, but of little economic importance.

Gamasidæ, many predacious and lurking commonly under fallen leaves and in moist places.

Ixodidæ, or ticks, all parasitic.

Tarsonemidæ, soft-bodied and of curious structure.

Tyroglyphidæ, cheese and flour mites, soft-bodied forms, in which the hypopus stage is very common.

Hydrachnidæ, or fresh-water mites; and Halacaridæ, or marine mites.

Sarcoptidæ, or itch mites; and Analgesidæ, or bird mites.

Eriophyidæ, or gall mites, remarkable for their minute size, tapering, annulate body, and possessing only four legs. See CHIGOE, 2.

MIT'FORD, JOHN (1781–1859). An English author and divine, born at Richmond in Surrey, Aug. 13, 1781. He graduated B.A. from Oriel College, Oxford, in 1804. Five years later he took orders in the English church, and in 1810 he received from Lord Redesdale the vicarage of Benhall in Suffolk. A few years later he obtained two other livings in the same shire. At Benhall he built a parsonage, collected a choice library, and amused himself in gardening. He took permanent lodging in London, where as time went on he came to live for most of the year. He was an intimate friend of Samuel Rogers, of Charles Lamb, and of other literary men. From 1834 to 1850 he edited the *Gentleman's Magazine*, to which he contributed largely. He died at Benhall, April 27, 1859. His *Miscellaneous Poems* appeared in 1858. For the Aldine edition of the English poets he contributed 11 memoirs. His best critical work was on Gray, found in *The Works of Thomas Gray* (1814) and in the Aldine edition (5 vols., 1835–43). His researches have been very freely used by succeeding editors. Mitford left three volumes of manuscript on Gray and a large mass of other manuscript, much of which is now in the South Kensington Museum and the library of the British Museum.

MITFORD, MARY RUSSELL (1787–1855). An English authoress, born at Alresford, Hampshire, Dec. 16, 1787. In 1797 she drew £20,000 in a lottery, with a part of which her father built a house at Reading. She was sent to a good London school for a short time (1798–1802) and then returned to her father's house. At this time she was reading extensively. In 1810 she published *Miscellaneous Poems*, which were immediately followed by other volumes (1811, 1812, 1813). The family, reduced to poverty as a result of the father's improvidence, moved in 1820 to a laborer's cottage at Three Mile Cross, a village near Reading. For a living she now began writing for the magazines and the stage. Among her plays (tragedies), which were moderately successful, are *Julian* (1823), *Foscari* (1826), and *Rienzi* (1828). In the meantime she had taken to writing sketches of village life as she had observed it. They were published (5 vols., 1824–32) in installments, under the title *Our Village*. These descriptive pieces possess charm, grace, and humor akin to Jane Austen's. They were followed by the more regular novel of country life, *Belford Regis* (1835), and, after a long interval, by *Atherton and Other Tales* (1854). In 1851 Miss Mitford removed to a near-by cottage at Swallowfield, where she died, Jan. 10, 1855. Consult: A. G. K. L'Estrange, *Life of Mary Russell Mitford* (London, 1870); id., *The Friendships of Mary Russell Mitford as Recorded in Letters from her Literary Correspondents* (2 vols., ib., 1882); J. T. Fields, *Yesterdays with Authors* (Boston, 1899); W. J. Roberts, *Mary Russell Mitford: The Tragedy of a Blue Stocking* (London, 1913); *Correspondence of Mary Russell Mitford with Charles Boner and John Ruskin*, edited by Elizabeth Lee (New York, 1915).

MITFORD, WILLIAM (1744–1827). An English historian, born in London. He studied at Queen's College, Oxford, and in 1769 became a captain in the South Hampshire militia. He made the acquaintance of Gibbon, then a fellow officer, by whose advice and encouragement he was induced to undertake his celebrated *History of Greece*. The first volume of this work appeared in 1784, and the fifth and last in 1810; it was supreme in European literature till Grote's *History of Greece* appeared. He was three times elected to Parliament, and was professor of ancient history at the Royal Academy. He also wrote *An Essay on the Harmony of Language* (1774) and several minor works.

MITH'AN. The name of the gayal (q.v.), among the Indo-Chinese tribes west of the Bay of Bengal.

MITHRADATES. See MITHRIDATES.

MITH'RAS (Gk. *Mίθρας*, OPers. *Miθra*, Skt. *Mitra*, friend). One of the chief deities of the ancient Persian religion. The god seems to have been known to the Indo-Iranians before their separation, as he appears in both the Avesta and the Veda. He is a god of light, invoked in company with the heaven (Ahura and Varuna), and is the guardian of truth and the enemy of all falsehood. In India this deity seems to have been early superseded, but in Persia he retained his place as one of the chief gods. It may be considered very doubtful whether the god was borrowed from the early Babylonians at a date long before our knowledge begins, more especially as in the earlier texts Mithras is not the sun but the light of heaven. In the Zoroastrian religion he is one of the Yazata, or spirits of the second rank, though even here he occupies a high position, seeing and knowing everything, a being whom it is impossible to deceive and in constant

conflict with the powers of darkness, so that he becomes a warrior god, who is the chief helper of Ahura-Mazda in his struggle with Ahriman (see ZOROASTER; ZOROASTRIANISM) and, by a natural development, of truth and loyalty. In the Old Persian inscriptions, it should be said, he is invoked by the Achæmenidæ along with Ahura-Mazda and Anahita, and his festival (on the sixteenth day of the seventh month) was one of the solemn functions of the state religion. Honored by the numerous princes who built up small principalities throughout western Asia after the division of Alexander's kingdom, the god was a prominent divinity in Cilicia, Cappadocia, and Commagene, though practically unknown in the Greek world. From these regions his worship came to the West to the Romans, through the Cilician pirates conquered by Pompey. It is not mentioned, however, by contemporary Roman writers till the first century of our era, and the earliest Latin inscriptions that name Mithras belong to the early second century. The cult with its mysteries was popular in the army and quickly spread over the whole Roman world, as its monuments in all the frontier provinces plainly show, and became the chief opponent of Christianity. The nature of the religion is obscure, as the sacred writings have perished and information must be drawn either from the writings of Christian adversaries or from the representations in the numerous places of worship. It seems clear that the basis of the cult was derived from the Mazdean worship, but with a considerable mixture of Chaldæan worship of the heavenly bodies. Mithras seems to have owed his prominence to the belief that he was the source of all life and could also redeem the souls of the dead and bring them into the better world. This worship was celebrated in underground chambers of small size, to which only those who belonged to the higher degrees were admitted, and was probably conducted according to elaborate ritual prescriptions. (For such a Mithræum at Rome, consult W. Dennison, "The Newly Discovered Mithræum at the Baths of Caracalla," in the *Classical Weekly*, vii, 151–152, New York, 1915.) The ceremonies included a sort of baptism to remove sins, anointing, and a sacred meal of bread and water, while a consecrated wine believed to possess wonderful power played a prominent part. With the cult of Mithras went a belief in the immortality of the soul and in the resurrection of the dead; it was this belief in particular that brought the followers of Mithras and the Christians into collision. The mysteries contained seven degrees, of which the first three seem to have been probationary and not to have admitted to the sacred ceremonies. The degrees are given in this order: (1) *Corax* or Raven; (2) *Gryphus* or Griffin; (3) *Miles* or Soldier; (4) *Leo* or Lion; (5) *Perses* or Persian; (6) *Heliodromos* or Courier of the Sun; (7) *Patres* or Fathers, who were at the head of the cult, and whose chief was the *pater patrum*. The other initiates called themselves brethren (*fratres*). Women seem to have been excluded from the rites proper of Mithras, but in the western part of the world those rites were brought in close alliance with the worship of the Great Mother of the Gods (q.v.), which was open to women as freely as to men. The nature of the initiation is not known. The undoubted similarity in much of this worship to the new religion of Christianity seems only to have made the battle between the rivals bitterer, and with the triumph of Christianity and the loss of the eastern provinces of the Roman Empire began the destruction of the Mithras worship, and by the end of the fourth century it seems to have been practically extinct in the West. Consult: F. V. M. Cumont, *Textes et monuments figurés relatifs aux mystères de Mithras* (Brussels, 1894–99); id., *Les mystères de Mithras* (2d ed., Paris, 1902), translated by T. J. McCormack as *The Mysteries of Mithras* (Chicago, 1903); id., in *The Open Court* (Chicago, November, 1902); A. Dieterich, *Eine Mithrasliturgie* (Leipzig, 1903); F. V. M. Cumont, *Les religions orientales dans le paganisme romain* (Paris, 1906), translated as *The Oriental Religions in Roman Paganism* (Chicago, 1911); J. B. Carter, *The Religious Life of Ancient Rome* (Boston, 1911); D. N. Robinson, "A Study of the Social Position of the Devotees of the Oriental Cults in the Western World, Based on the Inscriptions," in the *Transactions of the American Philological Association*, vol. xliv (ib., 1913).

MITHRIDATES, mĭth'rĭ-dā'tēz, or **MITHRADATES** (gift of Mithras, from OPers. *Miθra*, the sun god + *dāta*, given, p. p. of the root *da-*, to give). An old Persian name, common throughout the East, borne by several kings of Pontus. The most celebrated of them and the greatest of the rulers of Pontus was Mithridates VI, surnamed *Eupator* and *Dionysus*, but commonly called Mithridates the Great. He was born at Sinope about 134 B.C. and succeeded his father, Mithridates V, about 121 B.C. For a time, however, his mother was too strong for him, so that he withdrew to the mountains and lived there as a hunter. But at the age of about 20 he took the reins of government into his own hands. Little that is certain is known of the early part of his reign. He soon subdued the tribes along the northern coast of the Euxine as far as the Tauric Chersonese and set his son, Machares, on the throne of the Kingdom of Bosporus (q.v.); he then prepared to extend his conquests south of the Euxine and invaded Cappadocia and Bithynia. Here he encountered the Romans, who restored the kings of Bithynia and Cappadocia to power. Mithridates waged three wars with the Romans, known as the First, Second, and Third Mithridatic wars—the First, 88–84 B.C.; the Second, 83–82 B.C.; the Third, 74–65 B.C. The immediate cause of the First Mithridatic War was the invasion of the territories of Mithridates by Nicomedes, King of Bithynia, at the instigation of the Romans. Mithridates quickly compelled Nicomedes to withdraw, but was in the end defeated by the Roman general Flavius Fimbria, while his general Archelaus was defeated in Greece by Sulla. It was in the course of this war that Mithridates issued an order to all the cities of Asia to put to death, on the same day, all the Roman and Italian citizens who were to be found within their walls. Eighty thousand Romans and Italians are said to have perished in this massacre. As a result of the First Mithridatic War Mithridates consented to abandon all his conquests in Asia, to pay a sum of 2000 talents, and to surrender to the Romans a fleet of 70 ships. The Second Mithridatic War was due to the invasion of Mithridates' dominions by the Roman general Murena. The war was in the main favorable to Mithridates, but was short-lived, Murena being soon ordered by Sulla to withdraw. In 74 B.C. Nicomedes

III, King of Bithynia, died, leaving his dominions by will to the Romans. Mithridates claimed that Nicomedes had left a legitimate son and at once prepared to assert the latter's right. The Third Mithridatic War ensued. At first alone, and then supported by his son-in-law, Tigranes, King of Armenia, Mithridates successfully opposed the Roman forces, but in 66 B.C. the conduct of the war was intrusted to Pompey. (See LUCULLUS, LUCINO LICINIUS.) Mithridates was then obliged to retreat beyond the Euxine, where, besieged by his son, Pharnaces, who had rebelled against him and had been proclaimed King, he took his own life at Panticapæum in 63 B.C. Mithridates was a specimen of the true Eastern despot, but he possessed great ability and extraordinary energy and perseverance. His want of success was owing, not to his defects as a general, but to the impossibility of raising and training an army capable of coping with the Roman legions. He had received a Greek education at Sinope, could speak more than 20 different languages, and had a taste for art and science and appreciation of them. He owned a magnificent collection of pictures, statues, and engraved gems. In the estimation of the Romans he was the most formidable opponent they had ever encountered. Consult Theodor Reinach, *Mithridate Eupator* (Paris, 1890), translated into German, with corrections and additions by Reinach, by A. Goetz (Leipzig, 1895), and the article "Mithridates, 6," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MITLA, mē'tlä, or **MICTLAN**, mēk-tlän'. A famous ruin 30 miles east of Oaxaca City in southern Mexico. The name is Aztec and means 'the place of the dead.' In the centre of a wide, fertile valley surrounded by mountains are five clusters of stone buildings built around paved courts. Long stone lintels are used over the wide doorways. The walls of heavy concrete are veneered with cut stone and the façades are ornamented with sunken panels containing mosaics of finely carved stones in geometrical patterns. Traces of mural paintings are still visible. Cruciform tombs are located under some of the buildings. Little is known concerning the history of this remarkable site except that it was a centre of late Zapotecan culture captured about 1495 by the Aztecs.

The five clusters of stone buildings have been named (1) group of the Curacy; (2) the Columns; (3) the Arroyo; (4) the Adobe; (5) the South Side. Other foundations exist and a mile or so distant, on an isolated hill, are the remains of a fort.

The buildings, which are worthy of the name of temples or palaces, are massive, rectangular structures of dressed stone, set on platforms and erected with surprising accuracy. The stones are laid with such precision that the joints are scarcely discernible, and for this reason little mortar was required. The ground plan is simple and the rooms are, as a rule, long and narrow, while the walls are but one story in height. The grouping of the buildings is in the form of quadrangles.

The walls are faced with dressed stone or plaster. Mosaic stonework is used lavishly, the designs being frets and other geometric designs. The exterior walls have no openings, but the single or triple doorways that open on the courts are imposing in their massive treatment with monolithic lintels. The rooms were ceiled with beams of wood or slabs of stone. In case the room was wide two sets of beams were used, supported on a row of large stone columns, some of which are 16 feet high and 36 inches in diameter. The roofs were massive and flat, and probably constructed of beams, cross poles, and filling material of brush, capped with rammed clay, similar to the method employed by the Pueblo Indians of the southwestern United States. The floors were made of a durable cement. On the whole, the Mitla buildings, while formal in plan and profile, show perfect and charming mosaic surface decoration, arranged in panels which exhibit great fertility of geometric design, as well as skill in execution. In the Curacy and Arroyo groups mural paintings resembling the pictographs of the codices were employed on the lintels. A noteworthy feature is that realistic sculpture is almost lacking in these buildings.

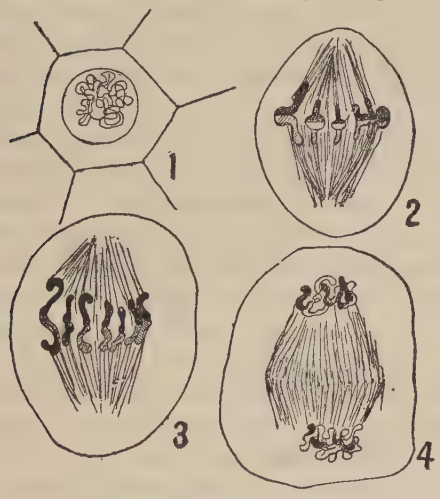
Two of the palaces have a basement chamber in the form of a cross. Several of these cruciform structures have been discovered in and near Mitla, but nowhere else in Mexico have they been observed, except at Chila in Puebla. It is surmised that they were sepulchres of important personages. The character of the Mitla masonry is also seen in the interesting fortified hill situated about 1 mile west of the village. In location, massiveness of construction, and skill in plan it ranks with the ancient fortifications of Peru. Piles of rounded stones on the walls indicate that the fort was defended by slingers. The quarries from which the ancient Mitlans secured their materials have been discovered. The blocks were obtained by channeling with stone picks and hammers the full length of the stones and across the ends; then channels were cut down the sides and under the blocks until they could be broken off. Enormous stones in all stages of the work still remain in the quarry. Pottery of excellent design and finish has been found. Painted pottery is uncommon here. Fan-shaped implements, a few celts of copper, and gold bells and beads have been found in the tombs. A remarkable cruciform tomb was found by Saville 5 miles from Mitla. These ruins are mainly of stone, but there are evidences of adobe buildings, and some mounds probably supported wooden structures. The large buildings were probably for religious purposes, but their exact use has not been determined by the researches yet made.

Consult: C. J. D. Charnay, *Cités et ruines américaines* (Paris, 1863); A. F. A. Bandelier, *Archæological Tour in Mexico in 1881* (Boston, 1884); W. H. Holmes, "Archæological Studies among the Ancient Cities of Mexico," in *Field Museum of Natural History, Anthropological Series* (Chicago, 1895–97); M. H. Saville, "Cruciform Structures Near Mitla," in *American Museum of Natural History, Bulletin*, vol. xiii (New York, 1900); Eduard Seler, "Wall Paintings at Mitla," in *Bureau of American Ethnology, Bulletin 28* (Washington, 1904).

MITO, mē'tô, or **MYTHO**. A town of Cochin-China, situated on an arm of the Mekong, about 45 miles southwest of Saigon, with which it is connected by rail (Map: French Indo-China, E 4). It has a college and a hospital and is on the trade route between Cambodia and Annam. Pop., 30,000.

MITO'SIS (Neo-Lat., from Gk. *μίτος, mitos*, thread). The phenomena accompanying the division of the nucleus of cells, a term proposed by

Fleming in 1882 and superseding "karyokinesis." In cell division the seat of the changes is the nucleus, in which portion of the cell the processes of cell division originate. After the nucleus subdivides the entire cell divides into halves, forming two new cells. Mitosis occurs not only in the division of cells during growth, but the nucleus subdivides, forming the first steps in reproduction or fertilization of all organisms. When the nucleus is about to divide, the chromatic granules forming part of the nuclear substance, and previously scattered throughout the central mass of the nucleus, become arranged in a row, forming a long thread,



STAGES IN MITOSIS.

1, preparatory to division; 2, early stage in separation of chromosomes; 3, later state in separation; 4, formation of daughter nuclei at poles, and of wall at equator of spindle.

which extends through the nucleus in an irregular spiral (spireme) and then divides into portions (chromosomes) of fairly equal length. The chromosomes are shaped like long loops, which afterward become shortened, thus giving rise to short loops, straight rods, or rounded granules. As a rule the number of chromosomes is constant for each species of plant or animal and also for successive series of cells during growth. By the time the process has reached this stage a special mechanism appears, which has till now remained concealed in the cell substance. This serves to divide the chromatin elements into two equal parts, to separate the resulting halves from one another, and to arrange them in a regular manner. At the opposite poles of the longitudinal axis of the nucleus two clear bodies—the centrosomes, each surrounded by a clear zone, the so-called sphere of attraction—now become visible. These were first discovered by Fol, by Van Beneden, and also by Boveri, who recognized their importance. They appear to possess a great power of attraction over the vital particles of the cell, so that these become arranged around them like a series of rays. At a certain stage in the preparation for division the substance of the cell body and of the nucleus gives rise to delicate fibres or threads; these fibres are motile and, after the disappearance of the nuclear membrane, seize the chromosomes with wonderful certainty and regularity, and in such a way that each element is held on either side by several threads from each pole. The chromatin elements thus immediately become arranged in a fixed and regular manner, so as to lie in the equatorial plane of the nucleus. The centrosomes and threads or astral fibres (*aster*), called the spindle, together form the amphiaster. The chromatin elements next split longitudinally, thus becoming doubled, as discovered by Fleming. This splitting is completed by the two halves being gradually drawn farther apart towards the opposite poles of the nuclear spindle, until they finally approach the centre of attraction or centrosome, which has now fulfilled its object for the present and retires into the obscurity of the cell substance, only to become active again at the next cell division. Each separate half of the nucleus now constitutes a daughter nucleus in which the chromatin breaks up and is scattered in minute granules in the nuclear network. The body of the cell then divides, showing two new cells. Roux has pointed out that the whole complex but wonderfully exact apparatus for the division of the nucleus exists for the purpose of dividing the chromatin substance in a fixed and regular manner, not merely quantitatively, but also in respect of the different qualities which must be contained in it. It will be remembered that the chromatin particles or chromosomes are believed to be bearers of heredity. The mechanism of mitosis is thus far unknown. The problem may be solved, as Wilson states, through chemical research.

Amitosis. Mitosis is the indirect division of the nucleus: where the nucleus elongates and directly divides through its total mass the process is called amitosis. This appears to occur exceptionally, but is known to take place in amœba, in leucocytes, and has been observed in the sperm cells and eggs of batrachians and some insects, but more commonly in pathological tissues.

Bibliography. Walther Fleming, *Zellsubstanz, Kern und Zellteilung* (Leipzig, 1882); Roux, *Ueber die Bedeutung der Kernteilungsfiguren* (Leipzig, 1883); *Gesammelte Abhandlungen über Entwicklungsmechanik der Organismen* (ib., 1895); August Weismann, *The Germ Plasm: A Theory of Heredity*, translated by W. N. Parker (New York, 1902); E. B. Wilson, *The Cell in Development and Inheritance* (2d ed., revised and enlarged, ib., 1911). See CELL; EMBRYOLOGY; MECHANICS OF DEVELOPMENT.

MITRA, mē'trȧ (Skt., friend). A Vedic Hindu god of light. He is mentioned most frequently in company with Varuna (q.v.), with whom in the Veda his attributes blend. Although he seems to have been a god of importance in the Indo-Iranian religion, he lost his rank early in the Indian period and was not recognized after the Vedic age. His Iranian counterpart, Mithras (q.v.), however, was one of the chief deities of the pre-Zoroastrian religion, where he represented the sun. Consult Hillebrandt, *Vedische Mythologie*, vol. iii (Breslau, 1902).

MITRA, RAJENDRALALA (1824–91). An Indian Orientalist, born in Calcutta. He belonged to the Kulin-Kayasth caste and was to a great extent self-educated. In 1846 he was appointed librarian of the Asiatic Society in Calcutta, and later philological secretary and vice president of the same organization. In 1885 he was elected president of the society, being the first native to attain that honor. He made

numerous contributions to the *Journal* of the society as well as to the series *Bibliotheca Indica*, editing more than 80 texts, at times with English translations. He was granted the title of Companion of the Indian Empire after the establishment of that Order in 1878 and was made a rajah 10 years later. The most important of his works are: *The Antiquities of Orissa* (2 vols., 1875, 1880); *Buddha Gaya, the Hermitage of Sakya Muni* (1878); *Catalogue of Sanskrit Manuscripts in the Library of the Mahârâjâ of Bikâner* (1880); *Indo-Aryans: Contributions towards the Elucidation of their Ancient and Mediæval History* (2 vols., 1881); *The Sanskrit Buddhist Literature of Nepal* (1882); *History of the Asiatic Society of Bengal*, in the centenary review of the society (1885); and a translation of the *Twelve Principal Upanishads* (1891).

MITRAILLEUSE, mē'trâ'yēz' (Fr., mitraille firer, from *mitrailler*, to fire mitraille, from *mitraille*, bits of grapeshot, from OF. *mitaille*, fragments, from *mite*, small bit; ultimately connected with Goth. *maitan*, to cut). A machine gun, in which is combined a number of rifle barrels, with breech-action mechanism, and designed to discharge small missiles with great rapidity. It was invented in Belgium, and adopted by the French a little before the war with Germany in 1870. Its official name is *canon à balles* (bullet cannon). The name *mitrailleuse* is now given to any machine gun whatever. See MACHINE GUN.

MI'TRAL VALVE. See HEART; CIRCULATION.

MI'TRE (OF., Fr. *mitre*, from Lat. *mitra*, from Gk. *μίτρα*, mitre, fillet, belt; probably ultimately of Oriental origin). The headdress worn in solemn functions by bishops and some abbots. The ornament is probably of Eastern origin, although the headdress of Eastern prelates at the present day is quite different, being a large round cap something like a crown. The Western mitre is a tall, tongue-shaped cap, terminating in a two-fold point, supposed to symbolize the "cloven tongues as of fire" in which the Holy Spirit descended upon the Apostles; two flaps or streamers fall from it behind over the shoulders. Opinion is much divided as to the date at which the mitre first came into use. Eusebius, Gregory of Nazianzus, Epiphanius, and others speak of an ornamented headdress worn in the Church; but there is no very early pictorial representation which exhibits any head covering at all resembling the modern mitre. From the tenth century, however, it is undoubtedly found in use, although not at first universally. At the Reformation the mitre was practically discarded as a part of the episcopal costume in England, though there are traces of its survival in isolated instances; and the first Bishop of the Episcopal church in America, Seabury, occasionally wore one. In the last half of the nineteenth century the practice was revived with increasing frequency in the Anglican communion. In the Roman Catholic ritual three kinds of mitres are distinguished: *mitra pretiosa*, richly ornamented with jewels, gold, and silver; *mitra auriphrygiata*, made up of gold brocade with embroidery; and *mitra simplex*, formed of white silk or linen damask, with scarcely any decoration, which is worn when black vestments are used. See COSTUME, ECCLESIASTICAL, and Plate.

MITRE, mē'trâ, BARTOLOMÉ (1821–1906). An Argentine statesman, soldier, and author, born at Buenos Aires. While a mere boy he went to Uruguay with his father and there in 1838 began his literary career as a contributor to *El Iniciador* of Montevideo. He continued to contribute to *El Nacional* and other periodicals during his residence in Montevideo. In 1839 he began his military career and in 1842 played an important part in the defense of Montevideo against the siege by Oribe. He was a member of the secret society, Asociación Nacional, which exerted a large influence on the government, and of the Assembly of Notables, which acted in place of a legislative body. A revolt, directed by the Porteños, caused Mitre to flee to Bolivia, where President Ballivian placed him in charge of the Military College. He was the President's chief of staff during a revolution and was decorated by the Bolivian government for his services. Upon the overthrow of Ballivian Mitre was exiled, going first to Peru and then to Chile, where he edited *El Comercio* at Valparaiso and *El Progreso* at Santiago. For attacking the corruption of the government his presses were confiscated and he was arrested and banished to Peru. In 1851 he returned to Argentina and joined Urquiza in the uprising against Rosas. He was in command of a battery of artillery in the battle of Monte Caseros (Feb. 3, 1852), in which Rosas was overthrown. Elected deputy of the Province of Buenos Aires, he openly attacked Urquiza, who was hostile to the Province of Buenos Aires, and assailed the Acuerdo de San Nicolás, which gave Urquiza unlimited powers. For this he was banished, but returned (September, 1852) and became a leading figure in the independent Province of Buenos Aires. He served the province as commander of its army, Minister of War (1855), and Minister of Government and Foreign Relations (1857). In 1859 Mitre was defeated by Urquiza at Cépeda, but he refused to surrender unconditionally and accept the constitution formed on the basis of the Acuerdo de San Nicolás. Instead he opened a campaign in favor of a revision of the constitution which would save the rights of Buenos Aires and give the country a national organization on a solid and popular basis. In November, 1859, an agreement was made between the Confederation and Buenos Aires, by which the latter rejoined the Confederacy. The next year a Constitutional Convention formed a new constitution (September, 1860), to which Mitre swore as Governor of Buenos Aires and as an Argentine citizen (October 21). The abuses committed by the national government caused Buenos Aires to take up arms in defense of the constitution in 1861. Mitre led the provincial forces and defeated Urquiza in the battle of Pavon (q.v.)—the triumph of the party of Argentine liberty. This is considered Mitre's greatest service to his country. From March to October, 1862, he was *encargado* of the national power, in which position he assembled the Congress which completed the unification of the Argentine nation. In the latter month he was unanimously elected President. He carried out the constitutional reorganization of the country, fostered internal improvement, and encouraged foreign immigration. He failed, however, to secure the federalization of the city of Buenos Aires. Upon the outbreak, in 1865, of the war of Paraguay with Argentina, Brazil, and Uruguay, Mitre joined in a coalition against the Paraguayan dictator

Francisco López (q.v.) and was in command of the allied forces until 1867. Defeated for reelection, he founded and edited for many years *La Nación*, a leading newspaper of Buenos Aires. He was elected Senator and in this position displayed remarkable powers of oratory. Having been defeated by corrupt methods in the presidential election in 1874, he led an ineffectual revolt, for which he was court-martialed and exiled, but he received an amnesty the following year. From 1878 to 1880 he served as deputy in the national Congress and in the latter year led the defense of Buenos Aires in a minor revolt. He actively opposed the administration of President Celman (1886–90) and was popularly acclaimed candidate for the canvass of 1892, but withdrew and joined Ex-President Roca in the support of Luis Saenz Peña, who was selected. He was again candidate for the presidency in 1898, but withdrew, and afterward was elected to the Senate, of which body he served as president. During his active career he devoted much time to literature; indeed, he ranks as one of Argentina's greatest writers. His *Historia de Belgrano y de la independencia argentina* (1857; 5th ed., 4 vols., 1902) and *Historia de San Martín y de la emancipación sud-americana* (1869; 3d ed., 6 vols., 1907) are the best accounts of the South American wars of independence. There is an abridged translation in English of the *Historia de San Martín*, entitled *The Emancipation of South America* (London, 1893), by W. Pilling. Mitre's speeches were collected as *Arengas* (3d ed., 3 vols., 1902). He also published *Rimas* (new ed., 1890); *Uldrich Schmidel, primer historiador del Río de la Plata* (1890); and many other works. Consult J. J. Biedma, *El Teniente General Bartolomé Mitre*, in Bartolomé Mitre, *Arengas*, vol. iii (Buenos Aires, 1902).

MI'TRE, The. A former London tavern, the favorite meeting place of Dr. Samuel Johnson, Boswell, and other celebrities. It stood on Fleet Street, and other well-known taverns of the same name were situated on Wood Street and Fenchurch Street, both destroyed in the great fire of 1666.

MI'TRE SHELL. A gastropod of the genus *Mitra*, family Mitridæ. The shells are very beautiful and much prized by collectors, the favorite being the bishop's mitre (*Mitra episcopalis*). The shell is turreted, smooth, white, spotted with bright red; pillar four-plaited; outer lip denticulated at its lower part; epidermis thin. It is found in East Indian seas. In this genus the shell is fusiform, thick; spire elevated, acute; aperture small, notched in front; columella obliquely plaited; operculum very small. The animal has a very long proboscis, and when irritated emits a purple liquid having a very offensive smell. Over 400 recent and 100 fossil species have been described. These mollusks are found at depths varying from the surface to 17 fathoms, on reefs, sandy mud, and sands. All are inhabitants of warm countries, notably the East Indian and Philippine regions.

MITROWITZ, mĭt'rō-vĭts, or Mitrovicza, mē'trō-vē-chō. A town of south Hungary, in the County of Szerem, on the Save, 43 miles west of Belgrade (Map: Hungary, F 4). On the opposite shore is the Servian town of Mitrovica. The chief industries are tanning leather and silkworm culture. It has a considerable trade in grain, fruit, and wine, and contains ruins of the old Roman city of Sirmium. Pop., 1900, 11,518; 1910, 12,909.

MITSCHERLICH, mĭch'ĕr-lĭk, Eilhardt (1794–1863). A German chemist, born at Neuende, near Jever. In 1811 he proceeded to the University of Heidelberg, where he devoted himself to history and philology and especially to the study of Persian. In 1814 he published a work on Persian history. In the same year he decided to take up the study of the medical sciences, and while working in chemistry under Link at Berlin he first observed the similarity in the crystalline form of phosphates and arsenates of similar chemical composition. He then set to work measuring crystals of a large number of substances, and was able to establish, in 1819, the principle of *isomorphism*. (See Atomic Weights.) The importance of the discovery was fully recognized by Berzelius, on whose invitation Mitscherlich went to Stockholm, remaining there until 1821. In the following year he was made professor extraordinary, and in 1825 full professor, in the University of Berlin. One of his earliest discoveries after his appointment was that of the occurrence of sulphur in two different crystalline forms—the first observed case of "dimorphism." He further discovered selenic and permanganic acids and nitrobenzene, and studied the formation of ethers, the phenomena of fermentation, etc. His principal work is his *Lehrbuch der Chemie* (1829–35; 4th ed., 1840–48). His papers on various scientific topics appeared in Poggendorff's *Annalen*, in the *Annales de chimie et de physique*, and in the *Abhandlungen* of the Academy of Berlin. A complete edition of his works was published at Berlin in 1896. Mitscherlich was an honorary member of almost all the great scientific societies and received the gold medal from the Royal Society of London for his discovery of the law of isomorphism. Consult Rose, *Eilhardt Mitscherlich* (Berlin, 1864). See Chemistry, section on *History*, paragraph *General Chemistry*.

MITSUKU'RI, Kakachi (1857–1909). A Japanese zoölogist, born at Edo. In 1873 he came to the United States, where he received the Ph.D. degree from Yale in 1879 and from Johns Hopkins in 1883. He was appointed professor in the science department of the Imperial University of Tokyo in 1882 and councilor of the university in 1893. In 1896 he was made head of the fur-seal commission and signed, on behalf of Japan, a treaty with the United States and Great Britain. In 1901 he became dean of the College of Science of the Tokyo University and in 1907 was decorated with the Order of the Sacred Treasure in recognition of public service. In later life his time was largely occupied with administrative duties. He was regarded not only as one of the leading zoölogists of Japan, but also as most influential in public life. His most important zoölogical publications, a series of papers on the embryology of the turtles, appeared at intervals from 1886 to 1896.

MITTAG-LEFFLER, mĭt'tăg-lĕf'lĕr, Magnus Gustaf, Baron von (1846–). A Swedish mathematician, born at Stockholm. He studied mathematics at Upsala and later in Paris under Weierstrass and in Berlin. He began his teaching as docent at Upsala in 1872, after having obtained the doctorate there the same year, and five years later became professor of mathematics at Helsingfors. In 1881 he was made

professor of mathematics at the University of Stockholm and subsequently was several times its rector. He was made a member of the Academy of Sciences of Sweden in 1883. His mathematical contributions are connected chiefly with the theory of functions. In 1882, under the patronage of King Oscar, he founded the *Acta Mathematica*, at present one of the leading mathematical journals of the world. The historical part of this journal has since 1887 been published separately by Eneström as the *Bibliotheca Mathematica*. It was Mittag-Leffler's appreciation of Sonya Kovalevsky's (q.v.) work that took her to Stockholm.

MITTERMAIER, mĭt'ĕr-mī'ĕr, KARL JOSEPH ANTON (1787–1867). A German jurist, born in Munich and educated at the universities of Landeshut and Heidelberg. He was a professor at Bonn for two years (1819–21), but the rest of his life was passed as professor of law and jurisprudence at Heidelberg. For many years he was a member of the Baden Legislature, and in 1848 he was President of the Frankfort Vorparlament, serving afterward as representative of the city of Baden in the German National Assembly. His greatest claim to distinction lies in his extensive writings on jurisprudence, among which is a complete manual of criminal law, *Das deutsche Strafverfahren*, and he was an earnest advocate of reform in the German criminal procedure and in prison discipline. The number of his published writings is very large, including many treatises on branches of law, discussions on all the important questions of his time connected with jurisprudence, and especially on trial by jury and the penal code. His principal works have been translated into many languages. He himself translated Francis Lieber's *Letter on Anglican and Gallican Liberty*, and edited the German translation of the same author's *Civil Liberty*.

MITTERMAIER, (GEORG GOTTFRIED) WOLFGANG (1867–). A German legal scholar and criminologist, the grandson of K. J. A. Mittermaier. He was born in Heidelberg and was educated there and in Berlin, and traveled in the United States, England, France, and Austria. He lectured on criminal law at Heidelberg in 1896 and became professor there in 1899, at Bern in 1900, and at Giessen in 1903. Among his published works are: *Die Militärstrafgerichtsordnung* (1899); *Amerikanische Reformatories* (1901), based on his own observation; *Kritische Beiträge zur Lehre von der Strafrechtsschuld* (1909); *Wie studiert man Rechtswissenschaft?* (1910).

MITTERWURZER, mĭt'ĕr-vụrts'ĕr, ANTON (1818–76). A German opera singer, one of the greatest barytone interpreters of the works of Gluck, Marschner, and Wagner. He was born at Sterzing in the Tirol, made his first theatrical appearance at Innsbruck, and at 21 was engaged at Dresden, where he stayed for 30 years and greatly influenced operatic methods. Mitterwurzer was at his best in such Wagnerian rôles as Wolfram, Telramund, and Hans Sachs.

MIT'TIMUS (Lat., we send). A written warrant or mandate issued by a competent judicial officer, directing a proper officer to convey safely the body of a prisoner to some jail or place of confinement and commanding the warden to receive and keep the prisoner for a certain time, or until released by due process of law. The act of sending the prisoner to prison is termed the commitment, and this latter term is now commonly employed to describe the warrant also. Any officer who disobeys such a command is guilty of contempt of court. See COMMITMENT; ARREST.

MITTU, mĭt'to͞o. An agricultural Negro tribe, akin to the Bongo and living on the upper Nile in southern Sudan between lat. 5° and 6° N. In addition to the Mittu proper the term is also applied to a number of neighboring groups allied in speech and customs though politically independent. Of these the Madi, Madi-Kaya, Abbakah, and Loobah are mentioned by Schweinfurth. They are of earthy red-brown color and below the middle stature, but muscular. The hair is short and crisp. The lighter color of the skin would indicate a type of Hamite blood; but they are all pagans, like the other negroes about them, and little affected by Mohammedanism. Goats, fowls, and dogs are their domestic animals. At certain seasons of the year they are engaged in hunting and fishing. The costume of the Mittu consists only of a fringed apron; but they are fond of decorating their hair and parts of the body, such as the neck, arms, and lips, with ornaments. Their weapons are bows and arrows, with jagged, murderous points. Culturally they are most closely related to the Bongo and seem to form an intermediate link between them and the Azande (Niam-niam). They are markedly musical, with a considerable sense for melody; among their instruments are the lyre, flute, and trumpet. Consult Georg Schweinfurth, *The Heart of Africa* (2 vols., New York, 1874).

MITTWEIDA, mĭt'vī'dȧ. An industrial town of Saxony, Germany, situated on the Zschopau, about 30 miles west-southwest of Dresden (Map: Germany, E 3). It has important manufactures of cotton and woolen goods, cigars, cement, machinery, and furniture. Its institutions include a Realschule and a technical school. Pop. (including Rössgen), 1900, 16,119; 1910, 17,800, chiefly Protestants.

MITYLENE, mĭt'ĭ-lē'nē. An island of the Ægean. See LESBOS; MYTILENE.

MIVART, mī'vȧrt, ST. GEORGE JACKSON (1827–1900). An English zoölogist, born in London, Nov. 30, 1827. He was educated at Harrow, at King's College, London, and then, having become a Catholic in 1844, at St. Mary's College, Oscott. He was called to the bar at Lincoln's Inn in 1851, but in 1862 became lecturer on comparative anatomy and zoölogy at St. Mary's Hospital, London. From 1890 to 1893 he held the chair of the philosophy of natural history at the University of Louvain, Belgium. In 1879 he was president of the biological section of the British Association. A most careful and competent anatomist and zoölogist, he wrote a large number of very important memoirs, especially upon the morphology and classification of vertebrates, and contributed largely to the discussion of the question of evolution. He was probably the most learned and powerful critic of Darwin and Huxley in minimizing the effect of natural selection as a factor of evolution and in insisting upon the existence of the guiding action of divine power, especially in the development of man's intellect and spiritual instinct. He distinguished, however, between absolute and derivative creation, maintaining that evolution operated only by means of the latter. His strength lay in natural science, and in this department he held a position of unquestioned eminence.

His efforts to reconcile the facts of science with the doctrines of religion aroused widespread attention. In the field of philosophy he published a number of works, such as *Lessons from Nature as Manifested in Mind and Matter* (1876); *Nature and Thought* (1882); *On Truth* (1889); *The Groundwork of Science: A Study of Epistemology* (1898). He claimed an increasing freedom of thought, which ultimately took him beyond what were considered in the Church the bounds of permissible speculation. After a series of magazine articles (1885–1900) dealing with the relations between science and faith, he was finally excommunicated by Cardinal Vaughan in January, 1900. He died April 1 of the same year in London. His more important works in natural science are: *The Genesis of Species* (1871); *Man and Apes* (1873); *The Common Frog* (1874); *The Cat* (1881); *Dogs, Jackals, Wolves, and Foxes* (1890); *American Types of Animal Life* (1894). His *Essays and Criticisms* (2 vols.) appeared in 1892.

MIWOK STOCK, or **MOQUELUMNAN.** A linguistic family of Indians in California consisting of the Miwok, Marin, and Middle Town tribes, now numbering 700. Consult A. L. Krober, in *American Anthropologist,* vol. viii (Lancaster, Pa., 1906), and S. A. Barrett, *Geography and Dialects of Miwok Indians* (Berkeley, Cal., 1908).

MIXED CADENCE, IN MUSIC. See HARMONY, *Cadences.*

MIXED RACES. Races which are blends of various other races. Of the factors which have been most potent in producing the varieties of man which we find on earth to-day, probably environment and crossbreeding must be assigned the first place. Unfortunately, neither one has been investigated with sufficient care to allow an accurate estimate of its specific influence. Further, the lack of any agreement among anthropologists as to a classification of human races complicates the problem, and until that agreement is reached confusion in the discussion is inevitable.

Certain general observations may, however, be permitted. With regard to crossbreeding it is undoubted that extensive migrations, with consequent blood mixtures, have been going on for an indefinite period. Accurate observation of anatomical and physiological characteristics of certain rather restricted groups, as in Europe, reveals a variability in these characters which has led some observers to conclude that a pure race does not exist at the present time. Recognizing these disturbing facts, however, any one will admit that there are certain types which are relatively permanent. We regard the fair white European as differing permanently from the negro, and both of these equally permanently from the typical Mongol. It is also a matter of common observation that mixture of any two of these types will produce a third, less distinctive, of course, but not to be included in either parent type. The real problem of hybridity as applied to man then arises: Are these subtypes permanent and fertile, or do they tend to revert to either one or the other of the parent types? It is here that the lack of accurate knowledge referred to above prevents positive statement. Early reports as to lack of fertility of certain half-breeds, as in the case of English and Australians, have been shown upon examination to be erroneous or the apparent sterility due to nonessential factors; and recent observations on half-breed American Indians actually show an increase rather than a decrease in fertility. Looking at the question broadly, it would seem that the evidence, while extremely scanty, points towards the view that any two races (however defined) can unite to form a third; and this in turn with others, until we have a confusion of strains and types in which the originals are indistinguishable, wholly or partly, which is apparently precisely the condition which we find to-day in various regions of the world. An authoritative catalogue of the existing mixed races of the world is therefore impossible. The most notable are probably the well-known mulatto, or cross between European and negro; the mestizo, so called, or cross between European and American Indian; and the complex mixtures which we find in the East Indian Archipelago, where Chinese and Malayan traits predominate.

The social significance of race mixture is of course very great, but the complicating factors in this aspect of the question are even greater than on the physical side. We find here two schools ardently advocating diametrically opposed views both as to the advantages or disadvantages of racial mixtures as well as to the mode of transmission of the characteristics of the parent stocks. The whole problem is involved in the general zoölogical problem of evolution and heredity, and unassailable ground as to the points involved cannot be assumed until a much wider range of facts is at our disposal and the disputed questions of inheritance in general have more nearly approached solution.

Prof. Eugen Fischer has recently studied the Hottentot-Boer breeds of German Southwest Africa and arrives at a relatively favorable interpretation of this hybrid race, both as to vitality and social characteristics. In America an optimistic view as to miscegenation is held by Prof. Franz Boas. Consult: Franz Boas, *The Mind of Primitive Man* (New York, 1911), and Fischer, *Die rehobother Bastards und das Bastardierungsproblem beim Menschen* (Jena, 1913). See CROSS BREEDING IN MAN.

MIXES. See ZOQUE.

MIXOG'AMY (from Gk. *μιξο-, mixo-,* mixed, from *μιγνύναι, mignynai,* to mix + *γάμος, gamos,* marriage). A term describing the breeding habits of most fishes, where the males and females congregate on the spawning beds and the number of the former sex is greatly in excess. The same habit has been observed in gars (*Lepidosteus*). On the other hand, the stickleback (*Gasterosteus*) is truly polygamous, several females depositing their eggs in the same nest, guarded by one male only. Some bony fishes (*Ophiocephalus,* and probably all chondropterygians) are monogamous, as probably are all the viviparous fishes. Consult Albert Günther, *An Introduction to the Study of Fishes* (London, 1880).

MIXOPHYTE. A term applied to plants of such a plastic nature that they are able to live either independently as autophytes or dependently upon dead organic matter as saprophytes. See AUTOPHYTE; SAPROPHYTE.

MIXTEC, or **MISTEC,** mē-stēk'. An important Mexican tribe of high culture occupying eastern Guerrero and northwestern Oaxaca. In culture they resembled their southern neighbors, the Zapotec. Like them they were skilled in agriculture, pottery, and weaving, built temples

of hewn stone, kept hieroglyphic records, and had a calendar system. They still keep themselves apart from the political affairs of Mexico and maintain some of their old arts. The population is well over 200,000 and the language is believed to constitute a distinct stock, although often grouped with the Zapotec. The name is Aztec and means 'cloud people.'

MIXTURE (OF., Fr. *mixture*, from Lat. *mistura*, mixture, from *miscere*, to mix). An aqueous preparation of an insoluble substance held in suspension by a suitable vehicle. Among the mixtures used in medicine are those of chalk, of rhubarb and soda, and the compound mixtures of iron and of glycyrrhiza (licorice).

MIXTURE. An organ stop, consisting of from three to six ranks of small metallic pipes. It is generally found in large organs, and resembles the sesquialtera and furniture stops, except that it is much higher and shriller. Like other compound stops, the two smaller ranks of the mixture stop change on the upper part of the organ scale into an octave lower. This is necessitated from the fact that the pipes in their upper ranks would produce too small a volume of sound. The mixture can be used only in forte and fortissimo passages, as otherwise the harmonics would be heard too prominently.

MIYA, mē'yȧ (Jap., august house). A term sometimes applied to the mansions of Japanese princes, but more commonly denoting the shrines of the Shinto religion. These buildings represent the ancient cabins of the primitive Japanese modified by the progress of civilization and by Buddhistic influence. The earth floor of the hut is replaced by wooden flooring raised 2 or 3 feet from the ground, necessitating steps at the entrance. A veranda going completely round the edifice has been added. The sides of the hut were made of mats, but the shrine has walls of wood. The roofs were originally thatched, but are now covered with shingles, tiles, or even copper. In many shrines Buddhist influence has led to much decoration, but the characteristic of the true miya is extreme simplicity. It contains neither picture, image, nor altar, but only a mirror, or in some instances a pillow for the god. Before the shrines is the *torii* (supposed to signify 'bird rest'), which is sometimes taken for a gateway by tourists. Often many of them are placed before a single shrine. From a cord which hangs above the entrance are suspended *go-hei*, paper cuttings, representative of the offerings of cloth which were made in ancient times. Services are infrequent, usually not oftener than once or twice a year, and in some shrines there are no ceremonies. In 1908 there were 130,258 miya in existence, most of them tiny constructions and only a few of wide reputation. The shrines are divided into four classes —national, provincial, prefectural, and local— and a few are supported in meagre fashion by funds from the Imperial treasury.

MIYÁDZŬ, mē-yäd'zū. The most important town of the Japanese Province of Tango in San-in-do (Hondo), 87 miles northwest of Kyoto (Map: Japan, D 6). It was the residence in feudal times of Matsudaira, one of the three daimyos who ruled the province. Pop., about 10,000. In the vicinity, near Ama-no-hashidate (heaven's bridge) is a narrow tongue of land which juts out into the sea in a way much admired by the Japanese.

MIYAJIMA, mē'yȧ-jē'mȧ (temple island), sometimes called ITSUKUSHIMA. A small, beautifully wooded island in the Bay of Hiroshima, Japan, celebrated as the site of one of the most ancient Shinto shrines of the country. The temple is dedicated to the goddess Benten, worshiped by women for attractiveness and easy childbirth and by men for wealth. It was built in the year 527. The island is also notable for its deer and the absence of dogs. Priests, image carvers, fishermen, and innkeepers make up the population.

MIYAKO, mē'yä'kō. Another name for Kyoto, a city of Japan.

MIZON, mē'zôN', LOUIS ALEXANDRE ANTOINE (1853–99). A French naval officer and explorer in Africa. He was born in Paris, studied at the Naval School (1869–72), and in 1877 was sent out to accompany Brazza on his expedition to the region of the Ogowai River in the Congo region. He was stationed at Franceville for six years, and in 1886 he published charts of the Ogowai. Four years afterward he was sent to Adamawa, where he promoted French commercial interests in the Niger country and greatly irritated Great Britain. The latter power in 1893, after Mizon had made a treaty with the Sultan of Hamarua, declared Hamarua a British protectorate and forced Mizon's recall. In 1895 he was made French Resident at Majunga in Madagascar. He died when on his way to take up the duties of Governor of the colony at Jibuti in French Somaliland.

MIZ'PAH, or **MIZ'PEH** (Heb., watch, outlook). The name of several places in Palestine, of which the most important are: 1. The heap of stones and pillar set up by Jacob and his brethren as a witness of the covenant between Jacob and Laban. It was also called Galeed by Jacob and Jegar-sahadutha by Laban (Gen. xxxi. 44–49), the latter being the western Aramaic rendering of the Hebrew *gal-'ed* (heap of testimony). The narrative points to the existence of a sanctuary in Galeed which was known as Mizpah. The pillar and the heap of stones are to be regarded as objects for the cult—the former a Baal symbol, the latter a boundary stone, serving also as an altar. It was at this sanctuary that Israel was encamped before the conflict with the Ammonites (Judg. x. 17), which, as Gen. xxxi. 25 informs us, lay in Gilead (upon which Gal-ed represents a play). The indications in the Old Testament are insufficient for determining the site of the place with certainty. It lay north of the Jabbok, and perhaps near the modern Jerash, which answers the conditions involved. 2. The place in the territory of Benjamin where Israel gathered before punishing the tribe of Benjamin for their outrage on the concubine of the Levite at Gibeah (Judg. xix–xx), and probably also the place where Samuel assembled Israel to resist the Philistines and subsequently to present Saul as King (1 Sam. x. 17 et seq.), though it is also possible that the two places may be distinct. The location is not certain. It may be a point on the mountain ridge north of Shafat. These gatherings again indicate the presence of a sanctuary at Mizpah, and the continued importance of the place is made manifest by its choice as a seat of government under Gedaliah (2 Kings xxv. 23; Jer. xl. 6). In postexilic times we meet with references to Mizpah, and it is of special interest to note that in the days of the Hasmonæans Mizpah again becomes a gathering place for the Jews (1 Macc. iii. 46). Besides these two Mizpahs there are references

in the Old Testament (*a*) to the land of Mizpah (Josh. xi. 3) and the valley of Mizpah (ib., xi. 8), which are identical. This Mizpah is mentioned in connection with the battle of Merom (q.v.), and may be located near Hermon. A fourth Mizpah was situated in the "lowland" of Judæa (Josh. xv. 38), and a fifth in Moab (1 Sam. xxii. 3). The use of Mizpah as an inscription for memorial rings is based upon the words occurring in connection with the setting up of the "heap" of stones by Jacob and his brethren: "The Lord watch between me and thee" (Gen. xxxi. 49).

MIZ'ZEN, or MIZ'EN. See MAST.

MJÖSEN, myē'zen. The largest lake in Norway, situated in one of the most fertile valleys of the country, 36 miles northeast of Christiania (Map: Norway, D 6). Its length is 62 miles, its width averages only 2 and nowhere exceeds 10 miles. It receives the Laugen River at Lillehammer and empties its waters through the Vormen and the Glommen into Skager Rack. Its depth is remarkable, reaching in the southern part 1460 feet, its bottom being here 1050 feet below sea level. The vicinity of the lake is very popular as a summer resort, and steamers ply on it regularly during the ice-free season, which in the southern part, on account of its great depth, sometimes lasts throughout the year.

MLAWA, m'lä'vȧ (Russ. *Mlava*). A district town in the Government of Plozk, 46 miles northeast of Plock (Map: Russia, B 4). It is at the junction of the Marienburg-Mlawa and Kowel-Mlawa railways. It has five churches, a sixteenth-century town hall, a first-class custom-house, and is an important trade centre. Mlawa was founded in 1429 as an Imperial city, but declined rapidly after the wars with Sweden. Pop., 1910, 18,652. It was the centre of extremely heavy fighting during the European War which began in 1914. In the early part of the war it was captured by the Germans. They strongly intrenched their position, and several Russian attempts to recapture it were unsuccessful, although combined land and aërial attacks were resorted to. See WAR IN EUROPE.

MLYNARSKI, mlē-när'skē, EMIL (1870–). A Polish composer, born at Kibarty in Suwalki. He received his musical education at the St. Petersburg Conservatory, where Leopold Auer (q.v.) was his violin teacher. In 1889 he joined the orchestra of the Russian Imperial Musical Society at St. Petersburg and a few years later became instructor of violin at its Odessa branch. In 1890–93 he toured England and Germany as violin virtuoso. In 1898 he was appointed conductor of the Warsaw Opera House, from 1901 to 1905 was conductor of the Warsaw Philharmonic concerts, and in 1904–07 was director of the local conservatory. In 1908 he moved to London. He wrote violin music, pieces for the piano, songs, and operas. His violin concerto won the Paderewski prize at Leipzig in 1898.

MNA. See MINA.

MNEMONICS, nē-mŏn'iks. See MEMORY.

MNEMOSYNE, nē-mŏs'ĭ-nē (Lat., from Gk. Μνημοσύνη). In classical mythology, the goddess of memory, daughter of Uranus and Gaia. By Zeus she became the mother of the Muses (q.v.).

MNESICLES, nēs'ĭ-klēz (Lat., from Gk. Μνησικλῆς, *Mnēsiklēs*). A Greek architect, who built the Propylæa (q.v.) of the Acropolis at Athens. His name was found on an inscription in its ruins, and Plutarch mentions him as its architect.

MNESTRA. See ERYSICHTHON.

MO'A (Maori name). A general name for a family (Dinornithidæ) of extinct ratite birds of New Zealand, some of which were of gigantic proportions. The existence of their remains and of legends among the Maoris relating to them was first published in 1838. The exploration of New Zealand revealed bones of these birds in great profusion, on the surface, in peat bogs, in seaside sand dunes, and in certain caves where the dry air had in some cases preserved not only the ligaments binding skeletal parts together but even pieces of dried skin and feathers, which still retained their chestnut and white colors, while footprints and broken eggshells have also been found. Prehistoric camping grounds furnish charred bones and fragments of eggshells.

The moas form a family more nearly associated in structure with the emus, cassowaries, and apteryx than with the ostriches. They were in organization nearest to the kiwis (*Apteryx*), but distinguished by their short beaks and by having aftershafts upon the feathers. They attained not only to great numbers and size in the isolation of New Zealand, but to a remarkable variety, some 20 species being now recognizable. Some were not larger than turkeys, and these perhaps may have had some vestiges of wing bones; but the longer moas were not only wingless but entirely destitute of any shoulder girdle whatever. In Canterbury College, Christchurch, South Island, New Zealand, the museum contains a moa room in which stand two splendid specimens of the *Dinornis maximus*, 12 feet, 3 inches high, as well as other specimens ranging from the size of a small emu to that of a giraffe. That the moa, although now extinct, existed at one time in very considerable numbers may be inferred from the fact that a search expedition by Dr. von Haast in the year 1866 obtained enough bones of this gigantic bird to fill an immense wagon. For a long time —indeed until very recently—it was believed that living specimens of the moa might still be discovered in that almost inaccessible mountainous region on the southwest and westernmost coasts of Otago, where even the Maori, in all probability, never penetrated. The expedition of Herr Reischek, the Austrian naturalist, who spent several months of the years 1887 and 1888 in that solitary country, pretty well dissipated this hope. In the genus *Pachyornis* the leg bones were short, massive, and extremely powerful, so that these are called the "elephant-footed" moas. Consult: Owens, *Extinct Birds of New Zealand* (London, 1879); Alfred Newton, *Dictionary of Birds* (New York, 1893–96); Walter Rothschild, *Extinct Birds* (London, 1907); F. A. Lucas, "Animals of the Past," in *American Museum of Natural History, Handbook Series, No. 4* (New York, 1913). See ÆPYORNIS; EXTINCT ANIMALS; EXTINCTION OF SPECIES.

MO'AB. The name given to a people occupying the high table-land east of the Dead Sea and the southern section of the Jordan (Map: Palestine, E 5). The southern boundary was Edom; the eastern, Ammon and the desert; the northern shifted from time to time, but in general was marked by a line some miles beyond the northern extremity of the Dead Sea. This land of Moab is a plateau from 3000 to 4000 feet above the Mediterranean Sea. The western slopes are gen-

erally steep and the aspect of the Moabite Mountains rising to the plateau is barren. It has streams in abundance; besides the Arnon, which divides the plateau, springs and brooks intersect the country. Numerous ruins testify to the former prosperity of the district, while the hundreds of rude stone monuments (stone circles, dolmens, cairns) show that it was densely settled in very early days. According to the biblical account, Moab, the eponymous ancestor of the Moabites, was a son of Lot by one of his daughters (Gen. xix. 37). This story, which traces both Moab and Ammon to an incestuous connection, may be a bit of tribal slander by Hebrew writers to throw discredit on their hated rivals and foes. (See LOT.) The close affiliation, however, between Hebrews and Moabites, which is indicated by the story, is correct. Not only was the language of Moab practically identical with Hebrew, but Moabites and Hebrews belong to the same branch of the Semitic stock, and for an indefinite period Hebrew and Moabitish history form an inseparable unit. The story of the separation of Abraham and Lot embodies a reminiscence of a union once existing between Hebrew and Moabitish clans which was dissolved by a quarrel over land. The land of Moab was included in the Egyptian supremacy over western Asia in the period from the seventeenth to the thirteenth century B.C., and the name Moab occurs in a list of conquests inscribed by Rameses II (1310–1244 B.C.) on one of his monuments at Luxor. The relations between Moab and Israel during the portion of Hebrew history known to us were generally hostile, and this hostility is traced back by tradition to the days of the Exodus (cf. Deut. xxiii. 4–5), but the oldest document we have regarding Moab is a fragment of a song (Num. xxi. 21–30) recalling a victory of the Amorites over Moab and the subsequent defeat of the Amorites by the Hebrews. The song, which bears marks of antiquity, may date from the early struggles of the Hebrews, anterior to the attempts of the latter to conquer Canaan to the west of the Jordan. On the other hand, the story of the endeavor of Balak, King of Moab, to secure the services of Balaam to curse Israel (Num. xxii–xxiv) is looked upon by many scholars as later than this invasion of Canaan, based upon the persistent hostility between Israel and Moab, and illustrating the invincible character of the former; while the apparent allusions to David and his conquests seem to indicate the age which produced the famous oracles. (See BALAAM.) After the conquest of Canaan the Hebrews were frequently at the mercy of the Moabites, as well as of Ammonites and Amalekites. We learn of a King Eglon of Moab, who held the Hebrews in subjection for 18 years (Judg. iii), from which they were freed by Ehud, a Benjaminite. Saul appears to have held the Moabites in check, while under David they actually became tributary to the Hebrews. It is not known whether Moab used the opportunity furnished by Jeroboam's revolt to secure its independence, or paid tribute to Israel after its separation from Judah. But from Mesha's inscription (see MOABITE STONE) we learn that Moab was oppressed by Israel for 40 years in the reigns of Omri and his son, and that in the middle of Ahab's reign the yoke of Israel was thrown off (c.860 B.C.). From that time on Moab seems to have maintained its independence of Israel, and had its own kings.

Salmanu paid tribute to Tiglath-pileser IV in 733; Moab took part in the revolt of Ashdod against Sargon II in 711; Kamoshnadab paid tribute to Sennacherib in 701, and Muzura to Esarhaddon and Asurbanipal. Subsequently Moab became tributary to Babylonia. In post-exilic sections of the books of Isaiah and Jeremiah we find references to Moab which point to the continued existence and, in a measure, prosperity of the country, but otherwise throw no light upon its history. The name lingered on into the Christian era. During the Roman occupancy of Palestine the land of Moab was still densely inhabited, as the Roman and Greek remains show, but gradually the Arabs of the desert overran it, and what culture once existed there came to an end. It remained for modern travelers like Seetzen and Burckhardt to rediscover it. The chief god of the Moabites was Chemosh (q.v.), and their religion, so far as we know it, bore the characteristic marks of early Semitic cults.

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MO'ABITE STONE, THE. A stone bearing an inscription of 34 lines in the Moabitish language, discovered in 1868 by the German missionary F. Klein at Diban in Moab. He took no copy of the inscription and gave no description of its contents. The negotiations set on foot for the purchase of the stone by Clermont-Ganneau, attaché of the French consulate at Jerusalem, who had also learned of the existence of the stone, led to quarrels among the Arab tribes claiming an interest in it, and the monument was unfortunately broken to pieces. The fragments, however, were with great difficulty collected, and are now preserved in the Louvre. Prior to the destruction of the stone squeezes had been obtained by Clermont-Ganneau. Some of these were very imperfect, but one was good. From a study of the fragments and the squeezes Clermont-Ganneau was able to publish the text and the first translation. As the result of numerous researches by French, German, and English scholars, the decipherment may now be said to be complete. The characters on the Moabite stone are those of the North Semitic alphabet (see ALPHABET), and the language is so closely allied to Hebrew that the conclusion is justified which makes Hebrew and Moabitish practically identical, though with dialectical differences. The inscription itself refers to the deeds of Mesha, King of Moab, who is mentioned in the very first line, and the interest of the stone is greatly enhanced by the circumstance that he is identical with the Mesha (q.v.) spoken of in 2 Kings iii. 4. Mesha begins in his inscription by referring to the affliction which Moab endured under Omri, King of Israel, and the latter's son (i.e., Ahab, who, however, is not mentioned by name). We know from the biblical narrative that Moab was tributary to Israel during the reigns of Omri and Ahab. This is the "affliction" referred to and is attributed by Mesha to the anger of his deity Chemosh. Thanks, however, to Chemosh, who turned with favor to

Mesha, the latter regained the cities which Israel had captured. Mesha adds in an exaggerated manner that "Israel perished with an everlasting destruction." But while in 2 Kings iii. 5 the revolt of Moab is said to have taken place after the death of Ahab, line 8 of the inscription makes it clear that the 40-year period of Israelitish oppression ended in the middle of the reign of Ahab. Since Mesha knew the length of Ahab's reign, the stone must have been erected after Ahab's death (c.851 B.C.), probably in 849 B.C. The rest of the inscription is taken up with details of the conflict and with building operations undertaken by Mesha. Besides its historical significance the inscription is of geographical importance because of the many names of sites in Moab which it contains. As one of the oldest inscriptions in the North Semitic alphabet the Moabite stone has also great epigraphical value.

Bibliography. C. Clermont-Ganneau, *La stèle de Dhiban* (Paris, 1870); Theodor Nöldeke, *Die Inschrift des Königs Mesa von Moab* (Kiel, 1870); Smend and Socin, *Die Inschrift des Königs Mesa von Moab* (Freiburg, 1886), with supplement in *Berichte der königlich sächsischen Gesellschaft der Wissenschaften* (Leipzig, 1897); C. Clermont-Ganneau, in *Journal asiatique*, (Paris, 1887); A. Nordländer, *Die Inschrift des Königs Mesa von Moab* (Leipzig, 1896); M. Lidzbarski, in *Ephemeris für semitische Epigraphik*, vol. i (Giessen, 1900); G. A. Cooke, *North Semitic Inscriptions* (Oxford, 1903); M. Lidzbarski, *Altsemitische Texte* (Giessen, 1907); W. H. Bennett, *Moabite Stone* (New York, 1911); S. R. Driver, *Notes on the Hebrew Text and the Topography of the Books of Samuel, with an Introduction on Hebrew Palæography* (2d ed., Oxford, 1913).

MOALLAKAT, mō'âl-lâ-kät' (Ar. *Mu'allaḳat*, the exalted ones). A *diwan*, or collection, of seven poems, made by Hammad, surnamed *al rawiya*, "the reciter." It consisted of what he considered the best poem of each of the following seven bards: 'Amru'l Kais, Tarafa, Zuhair, Labid, Antara ibn Shaddad, 'Amr ibn Kulthum, and Harith ibn Hilliza. Hammad lived in the first half of the eighth century. Ibn Abd Rabbihi (died 940) and Naḥḥas (died 949) both give the same list of the seven poets. But Ibn Kuteiba (ninth century) mentions also a poem of 'Abid among the Muallakat. Nabigha and A'sha enjoyed a reputation as poets quite equal to any of the seven, and later scholars, like Tibrizi (died 1109), therefore included in the list these two and 'Abid. Ibn Khaldun (died 1406) included also Al Kama, evidently confusing the Muallakat with the *diwan* of Al Alam, which contained a poem of each of the following six: 'Amru'l Kais, Zuhair, Tarafa, Nabigha, A'sha, and Al Kama. As for the title, Ibn Abd Rabbihi seems to have been the first to understand it literally of poems that were "suspended." Against this his contemporary, Naḥḥas, entered a protest, maintaining that the poems were so called because they were "lifted up," "exalted," "excellent." This view has been accepted in modern times by Hengstenberg, Sprenger, Nöldeke, Ahlwardt, and practically every Arabist, in place of the legend that the poems were hung up in the Kaaba, which is presented in its fullest form by Ibn Khaldun. The text has been published by Lyall, with the commentary of Tibrizi (Calcutta, 1894); Tarafa by Geiger in *Wiener Zeitschrift für die Kunde des Morgenlandes*, xix (Vienna, 1905), and Antara, with the commentary of Ibn al Anbari by Roscher in *Revista degli studi orientali* (Rome, iv, 1911; vi, 1913). Five of the poems were translated and interpreted by Theodor Nöldeke in *Sitzungsberichte der königlichen Akademie der Wissenschaften*, vols. cxl–cxliv (Vienna, 1900). Sir William Jones published the first English translation, *The Moallakat* (London, 1782); the most recent are those by F. E. Johnson, *Seven Arabic Poems* (ib., 1897), and Kennedy, *Pre-Islamic Poetry* (ib., 1908). See Amru'l Kais; Amr ibn Kulthum; Antar, Harith ibn Hilliza; Labiḍ; Tarafa; and Zuhair.

MOAT, mōt, (OF. *mote*, embankment, from ML. *mota*, mound, embankment, ditch, castle; probably connected ultimately with Bavarian *mott*, peat, Swiss *mutte*, turf). The ditch round the ramparts of a fortress, often filled with water as an obstacle against attack. See Fortification; Castle.

MOAWIYAH, mō'â-wē'yâ (Ar. *Mu'āwiyyah*) (c.610–680). Caliph and founder of the Ommiad dynasty. He was born at Mecca, the son of Abu Sufian, the bitter enemy of Mohammed. He was made Governor of Syria by the Caliph Othman, and during his term of office conquered the island of Rhodes, but lost Cyprus. On the proclamation of Ali as the successor of Othman in 656 Moawiyah revolted and with the aid of the gifted Amr ibn al Asi attempted to make himself Caliph. He was defeated in several battles by Ali, who, however, was prevented by domestic rebellion and foreign war from completely crushing his rival. Moawiyah was proclaimed Caliph at Damascus, 656, and after the assassination of Ali in 661 he succeeded in speedily reducing the rest of the Empire to submission. His army, after making extensive conquests, was unable, after a long siege and repeated assaults, to capture Constantinople, and in 678 he entered into a treaty of peace with the Byzantine Emperor. Moawiyah not only exerted absolute control over the Moslem Empire, but succeeded in having the caliphate declared hereditary in his family.

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MOB. See Crowd.

MO'BERLY. A city in Randolph Co., Mo., 129 miles east by north of Kansas City, on the Missouri, Kansas, and Texas and the Wabash railroads (Map: Missouri, D 2). It has the division headquarters and machine shops of the Wabash Railroad, brickyards, flouring and planing mills, foundries and machine shops, ice, shoe, wagon, glove, furniture, and frame factories, culvert works, cement works, and a large grain elevator. There are valuable deposits of coal and fire clay in the vicinity. An extensive trade is carried on in agricultural and dairy products, lumber, live stock, poultry, hides, wool, tobacco, and, of the city's manufactured products, flour and bricks. Moberly has a Carnegie library, two fine parks, an attractive Federal building, two hospitals, and a convent school. The water works are owned by the city. Pop., 1900, 8012; 1910, 10,923; 1914 (U. S. est.), 12,162; 1920, 12,808.

MOBERLY, George (1803–85). An English

prelate, Bishop of Salisbury. He was born in St. Petersburg (now Petrograd), Russia, and was educated at Winchester and Oxford. In 1826 he took the Oxford chancellor's prize for the best English essay. After connection with Balliol College as tutor and fellow he was in 1835–66 head master of Winchester. He was then presented to the living of Brightstone in the Isle of Wight and in 1868 became a canon of Chester Cathedral. In 1869 he was consecrated Bishop of Salisbury. Although he belonged to the High Church party, in 1872 he urged omission of the damnatory sections of the Athanasian Creed (q.v.). Of his numerous published works the most important are: *A Few Remarks on the Proposed Admission of Dissenters to the University of Oxford* (1834); *Sermons Preached at Winchester College* (1844); *Sermons on the Beatitudes* (1860; 3d ed., 1870). In 1868 he delivered the Bampton lectures, which appeared under the title of *The Administration of the Holy Spirit in the Body of Christ.*

MOBERLY, Robert Campbell (1845–1903). An English theologian. He was educated at Winchester and at New College, Oxford; was senior student of Christ Church in 1867–80; and was ordained a priest of the Established church in 1870. He was head of St. Stephen's House, Oxford, in 1876–78; served in 1878–80 as principal of the Diocesan Theological College at Salisbury, where he was also chaplain to his father, George Moberly, Bishop of Salisbury; and became vicar of Great Budworth, Cheshire, in 1880. He was appointed professor of pastoral theology at Oxford in 1892 and was chaplain in ordinary to Edward VII in 1901. His writings include: an important paper on "The Incarnation as the Basis of Dogma" (1889) in *Lux Mundi; Sorrow, Sin, and Beauty* (1889; 2d ed., 1903); *Ministerial Priesthood* (1897; 2d ed., 1899); his chief work, *Atonement and Personality* (1901); *Christ our Life* (1902); *Problems and Principles* (1904).

MOBILE, mō-bēl'. The county seat of Mobile County, the only seaport of Alabama, 140 miles east by north of New Orleans (Map: Alabama, A 5). It lies where the delta of Mobile River (the Mobile, Spanish, Raft, Tensaw, and Apalachee rivers) empties into Mobile Bay, 26 miles north of the Gulf of Mexico, and is served by five railroads—the Louisville and Nashville, Southern, Mobile and Ohio, New Orleans, Mobile, and Chicago, and the Alabama, Tennessee, and Northern. Its total area of 17.51 square miles extends from the west bank of Mobile River westward to the last foothills of the Appalachian chain at Spring Hill. To the north are large gum and cypress swamps, barely at sea level, while land towards the gulf is generally low. The city's streets are laid out at right angles, and many are lined with beautiful white Colonial residences. In the business district are the new United States government building, the Mobile and Ohio station, the Battle House, the City Bank and Trust Company building, the Van Antwerp office building, the County Court House, and the City Hall, which was remodeled from an old Spanish market; also the Providence Infirmary, United States Marine Hospital, Mobile Infirmary, and Southern Infirmary. The cathedral of the Immaculate Conception, a good example of Gothic architecture dating from the French occupation in 1720, is the seat of the Bishop of Mobile. Christ Episcopal Church, with a severe Greek exterior, was built in 1835. Mobile still retains a large number of the philanthropic institutions for which it was famed before the Civil War, when it was the premier cotton-shipping port of the South. Chief among them are the Medical School of the University of Alabama and Spring Hill College, the latter a Jesuit institution of excellent repute, founded in 1830; while McGill Institute, the Convent of the Academy of Visitation, and Barton Academy (the city high school) are worthy of mention. It has three small libraries. Along the bay shore south of the city is Monroe Park; the other chief recreation centres are Washington Square, Lyons Park, and Bienville Square. Across the bay on the east shore are beautiful summer homes, a colony of the advocates of the Henry George single-tax system at Fairhope, while on the west shore are the summer resorts of Coden and Bayou le Batre.

Mobile thrives principally as a port from which the cotton, lumber, and naval stores of the surrounding country are shipped to Cuba, Europe, South and Central America. It has regular sailings to New York, Cuba, Porto Rico, Central America, South America, and Europe. A 27-foot channel leads from the mouth of the bay to the city docks. From 1911 to 1914 the city made many improvements along the water front, and in the creation of municipal docks which cover 1500 feet of water front. The magnificent Turner-Hartwell docks with double slips extend 1600 feet into Mobile Bay, and the city acquired a vast new frontage of dredged land when the channel of the bay was straightened in 1913. Its exports, chiefly logs, hewn timber, shingles, pine lumber, rosin, cotton, and cotton products, amounted in 1913 to $28,823,873. Imports, chiefly bananas, pineapples, sisal grass, asphalt, potash, and sulphur ore, totaled $3,675,180. It has several large cotton compresses, a number of large saw mills which turn out pine, gum and cigar-box lumber, and several very important machine shops and a shipbuilding yard. There are also a brewery, sash and blind factories, veneering plants, cotton mills, an agricultural chemical plant, and in the suburb are the main repair shops of the Mobile and Ohio Railroad. In 1910 Mobile as the second manufacturing city of Alabama had invested in her enterprises $5,250,000, which produced $5,429,000 of finished goods, or an increase of about 10 per cent in the decade. The farming in the vicinity is much diversified, ranging from cotton to corn, pecans, Satsuma oranges, cabbages and staple vegetables, which are raised in large quantities. Mobile is the centre of an important Gulf fish and oyster industry.

The budget of the city in 1914 was $494,080, the principal expenditures being $170,000 for interest on bonds; police, $76,500; fire, $68,000; streets, $82,000. The city owns the water works. Pop., 1860, 29,258; 1900, 38,649; 1910, 51,521, of which 22,763, or 44 per cent, were negroes or of negro descent; in 1920, 60,151.

Mobile was founded in 1702 by Bienville and d'Iberville at a point on the Mobile River north of the present city and known as Twenty-seven Mile Bluff. After experiencing the violent annual spring freshets in 1710 the city was moved to its present site in 1711. It was the capital of the French Province of Louisiana until 1720. In 1763 it was ceded to the English as part of Florida, but in 1780 the Spanish under Galvez captured it, and in 1783 the possession of Spain was confirmed by treaty. It became the property

of the United States under the Louisiana Purchase, and was captured in 1813 by Gen. James Wilkinson. It was the headquarters of Gen. Andrew Jackson in 1814. It was granted a city charter in 1819. It was an important point during the Civil War, and on Aug. 5, 1864, Admiral Farragut bombarded Forts Morgan and Gaines, defending the mouth of the bay, and, after sinking the Confederate ram *Tennessee*, attacked and destroyed the main body of the Confederate fleet under Admiral Franklin Buchanan. (See MOBILE BAY, BATTLE OF.) In the spring of 1865 the Union general Canby defeated forces under Gen. R. C. Gibson, and the Federals took possession of it April 12. After the Reconstruction period it was placed in bankruptcy in 1879 as the Port of Mobile. It received a new charter in 1887. In 1906 a severe southeast gale caused the inundation of lower parts of the city by water backed up in the bay. There were many lives lost and much property destroyed at Coden, Cedar Point, and along the south shore of the county. In 1911 a commission form of government under three commissioners was adopted.

Mobile claims the distinction of being the home of the Mardi-gras celebration in the United States. As Mother of Mystics a masked society known as the Cowbellian de Rakin Society was formed in 1830. This was succeeded by the Order of Myths and the Infant Mystics, which still continue with several other organizations their yearly balls and elaborate street parades. It was the home of Raphael Semmes, the famous Confederate captain; Augusta Evans Wilson, writer; and Father Ryan, the poet priest.

Consult: "Mobile," in L. P. Powell (ed.), *Historic Towns of the Southern States* (New York, 1900); P. J. Hamilton, *Colonial Mobile* (Boston, 1910); id., *Founding of Mobile, 1702–1718* (Mobile, 1911).

MOBILE BAY. The estuary of the Alabama and Tombigbee rivers (whose waters after their junction form the Mobile and Tensaw rivers), running into the Gulf of Mexico, through the southwest portion of the State of Alabama (Map: Alabama, B 5). It is about 27 miles long and has an average width of about 8 miles. The southern part of the bay, stretching about 14 miles eastward from the entrance, is known as Bon Secours Bay; this is shallow, with an average depth of 7 to 15 feet. The entrance to the bay proper, between Mobile Point and the east end of Dauphin Island, is about 2¾ miles wide, but is obstructed by a number of islands and shoals. The main channel is about ½ mile wide, and 26 feet deep. Depths within the bay range from five to eleven fathoms. The entrance is defended by Forts Morgan and Gaines, and on Mobile Point is a lighthouse with a revolving light. The bay has also an outlet on the southwest through Grant's Pass, communicating with Mississippi Sound, used by steamers of light draft, and the regular course of the Mobile and New Orleans steamers. See MOBILE BAY, BATTLE OF.

MOBILE BAY, BATTLE OF. A battle of the Civil War in America, fought Aug. 5, 1864, between a Federal fleet under Rear Admiral Farragut and the Confederate ram *Tennessee* aided by three auxiliary gunboats and the guns of Fort Morgan. When Farragut was ordered to the Gulf of Mexico in January, 1864, he wished to attack Mobile and effectually put an end to blockade running, but not until late in July was he assured of the support of a land force and of ironclads, without which the attack was likely to prove a failure. The city, 30 miles above the Gulf, was protected by Fort Morgan and Fort Gaines, respectively on the eastern and western sides of the entrance to the bay. The channel was closed by piles and torpedoes except for a narrow space under the guns of Fort Morgan. At seven o'clock on the morning of August 5 the four monitors *Tecumseh*, *Manhattan*, *Winnebago*, and *Chickasaw* began to fire upon the fort as they steamed past. They were followed by the wooden sloops *Brooklyn*, *Hartford* (flagship), *Richmond*, *Lackawanna*, *Monongahela*, *Ossipee*, and *Oneida*, to each of which was lashed a gunboat, to prevent it from drifting if disabled. When the *Brooklyn* was almost abreast of the torpedoes she stopped and began to back. The captain of the *Tecumseh* disobeyed orders, steering to the west of the open channel, and his vessel was blown up. As the *Brooklyn* turned across the channel, to prevent fouling, Admiral Farragut ordered the course directly across the torpedoes. Though the torpedoes were felt to strike the bottoms of the vessels, none exploded. Little damage was done by the guns of the fort and the Federal gunboats were released. Soon they sank the *Selma*, drove the *Gaines* aground and the *Morgan* under the guns of the fort, and the fleet prepared to anchor. The ram *Tennessee* coming out from the shelter of the fort attacked the entire Federal fleet. Though hit many times, and rammed by the *Hartford*, the *Monongahela*, and the *Lackawanna*, her armor suffered little damage, but her smokestack was shot away, her steering gear disabled, and her commander had his leg broken by a splinter. Her port shutters were so jammed that it was impossible to use her guns successfully and at ten o'clock she surrendered. General Granger had invested Fort Gaines, August 3, and on August 7 that fort surrendered. Fort Morgan was immediately invested and surrendered on August 23. No attempt was made to take the city at this time on account of the shoal water, but the port was effectually closed. The Confederate losses amounted to 12 killed, 20 wounded, and 280 taken prisoners. The Federals lost 52 killed, 170 wounded. To this should be added from the crew of the *Tecumseh* 93 drowned and 4 captured. Consult: Loyall Farragut, *Life of David Glasgow Farragut* (New York, 1892), and A. T. Mahan, *Admiral Farragut*, in "The Great Commanders Series" (ib., 1892).

MOBILE POINT. A name applied to the end of a long, narrow strip of sand which stretches between Navy Cove and the Bay of Bon Secours to the north and the Gulf of Mexico to the south, at the eastern extremity of the entrance to Mobile Bay. Fort Morgan is situated here, on the ground once occupied by Fort Bowyer (q.v.). Andrew Jackson repaired Fort Bowyer, on Mobile Point, and garrisoned it just in time for it to resist attack by the British on September 15, 1814. On Feb. 11, 1815, 34 days after the battle of New Orleans, a British force captured Fort Bowyer, but withdrew on April 1.

MOBILE RIVER. The west branch of the system of channels through which the united Alabama and Tombigbee rivers discharge into the head of Mobile Bay near the west shore. It is about 38 miles long, and communicates at several points with the Tensaw, or eastern branch of the system.

MOBILES, mō'bēl' (Fr. *garde nationale mobile*, usually called *garde mobile*). A body of

French troops created by law in 1868 and suppressed in 1872. It was composed of young men not included in the class with the colors; men exempt from these classes; men who had procured substitutes; and men who had served but who wanted to enlist anew.

MOBIL'IAN TRADE LANGUAGE. An Indian trade jargon formerly serving the same purpose of intertribal and trade communication in the Gulf States that is still served by the Chinook jargon (q.v.) along the Columbia and the northwest coast, by the *lingoa geral* in Brazil, and to a certain extent by the sign language (q.v.) of the plains. It was based upon Choctaw, with additions from all the neighboring dialects and from the more northern Algonquian languages, and was the common medium of communication among all the tribes of the Gulf region, from the Atlantic coast of Florida probably as far west as Matagorda Bay in Texas and northward along both banks of the Mississippi to the Algonquian frontier about the entrance of the Ohio. It was called *Mobilienne* by the French, from Mobile, the great trading centre of the Gulf region. Along the Mississippi it was sometimes known as the Chickasaw trade language. In an official report upon the Texas tribes in 1805 Sibley stated that the Mobilian was spoken in addition to their native language by all the Indians who had come from the east side of the Mississippi. It was still spoken in Louisiana 70 years ago, but has since died out with the general decay of the Indian life.

MOBILIER, mō'bē'yā', CRÉDIT, krā'dē'. See CRÉDIT MOBILIER.

MOBILIZA'TION (Fr. *mobilisation*, from *mobiliser*, to mobilize, from *mobile*, Lat. *mobilis*, movable, from *movere*, to move, Skt. *mīv*, to push). The expansion, equipment, and concentration of the national military assets and the organization of the same into the larger tactical units prepared for immediate war service. The term is used to express the general preparation of both the army and the navy, but is more commonly employed with respect to the assembling of armies. For the navy mobilization includes placing in commission all ships held in reserve; receiving, equipping, and assigning the naval reservists; organizing the ships into divisions, squadrons, and fleets; supplying these with the necessary ammunition, coal, and with supply, repair, and hospital ships, etc., providing in general for creating and maintaining "fleets in being."

In continental Europe the national army in war is the "nation in arms," i.e., it is composed practically of the entire able-bodied male population, usually between the ages of 18 and 48. Since it is neither necessary nor possible, for economic reasons, to maintain permanently in peace the great forces that may be temporarily required in war, these Powers have adopted the system of a relatively small peace establishment capable of enormous expansion and rapid concentration when war is imminent. This expansion in size and concentration at threatened points is mobilization. The rapidity of mobilization is one measure of military efficiency, and an important one, for the reason that it affords the opportunity of securing the strategical and tactical advantages of the offensive. The number of trained soldiers and the rapidity of mobilization in any theatre of war are dependent on the form of government, whether centralized or decentralized; on population; on the national genius for military organization; on the general political policies with respect to neighboring nations; on geographical location; on the local terrain and number of roads and railroads to the theatre of war; on economic conditions; on the system of service in time of peace, compulsory or volunteer, employed in training men for war. All great nations except England and the United States have adopted the compulsory system of training in peace, so that in war such nations, without delay, can embody in a great war army civilians previously trained as soldiers. In England and the United States, where the volunteer system is used, there is no such large body of trained reservists. In order to meet any great national emergency they must depend upon the slow process of volunteer recruiting and training such recruits after war has been declared.

It is true that England, in the special and army reserve class, had trained volunteer reservists, but their number was insignificant compared with the numbers of conscript reservists available for the continental armies when the European War of 1914 began. Mobilization as technically understood in compulsory-service armies has no application in volunteer systems like that of England and the United States, for the reason that there is little or nothing in the way of trained reservists to mobilize, or put "in being." The word mobilization when used with respect to the American or English system would be understood as meaning rather a system of recruiting volunteer civilians and their assemblage in camps for equipment and training. In the Spanish-American War of 1898 it required nearly two months to mobilize and transport to Santiago the insignificant force of about 15,000 men. In the European War of 1914 England was able to mobilize for *immediate* use in France not more than four divisions, about 80,000 men, and at the end of six months about 720,000 men, of which about half were trained troops, the rest partially trained colonial and Indian contingents and volunteers recruited after the war began. In strong contrast were the wonderful systems of France and Germany. At the end of two weeks France had an active field army of at least 1,380,000 men; Germany an army of 1,850,000 at the end of six days. These were only the initial mobilizations. Later there followed other classes of reservists, until the number of trained or partly trained men totaled an estimated number of 4,400,000 for France and 5,300,000 for Germany. Owing to the extent of territory over which her reservists are scattered and the lack of railways to the German and Austrian frontiers Russian mobilization on those frontiers was much slower than that of Germany. Russia's regular army was estimated at about 1,200,000, with a potential mobilization of 1,850,000 in 30 days. Her ultimate strength in men might reach 7,700,000 provided she had the necessary arms and equipment. Austria's regular army is about 400,000; initial mobilization, in about three weeks, 820,000; ultimate strength, 2,200,000. Japan maintains a peace army of about 250,000; initial mobilization, 600,000; ultimate trained strength, 1,500,000. The United States could mobilize in the United States proper an incomplete field army of about 25,000 regulars in about two weeks and four incomplete divisions (80,000 men) of partially trained militia of doubtful value in about one month; total, 105,000 men in one month. As

there are no trained reservists, further effective increase could not take place until the volunteer recruits had been trained, possibly in six months. All the above figures are estimates for 1914–15. The exact strength in each case is known only to officers of the general staffs, who are extremely careful in their efforts to mislead their possible national enemies.

Details of Mobilization. The new French plan and detailed methods of mobilization, though frequently practiced in peace, had its first complete test in the European War of 1914. The scheme worked smoothly, efficiently, and successfully. The general plan provided: 1. In peace, detailed instructions for the guidance of each reservist; for all private owners of horses, wagons, and automobiles; for all civilian officials, especially the railway and telegraph personnel. 2. Upon the declaration of war, a proclamation of martial law throughout the country; the announcement and posting of a brief general mobilization order designating the days of mobilization and making the requisition for private transportation previously inspected and accepted; putting into effect the military train schedules; taking control of the telegraph and telephone lines; assuming the censorship of the press and military control of cafés selling intoxicating liquor; the supervision of prices asked for food products; etc. The decree of the President of the Republic proclaiming martial law, posted Aug. 2, 1914, read as follows: "The 86 Departments, the territory of Belfort, and the three Departments of Algeria are declared under martial law. Martial law will be maintained throughout the duration of the war." Under French law, "by virtue of martial law, the powers with which the civil authority is clothed for the maintenance of order and police pass at once and in their entirety to the military authority, and the civil authority exercises only those powers of which it has not been dispossessed by the military authority." The powers thus transferred include the right of search of houses, the removal of suspects and individuals without domicile in the district under martial law, the enforced surrender of arms and ammunition and right to search for same, prohibition of publications and assemblages likely to cause excitement and disorder, jurisdiction over crimes and offenses against the safety of the state, against the constitution, or against the public peace, whatever the rank of the principals or accomplices. Citizens continue to enjoy all the rights guaranteed by the constitution, except those which are expressly suspended.

Mobilization was announced to the inhabitants throughout France by posting a copy of the order in conspicuous public places. In the smaller towns and villages the people were assembled by the beating of drums, ringing of bells, etc., the order then being read by a gendarme or town official. Individual reservists in country districts were reached by telephone or messenger. The order was promulgated in the afternoon of August 1 and read as follows:

"The Army and Navy. Order for General Mobilization

By decree of the President of the Republic the mobilization of the Army and Navy is ordered; also the call for the animals, wagons, and harness necessary for the equipment of those forces.

The first day of mobilization is Sunday, Aug. 2, 1914

Every Frenchman liable for military service must, under penalty of being punished to the full extent of the law, obey the instructions of the mobilization section (see colored pages placed in his individual booklet).

There are included under the present order: *all* men not present with the colors, belonging:

1st. To the Army, including colonial troops and the men of the auxiliary services.

2d. To the Navy, including registered sailors and naval reservists.

Table Showing Calendar Dates of Mobilization Days

The *first day* of mobilization is Sunday, Aug. 2, 1914.

. . . . . .

The *fifteenth day* of mobilization is Sunday, Aug. 16, 1914."

By the promulgation of these two documents announcing martial law and general mobilization respectively the whole of France and Algeria passed smoothly and quickly from a status of peace to a status of war. Every French citizen liable for military duty dropped his work, consulted the colored pages of his individual instruction booklet, reported at a certain hour of a certain mobilization day at a designated railroad station for transportation to the headquarters of his regiment, where he was at once uniformed, armed, and equipped for service in the field with his organization. With equal ease and rapidity were assembled the vast number of animals, wagons, harness, and motor vehicles required for the armies being mobilized. The owner presents his property at a designated time and place, receives an order for the value previously agreed upon, and may, if he so desires, have this order cashed immediately by the local army paymaster. The civilian railway man, the telegraph operator, the business man, the doctor, donned a uniform and, in accordance with individual instructions received in peace, proceeded, if so ordered, with the practice of his business or profession under military control and for the sole benefit of the government or the army.

In the United States mobilization is accomplished as follows: If war appears imminent, mobilization camps are selected by the War Department for the organized militia and volunteers. The regular army is mobilized at its permanent stations. At the mobilization camps troops are assembled and raised to war strength, equipped, and prepared for service. Recruits for the regular army are assembled, equipped, and trained at the five permanent recruit depots (see Depot) and then sent to their organizations. Department (territorial) commanders are responsible that all military organizations leave mobilization points: (1) with the full equipment required by existing orders; (2) with sufficient rations and grain to supply them fully while en route; and (3) with two days' rations and grain for use after their arrival at the concentration camps. A concentration camp is a place near the scene of intended operations or near an embarkation point, where troops are assembled for immediate use against the enemy or for transport to an over-sea theatre of operations.

Consult "Pages d'histoire," in *Mobilisation*, Librairie Militaire (Paris, 1914); *Field Service Regulations, U. S. A.* (Washington, 1914). See CAMP; FRONTIER; *Army* sections under countries.

MÖBIUS, mē'bē-us, AUGUST FERDINAND (1790–1868). A German mathematician, born in Leipzig. He studied at the universities of Leipzig and Göttingen. At first he devoted his attention to law, but later, under the influence of Gauss, he took up mathematical astronomy. In 1816 he was made professor at Leipzig and almost immediately afterward became director of the observatory in the Pleissenburg, which was built after his plans (1818–21). His important astronomical and mathematical memoirs appeared from this time on in the *Astronomische Nachrichten*, Crelle's *Journal*, and the *Berichte* of the Scientific Society of Leipzig. His leading mathematical work was *Der barycentrische Calcul* (1827). This contained a novel discussion of homogeneous coördinates, presented the first systematic discussion of the essential differences between the modern and the ancient geometries, set forth the generalization of figures, stated the invariant property of anharmonic ratios (which was, however, known to Menelaus and Proclus), and made extensive use of the principle of duality. He also wrote the following works: *Die Hauptsätze der Astronomie* (1836; 7th ed., 1890); *Lehrbuch der Statik* (1837); *Die Elemente der Mechanik des Himmels* (1843). His *Gesammelte Werke* have been edited by Baltzer, Klein, and Scheibner (4 vols., Leipzig, 1885–87).

MÖBIUS, KARL AUGUST (1825–1908). A German zoölogist. He was born in Eilenburg; studied at Berlin, and in 1868 was made professor of zoölogy at Kiel. There he became especially interested in marine animals, and was a member of the commission of 1871 and 1872 for the investigation of German seas. Möbius went to Berlin in 1887 as director of the zoölogical museum, retiring in 1905. In 1901 he was president of the fifth International Zoölogical Congress at Berlin. His publications include: *Die Nester der geselligen Wespen* (1856); *Die echten Perlen* (1857); *Neue Seesterne des Hamburger und Kieler Museums* (1859); *Fauna der Kieler Bucht* (1865–72), with H. A. Meyer; *Die Auster und die Austernwirtschaft* (1877); *Die Fische der Ostsee* (1882), with Heincke; *Aesthetische Betrachtung der Saugethiere, Mollusken, Vögel, Insecten* (1900–05).

MÖBIUS, PAUL JULIUS (1853–1907). A German psychiatrist and medical writer. Born at Leipzig, he studied there and in Jena and Marburg, graduating as Ph.D. in 1874, as M.D. in 1876. In 1883 he was admitted as privatdocent to the medical faculty at Leipzig, resigning in 1893. From 1885 he was editor of *Schmidts Jahrbücher der gesamten Medizin*. He was a thorough investigator and a prolific writer, not only in medicine but also in social problems. Among his best-known medical works are: *Allgemeine Diagnostik der Nervenkrankheiten* (2d ed., 1894); *Abriss der Lehre von den Nervenkrankheiten* (1893); *Beiträge zur Lehre von den Geschlechtsunterschieden* (1903–04); J. J. *Rousseaus Krankheitsgeschichte* (1889); *Ueber das Pathologische bei Goethe* (1898); *Ueber Schopenhauer* (1899); *Ueber das Pathologische bei Nietzsche* (1902). His *Ausgewählte Werke* appeared in Leipzig in 1905. Of his writings intended for a wider circle of readers may be mentioned: *Ueber die Behandlung von Nervenkranken und die Errichtung von Nervenheilstätten* (2d ed., 1896); *Ueber den physiologischen Schwachsinn des Weibes* (7th ed., 1905).

MÖBIUS, THEODOR (1821–90). A German philologist, one of the foremost students of old Norse literature and language, son of August Ferdinand Möbius, the mathematician. He was born at Leipzig, studied there and in Berlin, and in 1852 became docent of Scandinavian languages at Leipzig. He was promoted to professor in 1859, and from 1865 to 1888 he was a member of the faculty of Kiel as professor of Norse philology. Möbius' most valuable work was as an editor of Norse sagas. Especial mention should be made of *Fornsögur* (1860), with Vigfússon; *Edda Sæmundar* (1860); *Islendingabók* (1869); *Málsháttakvæthi* (1873); Snorre's *Háttatal* (1879–81); *Kormákssaga* (1886). His other work includes the dissertation, *Die ältere isländische Saga* (1852); the valuable bibliography, *Catalogus Librorum Islandicorum et Norvegicorum Ætatis Mediæ* (1856; a supplemental volume in 1880); *Analecta Norræna* (1859; 2d ed., 1877); *Altnordische Philologie im skandinavischen Norden* (1864); *Altnordisches Glossar* (1866); *Dänische Formenlehre* (1871); *Ueber die altnordische Sprache* (1872).

MOCAYA OIL. See GRUGRU PALM NUT.

MOC'CASIN. See SHOES AND SHOE MANUFACTURE.

MOCCASIN FLOWER. See LADY'S-SLIPPER; also Colored Plate of ORCHIDS, AMERICAN.

MOCCASIN SNAKE, WATER MOCCASIN, or COTTONMOUTH. An aquatic, fish-eating, venomous pit viper (*Ancistrodon piscivorus*) of the southern United States, allied to the copperhead. It may grow to be 4 feet long; is thick and heavy in body; has a tapering tail, without any rattle or spine; and in color is dark chestnut brown, with light marks on the lips, obscure blackish bars on the sides, and the abdomen black blotched with yellowish white. The interior of the mouth, displayed when the snake is about to strike, is cottony white. This serpent exists in large numbers from southern Indiana and southeastern Virginia to the Rio Grande in swamps, marshes, on overflowed lands, and along rivers and bayous, where it is fond of lying in the sunshine upon banks, tussocks, driftwood, or bushes and trees overhanging the water. It never goes far away from such places, and is really a water snake; its food is mainly frogs and fishes. When disturbed it may escape by swimming, but is quite as likely to turn and fight fearlessly. It is one of the most virulent and deadly of all American serpents, but fortunately it does not wander into places where men usually go, except in the irrigated rice fields, where it is greatly dreaded. In captivity it is one of the most untamable and ferocious of known reptiles. It produces eight or ten young annually in midsummer, all fully prepared for offense or defense. The moccasin is "mimicked" by the quite harmless water snake *Natrix*, which, however, is usually much smaller, has a narrower, less triangular and forbidding head, and may always be distinguished by the double row of scales on the underside of the tail. Consult L. H. Stejneger, *Annual Report of the Smithsonian Institution for 1893* (Washington, 1895), and R. L. Ditmars, *The Reptile Book* (Garden City, N. Y., 1914). Cf. COPPERHEAD; RATTLESNAKE.

MOCENIGO, mō'chā-nē'gō. The name of a prominent Venetian family which furnishes several able commanders and doges to the Republic.

The most noted was Tomaso, Doge from 1414 to 1423. At a time when Venice was mistress of extensive possessions, Mocenigo endeavored to maintain her position by a policy of peace. His chief opponent was Francesco Foscari, the next Doge, who urged a policy of conquests on the mainland of Italy. Mocenigo was able to withhold Venice from this course, which afterward proved so disastrous to her power. To him was due the building of the present Doge's palace. At the time of Tomaso's death Venice had reached the zenith of her glory. Consult Alethea Wiel, *Venice* (New York, 1894).

MOCHA, mō'kȧ, or MA'KHA. A strongly fortified seaport, and once the capital, of the Province of Yemen in Arabia. It is situated on the Red Sea, at the head of a little bay near the Strait of Bab el Mandeb, and 130 miles west-northwest of Aden (Map: Turkey in Asia, E 9). It stands in a dry, arid plain and its water is brought by aqueduct from the hills 16 miles distant. The town is ancient, but is now in a ruinous condition. The harbor is shallow and is frequented only by Arab dhows. It formerly exported large amounts of coffee and other produce, which are now distributed through the ports of Aden and Hodeida. Pop., 5000.

MOCHA STONE, or DENDRITIC AGATE. A name given to those cryptocrystalline varieties of quartz, such as agate and chalcedony, which contain mosslike or dendritic forms, usually consisting of manganese dioxide distributed through the mass. They were originally brought into Europe from Mocha. Of a similar nature is the moss agate.

MOCHNACKI, mȯk-näts'kē, MAURYCY (1803–35). A Polish publicist and critic, born at Bojaniec, Galicia. He took part in the revolution of 1830–31, and, after the capture of Warsaw, left his native country and spent the remainder of his life in France. He was the defender of the Romantic school in Poland, and is said to have dealt the deathblow to classicism in that country. His works are *A History of Polish Literature in the Nineteenth Century* (1830) and a valuable *History of the National Insurrection in Poland in 1830 and 1831* (1834).

MOCKING BIRD (*Mimus polyglottos*). The most famous, if not the sweetest and most beautiful, of American songsters. It receives its popular name from its extraordinary powers of vocal imitation. It is often called mocking thrush, and was formerly considered a peculiarly modified thrush, but now, with its near relatives the catbird and brown thrasher, it is classified very near the wrens. The genus *Mimus* is characterized by the elongate form, long tail, short wings, and straight bill, much shorter than the head, notched near the tip, and whiteness of the plumage on the inferior surface of the body. The mocking bird is about 10 or 11 inches long, the tail being nearly one-half the total length. The upper parts are ashy gray; the wings and tail are nearly black, extensively marked with white; under parts grayish white. The bird is very common in the South Atlantic and Gulf States, and in summer ranges as far north as Massachusetts and westward to the Pacific coast. The nest is built in bushes and low trees. It is made of twigs, leaves, weed stalks, and grasses, lined with rootlets, cotton, etc. The eggs are four to six in number, pale greenish blue, heavily spotted and blotched, especially near the larger end, with bright brown. Two and sometimes three broods are reared in the season, which begins early in the spring and lasts until the end of the summer. During the spring and early summer the birds sing all day and even all night, and in many localities the air rings with their music. Their native song is extraordinarily beautiful, but it has in addition the power of reproducing the songs of other birds with such accuracy as to deceive even the imitated birds. There is, however, very great individual difference in this power, for while some birds seem seldom to attempt any mimicry, others are constantly imitating the sounds which they hear.

When taken from the nest young mocking birds readily become accustomed to cage life and may live for many years. They are easily taught and often improve greatly with careful training. The food of the mocking bird is largely composed of insects and berries or seeds. An inhabitant of gardens and roadsides, fond of human habitations, and seldom seen in the woods, the mocking bird is often found in villages and even in the streets of large towns.

Besides the common mocking bird more than a dozen other species of *Mimus* occur in the West Indies, Mexico, Central and South America. The mountain mocking bird (*Oreoscoptes montanus*) of the western United States is a much smaller and quite different bird and not especially notable as a songster. Its more common name is sage thrasher. See Colored Plate of SONG BIRDS with article THRUSH.

MOCKING WREN. The Carolina wren. See WREN.

MOCK MOONS. See HALO.

MOCK ORANGE. A hardy flowering shrub. See CHERRY LAUREL; PHILADELPHUS.

MOCK SUNS. See HALO.

MOCOA, mō-kō'ȧ. An Indian village in southern Colombia, South America. Brinton includes in the Mocoan linguistic family the Almaguereños, Mocoas, Engaños or Mgaños, Patias, Sebondoyes, etc., found between the first and second degrees, on the affluents of the Río Caquetá and near the source of the Putumayo. Consult A. F. Chamberlain in *Journal de la Société des Américanistes de Paris,* N. S., vol. vii (Paris, 1910).

MOCQUEREAU, mȯk'kē-rō', DOM ANDRÉ (1849–). A French musical scholar, born at La Tessonalle, near Cholet. He received his education at Paris, and while still very young appeared as cellist in Dancla's chamber-music concerts. In 1875 he entered the order of the Benedictines of Solesmes. There he became intensely interested in Gregorian music, to the study and elucidation of which he devoted his whole life. In 1889 he began the publication of his famous and learned *Paléographie Musicale,* a series of photographic reproductions of mediæval manuscripts with monographs regarding the nature and interpretation of the same. In 1904 Pope Pius X issued an order that all reprints of Gregorian music appearing thereafter in the *Editio Vaticana* must conform to the versions given in the *Paléographie.* Besides this monumental work, of which 10 volumes had appeared to 1915, he wrote *L'Art grégorien* (1895), *Notes sur l'influence de l'accent et du cursus tonique latins dans le chant ambrosien* (1897), *Méthode de chant grégorien* (1899).

MODALISM. See MONARCHIANS.

MOD'DER, or KAIBA, RIVER. A left affluent of the Vaal River, South Africa, which it joins after an easterly course of 186 miles, about 31 miles above its junction with the Orange

River (Map: Cape of Good Hope, G 7). During the War of 1899–1902 its banks were the scene of much fighting and witnessed the repulse of the British troops at Maagersfontein in 1899 and the surrender of Cronje at Paardeberg in 1900.

MOD'ELING (from *model*, from OF. *modelle*, Fr. *modèle*, from Lat. **modellus*, from *modulus*, standard, dim. of *modus*, measure). The process of preparing the original pattern or design from which a work in sculpture is to be cast or carved. Modeling is also practiced by medalists, the head or figure intended to be cut in the die being first modeled in relief with wax on a piece of slate. Goldsmiths, silversmiths, and jewelers also model intricate and artistic forms and ornaments of pieces of plate to be cast and chased by them, or in which jewels are to be set. Modeling is also a branch of the potter's trade. For large models the material employed is potter's clay, which, when used by sculptors, is mixed with a portion of sandstone, finely pulverized, to make it work freely. In painting the term "modeling" is used to denote that quality which conveys to the eye the sense of projection, volume, and bulk of an object.

MODEL YACHTING. The pastime of sailing model yachts. In England it is known as miniature yachting, under which name it was first generally practiced in America. The boats used were either exact models to scale of well-known large yachts, or of such perfection as to be capable of being built full size from the models. Departures from conventional design and new types are frequently tried out first in model yachts. Model yachting as an organized pastime is popular in Great Britain and the United States and several clubs have been formed in the larger cities to promote racing between model yachts. Model sailing yachts are usually of sloop or schooner rig and many of the modern ones are of the fin-keel type with outside lead ballast. The hulls of these model yachts are made in various ways, but are usually either shaped up from one piece of soft wood, dug out inside and decked, or are "built up" of layers of soft-wood plank, shaped to the horizontal section or plane before fastening together and then smoothed down to the sectional and profile shape, the labor of the modeling being thus lessened. These models are rigged with great accuracy and, in sailing them, they are usually steered mechanically. They sometimes have a weighted rudder, either with lead on the rudder or on the tiller, so that the former swings as the boat heels and thus counteracts its tendency to come up into the wind. Others have the main sheet attached to the tiller with a wire-spring control which returns the rudder to a fixed position when the pressure from the sheet is relieved, while some have other forms of balance gear or tillers that may be set in any desired position. They thus steer themselves on the various points of sailing. In the United States model yachts are sometimes built up to 5 feet or over in length, but are usually from 30 to 48 inches long. In regattas they are frequently handicapped according to local measurement rules. In experimental work the model department is one of the most important branches of modern shipbuilding plants, owing to the practice of "trying out" important yachts in the shape of models before proceeding with full-size construction. In this manner faults in design are discovered and remedied. Naval vessels are also usually tested out with models in experimental tanks before building. In Great Britain model power yachting is very popular and models of various types of power boats are built from 2 to 4 or 5 feet in length, with miniature power plants (both steam and internal-combustion engines). These are operated on the small lakes and lagoons provided by the municipalities or in experimental tanks.

MODENA, mō'dā-nà (Lat. *Mutina*). A former duchy in northern Italy, south of the Po, included in the *compartimento* of Emilia in the modern Kingdom of Italy. The Roman colony of Mutina was founded on the Æmilian Way about 215 B.C., after the conquest of Cisalpine Gaul. Modena was acquired by the house of Este (q.v.) in 1288, and in 1452 the Marquis Borso d'Este was made Duke of Modena by the Emperor Frederick III. He was at the same time made Duke of Ferrara by the Pope, and the political destinies of the two cities were therefore united until 1598, when Ferrara was seized as an escheated fief by its overlord, the Pope, while Modena, with Reggio and Mirandola, remained in the possession of the house of Este. In 1796 the Duke Ercole was dethroned by Bonaparte, and Modena, with Ferrara and Bologna, was erected into the Cispadane Republic, which in 1797 was merged in the Cisalpine Republic. By the Treaty of Lunéville (1801) the Duke of Modena received the Breisgau in exchange for his duchy. On the death of Duke Ercole III in 1803 the duchy devolved by marriage upon the house of Hapsburg, the daughter of Ercole having married Ferdinand, a son of Maria Theresa, and it was awarded by the Congress of Vienna to the son of this marriage, Francis IV, who proved a cruel despot. He married Beatrice, daughter of the King of Sardinia. In 1831 an uprising forced him to take refuge in Austria, but he was promptly restored by Austrian arms, and ruled by the methods which the Hapsburg connections made familiar in all parts of Italy at that time. Francis IV died in 1846 and was succeeded by his son, Francis V. In 1848 he was forced to flee from his state, which proclaimed itself a part of the Sardinian Kingdom, but he was soon reinstated by Austria. He fled when war with Austria broke out in 1859, and although it was provided by the Treaty of Zurich that he should be restored, the people of the duchy declared their wish to be united with Sardinia in the new Kingdom of Italy. Modena then became incorporated into united Italy. See ITALY.

MODENA. A city in northern Italy, formerly the capital of the Duchy of Modena and now the capital of the province of the same name, situated in a rich gardened plain between the Panaro and the Secchia, 24 miles northwest of Bologna (Map: Italy, C 2). A navigable canal connects it with both rivers. It is a city of spacious streets and roomy arcades and is divided into an old and a new part by the historic Via Æmilia. On the main piazza rises the fine Romanesque cathedral, dating from 1099, by Lanfranco. The exterior was restored in 1893 and the interior in 1897. The façade is embellished with curious sculptures. The exterior is also enriched by a rose window and by a colonnade encircling the whole edifice. The interior is at first disappointing, but is in reality imposing. There are here a good altarpiece by Dosso Dossi and a fine group by Mazzoni. The famous Campanile, dating from 1224, is

over 300 feet high. It leans slightly. The Gothic church of San Francesco has an immense and excellent terra-cotta "Descent from the Cross" by Begarelli. The church of San Pietro is remarkable for its fine brick Renaissance façade.

Modena is rich in palaces. The Palace Albergo Arti (1767) now holds the municipal museum, containing several interesting collections. The historic library here—Biblioteca Estense, one of the most famous in Italy—had 140,740 volumes and also over 8000 manuscripts in 1913, some of them very rare. It possesses in addition a coin collection and museum of archæology. Its picture gallery is quite well known, comprising examples by Correggio, Dosso Dossi, Guido Reni, and Velazquez. The splendid ducal palace dating from 1635 is now used for a military school. Modena has statues of Tassoni and Victor Emmanuel II. The trade of Modena is not very important. There are weekly cattle markets—grain, beef, sausages, fruit, wine, and liquors being chiefly dealt in. The manufactures are few. Linen and woolen goods, leather, hats, vinegar, glass, and pottery are produced. Silk is woven, but less extensively than formerly.

In art history Modena is known for its terra cottas. It is the seat of an archbishop and has a university, a theological seminary, a military school for infantry and cavalry, a technical institute, a technical school, an agricultural college, and an academy of fine arts. The university, founded in 1683, has three faculties and a pharmaceutical and a veterinary school. The number of students was 455 in 1913. The public gardens are lovely, and the site of the former ramparts serves as a pleasure ground. Pop. (commune), 1901, 64,843; census of 1911, 70,923. For history, see MODENA (duchy).

MODENA, GUSTAVO (1803–61). A noted Italian actor. He was born in Venice and began the practice of law, first at Bologna, then at Rome. He made his début at the latter place in 1826 and at once sprang into prominence as a tragedian. Among his greatest impersonations were those in the plays of Alfieri, and several from the French, especially the rôle of Louis XI. Political troubles obliged him to live in exile from 1831 to 1837. In the movements of 1847 his patriotism again led him to take a prominent part. He published at this time his *Dialoghetti popolari.*

MOD'ERATOR (Lat. *moderator,* one who regulates, from *moderare,* to regulate; connected with *modestus,* discreet, *modus,* measure, and ultimately with OHG. *mezan, mezzan,* Ger. *messen,* Goth. *mitan,* AS. *metan,* Eng. *mete*). A title of the presiding officer on certain occasions, chiefly academic and ecclesiastical. In the Congregational and Presbyterian churches of the United States the title of moderator is given to the presiding officer of assemblies. In the former the title is used not only in the meetings of congregations and district, State, and triennial conventions, but also in councils called to act in a judicial capacity. The presiding officers in the series of Church courts provided for in the Presbyterian system, viz., the session, the presbytery, the synod, and the General Assembly, are usually called moderators. The pastor of a local church is, ex officio, moderator of the session of the church, while in the other bodies mentioned the moderators are elected from among the presbyters. The most important function of these officers, apart from presiding at the sessions of the body, is the naming of the standing committees. The term is also applied to the superintendent of the examinations for degrees and honors at the universities of Cambridge and Oxford. In the United States the presiding officer of a town meeting is also called moderator.

MODERN GREEK. See GREEK LANGUAGE (at the end). For the literature of modern Greek, see ROMAIC LITERATURE.

MODERN INSTANCE, A. A novel by W. D. Howells (1881). Though painful in its general features, it is a graphic picture of certain phases of New England life.

MOD'ERNISM. A term applied to opinions advanced by Catholic writers—chiefly ecclesiastics—both in Europe and America, which ran counter to traditional orthodoxy. It was an attempt to adjust religious views to the spirit of modern progress. It finally drew from Pius X an Encyclical which reprobated the doctrine as modernism and its teachers as modernists. The system is considered an outcome of the French Revolution, liberalism, and modern critical scholarship. Its advocates, in many instances men of ability and education, are not always clear in their formulas. Their tendency appears to be a denial of the objective value of the Catholic creed and a confining of its dogmas to a mere symbolism begotten of the most intimate aspirations of individual human nature. Albert Houtin, at one time a partisan, in his *History of Catholic Modernism* (Paris, 1913) says modernism may be defined as "the desire of adapting religion to the social, moral, and intellectual needs of the times; and if the word employed to designate it is not very ancient, it at least represents the eternal conflict between the spirit of progress and the spirit of inertia, between those who make of religion a formula and those for whom it is life itself." They summoned to their aid principles advocated by Kantism, pragmatism, evolution, and higher criticism. The spread of the propaganda was rapid and wide. There were champions of the new doctrine in the Old World and the New. The antichristian and anticlerical press entered the lists. Names of note subscribed to it—names such as Father George Tyrrell (q.v.), whom Houtin calls the leader, Baron Frederic von Hügel, Alfred Loisy (q.v.), and others. From 1888 until 1907 there was no general censure. Some writings had been condemned and letters of remonstrance from some cardinals and bishops were issued. In July, 1907, a decree approved by the Pope appeared; its opening words were "Lamentabili sane exitu." It contained and condemned as heretical, false, rash, bold, and offensive 65 propositions, 38 of which related to biblical criticism and the remainder to modernism. Cardinal Vanutelli on Aug. 28, 1907, wrote to bishops and superiors of religious orders demanding an immediate and rigorous suspension of professors in all educational institutions who did not conform to the decree. He moreover proscribed the reading of all publications favoring modernism. On September 6 of the same year was communicated to the whole world the encyclical of Pius X beginning with the words "Pascendi Dominici Gregis," which words are now its historical title. Modernism, it says, is a synthesis of all heresies and has affected the layman, the theologian, the historian, the critic, the apologist, and the reformer. The causes of

this novelty are put down as curiosity, pride, and ignorance of scholastic philosophy. It has broached errors concerning the inspiration, truth, and study of Holy Writ; concerning the teaching of the Church, Christology, the sacraments, the institution and organization of the Church, and doctrinal evolution. The encyclical seeks the necessary remedies and imposes a series of energetic measures and closes with a stirring appeal to the rulers of the Church. It proposes the study of scholastic philosophy, the removal of all educators imbued with modernism, the prohibition of all publications of a like nature, and the convening by bishops every two months of a Council of Vigilance whose duty it shall be to abolish everything that savors of novelty in religious matters. Naturally those indicted in the encyclical were vehement in their protestations. The general attitude seems to have been one of peaceful surrender. But Pius X had not as yet struck the final blow. It came in the shape of a decree the initial words of which are "Sacrorum antistitum." It is dated Sept. 1, 1910. It impeaches modernist obstinacy and specious cunning. It adds to the practical measures laid down in the "Pascendi." It insists upon all members of the priesthood of all ranks and upon candidates for holy orders and upon all professors in all houses of ecclesiastical training taking a solemn oath respecting modernist views and adhering to all the authoritative teaching of the Church. It is simply a profession of faith, giving assent to all articles of Catholic belief and dissenting from all the tenets in all times condemned by the Church of Rome. All who take it swear that they admit the existence of God and the demonstrability of the same by the light of natural reason; that they accept the exterior proofs of revelation, i.e., miracles and prophecies, as indubitable signs of the divine origin of religion; that they acknowledge the Church as guardian and mistress of the revealed word which was declared by Christ during his life on earth and declared really and historically; that they reject the heretical supposition of the evolution of dogma; that they deny the substituting for the deposit of divine faith confided to the Church a philosophic fiction or an evolution of human conscience susceptible of indefinite progress; that they adhere to everything contained in the encyclical "Pascendi" and the decree "Lamentabili," all relating to the history of dogma; that they do not consent to the statement that anything proposed by the Church can contradict history or be incompatible with the most authentic origin of Christianity; that they refuse to affirm that there is nothing divine in sacred tradition or if it be divine it is so in a pantheistic sense only; that they will support unto the end that the certain criterion of truth is, has been, and will be till the end in the episcopacy transmitted through apostolic succession, not, however, in such manner as to hold that which is most in keeping with the culture of an epoch, but in the sense that the absolute truth preached in the beginning must never be believed in any other meaning.

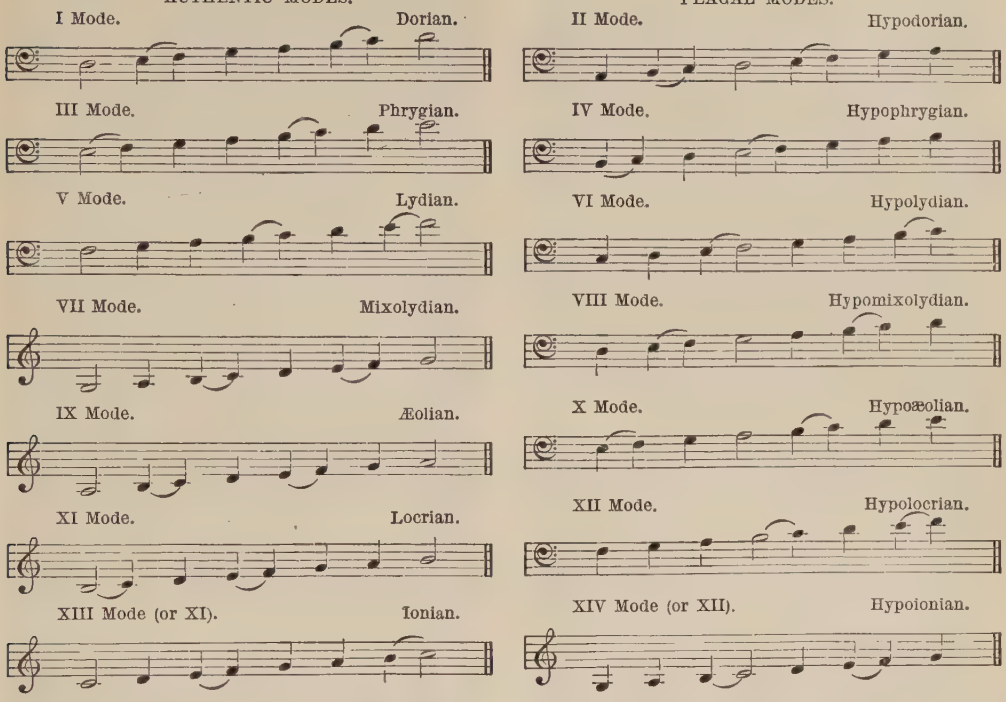
This synopsis discloses more clearly perhaps than anything else can some of the most striking declarations made by the modernists. Practically the entire Catholic priesthood subscribed to these promises. Those who refused have been dealt with severely and are outside the pale of the Church either as suspended or excommunicated. At the present moment there are apparent no symptoms of modernism within the Roman Catholic church.

Bibliography. The best reading on the subject of modernism will be found in the *Acts* of the Roman see and notably among the documents alluded to in this article; the works of Father George Tyrrell, especially *Mediævalism* (London, 1909); also his *Autobiography and Life* (2 vols., ib., 1912); Charles Gore, *The New Theology and the Old Religion* (New York, 1908); Cardinal Mercier, *Le modernisme* (Brussels, 1908; Eng. trans., St. Louis, 1910); Joseph Rickaby, *The Modernist* (London, 1908); A. L. Lilley, *Modernism: A Record and Review* (New York, 1908); Paul Sabatier, *Modernism*, translated by C. A. Miles, Jowett lectures (ib., 1908); Newman Smyth, *Passing Protestantism and Coming Catholicism* (ib., 1908); A. F. Loisy, *The Gospel and the Church* (ib., 1909); Vermeersch, *Tractatus de Modernismo* (Bruges, 1910); J. M. Bampton, *Modernism and Modern Thought* (London, 1913); Albert Houtain, *L'Histoire du modernisme catholique* (Paris, 1913).

MODERN MACCABEES, KNIGHTS OF THE. A fraternal beneficial organization founded in 1881 for social and benevolent purposes. The organization had at the close of the year 1914 one great camp and 1290 subordinate tents or branches, with a total membership of 61,863. During the year 1914 the organization disbursed $1,240,690, and the entire amount of benefits paid since the date of organization was $21,590,889. This is the original order bearing this title.

MODES (OF., Fr. *mode*, from Lat. *modus*, measure, manner). The octave species in use before the time of the invention of harmony as well as during the period of the contrapuntal style up to the time of Bach. The original scale of the ancient Greeks was a *descending* minor scale with semisteps between the third and fourth and seventh and eighth degrees. Other tones than the fundamental were also taken as starting points, but the tones of the original scale remained unaltered. This shifted the position of the semisteps every time the starting tone was shifted. The combinations of tones thus obtained were regarded as separate scales and called octave species. This system the theorists of the early Middle Ages adopted, but instead of using *descending* scales they made use of *ascending* ones. At the same time they retained the original Greek names, but applied them to scales not corresponding to the original Greek scales. From among the nine octave species of the Greeks four were originally selected for the service of the Church. These were known as the *authentic modes*. Their establishment is commonly attributed to St. Ambrose, Bishop of Milan, who died in 397 A.D. Some time later—and tradition mentions St. Gregory I (Pope from 590 to 604) as their originator—four other modes were added. These were called the *plagal modes*. During the sixteenth century, when the principles of harmony began to be first understood, two more authentic with their corresponding plagal modes were added, so that the total number of Church modes was 12. Some theorists claimed the existence of two more, Locrian and Hypolocrian (one authentic and one plagal); but neither of these was ever used in actual practice. The

reason for their rejection will become apparent a little farther on. The following is a complete table of the fourteen modes:



(In this table the final note, corresponding to our modern tonic, of each mode is indicated by a half note, the semisteps by slurs.) It will be seen that the compass of every *authentic* mode is from the final to its octave above; that of every *plagal* mode from a fourth below to a fifth above the final. Every *authentic* mode has its corresponding *plagal* distinguished by the prefix hypo (under), and beginning a fourth below the authentic mode. Furthermore, every mode must be considered as consisting of two series of tones forming either a pentachord or a tetrachord in such a manner that the highest tone of the lower series is at the same time the lowest tone of the higher series. In the authentic modes the first five tones constitute the pentachord, the last four the tetrachord. In the plagal modes the tetrachord comes before the pentachord. The former arrangement is called by the eminent theorist Zarlino (q.v.) *harmonic division* (*divisione armonica*); the latter arrangement, *arithmetical division* (*divisione aritmetica*). In examining the above table it will be noticed that the pentachords and tetrachords of all the modes, except the Locrian and Hypolocrian, exhibit the compass of a *perfect* fifth or fourth. In these two modes the pentachord represents the compass of a *diminished* fifth, the tetrachord that of an *augmented* fourth (tritonus). Both these intervals were strongly condemned by musical theory, and hence these two modes were rejected as impure, and therefore impracticable.

In every mode four notes have a special significance, just as the tonic, dominant, and subdominant have in our modern scales. These notes are: (1) the final; (2) the dominant; (3) the mediant; (4) the participant. The *final* is the tone on which every melody ends. By means of this tone the mode in which any melody is written is determined. If it moves within the range of the final and its octave, the mode is authentic; if it moves below or above the final, the mode is plagal. The *dominant* of every authentic mode is found a fifth above the final; of every plagal mode a third below the dominant of its corresponding authentic mode. The only tone which can never serve as a dominant is B. Whenever B would occur C is substituted for it. The reason for this change is that B always forms a dissonant interval with F, either an augmented fourth or a diminished fifth. The *mediant* derives its name from the fact that in the authentic modes it always lies midway between the final and the dominant; it is always the third tone of the mode. In the plagal modes the position of the mediant is rather unsettled, owing to the necessity of obtaining a convenient tone for cadences, as in the case of the dominant, and for the same reason B can never appear as a mediant. C is invariably substituted. The *participant* in the authentic modes lies either between the final and the mediant, or between the mediant and the dominant. If, however, two notes lie between the mediant and the dominant, either tone may serve as the participant. In the plagal modes the participant is always the same as the dominant of the corresponding authentic mode. Since each plagal mode begins a fourth below its corresponding authentic, this dominant (participant of the plagal) is the same as the lowest tone of the plagal mode. Here, again, B is barred and C substituted. Likewise F can never be participant, the next higher tone (G) being substituted.

While every melody must end upon the final,

it may begin upon any one of the four just-mentioned tones. But any phrase except the last of a melody may also end upon these tones. Hence they are also called *cadences* or *modulations*. As in a long melody a feeling of monotony would be produced by the constant employment of these modulations, two or more tones are admitted. The final, dominant, mediant, and participant are called *regular* modulations and the additional tones *conceded* modulations. One of the most frequent of these conceded modulations is the seventh tone of the mode. This always appears an octave lower than the true pitch, on account of a license permitting the extension of every authentic mode by one tone below its final and of every plagal mode by a sixth above the final. In order to bring melodies within the range of certain voices it sometimes happens that they are written a fourth higher or a fifth lower than the regular mode. Such transposition is always indicated by a B flat in the signature. In these cases the true final will be either a fourth below or a fifth above the closing note.

According to their range melodies are classed as *perfect*, *imperfect*, and *superfluous*. A perfect melody moves within the range of the mode in which it is written; an imperfect melody does not exhaust the entire range; a superfluous melody exceeds the range either above or below. Some melodies exhaust the complete range of both the authentic and its corresponding plagal mode; these are said to be written in a *mixed mode*. See GREEK MUSIC; PLAIN CHANT; and for an explanation of the two modes in use at present, see MAJOR; MINOR.

MODES'TO. A city and the county seat of Stanislaus Co., Cal., 77 miles south by east of Sacramento, on the Tuolumne River and on the Southern Pacific Railroad (Map: California, D 5). It has some manufactures and a trade in grain, fruit, wool, live stock, alfalfa meal, hay, and dairy products, being located in a productive region, the fertility of which is developed by an elaborate system of irrigation. The courthouse, public library, and county hospital are fine structures. Modesto adopted the commission form of government in 1912. The city owns its water works. Pop., 1900, 2024; 1910, 4034.

MODICA, mō'dē-kâ. A city in the Province of Syracuse, Sicily, 33 miles southwest of the city of Syracuse, in the fertile and beautiful valley of the river Mauro. It is 1445 feet above the sea (Map: Italy, E 6). There are a public library, a hospital, an infant asylum, a Gymnasium, technical schools, a technical institute, and a theatre. The chief products are cattle, wine, grain, oil, and tropical fruits. Pop. (commune), 1901, 48,962; 1911, 55,924.

MODIFICATION OF TEMPO. See TEMPO.

MODIL'LION (OF. *modillion, modiglion*, Fr. *modillion*, from It. *modiglione*, modillion, from Lat. *modulus*, model). An ornamental bracket much used in classic architecture, especially in the cornices of the Corinthian and Composite styles. It is so called only when used in a long series—not singly—and is usually small. Larger and single brackets are called *consoles*.

MODIOLOIDES, mō'dī-ō-loi'dēz (Neo-Lat. nom. pl., from Lat. *modiolus*, nave of a wheel + Gk. *εἶδος, eidos*, form). One of the very earliest fossil clams known, found in rocks of Lower Cambrian age. See FORDILLA; PELECYPODA.

MODIOMORPHA, mō'dī-ō-môr'fâ (barrel-shaped; from *modio*, an abbreviation of Lat. *modiolus*, the nave or hub of a wheel, and Gk. *μορφή, morphē*, form, shape). A group of pelecypods similar in aspect to the recent *Mytilus*, of which they are the Paleozoic prototype. The fossil Modiomorpha are extremely abundant in the Devonian rocks, especially of North America. See PELECYPODA.

MODJESKA, mō-jĕs'kâ, HELENA (1844–1909). A noted actress, of Polish origin, who after 1876 resided in the United States. She was the daughter of Michael Opido, a musician, and was born in Cracow, Oct. 12, 1844. Married in 1860 to a manager named Modrzejewski, from the contraction of whose name comes that by which she is known, she became in 1865 the leading actress in the theatre of her native city. Her husband died in 1865 and three years later she was married to Count Bozenta Chlapowski and became the star of the Imperial Theatre of Warsaw. Political difficulties and ill health led her in 1876 to go with her husband and others, including Henryk Sienkiewicz, to California, where they established a Polish colony. This did not succeed, and after only a few months' study of English the Polish Countess made her début in San Francisco (July, 1877) as Adrienne Lecouvreur. She won a surprising success, and was soon seen in New York in the same play. In 1880 she made her London début in the part of Camille. In 1889 and 1890 she starred with Edwin Booth, with whom she had already in 1883 appeared in *Romeo and Juliet*. Her most notable impersonations were of Shakespearean characters, among them Ophelia, Rosalind, Viola, Imogen, Cleopatra, and Lady Macbeth; but she was also famous as Mary Stuart, and appeared with success in modern plays. Her great natural gifts gained her as a tragic actress a foremost rank upon the American stage, despite the fact that she never used English with ease. In May, 1905, she was given a farewell benefit in New York City at the Metropolitan Opera House. She then settled in Orange County, in southern California, and died April 8, 1909. She was buried at Cracow, Poland. Consult: R. W. Gilder, in Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (New York, 1886); McKay and Wingate, *Famous American Actors of To-Day* (ib., 1896); L. C. Strang, *Famous Actresses of the Day in America* (Boston, 1899); William Winter, *The Wallet of Time*, vol. i (New York, 1913); and above all, *Memories and Impressions of Helena Modjeska: An Autobiography* (ib., 1910).

MÖDLING, mĕd'lĭng. A town and favorite summer resort of Lower Austria, situated at the foot of the Wienerwald, 10 miles south-southwest of Vienna (Map: Austria-Hungary, E 2). It has a fifteenth-century church, a military academy, a girls' school, and an agricultural school with courses in brewing and horticulture. The manufactures consist of iron products, railway supplies, boilers, sash and blind work, cartons, lacquer, and shoes. Pop., 1900, 15,304; 1910, 18,067.

MO'DOC. A small but warlike and aggressive tribe, formerly ranging about Lower Klamath Lake and Lost River, and on the extreme northeast frontier of California. The name is said to mean 'aliens' (i.e., enemies), having been given by some one of the neighboring tribes. They call themselves *Maklaks*, 'people,' and with their northern neighbors, the Klamath,

whose language they speak and with whom they originally formed one tribe, are classified as a distinct linguistic stock known as Lutuamian. At some earlier period they seceded from the parent Klamath tribe and established themselves on Lost River. Their houses were round log structures, covered with earth, and their women were expert basket weavers and cradle makers. The Modoc made no alliances, but were at war with all the weaker surrounding tribes, and carried on a regular slave trade by selling their captives to the Columbia tribes in exchange for ponies. They came into early collision with the California immigrants, and a chronic warfare was inaugurated, marked by wholesale massacres on both sides. In 1850 they were severely defeated by troops under Captain Lyon. In 1852 they massacred a number of settlers, for which terrible retaliation was made by a band of miners under the notorious Ben Wright, who invited their warriors to a feast and peace conference and treacherously murdered 41 of the 46 who responded. Although thus diminished by nearly half their fighting force, the Modoc recommenced the war of extermination, which continued until 1864, when they entered into a treaty by which they agreed to go upon the Klamath reservation in Oregon. By this time they had been reduced to about 250. Finding their position there intolerable by reason of the persecution and insults of the Klamath, who considered them as rebels, the majority under a younger leader known as Captain Jack (q.v.) left the reservation and returned to their old home on Lost River. They were induced to return on promise of protection, but finding themselves again subjected to the same persecution without official redress, they returned to Lost River, leaving only about 100 behind under the old hereditary chief Skonchin. Orders were given to the troops to bring them back, and on Nov. 29, 1872, the final Modoc war was begun by a night attack on Captain Jack's camp. The Modoc retreated to the Lava Beds, just across the line, where they so intrenched themselves in the labyrinth of volcanic rocks that 400 regular troops were twice forced to retire with heavy loss without being able to come near enough even to see one of their concealed enemies. A peace commission to confer with the hostiles was then appointed, consisting of General Canby, Rev. Dr. Thomas, and Indian Superintendent Meacham. They met the head men of the Modoc on April 11, 1873. Jack repeated his demand to remain on Lost River and, on Canby's refusal, drew his revolver and shot him dead. At the same moment the other warriors fired, killing Thomas instantly and severely wounding Meacham, but were driven off before they could finish the work by the arrival of the troops whom Canby had kept hidden within easy reach. The war was continued under General Davis until the hostiles were finally starved out and compelled to surrender two months later. A part of the surrendered hostiles were returned to their kindred on the Klamath reservation, Oregon, while the rest were transported to the Quapaw reservation in Oklahoma. Those on the Klamath reservation now number 212, and are apparently fairly prosperous and advancing and coalescing with the Klamath. Those on the Quapaw reservation number 33, having decreased about one-half since the removal. See KLAMATH.

MO'DRED. The nephew of King Arthur. Tennyson represents him ambitious to gain the throne, and after revealing Guinevere's unfaithfulness to the King, he stirs up a revolt, during which Arthur is slain.

MODUGNO, mō-dōō'nyō. A town in the Province of Bari delle Puglie, Italy, 5 miles southwest of Bari. It has a twelfth-century Renaissance church and markets fruit. Pop. (commune), 1901, 11,885; 1911, 11,784.

MODULA'TION, IN MUSIC (Lat. *modulatio*, from *modulari*, to regulate, from *modulus*, dim. of *modus*, measure, manner). The process of changing from one key to another within the same composition. In a movement of even the smallest dimensions monotony would result if the composer should confine himself strictly to one key. There are two kinds of modulations—*passing* and *final*. Passing modulation introduces chords belonging to other keys only incidentally and soon returns to the original key. But when a piece modulates so that the original key is abandoned and a new key takes its place the modulation is final. In the sonata form (see SONATA) the first development of the principal subject confines itself only to *passing* modulations. A *final* modulation occurs at the entrance of the secondary subject (generally to the dominant key). The second or development section is concerned entirely with *passing* modulation. But even here the choice of keys is not arbitrary. However, no rules can be given; the artistic and æsthetic instinct of the composer is the sole guide. According to the theory of the present day, all modulation is regarded in its relation to the principal key of the piece, and, in a wider sense, all keys are but steps within the unlimited domain of tonality (q.v.). Older composers are very sparing and careful in the use of modulation, but those of the nineteenth century (especially Wagner, Schumann, Chopin) practically removed all barriers. The means of modulation are various and cannot be discussed in an article like the present. The most frequent expedient is the different interpretations put upon the same chord. Thus the chord c, e, g may be conceived as tonic of C, dominant of F, subdominant of G, etc., and consequently can be used to modulate at once to those keys. In modern music the chord of the diminished seventh plays an important part in modulation. Thus c♯, e, g, b♭ leads into D minor; the same chord conceived as e, g, b♭, d♭ into F minor; as g, b♭, d♭, f♭ to A flat minor; as a♯, c♯, e, g into B minor, etc. Consult: F. Dräseke, *Anweisung zum kunstgerechten Modulieren* (Freienwalde, 1876); H. Riemann, *Systematische Modulationslehre* (Leipzig, 1887); id., *Harmonie und Modulationslehre* (ib., 1900); S. Jadassohn, *Die Kunst zu modulieren* (ib., 1890). See HARMONY.

MOD'ULE (Fr. *module*, from Lat. *modulus*, small measure). In architecture, a conventional unit of measurement for determining the proportions of the various parts of a building, especially of the classic orders. Vitruvius (iv, 3) divides a hexastyle Doric front, e.g., into 44 modules; a tetrastyle into 28; the lower diameter of the column then measures two modules, the height of the column 14 modules, and so on. This scheme was undoubtedly derived from late Greek writers. The writers of the middle and late Renaissance, first in Italy and later in France, delighted in designing individual versions of the classic Roman orders

and in formulating for each of these a minutely detailed canon of proportions based upon modules divided into "parts." Thus, Vignola (q.v.), taking the lower semidiameter of the shaft as his module, divided this into 12 parts for the Tuscan and Doric orders and 18 for the other orders. Palladio and some French writers divided the semidiameter module into 30 parts for all the orders. The module of Perrault was one-third the diameter. Jomard adopted as a module for Egyptian architecture one-tenth the height of the column. Prof. W. R. Ware simplified Vignola's scheme by taking the diameter as the module divided into six parts. See ORDERS OF ARCHITECTURE.

MOD'ULUS (Lat., small measure). A term variously used in mathematics. In the theory of logarithms (q.v.) it designates the multiplier by which one system of logarithms is transformed into another. The expression $\sqrt{a^2 + b^2}$ is often called the modulus of the complex number $a + bi$, where i stands for $\sqrt{-1}$. (See COMPLEX NUMBER.) In the theory of numbers the term congruence (q.v.) is applied to an equality in which we neglect certain quantities which are called moduli; e.g., $26 \equiv 12 \pmod 7$ denotes that 26 is congruent to 12 to the modulus 7, i.e., that $26 - 12$ is a multiple of 7, or that the remainder found in dividing 26 by 7 (i.e., 26 with the multiples of 7 neglected) is equal to the remainder found in dividing 12 by 7, this remainder being 5 in both cases. See CONGRUENCE.

MODULUS OF ELASTICITY. See ELASTICITY.

MOE, mō, JÖRGEN (ENGEBRETSEN) (1813–82). A Norwegian poet, folklorist, and bishop. He was born at Hole in Ringerike, and before his entry at the University of Christiania became well acquainted with Asbjörnsen (q.v.), later his collaborator. From 1835 to 1852 hardly a year passed during which Moe did not make a long tour of the country in search of popular legends. The first collection of these tales, edited by Moe and Asbjörnsen under the title *Norske Folkeeventyr,* appeared in 1842–44, was republished by Moe in 1852, and was translated into English by Dasent (1859). His *Samlede Skrifter* (2 vols., 1877) include popular poems (1849) and the juvenile stories, *I Brönden og i Kjærnet* (1851). Moe died at Christiansand, where he had been Bishop for seven years. Consult J. B. Halvorsen, *Norsk Forfatter-Lexikon,* vol. iv (Christiania, 1896), and Henrik Jæger, *Illustreret norsk Literaturhistorie,* vol. iii (ib., 1896).

MOE, LOUIS MARIA NIELS PEDER HALLING (1859–). A Danish illustrator and etcher, born near Arendal, Norway. He studied at the Academy of Copenhagen and under Tuxen. He is best known for his illustrations of Saxo's *Krönike* (Winkel-Horn's translation), of Sagas, and of many books for children. To a number of his illustrations he himself wrote the text, such as *Langt, langt bort i Skoge* (1904). After 1900 he interested himself also in etching, and published collections of fantastic pictures from fairy tales and from animal life, among them *Dyrefabler* (1909).

MOE, (INGEBRET) MOLTKE (1859–1913). A Norwegian folklorist, born at Krödsherred in Ringerike, son of Jörgen Moe. He studied theology and the history of religion at the University of Christiania and then took up the study of comparative folklore. After 1876, when he became collaborator with P. Chr. Asbjörnsen, he went through the country on a government stipend, collecting traditions. In 1886 he was appointed professor of the Norwegian native language and of popular traditions, later also of Old Norse, at the University of Christiania. A learned and remarkably cultured man, Moe performed a real service in the field of folklore. He contributed to numerous periodicals and was a collaborator in many important literary enterprises. As an educational expert he was much consulted by the government. He revised several editions of Asbjörnsen's and Moe's *Folkeeventyr* and of Asbjörnsen's *Huldreeventyr.* Among his own publications are: *Norske Fornkvæde og Folkevisur* (1877); *Ten Norske Folkeviser* (1899); *Retskrivning og Folkedannelse* (1900), a valuable work. Consult J. B. Halvorsen, *Norsk Forfatter-Lexikon* (Christiania, 1885–1908).

MOEL, moil (Welsh, hill). A hill having a rounded outline in its upper portion because the summit is protected from rapid denudation by a layer of soil and a growth of forest trees or grass or by marshes of peat. Consult Marr, *The Geographical Journal* (London, 1901).

MOELLER, mēl'lēr, HENRY (1849–). An American Roman Catholic archbishop, born at Cincinnati, Ohio, where he studied at St. Xavier's College in 1863–69. He was then a student in Rome, where he received the degree of D.D. from the Propaganda in 1876. He held a pastorate at Bellefontaine, Ohio, in 1876–77; was professor at Mount St. Mary's Seminary in 1877–79; and served as secretary to Bishop Chatard, of Indianapolis, in 1879–80. From 1880 to 1900 he was secretary and chancellor of the archdiocese of Cincinnati; then served as Bishop of Columbus in 1900–03; and was promoted to Coadjutor Archbishop of Cincinnati, where he became Archbishop in 1904 and was invested with the pallium in 1905.

MÖEN, mē'en. A Danish island in the Baltic Sea, separated from Seeland on the northwest by the Ulv Sound and from Falster on the southwest by the Grön Sound (Map: Denmark, F 3). Area, 82 square miles. Pop., 1901, 14,504; 1911, 14,127. Its surface is remarkably irregular compared with the rest of Denmark. The limestone formation which underlies a large part of the country here crops out in the form of high and steep chalk cliffs of great natural beauty. The soil is very fertile. Agriculture and fisheries are the leading industries. The chief town and seaport is Stege, on the west coast, with a population in 1911 of 2250.

MŒ'RÆ. The Greek name of the Fates. See PARCÆ.

MŒRIS, mē'rĭs (Lat., from Gk. Μοῖρις, *Moiris*), LAKE. The ancient name of a sheet of water in central Egypt, a remnant of which, it is generally agreed, exists in the present Birket Karun or Birket el Kerun (lake of horns), 34 miles long by 4½ miles wide, extending along the northwestern borders of the Province of Fayum (Map: Egypt, C 2). Classical writers have left confused descriptions of a great artificial reservoir at this locality for storing the water of the Nile and irrigating the surrounding country by means of sluices. As the lake is at present 130 feet below the level of the sea, it must, within historic times, have hollowed out its bed 200 feet, or the artificial lake must have been a small reservoir southeast of it, or else the an-

cients must have totally misrepresented the whole matter. The investigations of Major Brown, which have been fully confirmed by Petrie, seem to point to the last-named solution. The lake formed by the Bahr Yusuf (Joseph's Canal) must have been much larger, until the kings of the twelfth dynasty, and later the second Ptolemy, diked off considerable portions. The semimythical King Mœris of Herodotus is Amenemhat III, the builder of the Labyrinth (q.v.), whose two colossi have been discovered at Biahmu. Consult W. M. Flinders Petrie, *Hawara, Biahmu, and Arsinoë* (London, 1889).

MŒRITHE'RIUM. A very generalized fossil mammalian type, the most primitive known ancestor of the Proboscidea. It was about the size of a tapir and is found in Upper Eocene deposits of the Fayum, Egypt. It was a subaquatic animal, and its chief resemblance to the elephants was the enlargement of the same front pair of teeth as those constituting the tusks of the modern elephants; the structure of the grinding teeth showed them to be essentially ancestral to those of Palæomastodon (q.v.). Other parts of the animal exhibit analogies to the primitive sea cows or sirenians.

MOERO, mwā'rō, Moero-Mkata, or Mweru. A lake in south Central Africa, situated 100 miles west of the south end of Lake Tanganyika. (Map: Congo, Belgian, E 4). It lies on a plateau at an altitude of 3000 feet and is surrounded, especially on the north, by wooded mountains having an alpine aspect. It is 68 miles long, 24 miles wide, and its bottom slopes gradually downward towards the north, where depths of 40 feet are registered. An extensive swamp, 30 miles long, at the south end marks the former extent of the lake. It is evidently of great age, as it contains a remarkable species of fish belonging to the Silurian period and of amphibious habits. The Luapula River enters the lake at the southern end and leaves at the northern end to join the Congo. The lake was discovered in 1867 by Livingstone. The settlement of Rhodesia was founded on its eastern shore in 1892.

MŒSIA, mē'shĭ-ȧ (Lat., from Gk. Μοισία, *Moisia*). An ancient Roman province, bounded by the Danube, and for a short distance by the Savus (Save) on the north, the Black Sea on the east, the mountain chains of Hæmus (Balkan) and Orbelus on the south, and the range of Scardus and the river Drinus on the west (Map: Rome, E 2). The river Cibrus (Tzibritza) divided it into two parts, of which the eastern (Mœsia Inferior) corresponded approximately to the present Bulgaria and the western (Mœsia Superior) to Servia. Its original inhabitants were mostly of Thracian race. Gaulish or Celtic invaders settled in western Mœsia about 277 B.C., under the name of Scordisci. The Romans first came in contact with the tribes of Mœsia after the conquest of Macedonia. In 75 B.C. C. Scribonius Curio, proconsul of Macedonia, forced his way as far north as the Danube and gained a victory over the Mœsians, but the country was not completely subjugated till 29 B.C. It was made a Roman province in the reign of Augustus and flourished for more than two centuries; but as a frontier province it was much exposed to hostile invasions and required a line of fortresses and stations all along the south bank of the Danube and a wall from Axiopolis to Tomi. The chief Roman towns were Viminacium in Mœsia Superior, and Istros, Marcianopolis, Nicopolis, and Tomi (to which Ovid was banished) in Mœsia Inferior. In 250 A.D. the Goths (q.v.) made an irruption into the country and defeated and slew the Roman Emperor Decius in the following year, and about the end of the fourth century it was given up to them by the Emperor Theodosius I. (See Mœso-Goths.) Slavic tribes settled in Mœsia in the sixth and seventh centuries, and towards the close of the seventh century the Bulgarians established their kingdom in the eastern part. Consult S. E. Stout, *The Governors of Mœsia* (Princeton, 1911).

MŒSO-GOTHS, mē'sō-gŏths'. A name given to the Goths who, early in the third century, settled in Lower Mœsia, at the mouth of the Danube. (See Mœsia.) In the fourth century they were converted to Christianity through the efforts of Ulfilas, who translated the Bible into their dialect. (See Ulfilas.) The name Mœso-Goths is applied especially to those Goths who remained in Mœsia after the great migrations early in the fifth century. See Goths.

MOF'FAT, David Halliday (1839–1911). An American banker and railroad builder, born at Washingtonville, Orange Co., N. Y. He became a bank messenger in New York City in 1854, a bank clerk at Des Moines, Iowa, in 1855, and then clerk and cashier in a bank at Omaha. In 1860 he went by prairie schooner to Denver. During the Civil War he made several large shipments of gold bullion to the East. In 1866 he became cashier, and shortly afterward president, of the First National Bank of Denver, in which capacity he served until his death. He was president of the Denver and Rio Grande Railroad in 1884–91, built the Florence and Cripple Creek Railroad largely at his own expense, and was interested in more than 100 mines in Colorado.

MOFFAT, Robert (1795–1883). A Scottish Congregational missionary to South Africa, born in Ormiston, Scotland. In early life he was a gardener, but having made the acquaintance of some Wesleyan ministers, he determined to engage in religious work and sought to qualify himself to be a missionary. He was accepted by the London Missionary Society and set apart for the ministry in 1816, was appointed to South Africa, and arrived at Cape Town early in 1817. He proceeded to Namaqualand and to the kraal of Africaner, a savage chief, who was converted and became an earnest Christian. The country, however, did not prove well adapted for the location of a mission centre, and Moffat, after having explored a considerable region, established the station of Kuruman in 1825. His missionary labors were very successful and productive of great benefits in the amelioration of the character of the people and the development of civilization. In 1859 a new centre was established among the Matabele at Inajati. The missionary labors of Dr. Moffat and his travels and adventures are described in his book, *Missionary Labors and Scenes in South Africa* (1842). During 1839–43 he visited England and then returned to Africa and remained there till 1870, when he went back to England and settled in Brixton, London, where he spent the rest of his life. In 1873 he was presented with the sum of £5800 in recognition of his great services. His wife (Mary Smith), whom he married in 1819, shared in all his missionary labors, and his daughter Mary became the wife of David Livingstone (q.v.). Besides the volume already men-

tioned, Dr. Moffat published *Africa, or Gospel Light Shining in the Midst of Heathen Darkness: A Sermon on Faith* (1841) and *Rivers of Water in Dry Places: An Account of the Introduction of Christianity into South Africa, and of Mr. Moffat's Missionary Labors* (1863). He also translated the Bible into the language of the Bechuanas. The full account of Moffat's life and labors is given in the *Lives of Robert and Mary Moffat,* by their son, John Smith Moffat (London, 1885; popular ed., 1889).

MOFFATT, James (1870–). A British biblical scholar. He was born in Glasgow and was educated there in the academy, university, and Free Church College. He was ordained to the ministry of the Free church in 1896, was Jowett lecturer in London in 1907, and left his church at Broughty Ferry in 1911 to become Yates professor of Greek and New Testament exegesis at Mansfield College, Oxford. He translated (1904–05) Harnack's *Expansion of Christianity,* edited "Thessalonians" (1908) and "Revelation" in the *Expositor's Greek Testament,* and wrote: *The Historical New Testament* (2d ed., 1901); *George Meredith, a Primer to the Novels* (1909); *Paul and Paulinism* (1910); a valuable *Introduction to the Literature of the New Testament* (1911); *The Theology of the Gospels* (1912), being lectures delivered at Glasgow; a new version of the New Testament (1913); *Expositor's Dictionary of Poetical Quotations* (1915).

MOFFETT, Cleveland (Langston) (1863–). An American journalist and author, born at Boonville, N. Y., and educated at Yale, where he graduated in 1883. From 1887 to 1892 he was connected with the New York *Herald,* for four years on the European staff and for a year on the New York staff. In 1893–94 he was foreign editor of the New York *Recorder.* Magazine work then engaged him for a time, but he returned to the *Herald* as Sunday editor (1908–09). In the meantime, and subsequently, novels and plays came from his pen: *Real Detective Stories* (1898); *Careers of Danger and Daring* (1901); *A King in Rags* (1907); *The Battle* (1909); *The Bishop's Purse* (1913); and the plays: *Money Talks* (1906); *Playing the Game* (1907); *The Battle* (1908); *Greater than the Law* (1912). He also translated Bourget's *Cosmopolis* (1894).

MOGADOR, mŏg-â-dōr′, or Suera. The principal seaport of Morocco, situated on the Atlantic coast, 120 miles west-southwest of the city of Morocco, of which it is the port (Map: Africa, C 1). It is built on a rocky promontory, surrounded on the land side by sand dunes. A channel between the town and a neighboring island forms the harbor. Mogador is the best-built town of Morocco, having been planned by a French engineer in 1760. A part of it, the Kasbah or castle, is surrounded by walls and contains the residences of the Moorish officials and of the protected Jewish and Christian merchants. Most of the Jews, however, live in a separate quarter of the city. Its equable climate renders it a health resort which is becoming increasingly popular with European sufferers from tuberculosis. The trade of the city is considerable and is mostly with Great Britain and France. The principal exports are olive oil, almonds, gum arabic, hides, goat skins, and wool. The city occupies the site of a much older town. In 1844 it was bombarded by the French. Pop., about 22,000, nearly half of whom are Jews.

MOGILA, mo-gē′lâ, or **MOGILAS,** Peter (c.1597–1647). A Russian theologian. He was born in Moldavia, of a noble Wallachian family, and was educated at the University of Paris. After serving in the Polish army he went into a monastery at Kiev and became metropolitan of that see in 1629. He set up a printing press and founded an academy and a library, to which he gave his own collection of books. He published a catechism in 1645 and other minor works. His great title to fame rests upon the *Confession of Faith of the Greek Church,* which was drawn up at his instance by the Abbot Kosslovski of Kiev, approved at a provincial synod in 1640, and accepted by the patriarchs of Constantinople, Jerusalem, and Antioch in 1642–43 and by the Synod of Jerusalem in 1672. It has been edited in Greek and Latin by Panageotes (Amsterdam, 1667) and Hoffmann (Leipzig, 1695). A German translation by Frisch appeared at Frankfort in 1727. It is given by Von Kimmell in *Libri Symbolici Ecclesiæ Orientalis* (Jena, 1843).

MOGK, mŏk, Eugen (1854–). A German philologist, born at Döbeln, in Saxony. He was educated at the University of Leipzig; worked in 1879–80 in the libraries of Copenhagen, Stockholm, and Upsala; and became a teacher in the Leipzig Realgymnasium in 1883 and professor of Norse philology at the University in 1893. He edited the *Altnordische Saga-Bibliothek* (1891 et seq.) and *Altnordische Texte* (1886–90). To Paul's *Grundriss der germanischen Philologie* he contributed important monographs on the literature of Iceland and on Germanic mythology. He also wrote *Die deutsche Sitten und Bräuche* (1907) and *Das Menschenopfer bei den Germanen* (1909).

MOGOK, mō′gŏk. The capital of the District of Ruby Mines, Upper Burma, India, 36 miles east of Irrawaddy (Map: Burma, C 2). The town lies in a valley at an altitude of 4000 feet above the sea. It is a collection of 9 villages and is the headquarters of the ruby mines of Burma, which are controlled by the Ruby Mines Company, a European enterprise which has introduced complete modern mining equipment with hydroelectric power furnished by the Yeni stream. Pop., 1901, 6078; 1911, 11,069.

MO'GONTI'ACUM. The Roman name of Mainz.

MOGUL′, Great (more correctly *Mughal,* or *Moghul;* Hind. *Mughal,* from Mongol *Mongol,* Mongol, from *mong,* to be brave). The popular designation of the Emperor of Delhi as the impersonation of the powerful empire established in Hindustan by the Mongol conqueror, Baber, the great-grandson of Timur, in 1526. The most important princes of this line, after Baber (the first Great Mogul), who died in 1530, were Akbar (1556–1605), Jehangir (1605–27), Shah Jehan (1628–58), and Aurungzebe (1658–1707). In 1803 the Great Mogul, Shah Alam II, was deprived of his throne, and in 1827 he surrendered even the appearance of authority, becoming a pensioner of the British. In 1857 Mohammed Bahadur, the last of the dynasty, who had been invested with the Imperial dignity at Delhi at the outbreak of the Sepoy Mutiny, was condemned for his complicity in the mutiny and transported to Rangoon, where he died in 1862.

Bibliography. H. G. Keene, *History of the Mogul Empire* (London, 1888); Stanley Lane-Poole, *History of the Mogul Emperors* (ib.,

1892); Horn, *Das Heer- und Kriegswesen der Grossmoguls* (Leyden, 1894); E. S. Holden, *The Mogul Emperors of Hindustan* (London, 1895); Haidar, *History of the Moguls of Central Asia* (ib., 1898). The *Bábar-Náma*, or autobiography of Baber, was published by Beveridge (London, 1905), while Mannucci's *Storia do Mogor*, or *Mogul India, 1653–1708*, has been translated by Irvine (3 vols., ib., 1906–07).

MOGULES'KO, SIGMUND (1858–1914). A Jewish-American actor, born in the Province of Bessarabia. When he was nine years old, his musical talent was discovered by a famous cantor visiting the town. After several years of early training Mogulesko entered the Bucharest Conservatory of Music, and at 14 was already intrusted by the local cantor with the leadership of a choir of 20 voices, besides performing a similar function in an opera chorus. Six years later, with the opening of a Jewish theatre at Bucharest (the first of its kind in the world), his desire to go on the stage was realized. For seven years he played in Russian, Rumanian, and Galician cities, and in 1885, when Jewish theatricals were forbidden in Russia, settled in the United States. Mogulesko, though a character actor, was essentially a comedian. His art was spontaneous, not studied. He was undoubtedly one of the greatest Jewish actors since the founding of Jewish theatres. He composed some *entr'acte* music, which has been frequently played in New York theatres.

MOGYORÓSSY, mŏg'yô-rôs'ĭ, ÁRKÁD (1851–). A Latinist, better known as Arcadius Avellanus. He was born at Esztergom, Hungary; learned Latin as a child, finishing his education in Hungary; and, having come to the United States, was editor and publisher in Philadelphia (after 1894) of the *Præco Latinus* (or *Latin Herald*), a Latin periodical for promoting the adoption of this language for speaking. Mogyoróssy's publications include: *Palæstra: A Primer for Spoken Latin* (1893–1915); *Arena Palæstarum* (1893); *Robinson Crusœus* (1897); *Medulla* (1898); *The Colloquia of Maturinus Corderius, the Teacher of John Calvin* (1904); *Fabulæ Tusculanæ* (1913); translations into Latin of Ruskin's *King of the Golden River* (1913) and of *The Adventures of Captain Mago* (1914), an account of an imaginary journey of a Carthaginian sailor to Spain.

MOHÁCS, mô'häch. A grand commune and market town in the County of Baranya, Hungary, on the right bank of the Danube, 23 miles east-southeast of Fünfkirchen (Map: Hungary, F 4). It is poorly built, but is a railway junction point and an important station for steamers. It manufactures silk, lumber, and bricks and is the centre of the coal trade of the Fünfkirchen district. It is noted as the scene of the battle of Aug. 29, 1526, between the Hungarians under Louis II and the Turks under Solyman the Magnificent. The King and 24,000 Hungarians and Germans perished, and a large part of Hungary fell under the yoke of Turkey. On Aug. 12, 1687, a second battle was fought at Mohács, in which the Imperialists under Charles of Lorraine defeated the Turks, thereby putting an end to the Turkish dominion in central Hungary. Pop., 1900, 15,832; 1910, 17,092.

MO'HAIR (OF. *mouhaire, mouaire, mohere*, Fr. *moire*, from Ar. *mukhayyar*, fabric of goats' hair). The wool of the Angora goat (see GOAT) of Asia Minor and South Africa. Few animals have so beautiful a covering as the fine, soft, silky, long, and usually pure white fibre of this goat. Each animal at the annual clip in April or May yields from two pounds to four pounds of wool. The fabric *mohair* made from this wool is characterized by its light weight, smooth, dust-shedding surface, and lustre. In pile fabrics, such as plushes and astrakhans, mohair is sometimes used for the pile warp, while the body is made of cotton. The fabric known as camel's hair is made from the best mohair, which enters into the manufacture of many fabrics. Mohair is used as a substitute for human hair in switches and wigs. Consult "The Angora Goat," *United States Department of Agriculture, Farmers' Bulletin, No. 137* (Washington, 1901). For the production of mohair in the United States, see WOOL.

MOHAM'MED (Ar. *Muḥammad*, praised, approved, or endowed with praiseworthy qualities). The founder of Islam. It is not certain whether Mohammed was his original name or a cognomen given him in the latter part of the Meccan period. Some scholars, among them Huart (*Histoire des Arabes*, p. 90, Paris, 1912), think that his proper name has remained unknown, or possibly was Ḳutham. Others, like Nöldeke (in *Der Islam*, p. 160, Strassburg, 1914), maintain that Mohammed was his real name. If reliance can be placed upon the statements that he was about 63 years old when he died, the traditional date of his birth, 570 A.D., would be approximately correct. But tradition also connects his birth with "the year of the elephant." The march upon Mecca by Abraha, the Abyssinian ruler of Yemen, at the instance of Justinian, who was at war with Khosrau I, must have occurred before 562. It is therefore doubtful when the prophet was born. His birthplace was undoubtedly Mecca. He was the son of Abdallah, of the family of Hashim, and Amina, of the family of Zuhra. There is no reason to doubt that both belonged to branches of the powerful tribe of the Koreish. His father, a poor merchant, seems to have died before Mohammed was born; and his mother, following the custom of her tribe, is said to have given the child to Halima, of the tribe of the Banu Sa'd, that she might nurse him in the healthful air of the desert. A few years afterward his mother died. His grandfather, Abd al Muttalib, adopted the boy; and when the grandfather died, Mohammed's uncle, Abu Talib, a man of influence, though poor, took him into his house and remained his friend and protector as long as he lived. Concerning Mohammed's youth we have no trustworthy information. It is probable that he was about 25 years of age when he entered the service of a rich widow named Khadija, who was also of the Koreish, and accompanied her caravans, perhaps as a camel driver, to the fairs. In these travels he is said to have met a Christian monk, Nestur, and this is likely to be true. Whether his journeys took him to Syria, to Hira, and to Yemen cannot be determined with certainty, but is not improbable, and Nöldeke suggests that he may have been even to Abyssinia. Khadija, who was older than Mohammed and twice widowed, offered him her hand, which he accepted. It was a happy marriage. As long as she lived he took no other wife. According to tradition, she bore him three sons, al Ḳasim, al Ṭahir, and al Ṭayyib, and four daughters, Zainab, Ruḳayya, Umm Ḳulthum, and Fatima. Ḳasim died before Mohammed's

prophetic ministry began. Al Ṭahir and al Ṭayyib are probably fictitious names. The daughters grew up, but only Fatima seems to have left any issue. Mohammed conducted Khadija's business with success and his surname al Amin (the faithful) seems to indicate the high esteem in which he was held for his integrity and good judgment.

The story of Mohammed's life from the time when the first revelations came to him until the emigration to Yathrib (Medina) is better known than that of his youth and early manhood, but is still very obscure and full of uncertainty, both as to the events and circumstances and in regard to the inner development. There are indeed numerous suras, or chapters, of the Koran that unmistakably come from this Meccan period, extending perhaps from 610 to 622 A.D., and it is even possible to distinguish between an earlier and a later group among these suras. These oracles, which in the main, no doubt, have come down to us in their original form, are invaluable testimonies, but do not yield much information concerning the succession of events or the growth of Mohammed's prophetic consciousness, and contain many allusions that cannot be understood without knowledge drawn from other sources. The collections of tradition (*ḥadith*), the early biographies (*ṣira*), and the exegetical elucidations in the commentaries on the Koran (*ṭafsir*) have been widely used as such extraneous sources; but the searching analysis of the *ḥadith* by Goldziher and the more recent investigations of the *ṣira* and the *ṭafsir* by Lammens (see HADITH) have led many eminent scholars to assume a more radical position than heretofore. A cautious and circumspect criticism must manifestly seek to steer its way between a skepticism tinged with prejudice and a generosity touched with apologetic interest to a purely historical viewpoint. While in a certain sense it still may be said that Islam is the only great religion born in the broad daylight of history, there are many serious obstacles in the way of securing a conception of Mohammed's life based throughout on well-authenticated facts and of securing a fair and carefully considered estimate of his character.

Vague and inadequate as our knowledge is concerning the undercurrents of religious life among the Arabs in the period immediately before the appearance of Mohammed, we are not wholly without evidence as regards some of the tendencies that prepared the way for the great prophetic movement. While the Arabian Jews mentioned in Acts ii. 11 may have come from Arabia Petræa, it is certain that the Jewish tribes Kainuḳa, Nadir, and Kuraiza had been settled in Yathrib long before the immigration of Mohammed, other settlements existed at Khaibar, Fadak, and Taima, and in Yemen there were Jewish colonies as early as the fourth century A.D., and a Jew, Yusuf dhu Nuwas, reigned in Saba 520–525 A.D. Through the Abyssinian conquests in Yemen Christianity spread into Nejran, and in the north the Ghassanids were at least nominal Christians. From Egypt and Syria Jews and Christians came as slaves or as merchants to Mecca. The Aus and the Khazraj in Yathrib seem to have come from Yemen, and Mazdaism is likely to have become known there through Sassanid influence before Christianity came in with the Axumites. Even the Sabians, or Mandæans, on the lower Euphrates, are likely to have been known to the Laḥmids in Ḥira and the Arabs employed by them. The poets seem to have been especially subject to the foreign impact. Every *kahin* (diviner) or *sha'ir* (knowing one) cannot of course be supposed to have sung altogether after the fashion of the Moallakat (q.v.), and it must be remembered that the remnants of pre-Islamic poetry have been copied by Moslem hands; but the reticence about local divine names and the use of a neutral expression like Allah (*al ilahu*, 'the god,' 'the deity') by the great poets may be original and not wholly due to expediency on the part of singers called upon to recite their poems to Jewish and Christian audiences, but to some extent to a broadened outlook. The poems of Umayya ibn Abu'l Salt, recently collected, edited, and translated by Schultess (Leipzig, 1911), obviously composed for the edification of Arabs in the time of ignorance, and not intended for Jewish or Christian ears, reveal indeed such a familiarity with biblical lore that it is not impossible that they were one of the sources of Mohammed's knowledge. Although it is extremely difficult to sift the tradition as to the *ḥanifs*, two facts seem to be well established: the name was for some reason given to such men as Waraka ibn Naufal and Zaid ibn 'Amr who, without being either Jews or Christians, were opposed to polytheism and idolatry, and Mohammed himself used the term of Abraham as a worshiper of one god and not an idolater, as well as of his own followers, the Moslems. In Hebrew the word *ḥanif* designates a wicked, impious, godless person, an apostate from the faith; in Aramaic it acquired the special sense of heretic; in Arabic it may also have carried the meaning of one fallen away from the ancestral faith and practice or inclining to a monotheistic belief, the term of reproach becoming one of special honor on the lips of the prophet. There were, no doubt, many such *ḥanifs*, obscure forerunners of Mohammed in Arabia.

It was possibly about 610 A.D. that Mohammed began to be disturbed by certain experiences that came to him. As the result, apparently, of a physical malady he had hallucinations, he heard strange sounds as of the ringing of great bells, a voice seemed to speak to him, a spirit sought to take possession of him. At first he appears to have conceived of this spirit as a *jinn*, and of himself as called to become a poet, a seer, a diviner, as so many others. The tradition of such an original conception lived long at Mecca. But he gradually seems to have become impressed with the idea that it was no ordinary *jinn* producing poetic inspiration whose voice he heard, but that of "the faithful spirit," "the spirit of holiness." Later this being was identified as Gabriel. We have no means of determining which is the earliest of the suras. But the opening words, though not the whole, of Sura xcvi may well claim to represent one of the oldest of Mohammed's recorded revelations. These words have sometimes been translated "Read, in the name of thy Lord." But there can be little doubt that they should be rendered "Recite (or proclaim), in the name of thy Lord." That the revelations came through the ear is the unanimous testimony of Moslem tradition; and Suras lxxv, 16 ff.; xx, 113; xxv, 34 clearly show that the process of revelation includes a reciting from the heavenly book by the spirit and repetition of what he has heard by the prophet. This has been emphasized by

Snouck Hurgronje and Nöldeke, and most recently in a very convincing manner by Pedersen (in *Der Islam*, Strassburg, 1914, pp. 110 ff.). Mohammed does not seem to have known how to read and write, but he knew how to proclaim in a very impressive manner what he was convinced that he had heard. The elevated prose he employed, approaching poetry in its rhythmic swing, its assonance, and frequent rhyme, naturally produced the impression upon those to whom he confided his visions that he was a poet inspired by a *jinn*.

It was only after inner struggles, testifying to the genuineness of his ecstatic experiences, that he thus revealed what had happened to him even to his wife Khadija, his friend Abu Bekr, and his cousin Ali, who encouraged him by their confidence. That he was receiving revelations from the heavenly book naturally created in him the conviction that he had been chosen by his Lord as an instrument to make known to his people the contents of this book, as others had to other nations, and that the message sent down to diverse persons at different times must be essentially the same, as it came from the same source, which could contain no contradictory statements. He consequently identified himself with an order of messengers to whom he counted not only Abraham, Moses, and Jesus, but also Hud, who was sent to Ad, and Salih, who was sent to Thamud, and others. It may not have been until he left Mecca that he assumed definitively such titles as *al nabi* (*the* prophet) and *rasul Allahi* (the messenger of Allah). His message did not centre about himself, but about Allah, and not so much about his nature as about his authority, his righteous demands, the inevitability of his judgment, and his mercy to those who believe his messengers. Allah's rights are based upon the fact that he is man's creator. Through some channel, possibly a physician, Mohammed had obtained a knowledge, unusual in his age, of embryogeny. In view of this constantly recurring wonder of man's embryonic development, he found it easy to believe in a re-creation of man in the resurrection of the dead. The purpose of this resurrection could only be a judgment upon man's earthly life, the sentence to eternal punishment in hell or the acquittal and gracious gift of eternal life. With deep earnestness he realized the terrible danger of man's plight, the need of divine guidance, and the wonderful mercy of Allah. To his quickened moral sense it became clear that the issues of life depend upon the line of conduct that is followed. He looked with horror upon many practices prevalent in the community, such as murder, theft, adultery, exposure of female children, cruelty to women, dishonesty in trade, lying, usury, oppression of the poor, luxury, gluttony, and drunkenness; and he believed that only by a surrender of self to Allah (*islam*), by abandoning idolatry and seeking in prayer and meditation, after the fashion of the *ḥanifs*, to be guided aright, by encouraging one another to patience and well-doing, and by acting justly and mercifully, would it be possible to lead a life acceptable to Allah. As for himself, he had no further duty than to announce his message, to warn and exhort; he had no right to use force. Having been an orphan and poor himself, he could sympathize with those who were neglected and ill treated; having been honored by his Lord, he proclaimed, with fear and trembling, yet with unmistakable gratitude and love, what came to him in moments of trance and ecstasy. How genuine these experiences were may be judged from the fact that the oracles sometimes contained rebuke of himself—his pride and indifference in turning away a beggar, his unseemly eagerness for revelations, his failure at times to distinguish between the voice of the spirit and that of the devil. There is no reason to doubt that after reciting the words "Have you seen al Lat and al Uzza, and that other, al Manat, the third idol?" (Sura liii, 19 f.), he once added: "These are the exalted princesses, and their intercession is desired" (Tabari, 1, 1192, 1195), but later announced that he had been reproached by the spirit for having uttered these words, by consequence of which they have disappeared from our present text of the Koran.

While the accounts of persecutions may be exaggerated, there can be no question that much disapproval was expressed, much mockery was indulged in, and occasionally violence was resorted to by the unbelieving Koreish. Finally the family of Hashim seems to have been forced into the part of Mecca called "the ravine of Abu Talib." This application of the principle of the Ghetto may have been dictated by fear of evil consequences to the community from Mohammed's blasphemies against gods and goddesses, or from the free association of men of different clans who had the same religious opinions which manifestly threatened the tribal organization, as well as by resentment because of what seemed like personal abuse, the consignment of their parents to hell, and an attack upon their prestige and revenue. A considerable number of the Moslems emigrated to Abyssinia, where they were well received by the Negus. Some of these returned many years later, some became converts to Christianity, and some, at least temporarily, relapsed into paganism. It was probably exclusion from the Ka'ba that caused that strange experience of the Prophet when, whether in the flesh or out of the flesh he probably did not himself know, he was carried away in a night to Jerusalem. Neither his enemies who laughed at him, nor Abu Bekr who vouched for the accuracy of his description, nor he himself, probably, could tell what actually happened; and we do not know whether Mohammed ever was in Jerusalem. Three years the boycott lasted; then a compromise was effected. But after the death of Khadija, about 619, and of Abu Talib, a little later, Mohammed naturally sought for other allies and protectors, and he first attempted to reach the tribe of Thakif at Ṭaif. When this proved to be in vain, and his uncle Abu Lahab refused to protect him, he at last entered into negotiations with the pilgrims who came to Mecca from Yathrib, some of whom had come under the influence of his teaching. The invitation to Mohammed to become the political and religious head of Yathrib did not come as the result of a town meeting, but of a conspiracy. There was no plebiscite, but there is likely to have been a secret agreement between the local Moslems and some of the more eminent leaders of the Aus and the Khazraj and possibly also of the Jews. An oath of allegiance was given by the conspirators on behalf of the Banu Kaila at the second meeting of Akaba, near Mecca; and Mohammed then undertook to remove some 150 of his followers from Mecca to Yathrib. He remained in the city himself until the last of the emigrants had left; then he

cautiously picked his way, together with Abu Bekr, to his new home. After his arrival in Yathrib he sent to Mecca for his wife Saud and his daughters. There is no evidence of any effort on the part of the Koreish to prevent this departure. It was not a flight from persecution, but a deliberate removal, a voluntary emigration, as the word *hijra* implies. As to the date, it is certain that it occurred in the month of Muharram, 622 A.D.; but the calendar instituted 17 years later by Omar begins the year on the first of Muharram, i.e., fifth of July, which may or may not have been the date of Mohammed's leaving Mecca.

Concerning Mohammed's life in Yathrib, which now becomes known as *Medinat al nabi* (the city of the prophet) or simply *al Medina*, we are better informed than in the case of any other period of his career. There are indeed many gaps in our knowledge; many legends formed especially about his last illness and death; the stories of his domestic troubles have no doubt been colored in transmission by the prejudices and interests of rival factions; and some of the letters said to have been dictated by Mohammed may be suspected of being fictitious. But we possess a very important document in the treaty of Mohammed and the emigrants from Mecca with Yathrib, a kind of charter of the new community, preserved by Ibn Hisham (ed. Wüstenfeld, pp. 341 ff.) and translated by Wellhausen (*Muhammads Gemeindeordnung von Medina*, Berlin, 1889). The bulk of the correspondence of Mohammed preserved by Ibn Ishak, al Wakidi, and Ibn Sa'd, and translated by Wellhausen (*Ibn Sa'd, die Schreiben Muhammads und die Gesandtschaften an ihn*, Berlin, 1889), is no doubt genuine. Poems by enemies like Ibn Ziba'ra and Umayya ibn Abu'l Salt copied by Moslem historians are of distinct value. The historical character of accounts of defeat and of dishonorable deeds calling for an apology cannot well be questioned; and the excellence of early Arabic historiography is quite remarkable.

The emigration to Medina brought with it a notable change in the Prophet's position. He became the civil head of a community. This *umma*, or community, consisted of the followers of Mohammed, called Koreish, *muhajiruna* (emigrants), or *aṣḥab* (companions); further, the Banu Kaila, i.e., Khazraj and Aus, made up of believers called *anṣar* (helpers), and others spoken of as *munafikuna* (doubters, vacillating ones), and various Jewish tribes considered as clients of the Banu Kaila. The "emigrants" broke their natural tribal relations in Mecca and entered into a fictitious brotherhood (*ḥuwa*) with the Yathribine "helpers." In the new charter Mohammed was referred to as "the Prophet." It was therefore unavoidable that the community became a theocracy: not a hierocracy, however, under foreign rule, as Judæa in the Persian period, nor a government by a priestly ruler, like the Hasmonæans, but an independent state whose civil and religious life is ordered by divine oracles that come through a prophet, resembling to some extent the theocracy of Florence in the days of Savonarola's power. This must be borne in mind if Mohammed's activity in Medina is to be understood and his character fairly judged. At Medina he became more fully acquainted with Judaism, and probably in a measure also with some form of Christianity. He sought to gain the Jews, and at first made some notable converts; but he laid himself open to ridicule by maintaining that he knew that certain things could not be in the Law of Moses, but must be falsely ascribed to the legislator, since they did not agree with the revelations he had received from the heavenly book. In this he betrayed ignorance, but not insincerity, as the insistence by good men upon absolute harmony between all divine oracles is of very common occurrence in all religions. Allah could not contradict himself.

It became a serious question how much contradiction, mockery, and blasphemy his prophet, now responsible for the order and welfare of the community, should endure in patience. His disappointment in not seeing the Jews in larger numbers embracing Islam may have led him to change the *kibla* (see KIBLAH), or direction in prayer, from Jerusalem to Mecca, though it would not be strange if, entirely apart from this, a conviction should have grown up in his mind that the Ka'ba, purged from idolatry, would be the most acceptable temple of Allah on the earth. Neither was he quite certain how far the rules and conventions of the period of ignorance were still binding upon Moslems. At first he hesitated to justify the infraction of the customary month of truce; later he minimized the guilt by magnifying the sin of those who had rejected Allah and driven out his people. The problem whether a state, and he as the head of a state, had the right to engage in war probably never occurred to his mind, either in a trance or in a waking condition. The Koreish of Mecca were the enemies of Medina; they had made themselves the enemies of Allah. In the battle of Bedr in February, 624, they were defeated by a small band of Moslems. Allah had given them victory, though the Koreish had greatly outnumbered them. Similarly, Mohammed is not likely ever to have considered whether the *lex talionis* could be set aside altogether, or even whether private blood revenge, the law of the desert, could be abolished. When, as the result of a quarrel, one of the Banu Ḳainuḳa, a Jewish tribe, had been slain by the Moslems, and these had in turn killed the murderer, revenge for the Moslem was sought. The Ḳainuḳa fortified themselves, were besieged by the Moslems, and finally forced to emigrate to Syria, their property being confiscated and given to the Muhajira, who thus were freed from their dependence upon the Banu Ḳaila.

At Ohod, in 625, Abu Sufyan and the Koreish gained a victory over the people of Medina. The Prophet was wounded and had to hide himself. When this misfortune was laid up against him by the "doubters" and some of the Jews of the tribe of al Nadir as a sign that he was not a true prophet, Mohammed gave indeed counsels of moderation to his zealous followers, and knew how to change the defeat into a moral victory by explaining that the cause of the disaster was the lack of faith in Allah, but he did not forget the attitude of the al Nadir; and when they refused to furnish their share of money needed as compensation for a case of manslaughter by error, their palm trees were ultimately cut down and they were driven out of Medina. Mohammed unquestionably did much to improve the conjugal relations of his people, by abolishing mota marriages contracted for a brief period, punishing adultery, forbidding fornication, limiting the number of wives to four, regulating divorce, insisting upon the rights of wives, and protect-

ing children. It is significant that, when one of the tribes indicating its willingness to accept Islam sought to secure a concession in favor of fornication, he refused with indignation to accede to their request. But his growing conception of holding a unique position in Allah's favor led him to feel that Allah would grant him exceptional privileges. Unselfish and abstemious, he asked little for himself in other respects, but his excitable erotic nature made large demands upon divine clemency and generosity. He not only increased the number of his wives beyond that permitted by Allah to others, but also took to himself Zainab, the wife of his adopted son Zaid ibn Harith, whom he had surprised in the bath. Zaid promptly offered to divorce her; Mohammed hesitated, but received a general dispensation covering all such cases; and Zainab afterward tried to poison him, proudly giving her reasons for this act. The suras of the period hint at many domestic troubles, which are more or less accurately explained by the tradition. His sensitiveness to ridicule also made him miserable and led him to countenance the removal of offending poets through zealous Moslems, if not to incite feuds by which he could get rid of them.

In 627 "the war of the trenches" broke out. The Banu'l Nadir had found a refuge in Khaibar, but longed for revenge, and entered into a coalition with the Koreish, the Banu Sulaim, and the Banu Ghatafan. With something like 5500 men they marched against Medina. The city seemed to be doomed, as it had no wall, and the buildings could be united for defense only on one side, while the others were altogether open. Then a Persian slave, Salman al Farisi, suggested the idea of digging a trench. Such a device was called in his language, the Pahlavi, *kandaka*. The siege lasted about a month. Mohammed made peace with the allies of the Koreish, and these returned to Mecca without having accomplished anything. While the war was going on there were diplomatic conversations between the Koreish and the Banu Kuraiza, the last important Jewish tribe in Medina. These demanded hostages of the Koreish, which they refused to give. The matter came to the attention of Mohammed, who besieged them for 25 days. When they finally surrendered without condition their men were to be executed and their women sold into slavery, though it is doubtful whether the sentence was actually carried out. Successful raids were then made in various parts of Arabia.

In 628 Mohammed desired to make a pilgrimage to the Ka'ba. He started with a large number of followers, and encamped in the plain of Hudaibiya. From there Othman was sent as an ambassador to deal with the Koreish, who had come out in large numbers ready for battle. He secured a treaty of peace for 10 years, and the right for Mohammed and the Moslems to hold possession of the city of Mecca and the Ka'ba for three days the following year, with the duty of returning Koreishite fugitives. Not realizing the advantages gained, but deploring their return without booty, the Moslems were dissatisfied with this treaty of Hudaibiya. Mohammed, therefore, sent them against the Jewish city of Khaibar, which they captured and plundered. The pilgrimage was made the following year (629) by 2000 Moslems, and made so strong an impression in Mecca that two of the leading generals of the Koreish, Amr and Khalid, soon appeared in Medina and embraced Islam. It is possible that, when the news reached Arabia of the defeat and expulsion of the Persians by Heraclius, Mohammed sent a message to the Byzantine Emperor calling his attention to the prophecy he had made several years before of this victory of the Greeks (Sura xxx, 1 ff.), and that his messenger was slighted. There can be no reason to doubt that he dispatched a messenger to the Ghassanid King at Bosra, Amr al Harith, for the murder of this ambassador led to the expedition into the east Jordan country which ended in the ignominious defeat at Muta in September, 629. The letters said to have been sent to Khosrau Parvez, the Sassanid King, and to the Negus of Abyssinia, as well as the answers, may be spurious, but the fact that embassies were dispatched can scarcely be doubted. The Mukaukis of Egypt, possibly the head of the Coptic church, must have received a message, since he sent him several female slaves, one of whom, Mary, bore him a son, Ibrahim, who died at the age of 18 months. Haudha ibn Ali, King of Yemama, proposed a peaceful division of Arabia between them, which Mohammed declined; al Mundhir, the Lahmid King at Hira, received a message from him. On the other hand, he also received many deputations from different parts of the peninsula seeking alliance with him. In 630 a quarrel between the Koreish and the Khuza'a, who were in alliance with Mohammed, was construed by him as a breach of faith on their part, and justified him in "cutting loose from the idolaters" (Sura ix, 1 ff.). He marched against Mecca in January, 630, with an army of about 10,000 men. Abu Sufyan was sent to discover Mohammed's design; he went over to Mohammed's side, and when he returned to Mecca presented the situation in such a light that the city capitulated. As it was impossible to allow the victors to pillage the city, which had not been defended, Mohammed imposed upon it a war indemnity, levying large sums from the richer citizens. He proclaimed a general amnesty from which only 10 were excepted, among them two female singers who had chanted derisive songs about Mohammed. Abdallah ibn Sa'd, who had been Mohammed's secretary in Medina, transcribing his revelations, but had been accused by the Prophet of reproducing them inaccurately, had renounced Islam and fled to Mecca. He was now an apostate and deserved death, but was finally pardoned after long and earnest efforts on the part of Othman. Abdallah's return to his ancestral faith may have been due to a too intimate acquaintance with the manner in which the later revelations came and were reproduced. While Mohammed in Medina never seems to have doubted his mission or lost the sense of being inspired, as did Savonarola after the fateful decision in the case of the Medici, the nature of these later discourses is such that it is extremely improbable that, as a rule, they were the result of ecstatic experiences like those of the Meccan period. He was no doubt subject at times to similar trancelike conditions; and occasional signs are not wanting of the power, originality, and freshness characteristic of the earlier days. But in the main these suras show by their length, monotonous repetition, shrewd wording, careful elaboration, and flowing style that they are homilies rather than oracles, apologies for the faith and practice of the Prophet rather than inspired utterances.

Medina remained the residence of Mohammed and the capital of the state even after the capture of Mecca. The adhesion of new tribes enlarged this growing empire. Taif was besieged and taken. There are grave doubts about some of the details of the reported campaign against Tabuk, but the expedition itself is certainly historical. In 632 Mohammed determined to make the pilgrimage to Mecca. He had performed the *'umra*, or pious visit, possible at any time of the year, before, but now for the first time he undertook, at the head of many thousand Moslems, the formal pilgrimage, with its holy rites, the procession around the Ka'ba, the run between Safa and Merwa, the visit to Mount Arafat, where he laid down the laws and ordinances concerning the pilgrimage, the meditation during the night at Muzdalifa, the stoning of the devil in the valley of Mina, the sacrifice, the shaving of the head and cutting of the nails, and the drinking from the well Zemzem. (See ARAFAT; HAJJ; KAABA.) He was apparently conscious that his work was done; for after many exhortations to his followers to protect the weak, the poor, and the women, to abstain from usury, and to live a righteous life, he is said to have closed his prayers with the words: "Oh, Allah! Have I not completed my mission?" to which the people answered: "Yea, Allah." Soon after his return to Medina he was taken ill with pleurisy. But neither the remedies tried, such as the pouring of water over him and the injection of medicine in Abyssinian fashion, nor the care given him, in eager and loyal, even though not wholly unselfish, rivalry, by Ali and Fatima on the one hand and Ayesha, Abu Bekr, and Omar on the other, could help him, and he died on Monday, June 8, 632 (13th Rebi' I, 11 A.H.) in the arms of Ayesha, and was buried in her house Tuesday night. His death created a serious situation, as he had not indicated his wish, or Allah's will, in reference to a successor. While Ali's claims were urged in the council by Talha and Zubair, he undertook himself, as the nearest of kin, the embalming and burial of the Prophet; through Omar's influence Abu Bekr was chosen as Caliph (*khalifa*), "representative" of, or "substitute" for, Mohammed.

Mohammed is described as of middle height, lean, but broad-shouldered, with a well-developed head and somewhat curly hair. His eyes were large and black, his nose was prominent, slightly aquiline, and finely formed. He wore a long beard, which added to the dignity of his appearance. A black mole between his shoulders became known among Moslems as the "seal of prophecy." He is praised for his amiability, his loyalty to friends, his frequent readiness to forgive an enemy, his tenderness towards his family, his great generosity, his kindness to the poor, his care of orphans, the simplicity of his domestic life. Even after his removal to Medina he lived in simple quarters, mended his own clothes, and freed all his slaves. He had himself refrained from the use of wine and strong drink long before he imposed total abstinence upon his followers, for military reasons, in order to improve their discipline and fighting qualities. He shared with his men the hardships of warfare, though his physical bravery was never quite equal to his moral courage. He had the defects of his qualities. His remarkable practical sagacity and shrewdness sometimes degenerated into cunning and deceit. The extraordinary intelligence which enabled him, the unlettered camel driver, to produce a literature also permitted him at times to indulge in disingenuous apologetics. His keen sensibilities and rich gifts of imagination made him occasionally irritable, melancholy, suspicious, and revengeful. With his deep earnestness he could not understand those who trifled or acted the part of hypocrites; the enemies of Allah became his enemies. The more convinced he became that his inspiration differed from that of the poets and the diviners, that he was possessed by a holy spirit and not by a *jinn*, the more horrible, blasphemous, and unendurable seemed to him the mockeries of those Jewish and pagan poets who made his life so bitter. The affectionate nature, strongly rooted in the life of the senses, which for many years had found its full satisfaction in Khadija's love, after her departure sought for gratification in many directions, but he may not have been conscious of any inconsistency between Allah's permitting all believers to have four wives and his graciously granting the Prophet a few more, and from his knowledge of what he considered Allah's revelation to the Jewish people he did not gather that there was in the heavenly book a prohibition of polygamy as such, nor is there any evidence that he was familiar with the views of Jesus on the subject. From his fundamental conception of the process of revelation followed, not only the recognition of Judaism, Christianity, and Sabianism, i.e., Mandaism, as permitted religions, and toleration of those who professed them as the *ahl al kitabi* (the people of the book), the recipients of a revelation from the heavenly book, but also suppression of paganism as a *religio illicita*, and the *jihad*, or holy war, against idolaters, not accounted worthy of such a revelation. The very conviction that he had been intrusted with a message to his people and to mankind, was indeed a prophet like those who had been sent in earlier times, and as the latest of the prophets the one to whose voice his contemporaries were especially bound to listen—a conviction that has influenced the world profoundly during thirteen centuries—evidently tended to produce in his own mind the idea that he held an exceptional position among the sons of men, involving peculiar duties and compensating privileges. With all his serious limitations and aberrations, the essential sincerity of his nature cannot be questioned; and an historical criticism that blinks no fact, yields nothing to credulity, weighs every testimony, has no partisan interest, and seeks only the truth, must acknowledge his claim to belong to that order of prophets who, whatever the nature of their psychical experience may have been, in diverse times and in diverse manners, have admonished, taught, uttered austere and sublime thoughts, laid down principles of conduct nobler than those they found, and devoted themselves fearlessly to their high calling, being irresistibly impelled to their ministry by a power within.

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MOHAMMED. The name of five sultans of Turkey.—Mohammed I was the son of Sultan Bajazet I, who was defeated and captured by Timur in 1402 and died in captivity in 1403. Mohammed I, after sharing the supreme power with his brothers, became sole Sultan in 1413. He reigned until 1421. He consolidated the Empire, which had suffered from the inroad of Timur.—Mohammed II (c.1430–81) was Sultan from 1451 to 1481. He was surnamed *El-Ghazi*, i.e., conqueror (of infidels), and also *Buyuk*, i.e., the Great. He was born at Adrianople and succeeded his father, Amurath II. His first acts were the murder of his brother and the suppression of a rebellion in Karamania. Having thus secured himself on the throne, he bent all his energies in order to effect the capture of Constantinople. This city was now the sole remnant of the once mighty empire of the Cæsars, and after more than a year spent in preparations, Mohammed commenced the siege on April 6, 1453, with an army of about 70,000 and a fleet of 320 vessels. The Greeks, aided by gallant bands under Gian Giustiniani, a noble Genoese, long maintained an obstinate resistance. On the morning of May 29 the Turks made a combined attack by land and sea without success; but the retirement from the ramparts of Giustiniani, who had been severely wounded, caused a panic among his followers, and the simultaneous charge of a chosen body of janizaries, with Mohammed himself at their head, proved irresistible. The brave Emperor, Constantine XI, died in the breach, and the Turks poured in over his corpse to plunder and devastate his capital. Mohammed now transferred the seat of his government to Constantinople, and sought to gain the good will of the inhabitants by promising them a free exercise of their religion. After achieving this great conquest, he made formidable preparations for the invasion of Hungary. Belgrade was the first point of attack; but Jānos Hunyady (q.v.) compelled him to raise the siege (1456). Soon after this Mohammed became master of the Morea, annexed Servia, and conquered the Empire of Trebizond, an offshoot of the Byzantine Empire. He then turned his arms against the Albanians, whose leader, Scanderbeg, long defied the Turkish power. Scanderbeg died in 1468, and 10 years later the subjugation of Albania was completed. In 1470 Mohammed conquered Negropont from the Venetians. In 1475 he made the Khan of the Crimea tributary, and at the same time deprived the Genoese of Kaffa. In 1480, however, he was repulsed by the Knights of St. John from Rhodes. In the same year he captured Otranto in Italy, the last achievement of his reign. Mohammed was possessed of great abilities; he was brave, enterprising, and sagacious; he is said to have spoken five languages fluently, and to have been well versed in geography, ancient history, natural sciences, and the fine arts. But the brilliancy of his career and the occasional generosity and even magnanimity which he showed cannot obliterate the recollection of those acts of cruelty and treachery which have justly branded him as the most ruthless tyrant of the house of Osman.—Mohammed III (1566–1603) was Sultan from 1595 to 1603. He succeeded his father and at once murdered 19 brothers. He waged war against Austria without success.—Mohammed IV (1641–91) was Sultan from 1648 to 1687. He succeeded his father, Ibrahim, who had been murdered by the janizaries. The real rulers were the Kiuprili (q.v.). The reign of Mohammed IV saw the decline of Turkish power in Europe. The great onslaught upon the house of Austria in 1683 resulted in the defeat of Kara Mustapha (q.v.). After other disasters Mohammed was dethroned in 1687.—Mohammed V (1844–1918) was chosen by the National Assembly on April 27, 1909, to succeed his brother Abd-ul-Hamid II (q.v.), whom they had just deposed. Consult Stanley Lane-Poole, *Story of Turkey* (New York, 1889).

MOHAMMED ALI. See Mehemet Ali.

MOHAMMED ALI MIRZA, ä'lē mēr'zà (1872–). A shah of Persia, eldest son of Muzaffar ed Din. He received a liberal education in the English and French languages and married one of his cousins, the daughter of Prince Naïeb Saltaneh, Minister of War. In 1899 he was intrusted with the government of the most important province of Persia, that of Azerbai-

jan. He opposed the constitution and parliamentary government established by his father for the Persian people in 1906. When Muzaffar ed Din died on Jan. 10, 1907, Mohammed Ali succeeded him as Shah. He continually quarreled with the National Council and dissolved that body in 1908. A revolution resulted; the Shah made concessions when it was too late; and on July 15, 1909, the victorious rebels compelled him to take refuge in the Russian Legation. The Council declared this to be an act of abdication and elected his son, Ahmed Mirza (born in 1895), as his successor. Mohammed Ali went into exile in the Crimea, but was granted a pension. See PERSIA, *History*, and consult the corresponding article and section in the NEW INTERNATIONAL YEAR BOOK for 1909.

MOHAM'MEDAN ARCHITECTURE. See ARCHITECTURE.

MOHAMMEDAN ART. The art produced by Mohammedan nations from the seventh century A.D. to the present time; called also MOSLEM ART. The most flourishing period was between the ninth and fourteenth centuries, though in certain places, such as Constantinople, Cairo, Persia, and India, the golden age came later. The homes of this art have been mainly Syria, Persia, Egypt, north Africa, Spain, Asia Minor, India, Sicily, and Constantinople. The Arabs, founders and propagators of Mohammedanism, possessed none of the arts (see ARABIAN ART), and consequently a period of at least two centuries passed before the amalgamation of converted peoples, after tentative efforts to adapt preceding artistic forms, created the special types of Mohammedan art. This work was done especially in Syria, Persia, and Egypt, though north Africa and Spain also contributed their share. Byzantine, Persian, and Coptic artists, even if Christians, were employed at first; but finally all the branches were practiced by Mohammedans. The religious prejudice against the representation of the human figure in art, especially in sculpture, prevented any development in the large fields of figure sculpture and painting, forcing the artist into decorative work in pure line and color, in which he became the most consummate master in the whole history of art. In Persia, it is true, this prejudice was far less strong, and a national school of figure painting was developed in the fifteenth and sixteenth centuries. But the exceptions to the hostility to sculpture, which was especially an idolatrous art in Moslem eyes, are very few. Surface ornamentation became the special domain of Moslem art, whether displayed on broad architectural surfaces or on the smallest article of furniture or decoration. This ornamentation, like the forms of architecture themselves, was at first derived from Byzantine models, as in the earliest Cairo work, with a large added element of stiff floral patterns, mainly of classic origin. But gradually the invasion of purely geometrical forms almost extinguished the flora, and the system was evolved and completed in the eleventh century, which is a combination of pure geometric and arabesque designs, used with ever-increasing profusion until all surfaces were covered with it.

ARCHITECTURE

The origins of Mohammedan architecture must be studied in the mosques (q.v.). As the Mohammedans in the countries which they conquered found themselves surrounded by magnificent monuments of all the past civilizations of the East, it was natural that they should turn to them for the type of their own places of worship. The first important mosque was that erected by the conqueror Omar at Jerusalem in 637—a purely Byzantine design, possibly even a Byzantine church slightly altered. This disappeared centuries ago. The earliest mosque of any pretension now extant was that of Amru (641 A.D.) at Fostat, which consecrated the Arab conquest of Egypt. It served as a type for two centuries. Its colonnades around an open court seem to combine the plan of the atrium of a Christian basilica and the hypostyle hall of an Egyptian temple. The columns were taken from churches and arranged in numerous rows, surmounted by round or pointed arches, on which rested a flat, wooden ceiling. There appear to have been no æsthetic beauty and no decoration in this perfectly plain brick structure. It was in Syria, where the Ommiad caliphs had their capital at Damascus, that the first artistic monuments were erected under Abd al Malak and his son Al Walid (c.700 A.D.). They spent immense sums on three buildings which still remain: the mosque of Damascus (705), reputed the most sumptuous monument of the Mohammedan world and built to surpass the works of Christian architecture in Syria (repeatedly altered and badly injured by fire in 1893); the Al Aksa Mosque and the Dome of the Rock, commonly miscalled mosque of Omar (691), both in Jerusalem, built to rival the church of the Holy Sepulchre. The Al Aksa was of a different type from the Egyptian mosques and more like a hall or a Christian church. The principal side of its court, called the jami, containing the mihrab and pulpit (mimbar), had a forest of 280 columns in 20 rows, and in the centre, in front of the mihrab, rose a dome. On the other hand the great Damascus Mosque was of the Egyptian type of the mosque of Amru, the type of the atrium, and had only a triple line of columns on the jami (main hall) side and a single row on the others. In both mosques the columns now support pointed arches. The courts were filled with secondary monuments, usually in the shape of domed chapels or fountains. The most important of these is the Dome of the Rock in the court of the Al Aksa Mosque. It followed the Byzantine domical type; its central dome, 112 feet high, is supported on four square piers with intermediate columns and is surrounded by two concentric aisles with eight piers and 16 columns on an octagonal plan.

The next important building in the Mohammedan world is the great mosque at Cordova, the capital of the new Kingdom of Spain. It was founded in 786, and its main hall, as it now stands after two enlargements in 876 and 976, is the largest of all mosques, measuring 534 by 387 feet and containing 856 columns in 19 aisles. Its wooden ceiling, notwithstanding this great length, is 30 feet high. The intricate effect of the maze of columns is increased by the lack of any broad and lofty central nave and by the unique arrangement of two stories of superposed horseshoe arches, as well as by the alternation of white and black marbles in the arches. The decoration shows an early form of stiff foliated arabesque in small separate compartments. The eighth century and the following witnessed a flowering of Mohammedan architecture in all provinces and in all classes of buildings: foun-

tains, baths, aqueducts, palaces, khans, bridges, caravanserais, minarets, mausoleums, monasteries and colleges, bazars and city gates, hospitals, cloisters. A large part of the revenues of the state was devoted to public works. Bagdad was built in 762 and became the capital of the caliphate. Great buildings were erected in the cities of north Africa, in Kairwan (mosque in 837), Algiers, Tlemcen, Tunis (mosque and arsenal in 742). The wonderful buildings of Bagdad, no longer extant, probably gave the keynote to the new art. Much of this early architecture and ornament betrays Byzantine origins; but gradually Persian preponderance makes itself felt through the dynasty of the Abbasides, with Bagdad as centre. The wooden roof is entirely abandoned for the dome. A purely Oriental system of ornament is invented, both geometric and arabesque. The wall surfaces, which had hitherto been left plain or ornamented in Byzantine fashion, are covered with intricate stuccoes and faïence tiles, inherited from ancient Persia and Babylonia.

Egypt. Egypt remained for a while outside of this movement, probably because its architecture was still in the hands of native Christian Copts: no domes were used and brick had not yet given place to stone. The earliest mosque in Cairo was that of Amru (642), still extant, but greatly dilapidated, comprising a court, cloisters, and sanctuary. Far more magnificent was that built by Ibn Tulûn when he declared Egypt's independence (876–879). As Ibn Tulûn objected to employing Christian columns for the new mosque, his Christian Coptic architect offered to build it with piers in place of columns. This mosque is of the cloistered type, with two aisles on three sides of the court, or *sahn*, and five aisles in the sanctuary; these are formed of 160 rectangular piers supporting broad, stilted, pointed arches, such as the Copts had always employed. The entire construction was of brick stuccoed, the stucco being decorated with stiff arabesques in relief of the knop and flower pattern derived from ancient Oriental or Egyptian models. A flat wooden roof rested on the walls not far above the crown of the arches. The wall inclosing the mosque forms a court about 300 feet square. All the brilliant revetment and coloring have disappeared. Still this remains the finest example of the early type of mosque. It also has a couple of the earliest minarets, built, as were all the early ones, of brick (twelfth century). There is a small dome in front of the mihrab, as in the earlier Syrian and Palestinian mosques.

Under another dynasty another great mosque was built—the El Azhar or university mosque, in the newly founded capital, Cairo, begun in 969. Here the same cloistered plan was used, but with columns from churches in place of piers. When in 996 the mosque of El Hakim was built, however, the quadrangular pier was used as in the mosque of Tulûn; but its proportions are far slenderer and higher.

It was in the following century that Egyptian architects adopted the dome. Cairo's great characteristic is its multitude of domes. They were used mainly over funerary chapels. There now arose an important class of funerary mosques attached to royal tombs. The Egyptian rulers of the Fatimite dynasty displaced the caliphs of Bagdad as principal patrons of Mohammedan art, and the monuments of Syria, north Africa, and Sicily were inspired from Egypt during the eleventh and twelfth centuries. Undoubtedly it was the thorough study and application of geometry by Arab writers of the schools of Bagdad and Cairo that made possible not only the scientific architecture of this period, but the wonderful system of geometrical ornament that became so much a part of it. A consistent style was finally developed, which spread over the entire Mohammedan world from Spain and Morocco to Persia, and from Asia Minor to India. The minaret towers were multiplied and began to lose their early heaviness (see MINARET) and to take on great variety of forms, and, being built of stone as well as brick, they were better adapted to a richer ornamentation. The heavy walls were crowned with delicate battlements.

Most characteristic was the invention of the stalactite motive in decoration, which was applied to every possible form of corbeling and by means of which a highly ornamental substitute was found for the Byzantine pendentive in effecting the transition from the square plan to the circular or polygonal dome. The historical tendency was ever to raise the domes higher and make them more pointed. Their numbers multiplied in the thirteenth and following centuries. The cemeteries of Cairo are full of ruined but beautiful mediæval domical tombs. The mausoleum mosques of sultans Hasan, Barkuk, Kait Bey, Kalaun, El Ghuri are the finest examples in Cairo of the domical style. Beginning with the tomb of Esh Shafi'y in 1211, passing through the stage of the tomb mosque of Es Salih in 1249, complete success was realized in adapting the dome to the mosque plan under the impetus given by the Mameluke sultans in the mosque of Hasan in 1356, where the plan is a Greek cross centring about an open court and with the domed tomb behind the mihrab. This magnificent building was regarded as unequaled in Mohammedan lands. Its proportions are grandiose; the tunnel vaults over the arms of its cross are bold. Stone and marble have definitely replaced brick. During this time, however, the type of the old cloistered mosque had been continued in buildings not connected with tombs, such as those of Bibars (1268), of En Nasir (1318), Kusun (1329), El Maridany (1339). The system of stalactite corbeling was used to fill up gaps between all different planes. Like most of Mohammedan work, it conceals under apparent irregularity and freedom, not to say vagrant fancy, the most scientific accuracy of form. The wonderful development of decorative work at this time in mosaic faïence, wood carving, marble inlay, metal, etc., is noticed later in this article and in special articles.

Spain. Meanwhile other Mohammedan lands had been following the example of Egypt. The Arabo-Byzantine style of the monuments of Cordova had ruled for about two centuries; a national Mohammedan style was formed shortly before 1000, as in Egypt, as shown in monuments of Tarragona, Segovia, and especially Toledo and later in Granada and Seville. The horseshoe arch, often minutely cusped, was characteristic of this Hispano-Moresque style, together with a peculiar cubical form of capital and, above all, a system of mural decoration in all-over patterns molded or stamped in stucco and enriched with decorative inscriptions and brilliant coloring. The famous Giralda tower at Seville belongs to this middle style, while the alcázars, or Moorish palaces, at Seville (q.v.),

Segovia, and Malaga usher in the style of the Alhambra at Granada. When in 1238 Granada became the capital of the Moors in Spain, its monuments expressed the development of native arts for the ensuing century. Here is found the richest extant combination of the different kinds of surface decoration in which Mohammedan art excelled; arabesque and geometrical ornament, diaper patterns of extraordinary richness, stalactile corbeling, stucco and faïence, mosaic and marble inlay cover every inch of space. But though so rich, the ornament of the Alhambra, being largely cast or stamped, lacks the life and dignity of the freer Egyptian work of the same kind. See ALHAMBRA.

Persia. The Turks and Mongols made such havoc of the earlier monuments of Mohammedan Persia, the region of Bagdad and the great northern states of Bokhara and Samarkand, that nothing has survived in these regions of earlier date than 1300. But the following three centuries, while they show a style no longer in its early prime, produced highly interesting works in Persia and in the derived styles of other countries. The Tatars and Seljuk Turks adapted their work from Persian models, in the buildings of the thirteenth and fourteenth centuries at Sivas, Kaisarieh, Konieh, Nigdeh, Nicæa, Brusa, etc. The contemporary buildings in Persia, at Tabriz, Sultanieh, Teheran, and especially those of the Sefi dynasty at Ispahan (the Meidan, mosque of Mesjid Shah, Bazar, and Medresseh of Hosein Shah), show that Persian architecture was capable of grandiose conceptions finely executed. In Persian ornament, flowing lines were preferred to angular and geometrical designs; even its arabesques are more continuous and soft, and it hardly ever resorted to stalactite corbeling. The bulbous pointed dome is universal, and a vast niche, extending through the whole height of the façade, framed the main portal. The material of construction is brick, faced with enameled tiles of brilliant colors in minute arabesque patterns. A kind of four-centred pointed arch, somewhat like a Tudor arch, is almost universal. The minarets have circular shafts and are very slender, being topped by small domes.

India. At the same time Mohammedan art in India, which made its beginnings in the Kûtûb Minar and mosque and gate of Allah el Din and tomb of Altompsh at Old Delhi, and at Ajmere, in the thirteenth century, received a great impetus through the establishment of the Mogul supremacy (1526), and produced a style that was in many ways the grandest in the whole sphere of Mohammedan architecture. Buildings like the mosque and tomb of Mahmud at Bijapur, the mosques at Fatehpur-Sikri, Agra, and Delhi, the palace of Akbar at Allahabad, and the Taj Mahal at Agra are masterpieces. Red sandstone and marble are the chief building materials; the Taj is largely of alabaster. There is undoubtedly a dependence on the art of Persia in the shape of the pointed arches and domes and in the niche façades, but these Indian architects showed a surpassing sense of composition and effectiveness, never allowing, as the architects of Egypt and Spain so often did, the love of detail to become paramount.

Turkey. Finally, when the Turks captured Constantinople (1453), they adopted the Byzantine system of plan and construction (and specifically that of Hagia Sophia, which became their chief mosque) and superimposed upon this a style of surface decoration which they had developed from Persian models. The architects they employed at first were Christian Greeks, but Sinan, the greatest of them all and a designer of extraordinary genius, was a Moslem. Their mosques have ever since been variations of the type of Hagia Sophia on a smaller scale. But some of them have great merit of dignity and composition and some originality in the exterior treatment, e.g., the mosque of Mohammed II, which has four semidomes grouped around the central one, and especially the Suleimanieh Mosque (1553). These have alternating white and black marbles in the interior voussoirs, and the simple brilliancy of the surfaces gives quite a different effect from a Byzantine interior. The mosques of Ahmet I (1608) and the Yeni Djami (1658), and at Adrianople the noble mosque of Selim, are works of impressive grandeur. The Turkish minaret is of stone, cylindrical, with a tall conical spire and carved galleries. For details regarding special classes of buildings and the delightful domestic architecture of the Moslems, see special articles, such as CARAVANSERAI; FOUNTAIN; BAZAR; TEKIYE; MINARET; MOSQUE.

MINOR ARTS

Decoration. The carving of the Mohammedans was purely decorative, becoming richer as the Middle Ages advanced. In the earlier stages it partook somewhat of Byzantine design, as in the mosque of Cordova and in early Egyptian and Syrian mosques. But it was then scanty and rather heavy. When the schools became more differentiated in the eleventh century, into the Persian naturalistic, figured and floral; the Syrian schematic, animal and floral; and the Egyptian, geometric and stiff floral schools, ornament began to spread over the entire building. Even the exterior surfaces of domes and walls were covered with a lacework cut in stone or stucco. Color was given by marble mosaics in Egypt, or in Syria and Persia by brilliantly colored tiles. The mosque of Omar is an early, the Alhambra at Granada a mediæval, and the mosque of Ispahan a late example. The tiles became an Oriental specialty and were imitated in Spain until recently. In Persia and in Asiatic Turkey the production of these decorative tiles is still an active craft. True sculpture, as distinguished from surface carving, is practically unknown in Moslem art, the Lion Fountain of the Alhambra offering the single notable exception. See AZULEJO.

Woodwork and Ivory. In no style of art has so varied an artistic use been made of wood. Where other styles have used stone and marble we find wood used, e.g., in carved ceilings, windows, pulpits, lecterns, screens, latticework, doors, balconies, parapets, tomb casings. In the richest pieces ivory and mother-of-pearl are sometimes used in connection with wood, being either inlaid in carved panels or being set as panels in wooden frames. Wood was used not only for the furniture of the private house, but for that of the mosque, such as cupboards, tables, and the classes of work mentioned above. Some of the best examples of floral design in Egypt are preserved in wood carvings. The most magnificent pieces are probably the pulpits, such as that of Kait Bey in South Kensington Museum, and the panels from those of Maridany, Lagin, and Kusun in the same museum. The

panels of the hospital of Kalaun show a Persian style of figures and animals rather than the floral and geometrical patterns. The reading platform of the mosque of Kait Bey is a fine instance of marquetry and ivory, largely in polygonal design. Ebony and ivory were often combined in mosaic-like patterns, sometimes framed in strips of metal, as in jewel cases and other boxes. But the most extensive of all the wood carvings and inlaid work were the ceilings of mosques and palaces, as in those of Kait Bey, El Moyyed, and El Bordeini.

Metal Work. The Persians, Syrians, and Egyptians were skillful workers in metal. Perhaps the earliest centre was in Mesopotamia, at Mosul. Brass, bronze, and copper were chiefly used. While chiseled bronze and repoussé copper seem the earliest processes, the works came to be often inlaid with silver and sometimes with gold by different processes: (1) by incrusting a thread of gold or silver into an undercut groove; (2) by inclosing a metal strip or plate between raised walls; (3) by pressing a thin leaf of metal into stipple marks. The entire metal surface was excavated according to the elaborate design, the edges undercut, the threads or plates of gold or silver inserted and burnished, and then the surfaces chased with all the details that could not be given by the general outlines. Animals, birds, human figures, hunting scenes, feasting scenes, and other genre subjects, as well as floral designs, characterize more especially the Persian and Syrian works, while arabesques and geometric patterns predominate in Egypt. Inscriptions are made almost always to contribute to the decorative effect. The Mesopotamian and Persian schools, though undoubtedly of much earlier origin, gained new life in the twelfth century, when Tatar and Turkish influence gave to artists far greater freedom in the use of the human figure. The school of Damascus was the most famous centre at the time of the Crusades, giving its name to the entire process of damaskeening or inlaying. The Egyptian school, with its centre at Cairo, flourished somewhat later, under the Mameluke rulers of the fourteenth century. The objects made wholly of gold and silver have almost entirely disappeared, but the inventories of the palaces of the rulers of Bagdad and Cairo prove the existence of many thousands of such objects—vases, boxes, mirrors, stands, lamps, trays, coffers, figures of birds and animals, dishes, cups, flagons, bowls. Of these classes many objects still remain in the baser metals, either plain or damaskeened; particularly interesting are the hanging lamps, lanterns, and chandeliers, the stands and tables, mosque doors, perfume burners, ewers, boxes (especially writing boxes), trays, and bowls. It is in the magnificent arms and armor that the metal workers showed the supremest mastery, using all the processes—chiseling, damaskeening, enameling, jewel setting—to produce the masterpieces in the shape of poniards, swords, and yataghans, helmets, breastplates, and lances, stirrups, bits, and the rest of the military equipment and caparison, including, in later times, muskets, pistols, and halberds. In this special field the school of Syria (Damascus) reigned supreme, manufacturing the best pieces for the entire Mohammedan world. The Persian style was more ornate, standing midway between Syrian simplicity and Indian gorgeousness. See INDIAN ART.

Glass. It is in Egypt that stained-glass windows were made, rivaling on a small scale the cathedral windows of the Gothic period. Here, as in every other branch, there is originality of methods. The windows are small, forming usually an oblong of less than 2 by 3 or 4 feet. The frame is of wood, and the process consists of pouring a bed of plaster into this frame, letting it set, and then cutting out the design, leaving only narrow rims or bands of plaster to hold the glass. The design is extremely elaborate, with a central motif, usually of flowers, plants, and trees; the bits of stained glass cut to fit over the openings are laid on and fastened with fresh plaster. The openings are often slanting towards the street and the plaster artistically finished on the outside. The effect on the inside is similar to mosaic. The commonest designs are: pinks and other flowers growing from a vase; cypress with entwined flower stem; scroll of flowers and leaves; kiosk between buds or cypresses; one or two cypresses with flowers. Earlier than these are the more purely geometric designs, as in the tomb of Bibars at Cairo. Of course the plaster is far more fragile than lead as a frame, and the windows easily disintegrate and cannot be made large. Such windows (called kamariyeh) are found not merely in mosques, but in the meshrabiyeh or latticed projecting windows of private houses. Such windows, of monumental size and importance, adorn the mosques of Solyman, Ahmet I, the Yeni Djami, and others at Constantinople. In harmony and quiet depth of color they equal or surpass their more colossal Gothic counterparts.

A different kind of artistic glass is exemplified in the mosque lamps of enameled and painted glass. It is true that there is a great quantity of exquisite glass, both white and colored, showing in Persia; Syria and Egypt still carried on in the Middle Ages the old Egyptian and Phœnician industry, with exquisite understanding of forms and tones, furnishing models to Venice; but it is in the mosque lamps that the glassworkers certainly enter the domain of fine art. Here the colors are enameled on a gilt ground and the designs are similar to those of metal work, with greater prominence given to inscriptions; cobalt, red, pale green, and white are the principal enamels, and the decoration is in bands with medallions. The most beautiful examples are works of the fourteenth century from the mosques of Cairo. The mellow light shining through the enamels and glass of these suspended lamps was of an exquisite effect.

Illumination of Manuscripts. The aversion to the representation of the human figure hindered the development of the art of illumination—a branch of art not cultivated extensively until the later Middle Ages. It is true that figured compositions were not unknown either to the Egyptian or the Syrian artists, but it was the Persian school, under Tatar and Mongol influences, which first boldly attempted scenes of daily life and of history. There are many manuscripts of the Koran belonging to the other schools, whose first and last pages are a mass of geometric and floral ornament. The finest collection of Egyptian manuscripts, executed mainly for the sultans of the fourteenth and fifteenth centuries, is that of the Cairo Museum rescued from the mosques, such as those of sultans Kalaun, Shaban, and Barkuk. Sometimes the flowers, arabesques, and polygons are in colors on a gold ground, sometimes in gold on a ground of

plain blue or red or of shaded and grouped colors. The finest of these illuminated pages surpass anything done by Christian artists in richness, in exquisite coloring, and in fineness of execution. They are executed not on vellum, but on fine Egyptian cream-colored or reddish paper. The Syrian and Persian schools avoided the geometric ornamentation, and their floral designs were freer and more naturalistic. The Persian fondness for legend and poetry shows itself in the rich illumination of poems and stories which gave occasion for charming genre scenes and vignettes, and the artist's fancy sprinkled animals and birds in riotous confusion on a background of beautiful garden scenes.

It is in these figured illuminations alone that we can study the style of the fresco painters of Mohammedanism, whose works have disappeared. It is plain from native writers that the caliphs of Bagdad, the rulers of Egypt and Spain, at different times lavishly patronized figure painters and that such works were not confined to the Persian school. It is interesting to note the similarity between Persian and Chinese painted design and to make the Mongols the intermediaries between the two schools. The primitive conception of composition and figure and the awkward conventionalities make the Persian school, though successful in coloring, less successful in its sphere than the purely decorative Egyptian. The most famous Persian illuminators belong to the sixteenth century, such as Fabrizi, Jehangir, Bukhari, and Bahzada. The latter's works are masterly in composition and correspond to the Italian Giottesque masters. The last great master was Mari, a Naturalist from India.

Textile Fabrics. The Far East had always been famous for its artistic stuffs, embroideries, tapestries, rugs. It was as successors to the arts of Persia and Babylon that the Mohammedans developed this branch, though Bagdad, Damascus, Cairo, and Cordova all took part and the tribes and villages rivaled with the large cities. Nothing became more characteristic of the East, nothing influenced the West more strongly, through constant importation and the contact of the Crusaders. The haute-lice tapestry, after a method long lost in Europe, was in current use. The same difference finally appeared in the designs here as in other branches: geometrical and set patterns being more common in Egypt; free floral designs being used in Persia. The few known Persian rugs of as early a period as the thirteenth and fourteenth centuries are now valued at many thousand dollars ($10,000 to $40,000), and a study of their design shows an almost incalculable variety of native flowers naturalistically reproduced. The Syrian school had much in common with the Byzantine and, as usual, occupied a middle position, with medallions in a stiff floral ground containing heraldic animals or birds. There were in every Mohammedan country royal manufactories whose products were entirely reserved for the court and sovereign; the standards, baldachins, tents, royal robes, hangings, housings, and rugs were all of a magnificence unknown to the ruder West and unsurpassed at any time. The known specimens date no earlier than the eleventh century, and the art decayed before the sixteenth century.

Influence on Europe. Sicily, southern Italy, Venice, and Spain were affected by the Mohammedan arts during the Middle Ages and even as late as the Renaissance. Hence the use of the pointed and the horseshoe arch in many parts of southern Europe. The cosmopolitan culture of the Norman kings of Sicily had a large Mohammedan element. The palaces of the kings—such as La Kuba, La Ziza, Favara, and Baida—were imitated from those of the Eastern emirs and sultans; San Giovanni degli Eremiti seems an importation from Cairo. Mohammedan artists executed the wonderful stalactite ceiling in carved wood and probably also the geometric mosaics in the Cappella Palatina at Palermo. The famous Ruffolo Palace at Ravello and several cloisters (e.g., at Amalfi) show the spread of Eastern architectural forms in Campania. It is interesting to see how in most cases where there are traces of Byzantine art there are also signs of Mohammedan influence, and vice versa. This is nowhere more evident than in Venice, where both forms of Oriental art were so prominent. Here quite a flourishing school of Mohammedan metal workers was established, existing as late as the sixteenth century, when Mahmud El Kurdi signed some exquisite pieces. The Italian artists who imitated them called themselves workers *all' agemina*, 'in the Persian style,' and even Cellini confesses to have copied Oriental arms. In fact, the Renaissance metal workers of the sixteenth century both in Italy and France owed more than their mediæval predecessors to Oriental design; and there are traces of a like influence in German ironwork and niellos of the sixteenth century, especially that of Nuremberg. Even more widespread and radical was the use and imitation in Europe of Oriental stuffs and fabrics, partly Byzantine, but especially Mohammedan—wonderful not merely for beauty of material, but for the figures and patterns woven or embroidered. The imported tents, baldachins, hangings, carpets, and the like furnished the models for the European ateliers in Sicily, Rome, Venice, Belgium, and France.

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first serious work was Girault de Prangey, *L'Architecture des Arabes et des Maures en Espagne, en Sicile et en Barbarie* (ib., 1842), which should be supplemented by the Spanish government publication, *Monumentos arquitectonicos de España* (Madrid, 1877 et seq.); also A. F. Calvert, *Moorish Remains in Spain* (2 vols., London, 1905–07). The sumptuous *Jeypore Portfolio of Architectural Details* edited by S. S. Jacob (7 vols., London, 1890–94) illustrates Moslem decorative art in one province of India. The architecture of Turkey is treated with some fullness in two works: Montani, *Architecture ottomane* (Constantinople, 1873), and Parvillée, *Architecture et décoration turques* (Paris, 1874). By far the best general treatise on Mohammedan art is that of Saladin and Migeon, *Manuel d'art mussulman* (2 vols., Paris, 1907). Nothing satisfactory has been published about the monuments of northern Africa, of Syria, or Asia Minor. Aside from the works remaining in situ there are not many collections of the smaller works of Mohammedan art. That of the South Kensington Museum is important, as are those of Cairo, of Constantinople, and of the Musée des Arts Decoratifs in Paris. See cuts in articles Arabesque and Arabian Art.

MOHAM'MEDANISM. The name commonly given in the West to the religion founded by Mohammed. The proper name is Islam (q.v.), suggested by Mohammed himself, which meant 'resignation,' or acceptance of the divine will, and was explained by the prophet to include the performance of five duties (the "five cardinal points of Islam"), viz.: acceptance of the formula, "there is no god but Allah, and Mohammed is his prophet"; prayer; almsgiving; the fast of Ramadan; and the pilgrimage to Mecca.

Doctrine and Practice. Like every organized religion, Islam, as developed by the Mohammedan theologians, presents two sides—the theoretical part, known as *'īmān* (faith), and the practical part called *dīn* (religion). The doctrine concerning *God*, His nature and attributes, coincides with the Jewish and Christian in so far as He is by both taught to be the Creator of all things in heaven and earth, who rules and preserves all things, without beginning, omnipotent, omniscient, omnipresent, and full of mercy. But, according to the Mohammedan belief, He has no offspring. Jesus is regarded, like Adam, Abraham, and Moses, as a prophet and apostle, although his birth is said to have been due to a divine intervention; as the Koran superseded the Gospel, so Mohammed superseded Jesus and all preceding prophets. Next to the belief in God that in *angels* forms a prominent dogma, and, like the former, may be traced back directly to Jewish and Christian and in a smaller degree to Persian influences. Created of fire and endowed with a kind of incorporeal body, angels stand between God and man. There are four chief angels: Gabriel, the angel of revelation; Michael, the special protector and guardian of the Jews; Azrael, the angel of death; Israfil (Uriel), whose office it will be to sound the trumpet at the resurrection. Besides angels there are good and evil genii (see Jinn), of a grosser fabric than the former and subject to death. They have different names and offices (*pīrīs*, fairies; *deves*, giants; *takwīns*, fates; etc.), and are much like the *shēdīm* in the Talmud and Midrash and the demons of other peoples. The chief of the evil genii is Iblis (q.v.), once called Azazil, who, refusing to pay homage to Adam, was rejected by God. A third belief is that in certain divinely given *scriptures*, revealed successively to the different *prophets*. Originally there were 104 sacred books, but only four have survived, viz.: the Pentateuch, the Psalms, the Gospel, and the Koran, and the first three are in a mutilated and falsified condition. The number of prophets sent at different times is stated variously at between 200,000 and 300,000. Among them 313 were apostles and six were specially commissioned to proclaim new laws and dispensations, which abrogated the preceding ones. These were Adam, Noah, Abraham, Moses, Jesus, and Mohammed—the last the greatest of them all, and the propagator of the final dispensation. The belief in the *resurrection* and the *final judgment* is an important article of faith, which in the theological writings later than Mohammed is elaborately developed. The condition of the dead in the future world and the punishment of the wicked are pictured with a great multiplicity of details. The dead are received in their graves by an angel announcing the coming of the two examiners, Munkar (unknown) and Nakir (repudiating), who, described as two black angels with blue eyes, put questions to the dead respecting his belief in God and Mohammed and, in accordance with the answers, either torture or comfort him. The soul, awaiting a general resurrection, is treated according to its rank; prophets enter immediately into Paradise; martyrs, in the shape of a green bird, partake of the delights of the abode of bliss; common believers either stay near the grave, or are with Adam in the lowest heaven, or remain in the well Zemzem or in the trumpet of the resurrection, or rest in the shape of a white bird under the throne of God. The souls of infidels dwell in a certain well in the province of Hadramaut (interpreted as chamber of death), or, being first offered to heaven, then to earth, and rejected by both, are subject to unspeakable tortures until the day of resurrection. Concerning the latter considerable discrepancy reigns among the Mohammedan theologians. Mohammed himself seems to have held that both soul and body will be raised, and it is said that the rump bone will remain uncorrupted till the last day, and from it the whole body will spring anew after a forty days' rain. Among the signs by which the approach of the last day may be known are the decay of faith among men, the advancing of the meanest persons to the highest dignities, wars, seditions, and tumults, and consequent dire distress. Certain provinces shall revolt, and the buildings of Medina shall reach to Mecca. These are the eight "lesser" signs; of "greater" signs there are no less than 17; the sun will rise in the west, the Beast will appear, Constantinople will be taken by the descendants of Isaac, the Antichrist will come and be killed by Jesus at Lud (Lydda). Further, there will come a war with the Jews, Gog and Magog's (*Yājūj* and *Mājūj*) eruption, a great smoke, an eclipse, the Mohammedans will return to idolatry, a great treasure will be found in the Euphrates, the Kaaba will be destroyed by the Ethiopians, beasts and inanimate things will speak, and finally, a wind will sweep away the souls of those who have faith, even if equal only to a grain of mustard seed, so that the world shall be left in ignorance. The time of the resurrection even Mohammed could not learn

from Gabriel; it is a mystery. Three blasts will announce it—that of consternation, of such terrible power that mothers will neglect the babes on their breasts and heaven and earth will melt; that of examination, which will annihilate all things and beings, even the angel of death, save Paradise and hell and their inhabitants; and, 40 years later, that of resurrection, when all men, Mohammed first, will have their souls breathed into their restored bodies and will sleep in their sepulchres until the final doom has been passed upon them. The day of judgment, lasting from 1000 to 50,000 years, will call up angels, genii, men, and animals. The trial over, the righteous will enter Paradise, to the right hand, and the wicked will pass to the left, into hell; both, however, have first to go over the bridge *Al Sirāt*, laid over the midst of hell, finer than a hair, sharper than the edge of a sword, and beset with thorns on either side. The righteous will proceed on their path with ease and swiftness, but the wicked will fall headlong. *Hell* is divided into seven stories or apartments, respectively assigned to Mohammedans, Jews, Christians, Sabians, Magians, idolaters, and—the lowest of all—to the hypocrites, who, outwardly professing a religion, in reality had none. The degrees of pain—chiefly consisting in intense heat and cold—vary; but the Mohammedans and all those who professed the unity of God will finally be released, while unbelievers and idolaters will be condemned to eternal punishment. *Paradise* is divided from hell by a partition (*'urf*) in which a certain number of half saints will find place. The blessed, destined for the abode of eternal delight (*Al Jannah*, Heb. *Gan-Eden*), will first drink of the pond of the Prophet, which is supplied from the rivers of Paradise, whiter than milk and more odoriferous than musk. Arrived at one of the eight gates, they will be met by beautiful youths and angels; and their degree of righteousness (prophets, religious teachers, martyrs, believers) will procure for them the corresponding degree of happiness. Mankind on the last day will be assembled in three classes: (1) those who go on foot, believers whose good works have been few; (2) those who ride, believers acceptable in the eyes of God; and (3) those who creep, the unbelievers. The various felicities which await the pious represent a conglomeration of Jewish, Christian, Zoroastrian, and other fancies to which the Prophet's own sensual imagination has added very considerably. Feasting in the most gorgeous and delicious variety, the most costly and brilliant garments, odors, and music of the most ravishing nature, and, above all, the enjoyment of the *Hur al 'uyūn*, the black-eyed daughters of Paradise (see HOURI), created of pure musk, are held out as a reward to the commonest inhabitant of Paradise, who will always remain in the full vigor of youth and manhood. For those deserving a higher degree of recompense rewards will be prepared of a purely spiritual kind—i.e., the "beholding of God's face" (Shekinah) by night and by day. The last of the precepts of pure faith taught by Mohammedanism is the full and unconditional *submission* to God's decree, and the *predestination* of good and evil, which is found from the beginning inscribed on a "preserved table." Not only a man's fortunes, but his deeds, and consequently his future reward or punishment, are irrevocably, and thus unavoidably, preordained—a doctrine which is not, however, taken literally by all Moslems.

The first of the four chief duties of *dīn*, or the practical part of Islam, is *prayer*, "the key of Paradise." Certain religious purifications are included as necessary preparations. They are of two kinds: the *ghusl*, or total immersion of the body, required on certain special occasions, and the *wudū'*, a partial ablution, to be performed immediately before the prayer. This is of primary importance, and consists in washing the hands, face, ears, and feet up to the ankles—a proceeding generally accompanied at each stage by corresponding pious sentences, and concluded by the recital of the ninety-seventh sura of the Koran. If water is not to be had, sand may supply its place. Even the ground or the carpet upon which one prays must be as clean as possible, and the use of a special prayer carpet (*sajjādah*) is therefore recommended. Every Mohammedan is required to pray five times in the space of 24 hours. The prayer (*salāt*) itself consists partly of extracts from the Koran (*farḍ*), partly of sentences ordained upon the precept or practice of the Prophet (*sunna*). The times of prayer are: daybreak (*fajr*); noon (*ẓuhr*); afternoon, midway between the second and fourth (*'asr*); evening (*maghrib*); after night has closed in (*'ishā*). These several times of prayer are announced by the muezzins (q.v.) from the minarets of the mosques. The believer passes through a series of 13 postures during his prayers; and a certain number of such inclinations of head and knees, prostrations, etc., is called *rak'ah*. It is necessary that the face of the worshiper should be turned towards the kiblah, i.e., in the direction of Mecca (see KIBLAH). Women, although not forbidden to enter the mosque, yet are not supposed to pray there, lest their presence should be hurtful to true devotion. Besides these prayers there are others ordained for special occasions, as on a pilgrimage, before a battle, at funerals, during an eclipse, etc. The Moslems do not pray to Mohammed, but simply implore his intercession, as they do that of the numerous saints, the relatives of the Prophet, and the first propagators of Islam. Petitions, moreover, play a subsidiary part in the prayers, which are chiefly made up of thanksgivings and praise formulas. Mohammedanism has no clergy in the Western sense of the word, but there is always a leader (*'imām*), who takes his stand at the head of the congregation and "leads" the latter in prayer. (See IMAM; MOLLAH; MUFTI.) Next to prayer stands the duty of giving *alms*. These are twofold, legal (*zakāt*) and voluntary (*sadaḳah*), but the former, originally collected by the sovereign and applied to pious uses, has now been practically abrogated. The sadakah, according to the law, is to be given once every year, of cattle, money, corn, fruits, and wares sold, at about the rate of from 2½ up to 20 per cent. Besides these, it is usual to bestow a measure of provisions upon the poor at the end of the sacred month of Ramadan. The duty of *fasting* follows. During the whole month of Ramadan the Moslem is commanded to refrain from eating, drinking, and every indulgence in worldly pleasure, from daybreak until sunset. During the night he is allowed to eat, drink, and enjoy himself. Certain classes are exempt, as it was Mohammed's special and express desire that no one should fast who is not equal to it, lest he injure his health and disqualify himself

for necessary labor. Of other commendable fast days, the most important is the *'Ashūrā*, on the tenth of Muharram, corresponding in a measure to the Jewish Day of Atonement. The fast of Ramadan is universally kept, in letter if not in spirit, fasting being considered "one-fourth part of the faith." (See FAST; RAMADAN.) The last duty is the *pilgrimage* to Mecca, which every Moslem must make once in his life, if he be free, sound in body, and able to meet the expense. Women also perform the pilgrimage. To pay the way of one who cannot himself afford it is considered a pious act, and the Shiites allow the pilgrimage to be made by proxy. See HAJJ; HAJJI.

To the "positive" ordinances of Islam may be added the *saghīr* or *lesser* and *kabīr* or *greater festivals*. The first (*al fiṭr*, or breaking the fast) follows immediately upon Ramadan, beginning on the first day of the month of Shawwal, and lasts three days. The second (*'īd al ḳurbān*, or sacrifice festival, also called *'īd al ḍuha* in India, *'īd al Bairam* in Turkey and Egypt) begins on the tenth of Dhu'l hijjah. The latter was intended to be the more important of the two, but the people have in most places changed the order, and make the lesser festival, which follows Ramadan, the more joyful and the longer. The day set aside for the weekly assembly is Friday, which, however, is not a day of rest.

Islam also enjoins a number of *prohibitory laws* based upon utterances of the Prophet. The drinking of *wine*, which includes all strong and inebriating liquors, is rigorously forbidden. Chiefly through European influence some Moslems have lost their scruples on this score, but the great majority of the faithful refuse even to make use of the proceeds of the sale of wine or grapes. Some scrupulous believers even include opium, coffee, and tobacco in the prohibition; but general practice has decided differently. The prohibitory laws respecting *food* resemble closely those of Rabbinical Judaism; blood, the flesh of swine, animals which have died from disease or age, or on which the name of some idol has been invoked, or which have been sacrificed unto an idol, or which have been strangled, or killed by a blow, a fall or by some other beast, are strictly forbidden. "Pure" animals must be slaughtered according to certain fixed rules, and fish, bird, game, are generally allowed for food. All *games* subject to chance—such as dice, cards, tables, bets, etc.—are considered so wicked that a gambler's testimony is invalid in a court of law. Chess and other games depending on skill—provided they do not interfere with the regular performance of religious duties, and that they are played without any stakes—are allowed by the majority of Moslem theologians. *Usury* is strictly prohibited. Taking interest upon any loans, however large or small, or profiting in trade through questionable means, save by buying and selling, is severely condemned. To prevent the faithful from ever falling back into idolatry, the laws relating to *images and pictures* have been made very stringent. Whosoever makes an imitation of any living being in stone, wood, or any other material, shall, on the day of judgment, be asked to endow his creation with life and soul, and, on his protesting his inability to do so, shall undergo the punishment of hell for a certain period.

The *civil* and *criminal laws* of Mohammedanism, founded on both the Koran and the Traditions (*Sunna*, q.v.), in instances where the letter of the written or oral precept allows of various explanations, or where the case in question is unprecedented, are interpreted according to the opinion of one of the four great masters of Islam: Abu Hanifah (born 702), Malik ibn Anas (born 714), Mohammed al Shafii (born 767), and Ahmad ibn Hanbal (born 780), within the pale of their respective sects. (See MOHAMMEDAN SECTS.) Upon the principal points all Mohammedans agree. In regard to *marriage*, polygamy is allowed, but not without restriction. Four wives, though he may cohabit with any number of concubine slaves, is the legal limit for a Moslem. The Prophet's example proves nothing to the contrary, since he was endowed with special privileges and was not in all respects subject to the common law. It is, moreover, added as advice that to marry one or two is quite sufficient for a man. As a matter of fact, the rule among Mohammedans of the present day is to have but one wife. A Moslem may marry a Christian woman or a Jewess, but a Mohammedan woman is not, under any circumstances, to marry an unbeliever. In all cases, however, the child born of a Moslem, whatever the mother's faith, is a Moslem; nor does the wife who is an unbeliever inherit at her husband's death. Forbidden degrees are: the mother, daughter, sister, half sister, aunt, niece, foster mother, or a woman related to the faithful "by milk in any of the degrees which would preclude his marriage with her if she were similarly related to him by consanguinity"; the mother of his wife, even if he be not yet actually married to the latter; the daughter of his wife, if the latter still be his legal wife; his father's wife and his son's wife; two sisters at the same time; wives who stand to each other in the relation of aunt and niece; or the unemancipated slave, or another man's slave, if he have already a free wife. A simple declaration of a man and woman at the age of puberty, before two witnesses, of their intention to marry each other, and the payment of part of the dowry (which is indispensable, and must amount to at least 10 dirhems, or about $1) is sufficient for a legal marriage. A girl under age is given away by her natural or appointed guardian, with or without her consent. To see the face of any woman who is neither his wife nor his concubine, nor belongs to any of the forbidden degrees, is strictly forbidden to the believer. *Divorce* is a comparatively light matter with the Mohammedans. Twice a man may send away his wife and take her back again without any ceremony; the third time, however, he may not receive her again in wedlock unless she have been married properly to another man in the meantime. Mere dislike is sufficient reason for a man to dissolve the conjugal ties, and his saying "Thou art divorced," or "I divorce thee," together with the repayment of the dowry, is all that is required from him by the law. A wife, on the other hand, is bound to her husband forever, unless she can prove some flagrant ill usage or neglect of conjugal duty on his part; and even then she forfeits part, or the whole, of her dowry. A divorced woman is obliged to wait, like the widow, for a certain period before marrying again. If she have a young child, she is to suckle it until it be two years old, and the father is to bear all the expenses of the maintenance of mother and child. If a

slave becomes a mother by her master, and he acknowledges the child to be his own, the latter is free, the mother becomes the wife of her master, and may not be given away or otherwise disposed of by him during his lifetime. A free person, wishing to marry his or her slave, must first emancipate this slave; and if the slave of another person has been married by a free man or woman, and afterward becomes the latter's property, the marriage becomes illegal, and can only be renewed by a legal contract and emancipation. As regards *inheritance*, males generally receive a double share. A person may not bequeath more than one-third of his property, unless there be no legal heirs. Children, whether begotten with the legal wife, or slave, or concubine, or only adopted, and their descendants, are the first heirs; next come the claims of wives, parents, brothers, sisters, in their order. Where there is no legal heir the property falls to the state. The law is very lenient towards *debtors*. Insolvency and inability to work for the discharge of the claim absolve from all further obligations. The most conscientious performance of all private contracts is constantly recommended in the Koran. *Murder* is either punished with death or by the payment of a fine to the family of the deceased, according to their own pleasure. There must, however, be palliating circumstances in the latter case. The Bedouins still maintain the primitive Semitic law of blood revenge, and up to this day the "vendetta" often rages not only between family and family, but between whole tribes, villages, and provinces. Unintentional homicide is expiated by freeing a believer from slavery and paying to the family a certain sum in proportion to the rank and sex of the deceased. He who has not the means of freeing a believer is to fast for two months by way of penance. According to the strict letter of the law a man is not liable to capital punishment for killing his own child or an infidel; but practically no difference is made by the Mohammedan governments (chiefly the Turkish) at the present time. Murder is punished with death and no fine frees the culprit. *Injuries to the person* are punished according to the primitive law of retaliation; i.e., a certain proportionate fine in money is to be paid to the injured. The payment for any of the single limbs of the human body (e.g., the nose) is the full price of blood, as for a homicide; for a limb which is found twice, like hand or foot, half; for a finger or a toe, the tenth part; etc. Women and slaves have smaller claims. Injuries of a dangerous or otherwise grievous nature pay the full price; those of an inferior kind, however, bring the perpetrator within the province of the lash or cudgel. The Koran orders small *theft* to be punished by cutting off the chief offending limb, the right hand; the second theft is punishable by the loss of the left foot; the third, of the left hand; the fourth, of the right foot, etc.; but the ordinary punishments of imprisonment, hard labor, and the bastinado have been substituted in later times. The property stolen must not, however, have been of easy access to the thief, nor must it have consisted of food, since he may have taken this to satisfy the craving of his hunger. *Unchastity* on the part of a woman was in the commencement of Islam punished by imprisonment for life, for which afterward, however, stoning was substituted in the case of a married woman and a hundred stripes and a year's exile in the case of an unmarried free woman, a slave to undergo only half of that punishment. He who accuses a "woman of reputation" of adultery or fornication must produce four (male) witnesses, and if he be not able to do so he is to receive fourscore stripes, nor is his testimony ever after to be received unless he swear four times that he speaks the truth and the fifth time imprecate God's vengeance if he speak false. Even this testimony may be overthrown by the wife's swearing four times that her accuser is a liar, and imprecating the fifth time the wrath of God upon herself if he speak the truth. In the latter case she is free from punishment; the marriage, however, is to be dissolved. Fornication in either sex is, by the law of the Koran, to be visited with a hundred stripes. *Infidelity*, or *apostasy* from Islam, is a crime to be visited by the death of the offender, if he have been warned thrice without recanting. Severer still, i.e., not to be averted by repentance or revocation of any kind, is the punishment inflicted for blasphemy—against God, Mohammed, Jesus, Moses, or any other prophet. Immediate death is the doom of the offender.

A further injunction of the Koran is that of making war against the infidels (*jihād*). He who is slain while fighting in defense of Islam or for its propagation is reckoned a martyr; while a deserter from the holy war is held up as an object of execration and has forfeited his life in this world as well as in the world to come. At first all the enemies taken in battle were ruthlessly slain; later, however, it became the law to give the people of a different faith against whom war was declared the choice of three things—either to embrace Islam, in which case they become Moslems at once, free in their persons and fortunes, and entitled to all the privileges of Moslems; or to submit to pay tribute, in which case they were allowed to continue in their religion if it did not imply gross idolatry or otherwise offend against the moral law; or to decide the quarrel by the fortune of war, in which case the captive women and children were made slaves and the men either slain if they did not become converts at the last moment or otherwise disposed of by the prince. The fifth part of the spoil belongs "to God," i.e., must be devoted to a sanctuary, to the Prophet and his kindred, to the orphans, the poor, and the traveler.

It must not be overlooked that the Islam of history and of the present time is not the pure and unmodified teaching of its founder. The Koran was not intended to be a systematically arranged code of laws. Such laws and regulations as it contains were called forth by some occurrence during the Prophet's life, and were, properly, supplementary to existing laws and customs, which they abrogated, confirmed, or modified according to the occasion. In course of time cases arose for which no written rules could be found laid down by Mohammed. Recourse was then had to traditional oral dicta or to the Sunna (q.v.); in time precedents were established and laws came into force by the concurrence of the learned (*ijmā'*), or by a process of reasoning (*kiyās*). In this way the peculiar system which is called Mohammedan jurisprudence came into being, theoretically founded on the Koran, but often strangely at variance with the principles and spirit of its author. In like manner the reprehensible features of the doctrine and daily life of Islam

must not be charged indiscriminately against Mohammed. That part of the system which most distinctly reveals the mind of its founder, and which also has undergone least change in the course of time and constitutes its most complete and brightest part, is its ethics. Injustice, falsehood, pride, vindictiveness, calumny, mockery, avarice, prodigality, debauchery, mistrust, and suspicion are inveighed against as ungodly and wicked; while benevolence, liberality, modesty, forbearance, patience and endurance, frugality, sincerity, straightforwardness, decency, love of peace and truth, and above all trust in God and submission to His will, are considered as the pillars of true piety and the principal signs of a true believer. Mohammed never expressly laid down that doctrine of absolute predestination and "fatality" which destroys all human will and freedom, and which by the influence of Mohammedan theologians became a fixed element in the orthodox creed. A glance at his system of faith (so far as he had a system), built on hope and fear, rewards and punishments, Paradise and hell, both to be man's portion according to his acts in this life, and the incessant exhortations to virtue and denunciations of vice, are sufficient to prove that aboriginal predestination is not in the Koran, where only submission to Allah's will, hope during misfortune, modesty in prosperity, and entire confidence in the divine plans are supported by the argument that everything is in the hands of the highest Being and that there is no appeal against His absolute decrees. This is but one instance of the way in which Mohammed's dicta have been developed and explained—in such a manner that he has often been made to teach doctrines which he really did not teach; and thus many elements now found in the Moslem creed, if carefully traced back to their original source, will be seen to be the growth of later generations.

In a general estimate of Mohammedanism it should not be forgotten what Islam has done for the cause of humanity and more particularly the share it had in the development of science and art in Europe. Broadly speaking, the Mohammedans may be said to have been the teachers of barbarous Europe from the ninth to the thirteenth century. It is from the days of the Abbasid rulers that the real renaissance of the Greek spirit and Greek culture is to be dated. Classical literature would have been irredeemably lost had it not been for the home it found in the schools of the "unbelievers" of the "dark ages." Arabic philosophy, medicine, natural history, geography, history, grammar, rhetoric, schooled by the old Hellenic masters, and the "golden art of poetry," brought forth an abundant harvest of works, many of which will live and teach as long as there will be generations to be taught. See ARABIC LANGUAGE AND LITERATURE.

History. In the first three years of his mission Mohammed won 40 converts, including his wife, Khadija, Abu Bekr, and Othman. Then followed Ali, Omar ibn Khattab, and Hamza. In 615 the persecutions of the Koreish drove 15 of the converts into Abyssinia, and they were later joined by 100 more. After Mohammed's return from Taif to Mecca he won over some of the Bani Khazraj of Yathrib (Medina), who then made converts among the Bani Aus, formerly their enemies. The new faith spread rapidly from tribe to tribe, the Bani Abd al Ashhal going over in a body. In 622 the number of Mohammedan pilgrims from Yathrib is said to have been 73. After the departure from Mecca Mohammed became the arbiter between the Aus and the Khazraj in Yathrib, and the civil head of the commonwealth. Thus Islam became a political as well as a religious movement.

Mohammed's plans included now nothing less than the conversion of the world to Islam. If he had at first hoped to accomplish this by peaceful measures alone, the aggressiveness of his enemies in advancing against Medina soon forced the preacher to become warrior also, and military success won more and more converts. In 628 Mohammed sent letters to the Byzantine Emperor, Heraclius, to the King of Persia, to the Governor of Yemen, to the Governor of Egypt, and to the King of Abyssinia, inviting them to join the new religion. In the same year he converted part of the Bani Daus of Yemen, and two years later the rest of the tribe followed; in the meanwhile 15 other tribes responded. With the fall of Mecca in 630 A.D., the triumph of Islam in Arabia was assured. Some of the Prophet's bitterest enemies became his most ardent followers; and the next year saw so many embassies suing for alliance that it became known as the "year of the deputations."

After Abu Bekr had brought about the resubjugation of the northern tribes, who had revolted on Mohammed's death, an army was sent into Syria, as the Prophet himself had planned. A second army was sent into Irak. The latter came into contact with the Persian forces, and in Omar's caliphate, by the victory at Kadisiyyah, Chaldæa and Mesopotamia were assured to the Arabs. Christian Bedouins of both sides of the Euphrates became converted at this time, even though tolerance was extended to those who kept their own faith. In Syria almost the only opposition came from Heraclius' armies. The great mass of the people, oppressed by the Byzantines, welcomed the Arabs. By 639 the Greeks had been driven out of the province, most of the large towns having made treaties which guaranteed them toleration of religious belief and protection of life and property on the mere payment of the *jizyah* (poll tax) and *kharaj* (land tax). Friendly relations being thus established, in the following years there was a gradual assimilation of Arabic manners and customs throughout Syria, which made the conversion of the natives easy. Many Christians were converted in the 50 years between Omar and Abd al Malik in Irak, Khorasan, etc. Omar II (717–720) was particularly successful by lightening the burdens of Mohammedan landowners. In addition, the children of women captives were brought up as Moslems; and slaves were allowed to purchase their freedom at the price of conversion. In the tenth century the Nestorian Bishop of Bet Garmai was a noted convert; in 1016 Ignatius, the Jacobite Metropolitan of Takrit (at Bagdad), became Abu Muslim. Converts were won in the following centuries, even from among the Crusaders. Bainaud and his followers embraced Mohammedanism in a body; 3000 Crusaders accepted Islam in Phrygia in 1148 as a result of Mohammedan kindness contrasted with ill treatment on the part of Greek Christians. To-day over 50 per cent of the population of Syria and Palestine is Moslem.

The rapidity with which Mohammedanism spread in Syria and Mesopotamia was not duplicated in the country to the north. In Armenia, even after the Christian power had been overthrown by the Seljuks of the eleventh century, the mass of the population continued Christian. Georgia resisted until the invasion of the Mongols. After the fall of Constantinople (1453) the western and central portions of the country became converted, and after the ruling dynasty of Samtskhé in 1625 had become Mohammedan, progress was rapid among the aristocracy. The eastern portion of the country had submitted to Persia, and hence was naturally subject to Mohammedan influence. In the seventeenth century there were two petty kingdoms in the East the rulers of which, though native princes, were Moslems. Since the beginning of the nineteenth century Georgia has belonged to Russia, but certain parts are still Mohammedan.

After the Mohammedans had succeeded in subduing Syria they turned their attention to Egypt. Amr ibn al Asi drove the Byzantines out between 639 and 641 A.D., and the whole of the country as far south as Abyssinia and as far west as Libya came under Moslem influence. The conquerors, who treated the natives, and especially the Copts, with great favor, were welcomed by them. Many Copts accepted Islam even before the fall of Alexandria; while the number of converts, partly forced, partly willing, up to the caliphate of Omar II (717–720) was large. In the twelfth century Islam was carried, principally by Moslem merchants, into Lower Egypt, and in the fourteenth century into Nubia, the King of Dongola becoming a Moslem in 1340. In Abyssinia conversions were first made in the coast towns in the tenth century, and towards the end of the twelfth a Mohammedan dynasty was founded. In the sixteenth century the Mohammedan Kingdom of Adal, between Abyssinia and the southern end of the Red Sea, came into existence; in the seventeenth one-third of its entire population was Moslem, while in the middle of the nineteenth one-half of the central province of Abyssinia had likewise been converted.

Amr ibn al Asi conquered northern Africa as far as Barca (Cyrenaica). Before the end of the century rapid progress had been made among the Berbers, who made their last resistance at the Spring of Kahina in 703. Musa ibn Nusair and Omar II, the Conqueror, made innumerable converts. In 789 western Africa (Mauretania) became separated from Egypt as a kingdom under Idris, founder of the Idrisite dynasty; in addition to converting many Berbers, he is said to have forced Christians and Jews to apostatize. The Berbers, however, under the Idrisites as under the Aghlabites (a dynasty founded in 800 by Ibrahim ibn Aghlab, hereditary Governor of Ifrikiyyah) were in constant revolt. In the beginning of the tenth century Abu Abd Allah appeared among them as the apostle of the Ismailian sect and succeeded in winning over the whole of the powerful Kitamah tribe to the support of the imamate of Ubaid Allah; and the dynasty of the Fatimites was thus successfully established in Kairawan. Early in the eleventh century the faith spread rapidly among the Berbers of the Sahara also, among whom it had been introduced in the ninth century. The revival was due principally to a chieftain of the Lamtuna tribe, Abd Allah ibn Yasin, who founded a monastery, *ribaṭ*, and won many disciples from various tribes, to which he sent them back as missionaries. In 1042 he led his followers, known as the *Murabiṭuna* (Almoravides), against the neighboring tribes, and by force and persuasion succeeded in establishing a vast empire. Before the end of the century it extended from Senegambia to Algiers; Mohammedan Spain was brought under the sway of the Almoravides. In the beginning of the twelfth century another dynasty was founded among the Berbers, when Abu Abd Allah Muhammad ibn Tumart appeared in the Mauretanian mountains and preached especially against the laxity of morals and the excessive veneration paid to saints. His followers became known as the *Muwaḥḥiduna* (Almohades, or Unitarians). The conquests and conversions of the Almohades were likewise enormous; by 1160 they had an empire extending from Barca to the Atlantic, and embracing Mohammedan Spain. After these events but few of the Berbers remained heathen.

From northern Africa Islam soon penetrated into the interior of the continent. The Almoravides made many converts in the eleventh century among the negroes of the Sudan, who had already become familiar with the new faith through the visits of merchants and missionaries. The negro tribes of the west were first won over; as early as 1010 the King of Surhay (southeast of Timbuktu) became a Moslem; the states on the upper Niger, Timbuktu (founded in 1077) and Melle (west Sudan, founded by the Mandingos), followed and furnished active missionaries as well. The kingdoms of Bornu and Kanem, along Lake Chad, became converted in the eleventh century, the latter kingdom extending as far as Egypt and Nubia. In Darfur a Moslem dynasty was founded in the fourteenth century; at the end of the sixteenth century Wadai and Bagirmi, and in the seventeenth portions of the Hausa country, became Moslem. In the nineteenth century there was a remarkable revival of Mohammedanism due to the influence of the Wahabis. The Fulahs were united into one political organization by Sheik Othman Danfodio, and compelled all the remaining tribes to accept Islam. In French West Africa and French Equatorial Africa Mohammedanism has spread far and wide; and active missionary work has been carried on in Kamerun. The nineteenth-century movement was aided by such religious orders as the Amirghaniyyah, the Tijaniyyah, the Kadriyyah, and the Sanusiyyah. The vast theocracy of the Sanusiyyah has settlements and schools extending from Egypt to Morocco, in the Sudan, Senegambia, Somaliland, the Sahara, and the Galla country; they have gained many converts by education and the purchase of slaves.

Along the west coast of Africa Islam has made steady progress; e.g., on the Guinea coast, in Sierra Leone, in the Ashanti country, Dahomey, the Gold Coast, Lagos (where there are 10,000 Moslems), and Liberia (where there are more Moslems than heathen). Often the common people are converts where the chieftains are not. There is hardly a town along the coast for 2000 miles from the Senegal which has not a mosque.

On the east coast the Emozaydij made settlements before the tenth century; they were Shiites, and were followed by Sunnis, who

founded the town of Magadoxo, and other towns on the coast from Aden to the tropic of Capricorn. Arab traders made Zanzibar Mohammedan. Inland, however, only the Galla and Somali tribes are even partly Moslem. In Cape of Good Hope there have been Moslems since the seventeenth and eighteenth centuries, Islam having been carried there by the Malays. Even among the Hottentots there are converts who make the pilgrimage to Mecca, while in the diamond fields the coolies are said to be missionaries.

Islam was introduced into Spain in 711 by Tarik with 12,000 Berbers. The first converts were from among the ill-treated slaves. The remnant of the heathen population followed, then the nobles and the middle and lower classes of the Christians, so that the majority of the population soon consisted of Mohammedans of non-Arab blood. In 1311 there were 200,000 Mohammedans in Granada alone, only 500 of them being of Arab descent. On the whole, conversion was carried on peacefully except when the Almoravides at the close of the eleventh century came to Spain. The Moslem power began to decline as early as the eleventh century. After the fall of the Almohades, in 1257, it continued chiefly in Granada; the last Moriscos were driven out in 1609.

The Aghlabites made themselves masters of Sicily in 827–878, and under this dynasty and their successors, the Fatimites, a flourishing Moslem civilization existed in the island, the effects of which were still felt after the Norman Conquest (1061–1090) and under the Hohenstaufens (1194–1266).

The Turkish Empire made its first conquests in Europe, at the time of the decline of Islam in Spain. The inception of the Ottoman Empire dates from the beginning of the thirteenth century, when 50,000 Turks settled in the northwest of Asia Minor. In 1353 they entered Europe for the first time and in 1361 made Adrianople their capital. Before the end of the century Bulgaria, Macedonia, Thessaly, and most of Thrace had been subdued by Bajazet; Amurath II (1421–51) added to this territory, and Mohammed II (1451–81), after taking Constantinople in 1453, extended his rule over Greece, Servia, Bosnia, and Albania. A large part of Hungary was added by Suleiman II (1520–66); in the seventeenth century Crete was taken, and Podolia was ceded by the Poles. The most noted example of forced conversion was the enrollment of Christian children in the ranks of the Janizaries (q.v.). Large numbers were converted peaceably from all ranks; in the fifteenth century Adrianople was the home of countless renegades; in the seventeenth converts were made even among the Christian clergy. Progress was very rapid at this time. The power of Servia was broken by the Turks in 1389, but the country was not reduced to the position of a Turkish province until 1459, when the inhabitants chose Mohammedan rule in preference to the Roman Catholicism of Hungary. However, though the nobles became Moslems, only in Old Servia (northeast of Albania) since the seventeenth century has the spread of Islam been rapid. The same period was the date of the rapid conversion of Montenegro; in Bosnia the Bogomiles joined Islam in large numbers after Mohammed II had released over 70 cities from Catholic persecution. The other inhabitants followed gradually, and the Christians left the way clear by emigrating into the neighboring countries. The conversion of the inhabitants of Crete first took place in the ninth and tenth centuries, when the whole population joined Islam; at the beginning of the thirteenth century the Venetians acquired the island, and in 1669, when it was taken from Venice by the Turks, the inhabitants had to be reconverted; within 50 years half of them were again Moslem.

In Persia Islam made progress very early, for under Zoroastrianism the people were oppressed by priest and ruler alike. After the fall of the Sassanid dynasty in the middle of the seventh century converts were easily made, at first mainly from among the despised industrial classes and artisans. Later the Shiites met with great success, for Husain, son of Ali, had married Shahban, daughter of Yezdegerd, the last Sassanid; and in the middle of the eighth century the Ismailians showed a wonderful power of adapting themselves and their teachings to all classes and creeds. At the close of the ninth century Saman, a noble of Balkh, became a Moslem and founded the dynasty of the Samanids (874–999). Conversions were made in the ninth century by Karim ibn Shahriyar, the converted King of the Kabusiyyah dynasty, and by Nasir al Hakk of Dailam; in 912 Hasan ibn Ali, of an Abd dynasty on the Caspian, made many converts in Dailam and Tabaristan.

North of Persia there had been much opposition to Islam, and allegiance to the Caliph was often renounced as soon as the armies were withdrawn. In Samarkand, however, conversions were brought about by Ibn Kutaibah, who burned the heathens' idols. Among the Afghans the King of Kabul was converted about 800; in Transoxiana many converts were made in the eighth century, and by the middle of the ninth Mohammedanism was general. The greatest impetus to the spread of the new faith came about the middle of the tenth century, when some of the Turkish chieftains were converted; in Turkestan the founder of the Ilak Khans converted 2000 families of his tribe, who became known as Turcomans. In 956 the Seljuk Turks had their origin, when Seljuk migrated with his clan to Bokhara from the Kirghiz steppes.

Much of the progress which Islam had made was lost by the Mongol invasion. Bokhara, Samarkand, Balkh, and Bagdad were left in ruins, and almost without inhabitants. Many Mongol rulers, such as Kublai Khan, were energetic in their opposition to Islam. But in the time of Ogdai Khan (1229–41) certain Buddhists were converted; Yisun Timur Khan (1323–28) was an earnest Moslem and made converts of his troops; Baraka Khan (1256–65) turned Moslem with his subjects—the first ruling Mongol prince to take this step in the eastern portion of the Mongol territory. But it was not till 1295 that Islam became the ruling religion of Persia; at that date Ghazan, seventh of the Ilak khans, joined the new faith. In the Middle Kingdom, in the reigns of Tirneashirin Khan (1322–30) and Tughlak Timur Khan (1347–63), Islam became generally adopted, though Burak Khan (1266–70) had also been a Moslem. In the Golden Horde the leaders and aristocracy followed Baraka Khan when he became converted; Uzbeg Khan (1313–40) placed Islam on a solid basis. The Mongols were likewise successful, to some extent, in introducing Mohammedanism into Russia;

e.g., in the Crimea and among the Finns, the Tcheremisses, the Tchuvashes (whole villages of which are Moslem), and the northeast Russian tribes, among whom there are many Mohammedans. In Siberia the first conversions were made in the latter half of the sixteenth century. Since 1745 the Baraba Tatars, between the Irtish and Ob, have been converted. After the proclamation in 1905 of an edict granting religious liberty large numbers of nominal Christians in Asiatic Russia have openly embraced Islam.

In India the first great Mohammedan conqueror was Mohammed Kasim (711), who took Darbul (capital of Sind), Multan, and other cities early in the eighth century. Under Omar II the native princes were called upon to become Mohammedans, and received Arabic names; but many of them later became heathens again. In 1019 Hardat and 10,000 men accepted Islam; but it was some time before the new religion gained a firm footing in India. Down to near the close of the twelfth century Mohammedan India was only a province of Ghazni; at that time Mohammed Ghuri conquered the northern part to the mouth of the Ganges, and his slave Kutb al Din was made Viceroy of Delhi. The latter then proclaimed himself sovereign of Hindustan and founded the dynasty of the "Slave Kings," the first Mohammedan dynasty in India. Mohammed Ghuri likewise converted the Ghakkars, in the mountains north of Punjab. Under the succeeding dynasty, the Khiljis (1295–1320), Mohammedan rule was extended to the Deccan. The Tughlak dynasty which followed was troubled by revolt and desertion, and its power was much reduced; the Sayyids, as well as the Lodis (1451–1526), were rulers over but one province, Bengal, Jaunpur, Malwa, and Gujarat having independent Moslem dynasties. The Mogul Empire was established in 1526 by Baber, and then Islamic influences were more successful. Many rajputs were converted when idolatry was made a bar to advancement at court. In the eastern districts of the Punjab and in Cawnpore many converts were made in the reign of Aurungzebe.

In southern India and in Bengal the spread of Islam was more rapid. The southern coast was subject to the Mohammedan influences of traders; even in the eighth century refugees had come there from Irak, and missionaries in the eleventh. In Malabar the Mappilas, descendants of the early refugees, are estimated at one-fifth of the population. The Laccadive and Maldive islands, as well as Malabar, have an almost exclusively Moslem population. In the Deccan Arabs settled in the tenth century; it had the Mohammedan dynasties of the Bahmanids (1347–1490) and Bijapur (1489–1686). Bengal was the scene of most active propaganda, and Islam was welcomed especially among the lower-caste Brahmins. Lower Bengal has been the scene of a great Mohammedan revival even in the last few years. Kashmir had a Mohammedan king in the fourteenth century; Islam became supreme in the time of Akbar, and today claims over 70 per cent of the population. In Baltistan there has been a Mohammedan population for over three centuries, and the faith is being carried by merchants from Kashmir, as well as from Persia, even into Tibet. In the various parts of India there are about 67,000,000 Moslems, the number of annual converts being estimated at about 600,000. It is worth noticing, however, that in Agra only about one-tenth and in Delhi only about one-fourth of the population is Moslem, and these are prominent centres of Mohammedan power.

Mohammedanism penetrated into China from the south and from the west. Friendly relations were established between the caliphs and the emperors in the time of the Caliph Walid (705–717), when the general Kutaibah ibn Muslim sent ambassadors to the Chinese court. Later Moslem traders entered from Arabia, Bokhara, and Transoxiana. The first mosque was built in 742, in the capital city, Shensi, northern China. In 758, 4000 Arab soldiers were sent by the Caliph Al Mansur to aid the Emperor Sah-Tsung in crushing a rebellion; they remained in China and intermarried with the natives. The annals of the Tang dynasty (618–907) record the arrival of Moslems at Canton; there in the ninth century they lived as a separate community. They were joined later by other arrivals, and intermarried with the natives. Mohammedans entered the Province of Kansu (part of the Empire of Hoey-hu), and the Khan was converted, in the tenth century. The Uigurs, a Turkish tribe transferred to the Great Wall in the Tang dynasty, became Moslems in the ninth century. All of these Moslem communities formed centres for the spread of Islam throughout the Empire. Further accessions of Syrians, Arabs, and Persians followed the great Mongol conquest. Under the Mongol khakans Mohammedans were well treated and rose to positions of trust (in 1244 Abd al Rahman was head of the Imperial finances). At the beginning of the fourteenth century all the inhabitants of Yunnan were Moslems, and in every town throughout the Empire there was a special Moslem quarter. After the expulsion of the Mongols the Mohammedans avoided all external signs of their religion, and assimilated themselves as far as possible to the rest of the population, while keeping the essentials of their religion intact. Missionary efforts were continued quietly and slowly but surely; the only conversion in large numbers took place in 1770, when a revolt was put down in Sungaria and the 10,000 military colonists who were sent there all embraced Islam, and after a famine in 1790 in the Province of Kwangtung, when 10,000 children are said to have been bought and brought up as Moslems. There was a general revival of interest in the eighteenth century, when commercial relations were reëstablished with the outside Mohammedan world. To-day there are about 12,000,000 Mohammedans in the Chinese Republic, of which three-fourths are in the provinces of Kansu and Shensi, in the northwest. As an example of the cities in the east, Peking has 20,000 Moslems, with 13 mosques.

The spread of Islam into the Malay Islands dates from the twelfth century, when more or less successful attempts were made to introduce it into Sumatra; in the fourteenth century the Shereef of Mecca sent missionaries to the island and succeeded in making many converts. In the fifteenth century the great Kingdom of Menang-Kaban had many converts, and the larger part of central Sumatra is now Moslem. On the Malay Peninsula the Kingdom of Malacca was converted in the thirteenth or fourteenth century; the Moslems of the peninsula to-day are said to be most strict in their religious practices, though extremely tolerant.

Converts have been made among the Siamese Buddhists of the north and among the wild tribes of the peninsula. In Java the first notable success of Islam took place in the fourteenth century, and in the following century the new faith was firmly established on the east coast. In the fifteenth century Radan Rahmat, nephew of the Hindu King of Majapahit, made many converts in Ampel and in other places on the east coast; at the same time conversions were made in the west. Radan Patah headed a confederacy which, in 1478, defeated the King of Majapahit, replacing the Hindu with a Moslem dynasty. To-day nearly the whole of Java is Mohammedan. In Celebes general conversion along the coast began in the seventeenth century. The Macassars were the first converts; they then, after much resistance, converted the Bugis, who likewise became propagandists. In the north the Kingdom of Balaang-Mongondou, which was Christian for centuries, was finally converted in 1844. The population of this Kingdom is now half heathen and half Moslem. The island of Sumbawa has had a Moslem population since 1540; Lombok was one of the scenes of conversion by the Bugis.

In the Philippine Islands there has been a long struggle between Christianity and Islam. In Mindanao and the Sulu Islands civilized Mohammedan tribes existed as early as 1521, when the Spaniards came to the islands. Owing to their obnoxious and ill-advised methods, the Spaniards could make no progress in the face of Islam. The Mohammedans, as elsewhere, learned the language of the people, adopted their customs and intermarried with them, thereby winning great success. The independent Kingdom of Mindanao had 360,000 Moslem subjects in the nineteenth century. The Sulu Islands have also been a Mohammedan stronghold. Among the lower classes in the northern islands Islam has not made much headway, as indeed has been the case throughout the archipelago. In New Guinea and the islands to the northwest of it progress has been made only on the coasts. In the archipelago as a whole, however, Islam is spreading. The religious orders, especially the Sanusiyyah, are very active.

It is almost impossible to give reliable figures of the total Mohammedan population of the world. According to a recent estimate (1915), the number may be placed approximately at 220,000,000. This is based in part on the latest available census reports, in part on official and private estimates of varying degrees of probability. The unwillingness of Moslem householders to give an account of the members of their harems interferes everywhere with scientific census taking, and in many lands where Mohammedan missions have been particularly active in recent times no census has ever been taken. The following figures can therefore only claim to be approximately correct. In Asia: Turkey, 15,000,000; Persia, 9,200,000; Afghanistan, 5,000,000; India (1911), 66,623,412; Russia (1911), 13,906,972; China, 12,000,000; Indo-China and Siam, 2,000,000; total in Asia, about 124,000,000; in the East Indies and other islands of the Pacific, about 35,000,000; in Africa: Egypt (1907), 10,336,826; Sudan, 3,000,000; Abyssinia, 5,000,000; Barca and Tripoli, 2,000,000; Tunis, 2,000,000; Algiers, 5,000,000; Morocco, 5,000,000; Liberia, 1,000,000; French West and Equatorial Africa, about 10,000,000; British West, East, Central, and South Africa, about 10,000,000; West and East German, Belgian, and Italian East Africa, about 3,000,000; total in Africa, about 56,000,000; in Europe: Turkey, Bulgaria, Servia, Albania, Greece, Austria, and Russia, about 5,000,000. It is significant that only about 31,000,000, or less than 15 per cent, of this Mohammedan population are found in politically independent Moslem states, viz.: in Turkey, 16,500,000; Persia, 9,200,000; Afghanistan, 5,000,000; while Great Britain has about 95,000,000, Holland about 30,000,000, France about 22,000,000, Russia about 14,000,000, China about 12,000,000, and Abyssinia about 5,000,000 Mohammedans.

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MOHAM'MEDAN SECTS. The movement which led to the division of Islam into opposing parties was at first a political one, though religious, theological, and philosophical questions soon arose which added to the complexity of the situation and caused a further subdivision into sects. Mohammed died without naming his successor; and while Abu Bekr was looked upon by many as the natural leader, others felt that Ali, who was not only the cousin and son-in-law but also a decided favorite of the Prophet, should be his successor. Among the Arabs, however, leadership was not a matter of inheritance but of election; and when Abu Bekr was chosen Caliph he received the recognition of all, including Ali. Omar's election likewise resulted in general satisfaction, although the Ommiads, who, even when they had accepted Islam, were still rivals of the Prophet's family, began to show their opposition to those who had been the Prophet's intimate companions. On Omar's death the caliphate was again denied to Ali, Othman being chosen. Othman's misrule, however, caused great dissatisfaction, and when he was assassinated Ali finally came to the caliphate. The hostility of the Ommiads, however, continued, and soon turned into open revolt, with Moawiyah, the Ommiad Governor of Syria, at its head. The question as to the right of succession, which was soon to cause the permanent separation of the whole Mohammedan world into Shiites and Sunnites, had even then presented itself in great seriousness, the followers of Ali claiming that only the Prophet's family had the right to the caliphate, the Ommiads opposing this claim.

There was also a third party, afterward known as the Kharijites (those who go forth), who held the old Arab view on the question of succession and were thus directly opposed, in principle, to the "legitimists." They were, in reality, in favor of a theocracy; and they claimed that any man might be called to the *imāmah*, or leadership, even if he did not belong to the Koreish, or was not even a freeman, provided only that he was just and pious and fit in every other respect. As a result of this they also claimed that an unrighteous imam might be deposed, or even put to death; and furthermore, that there was no absolute need for any imam at all. Since Ali, however, united in his person the claims of heredity and of election, they were at first among his partisans. But when, at the battle of Siffin, Ali submitted to arbitration the decision of his right to the caliphate as against Moawiyah, they refused to stand by the decision and swear allegiance to either one or the other. Twelve thousand of them consequently deserted Ali's camp in a body; they proclaimed "no rule but that of Allah alone." The Kharijites, though often defeated in this and succeeding caliphates, appeared again and again as the assailants of the established government.

After Ali's death, when Moawiyah had finally succeeded in establishing himself in control, he induced Hasan (q.v.), the elder son of Ali, to yield up his prerogatives. Ali's followers, however, refused to recognize Moawiyah and espoused the cause of Husain, Ali's second son. A bloody struggle followed, in which Husain lost his life. The division of the Mohammedans into Sunnites and Shiites was now fixed, and the Shiites, consistently developing the theory of legitimism, refused to recognize that there had ever been any legitimate caliph between Mohammed and Ali. See SHIITES; SUNNITES.

Despite the fact that with Ali's death and the Ommiad supremacy the question as to the caliphate was settled, the Shiites still looked to the descendants of Ali as their religious leaders, or imams. But even among the Shiites themselves unanimity in regard to the imamate did not long prevail, and discussions of a theological nature likewise proved a source of trouble. The impulse to such discussion came from Persia, into which Mohammedanism had well penetrated, and which, since the principle of hereditary succession had always obtained there, naturally espoused the cause of Ali.

Down to the sixth imam, Ja'far al Sadik (died 765), there was agreement among the Shiites; Ja'far, however, had two sons, Ismail and Musa al Kasim. The former, as the elder, should have been successor to the imamate. The father, however, is said to have declared in favor of Musa; and on Ja'far's death a division ensued between the adherents of Ismail—the Ismailians (*Ismā'iliyyah*)—and those of Musa, the greater part of the Shiites following the latter.

From this time on the question of the imamate received more and more a theological, mystical treatment. The notion of the imam, in general, was that of an ever-living, though at times hidden, supreme guide of the people, who after a time is restored to humanity, or at least to the believing part of it. (See MAHDI.) The Ismailian doctrine was that the imam had been revealed in Ali, whereas during the preceding ages the imams had been concealed; that Ali himself had reappeared in every imam till the time of Ismail, and had then become invisible again; but that he would descend some day "from the clouds" to unite all believers and to restore the pure faith. The real importance, however, of the Ismailians, who existed unobserved for some time, dates from Abd Allah ibn Maimun, whose father had been executed for professing materialistic doctrines and trying to turn people away from the doctrines of Islam. Abd Allah seems to have practically carried out his father's notions. Aided by favorable circumstances, he matured a plan which, for the boldness and genius of conception and for the energy and vigor with which it was carried out, has not many parallels in history. Nothing less was contemplated than the union of the Arabic conquerors and the many races they had subjected since Mohammed's death, and the enthronement of what afterward was called "Pure Reason" as the sole deity to be worshiped. The advanced should be free of all so-called religious fetters,

which, as symbols and allegorical actions, should be laid all the heavier on the necks of the less advanced strata of society. The "believers" and "conquerors" were to be made missionaries for unbelief and the implements for the destruction of their own empire. With an extraordinary knowledge of the human heart and human weakness, he offered devotion to the believer; liberty, if not license, to the "free in spirit"; philosophy to the "strong-minded"; mystic hopes to the fanatics; miracles to the masses. The Messiah whom Abd Allah preached stood higher than Mohammed himself, and, though he did not reject the Koran, he yet contrived to allegorize and symbolize away nearly all its narratives and precepts. An elaborate secret doctrine was worked out, into which the members of the sect were initiated by degrees. Missionary schools were established, and the instruction given to the young missionaries was artfully designed to win over not merely all the different Mohammedan sects, both Sunnites and Shiites, but also Jews and Christians. By the time the neophyte had completed the ninth and concluding degree of initiation all his earlier religious beliefs had been explained away. He had learned that no miracle had ever been performed; that the prophet is merely a man distinguished by his purity and the perfection of his intelligence; and that this purity of his intelligence is precisely what is called prophecy. God throws into the prophet's mind what pleases Him, and that is what is understood by the Word of God. The prophet clothes this Word afterward with flesh and bones and communicates it to the multitudes. He establishes by this means the systems of religious institutions which appear to him the most advantageous for the ruling of men; but these institutions and behests are but temporary and intended for the preservation of order and worldly interests. No man who has knowledge need practice any single one of them; to him his knowledge suffices.

The creed of the Ismailians was gradually built up and many changes were introduced into it at different times; from it sprang various other sects, notably that of the Karmathians. This sect sprang up in the ninth century, under the caliphate of Al Mutamid, and by a combination of extraordinary circumstances succeeded in establishing itself for a time as a political power which threatened to overturn the caliphate itself. The practical exertions of Abd Allah ibn Maimun and their wonderful results had soon attracted the attention of the authorities. Obliged to flee from place to place, he sought refuge successively in Karaj, in Ispahan, in Ahwaz, in Basra, finally in Salamia, in Syria, where he died, leaving his son Ahmad his successor as chief of the Ismailians. One of Ahmad's missionaries (or, according to other accounts, a convert of a missionary) was Al Karmat. He lived in Irak, and was a fit man to carry out the plans of Abd Allah ibn Maimun. His house in Kufa became the centre whence all the missionaries were sent forth and where all the details of a great conspiracy were directed. One of the most noted of the missionaries, Abu Said, won over a great part of the people of Bahrein, the majority of whom were not Mohammedans and were impatient of Moslem rule. In 900 Abu Said defeated an army of 10,000 men sent against him by the Caliph and captured the latter's general. He then gained undisputed possession of the whole country, destroyed the old capital, Hajar, and made Al Hasa, his own residence, the capital. At the same time two other Karmathian chieftains arose to threaten the court of Bagdad, one near Kufa and the other in Syria. The former was defeated, captured, and tortured to death. The latter at first defeated the Governor of Damascus most ignominiously, but in 907 the Caliph's general, Wasif, won a decisive victory and made an end of this branch of the Karmathians. Meanwhile both Al Karmat and Abu Said disappear from view and the leadership passed to Abu Said's son, Abu Tahir. In 923 he seized Basra. The next year he pillaged the Meccan caravan and plundered Kufa. In 927 he gained a decided victory over the Caliph's troops in Irak. In 929 he appeared at Mecca at the head of his army, when the pilgrimage was at its height. Attempts to buy him off were unavailing, and a fearful massacre, lasting several days, ensued. The holy places were desecrated and the Black Stone was carried off. Abu Tahir may have thought that this act would destroy the sanctity of Mecca and the Kaaba in the eyes of the faithful, but if so he was mistaken; the caravans still went on their usual annual pilgrimage as often as he did not restrain them by force. In 939 the emir of the pilgrimage, Abu Tahir's personal friend, persuaded him to conclude a treaty by which the pilgrimage was again allowed, on payment of five dinars for every camel and seven for every horse. The Black Stone was returned for an enormous ransom in 950, seven years after Abu Tahir's death. At that time the Karmathians were masters of Irak, Syria, and Arabia. Little of importance is heard of them again till 990, when they were defeated before Kufa—an event which seems to have made an end of their dominion in Irak and Syria. About 993 they were again defeated by Asfar, and their chief lost his life. They retreated to Al Hasa, where they fortified themselves, while Asfar marched against Al Katif, captured it, and carried away all the baggage, slaves, and animals of the Karmathians of that town and then retired to Basra. The Karmathians retained Al Hasa for a considerable time, but nothing further is heard of them in history. In 1862–63 Palgrave found remnants of them still living in Najran and in Bahrein and Oman, and their hatred of Islam seemed in no wise abated.

Concerning the special beliefs of the Karmathians, so far as they have been preserved, their system seems in the beginning to have been merely a sort of reformed Islam. The prophet Al Karmat, it was held, had brought a new law into the world, by which many of the tenets of Mohammedanism were altered, many ancient ceremonies abrogated, new forms of prayer introduced, and an entirely new kind of fast inculcated. Wine and a few other things prohibited by the Koran were allowed. Certain of the precepts of the book were turned into mere allegories. Instead of tithes they gave the fifth part of their property to the imam. Prayer was merely the symbol of obedience to the imam. Fasting was the symbol of silence, or rather of concealment of religious doctrine from the stranger.

Another offshoot of the Ismailians is the sect known as Assassins (*ḥashshishin*, a name derived from *ḥashish*, a drink drawn from hemp, to which the members of the sect were addicted). The sect owed its origin to Hasan ibn Sabbah,

a Persian fanatic, who at the beginning of the eleventh century formed a secret society, the members of which swore blind obedience to their leader, known to history as the "Old Man of the Mountain." From their mountain fastnesses in Persia (Alamut) they bade defiance for two centuries to the strongest armies sent against them by Moslem rulers, and they were reduced to harmlessness only by the Mongol invasion (1255). They owed their power chiefly to the perfection of their secret organization and to the unscrupulousness with which they carried out their plans. They were perhaps best known for the countless assassinations of which the members of the sect were guilty. From Persia they spread into Syria and Asia Minor. While Hasan ibn Sabbah was still alive the Governor of Aleppo had invited them to settle in his territory, and they had taken possession of various mountain fastnesses from which they were enabled to play an important rôle in the Crusades. There are still a few Assassins in the neighborhood of Homs. See ASSASSINS.

When the Assassins came into Syria they found the mountain regions around Hama in possession of the Nosairians, apparently a remnant of the ancient Syro-Phœnician population of the land, which had preserved its own religion through the centuries despite all the efforts of Christianity. Most of the Nosairians displayed a bitter enmity towards the Ismailians, though some embraced their cause, and at the end of the tenth century there was a strong infiltration of Ismailian doctrines into the general Nosairian religious system. In fact, the Nosairian religion, without being identical with Ismailism, shows many strong points of analogy with it. The Nosairians are divided into four sects—*Haidariyyah*, *Ḳalaziyyah* (or *Ḳamariyyah*), *Shamaliyyah* (or *Shamsiyyah*), and *Ghaibiyyah*. The *Shamaliyyah* and *Kalaziyyah* are the most important. They all possess the same religious book (*Kitāb al Majmuʿ*), and differ from one another only on points of minor importance. The chief variations from the Ismailian doctrines are these: while the Ismailians taught that of the seven cycles corresponding to the various manifestations of the deity, the sixth, that of Mohammed, was closed with the death of Ja'far, and the seventh, which was to be characterized by the coming of the Mahdi, or Messiah, was thereby opened, the Nosairians taught that the seventh was closed by the seventh divine manifestation, that of Ali. Furthermore, the Nosairians recognized Musa instead of Ismail as the successor of Ja'far al Sadik. This was probably due to the fact that they had accepted as their leader Mohammed ibn Nosair, who was a partisan of the eleventh imam, a descendant of Musa; and with Musa (died 799), who was the seventh imam, they considered the number of imams to have been completed. Another striking characteristic of the Nosairian belief was their attitude towards the *natiḳs*, the various divine incarnations. The Ismailians held that all the natiks excepting Mohammed were superior to their *assas* (foundations) or *sameṭs*, while the Nosairians placed all of their assas above the natiks. But of greatest importance was the degree to which they carried their doctrine of the divinity of Ali. Ali, while he confided the *word* to Mohammed, had reserved the *maʿna* (meaning) for himself. Ali is their god in heaven and their imam on earth; he is concealed from man because of his divine nature; he is not created and has no attributes; his essence is the light. He created Mohammed to be the veil with which he conceals himself, the place in which he resides, the bearer of his name. Mohammed in his turn created Salman al Farisi to be the *bab*, or gate—the one through whom man communicates with the deity, and who is charged by the divinity with the making of his propaganda. Salman created the five "incomparables" (in reality five planets) which created the world. See NOSAIRIANS.

Besides the Assassins and Nosairians, a third sect with Ismailian tendencies found refuge in the Syrian mountain districts—the Druses. When Abd Allah ibn Maimun found himself persecuted by the authorities he fled to Syria and continued to preach there the coming of the Mahdi. His son Mohammed continued the propaganda, and finally the Mahdi himself appeared among the Berbers of north Africa. This Mahdi founded the dynasty of the Fatimites (909), the sixth of which, Hakim, probably under Ismailian influence, declared himself an incarnation of the deity. He disappeared mysteriously, which helped to support his contentions. Hamza and Al Darzi (whence the name Druse) were his propagandists (*dāʿi*), and gained many followers in the Lebanon mountains. It is interesting to note that one of Hamza's treatises was intended as a refutation of the Nosairian doctrines, and tried to show that Hakim, not Ali, was God. See DRUSES.

A sectary whose name has become familiar through the use made of his story by Thomas Moore in his *Lalla Rookh* was Hakim ibn Allah, better known as Al Mokanna (the veiled) because he wore a mask to conceal the disfigurement of his face. He lived in the eighth century and headed a revolt against the Mahdi, the third Abbaside Caliph. He claimed to be an incarnation of the deity and won repute as a miracle worker. He made many followers and for a time maintained himself against the Caliph, but was ultimately defeated and committed suicide. He left word that he would reappear as a gray man riding a gray beast, and his followers long expected his coming. They dressed only in white. See HAKIM IBN ALLAH.

All of these Shiite sects were political, or at least politico-religious, sects, whose doctrines turned about the question of the imamah. But there were in Islam also some sects purely theological, differing on such questions as predestination, free will, belief, idea of God, and revelation—points upon which Mohammed had not expressed himself clearly. It was again in Persia that the movement looking towards independent religious views took its rise, under the influence of Greek philosophy.

The most important of these theological or philosophical sects was perhaps the rationalistic sect of the Mutazilites (*Muʿtazilah*, from *ʿazala*, to separate). They were called also Muattalites —i.e., those who divest God of His attributes (Ar. *Muʿaṭṭilun*)—and Kadarites—i.e., "those who hold that man has a free will (Ar. *ḳadar*) and deny the strict doctrine of predestination." The first beginnings of this sect are traced to Mabad, who already in the time of Mohammed himself began to question predestination by pointing out how kings carry on unjust wars, kill men, and steal their goods, and all the while pretend to be merely executing God's decrees. The real founder of the sect, as such, however, was Wasil ibn Ata (c.745). He denied God's

"qualities," such as knowledge, power, will, life, as leading to, if not directly implying, polytheism. As to predestination, he held that it existed only with regard to the outward good or evil that befalls man, such as illness or recovery, death or life, while man's actions are entirely in his own hands. God, he said, had given commandments to mankind, and it was not to be supposed that He had at the same time preordained that some should disobey these commandments and that, further, they should be punished for it. Man alone is the agent in his good or evil actions, in his belief or unbelief, obedience or disobedience, and he is rewarded according to his deeds. These doctrines were further developed by Wasil's disciple Abu'l Hudhail al Allaf (died c.845), who did not deny so absolutely God's "qualities," but modified their meaning in the manner of the Greek philosophers, holding that every quality was also God's essence. The attributes are thus not without but within Him, and so far from being a multiplicity they merely designate the various ways of the manifestations of the Godhead. God's will he declared to be a peculiar kind of knowledge, through which God did what He foresaw to be salutary in the end. Man's freedom of action is possible only in this world. In the next all will be according to necessary laws immutably preordained. The righteous will enjoy everlasting bliss, and for the wicked everlasting punishment will be decreed. A dangerous doctrine of this system was the assumption that before the Koran had been revealed man had already come to the conclusion of right and wrong. By his inner intellect, Abu'l Hudhail held, everybody must and does know—even without the aid of the divinely given commandments—whether the thing he is doing be right or wrong, just or unjust, true or false. His belief in the traditions was also by no means an absolute one; indeed, it was held by the Mutazilites that even some of the earliest "traditioners" may have told untruths, or have been imposed upon, and every tradition was to be rejected which was opposed to the Koran, to more authentic traditions, or even to mere reason. As to the Koran, although its authority was recognized, it was held to be created and not an object of worship.

Many were the branches of the Mutazilites. There were, apart from the disciples of Abu'l Hudhail, the *Jubbaians*, who adopted Abu Ali ibn Abd al Wahhab's (Al Jubbaï, died 914) opinion to the effect that the knowledge ascribed to God was not an "attribute"; nor was his knowledge "necessary"; nor did sin prove anything as to the belief or unbelief of him who committed it, who would anyhow be subjected to eternal punishment if he died in it. Besides these, there were the Hashimites, the disciples of Abu Hashim Abd al Salam, son of Al Jubbaï, who held that an infidel was not the creation of God, who could not produce evil. Another branch of the Mutazilites were the disciples of Ahmad ibn Habit (or Haït), who held that Jesus was the eternal word *incarnate*, and that he had assumed a real body; that there were two gods or creators, one eternal—viz., the Most High God—and the other not eternal—viz., Jesus—not unlike the Arian and Socinian theories on this subject; that there is a successive transmigration of the soul from one body into another, and that the last body will enjoy the reward or suffer the punishments due to each soul, and that God will be seen at the resurrection with the eyes of understanding, not of the body.

Four more divisions of this sect are mentioned—viz., the *Jâḥiziyyah*, whose master's (Amr ibn Bahr al Jahiz) notion about the Koran was that it was "a body that might grow into a man, and sometimes into a beast, or to have, as others put it, two faces, one human, the other that of an animal, according to the different interpretations." He further taught that the damned would become fire and thus be attracted by hell; also that the mere belief in God and the Prophet constituted a "faithful one." Of rather different tendencies was Isa al Muzdar, the founder of the branch of the *Muzdariyyah*. He not only held the Koran to be uncreated and eternal, but so far from denying God the power of doing evil, he declared it to be possible for God to be a liar and unjust. Another branch was formed by the *Bishriyyah* (from Bishr ibn al Mutamir), who, while they carried man's free agency rather to excess, yet held that God might doom even an infant to eternal punishment—all the while granting that He would be unjust in so doing. The last of these Mutazilite sectarians to be mentioned are the *Thumamiyyah*, who held, after their master, Thumamah ibn Ashras, that sinners will undergo eternal damnation and punishment; that free actions have no producing author; and that, at the resurrection, all infidels, atheists, Jews, Christians, Magians, and heretics will be returned to dust and will not enter either Paradise or hell. For the scientific development which the doctrines of the Mutazilites begot, and which resulted in the encyclopædic labors called "The Treatises of the Sincere Brethren and True Friends," see SINCERE BRETHREN.

Allied to the Mutazilites in their view of the divine attributes, but diametrically opposed to them in their view of predestination, were the Jabarites (Necessarians). They held that man's every act is the result of the will of God and that there is no human responsibility. There are pure Jabarites and middle Jabarites.

Opposed to both the Mutazilites and the Jabarites were the Sifatites ("Attributists"). With them God's attributes, whether essential or operative, or declarative or historical—i.e., used in historical narration (eyes, face, hand); anthropomorphisms, in fact—were considered eternal. But here again lay the germs for more dissensions and more sects. Some, taking this doctrine of God's attributes in a strictly literal sense, assumed a likeness between God and created things, while others gave it a more allegorical interpretation, without, however, entering into any particulars beyond the reiterated doctrine that God had no companion or similitude. The different sects into which the Sifatites split were, first, the *Asharians*, so called from Abu'l Hasan al Ashari (883–951), who, at first a Mutazilite, disagreed with his masters on the point of God's being bound to do always that which is best. He became the founder of a new school, which held (1) that God's attributes are distinct from His essence, and that any literal understanding of the words that stand for God's members in the Koran is reprehensible; (2) that predestination must be taken in its most literal meaning—i.e., that God preordains everything. The opinions on this point of man's free will are, however, much divided, as, indeed, to combine a predestination which ordains every act

with man's free choice is not easy. The middle path, adopted by the greater number of the doctors, is expressed in this formula: there is neither compulsion nor free liberty, but the way lies between the two, the power and will being both created by God, while the merit or guilt is imputed to man. Regarding mortal sin, it was held by this sect that if a believer die guilty of it without repentance, he will not, for all that, always remain a denizen of hell. God will either pardon him or the Prophet will intercede in his behalf. Further, he in whose heart there is faith of but the weight of an ant shall be delivered from hell fire. From this more philosophical opinion, however, departed a number of other Sifatian sects, who, taking the Koranic words more literally, transformed God's attributes into grossly corporeal things; the *Mushabbihites*, or Assimilators, conceived God to be a figure having limbs like those of created beings, either of a bodily or a spiritual nature, capable of locomotion, ascent, or descent, etc.

The *Murjites*, likewise regarded as a sect of the Sifatites, are sometimes regarded as the representatives of the whole sect, for their doctrines were very widespread, and they counted among them such men as Said ibn Jubair. The sect arose in Syria or north Arabia. It is worthy of note that some of the Murjites hold views approaching closely not only to those of the Mutazilites and Jabarians, but even, with reference to the imam, to those of the Kharijites.

Aside from the sects which owed their rise to political or theological differences, there were others in Islam which sprang from mysticism and asceticism. It is true that the secluded life of the monastery or hermitage was forbidden to Mohammedans by the Koran; nevertheless as early as the first and second centuries of the Hejira a sect of mystics had come into existence the distinguishing external mark of whom was a garment of coarse wool (*suf*), such as had been worn by the founder of the sect, Abu Said ibn Abu'l Khair (815); they came therefore to be known as Sufis. Their main idea was that to attain to a nearer friendship with God there was necessary a certain course of life which, without demanding entire withdrawal from the world, insisted that religious laws be scrupulously observed and that, God being loved above all else, everything worldly be despised. Merx has shown that this Oriental mysticism goes back finally to Palestine and Neoplatonic philosophy, having come to the Mohammedans through the writings of Syrian philosophers. The main stronghold of the sect, however, was, like that of so many others, in Persia, where Sufiism made many converts from among the heterodox and also gradually altered its original character. At first the Sufi had aimed by ascetic practices and religious contemplation to enter into a state of ecstasy in which he might attain to a real knowledge of the deity; but later Sufiism became in certain regards a real pantheism, and its adherents in the ecstatic state felt themselves united with, and a part of, the Godhead. Sufiism had its organization like other religious orders; the religious meetings were called *dhikrs;* novices (*murid*) were held to regular and exacting duties, as well as to strict compliance with the commands of the sheikh.

A later development (twelfth and thirteenth centuries) of mysticism is represented by the various orders of Dervishes—*Kadiriyyah*, *Rifaiyyah*, *Maulawiyyah*, etc.—each with its own garb and symbols, rules of faith and practice as determined by its founder. Their *dhikrs* take placé once or oftener every week in their religious houses (*takkiyyah*). There are howling, whirling, and dancing dervishes, and in some orders the members become so insensible to physical sensation while in the state of ecstasy that they swallow glass or glowing coals, and often wound themselves severely in other ways. Most dervishes follow a trade and do not withdraw from the affairs of life. There are also some begging dervishes, who have no dwelling places and live entirely from alms. See DERVISH.

Babism (q.v.) and *Bahaism* may be regarded as the last of the Shiite religious movements in Islam, though the former only outwardly conforms to the religion of Mohammed and the latter has practically developed into a distinct religion rather than a Moslem sect. Mirza Ali Mohammed ibn Radhik was the founder of Babism. He was born at Shiraz, March 26, 1821, proclaimed himself as the *bab al din* (door to the religion), June 11, 1844, and was shot to death at Tabriz, July 8, 1850. Ali Mohammed at first appeared only as a reformer of Islam; but as he declared himself to be the mirror in which God is reflected so that every one can see Him, it became evident that he regarded Mohammed not less than Moses and Jesus as superseded. Both in its theology and its social ethics Babism differs from the orthodox schools in Islam. Its pantheism is of such a nature that it clearly connects itself with Sufiism, but many of its practical precepts are at least less obviously related to Moslem mysticism. Ali Mohammed wrote several works, extant in manuscripts, but not yet published in the original Arabic and Persian. Only the Arabic *Bayan* has been translated into French by Nicolas. At Teheran the two half brothers Mirza Yahya Nuri, called Ṣubḥ i Azal (the dawn of eternity), and Mirza Husain Ali Nuri, later known as Baha Allah (the glory of Allah), became converts to Babism. Husain Allah Nuri was born in Mazenderan, Nov. 12, 1817, and was 30 years of age when he became a follower of Bab, whom he never saw. Mirza Yahya had been designated by the Bab as his successor and was recognized as such by the Babis, but in 1867 Husain Ali Nuri claimed to be "he whom Allah shall manifest," and that Bab was only his herald and forerunner. This led to a schism, and since that time there are two sects, the Bahais and the Azalis. The strife between the two parties, in which many were killed, forced the Turkish government to intervene. Subḥ i Azal was sent to Famagusta, Baha Allah to Akka. The former looked upon the revelation in Bab as final, at least for a millennium, and kept in touch with Islam. The latter appealed to all men, not only the Moslems, sought a common ground on which all religions could meet, and emphasized the distinction of his "manifestation" and teaching from Babism. Among his writings are *Ikan*, translated into French by Dreyfus and Habib Allah in 1904; *Kitab i Akdas*, translated into Russian by Tumanski in 1899; and some epistles, translated into English by Browne in 1889. Baha Allah died in 1892, and differences as to the succession immediately arose between his two sons, Abbas Effendi, also called Abdu'l Baha (the servant of the glory), or Ghuzn i A'zam (the most mighty branch), and Mirza Mohammed Ali,

called Ghuzn i Akbar (the most great branch). Abbas Effendi seems to have claimed that the revelation was not ended, while Mohammed Ali and his followers abided by the manifestation in Baha Allah. Thus Bahaism in its turn split up into two rival sects. In recent years that of Mohammed Ali has on the whole decreased, though there have been some notable accessions from the other camp. Abbas Effendi has had a larger following. During the years when he was kept under surveillance in Akka many men and women made pilgrimages to this "holy city" to see "the Master," among them not a few from England and America. The first missionaries of the faith in America were Khairallah, who afterward espoused the cause of Mohammed Ali, and Abu'l Fazl, who was sent over to prevent the schism from spreading. In 1913 Abbas Effendi visited the United States. His *Mufawazat* (outpourings) were translated by Dreyfus into French and by Laura Barney into English in 1908. He also seems to be the author of *The Traveler's Narrative*, translated by Browne. Numerous messages, designated as "tablets," sent to believers, also set forth his ideas on a variety of subjects. Although his works contain no new development of thought, and he has made no further claim for himself than to be "the servant of the glory," the fact that through him Bahaism has become known and has won a number of disciples in England, America, Germany, and France, to whom he is the last of the prophets, the organ of revelation, the final "manifestation," has enhanced his prestige, and probably also affected to some extent the emphasis of his teaching. Religious toleration, search for the essence of truth in different religions, opposition to the *jihad* and war in general, demand for certain social reforms, a more or less pronounced mysticism, and self-effacing devotion to a leader characterize Bahaism and Babism alike. In politics the Persian Bahais seem to have supported the court and favored the interests of Russian and English diplomacy, while the Azalis have espoused the popular cause of the Nationalists.

Such are the numerous sects against which orthodox Mohammedanism has been forced to contend; but, although Shiite doctrines more than once threatened to gain the ascendancy, Sunnism has always remained the victor in the end. The four sects into which the Sunnites are divided—the *Hanbalites, Malikites, Hanifites,* and *Shafi'ites*—differ only in regard to a few points of minor importance connected with religious observances and civil and religious jurisprudence. These sects have remained almost without change since their foundation under the Abbaside dynasty. Nevertheless, certain innovations had crept into the life of orthodox Mohammedans, principally an exaggeration of the reverence paid to the numerous saints, which amounted often to actual worship. It was against such abuses, as well as against all forms of luxury in everyday life, tobacco smoking, etc., that Abd al Wahhab and his followers, the Wahabis, arose in the middle of the eighteenth century. From Nejd they carried on an iconoclastic warfare throughout the country; they conquered Mecca and Medina, and in destroying the many sanctuaries there did not even spare the grave of Mohammed. Previous to this they had taken Kerbela, a holy city of the Shiites in Mesopotamia. They were defeated finally by Egyptian troops, and driven back into the interior of the peninsula. But the Wahabite state, with Riyad for its capital, is still independent and, according to recent accounts of travelers (1915), more powerful than it has been for a long time, while as a sect the Wahabis have spread their influence into Africa and India. See WAHABIS.

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MOHAMMED BEN MOHAMMED BEN YAHAYA, yä'hâ-yâ, ABUL WEFA, or WAFA (940–998). An Arabic mathematician and astronomer, born at Buzjan and generally known as Abul Wefa. He translated and commented upon works of several Greek mathematicians and calculated a table of sines at intervals of half a degree and also a table of tangents, which, however, was used only for determining

the altitude of the sun. The ratio sin α / cos α was called by him the shadow. He is, however, most famous for having made the oldest known attempt to solve geometric problems with only one opening of the compasses. He wrote a book containing 12 chapters on geometrical constructions. Our knowledge of this work is due to a Persian translation of an Arabic manuscript, written by a pupil of Abul Wefa. The problems may be divided into three groups: (1) those dealing with the solution of geometrical problems by one opening of the compasses; (2) to divide a given square into a given number of squares and to construct a square equal to a number of given squares; this is done by juxtaposition and not by the Pythagorean method; (3) problems having for aim the construction of regular polyhedra. In the problem duel between Tartaglia (q.v.), on one hand, and Cardan (q.v.) and Ferrari, on the other, problems of the first group were given for solution and appear in the works of Leonardo da Vinci and Cardan. They also occur in several other works of the sixteenth century, but first found accurate scientific expression in Steiner's *Geometrische Constructionen, etc.* (1883). Consult Volpcke, *Journal Asiatique*, vol. .v (5th series, Paris, 1855), and Cantor, *Geschichte der Mathematik*, vol. i (Leipzig, 1900).

MOHAMMED IBN JABIR IBN SINAN. See Al Battani.

MOHAMMED IBN MU'SA AL KHUWARIZMI. See Al Khuwarizmi.

MOHAMMED IBN ZAKARIYA AL RAZI. See Rhazes.

MOHAMMED KŪDAH BUNDAH KHAN, kōō'dȧ bōōn'dȧ kän. See Mongol Dynasties.

MOHAMMED'S COFFIN. See Mahomet's Coffin.

MOHAMMED, SIDI. See Sidi Mohammed.

MOHAMMERAH, mō-häm'mȧ-rȧ. A town in southwest Persia, Province of Khuzistan, situated on a canal leading from the Karun River to the Shat el Arab, 35 miles from the Persian Gulf (Map: Asia, Central, C 7). The harbor is good, and the town has had an active trade since the opening of the Karun to international navigation in 1889. Pop., 15,000.

MOHAUNT. See Hibiscus.

MOHAVE, mō-hä'vȧ. An interesting tribe of Yuman stock (q.v.), residing along both banks of the lower Colorado River, in Arizona and California. Their popular name, corrupted from *hamok-habi*, signifies "three mountains," in allusion to the three buttes known as the Needles, which they regard as the central point of their ancient territory. They are agricultural, although somewhat nomadic in habit, and in physical type they rank among the finest specimens of the American aborigine. They live in low wikiups of brushwood covered with sand, make pottery and baskets, and cultivate corn, pumpkins, melons, and beans, which, with fish and mesquite beans, give them an abundant subsistence. They practice tattooing and cremate their dead. They have certain hereditary family names and a chiefship hereditary in the male line, but do not seem to have the true clan system. Consult A. L. Kroeber, "Preliminary Sketch of the Mohave Indians," in *American Anthropologist*, vol. iv (N. S., New York, 1902), and P. E. Goddard, "Indians of the Southwest," in American Museum of Natural History, *Handbook Series No. 2* (ib., 1912).

MOHAVE DESERT. A desert region in south California, lying principally in San Bernardino County (Map: California, J 7). It is a part of the Colorado Desert (q.v.), although the two names are often used synonymously.

MO'HAWK (New England Algonquin name, *Maqua, Mahaqua*, Bear; they call themselves *Ganiega-rono*, Bear People, or Flint People). The leading tribe of the Iroquois (q.v.) Confederacy and formerly occupying the lower Mohawk River valley in New York. They were considered the keepers of the eastern door or frontier of the long house of the Confederacy, the Seneca being assigned the duty of guarding the western door. The Mohawk territory was supposed to extend northward to the St. Lawrence, eastward to the country of the Mahican and Wappinger along the Hudson, and southward to the watershed of the Delaware River and the Catskill Mountains, where they bordered upon the Delaware and Munsee. Their geographic position thus brought them into early and intimate contact with the Dutch and English settlers, from whom they procured the firearms which soon made their very name a terror to the remoter tribes. This exposed situation, however, caused them to suffer much more than their confederates in the Colonial wars, so that their seven villages of 1644 were reduced to five in 1677, some whole clans seeming to have been wiped out. See Iroquois.

MOHAWK RIVER. The largest affluent of the Hudson. It rises in the sandy hills south of Boonville, Oneida County, and about 40 miles from the east end of Lake Ontario, flows southward until it reaches the city of Rome, then turns eastward, and continues in nearly that direction until it enters the Hudson at Cohoes (Map: New York, F 5). Its total length is about 140 miles, and its drainage area embraces 3470 square miles. Its course lies chiefly in the celebrated Mohawk valley, one of the most beautiful and fertile agricultural regions in the United States. In Colonial times the valley was the main highway to the Great Lakes, and during the Revolution a bitter contest was waged between the American and British forces for its control. There are many thriving manufacturing cities along the Mohawk, which is paralleled by the Erie Canal and by the New York Central and the West Shore railroads, forming a great trade route between the Atlantic seaboard and the West. See New York.

MOHE'GAN (dialectic form of *Mahican*, from which tribe the Mohegan were originally an offshoot). An Algonquin tribe formerly residing chiefly upon the Thames River in eastern Connecticut and claiming dominion by conquest over several smaller adjoining tribes, not all of which, however, admitted the claim. They seem to have been an eastern extension from the Mahican (q.v.) of the Hudson, while the warlike Pequot (q.v.) were in turn a branch of the Mohegan. At the period of the first settlement of Connecticut the two last-named tribes formed one body under the rule of Sassacus. Uncas, a subordinate chieftain, rebelled against him and assumed a distinct authority as the leader of a small band on the Thames, near the present Norwich. This band became known in history as the Mohegan, while those remaining with Sassacus were distinguished as Pequot. In the struggle between the Pequot and the colonists Uncas aided the English, and in consequence, on the destruction of the Pequot tribe in 1637, the greater part of the survivors were placed

under the dominion of the Mohegan chief, who thus obtained control of the territory of both tribes. He took such care to strengthen his power with the English that after the death of King Philip in 1676 the Mohegan were the only important tribe remaining in southern New England. As the settlements extended they sold most of their lands, retaining only a small reservation on the Thames River in New London Co., Conn., centring about their village, Mohegan. The villages of Groton and Stonington, occupied chiefly by the remnants of the conquered Pequot, were considered also as under Mohegan jurisdiction. They rapidly dwindled when surrounded by the whites, many joining the kindred mission bands at Scaticook and Brotherton in New York. The rest continued to reside at Mohegan, until now they are so mixed with negro and white blood that they have practically lost their identity, although they still retain official State recognition. In 1705 they numbered 750 at Mohegan, reduced to 206 in 1774, 69 in 1809, and 22 in 1910. Consult F. G. Speck, *Notes on the Mohegan and Niantic Indians* (New York, 1909).

MOHILEV, mô-hê-lyĕf′. A government of European Russia consisting of 11 districts and bounded by the Government of Vitebsk on the north, Smolensk on the east, Tchernigov on the southeast and south, and Minsk on the west (Map: Russia, D 4). Area, 18,551 square miles. The northern part of the government is slightly elevated, forming the watershed between the Dnieper and the Düna. The southern and larger part belongs to the region of Poliessie (q.v.) and is low and partly marshy. The government is well watered; the Dnieper and its tributary the Sozh are the chief rivers. Mohilev has a moderate but rather damp climate, and in the low and marshy parts fever is prevalent. Agriculture, which is the principal industry, is carried on by the most primitive methods and famines are not infrequent. The live stock is of a very inferior breed. Gardening is carried on extensively in the vicinity of the towns. The forests, covering more than one-third of the total area, yield turpentine and charcoal and supply the material for the production of wood implements, wagons, etc., which are manufactured on a small scale. In addition there are produced paper, oil, wire nails, flour, glass, matches, etc. The trade is largely in the hands of the Jews. Pop., 1909, 2,164,800; 1913, 2,333,300. Capital, Mohilev (q.v.). In early times the present Province of Mohilev belonged to the Principality of Smolensk. Annexed in the fourteenth century to Lithuania, it afterward became part of the Polish monarchy and was annexed to Russia at the first partition of Poland in 1772.

MOHILEV. The capital of the Government of Mohilev in west Russia, situated on both banks of the Dnieper, 483 miles south of St. Petersburg and 375 miles southwest of Moscow (Map: Russia, D 4). It lies in a picturesque region and has a number of interesting buildings. The Public Park, the Roman Catholic cathedral, in Greek style, whose corner stone was laid in 1780 by Catharine II and the German Emperor Joseph II, the town hall (1679) with an octagonal tower, and the new theatre are among the centres of interest at Mohilev. There are also some interesting monasteries, numerous churches of different denominations, and a museum with noteworthy collections. The educational institutions include two Gymnasia, two theological seminaries, several special schools, a manual-training school, and a public library. Mohilev produces largely leather, linseed oil, flour, and tobacco. A considerable part of its inhabitants are engaged in gardening and fishing. Pop., 1911, 54,058, of whom more than half were Jews.

MOHILEV. The capital of a district of the same name in the Russian Government of Podolia, situated on the Dniester, 89 miles eastsoutheast of Kamenetz-Podolsk (Map: Russia, C 5). The inhabitants are chiefly engaged in gardening and the transit trade in agricultural products and lumber with Galicia and Odessa. The town has several educational institutions. Pop., 1897, 22,100; 1910, 32,604, over one-half Jewish.

MOHL, mōl, Hugo von (1805–72). A German botanist. He was born in Stuttgart, a brother of Julius and Robert von Mohl, was educated in the classics at the Gymnasium at Stuttgart, and studied medicine at the University of Tübingen (1823–28). After making investigations at Munich (1828–32), he served as professor of physiology in the Academy (1832–34) and University (1834–35) of Bern, and finally was professor of botany at Tübingen (1835–72). There were two distinct periods in his career. During 1827–45 he was mainly concerned with the anatomy of plants, in which he was the leading investigator. During 1845–72 he was concerned chiefly with the development of organs and tissues, and was specially interested in cell formation. His contributions to botanical knowledge fall into three categories. In phytotomy he demonstrated that the cell, as distinguished from fibres, tubes, and intercellular substances, is the sole and fundamental element in plant structure; advanced the theory that secondary thickening of cell walls comes from within; developed with great clearness the idea of the chemical nature of the cell wall; showed the nature of intercellular substances; and classified tissues for comparison in different groups of plants. In cytology he showed that chloroplasts consist of protoplasm, and gave the name "protoplasm" to the "primordial utricle," explaining its rôle in cell division. In physiology he discovered the influence of contact on the movements of tendrils. He published 90 monographs, each of which represented a distinct contribution to botany, mostly in the fields of anatomy and histology. Perhaps his three most notable publications were *Vermischte Schriften botanischen Inhalts* (1845), a collection on various subjects, containing also a considerable number of his most important monographs; *Mikrographie* (1846); *Grundzüge der Anatomie und Physiologie der vegetabilischen Zelle* (1851). Von Mohl also established, in 1843, the *Botanische Zeitung,* which has continued to be one of the most influential of botanical journals. He remained its editor until his death in 1872.

MOHL, Julius von (1800–76). A German Orientalist, brother of Hugo and Robert von Mohl. He was born at Stuttgart, Oct. 28, 1800; studied Persian and Chinese at Tübingen, Paris, London, and Oxford; was professor of Oriental literature in Tübingen (1826–32); went to Paris and became professor of Persian at the Collège de France in 1847 and in 1852 inspector of the Oriental department of the national printing office. He died at Paris, Jan. 3, 1876. His

principal work is his edition of Firdausi's *Shāh Nāmah* (6 vols., 1838–66), of which he also made a complete French translation, published after his death, *Le livre des rois traduit et commenté* (1876–78). His reports to the Société Asiatique were collected after his death and published under the title *Vingt-sept ans d'histoire des études orientales* (2 vols., 1879–80). His *Lettres de M. Botta sur les découvertes à Khorsabad* (1845) relate to the excavations at Nineveh. His wife, who was Miss Mary Clarke (1793–1883), maintained for many years a salon frequented by the wits and scholars of her time. She was the author of a work on *Madame Récamier* (London, 1862). Consult Simpson, *Letters and Recollections of Julius and Mary Mohl* (London, 1887).

MOHL, Robert von (1799–1875). A German jurist and statesman, brother of Hugo and Julius von Mohl. He was born in Stuttgart, studied law at Heidelberg, Göttingen, and Tübingen, and in 1824, after publishing *Das Bundesstaatsrecht der Vereinigten Staaten von Nord-Amerika*, was made a professor of public law at Tübingen. In 1836 he was made head librarian of the university. But his attack on the political régime in 1845 forced him from his chair and from the government employ. Almost immediately afterward he was elected to the Lower Chamber of Württemberg, became professor at Heidelberg (1847), and was a member of the Vorparlament and of the National Assembly at Frankfort. After acting for seven months as Minister of Justice in the Imperial ministry set up by the Frankfort Parliament he returned to his professorial duties in Heidelberg (1849), and from 1857 represented the university in the First Chamber of Baden. From 1861 to 1866 he was representative of Baden at the German Bund at Frankfort, and during 1867–71 he was Envoy at Munich. In 1871 he was appointed president of the financial chamber of Baden. A year before Mohl's death he was elected to the German Reichstag from Baden. Among his writings are: *Staatsrecht des Königreichs Württemberg* (2d ed., 1840); *Die deutsche Polizeiwissenschaft nach den Grundsätzen des Rechtsstaats* (1832–34; 3d ed., 1866); *Encyklopädie der Staatswissenschaften* (1859; 3d ed., 1887); *Das deutsche Reichsstaatsrecht* (1873).

MÖHLER, mē'lĕr, Johann Adam (1796–1838). One of the most distinguished modern polemical divines of the Roman Catholic church. He was born at Igersheim in Württemberg, May 6, 1796. He received his education at the Gymnasium of Mergentheim, the lyceum of Ellwangen, and the University of Tübingen. He received priest's orders in 1819 and for a short time was employed in missionary duty. In 1823 he began to lecture on canon law and Church history at Tübingen and in 1826 became professor extraordinary, in 1828 professor ordinary, of theology. His earliest publication was *Die Einheit in der Kirche oder das Prinzip des Katholizismus* (1825), which was followed in 1827 by a historico-theological essay *Athanasius und die Kirche seiner Zeit.* His reputation rests mainly on his *Symbolik* (1832; Eng. trans., London, 1843, reprinted, 1894). This work led to a controversy with his Protestant colleague in the university, F. C. Baur (q.v.), and Möhler's two replies were important for Catholic theology (late editions, Ratisbon, 1900, Mainz, 1906). In 1835 Möhler removed to the University of Munich. His first appointment was nominally the chair of biblical exegesis, but he really devoted himself to the department of Church history, in which his opening course was eminently successful. He died in Würzburg, April 12, 1838. His miscellaneous works were collected and published posthumously in two volumes (Regensburg, 1839–40) by his friend Dr. Döllinger; his lectures on Church history by Gams (ib., 1867–70). Consult his biography by Wörner (Regensburg, 1866) and by Friedrich (Munich, 1894).

MOHLER, mō'lĕr, John Frederick (1864–). An American physicist, born at Boiling Springs, Pa. He graduated at Dickinson College in 1887 and at Johns Hopkins University (Ph.D.) in 1897. After teaching mathematics in academies at Dover, Del., and at Wilbraham, Mass., from 1887 to 1894, he became (1896) professor of physics at Dickinson. His researches include investigations on the surface tension of water below 0° C. He assisted in the discovery that the pressure surrounding the electric arc changes the wave length of the light emitted, and discovered the relation of the shift of spectral lines to the atomic volume, as well as a peculiarity in the light spectrum of magnesium. He also measured the pressure in the electric-light spark. His publications include *A Manual of Practical Physics* (1897–1903) and numerous articles in scientific journals.

MOHN, mōn, Henrik (1835–). A Norwegian meteorologist, born at Bergen and educated at Christiania. In 1860 he won the King's gold medal and obtained a government scholarship in astronomy, in 1861 became connected with the astronomical observatory, and in 1866 director of and professor in the meteorological institute of Christiania University. Mohn represented Norway in many international congresses of meteorology and was a member of the Polar Commission which organized magnetic and meteorological stations (1882 et seq.). His writings include: *Les orages dans la péninsule scandinave* (1888), with Hildebrandsson; a very valuable *Grundzüge der Meteorologie* (1875; 5th ed., 1898; trans. into Italian, Spanish, French, Russian, Polish, and Flemish); *The North Ocean, its Depths, Temperature, and Circulation* (1887); two large works: *The Norwegian North Polar Expedition, 1893–96*, vol. vi, *Meteorology* (1905); *Meteorology: Report of the Second Norwegian Arctic Expedition in the "Fram," 1898–1902* (1907).

MO'HO. A tropical tree. See Hibiscus.

MOHO. A honey sucker of the Sandwich Islands whose native name has become the designation of a local genus of the family Meliphagidæ, which contains two species, the yellow-tufted moho or o-o or uho (*Moho nobilis*) and another (*Moho apicalis*). They are handsome, long-tailed, blackish birds with bright yellow tufts of feathers on each side of the wings and some white tail feathers. After the disappearance of the mamo (q.v.) the feathers of the moho were used for making the ceremonial robes and ornaments of Hawaiian chiefs, until they were superseded by European clothes and insignia of rank. Early accounts of the islands record that this bird, which frequented the mountains and forests and had much the appearance and habits of a North American oriole, was captured by means of birdlime. Its yellow feathers having been plucked out, it was then freed, in hope that it would furnish an-

other supply the next year. These feathers, from which also a beautiful head-dress (for women) called leis was made, were received by the King as a poll tax; yet it took many years to collect enough for a mantle, the price of which, estimating the time and labor at modern standards, would probably exceed a million dollars. A few examples of these feather cloaks are preserved in European museums. See Plate of CREEPERS.

MO'HOCKS. The name by which the members of the Mohock or Mohawk Club of London in 1711–12 were known. The object of the club was mischief. With the Restoration it had become a favorite amusement of dissolute young gentlemen to swagger at night about the town, breaking windows, upsetting sedans, beating quiet men, and offering rude caresses to pretty women. The Mohocks, who formed one of the ruffian clubs of the time, made a specialty of slitting men's noses, beating people, and rolling women in hogsheads down Snow Hill. Prince Eugene of Savoy was charged by a Jesuit spy with having suggested that they should assassinate the Earl of Oxford. A royal proclamation dissolved the club after about a year's existence. Consult Jonathan Swift, *Journal to Stella* (new ed., New York, 1904).

MOHONK' LAKE. A summer settlement in Ulster Co., New York, 14 miles northwest of Poughkeepsie and 5½ miles from New Paltz, from which it is reached by stage. In the Shawangunk Mountains, it is situated on the north end of Lake Mohonk, which is fed by underground springs, at an elevation of about 1200 feet near the summit of "Sky Top," and is surrounded by mountain scenery of distinctive beauty. The settlement is the work of Albert Keith Smiley (q.v.), who purchased a large tract of land here in 1860 and in 1870 built a large hotel. The estate is beautifully laid out and consists of a tract of land of about 5500 acres. It is chiefly noted as the home of the Lake Mohonk Conference (q.v.).

MOHOS. See MOXOS.

MOHR (Ar. *muhr*, colt, from *mahara*, to be adroit). A West African gazelle (*Gazella mohr*), called the swift, and among the largest of its group, which is much hunted by the Arabs of Senegal because its stomach often contains the bezoars called mohr's eggs, so highly valued in Morocco and the western Sahara for their supposed medicinal properties. See BEZOAR.

MOHR, CHARLES THEODOR (1824–1901). An American botanist and forester. He was born at Esslingen in Württemberg, studied at the Stuttgart Polytechnic, and with Kappler explored Dutch Guiana in 1845. He went to California on the discovery of gold in 1849 and, after four years as a druggist in Louisville, Ky., removed to Mobile, Ala., in 1857. He was a member of the committee on revision of the United States Pharmacopœia in 1890, and in 1892 gave himself up to forestry and botany. He had been appointed botanist of the Alabama Geological Survey in 1884 and agent of the Forestry Division of the United States Department of Agriculture in 1889. He contributed to Berney's *Handbook of Alabama* and wrote *The Timber Pines of the Southern United States* (1896–97) and *Plant Life of Alabama* (1901).

MOHR, KARL FRIEDRICH (1806–79). A German chemist, born at Coblenz. He was educated at Heidelberg, Berlin, and Bonn, and then entered his father's apothecary business, to which he succeeded in 1840. He retired from business in 1857, and after financial losses became a lecturer in 1864 and professor of pharmacy in 1867 at Bonn. Before his death Mohr had become the best-known pharmaceutical chemist in Germany. His publications include: *Pharmacopœia Universalis* (2 vols., 1845); *Lehrbuch der pharmaceutischen Technik* (1847; 3d ed., 1866); a famous *Lehrbuch der chemisch-analytischen Titriermethode* (2 vols., 1855–59; 7th ed., 1896); *Geschichte der Erde* (1866; 2d ed., 1875).

MOHSITE. See ILMENITE.

MO'HUN, MICHAEL (?1625–84). A noted English actor of the period following the Restoration. He had been a soldier both in the Civil War and afterward in Flanders, where he got the title of major, by which he was known. He was a member of the company in the early days at Drury Lane, then the Theatre Royal, and created rôles in several of the plays of Dryden and of Lee. King Charles II, for whose father he had fought, regarded him highly. He died in London in October, 1684. Consult: Geneste, *History of the English Stage* (Bath, 1832); Doran, *Annals of the Stage* (ed. Lowe, London, 1888); Downes, *Roscius Anglicanus* (reprinted, ib., 1886).

MOIDORE, moi'dōr (Portug. *moeda d'our*, money of gold). A former gold coin of Portugal, of the value of 4800 reis, equivalent to 21s. 2d. or nearly $5.18. It was also called lisbonine.

MOIGNO, mwä'nyō', FRANÇOIS NAPOLÉON MARIE (1804–84). A French mathematician, born at Guéméné in Morbihan. He entered the Society of Jesus in 1822 and devoted himself to the study of mathematics and physics. During the revolution of 1830 he sought refuge with others of his order in Switzerland. In 1836 he became professor of mathematics at the preparatory school of Sainte-Geneviève in Paris. He resigned from his order in 1843 and became connected with various journals, of which he founded *Cosmos* (1852) and *Les Mondes* (1862). In 1873 he was appointed one of the canons of the chapter of Saint-Denis. Among his works are: *Leçons de calcul différentiel et de calcul intégral* (1840–61); *Répertoire d'optique moderne* (1847–50); *Saccharimetrie* (1869); *Les splendeurs de la foi* (1879–83); *Les livres saints et la science* (1884).

MOIR, DAVID MACBETH (1798–1851). A Scottish physician and author, born at Musselburgh, a small seaport near Edinburgh. He studied medicine and practiced in his native town. Moir became widely known by his essays and poems contributed to *Blackwood's Magazine* under the signature Δ (delta). He died July 6, 1851. Moir's most interesting production is a Scottish novel entitled *The Autobiography of Mansie Wauch* (1828; new ed., 1895). Consult also *Poetical Works*, edited with memoir by Aird (Edinburgh, 1852).

MOI'RA, second EARL OF. An English general and administrator in India. See HASTINGS, FRANCIS RAWDON-HASTINGS, MARQUIS OF.

MOIRE, mwär (Fr., mohair). A silk figured by the peculiar process called watering. The silks for this purpose are moistened and then folded from one end to the other in triangular folds. After being thus reduced to a comparatively small length they are submitted to heavy pressure, generally in a hydraulic press. After being removed from the press the fabric is

found to be covered with wavy lines. As only one side is to be waved, the fabric is made up for the press with a pasteboard above each second fold. The silk is next hot-pressed, and the side next to the pasteboard comes out glazed, while the other remains watered. The finest kinds of watered silks are known as moires antiques. The same process has been applied to woolen fabrics called moreen.

MOIS, mō'ĕz (an Annamese term corresponding to the Cambodian *Peunong,* Loatian *Kha,* Tonkinese *Myong, Muong,* etc.). An extensive group of so-called savage tribes dispersed over the table-lands and mountains between the Mekong and the Annamese coast, from the frontiers of Yunnan to Cochin-China. They have been regarded as one of the older groups of Farther Indian aborigines. In spite of the multitude of tribes into which the Mois are divided they exhibit a remarkable uniformity in physical type and manners. In physical type they are rather short, dolichocephalic, straight-eyed, somewhat wavy-haired, with reddish dirty-white skin. The Mois are as a rule of peaceful disposition, being hunters and husbandmen of a primitive sort. In the Mois a sub-Caucasic (white) physical trait has been detected, and others ally them, by reason of their manners and customs and implements, with the Malayan peoples. Consult Dourisbouve, *Les sauvages Ba-Hnars* (Paris, 1873), and Billet, *Deux ans dans le Haut-Tonkin, etc.* (ib., 1896). See Indo-Chinese.

MOISSAC, mwä'sȧk'. A town in the Department of Tarn-et-Garonne, France, on the river Tarn, 17 miles west-northwest of Montauban (Map: France, S., F 4). The church of St. Pierre, dating from the year 1100, has a portal with very unusual carving. There are also an abbot's palace, a communal college, a library, and a museum. Moissac has a good trade in flour, grain, oil, wine, poultry, and fruit. Pop., 1901, 8407; 1911, 8137.

MOISSAN, mwä'sän', Henri (1852–1907). A French chemist, born in Paris. He studied at the Museum of Natural History; became connected with the School of Pharmacy (1879), its professor of toxicology (1886) and of mineral chemistry (1889). In 1900 he was appointed professor at the Sorbonne. He won the Lacaze prize in 1887 for his valuable experiments with fluorine, which he was the first to isolate and to liquefy. Considerable notoriety attended his announcement, in 1893, that he had succeeded in producing artificial diamonds by suddenly chilling a molten mass of iron containing dissolved carbon. More practical was his simplification of the production of acetylene gas and his inorganic syntheses by the use of the electric furnace. In 1906 he was awarded the Nobel prize for chemistry. Moissan contributed articles on chromium, manganese, and iron to Frémy's *Encyclopédie chimique;* wrote: *L'Isolement du fluor* (1886); *Reproduction du diamant* (1893); *Carbure de calcium* (1894); *Etude complète des carbones amorphes et des graphites* (1898); *Classification des éléments* (1904); and edited an excellent *Traité de chimie minérale* (1905).

MOISTURE. See Humidity.

MOIVRE, mwä'vr', Abraham de. A French-English mathematician. See De Moivre.

MOJARRA, mō-här'rȧ (Portug. name). Any of many carnivorous sea fishes of moderate or small size, allied to the porgies (Sparidæ), and constituting the tropical family Gerridæ. Some of them are well known and of some importance as market fishes. The small silvery Pacific coast species of the genus *Eucinostomus* are called mojarritas. The mojarra blanca, or broad shad (*Xystœma cinereum*), is a favorite food fish on both coasts of Central America and in Cuba. Another species of that region (*Gerres olisthostomus*) is called Irish pompano and mutton fish by fishermen. The term is applied, by the aid of a discriminative adjective, to various outside fishes, e.g., the cow-pilot.

MOJI, mō'jē. A town of Japan situated at the north extremity of the island of Kiushiu, on the Strait of Shimonoseki and opposite the city of that name (Map: Japan, B 7). It has grown rapidly to an important place since 1891, when it became the terminus of the Kiushiu Railroad. The extensive coal deposits in the neighborhood also add to its importance. The Moji side of the channel, which is here 1 mile wide, is more convenient as a landing place for steamers than the port of Shimonoseki. The imports and exports at Moji in 1913 were valued at $19,687,969 and $10,406,112, respectively. Pop., 1903, 38,065; 1908, 55,682.

MOJOS. See Moxos.

MOJSISOVICS, moi'sē-sō'vĭch, Edmund von (1839–1907). An Austrian geologist and student of the Alps. He was born and educated at Vienna; founded the Austrian Alpine Society—the first of the kind in Europe—in 1862, and in 1869 a like association in Germany, which joined the Austrian society in 1873. In the Imperial Geological Institute he became chief geologist in 1870 and assistant director in 1892. He retired in 1901. His more important works include: *Das Gebirge um Hallstatt* (1873–76); *Die Dolomitriffe von Südtirol und Venetien* (1878–80); *Die Cephalopoden der mediterranen Triasprovinz* (1882); *Arktische Triasfaunen* (1886); *Die Cephalopoden der Hallstätter Kalke* (1873–1903); *Die Cephalopoden der oberen Trias des Himalaya* (1896).

MOKANNA, mō-kän'nȧ, Al. See Hakim ibn Allah; Mohammedan Sects.

MOKI, mō'kē. A Pueblo tribe of Arizona. See Hopi.

MOLA DI BARI, mō'lȧ dē bä'rē. A city in the Province of Bari delle Puglie, Italy, on the Adriatic Sea, 12 miles southeast of Bari (Map: Italy, F 4). The exports consist of oil, live stock, leather, and wine. Pop. (commune), 1901, 13,962; 1911, 14,911.

MOLA DI GAETA, dē gȧ-ā'tȧ. The old name of Formia (q.v.), a seaport in south Italy.

MOLALA, mō-lä'lȧ. See Wahlatpuan.

MOLA'RIA. A genus of arthropods, found fossil in the Stephen formation, of Middle Cambrian age, in British Columbia. It consists of a semicircular cephalic shield without any trace of eyes, a trilobed dorsal test, and a long slender telson. It is supposed to belong to the Arachnida and is placed in the family Aglaspidæ. Other similar forms are Habelia and Emeraldella. See Merostomata; Stephen Formation.

MOLAR WEIGHT. See Molecules.

MOLASSE, mō-lȧs' (Fr. fem. of *mol,* from Lat. *mollis,* soft). An extensive middle Tertiary deposit occupying the central lake region of Switzerland between the Alps and the Jura. It consists chiefly of sandstone, marls, and limestones, but at the foot of the Alps it usually

takes the form of a conglomerate called Nagel flue, which is said to attain the astonishing thickness of from 6000 to 8000 feet in some localities. The molasse includes the Oeningen group of strata, which is remarkable for its fossil insects and plants.

MOLAS'SES. See SUGAR.

MOLAY, mō'lā', JACQUES DE (c.1243–1314). The last Grand Master of the Templars. He was a native of Burgundy, and entered the Order of Templars in 1265, and was elected Grand Master in 1297. About this time Philip IV of France (1285–1314) undertook to carry out the project which he had formed to destroy the order, chiefly because the French monarchy was in sore financial straits and the Templars were wealthy. There was at this time constant talk of a new crusade, and Clement V called the Grand Master of the Templars to Europe. The call was answered by Molay, who appeared in France in the fall of 1306, accompanied by a chosen band of distinguished knights of the order. He repaired to Poitiers in 1307 to render his allegiance to the Pope, and was there informed of serious charges against the order. He went away believing that he had cleared the order and remained in high honor with the King. But the latter was working secretly through the officers of the Inquisition in France and procured the arrest of every Templar in France on Oct. 13, 1307; Jacques de Molay was seized in the house of the Temple and taken before special commissioners of the Inquisition. Although the Pope was indignant at this action on the part of Philip, and suspended the powers of the Inquisition in France, the King finally induced him to take part in the action. Molay was examined repeatedly by papal commissions, confessed the truth of some of the charges, and finally on March 18, 1314, he was condemned to perpetual imprisonment. He, however, immediately retracted all he had said, and thereupon was burnt the same evening, protesting the innocence of the order. Consult: F. Gmelin, *Schuld oder Unschuld des Tempelordens* (Stuttgart, 1893); Ernest Lavisse, *Histoire de France,* vol. iv, part ii (Paris, 1901); H. C. Lea, *History of the Inquisition of the Middle Ages,* vol. iii (new ed., New York, 1906). See TEMPLARS, KNIGHTS.

MOLBECH, mōl'bĕk, CHRISTIAN (1783–1857). A Danish philologist and historian, born at Sorö. He had a position in the Royal Library at Copenhagen and was professor of literature in the university of that city from 1829 to 1843, being simultaneously codirector of the Royal Theatre. He wrote several works, critical, poetical, historical, and philological, the most important of which is a Danish dictionary (2 vols., 1828–33; 2d ed., 1854–59), the first of real value ever compiled. He also wrote a Danish dialect lexicon (1833–41) and a Danish glossary (1853–66). His other works include: *Dansk Haand-Ordbog til Retskrivnings og Sprogrigtigheds Fremme* (1813) and editions of *Den danske Riimkrönike* (1825); *Henrik Harpestrengs Lægebog* (1826); *Den ældste danske Bibel-Oversættelse . . .* (1828).

MOLBECH, CHRISTIAN KNUD FREDERIK (1821–88). A Danish poet and critic, born at Copenhagen, the son of Christian Molbech. He was professor of Scandinavian literature at the University of Kiel for 11 years (1853–64) and wrote several romantic dramas, such as *Klintekongens Brud* (1845), *Dante* (1842), *Venusbjerget* (1845), and *Ambrosius* (1878; 15th ed., 1909; Eng., Fr., Ger. trans.), and published collections of poems, such as *Billeder fra Jesu Liv* (1840), *Lyriske Digte og Romancer* (1863), *Dæmring* (1851; 3d ed., 1856), and *Efterladte Digte* (1888). As critic and theatrical censor Molbech was in touch with stage matters, and much of his work in this line is of interest. The most valuable contribution he made to the literature of his country was an excellent translation of Dante, *Den guddommelige Komedie* (4 vols., 1851–63; 4th ed., 1909).

MOLD (AS. *molde,* Goth. *mulda,* OHG. *molta,* dialectic Ger. *Molt,* dust, connected with Goth., OHG. *malan,* Ger. *mahlen,* Ir. *melim,* Lith. *malti,* Lat. *molere,* to grind). A term applied to various saprophytic fungi, but chiefly used in connection with the black molds (Mucorales). These molds are common on organic material, such as stale bread (kept moist and warm), fruits, fruit juices, etc., and possess a characteristic cobwebby, fleecy, white mycelium (q.v.), composed of large, often glistening and profusely branching hyphæ (see HYPHA). The common bread mold is *Rhizopus nigricans,* so named because the spores and sporangium stalk are dark, or often black, a fact which also suggests the common name, black mold. The ordinary mold on manure is *Mucor mucedo.* Recent investigations of the black molds have shown that the mycelia are sexually differentiated, so that two different strains must be brought together before the sex act occurs or even before the sex organs are formed. The term "mold" is also applied frequently to the so-called herbarium mold (*Aspergillus*), which occurs also on bread, preserves, etc., and to the blue mold (*Penicillium*) on bread, etc. These forms are usually differentiated from the black molds by being called blue and green molds. For black molds, see PHYCOMYCETES; and for blue and green molds, see ASCOMYCETES.

MOLDAU, mōl'dou (Bohem. *Vitava*). The chief river of Bohemia and an important tributary of the Elbe (Map: Austria, D 2). It rises in the Böhmerwald, on the southwest frontier, at an elevation of 3800 feet above the sea, and flows first southeast, then northward past the city of Prague, and enters the Elbe opposite Melnik, after a course of 265 miles. It becomes navigable at Budweis, and by means of canalization vessels of 700 to 800 tons can reach Prague at any season.

MOLDA'VIA. A former principality in southeastern Europe, now forming, together with Wallachia (q.v.) and the Dobrudja (q.v.), the Kingdom of Rumania (Map: Balkan Peninsula, F 1). It is bounded on the north and east by the Pruth, which separates it from Russia, on the south by Wallachia, and on the west by Transylvania. Area, 14,759 square miles. Pop., 1899, 1,832,106; 1912, 2,145,464. The chief town is Jassy, the capital of the principality. For further description, see RUMANIA.

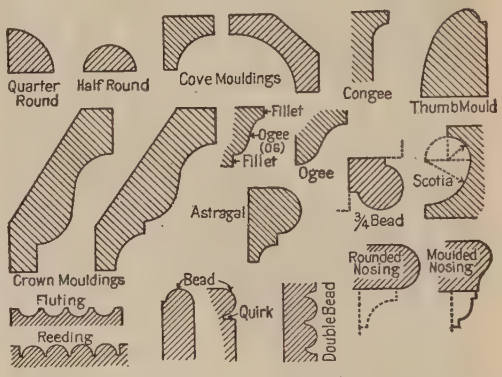
History. The Principality of Moldavia was founded about the middle of the fourteenth century by the Wallach Voivode Bogdan. Its cradle appears to have been in the northeastern Carpathians, near the sources of the Theiss. It soon grew to be a large state, embracing, in addition to the present Moldavia, Bukowina and Bessarabia. The dominion over this region was coveted by the kings of Poland and Hungary, and the Moldavian princes leaned now on the one power and now on the other, neither being able

permanently to assert its overlordship. Prince Stephen the Great was a powerful ruler (1457–1504). He defied the armies of the great Sultan Mohammed II, winning a signal victory over the Turks at Rakova in 1475. His successors, however, were unable to withstand the growing power of the Moslems, and early in the sixteenth century Moldavia became tributary to the Porte. The Turks proceeded to build fortresses in the Moldavian territory, and their hold on the country was gradually tightened, although Moldavia remained without the sphere of Turkish settlement. From the early part of the eighteenth century down to the outbreak of the Greek revolution in 1821, which began with Ypsilanti's brave deed at Jassi, Moldavia, as well as Wallachia, was governed by hospodars appointed by the Sultan from the aristocratic Greek families, known as Fanariots. The designs of Russia in the direction of dominion in the regions held in subjection by the Turks—designs which she sought to advance by claiming a protectorate over the Greek Christians in the Turkish dominions—violently affected the fortunes of Moldavia, which lay in the path of the Russian armies and was repeatedly subjected to Russian occupation. In 1812 Bessarabia was ceded by Turkey to Russia, Bukowina having been annexed to Austria in 1777. After 1821 native princes were once more at the head of the government. The protectorate accorded to Russia by Turkey in the Treaty of Adrianople (1829), which threatened to make Moldavia and Wallachia mere dependencies of Russia, was terminated by the Crimean War and the Treaty of Paris (1856). In 1859–61 Moldavia and Wallachia were united into the Principality of Rumania. In March, 1907, there was a peasant uprising, resulting in many deaths and great loss of property. See RUMANIA.

MOLDING. See FOUNDING.

MOLDING (from mold, OF. *moller, moler*, Fr. *mouler*, Sp., Portug. *moldar*, to measure, from Lat. *modulare*, to measure, from *modulus*, dim. of *modus*, measure, melody, manner, mode). A decorative strip or edging projecting or receding from the general surface adjoining it and having the same section or profile from end to end, the profile being usually composed chiefly or wholly of curves. Moldings are employed to frame pictures and panels, to decorate the edges of arches and openings, to form belts, bands, and cornices, and to emphasize all manner of architectural features, by the narrow lines or strips of modulated light and shade which they produce. Classic moldings generally project, Romanesque and Gothic moldings generally recede, from the general surface. Moldings may be plain or they may be carved with repeated ornament motives. In the classic styles there are eight typical moldings: the *fillet* and *bead* or *astragal*, very narrow projecting moldings, square and half-round respectively; the *cavetto* and *ovolo*, quarter-round moldings, respectively concave and convex; the *scotia*, half-elliptical concave, and *torus*, half-round convex; the *cyma recta* and *cyma reversa*, each composed of a quarter-round convex and quarter-round concave profile. The cyma or ovolo or group of moldings at the bottom of a cornice is called the *bed mold;* the cyma above the corona is the *cymatium;* the fillet at the top of the architrave is the *tænia*. In Romanesque and Gothic architecture the variety of moldings is greater, the hollows are deeper, the convex moldings bolder, and it is by the multiplying of rolls or *boutels*, hollows, oblique fillets and other profiles that much of the splendid decorative effect of Gothic interiors is produced, especially in English architecture. *Enriched* moldings are those which are carved with repeated ornaments—the bead-and-reel, egg-and-dart, water-leaf, acanthus, and anthemion in classic art; the zigzag, billet, dog-tooth, and beakhead in Romanesque art; the ball-flower, crocket, and leaves and vines of all sorts in Gothic art. While in the classic styles the convex moldings are the ones most generally carved, in Gothic art the chief adornments are in the hollows, in which the flowers or vines produce spots of light against the shadow. The Oriental styles make little account of moldings. Egyptian architecture knew only the bundle torus; in Assyrian and in Moslem design moldings hardly appear.

In carpentry and cabinetwork moldings are of the first importance and of great variety, with



FORMS OF MOLDING IN CARPENTRY.

special names for each—ogee, cove, thumb mold, plowed bead, bolection, etc. A picture molding is a horizontal strip of molding on a wall, from which pictures may be hung. The treatment of moldings constitutes one of the distinguishing marks of styles in architecture and decoration. See special articles on the different forms of molding above enumerated; also ORDERS OF ARCHITECTURE.

MOLDING SAND. Under this term are included siliceous sandy materials employed for making either molds or cores for use in casting iron, steel, bronze, brass, etc. The materials used vary in character from a loamy clay to a sand or even a gravel, often but not always of highly siliceous character, the grade of the material employed depending on the size or character of the casting, the kind of metal, or the portion of the mold in which the sand is to be used. Smaller castings and those with a smooth surface call for a fine sand, while large castings and cores used to fill the hollow spaces of the castings call for coarser material. One or more grades of sand may be mixed together, and the blending of molding sands is now quite extensively practiced both at the pit and foundry. But even so, certain foreign substances, as flour, oil, molasses, etc., may sometimes have to be added to increase the sand's bonding power. A molding sand should be strong enough to hold its shape in use, resistant to heat, and porous enough to permit the escape of gases but not admit the molten metal. Its value, then, depends on its physical properties, which are not indi-

cated by a chemical analysis but have to be determined by laboratory and foundry tests. Molding sands for ordinary work are obtainable at many places, but the better grades for finer work are less common and are obtained chiefly from the upper Hudson valley in New York and from the localities of Conneaut, Ohio, Newport, Ky., and Valparaiso, Ind. Consult: Kümmel and Parmalee, in New Jersey Geological Survey, *Annual Report* (Trenton, 1904); Ries and Rosen, in Michigan Geological Survey, *Annual Report* (Lansing, 1907); Heinrich Ries, *Economic Geology* (3d ed., New York, 1910); also *Proceedings of the Foundrymen's Association* (Cleveland).

MOLE (abbreviation of *molewarp, moldwarp, mouldwarp,* OHG. *moltwerf, multwerf,* Ger. *Maulwurf,* from AS. *molde,* dust + *weorpan,* Goth. *wairpan,* OHG. *werfan,* Ger. *werfen,* to throw). A small mammal belonging to the order Insectivora and to the family Talpidæ, although the name is often applied to other nearly related forms. It is a small animal, generally less than 8 inches in length, thickset, with short stout limbs, the anterior pair powerful and especially adapted for digging. The fur is dense and soft, lying backward or forward with equal ease; the tail is short; and the eyes are very small. In many species the eyes are covered over by a membrane, and recent investigations on the common American mole show that the eye itself is much degenerated and probably is of practically no use as an organ of sight. Moles are subterranean in their habits and more or less nocturnal. They are very voracious and eat animal food exclusively. The earthworm is the principal article in their diet, but all other worms, grubs, caterpillars, and insects are readily eaten, and in captivity raw meat, small birds and mammals, and even other moles, will be seized and eaten greedily. Although the limbs are short, moles are capable of very rapid movements. When in pursuit of earthworms moles often travel long distances underground, and frequently so near the surface that the earth becomes raised up above the tunnel which they make. Moles are therefore constantly hunted and trapped by gardeners. The favorite method of capture is by means of a trap set in one of these underground galleries. The simplest form of trap is a wire noose so arranged on a spring that when the mole enters it the spring is released and the wire is drawn taut.

Moles build very remarkable nests, or homes, consisting of two circular galleries, the smaller above the larger, and connected with it by five straight passages; at the centre is a chamber connecting with the upper gallery, while from the lower gallery horizontal passages run out in all directions. From these horizontal passages are given off the various subsurface tunnels made when the mole is in search of food. The central chamber and circular galleries are built in a mound of earth, more or less elevated above the surface, and larger than the ordinary heaps of earth, or molehills, thrown up by these animals. From the central chamber there is also a vertical tunnel leading downward and then bending upward again to join one of the horizontal galleries. The young are brought forth not in the central chamber, but in a special chamber formed where two or three horizontal galleries meet, which is lined with leaves and other warm materials. Four or five young ones are usually produced at a birth, and some writers state that a second brood is produced late in the summer. Moles take to water readily and swim well, so that they are able to cross considerable lakes and streams.

The anatomy of moles is interesting because it is so modified as to adapt the animal admirably to its manner of life. The fore limbs are attached to the skeleton so far forward that they lie beside the neck and thus add but little to the general width, yet remain sufficiently long to reach earth ahead of the nose. The hind limbs are also so arranged as not to occupy unnecessary space, the hip joints being closely approximated to the axis of the body. The humerus is very short and of a peculiar shape, and the carpals are very wide. On the inner (radial) side of the hand is a large sickle-shaped bone, regarded by some as a prepollex. The teeth vary in number from 36 to 44, in different genera. The Old World moles have 42 or 44 teeth, and the first and second upper incisors are of about the same size, while the moles of America have 36 or 44 teeth, and the first upper incisor is much larger than the second. The common mole of Europe (*Talpa europæa*) is very widely distributed, ranging from England to Japan and from the Altai to the Himalaya mountains. The eyes in this species are not covered by a membrane, as they are in the rest of the genus. The habits of the European mole have been carefully studied, and the remarks made above in regard to the burrows and nests of moles refer especially to that species. Seven other species of *Talpa* are known, chiefly Asiatic, but only two occur south of the Himalayas. Moles are absent from Africa and Australasia. Two peculiar moles occur in Tibet, one of which is placed in a distinct genus, as it has a somewhat narrower hand and only 42 teeth.

DENTITION OF THE MOLE.

The American moles belong to the genera *Scalops,* or *Scalopus,* having 36 teeth, webbed hind feet, and a narrow, slender muzzle; *Scapanus,* with 44 teeth and a narrow, tapering muzzle; *Parascalops* and *Condylura,* with 44 teeth and a remarkable snoutlike muzzle, fringed with a circle of about 20 slender, soft, cartilaginous processes. This last genus contains only a single species, the well-known star-nosed mole (*Condylura cristata*), which is not uncommon throughout the northern United States. Its very curious snout is somewhat piglike, but the fringing processes give it a unique appearance. In habits this species closely resembles the more ordinary moles. The common mole of the eastern United States (*Scalopus aquaticus*) is a rather shrewlike animal, partial to the banks of streams. No moles occur south of the United States.

The name mole is often given to other insectivorous burrowing mammals, as the mole shrew of northwestern America (*Neurotrichus gibbsii*), which in structure approaches the desman (q.v.) but in habits is somewhat like a mole. The golden moles (see GOLDEN MOLE) of South Africa belong to a different family, the Chrysochloridæ, and are not closely related to the Talpidæ, although in external appearance they are strikingly like them. There are seven or eight species in the single genus *Chrysochloris.* The

strange marsupial mole (q.v.) of southern Australia and the duck mole (i.e., the duckbill) are marsupials with more or less molelike appearance and habits.

Moles are found fossil throughout the Tertiary strata of Europe, a fact of great significance as showing how ancient must be the insectivorous type of mammals. The genus *Talpa* may be traced back even as far as the Lower Miocene, with its peculiarities of structure already well developed, while true members of the family Talpidæ appeared at least as early as the Lutetian in the Middle Eocene.

MOLE. See NÆVUS.

MOLE, GOLDEN. See GOLDEN MOLE.

MOLÉ, mō'lā', LOUIS MATTHIEU, COUNT (1781–1855). A French statesman, born in Paris. He was a descendant of the famous French magistrate Matthieu Molé (1584–1656), prominent at the time of the Fronde (q.v.). His father, president of the Parliament of Paris, died by the guillotine in 1794. After spending his early life in exile he returned to France, and first attracted notice by his *Essais de morale et de politique* (1805), in which he vindicated the government of Napoleon on the ground of necessity. The attention of the Emperor was then drawn to him; he was appointed to various offices in succession, was raised to the dignity of a count, and became Minister of Justice (1813). After Napoleon's return from Elba he refused to subscribe to the declaration of the Council of State banishing the Bourbons forever from France, and declined a seat in the Chamber of Peers. In 1815 Louis XVIII made him a peer of France. In 1817 he was for a short time Minister of Marine, but afterward acted independently of party, and was one of the principal orators in the Chamber of Peers. In 1830 he became Minister of Foreign Affairs in Louis Philippe's first cabinet, but remained in office only a short time. From 1836 to 1839 he was Prime Minister as successor to Thiers. He also held the portfolio of Foreign Affairs. In 1840 he was chosen a member of the French Academy. From that time he took little part in political affairs, but after the revolution of 1848 exerted himself to rally and unite the party of order in the National Assembly, to which he had been elected. After the coup d'état he retired to private life.

MOLECH, mō'lĕk. The name or designation of a deity referred to in the Old Testament. It is generally recognized that the form Molech is an intentional distortion of *melek* by the substitution of the vowels of *bosheth* (shame). Most of the passages in which it occurs have reference to human sacrifice as forming a part of the cult of this deity, and particularly to child sacrifice or the sacrifice of the firstborn, referred to as "passing through the fire." (Lev. xviii. 21; 2 Kings xxiii. 10.) This phrase only implies that the victims were "given over" to the deity as a sacrifice, first slain and then burnt, as is evident from Ezek. xvi. 20 f., xxiii. 39; Jer. vii. 31, xix. 4 ff.; Deut. xii. 31; and other passages. At a later time, when all memory of the rite had passed away, the expression was explained by imaginary tales of children walking or leaping alive through the flames as an ordeal or of their being burned to death in the arms of an idol. There is no foundation for these stories. As to the god to whom these sacrifices were offered, scholars generally hold that Yahwe is meant. He is often designated as *ha-melek* (the king). (Isa. vi. 5; Jer. lxvi. 18, xlviii. 15; and elsewhere.) The testimony of Jeremiah (vii. 31) and of Ezekiel (xvi. 20 f., xxiii. 37 ff.) is sufficient to prove that the rite survived among the Jews to a comparatively late period, though very possibly it was only a last resort, in time of great distress, to avert disaster or placate an angry deity, as was the case among the Moabites (see MESHA), and also that such offerings were made to Yahwe, since Jeremiah takes pains to deny that Yahwe had commanded them, and Ezekiel explains that Yahwe had indeed given them statutes that were not good, and defiled them by their sacrificial gifts in offering every firstborn, but only to fill them with horror. The law to which Ezekiel refers is clearly that of Ex. xiii. 12: "Thou shalt offer every firstborn to Yahwe." The anxious question of Mic. vi. 7: "Will Yahwe accept thousands of rams, ten thousand streams of oil? shall I give my firstborn for my transgression, the fruit of my body for the sin of my soul?" also shows how earnestly this sacrifice was contemplated as the supreme test of devotion to Yahwe. But the historian censures Ahaz for following the manner of the nations in performing the rite (2 Kings xvi. 4); it is forbidden in Deut. xviii. 10 and Lev. xviii. 21, xx. 2–6, and provision is made for the redemption of the firstborn. (See FIRSTBORN.) It has been supposed that the custom came into vogue in the days of Manasseh through Assyrian influence; but there is as yet no trace of it in Assyrian literature. Since it existed to a late time among the Carthaginians, it has been conjectured that it came into Judah from Phœnicia in the seventh century. It is probable, however, that it had existed sporadically from the earliest times among the Hebrews. While it manifestly was connected with the Yahwe cult, there is room for a question whether the Melek to whom the offering was made was always thought of as identical with Yahwe, or was not sometimes considered as a separate deity. As the Canaanites (including the Phœnicians) had their Milk and Melkart (cf. Abu Milki in the Tel el Amarna tablets and Milk Natan in later inscriptions), the Ammonites their Milcom (q.v.), and the Edomites their Malik (cf. Malik Ramu in an Assyrian text), so Israel and Judah may also have recognized a distinct Melek, of whose worship the child sacrifice was a prominent feature. The tone of some of the denunciations and legal prohibitions strongly suggests this. It is even possible that the commandment to offer the firstborn to Yahwe (Ex. xiii. 12, xxii. 29) was at first a protest against offering them to Melek or any other Baal, and the arrangement for redeeming them a later method of combating both the child sacrifice to Melek and its use in the worship of Yahwe in his capacity of melek, or king.

Bibliography. Baudissin, *Jahve et Moloch* (Leipzig, 1874); Baethgen, *Beiträge zur semitischen Religionsgeschichte* (Berlin, 1888); Eerdmans, *Melekdienst* (Leyden, 1891); Kamphausen, *Das Verhältnis des Menschenopfers zur israelitischen Religion* (Leipzig, 1896); Moore, "Molech," in *Encyclopædia Biblica* (London, 1902); Benzinger, "Moloch," in *Die Religion in Geschichte und Gegenwart* (Tübingen, 1913).

MOLE CRICKET. Any one of the crickets of the genus *Gryllotalpa* and its close allies, forming a tribe Gryllotalpides, remarkable for the dilated front legs, which superficially resemble those of the mole, and which are admirably adapted to an underground life. The en-

tire existence of the insect is subterranean. It travels in burrows of its own digging, and lays its eggs and rears its young in the same excavation. The adaptation of the front legs to the economy of the insect is very striking, as the tibiæ and tarsi are so arranged as to act as shears with which rootlets are severed. Mole crickets are furnished with a curious auditory apparatus on the front leg below the knee, concealed in a deep fold of the surface. The male makes a sound which has been reduced to a scale by Scudder, and which differs from the songs of the other crickets. Sharp calls it a "dull, jarring note somewhat like that of the goatsucker." The mole cricket is principally carnivorous in its diet, although it feeds also to some extent upon vegetation, and the principal damage it does is in cutting roots which come in the way of its burrows. It is considered the most destructive insect to agriculture in Porto Rico, where it is called changa. The female lays from 200 to 400 eggs, and the young are at first gregarious, the mother watching over them and supplying them with food until their first molt; after this they disperse and begin to make burrows for themselves. These young are often devoured by the adult males. Consult David Sharp, "Insects," in *Cambridge Natural History*, vol. v (London, 1895), and O. W. Barrett, *The Changa, or the Mole Cricket* (Washington, 1903). See illustration under CRICKET.

MOL'ECULES—MOLEC'ULAR WEIGHTS (Fr. *molécule*, from Neo-Lat. *molecula*, dim. of Lat. *moles*, mass). It is now universally assumed by chemists and physicists that all bodies are made up of very small but finite material particles, the weight and composition of which determine the various properties of substances. These particles are called molecules. Each of these molecules is conceived to be formed by a group of elementary atoms, the sum of whose weights equals the weight of the molecule. When a substance is divided and subdivided by physical or mechanical means (e.g., by dissolving a small amount in a very large volume of some liquid and dividing the latter into small portions), its molecules become separated from one another without undergoing any change. When the substance is decomposed chemically, each molecule breaks up and its unity is destroyed. Atoms cannot be subdivided even by chemical changes of the substance containing them; and as up to the beginning of this century physical and chemical changes were the only types of change known and the only ones considered at all possible, atoms were assumed to be "incapable of subdivision by any means whatever." At present it may be considered as a definitely established fact that atoms undergo decomposition —true subdivision—during all radioactive processes. See ELECTRON; HELIUM; RADIUM.

The relative weights of molecules, termed molecular weights, are among the most important constants of nature, and their experimental determination presents no difficulty whatever. But it has been shown that even the absolute dimensions of molecules, their absolute weight, their actual number in a given volume of substance, their specific gravity, etc., can be ascertained with a high degree of probability. Brief mention may be made here of some of the simpler methods employed in searching for those absolute dimensions in the unseen world of molecules. Such theoretical researches are carried out mainly on the principle that when a hypothesis is admitted within the scope of an exact science we must have exhaustive knowledge of the deductions that can possibly be made from it. Only by correlating the deductions with facts can we judge whether the hypothesis is reliable or not, and experience teaches that deductions seemingly incapable of experimental verification may ultimately not be so at all. Of course, the calculation of the absolute dimensions of molecules is also fascinating in itself. Like certain speculations in astronomy, it shows that there is no limit in the depth of the invisible and inaccessible beyond which scientific thought may not be expected to penetrate.

ABSOLUTE DIMENSIONS OF MOLECULES

The fundamental hypotheses of the kinetic theory of gases lead to the proposition that at any given temperature the volume of a gas is inversely proportional to its pressure. This relation, which had been known as a matter of fact long before it was established deductively, may also be expressed by saying that at any given temperature the product of the pressure and volume of a gas is constant:

$$pv = c.$$

From the point of view of the kinetic theory, v represents in this formula the empty space within which the molecules of the gas are free to move—i.e., the total volume filled by the gas *minus* the volume actually occupied by its molecules and *minus* a certain further fraction of the volume rendered unavailable by the disorderly motions of the molecules. As long as the gas is not too highly compressed, the total volume may be used in the above formula instead of the unknown intermolecular space. For, under low pressures, the difference between the volume of a gas and the volume of its empty intermolecular space is very slight, and hence the error committed amounts practically to nothing. But as the pressure exerted on the gas increases its volume becomes small, and the fraction of that volume rendered unavailable by the bulk of the molecules and by the irregularity of their motion becomes considerable. In other words, the difference between the volume filled by the gas and the available intermolecular space becomes too great to be neglected. At the same time, as the distance between the molecules becomes smaller they begin to exercise a certain amount of attraction upon one another; the result is that the tendency of the gas to expand and the pressure exerted by it upon the containing vessel are appreciably diminished. Under such circumstances the simple formula mentioned above ceases to express the relation between the observed pressure and volume of gases, and the following formula, first constructed by Van der Waals, has to be employed instead:

$$\left(p + \frac{a}{v^2}\right)(v - b) = c.$$

In this formula p denotes the pressure actually observed. To conform to the theoretical law, we add to p the quantity $\frac{a}{v^2}$ depending on the specific mutual attraction of the molecules and therefore also upon the volume occupied by the gas. The factor $(v - b)$ in the formula represents the total volume filled by the gas, diminished by four times the volume actually occupied by its molecules, which are assumed to be

spherical. We thus obtain theoretically a set of ideal conditions, such as are in reality approached only when the volume occupied by the gas is very great. We have, namely, the ideal pressure—i.e., the pressure determined by the motion of the molecules and undiminished by their mutual attraction—and we have the actual volume within which the molecules are free to move; the product is evidently the same as in the case of the simpler law, $pv = c$, under low pressures.

The attraction of the molecules and their volume depend, of course, upon the nature of the gas. By actually determining the pressures and volumes of various gases, numbers may be substituted for c, p, and v in Van der Waals's formula, and thus equations may be obtained containing only two unknown quantities, a and b, the numerical values of which can then be easily computed. The following table shows the values of $\frac{1}{4}\ b$ (i.e., *the fraction of the volume of a gas actually occupied by its molecules*) for a few gases and vapors. These values are calculated for the temperature of freezing water (0° C.) and for normal atmospheric pressure:

SUBSTANCE	$\frac{1}{4}\ b$
Carbonic-acid gas	0.00050
Nitrous-oxide gas	0.00048
Sulphur-dioxide gas	0.00062
Ethylene gas	0.00056
Ethyl-chloride vapor	0.00097
Alcohol vapor	0.00093
Ether vapor	0.00144
Benzene vapor	0.00128
Carbon-disulphide vapor	0.00082

With the aid of these figures the specific gravity of the molecules, say of carbonic acid, may be readily calculated as follows: at 0° C. and under normal atmospheric pressure, 22,405 cubic centimeters of carbonic-acid gas weigh about 44 grams. The volume actually occupied by the molecules being $22{,}350 \times 0.00050$ cubic centimeters, *one* cubic centimeter entirely filled by carbonic-acid molecules, with no space between them, would evidently weigh

$$\frac{44}{22{,}350 \times 0.00050}$$

or about 4 grams; i.e., the specific gravity of a molecule of carbonic acid is about 4. Similarly, the specific gravities of the molecules of other substances are found to be as follows:

SUBSTANCE	Sp. gr. of molecules
Nitrous oxide	3.7
Sulphur dioxide	4.6
Ethylene	2.4
Ethyl chloride	2.9
Alcohol	2.2
Ether	2.3
Benzene	2.7
Carbon disulphide	4.3

Considerations of a somewhat more complicated nature lead to the conclusion that at 0° C., and under a pressure of 1 atmosphere, 1 cubic millimeter of *any gas or vapor* contains approximately 54,000,000,000,000,000 molecules. Since 1 cubic millimeter of hydrogen weighs 0.00009 milligram, the absolute weight of a single molecule of that gas is therefore

$$\frac{0.00009}{54{,}000{,}000{,}000{,}000{,}000}, \text{ which equals}$$

0.000,000,000,000,000,000,000,0166 milligram.

In a similar manner the absolute weight of a molecule of any other gas or vapor may be readily calculated, by dividing the weight of one cubic millimeter by 54,000,000,000,000,000.

MOLECULAR WEIGHTS

The practical value of the above results is, at least for the present, not nearly so great as that of the purely relative molecular weights constantly used in scientific work. For it is on our knowledge of these relative molecular weights that the modern theories concerning the structure and the mutual relations of chemical compounds, especially the numerous compounds of carbon, are based.

The principle underlying the determination of the relative molecular weights of gaseous or vaporized substances is Avogadro's rule (q.v.), according to which equal volumes of gases (under the same pressure and at the same temperature) contain equal numbers of molecules. Let a given volume of some gas weigh g_1 grams and let, under the same conditions, an equal volume of some second gas weigh g_2 grams. If the weight of a single molecule of the first gas is m_1 and the number of molecules in one volume is n_1, then the total weight g_1 is obviously the product of m_1 and n_1: $g_1 = m_1 n_1$. Similarly, if m_2 and n_2 are, respectively, the weight of a single molecule and the number of molecules of the second gas, then $g_2 = m_2 n_2$. But, the two volumes being equal, Avogadro's rule tells us that $n_1 = n_2$. Consequently we have

$$\frac{g_1}{g_2} = \frac{m_1 n_1}{m_2 n_2} = \frac{m_1}{m_2}.$$

In words: the ratio of the weights of two *single molecules* of different gases is the same as the ratio of the weights of *equal volumes* of the gases under the same conditions of pressure and temperature. And of course the weights of equal volumes of gases can be readily determined.

Chemists have agreed to call "molecular weight" or "molar weight" the weight of 22.407 liters of any gas or vapor at 0° C. and under a pressure of 1 atmosphere (i.e., 760 millimeters of mercury or, what is the same, a pressure of 1033.3 grams per square centimeter). The volume just mentioned is that occupied by exactly 32 grams of oxygen gas, and so 32 is given as the molecular weight, or molar weight, of oxygen.

In most cases it would be inconvenient, or even impossible, to put vapors at 0° C. under a pressure of 1 atmosphere; most vapors would be liquefied before this pressure is reached. In practice, therefore, the chemist determines the weight of some convenient volume (say 250 or 300 cubic centimeters at most) and under convenient conditions of pressure and temperature. Then, using the gas laws, he calculates what *would* be the weight of 22.407 liters under the normal conditions. The gas laws are mathematically expressed by the equation

$$PV = RT,$$

where V denotes the volume occupied by the molar weight of the gas under the pressure P and at the temperature T; the symbol R denotes the so-called gas constant, and its numerical value (when volumes are measured in liters, pressures in atmospheres, and temperatures on the absolute scale) is 0.0820. If we denote by M the molar weight of a gas and by v its specific volume (i.e., the volume occupied by 1 gram), then obviously $V = Mv$. The equation of the gas laws may, therefore, be written:

$$PMv = RT, \text{ or } 0.0820T,$$

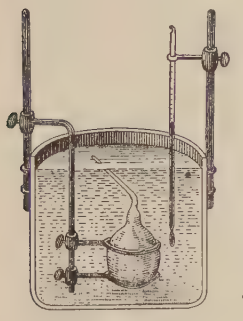
and therefore

$$M = \frac{0.0820T}{Pv}.$$

Thus in any given case the molar weight M becomes known if T, P, and v have been determined. This last equation may be referred to as the molar-weight formula.

Turning to the practical methods of carrying out such determinations, we find a method described by Menzies in 1910, which consists in fixing beforehand the temperature T and the specific volume v and determining what the pressure P will be when at the temperature T the gas has been forced to occupy, per gram, the volume v. In 1912 Porter described a practical procedure which consists in fixing beforehand the pressure and the specific volume and determining at what temperature the given vapor will under the pressure P occupy, per gram, the fixed volume v. Both these methods may be found explained in detail in the *Journal of the American Chemical Society*. The purposes of the present sketch will be served best by a description of the older, classic methods, which are still most commonly used in chemical laboratories. In these methods it is T and P that are fixed beforehand, and what is sought is the specific volume v of the gas under those fixed conditions of temperature and pressure. Following are the apparatus used:

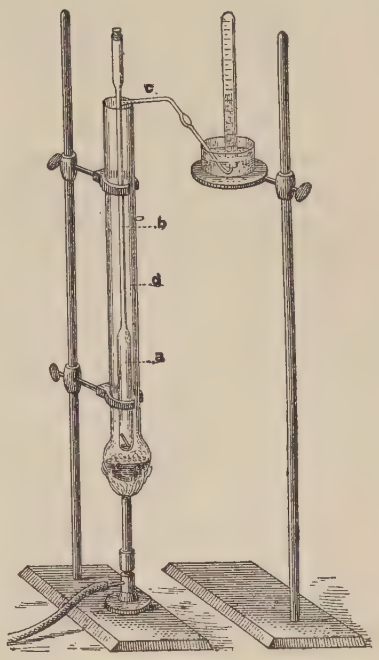
A. *Dumas's Apparatus* consists of a light glass flask (of about 250 cubic centimeters' capacity), whose neck is bent and drawn out into a long and narrow point. After carefully weighing the flask, 15 or 20 grams of the substance to be examined are introduced into it; it is then immersed in a bath whose temperature is constant and from 30 to 50 degrees higher than the boiling temperature of the substance in the flask.



DUMAS'S APPARATUS.

The substance soon begins to boil, and its vapors drive all the air out of the flask. When the substance has completely evaporated and the flask contains nothing but its vapor, the open end is carefully sealed off with the aid of a blowpipe. On cooling, the flask is cleaned and again weighed. Finally, its end is broken off under water, which rushes into the flask owing to the low pressure within; and when the latter is completely filled it is weighed a third and last time, together with the end that has been broken off. From the three weighings the weight and the volume of the vaporized substance in the apparatus become known. Dividing the volume (expressed in liters) by the weight, we get the specific volume v required by the molar-weight formula given above. The temperature T is that of the bath; the pressure P is that of the air as shown by the barometer, but expressed in atmospheres. Dumas's apparatus can be employed only when a considerable amount of substance is available.

B. *Victor Meyer's Apparatus* consists of a wide glass tube a, the lower end of which is closed and the upper joined on to a long glass tube b of smaller diameter. The narrow tube is provided, near its upper end, with a side tube c. During a determination this apparatus is placed in a long test-tube-like vessel d containing some liquid boiling at a higher temperature than the substance to be experimented upon. A little of the substance is carefully weighed in a small glass capsule; the rubber stopper closing the top end of the apparatus is for an instant removed, and the weighed capsule is dropped in. The substance quickly evaporates, driving out through the side tube c a volume of air equal to the volume of its own vapor. The air is collected in a graduated tube, and thus the volume of the vaporized substance becomes known. Dividing the volume by the weight employed gives the required specific volume. The temperature T is that of the graduated tube at the time of observing the volume; the pressure P is that prevailing within the graduated tube at the same time—usually the same as the barometric pressure outside. Victor Meyer's apparatus requires but a very small quantity of the substance that is to be experimented upon, which is an important advantage; for the preparation of large quantities of a substance may often involve great loss of time and also be very difficult.



VICTOR MEYER'S APPARATUS.

Effusion Method. An entirely different method of determining the relative molar weights of gaseous substances is based on a law discovered by Graham. When different gases are, under similar conditions, allowed to escape through a small opening, the lengths of time taken by equal volumes of the different gases to escape are proportional to the square root of the weights of those equal volumes. In other words, the weights of equal volumes of different gases are proportional to the square of the times of effusion. But as, according to Avogadro's Rule, the weights of equal volumes are proportional to the molecular weights, we may say: *the molecular weights of gases or vapors are proportional to the square of the times of effusion*, a proposition which may be called the Graham-Avogadro law. Denoting the times of effusion of two given

gases by t_1 and t_2, and their molecular weights by M_1 and M_2, we have

$$\frac{M_1}{M_2} = \left(\frac{t_1}{t_2}\right)^2.$$

In practice one chooses as a reference substance some gas of known molecular weight, say oxygen, with the molecular weight 32 (M_2 in our formula), and determines the time of effusion of a suitable volume of it under practically convenient conditions of temperature and pressure (the time t_2 in our formula). Then one determines the time of effusion (t_1) of the gas whose molecular weight (M_1) is required. The latter is then given by the expression:

$$M_1 = M_2\left(\frac{t_1}{t_2}\right)^2.$$

A valuable advantage of the method consists in the fact that it requires but very small amounts of substance, so that Debierne was able to use it in the case of so scarce a substance as the emanation of radium. The method is much used as a test in the illuminating-gas industry. The gases are allowed to effuse out of a glass tube the open lower end of which is immersed in a cylinder of mercury, the upper end being sealed with a disk of platinum having an effusion hole whose diameter should be at most one four-hundredth of the thickness of the disk.

Determination of Molecular Weights by Direct or Indirect Measurement of the Osmotic Pressure of Solutions. As Van't Hoff has shown, substances in solution exert an "osmotic pressure" which is in a sense analogous to the pressure of gases or vapors and in very dilute solutions obeys the same law as the pressure of gases. If we denote by π the osmotic pressure, by V the volume (in liters) of solution containing the molar weight of the dissolved substance, and by T the absolute temperature, we thus have

$$\pi V = RT,$$

where R is again the "gas constant" and has the value 0.0820. If, further, we denote by v the volume of solution containing *one* gram of the dissolved substance, and by M the molar weight of the latter, our equation may be written:

$$\pi vM = RT,$$

from which we obtain a molar-weight formula analogous to the one given above for gases and vapors: viz.,

$$M = \frac{0.0820T}{\pi v}.$$

Thus, by measuring the osmotic pressure π of a solution of a given dilution at a given temperature, we can ascertain the molar weight M of the dissolved substance. But as the direct measurement of osmotic pressure is exceedingly difficult, indirect methods are usually employed by the investigator. When a substance enters some solvent, say water, it changes the characteristic freezing and boiling temperatures of the solvent: the freezing point is lowered, the boiling point is raised. Now, the depression of the freezing point and the elevation of the boiling point have been shown to be proportional to the osmotic pressure of the solution. Therefore, instead of directly carrying out a determination of osmotic pressure, the chemist measures the change of freezing or boiling temperature caused by dissolving a given weight of substance. The laboratory methods commonly employed in determining the depression of freezing point and the rise of boiling point are described in the articles FREEZING POINT and BOILING POINT. See also SOLUTION; AVOGADRO'S RULE.

The osmotic-pressure methods just referred to are of the greatest practical importance to the chemist, for, while the number of substances that can be vaporized (and hence whose molecular weights can be determined by the vapor-density method) is limited, practically all substances can be obtained in solution.

Chemical Methods. It is often possible to determine the molecular weight of a substance by purely chemical methods, i.e., by studying its formation and chemical transformations. Consider, e.g., acetic acid. Analysis leads us to assign to it one of the following formulas: CH_2O, $C_2H_4O_2$, $C_3H_6O_3$, $C_4H_8O_4$, etc., corresponding to the molecular weights, 30, 60, 90, 120, etc. (See CHEMISTRY.) The fact that acetic acid is readily formed from ordinary alcohol, whose molecule (C_2H_6O) cannot possibly contain less than two carbon atoms (because for every two carbon atoms it contains a single atom of oxygen)—this fact renders it probable that the molecule of acetic acid, too, contains two carbon atoms. In other words, it becomes probable that $C_2H_4O_2$ is the formula, and hence 60 the molecular weight, of acetic acid. That CH_2O cannot be the formula of acetic acid is shown by the fact that the molecule ($C_2H_3O_2Ag$) of silver acetate, a compound made from acetic acid, cannot possibly contain less than two carbon atoms (because for every two carbon atoms it contains a single atom of silver). To sum up, the molecular weight of acetic acid is shown by purely chemical methods to be *probably* and *at least* 60. More exact information chemical methods cannot furnish. The *physicochemical* methods described above lead usually to much more definite conclusions. And because the molecular weights found by physical methods (i.e., on the basis of Avogadro's rule) are invariably found to be in perfect agreement with chemical facts, the molecular theory of the physicist can be, and is, inseparable from the atomic theory of the chemist, the two theories widening each other's scope of usefulness and together forming a powerful instrument for the study of nature.

See CHEMISTRY, and consult the literature of theoretical and physical chemistry recommended in that article. See also ATOMIC WEIGHTS; AVOGADRO'S RULE; BOILING POINT; FREEZING POINT; GASES, GENERAL PROPERTIES OF; SOLUTION.

MOLENAER, mō'le-när, JAN MIENSZE (?c.1605–68). A Dutch genre painter, born at Haarlem. He is thought to have been a pupil of Frans Hals, whom he imitated in his early works. Later he was influenced by Rembrandt. His pictures are usually scenes of peasant life, painted with much brilliancy and variety of characterization, combined, in his later works, with compactness of composition and subordination of local color to a warm brown tone. Good examples of his early manner are a "Scene in a Painter's Studio" (Berlin Gallery) and "A Family Party" (Van Loon collection, Amsterdam). In his later manner are "Grace before Meat" (Rijks-Museum, Amsterdam) and "A Flemish Wedding" (Haarlem). In 1636 he married Judith Leyster, one of the few distinguished women painters of that day.

MOLE RAT. One of the rodents of the family Spalacidæ, which spend their lives moving

about through the soil like moles and have assumed many molelike features and traits. The countries about the Mediterranean contain the typical mole rat (*Spalax typhlus*), a queer, yellowish-brown creature about the size of a rat, with the minute eyes completely covered by the skin and the ears and tail rudimentary. Its fur lies either way, and the animal seems able to dig backward as well as forward. It constructs tunnels like those of moles, throwing out heaps of earth at intervals. It is common in Egypt, where it burrows in sandy soil full of asphodels and hyacinths, whose bulbs it eats or stores in large quantities in deep chambers underground. South Africa contains several closely related animals of the subfamily Bathyerginæ, one of which, the coastwise strand mole (*Bathyergus maritimus*), is a foot long and numerous. Its eyes are still open, but are mere beads, of little use. Still stranger relatives of these are the sand rats (*Heterocephalus*) of Somaliland, which are about the size of mice, almost naked and blind. They remain always underground, tossing the sand out of the crater-like openings from their tunnels, but never themselves coming to the surface.

MOLESCHOTT, mō'le-shŏt, Jacob (1822–93). A physiologist and writer on dietetics, born at Herzogenbusch, Holland. He studied at Heidelberg and began the practice of medicine (1845) at Utrecht. Thence he removed, in 1847, to Heidelberg, where for seven years he lectured on physiology at the university. A real or supposed tendency towards materialism in his lectures alarmed the authorities, and in consequence he resigned. In 1856 he was appointed professor of physiology at the polytechnic at Zurich and in 1861 at Turin. He was called upon to fill the same chair in Rome in 1879; three years earlier he had been appointed a Senator of the Kingdom. He was a popular lecturer, and his physiological researches, particularly in regard to diet, muscular formation, the blood, and bile, are of value. Without asserting the impossibility of a spiritual life, he explained the origin and condition of animals by the working of physical causes. His characteristic formula was "No thought without phosphorus." His most important works are: *Physiologie der Nahrungsmittel* (1850; 2d ed., 1859); *Physiologie des Stoffwechsels in Pflanzen und Thieren* (1851); *Der Kreislauf des Lebens* (1852; 5th ed., 1887); *Untersuchungen zur Naturlehre des Menschen und der Tiere* (1856–93; continued after his death by Colosanti and Fubini); *Lehre der Nahrungsmittel* (1858); *Sulla vita umana* (1861–67), a collection of essays; *Physiologisches Skizzenbuch* (1861); *Consigli e conferti nei tempi di colera* (1864; 3d ed., 1884); *Sull' influenza della luce mista e cromatica nell' esalazione di acido carbonico per l' organismo animale* (1879), with Fubini. *Kleine Schriften* (1880–87) contains his collected essays and addresses. After his death appeared his autobiography *Für meine Freunde* (1894).

MOLE SHREW. A book name for the common North American short-tailed shrew (*Blarina brevicauda*). See Shrew.

MOLE'SKIN (so called from its soft, thick shag, like the fur on a mole). An extra-strong double-twilled fustian, dyed after the pile is cut. See Fustian.

MOLESWORTH, mōlz'wĕrth, Sir Guilford Lindsey (1828–). An English civil engineer. He was educated at the college of civil engineers at Putney. In 1852 he became chief assistant engineer of the London, Brighton, and South Coast Railroad, but soon resigned to conduct the constructions at Woolwich Arsenal during the Crimean War. After practicing his profession in London for a number of years he went to Ceylon in 1859 and in 1862 became chief engineer of the government railroad in that island. In 1867 he was appointed Director of Public Works and Director General of Railways to the Ceylon government and from 1871 to 1889 was consulting engineer to the Indian government with regard to State railways. He received medals from the British government for his services during the Afghan War and the Burma War. In 1904 he was president of the Institution of Civil Engineers. He published a *Pocket-book of Engineering Formulæ* (27th ed., 1914), which is regarded as authoritative. Among his other publications are: *State Railways in India* (1872); *Metrical Tables* (1880; 4th ed., 1909); *Imperialism in India* (1885); *Silver and Gold* (1891); *Our Empire under Protection and Free Trade* (1902); *Economic and Fiscal Facts and Fallacies* (1909).

MOLESWORTH, Mary Louisa, *née* Stewart (1839–1921). An English writer of books for young people, born in Holland and educated in Switzerland. She spent some time in France and Germany. She wrote several novels while young, and in 1875 published her first book for children. As a writer of juveniles her success was immediate. Through a delightful verisimilitude and an easy grace of style she found wide audience for many volumes, among which are: *Carrots* (1876); *Tapestry Poems* (1879); *The Green Casket* (1890); *The Laurel Walk* (1898); *The Grim House* (1899); *Jasper* (1906); *The Story of a Year* (1910); *Fairies Afield* (1911). Of *The Cuckoo Clock*, a classic of its kind, a new and handsome edition was published in 1914.

MOLESWORTH, Sir William (1810–55). An English statesman, known as the originator of colonial self-government. He was born in London, May 23, 1810, and was descended from an old Cornish family of large possessions. He early showed promise of distinction, although his university career at Cambridge was cut short by his sending a challenge to his tutor to fight a duel. He continued his education at the University of Edinburgh and subsequently at Munich. He succeeded to the family baronetcy in 1823. After making the usual tour of Europe he returned home and threw himself in 1831 into the movement for parliamentary reform. Next year, although only just of age, he was elected member of Parliament for East Cornwall. He sat for Leeds from 1837 to 1841. He was the friend of Bentham, James Mill, and George Grote and was regarded as the parliamentary representative of the philosophical radicals. In 1839 he commenced and carried to completion, at a cost of £6000, a reprint of the entire miscellaneous and voluminous writings of Hobbes, which were placed in most of the English university and provincial libraries. The publication did him great disservice in public life, his opponents endeavoring to identify him with the freethinking opinions of Thomas Hobbes in religion as well as with the philosopher's conclusions in favor of despotic government. In 1845 he was elected to Parliament for Southwark, which he continued to represent until his death. He was the first to call attention to the abuses connected with the transportation of criminals

and as chairman of a parliamentary committee brought to light the horrors of the convict system. He pointed out the maladministration of the Colonial Office, explained the true principles of colonial self-government, prepared drafts of constitutions for remote dependencies, and made investigations as to the true and natural relations between the Imperial government and its colonial empire. Molesworth's views, although at first unwelcome to the legislature, were adopted by successive administrations and became part of the colonial policy of Great Britain. In January, 1853, he accepted the office of First Commissioner of Public Works in the administration of the Earl of Aberdeen and in 1855 the post of Secretary of State for the Colonies in that of Viscount Palmerston. Before he could give proof of his administrative capacity he died, Oct. 22, 1855. He established the *London Review*, a new quarterly, in 1835 and afterward purchased the *Westminster Review*, the organ of the philosophical radicals. The two quarterlies being then merged into one, under the title of the *London and Westminster*, Molesworth contributed to it many articles on politics and political economy. The enduring influence of his views was attested by the fact that his speech on the abandonment of the Orange River Territory in 1854 was advanced by the Boer government in 1878 as the chief argument for the British withdrawal from the Transvaal. Consult M. G. Fawcett, *Life of Sir William Molesworth* (London, 1901).

MOLESWORTH, William Nassau (1816–90). An English clergyman and historian. He was born at Millbrook, near Southampton, graduated M.A. at Cambridge in 1842, and entered the English church. He was presented to St. Andrews, Manchester, in 1841 and to St. Clement Spotland, Rochdale, in 1844. He was a strong advocate of coöperation and had an interest in the well-known experiment of coöperation in the industries at Rochdale. Molesworth's most important writings are: *Essay on the French Alliance* (1860); *A History of the Reform Bill of 1832* (1864); *History of England from the Year 1830 to 1874* (3 vols., 1874); *History of the Church of England from 1660* (1882).

MOLFET'TA. An episcopal city in the Province of Bari delle Puglie, Italy, 16 miles northwest of Bari on the Adriatic Sea (Map: Italy, F 4). The city is pleasantly situated, and the old section, surrounded by walls studded with towers, presents a very striking aspect when approached from the sea. It has a twelfth-century Byzantine cathedral, a new cathedral, a lyceum, a Gymnasium, a seminary, a library with 22,000 volumes, a museum, and a theatre. A spacious harbor adds to the attractiveness of the new town and serves to render it an important commercial centre. There are extensive manufactures of flour, vermicelli, soap, bricks, and wine, and a large export trade in oil, almonds, carobs, nitre, and fish. Pop. (commune), 1901, 40,135; 1911, 43,263.

MOLIÈRE, mô'lyâr'. The name assumed by Jean Baptiste Poquelin (1622–73). The greatest dramatist and perhaps the greatest writer of France. Molière was born Jan. 15, 1622, in Paris. His father was a well-to-do tradesman and titular tapissier valet de chambre of the King, an office held later by Molière. Molière's mother died in 1632. He was educated by the Jesuits at the Collège de Clermont (1636–41) and came into touch with some literary men (Luillier, Chapelle, Gassendi). Some say he went to Orléans to study law; others that he studied theology at the Sorbonne; and others still that he went with the court as a minor officer to Narbonne and formed Bohemian associations, among them being the Béjarts, whose daughter, Armande, he afterward (1662) married. In 1643 Molière abandoned his office and family prospects for the stage. After two unsuccessful theatrical ventures he was imprisoned for debt (1645), and in the winter of 1646–47 he became chief of a troupe of players which for 12 years (1647–58) acted in the provinces. In October, 1658, Molière played for the first time before the King, acting in *Nicomède* and *Le docteur amoureux*. In these years of wandering Molière learned the practical side of his profession; as dramatic adapter and composer he learned its literary side. More than all, he learned human nature by observing the provinces in the excited period of the Fronde from the vantage ground of an actor who could view objectively the panorama of high and low life; and at the same time as manager he gained seriousness from responsibility—a seriousness that gives his satire sometimes a tinge of bitterness and always the seal of superiority.

On Molière's return to Paris (1658) he had the prestige of provincial success, and he had written two plays which he thought worthy of preservation, *L'Étourdi* and *Le dépit amoureux*. These were sufficiently superior in their easy, natural dialogue and the alert brilliancy of their style to win for him a court patronage which he never lost and a popularity which assured his troupe a permanent support in Paris. This work was, however, Italian in spirit; but in 1659 Molière discarded, with *Les précieuses ridicules*, the stereotyped pattern, with its stock characters, and inaugurated a new era in comedy with the first dramatic satire on cultured society in France. Not the affected language and manners of the Hôtel de Rambouillet, but those, rather, of its bourgeois imitators, who abounded in Paris, were ridiculed with such infinite good humor that the play has not yet lost its comic force.

As typical of Molière's genius, though of a quite other phase of it, is *Sganarelle* (1660), the first of those gay yet profound farces that still hold the stage because they evoke first a laugh and then a thoughtful smile. He was still feeling his way, and *Don Garcie de Navarre* (1661), a five-act tragi-comedy in verse, marks a relapse to the traditions of the Spanish stage. *L'Ecole des maris* (1661) shows, however, a decided advance. The plot is from Terence, but the aged lover is treated with a pathos and a fidelity to nature that bear the print of genius. From this point onward it becomes necessary to distinguish the work of Molière the born dramatist from that of Molière the theatrical manager and purveyor of court entertainments. He wrote very much in the latter capacity that he would not have written in the former. The financial success and prosperity of his company were also an obligation not to be neglected. To satisfy this he wrote conventional comedies and extravagant farces, and to please the royal taste he composed for festivals at Versailles some 13 semioperatic comedies, in which the text was only a pretext for dancing and singing, wherein high dignitaries of the court sometimes took part. He was distracted, too, by bitter attacks which he condescended occasionally to answer in his farces, though such controversy seems to

have spurred him to his greatest efforts and lent a keener edge to his attacks on hypocrisy and pharisaism.

Les fâcheux (The Bores), a comedy ballet in three acts, acted at Vaux (August, 1661) for Fouquet on the eve of his downfall, illustrates this diversion of genius and is interesting because Louis XIV suggested one of its scenes; *L'Ecole des femmes*, which follows (December, 1662), is an exhibition of Molière's mature art as a satirist aiming at social and moral reformation, and *La critique de l'école des femmes* with *L'Impromptu de Versailles*, which immediately follow this in 1663, are answers to the criticism that it evoked —criticism embittered by Molière's success and given a handle by his marriage (February, 1662) to Armande Béjart. She was probably the sister of an old member of his company, herself an actress, and her indiscretions were a source of constant vexation and jealousy to Molière.

L'Ecole des femmes is the first of Molière's great comedies, the first great serious comedy of French literature. It deals with the part of woman in society and her proper preparation for it and treats both in a spirit more liberal than the France of to-day wholly approves. This alone would have insured violent criticism, but to it was added a bold and contemptuous satire on the prevalent materialistic views of future punishment. The play was denounced, not merely as vulgar and obscene, but as impious, e.g., by Boursault in his *Portrait du peintre*. Boursault was answered by name in the merciless *Impromptu de Versailles*, where, too, the rival company of the Hôtel de Bourgogne were parodied and ridiculed.

This controversy had by no means subsided when Molière, after the trivial *Mariage forcé* (1664) and *La princesse d'élide* (1664), two comedy ballets, provoked redoubled fury by two attacks on hypocrisy, *Tartufe* and *Don Juan*, or *Le festin de Pierre*. Of the former, only three acts were presented in 1664. Jesuits and Jansenists alike winced at it, and five years of persistent effort barely extorted permission to present the masterpiece as a whole. *Don Juan* appeared in February, 1665, and in August the King significantly adopted Molière's troupe as his own. But even his sympathy had its limits, and this appointment was perhaps in the nature of a consolation for the suppression of *Don Juan* in the midst of a prosperous run. The full text of this play is preserved to us only in a copy kept by the chief of police.

While awaiting permission to act *Tartufe* in its entirety, with *Don Juan* forbidden, Molière wrote *L'Amour médecin* (1665), a clever attack on the medical practitioners of his day, and *Le misanthrope* (July, 1666), in which his rivals and critics rightly discerned "a new style of comedy," wherein the constant motive forces of universal human nature are shown modified by the highest refinement to which civilization had yet attained. The easy optimist is set off against the noble pessimist, and a social school for scandal supplies the lighter comedy and offers a pillory for fops and poetasters.

About this time Molière's health seems to have begun to fail. Cold and fatigue brought on a disease of the lungs, and what he says of the distracted and pedantic doctors of his day, when superstition and tradition were struggling with one another and with half-understood fragments of science, lent sad point to the *Médecin malgré lui*, the second of his noteworthy attacks on the quackery of that time. Then follows a period of relaxed activity with only three comedy ballets, *Mélicerte* (1666), *Le pastoral comique* (1667), and *Le Sicilien* (1667), followed by the comparatively insignificant *Amphitryon* (1668), a coarse yet witty adaptation from Plautus. In July of 1668 Molière shows his old self again in *George Dandin*, an immortal type of the man who marries above his social station and suffers the consequences with rueful self-accusation. The story is at least as old as Boccaccio, but Molière's squirarchic Sotenvilles are his creation and an abiding delight.

This little master stroke was followed in September, 1668, by a masterpiece, *L'Avare*, whose central figure, the caricatural Harpagon, is one of Molière's greatest studies of vitiated character. Several lighter pieces followed, first *M. de Pourceaugnac*, a comedy ballet with much raillery at the physicians; then *Les amants magnifiques* (1670), a persiflage of astrological extravagances; then that excellently comic farce, *Le bourgeois gentilhomme* (1670); then *Psyché* (1671), a tragedy ballet, written in collaboration with Corneille and Quinault. The music was by Lulli. Then followed the lively *Fourberies de Scapin* (1671) and finally the *Comtesse d'Escarbagnas*, a study of provincial manners and an attack on financiers, heralding thus Lesage's *Turcaret*. Much greater than any of these are the last legacies to French comedy of the dying Molière, *Les femmes savantes* (1672) and *Le malade imaginaire* (1673). The former recurs to the subject of the *Précieuses ridicules* and with ripest power attacks the admirers of pedantry and the affectations of learning. The latter, primarily a last gibe at physicians, is important for its widening of satiric comedy to include the perversion of childhood.

Le malade imaginaire was first acted Feb. 10, 1673. On the seventeenth Molière undertook the part of the hypochondriac invalid, though suffering from what he called a fluxion. In a fit of coughing he burst a blood vessel on the stage and died at his house a half hour later. His enemies pursued him in death. He was buried half clandestinely. The Archbishop of Paris, thinking Molière's ethics irreconcilable with Christianity, forbade public ceremony, but the command was evaded. The body was laid in St. Joseph's churchyard, but the site of the grave is uncertain.

No dramatist, save perhaps Shakespeare and Aristophanes, ever joined so much wit to so much seriousness as did Molière. There is often a pathetic, even a sad background to his scenes, but this never gets the better of his healthy humor. This humor depends for its effects not so much on plot as on revelation of character, and the satire is directed not so much against the excesses of nature as against those social faults or conventions which disguise or suppress nature. He is more apt to typify phases of character than to present complex natures, and in doing this he gave direction to the development of French comedy for several generations. There is no question that in the analysis of character Shakespeare, even Corneille, is more profound, and they tell a story with more dramatic force, but neither Corneille nor Racine gives so accurately picturesque, so fascinatingly truthful a portrait of French society as we find in the naturalistic, observant humorist, Molière.

Of Molière's *Works* the first edition was by his

friends and fellow actors, La Grange and Vinot (1682); by far the best is Despois and Mesnard's (11 vols., 1873–96). Excellent also are the editions of A. France (7 vols., 1876–91) and Monval (10 vols., 1879–89). One of the first English translations of Molière's *Works* appeared in London in 1748 in 10 volumes. There is a good cheap edition in two volumes with a study by Sainte-Beuve and English translations by Van Laun (6 vols., London, 1875–77), Wall (3 vols., 1876–77, 1891–1901), and K. P. Wormeley (Boston, 1894–97). Waller published an English and French edition (8 vols., Edinburgh, 1907). *Plays from Molière* translated by English dramatists, edited by Henry Morley, appeared in London in 1883. Consult for Molière's style, vocabulary, and usage, C. L. Livet, *Lexique de la langue de Molière* (Paris, 1895–97). Of the *Lives* of Molière that of Mahrenholtz, in German (Heilbronn, 1881), is most comprehensive. Consult also the periodical *Le Molieriste* and the biographies by F. Lotheissen (Frankfort, 1880), Moland (Paris, 1886), Gustave Larroumet (ib., 1886), Paul Mesnard (ib., 1889), Desfeuilles (ib., 1900), and Heinrich Schneegans (Berlin, 1901); the full *Bibliographie molièresque*, by Paul Lacroix (Paris, 1875); L. H. Vincent, *Molière* (Boston, 1902); H. M. Trollope, *Life of Molière* (New York, 1905); H. C. Chatfield-Taylor, *Molière* (ib., 1906); Martinenche, *Molière et la théâtre espagnol* (Paris, 1906); E. Rigal, *Molière* (1910); Brander Matthews, *Molière, his Life and his Works* (New York, 1910); M. I. Wolff, *Molière, der Dichter und sein Werk* (Munich, 1910); D. H. Miles, *Influence of Molière on Restoration Comedy* (New York, 1910); Emile Faguet, *Rousseau contre Molière* (Paris, 1912); also Currier and Gay (comps.), *Catalogue of the Molière Collection in Harvard College Library* (Cambridge, Mass., 1906).

MOLIÈRE, House of. See Comédie Française.

MOLINA, mô-lē'nȧ, Alonso de (c.1510–c.85). A Spanish missionary in Mexico. He was born at Escalona, Spain, early went to Mexico, learned the Aztec language, and was interpreter to the Franciscan friars. He subsequently joined the Franciscan Order and rose to be the superior of Santo Evangelio Province. His publications include translations into Aztec of the catechism and of a confessional manual, and a grammar of that language. His greatest work is his *Vocabulario en lengua castellana y mexicana* (1555; rev. ed., 1571), containing both Spanish-Mexican and Mexican-Spanish parts.

MOLINA, Count of. See Carlos, Don.

MOLINA, Juan Ignazio (1740–1829). An historian of Chile. He was born at Talca, Chile, studied in a Jesuit college at Santiago, taught there and at Bocalemo, and at the age of 20 became librarian at Santiago. He joined the Jesuits and on their expulsion from the country went to Italy in 1767. For several years he was a priest at Imola and in 1774 went to Bologna, where he taught in a private school. His views of the vitality of matter and of the sensibility of metals brought him into disfavor with the Church and he was removed from his professorate for a time. A legacy which Molina received in 1815 was devoted entire to the foundation of a library in Talca. Works: *Compendio di storia del Chile* (1776); *Saggio sulla storia naturale del Chile* (1782); *Saggio della storia civile del Chile* (1787).

MOLINA, Luis (1535–1600). A celebrated Spanish theologian, specially famous in the history of the controversy about divine grace. He was born at Cuenca in New Castile, entered the Jesuit Order at the age of 18, studied and then taught theology and philosophy at the College of Coimbra in Portugal, and was later appointed professor of theology at Evora, where he taught for 20 years. He then returned to Spain to devote himself to literary work and six months before his death was appointed professor of moral theology in a Jesuit school in Madrid. His fame rests mainly upon his celebrated work, *Concordia Liberi Arbitrii cum Grantæ Donis*, first printed in Lisbon in 1588, but not published until the following year. It was the first work of formal scholastic theology produced by the Jesuit Order, as it was the first written by any of them in the nature of a commentary on St. Thomas Aquinas, and scarcely any theological work has ever excited so widespread and lasting a controversy. The latest edition of it is by Lethilelleux (Paris, 1876). (For further details of this controversy, see Molinism.) Among his other works are his commentaries on the first part of the *Summa* of Aquinas (1592) and *De Justitia et Jure* (1592). His complete works were published in seven volumes (Venice, 1614) and with biography and bibliography in five volumes (Cologne, 1733).

MOLINA, Tirso de. A pseudonym of the Spanish dramatist Gabriel Téllez (q.v.).

MOLINARI, mô'lē'nȧ'rē', Gustave de (1819–1911). A Belgian political economist, born at Liége. He became a physician at Brussels, wrote works on homœopathic medicine, removed to Paris (1843), where he gained some distinction as a radical journalist, but was obliged by the coup d'état (1851) to return to Belgium, and there was appointed professor of political economy in the Musée Royal de l'Industrie Belge (Brussels) and later at Antwerp. In 1857 he went back to Paris, and in 1874 he was elected corresponding member of the Academy of Moral and Political Sciences of the Institute of France. He became editor of the *Journal des Débats* (1867) and of the *Journal des Economistes* (1881). From 1873 to 1875 he traveled and published his observations on the United States in *Lettres sur les Etats-Unis et le Canada* in 1875. He assisted in establishing the journals *L'Economiste Belge* and *La Bourse du Travail* and published numerous works, including *Etudes économiques* (1846); *Questions d'économie politique et de droit public* (2 vols., 1861); *L'Evolution économique du XIXème siècle* (1880); *Le droit de la paix et de la guerre* (1887); *Comment se resoudra la question sociale* (1896); *Questions économiques à l'ordre du jour* (1906); *Théorie de l'évolution* (1908).

MOLINE, mô-lēn'. A city in Rock Island Co., Ill., on the Mississippi and Rock rivers and on the Hennepin Canal, 3 miles east of the county seat, Rock Island, which is opposite Davenport, Iowa, the three cities being closely connected by steam and electric railroads, ferries, and bridges (Map: Illinois, D 2). The railroads entering the city are the Chicago, Milwaukee, and St. Paul, the Chicago, Rock Island, and Pacific, and the Chicago, Burlington, and Quincy. Moline derives excellent water power from the Mississippi, which is here dammed from the shore to the mid-river island,

an advantage which has contributed materially to the city's importance as an industrial centre. Coal is mined in the vicinity, and besides extensive automobile and plow works, there are manufactories of steel, elevator and milling machinery, scales, pianos, organs, furniture, carriages and wagons, steam engines, saw and planing mill products, foundry and machine-shop products, and pumps. A large trade is carried on in machinery, farming implements, grain, lumber, etc. Moline has a high-school library and a large public library, a park system comprising 150 acres, a fine city hall, and a well-equipped city hospital. Of interest in the vicinity are Black Hawk Watch Tower, Campbell's Island, and the Rock Island Arsenal. Moline has adopted the commission form of government. The water works are owned and operated by the municipality. Pop., 1900, 17,248; 1910, 24,199; 1914 (U. S. est.), 26,403; 1920, 30,709.

MOLINET, mô'lē'nā', JEAN (?–1507). A French poet and troubadour. He was a canon of the college church of Valenciennes, chronicler of the house of Burgundy, and librarian to Margaret of Austria, then Regent of the Low Countries. Molinet was one of the "grands rhétoriqueurs"; his poetry is pedantic, heavy, and complicated in rhythm, and his prose full of Latinisms, while both are replete with astonishing puerilities. A volume of his poems was printed in 1531, and his chronicles were published by Buchon in 1828. He also made a prose translation of the *Roman de la rose* (1503).

MO'LINISM. The name commonly applied to the doctrine of Luis Molina on the relation between divine grace and the will of man. The problem which it is meant to solve is as old as the fourth century, when it led to the well-known Pelagian controversy. (See PELAGIANISM.) In reconciling with the freedom of man's will the predestination of the elect to happiness and of the reprobate to punishment, Molina asserts that this predestination is consequent on God's foreknowledge of how man's will would act under any conceivable combination of circumstances, and that therefore it in no way affects the freedom of the particular actions. Accordingly, God gives to all men sufficient grace to enable them to live virtuously and merit happiness; certain individuals freely respond to this grace, while others resist it; God foresees both courses and founds His decrees upon this knowledge. This exposition was assailed in the schools first as a revival of the Pelagian heresy, inasmuch as it appears to place the efficacy of grace in the consent of man's will, and thus to recognize a natural power in man to perform supernatural acts; secondly, as setting aside altogether what the Scriptures represent as the special election of the predestined, by making each individual the arbiter of his own predestination or reprobation. The Dominicans, who were never very friendly to the Jesuits and who felt that this teaching misrepresented that of their great authority, St. Thomas, entered fiercely into controversy; the name of Thomists is generally applied to them and to the other antagonists of Molina. The dispute was brought under the cognizance of the Inquisitor General of Spain, who referred it to Pope Clement VIII. In 1597 he appointed the celebrated Congregatio de Auxiliis Divinæ Gratiæ to consider the entire question; the commission consisted of 11 members, representing different orders and schools. Before the death of Clement VIII in 1605 it had already held 68 sessions, and 17 more were held under Paul V, still without leading to any very definite result. Paul V finally dissolved it after nine years of anxious consultation and in 1611 forbade anything to be printed on either side without license from the Inquisition. The decree was confirmed by Urban VIII in 1625 and again in 1641, with special reference to a new outbreak of controversy occasioned by the publication of the *Augustinus* of Jansenius. The Jesuits had never committed themselves to Molina's doctrine as a whole, and they came gradually to a general support of a modified form of it known as congruism, taught especially by Suarez (q.v.) and Bellarmine (q.v.). While, according to the supporters of this teaching, Molina had placed the effective power of grace altogether in the assent of the free will, Suarez found it rather in the perfect harmony (*congruentia*) of grace with the character, temperament, tendencies, and habits of the individual. The real congruism of Suarez is, however, not so much a departure from the teaching of Molina as a clearer and more precise definition of it. Consult: Gerhard Schneemann, *Die Entstehung und Entwicklung der thomistisch-molinistischen Kontroverse* (Freiburg, 1880); De Régnon, *Bañes et Molina: histoire, doctrines, critique métaphysique* (Paris, 1883); Gayraud, *Thomisme et Molinisme* (ib., 1890).

MOLINO DEL REY, mô-lē'nō dĕl rā'ē (Sp., King's Mill). A series of massive stone buildings about 3000 feet west of Chapultepec (q.v.) and about 3 miles southwest of the city of Mexico; the scene, Sept. 8, 1847, of the most hotly contested battle of the war between the United States and Mexico. At the close of the armistice which followed the battle of Churubusco (see MEXICAN WAR) General Scott determined to destroy a cannon foundry and some military supplies supposed to be located here and on September 7 ordered an attack. Early on the following day General Worth, at the head of about 3100 men, assaulted the buildings, which had been strongly fortified and were then garrisoned by a force of 4000. After suffering severely from the artillery fire the Americans finally drove the Mexicans from their position and held the fortifications for the rest of the day, in spite of a large Mexican reënforcement sent forward by Santa Anna. Of the Mexicans 690 were made prisoners and probably as many as 3000 were killed or wounded. The American loss was heavier, in proportion to the force engaged, than in any other battle during the war, 116 being killed and 671 wounded. The Mexicans, supposing the attack to be part of a movement against Chapultepec (q.v.), regarded the engagement as a victory for their side and still commemorate it as such. Consult: H. H. Bancroft, *History of Mexico*, vol. v (San Francisco, 1885); Wilcox, *History of the Mexican War* (Washington, 1892); R. M. McElroy, *The Winning of the Far West* (New York, 1914).

MOLINOS, mô-lē'nôs, MIGUEL DE (1640–96). A Spanish mystic and leading representative of the doctrines of Quietism. He was born at Patacina in Aragon of noble parents and pursued a course of theological studies at Pampelona and Coimbra, from which university he received the degree of doctor of divinity. Hav-

ing been ordained priest, he acquired a high reputation as a director of conscience and a master of the spiritual life. He went in 1669 to Rome, where he made the same impression and won the friendship of many distinguished people. He declined all preferment and devoted himself entirely to the direction of souls. In 1675 he published an ascetical treatise in Spanish, under the name of *The Spiritual Guide*, which had a wide popularity and was translated into many languages (into English 10 years later; reprinted at Glasgow, 1885). His leading principle was that of habitual abstraction of the mind from sensible objects, with a view to gain, by passive contemplation, not only a profound realization of God's presence, but so perfect a communion with Him as to end in absorption into His essence. The dangers of his doctrine (for an examination of which and its subsequent history, see QUIETISM) were pointed out by not a few, among them the distinguished Jesuit Segneri; but so great was the popularity of Molinos that no decisive steps were taken until, in 1685, he was cited before the Holy Office and submitted to close imprisonment and examination. The Inquisition finally condemned 86 propositions extracted from his writings and in a decree, which was confirmed a few months later by a bull of Pope Innocent XI, required him publicly to abjure them and sentenced him to imprisonment for life. He underwent public penance and was admitted to absolution, but was detained until his death in 1696. Consult John Bigelow, *Molinos the Quietist* (New York, 1882), and J. S. Shorthouse, *Golden Thoughts from the Spiritual Guide of Molinos* (London, 1883).

MOLIQUE, mō'lēk', WILHELM BERNHARD (1802–69). A German violinist and composer, born at Nuremberg. His father was a musician, and the boy studied various instruments, but finally devoted himself to the violin. In 1815 he received some lessons from Spohr and then studied for two years under Rovelli in Munich. In 1820 he succeeded Rovelli as court violinist and after several successful tours became leader of the Royal Band at Stuttgart in 1826. In 1849 he resigned to go to England, in which country he remained till 1866, when he returned to Cannstadt, near Stuttgart, where he died. His compositions, especially his six violin concertos, are still in use.

MOLISE. See ABRUZZI E MOLISE.

MOLITOR, mō'lē'tôr', GABRIEL JEAN JOSEPH, COUNT (1770–1849). A French soldier, born at Hayange (Lorraine). He became a captain of volunteers in 1791, by 1799 had risen to the rank of general of brigade, having fought under Hoche, Massena, and Moreau. Subsequently he was commissioned a general of division and in 1805 fought in the Army of Italy and took part in the battle of Austerlitz. In 1806 he was appointed Governor of Dalmatia and in 1807 Governor of Pomerania, in 1809 contributed to the victory of Wagram, and in 1811–13 was in Holland. He was appointed inspector general of infantry at the Restoration, but received a command in Alsace from Napoleon during the Hundred Days. After the Second Restoration he did not again obtain his offices until 1818. In 1823 he commanded the Second Army Corps in the Spanish expedition and defeated Ballesteros, for which he was commissioned marshal. In 1847 he became commandant of the Invalides and was made Grand Chancellor of the Legion of Honor in 1848.

MOLKO, SOLOMON. See MESSIAH.

MOL'LAH (more properly Ar. *maulā*, Turk. pron. *mevla* or *mullā*). Among the Turks, the title of a superior judge. The mollahs are divided into two classes. Those in the first class exercise jurisdiction over the more important pashaliks. The mollahs of the second class hold office for a lunar month at a time, and their lowest rank is composed of the naibs over the inferior provinces, towns, and villages. The mollah is an expounder of civil, criminal, and canon law; he must, therefore, be a lawyer as well as an ecclesiastic. Under him is the qadi (or kadi), the judge who administers the law, and superior to him are the kadilesker and the mufti (q.v.). They are all, however, subject to the Sheikh ul Islam, who is the supreme mufti. In Persia the office of mollah, who is generally called akhun, is similar to what it is in Turkey. This superior there is the sadr, or chief of the mollahs. In the Mohammedan church the mollahs are beneficed clergy in receipt of some small salary attached to mosques and other pious foundations.

MOLLENDO, mōl-yĕn'dō. A coast town in the Department of Arequipa, Peru (Map: Peru, C 7). It is the principal port of south Peru and one of the chief points through which Bolivian trade is carried on. It is connected by railway with the mining districts of the interior of Peru and with Bolivia (La Paz). It exports alpaca wool, quinine, tin, gold, antimony, silver, and copper ores and imports chiefly merchandise for Bolivia. In 1913 its imports amounted to £580,802 and its exports to £1,104,580, giving it second rank in the former and third rank in the latter among the ports of Peru. It is the seat of a United States consular agent. Pop. (est.), 4000.

MÖLLENDORF, mēl'-lĕn-dôrf, RICHARD JOACHIM HEINRICH VON (1724–1816). A Prussian general, born at Lindenberg in Brandenburg. He was in the first and second Silesian wars and was made a captain for bravery at Soor (1746). In the Seven Years' War he rose to the rank of major and received the Order for Merit. At Torgau (1760), where he showed great bravery, he was captured by the Austrians, but he was released in 1761 and was made general a year after. Möllendorf was division commander in the War of the Bavarian Succession (1779), during which he received the Order of the Black Eagle; Governor of Berlin (1783); and commander in 1793 of the troops which put into effect the second partition of Poland, having been made field marshal. He was appointed commander in chief of the Army of the Rhine in 1794. In 1806 he again took the field, was wounded at Auerstädt and captured at Erfurt, but was released by Napoleon, who gave him the cross of the Legion of Honor.

MÖLLENDORF, ULRICH VON WILAMOWITZ-. See WILAMOWITZ-MÖLLENDORF, ULRICH VON.

MOLLENHAUER, mōl'ĕn-hou'ĕr, EMIL (1855–). An American orchestra and choral conductor. He was born in Brooklyn and was educated at Russell's Academy, New York. He became a member of Booth's Theatre Orchestra in 1869, first violin of the Theodore Thomas Orchestra in 1871, and a member of the New York and Brooklyn Philharmonic societies. Moving to Boston in 1884, he was a member of

the Boston Symphony Orchestra for four years, and served as conductor of the Germania Orchestra and the Municipal Concerts until 1903. He afterward served as conductor of the Handel and Haydn Society and of the Boston, Lynn, Brockton, Newburyport, and Salem oratorio societies.

MOL'LER, GEORG (1784–1852). A German architect. He was born in Hanover and studied architecture in Karlsruhe and Italy. After his return from Italy he was appointed court architect to the Grand Duke of Hesse. He designed the ducal palace at Wiesbaden, a number of public buildings and private residences at Darmstadt, and the theatre at Mainz. He discovered the original design of the Cologne Cathedral, the two towers of which have been finished in accordance with his published facsimile. His most important publications include *Denkmäler deutscher Baukunst* (1815–31) and *Beiträge zu der Lehre von den Konstruktionen* (1833–44).

MÖLLHAUSEN, mēl'hou-zen, BALDUIN (1825–1905). A German traveler and novelist, born at Bonn. He studied agriculture in Pomerania and spent several years in North America, traveling with Duke Paul of Württemberg (1851) and, at the instance of Humboldt, acting as draftsman to a scientific expedition to the Far West. After a second trip through the western part of the United States, especially Colorado, he wrote *Tagebuch einer Reise vom Mississippi nach den Küsten der Südsee* (1858) and *Reisen in die Felsengebirge Nordamerikas* (1861). His many novels, mostly on American topics, include: *Die Halbindianer* (1861); *Das Mormonenmädchen* (1864; 3d ed., 1871); *Das Monogramm* (1874); *Die beiden Yachten* (1891); *Fegefeuer in Frappes Wigwam* (1901). His *Illustrierte Romane, Reisen, und Abenteuer* were published in three series and 30 volumes (1906–13).

MOLLIEN, mô'lyăn', NICOLAS FRANÇOIS, COUNT (1758–1850). A French statesman, born in Paris. Early connected with the financial department of the French government, by 1784 he had charge of raising the taxes through the farmers-general. He narrowly escaped with his life during the Revolution, and in 1794 he retired to England for a time. He reëntered the ministry of finance under Gaudin in 1799, and when Napoleon became Emperor in 1804 Mollien was made a member of his Privy Council. Napoleon, who consulted him frequently on financial matters, made him Minister of the Treasury in 1806 and created him Count in 1808. He retired upon the first abdication of Napoleon in 1814, but again took up his ministerial duties during the Hundred Days in 1815. He lived in retirement under the Restoration and in 1819 was made a peer of France. He wrote *Mémoire d'un ministre du trésor publique 1780–1815* (Paris, 4 vols., 1845; new ed., 3 vols., 1898).

MOLLITIES (mŏl-lĭsh'ĭ-ēz) **OS'SIUM.** See OSTEOMALACIA.

MOLLUS'CA (Lat. nom. pl. neut. of *molluscus*, from *mollis*, soft). One of the chief divisions, or phyla, of the animal kingdom, the study of which is conchology or malacology. The body is bilaterally symmetrical except in snails (Gastropoda), not segmented as in worms and arthropods, but soft, fleshy, and usually protected by a bivalve or univalve shell; moving by a "foot" or muscular creeping disk in gastropods, or, in bivalves, by a tonguelike process; breathing by external gills which are either lamellate or plumelike. A shell is secreted by the fleshy mantle, and in nearly all except the Pelecypoda (q.v.), which are headless, the mouth is armed with an odontophore, an apparatus of muscles and tendons bearing a rasplike lingual ribbon (radula) for sawing or cutting the food or for drilling holes through shells. Many mollusca in their young or larval swimming stages begin as a trochosphere (q.v.), pass through a veliger stage, living at the surface of the sea and gradually sinking to the bottom by gravity as the shell grows larger and heavier. The Mollusca form a highly specialized group, the number of species amounting to upward of 40,000, about one-half of which are living, the other extinct; the earliest known species occur in Cambrian rocks. The group has a wide geographical and bathymetrical range, occurring in all seas from the shore to the abysses of the ocean and also on land and in fresh waters.

A SEGMENTED LARVA. Trochosphere of Chiton.

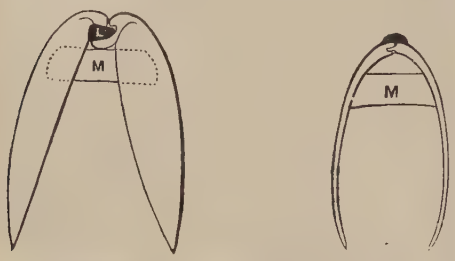
The affinities of this phylum are not yet settled. Mollusks have evidently descended from some wormlike form, as their larvæ are in some cases segmented and like the trochosphere or trochophore stage of seaworms (Annelida). In the adult segmental organs like those of worms are often present. On the whole they are a grade inferior to the spiders and insects. Mollusks are divided into five classes, i.e., (1) Amphineura (q.v.); (2) Pelecypoda (q.v.) or Lamellibranchiata; (3) Scaphopoda (q.v.); (4) Gastropoda (q.v.); and (5) Cephalopoda (q.v.). The Amphineura comprise a few forms formerly supposed to be worms (Chætoderma and Neomenia). These are primitive types from which, as some authors think, the other mollusks may have descended; all have a ladder-like nervous system, as in Chiton, and are either shell-less or somewhat like that of some Turbellaria (q.v.) and Peripatus (q.v.).

Bibliography. A. H. Cooke, "Molluscs," in *Cambridge Natural History*, vol. iii (New York, 1895); A. F. Arnold, *Sea-Beach at Ebb-Tide* (ib., 1901); A. G. Mayer, *Sea-Shore Life* (ib., 1905); J. E. Rogers, *Shell Book* (ib., 1908); S. P. Woodward, *Manual of the Mollusca* (4th ed., London, 1890); W. H. Dall, *Land and Fresh Water Mollusks* (Washington, 1910). See MOLLUSK.

MOLLUS'CUM CONTA'GIO'SUM. A comparatively rare skin disease occurring chiefly in children of the poorer class and believed to be contagious. Upon the skin are observed waxy-white, semiglobular, smooth elevations varying in size from a pinhead to a pea. The tumors consist of degenerated epithelial cells contained in the globules of hair follicles. The lesions are distributed chiefly upon the face, increase slowly in size and eventually suppurate; or they may be destroyed by incision, after which the contents are squeezed out or curetted away. Ointments containing mercury are sometimes efficacious.

MOL'LUSK. An animal of the phylum Mollusca (q.v.). Mollusks are usually easy to distinguish from other animals on account of their shell, whence they are commonly called shellfish; but the more we study their development

and morphology the more difficult is it to draw a definite line between them and certain worm-like forms. In their early development they travel along apparently the same developmental path as the worms (planarians as well as annelids) and then diverge into a separate path. That the type is a very successful one is proved



TRANSVERSE SECTIONS OF BIVALVE MOLLUSKS.

A clam (*Mya*) and a fresh-water mussel (*Unio*), showing the ligament (*L*) and adductor muscle (*M*).

by the enormous number of species both living and extinct—a success evidently due to the protection afforded them by their shell. In bivalves as well as univalves (Gastropoda) the shell is more or less solid, is composed mainly of carbonate of lime and secreted by the mantle.

A bivalve mollusk like the clam is completely protected by a pair of solid calcareous shells connected by a hinge consisting of a large tooth (in most bivalves there are three teeth) and ligament. The shells are equivalve or with both valves alike, but unlike at each end, the head end being more rounded. On the interior are two muscular impressions, or scars, made by the two adductor muscles. The shell of gastropods is spiral, and that part of the animal contained in the skin is asymmetrical, the twist or torsion being due to gravity or lopping over of the young shell in the larva stage.

As to the most primitive forms we are in the dark. The most characteristic mollusks are the cephalopods. They are bilateral and very highly modified, with a well-marked head containing two highly specialized eyes and two ears. The concentrated ganglia form a brain with cartilaginous protections, while the parts around the mouth are modified to form the tentacles and funnel. The heart and blood vessels are highly specialized.

The "foot" is a modification of the part of the mantle below and behind the mouth; it varies

A BIVALVE MOVING.

A fresh-water mussel (*Unio*) moving through the sand towards the left by means of its extended "foot."

greatly in shape, and is by disuse wanting in oysters and other fixed forms; in the pelecypods or bivalves it is tongue-shaped, and by being filled with water is thrust out between the valves of the shell, so that by means of it the clam can dig deep into the mud, or the fresh-water mussel can plow its way through the sand. In the snails (q.v.) the foot forms a flattened creeping disk extending along the whole length of the body. See illustrations under CONE SHELL; CONCH; ETC.

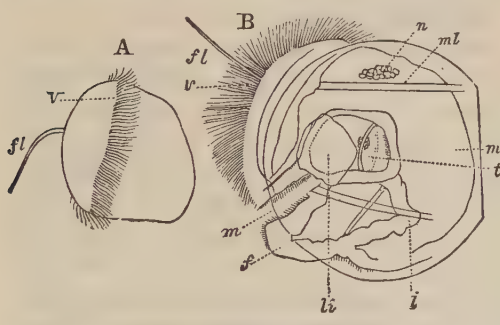
In the clam (q.v.) and most bivalves the hinder end of the body is prolonged into a double siphon, popularly called the head, through the lower division of which enters the water laden with microscopic animals and larvæ, which pass through the mantle cavity into the mouth, which is situated at the opposite end from the siphons. The upper division of the siphon opens out opposite the end of the intestine, which makes two and a half turns in the central or visceral mass, which is composed mostly of the ovaries. The bivalves breathe by a pair of leaflike gills, on each side of the visceral mass between it and the mantle; in the gastropods and cephalopods the gills are plume-like processes, called ctenidia. There is in mollusks a definite heart, which in the primitive forms is three-chambered, i.e., a ventricle and two auricles. The ventricle in the clam and most other bivalves surrounds the intestine; the arteries and veins are well developed; the blood is colorless. Mollusks as a rule differ from other animals in the nervous system, the ganglia, connected by threads (commissures), being grouped around the œsophagus, one pair (the brain) situated above; another, the pedal ganglia, in the foot, and the pair of visceral ganglia, nearer the middle of the body, and innervating the siphon, gills, digestive canal, and heart. See GASTROPODA; CLAM; OYSTER; DECAPODA; and the accompanying illustrations and plates.

Sense organs vary much in situation, number, and size. The eyes of the scallop, which leads an active life, leaping out of the sand and skipping over the surface, are large, highly developed, and numerous, being situated around the edges of the mantle; in those mollusks which burrow (clam) or are fixed (oyster), or live in holes in limestone or coral, etc., the eyes are atrophied. In the squid and other cephalopods they are large and as complicated as those of a fish. The eyes of the land snails are borne at the ends of the tentacles, but in burrowing marine gastropods they may be wanting through disuse, though present in the larvæ.

Our knowledge of the nature of vision in gastropod mollusks has hitherto been very scanty, no observations having been made since those of Lespès in 1851, until experiments by Willem brought out the following results: (1) Snails possess a well-developed power of touch, permitting them to perceive feeble jars of the soil beneath and slight movements of the surrounding media. (2) They see very badly and direct their movements principally by means of the senses of smell and touch. They form a confused image of large objects at an estimated distance of about a centimeter (.40 inch). They clearly distinguish the form of objects only at a distance of one or two millimeters. (3) The fresh-water snails do not have distinct vision at any distance. (4) There does not exist in mollusks a special vision of movements, such as insects possess. In general pulmonate mollusks respond to the action of light, in a degree differing in different species. They have dermatoptic perceptions, which vary much in intensity in different species. Organs of orientation, equilibrium, or hearing are the otocysts. In bivalves a single one is situated in the centre of the foot; in cephalopods they are large and placed one

behind each eye. The otocyst is a primitive form of ear, being a sac containing a minute particle of lime, the otolith. The sense of smell resides in the tentacles of the snail, the olfactory nerve branching out at the end. Also near the visceral ganglia is a group of sense cells (osphradia) supposed to be either olfactory or for testing the purity of the water entering by the respiratory current or, in snails, passing directly into the mantle cavity. Thus the organs of smell appear to be in all the forms represented by groups of specialized cells, which are persistent in nerve supply and position in all mollusks, showing that the sense of smell is all-important. Special organs of taste are as yet unknown in mollusks. Excretory organs are a single pair of highly modified tubes (nephridia) situated one on each side of the body just below the heart. See Nervous System, Evolution of the; Excretory System, Comparative Anatomy of the; and similar titles.

The female ovaries and male reproductive glands are unpaired. The eggs are small and exceedingly numerous, and pass out in bivalves among the folds of the gills, where the young develop. The animal after hatching passes through a gastrula, trochosphere, and veliger stage, the last so called from the two ciliated flaps on each side of the head. Towards the end



LARVAL STAGES OF MOLLUSKS.

A, a trochosphere of the cockle (*Cardium*); *v*, ciliated crown; *fl*, flagellum. *B*, veliger stage, with the shell developing; *v*, velum; *m*, mouth; *li*, liver lobes; *t*, stomach; *i*, intestine; *mt*, mantle; *f*, foot; *ml*, muscle; *n*, nervous ganglion.

of the veliger stage the shell appears, arising from the incipient mantle as a cup-shaped body in both bivalves and univalves, but the hinge and separate valves are indicated very early in the Pelecypoda. In the young *Unio*, or fresh-water mussel, the development history is more condensed. The velum is wanting or vestigial, and the young live between the gills of the parent fastened to each other by their threads (byssus). The shells (glochidium) are triangular, broader than long, with the apex hooked.

Fossil Mollusks. Remains of representatives of all the classes of mollusks occur in the lowest Paleozoic strata, having existed from the Cambrian period down to the present time. As they are so abundant, owing to their preservation as fossils (the shells in the absence of the animal being as a rule useful in classification), the mollusks are of great value as time marks and serve to distinguish the different formations.

The class which occurs fossil in the earliest (Cambrian) strata and concerning which there is no doubt is the Gastropoda. At the base of the Cambrian (Olenellus zone) have been found the shells of such primitive gastropod genera as *Scenella, Stenotheca, Platyceras, Rhaphistoma,* and *Pleurotomaria.* The last-named genus is remarkable for having persisted to the present time, as it is still found at great depths in the Atlantic Ocean. More doubtful are the pteropods of the Cambrian, of the genera *Hyolithes, Forellella,* etc., though their shells are much more abundantly found than those of the Gastropoda proper. Of pelecypods the Cambrian forms are obscure and doubtful, the only ones yet found being a tiny little shell (*Modioloides*), and *Fordilla,* which may turn out to be the shell of a crustacean; and this group is comparatively rare even in the Ordovician strata. Of cephalopods the earliest known genus is *Volborthella,* a minute orthoceratite detected in the Lower Cambrian rocks of Finland and Esthonia and in the St. John group, Nova Scotia.

The Cambrian, Ordovician, and Silurian mollusks present (except in generic and specific characters) comparatively unimportant differences from living forms. The earliest known pelecypods were the forerunners of the Nuculidæ; the earliest gastropods were *Pleurotomaria* and allied genera, some still living at great depths; the pteropods were in the main similar to existing forms, while the earliest cephalopods were the Orthoceratites, which are straight, uncoiled nautiloids. In tens of millions of years, therefore, the shelled mollusks have been one of the most numerous and characteristic groups of invertebrates, and became more and more differentiated and abundant in species, genera, and families as time went on; moreover, they are extremely abundant in the Mesozoic and Cenozoic eras, hence they afford unusually favorable data for the study of the phylogeny of both the chief and subordinate groups. This state of things was taken advantage of by Alpheus Hyatt in studies carried on for nearly 40 years, during which he applied the biogenetic law of Fritz Müller and Haeckel to the cephalopods, showing that the life of the individual during its rise and decline displays phenomena correlative with the collective life of the order to which it belongs. In these and similar studies he was followed by Wurtemberger and Neumayr. Their works on fossil cephalopods bear directly on such subjects as quick evolution, the effects of changes of environment, the action of use and disuse, acting throughout numberless generations. The facts gleaned from these mollusks also bear directly on the causes and mode of origin of the different classes, not only of mollusks, but of all other animal groups. The famous researches on the transmutations of the Tertiary shells of Steinheim by Hilgendorf and by Hyatt, those of Neumayr on the successive forms of *Paludina,* and the studies in the variations and evolution of other types by later authors, prove how valuable the shells of mollusks are in such studies.

For the uses by man of mollusks as food or ornament or money, see under Clam; Gastropoda; Gill; Oyster; Pearl; Pelecypoda; Shell Money.

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ed., ib., 1890); and the new edition, by Simroth, of the third volume of Bronn's *Klassen und Ordnungen des Thierreichs* (Leipzig, 1892–94); A. A. Gould, *Invertebrates of Massachusetts* (Boston, 1870); G. W. Tryon, *Manual of Conchology, Structural and Systematic* (17 vols., Philadelphia, 1879–98); Fischer, *Manuel de conchyliologie* (Paris, 1883–88); A. H. Cooke, "The Mollusca," in the *Cambridge Natural History*, vol. iii (New York, 1895); Pelseneer, *Introduction à l'étude des mollusques* (Paris, 1900); Josiah Keep, *West Coast Shells* (San Francisco, 1911). Morphological works of Owen, Gegenbaur, Huxley, Lamarck, Spengel, Lacaze-Duthiers, Bouvier, Bourne, Peck, Ihering, Brooks, Ryder, Hyatt, with monographs by Dall on deep-sea forms and numerous recent and fossil groups, by Binney, Verrill, Bush, Conrad, Kobelt, Pfeiffer, Martens, Reeves, Stearns, Chemnitz, Bourguignant, Pilsbury, and others.

MOLLWITZ, mŏl'vĭts. A village of Prussian Silesia, in the Government of Breslau, 7 miles west of Brieg. To the east of it lies the battlefield where Frederick II of Prussia gained his first victory over the Austrians under Marshal Neipperg, April 10, 1741. The Prussian cavalry was thrown into confusion by the Austrian and put to flight. Frederick left the field at the earnest solicitation of Marshal Schwerin, who saved the day with the infantry after a five hours' battle. The Austrians suffered heavily in killed, wounded, and prisoners.

MOLLY MAGUIRES, mă-gwīrz'. A secret criminal order which existed in 1854–77, and possibly afterward, in the anthracite coal mining region of northeastern Pennsylvania. Here 400 collieries employed 60,000 men; Americans, Germans, Welshmen, Englishmen, and Swedes comprised in one-half the number, the remainder being Irish. Among the latter appeared the Molly Maguires, a branch of the Physical Force party of Ireland. The order is alleged to have been affiliated with the Ancient Order of Hibernians. About 1865 the Molly Maguires first became generally known as a dangerous organization. In 1875, having been instrumental in forcing a general strike in the coal regions, it succeeded in obtaining an ascendancy in the councils of the miners, and from that period was prominent in assassinations and other outrages, committed usually on the persons and against the property of justices of the peace, police officers, and mining bosses. Only Irishmen, or the sons of Irishmen, who professed the Catholic faith, were admitted to membership; but by the laws of the Church they could not remain Catholics in good standing. The order was organized in divisions, each having a chief official known as a body master; and there were signs and passwords to enable members to distinguish each other. These signs and passwords were given to the members by the body masters, who received them from the county delegate, who got them from the State delegate, to whom they were furnished by the national delegate or national board in New York City; to the latter they came quarterly from Ireland by the hands of the steward of one of the transatlantic steamships. A central and governing organization known as the Board of Erin held quarterly meetings in England, Scotland, or Ireland. The final exposure, capture, and punishment of the Molly Maguires were largely due to the energy and determination of Franklin B. Gowan, president of the Philadelphia and Reading Coal and Iron Company, through the immediate instrumentality of James McParlan, a Pinkerton detective, who joined the Molly Maguires and became acquainted with their members and the secrets of their organization. Many members of the organization were apprehended, tried, and condemned, and their execution—that of a number of them occurring on the same day—so alarmed the members of the order that it ceased to have any extended influence. Consult: F. P. Dewees, *The Molly Maguires: The Origin, Growth, and Character of the Organization* (Philadelphia, 1877); Allan Pinkerton, *The Molly Maguires and the Detectives* (New York, 1878); J. F. Rhodes, "The Molly Maguires in the Anthracite Coal Region of Pennsylvania," in *American Historical Review*, vol. xv (ib., 1910).

MOL'LYMOKE. One of the many variants of mallemuck. See FULMAR.

MOLMENTI, mōl-măn'tē, POMPEO GHERARDO (1852–). An Italian scholar, born in Venice. He studied law at Pisa and Padua and subsequently became professor of Italian literature at the Liceo Marco Foscarini. Almost numberless monographs on various aspects of Venetian history led up to his monumental *Storia di Venezia nella vita privata* (Bergamo, 1908–09; Eng. trans. by Brown, Bergamo-New York, 1908). For this work he was made Senator of the Kingdom.

MOLOCH, mō'lŏk. See MOLECH.

MOLOCH, mō'lŏk. An extremely spinose lizard (*Moloch horridus*) of Western and also South Australia, belonging to the family Agamidæ (see AGAMA), and locally known as York devil or mountain devil. It is 5 to 7 inches long, broad and flat, and its thick skin is covered with spines and tubercles much like those of the American horned toad. This skin, which is yellowish, with reddish-brown blotches, is highly hygroscopic, absorbing water like blotting paper. It inhabits sandy districts, is quite harmless, and apparently lives entirely upon ants, which it catches in enormous quantities upon its long, glutinous tongue. Consult Saville Kent, *The Naturalist in Australia*. See Plate with article LIZARD.

MOLOCH, DER. An opera by Schillings (q.v.), first produced in Dresden, Dec. 8, 1906.

MOLOCHATES. See GEMS.

MOLO DI GIRGENTI, mō'lō dē jĕr-jān'tē. The former name of Porto Empedocle (q.v.), a seaport in Sicily.

MOLOKAI, mō'lō-kī. One of the Hawaiian Islands (q.v.).

MOLOKANI, mō'lō-kä'nē (Russ. pl. of *molokanŭ*, from *moloko*, milk). A Russian sect. It is said the name was given them in derision by the orthodox because, unlike the latter, they do not observe fasts. They call themselves Spiritual Christians. They are rationalists, basing doctrine and practice on the Scriptures interpreted by the individual judgment. As a consequence much diversity of opinion prevails among them, a condition which they do not consider reprehensible. They take the early Apostolic Church as depicted in the New Testament for the model of their ecclesiastical organization and have no hierarchy or paid clergy. A presbyter and assistants are chosen from their own number to care for the spiritual and moral interests of the community. At their religious services, held on Sunday in private houses, as they are not allowed to build churches, they

sing psalms, read the Scriptures, and engage in religious conversation. Doctrinal difficulties and questions of interpretation are freely discussed. They regard the sacraments as only symbolical, and lay aside the numerous ceremonies of the Russian church. They reverence Jesus, but do not believe in his divinity, and consider the miraculous portions of the New Testament narrative as fabulous. They have a system of strict supervision of the conduct of individuals. Offenders against morality are admonished in private or public, or excluded from the religious meetings, or even expelled. The Molokani are described as intelligent, well versed in the Scriptures, and in moral conduct and material prosperity decidedly superior to their orthodox neighbors. Because of their principle of private judgment and readiness to change their views, they are easily influenced by adventurers or fanatics; in several instances communities of them have been led astray by such individuals. They have also developed a tendency to break up into different sects, one of which has adopted many of the canons of the Jewish religion; another has made the common ownership of property one of its principles. Their origin is uncertain. A vague tradition says the sect was founded in the sixteenth century by foreign Protestants. Their original seat was in the south. They have been persecuted by the government, and many have been transported to remote parts of the Empire. Their number is estimated at several hundred thousand. Consult A. F. Heard, *The Russian Church and Russian Dissent* (London, 1887).

MOLON, Apollonius. See Apollonius Molon.

MOLOSSINÆ, mŏl'os-sī'nē. See Bat.

MOLTESEN, môl-tā'sen, Laust Jevsen (1865–). A Danish Church historian, born at Rodhede. Educated for the ministry at the University of Copenhagen, he wrote *Det kristne Munkevæsens Oprindelse og förste Udvikling* (1901) and, as a result of studies in Rome (1894–95), *De Avignonske Pavers Forhold til Danmark* (1896), for which he obtained the doctorate, and *Acta Pontificum Danica, 1316–78*, vol. i (1904). In his field he made large contributions.

MOLTING (ME. *mouten, mowten,* from Lat. *mutare,* to change, frequentative of *movere,* to move, Skt. *mīv,* to push), or Ecdysis. The process of periodically shedding the skin, or integument, or its appendages, as hair or feathers; exuviation.

Molting of Plumage in Birds. The change of plumage, or shedding of the old feathers, and their replacement by a new set. The whole plumage, says Dwight, may be renewed or only a part of it. In the case of most of the passerine birds there are two seasons of molts peculiar to the adults—a complete one, in all species, following the breeding season, and an incomplete molt which in certain species precedes the nuptial season. "The first, the postnuptial, restores the worn-out plumage; the second (when it is not suppressed), the prenuptial, adorns birds for the nuptial season." In a few species the prenuptial molt is complete, though usually the wing and tail are not involved, and often the renewal is confined to "a sprinkling of new feathers here and there." Young birds may also molt several times before they even acquire the feathers of adult structure, and many species need to pass through at least two molts besides those of the first summer before the plumage becomes wholly of the pattern and color of the adult. The loss of feathers during the molting process is so compensated for by the renewal of feathers that few birds (the Anatidæ and some other groups excepted) lose either the ability to fly or the protection afforded by their plumage. The feather areas are systematically replaced, the remiges falling out one after another in definite sequence and almost synchronously from each wing. The greater coverts are regularly replaced before the fall of the secondaries beneath them, the lesser coverts before the median, while even in the rows of the lesser coverts an alternation appears to be attempted. On the body the protective sequence is less obvious, but the molt regularly begins at fairly definite points.

The month of August marks the maximum of the molting season, though there is more or less shedding of feathers in nearly every month of the year. A complete molt is accomplished in from four to six weeks, while partial molts require much less time. A resemblance to the shedding of the skin of reptiles is seen in the ecdysis of the scaly feathers of the penguin, which peel off in flakes.

In certain species of European grouse the claws, which grow to an inordinate length in winter, may be partly shed or worn off as spring advances; the white pelican, both sexes of which during the breeding season bear on the ridge of the bill a horny projection, sheds it, so that these excrescences may be "gathered by the bushel." The puffin (q.v.) and some of its allies molt even the horny sheath of the bill, together with the outgrowths over the eyes.

Molt has recently been given a new importance by the researches of Bureau and Beebe. The former has spent many years in the intensive study of the European partridge and red-legged partridge, and has proved that the sequence of molt of the flight and other feathers is invariable. This lends support to the selection by Beebe of the sequence of tail molt as a trenchant character in dividing the Phasianidæ into subfamilies.

Shedding of Horns, etc., by Mammals. In mammals the periodic shedding of the hair or pelage is comparable with molting; as is also the process of annually shedding the antlers, the new antler being larger and consisting of a larger number of branches or tines. In the deer family the horns of the male are deciduous towards spring, while the pronghorn drops its horns in the autumn.

Molting, or Ecdysis, in the Lower Classes. In animals like Crustacea, Myriapoda, insects, and spiders, with a more or less solid exoskeleton, too dense to permit of gradual growth or increase in volume, there must be a periodical casting of the skin, or ecdysis. The same occurs in salamanders, and especially in the scaly reptiles, as snakes and lizards.

In the Crustacea, insects, and similar animals the old skin dies and the new integument is formed by a secretion thrown out by the inner layer of epithelial cells called the hypodermis. On removing the shell of the lobster the hypodermis is seen to be a richly colored, reddish, soft layer. The formation of the new layer of chitin arrests the supply of nourishment to the old skin, so that it dries and hardens and is finally shuffled off. In the crayfish and presumably in the lobster (q.v.), as well as in

lizards and snakes, the casting of the old skin is materially induced and aided by the growth on the surface of the hypodermis of a layer of very fine and equally distributed hairs, called casting hairs, which, by their rigidity and position, mechanically loosen and raise the old skin. These remain as vestiges, forming spikes, ridges, or warts, serving to ornament the crust of crabs or the outer edges of the skin scales of snakes and lizards.

In insects, where casting hairs are exceptional, the loosening and casting of the skin are brought about by the secretion of a fluid by the cells of the hypodermis. This fluid spreads over the whole surface when the cells are still soft and not hardened by exposure to the air. This same fluid, when the pupa extricates itself from the larval skin, extends around the whole pupa and serves to protect it and to glue together the wings, legs, antennæ, etc., in their new position.

The process of molting as seen in caterpillars (e.g., *Telea polyphemus*) is thus. It changes its skin five times before changing to a chrysalis; and the ecdysis occurs at regular periods, i.e., about every 10 days for the first four moltings, while about 20 days elapse between the fourth and fifth casting. The operation usually takes place after 4 P.M. A little before this time it holds its body erect, grasping a leaf with the two pairs of hind legs only; the skin is wrinkled and detached from the body by the fluid previously mentioned; the body now energetically contracts, so that the skin is pulled off and pushed towards the end of the body; the skin thus becomes so stretched that it soon tears just under the neck, and then separates from the head. When this is accomplished the most difficult operation is over, and now the process of casting goes on very rapidly. By repeated contractions the skin is folded towards the tail, like a glove when taken off, and the lining of the spiracles, mouth, fore stomach, and rectum comes out in long filaments. When about one-half of the body appears, the shell still remains like a cap, inclosing the jaws; then the worm, says Trouvelot, as if reminded of this loose skullcap, removes it by rubbing it on a leaf; this done, the worm finally crawls out of its skin, which is attached to the fastening made for the purpose. Directly after the ecdysis the larva increases in size, the head becoming distinctly larger as well as the body, which soon fills out.

The lobster frequently molts after maturity. But in insects which undergo a complete metamorphosis and which have the longest lives the number of molts is greatest. When the number is excessive this seems to be due to some physical cause, such as lack of food combined with low temperature. In caterpillars the number of ecdyses appears to be dependent on climate.

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MOLTKE, môlt'ke, ADAM WILHELM (1785–1864). A Danish statesman, born at Einsiedelsborg, Fünen. He studied law and in 1831 became Minister of Finance. Upon the death of Christian VIII, in the crisis of 1848, Moltke, who had served two absolute kings, formed a ministry including the most advanced and popular agitators, thus bridging over the gap between the old era and the new. The service he thereby rendered Denmark was very important. His administration introduced the constitution of June 5, 1849, and he also presided over the third constitutional ministry, formed in July, 1851. In 1852 he resigned, disapproving of the decree which sought to change Denmark into a composite, indivisible monarchy. He continued to serve in the Landsting, or Upper House, and from 1855 to 1863 was a member of the consultative Council of State.

MOLTKE, HELMUTH JOHANNES LUDWIG VON (1848–1916). A German general, nephew of the great field marshal Count von Moltke. His brother Friedrich (1852–) was Prussian Minister of the Interior in 1907–10. Helmuth was born at Gersdorf in Mecklenburg-Schwerin, entered the army when he was 20, and served in the Franco-Prussian War as a lieutenant. He was at the Kriegsakademie in 1876–79, became captain with the general staff in 1880, and in 1882–91 was second adjutant to his uncle. Thereafter his advance was rapid, and in 1906 he became chief of the Imperial general staff, receiving the rank of general of infantry in the same year. When war broke out in 1914 (see WAR IN EUROPE) his health was poor, and after repeated reports of his removal he was definitely superseded in December by Gen. Erich von Falkenhayn, former Minister of War, who for some weeks had been taking his place. Moltke's removal was supposed by many to have resulted from an unwillingness to accept the Kaiser's plan of campaign.

MOLTKE, HELMUTH KARL BERNHARD, COUNT VON (1800–91). A famous Prussian general. He was born at Parchim, Mecklenburg-Schwerin, Oct. 26, 1800, of an old noble family. In 1811 he was sent to the military academy at Copenhagen, and in 1819 became an officer in the Danish service, but in 1822 entered the Prussian army as second lieutenant. From 1823 to 1826 he studied at the military college at Berlin. In 1832 he served on the general staff, and was several times promoted, attaining the rank of captain in 1835. In the same year he went to the Orient and, with the sanction of the Prussian authorities, took a prominent part in the reorganization of the Turkish army initiated by Mahmud II. In 1839 Moltke returned to Prussia. His promotion was fairly rapid. In 1856 he was created major general and in 1858 he became chief of the general staff. In 1859 he was appointed lieutenant general. While on the general staff Moltke continued that remarkable development of the Prussian army which had been begun by Scharnhorst in 1807. Staff

schools were established, and Moltke, who was himself a lucid lecturer, succeeded in inspiring his officers with an enthusiastic interest in their work. A constant interchange of line and staff duties kept the staff in touch with the actual discipline, drill, and handling of troops and the business administration of each corps and division. Moreover, plans for possible campaigns and topographical surveys of neighboring countries were made in the minutest details.

After serving for a year as adjutant to Prince Henry of Prussia in Rome, Von Moltke returned to Germany and rose rapidly in the military ranks until in 1848 he became a member of the general staff and in 1855 first adjutant to Prince Frederick William. In 1857 he was appointed chief of the general staff of the army and labored to perfect the military organization. The first test of the system came in 1864 with the war of Prussia and Austria against Denmark. The full revelation of the Prussian efficiency was brought about by the Seven Weeks' War between Prussia and Austria in 1866. Europe was surprised to see a campaign so rapid and successful directed, so to say, from the seat of government, for Moltke had not gone to the front until shortly before the end of the war. The great strategist received from his King, William I, the Order of the Black Eagle, and from the Prussian Landtag 50,000 marks. The Franco-German War of 1870–71 was the crowning triumph of Moltke's career. The war had been long expected, and the marvelous readiness of the Prussian army was in striking contrast to the disorder existing in French military affairs. Moltke did not himself enter France until the war had already been strategically decided, but it was his plan that had been carried out with an astounding certainty and precision. He was rewarded in September, 1871, by promotion to the rank of field marshal and a large grant of money. The title of Count had been conferred upon him in 1870. Other European states also showered honors upon him. On Aug. 9, 1888, Moltke retired from active service. In 1841 he had married a stepdaughter of his sister, who died in 1868.

Moltke's writings on military matters, which include valuable essays on Turkish affairs, have all been published in various editions, the best being *Gesammelte Schriften und Denkwürdigkeiten* (8 vols., Berlin, 1892). English translations have been made under the following titles: *The Russians in Bulgaria and Rumelia in 1828 and 1829* (London, 1854); *Field Marshal Count Moltke's Letters from Russia* (New York, 1878); *The Franco-German War of 1870–71* (ib., 1892; new ed., 1901); *Moltke: His Life and Character, Sketched in Journals, Letters, Memoirs, a Novel, and Autobiographical Notes* (ib., 1892); *Letters of Field Marshal Count Helmuth von Moltke to his Mother and his Brothers* (ib., 1892); *Essays, Speeches, and Memoirs of Field Marshal Count Helmuth von Moltke* (2 vols., London, 1893); *Field Marshal Count Helmuth von Moltke as a Correspondent* (ib., 1893); *Moltke's Letters to his Wife and Other Relatives* (2 vols., ib., 1896); *Moltke's Tactical Problems from 1858 to 1882*, edited by the Prussian general staff (ib., 1899).

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MOLUC'CAS, or SPICE ISLANDS. An archipelago constituting part of the Dutch possessions in the East Indies and comprising most of the islands situated between Celebes and New Guinea and between the Philippines and the Timor Archipelago (Map: East India Islands, G 5, 6). The group lies on both sides of the equator. Its aggregate area is 21,516 square miles. It is divided into the northern and southern Moluccas. The former comprise the islands of Gilolo, the Obi group, Ternate, Tidore, and Morotai, with the adjacent islets; while the latter take in the islands of Ceram, Buru, and the Kei, Aru, and Banda groups with their surrounding islands. Certain authorities include other groups of adjacent islands under this general title, bringing the area thus included up to 43,864 square miles. In geological structure the Moluccas resemble the island of Celebes, being mostly composed of Archæan or Paleozoic rocks. The highest point is Mount Nusa Heli in Ceram, 10,000 feet high. The Moluccas lie in the line of volcanic activity which extends from the Sunda Islands northward through the Philippines and Japan. Many of the smaller islands are of volcanic formation throughout, and on Ternate, as well as in Gilolo, Morotai, Banda, and Tidore, there are active cones. The climate is hot, but as a rule not unhealthful. The Moluccas are not so well watered or rich in vegetation as the more westerly islands in the Dutch East Indies, but the production of spices, from which they derive their name, is very large. The pepper, nutmeg trees, and various other spice-producing plants are here indigenous. Coffee, cacao, tobacco, indigo, and rice are cultivated with success, and the pith of the sago palm is the staple food of the natives. In regard to the fauna, the islands are in the zone of contact of the Indonesian with the Australasian region. Besides species of marsupials there are wild hogs, civet cats, and a species of goats. Birds of bright plumage abound in the forests. Among insects the butterflies are remarkable for their size and the brilliancy of their colors. Sulphur is the most important mineral of the islands, but petroleum, porcelain clay, tin, and coal are also found.

Industry is chiefly confined to the raising of spices and food products. While the clove tree and the nutmeg occur in all the islands, clove culture is carried on especially in Amboina and the Uliassers, and the cultivation of the nutmeg in the Banda Islands. This is due mainly to the fact that the Dutch, in their desire to retain their supremacy in the spice market, restricted the cultivation of these spices to the above-mentioned islands until 1863, when the restriction was taken off. The trade of the group is centred chiefly around Amboina and Ternate. The exports consist mostly of cloves and other spices, sago, and coconuts. Administratively the archipelago is divided into the two residencies of Ternate and Amboina. The chief city as well as the commercial centre is Amboina (q.v.), on the island of the same name. The population is estimated at 450,000, and consists chiefly of Alfurese (q.v.) and Malays, the former being

frequently considered the original inhabitants, and found especially in the interior of the islands. The number of foreigners is insignificant.

The Moluccas were discovered by the Portuguese in 1512 and were formally taken possession of by them in 1521. They were soon, however, taken by the Dutch, who started the cultivation of spices here. In 1605 Amboina was made the chief station of the Dutch East India Company, which also built forts on several other islands. With the annexation of the Moluccas to the Dutch possessions in the East Indies the government also acquired a part of New Guinea and Celebes and a few other islands which constituted parts of the former vast possessions of the sultans of Ternate and Tidore. In 1867 the political unity of the islands was dissolved.

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MOLUCHE, mō-lōō′chā (Western people). An important tribe of Araucan stock (q.v.), residing on the northern head streams of the Limay River in southwestern Argentina. They are distinguished for their light complexion and regular features. Unlike most of their kindred, they are sedentary and industrial, having large herds of sheep and extensive apple orchards, whence they are sometimes called by the Spaniards Manzaneros, or apple people.

MO′LY (Lat., from Gk. *μῶλυ*). A magic herb with a black root and flower white as milk, given by Hermes to Odysseus as a protection against the magic of Circe (q.v.). (Cf. *Odyssey*, x, 305 ff.) Some scholars have identified the Homeric moly with hellebore (q.v.), much used in ancient times as a remedy against madness. In later writers the word is applied to garlic.

MOLYB′DENITE (from *molybdena*, from Lat. *molybdæna*, from Gk. *μολύβδαινα*, *molybdaina*, galena). A mineral, molybdenum disulphide, that crystallizes in the hexagonal system in soft, flexible, nonelastic plates, has a metallic lustre, and is of a bluish-gray color. It occurs in granite, gneiss, limestone, and other crystalline rocks and is found at various localities in Sweden, Norway, Finland, Saxony, France, Italy, Canada, and in the United States at various points in New England, New York, Pennsylvania, and California. It was long confounded with certain compounds of lead and of antimony until about 1778, when Scheele clearly showed that it was quite distinct from those substances. Molybdenite is the chief source of the molybdenum salts which are of considerable importance in chemical analysis and in the chemical industries such as dyeing, coloring pottery, etc. See MOLYBDENUM.

MOLYB′DENUM (Neo-Lat., from Lat. *molybdæna*, galena or litharge). A metallic element isolated by Hjelm in 1790, after Scheele had transformed the known sulphide of molybdenum into molybdic acid in 1778. The name was applied by the ancients to various substances containing lead. Subsequently it was applied to graphite and the mineral molybdenite. Molybdenum is not found native, but in combination as the sulphide (*molybdenite*), which is the source of the commercial supply of molybdenum, as the oxide (*molybdite*), with lead (*wulfenite*), and with cobalt (*pateraite*). In smaller quantities it is also found in other minerals. The metal itself is obtained by heating its chloride or trioxide to redness in a current of hydrogen. Molybdenum (symbol, Mo; atomic weight, 96) is a silver-white metal with a specific gravity of 8.6 and a melting point above that of platinum and but slightly below that of tungsten. It combines with oxygen to form the following four oxides: a monoxide (MoO), a sesquioxide (Mo_2O_3), a dioxide (MoO_2), and a trioxide (MoO_3), of which the trioxide is the only important commercial compound of molybdenum. The trioxide, usually called molybdic acid, combines with bases to form molybdates, of which the ammonium molybdate, $(NH_4)_2MoO_4$, is of value as a reagent for phosphoric acid. Molybdenum itself is used for hardening steel, molybdenum steel being even better than tungsten steel for the manufacture of tools. For this purpose it is used either as comparatively pure molybdenum or in the form of ferromolybdenum, an alloy made in the electric furnace and containing from 50 to 85 per cent of molybdenum, from 10 to 50 per cent of iron, small percentages of carbon, and very small quantities of silicon, sulphur, and phosphorus. See MOLYBDENITE.

MOLYN, mō-līn′, PIETER DE (c.1595–1661). A Dutch landscape and genre painter and etcher, born in London. A pupil of Frans Hals at Haarlem, he was received into the guild there in 1616. Besides landscapes in the style of Jan van Goyen, enlivened with biblical and other accessory figures or animals, he painted village festivals, military scenes, and the like with a broad touch and warm, forcible coloring. His pictures are very rare. The Brunswick Gallery contains a fine landscape of "Sandhills with Group of Trees" (1626) and the Berlin Museum a "Ravine with Figures" of very powerful effect. In the Museum at Brussels may be seen a "Night Festival" (1625), at Haarlem the "Sacking of a Village" (1630), and in the Metropolitan Museum, New York, a "Cottage with Landscape." Several of the pictures attributed to him in other galleries are probably by Pieter Mulier (q.v.).

MOLYN, PIETER DE, THE YOUNGER. See MULIER.

MOLYNEUX, mŭl′ĭ-nųks, WILLIAM (1656–98). An Irish philosopher and author, born in Dublin. He graduated at Trinity College, Dublin, in 1675; studied law at the Middle Temple, London, in 1675–78; published a translation of Descartes's *Meditationes de Prima Philosophia* in 1680; and in 1683 assisted in founding the Dublin Philosophical Society, of which the Royal Irish Academy was successor. In 1689–90, owing to the disturbances attending Tyrconnel's government, he resided in Chester, England, where he wrote the major part of his *Dioptrica Nova: A Treatise of Dioptrics* (1692), which long continued to be the most important work on the subject. From 1692 until his death he represented Dublin University in the Irish Parliament. He published in 1698 his *Case of Ireland Stated, in Relation to its Being Bound by Acts of Parliament Made in England* (1698),

his best-known work, in which he sought to prove the independence of the Irish Parliament and which evoked much discussion. His further writings include *Sciothericum Telescopicum* (1686), describing "a new contrivance of adapting a telescope to a horizontal dial."

MOLZA, mŏl'tsȧ, Francesco Maria (1489–1544). An Italian poet, born at Modena. He went as a youth to Rome, and after living for five years in Modena, returned to Rome in 1516. From this time he led a life of reckless dissipation. At times he was in the service of Cardinal Ippolito de' Medici and again in that of Cardinal Alessandro Farnese, but he wrote much graceful verse in the meantime. The most celebrated of his poems is the *Ninfa Tiberina*, composed in honor of Faustina Mancini. He wrote also sonnets, burlesques, romances, elegies, and epigrams. Consult *Poesie volgari e latine* (Parma, 1747–54). His granddaughter, Tarquinia Molza (1542–1607), was also a poet. Several of her poems have been printed with the works of her grandfather.

MOMBASA, mŏm-bȧs'ȧ, or **MOMBAZ.** The chief seaport town of the British East Africa Protectorate, situated on a small coral island off the coast in lat. 4° 3′ S. and long. 39° 43′ E., about 150 miles north of Zanzibar Island (Map: Africa, J 5). The shores of the island are rocky and abrupt; the island is connected with the mainland by a railway line. Mombasa is an important commercial centre, a naval coaling station, and the terminus of the Uganda Railway. It has a sheltered but shallow harbor with an iron pier and a stone wharf. There are a number of ancient buildings which testify to the ancient prosperity of the place, but the houses in the native quarter generally are poorly built. The chief object of interest is an extensive fort on a scarped rock built in 1596 by the Portuguese and restored in 1635. To the south of the fort is an attractive European quarter containing the bungalows of the official and commercial classes, the Anglican cathedral, the Roman Catholic church, three well-equipped hotels, and numerous European shops. Near the fort are the buildings of the High Court of British East Africa, of which Mombasa is the seat, the European Club, and the White Hospital. On the other side of the island, some 2 miles west of Mombasa, is Kilindini, now the chief port of entry for British East Africa and Uganda. It has the deepest landlocked harbor on the east coast of Africa, and vessels of the largest tonnage can enter safely. It is connected with Mombasa by a trolley line and contains the cable station of the Eastern Telegraph Company and numerous warehouses situated near the wharf. Mombasa has a thriving population both native and white and contains a number of East Indians, for whom special schools are provided by the government, which also furnishes an elementary school for the children of European parents. Mombasa was visited by Vasco da Gama in 1497 and held by the Portuguese during the greater part of the period from 1529 to 1698, when it appears to have become independent. The English held it from 1824 to 1826, after which it passed to Zanzibar and was ceded in 1891 to the Imperial British East Africa Company. At present it is under the direct administration of the crown. Pop., 1913, about 30,000, mainly Swahili, but containing some 4600 East Indians and 267 Europeans. Consult *Handbook for East Africa* (Mombasa) and Lord Cranworth, *A Colony in the Making* (London, 1912).

MOMBERT, mŏm'bĕrt, Jacob Isidor (1829–1913). An American Protestant Episcopal clergyman and scholar. He was born at Cassel, Germany, studied in England, at Leipzig, and at Heidelberg; was ordained priest in 1857; and afterward held charges in Quebec, Lancaster (Pa.), Dresden (Germany), Jersey City and Passaic (N. J.). After 1882 he devoted himself largely to study and writing. He translated Tholuck's *Commentary on the Psalms* and wrote: *Faith Victorious* (1882), a life of Archdeacon Johann Ebel of Königsberg; *Handbook of the English Versions of the Bible* (1883; new ed., 1907); *Great Lives* (1886); *Life of Charles the Great* (1889); *Short History of the Crusades* (1894); *Raphael's Sistine Madonna* (1895). In 1884 he brought out a verbatim reprint of the edition of 1530 of William Tyndale's *Five Books of Moses*, with various collations and prolegomena.

MO'MENT (Fr. *moment*, from Lat. *momentum*, movement, alteration, particle sufficient to turn the scales, moment, from *movere*, to move, Skt. *mīv*, to push). When portions of matter are in rotation about an axis those physical quantities which are used to describe motion of translation—e.g., force, momentum, inertia, or mass—cease to be useful in expressing the properties of the angular motion. Analogous expressions, however, can be found which are called moment of force, moment of momentum, moment of inertia—all with reference to the axis of rotation—which play the same part in the equations of rotation as do force, momentum, and mass in translation. The moment of a force about an axis is the product of the numerical value of the force by the perpendicular distance from the axis to the line of action of the force. The moment of momentum of a particle about the axis is the product of the momentum by the perpendicular distance from the axis to the direction of the velocity of the particle. (If the particle forms part of a rigid body rotating about a fixed axis, the moment of momentum equals the product of the moment of inertia and the angular velocity.) The moment of inertia of a rigid body about an axis is the summation of a series of terms, $m_1r_1^2 + m_2r_2^2 + \ldots$ (or Σmr^2), where m_1 is the mass of a particle of the body and r_1 is its distance from the axis, etc. See Mechanics.

MOMEN'TUM (Lat., movement, alteration, particle sufficient to turn the scales, moment), or Quantity of Motion. The product of the mass of a moving particle and its linear velocity. (It is a vector quantity.) Both terms were used by Galileo; the latter by Newton. It is a fundamental principle of mechanics (q.v.) that the numerical value of the influence of any external body in changing the motion of a moving particle is the rate of change of momentum with reference to the time, or the change in one second if the change is uniform. The total change of momentum in any time equals the impulse of the external force, or the product of the force and the interval of time. If a bullet enters a target, the *time* required for it to come to rest depends upon its *momentum;* but the *distance* it enters, upon its *kinetic energy.* Thus, to produce a powerful blow a great momentum (mv) is required; but to do destructive damage, great kinetic energy ($\frac{1}{2}mv^2$). If a system of bodies is moving free from external

influence, the geometrical sum of the linear momenta of all the bodies of the system remains unchanged regardless of how the momenta of the individual bodies are altered by impacts, explosions, etc. This is called the principle of the conservation of linear momentum. (By geometrical sum is meant the process of adding geometrically the lines which indicate the momenta of the individual bodies of the system.)

If a rigid body is rotating about a fixed axis, the product of its moment of inertia about this axis and its angular velocity is called its angular momentum, and it plays the same part in motion of rotation that linear momentum does in translation. See MECHANICS.

MOMIERS, mô'myâ' (Fr., mummers). The name given in derision to a class of evangelical Protestants of Switzerland and adjacent parts of Germany and France which sprang up about 1817 and whose members exhibited an uncommon degree of fervor in their religious services. They charged the national church with apostasy from the reformed faith, especially by denying the divinity of Christ. This subjected them to opposition, restraint, and fines. Among those who belonged to the Momiers or sympathized with them were César Malan, Louis Gaussen, Merle d'Aubigné, and F. Monod (qq.v.). Out of this sect sprang the French society styled the Evangelical Society for the Conversion of Roman Catholics, and the Free Church of Switzerland. Consult: *Geschichte der Momiers* (Basel, 1825); Von der Goltz, *Die reformirte Kirche Genfs im 19. Jahrhundert* (ib., 1864); Chenevière, *Quelques mots sur la Genève religieuse au XIXème siècle, de M. le Baron de Goltz* (Geneva, 1863).

MOMMSEN, mŏm'zen, THEODOR (1817–1903). An eminent German classical scholar. He was born Nov. 30, 1817, at Garding in Schleswig, where his father was a pastor. From 1838 to 1843 he studied at the University of Kiel, devoting himself especially to legal and historical subjects. From 1844 to 1847 he traveled and studied in Italy and France, giving special attention to inscriptions. In 1848 he became editor of the *Schleswigholsteinische Zeitung* at Rendsburg, and in the autumn of the same year was called to Leipzig as professor extraordinarius of law. Two years later, however, having been removed for political reasons, he withdrew to Switzerland, where he became professor of Roman law at the University of Zurich in 1852. After two years he was called to a similar position at Breslau and from 1858 he was professor of ancient history at Berlin. From 1874 to 1895 he was permanent secretary of the Berlin Royal Academy of Sciences. He also served as deputy in the Prussian Parliament from 1873 to 1882 and was a powerful factor in all liberal movements. Mommsen's literary activity began in 1843 with his famous monograph, *De Collegiis et Sodaliciis Romanorum,* and from that time he continued to make most important contributions to almost every field of classical learning. In 1902 he was awarded the Nobel prize for literature. His greatest works are: *Die unteritalischen Dialekte* (1850); *Römische Geschichte* (1854–56); vols. i–iii, in 8th ed., 1888; Eng. trans., New York, 1894), unquestionably one of the most masterly histories ever written; *Römische Chronologie* (2d ed., 1859); *Die Geschichte des römischen Münzwesens* (1860); *Römisches Staatsrecht* (3d ed., 1887–88); *Römisches Strafrecht* (1899); *The Provinces of the Roman Empire* (1885; 5th ed., 1894; Eng. trans. by W. P. Dickson, 1886, revised by F. Haverfield, 1909). Mommsen more than any other man became the founder of modern Latin epigraphy. (See INSCRIPTIONS, *Latin.*) By his publication of the volume *Inscriptiones Regni Neapolitani Latinæ* (1852) and his *Inscriptiones Confœderationis Helveticæ Latinæ* (1854) he set the model which has been followed in the great collection of Latin inscriptions, the *Corpus Inscriptionum Latinarum,* which has been published at the expense of the Berlin Academy since 1863. Of this great work Mommsen himself edited vols. i, iii, viii, and ix. He published also a large number of epigraphical works, one of the most important of which is the *Monumentum Ancyranum,* with extensive commentary (2d ed., 1883. This work deals with the great inscription described under ANGORA). He also edited many Latin works, including the *Digest,* the *Edict* of Diocletian (1893), and the *Codex Theodosianus* (1904–05), and served as coeditor of the *Monumenta Germaniæ Historica.* Many of his separate papers were gathered together in two volumes entitled *Römische Forschungen* (1863–79). Since his death his *Gesammelte Schriften* have been published in 8 volumes. For a full list of his publications up to 1887, consult Zangemeister, *Theodor Mommsen als Schriftsteller* (Heidelberg, 1887; expanded by Jacobs, 1905). See also C. Wachsmuth, *Worte zum Gedächtniss an Theodor Mommsen* (Leipzig, 1904), and J. E. Sandys, *A History of Classical Scholarship,* vol. iii (Cambridge, 1908).

Two of Theodor Mommsen's brothers were recognized scholars in special fields. TYCHO (1819–1900) was born at Garding, studied at Kiel, and was engaged in educative work until 1885, when he retired. He published a critical edition of Pindar (1864) and other works on the Greek poet. AUGUST, who was born at Oldesloe, and studied at Kiel, was also engaged in educational work, and published several volumes relating to Greek and Roman chronology.

MOMOR'DICA (Neo-Lat., from Lat. *mordere,* to bite; so called because the seeds look as if bitten). A genus of the family Cucurbitaceæ. *Momordica balsamina,* a native of southern Europe and of the East, used to cover arbors, produces a curious, oblong, much-warted fruit, called the balsam apple, which, when green, is infused in oil to form a vulnerary much esteemed in Syria and some other countries. The large, red, thorny fruit of *Momordica cochinchinensis,* called golkakra in India, is there used for food. *Momordica charantia,* a native of Asia and Africa, grown as an ornamental in the United States, is noted for its peculiarly sculptured seeds, the pulp surrounding which is eaten by the Chinese. *Momordica involucrata* is also cultivated as an ornamental.

MOMOSTENANGO, mō'mōs-tā-nän'gō. A town of the Department of Totonicapan, Guatemala, 60 miles northwest of the city of Guatemala. It is situated on a high plateau in the midst of an important agricultural region producing, rice, corn, and beans. Its inhabitants, chiefly Indians, are also engaged in weaving woolen cloth. Pop., about 18,000.

MO'MOTOM'BO. A volcano in Central America, situated on the northwest shore of Lake Managua in Nicaragua (Map: Central America, D 4). Its height is 6124 feet. It is still active; its last great eruption occurred in 1852.

MOMPÓS, mŏm'pōs, or **MOMPOX.** A town

of the Department of Bolívar, Colombia, situated on the Magdalena, 110 miles southeast of Cartagena (Map: Colombia, C 2). It has two colleges and several elementary schools. It was formerly an important port, but the river at this point is no longer navigable. The chief occupation of the inhabitants is the manufacture of jewelry, tools, and instruments. Pop. 1912, 14,703.

MO'MUS (Gk. Μῶμος, *Mōmos*, ridicule). To the Greeks the personification of mocking censure. In Hesiod, *Theogony*, 214, he is the offspring of Night, and in the lost epic poem, *Cypria* (q.v.), he seems to have suggested to Zeus the marriage of Thetis and the birth of a fair daughter, which would together bring about the Trojan War. His story was chosen for satyr dramas, and his name became proverbial for a carping and mocking critic. In Lucian and his contemporaries Momus is more prominent than in the earlier writers, and criticizes all the gods for their defects, even to the shoes of Aphrodite, who was otherwise faultless. For this Zeus finally drove him out of heaven. Consult Lucian, *Hermotimus*, 20, and *Deorum Concilium*.

MONA, mō'nȧ. An opera by H. Parker (q.v.), first produced in New York, March 14, 1912.

MO'NA. The name given by the Romans to an island invaded by Suetonius Paulinus in 60 A.D., and conquered by Agricola in 79 A.D. The island is commonly identified with Anglesey (q.v.), though on that island only meagre traces of Roman occupation have been found. The name Mona was sometimes applied by error, rather to the Isle of Man (q.v.).

MONACA, mŏn'*a*-k*a*. A borough in Beaver Co., Pa., 25 miles west of Pittsburgh, on the Ohio River and on the Pittsburgh and Lake Erie Railroad (Map: Pennsylvania, A 5). There are manufactories of enameled porcelain ware, glass, tile, tubing, drawn steel and wire, tools, etc. Fire clay is found in large quantities in the vicinity. Thiel College was founded here in 1866 and was removed to Greenville five years later. Monaca owns its water works. Pop., 1900, 2008; 1910, 3376.

MONACHISM, mŏn'ȧ-kĭz'm. See MONASTICISM.

MONACI, mō-nä'chē, ERNESTO (1844–). An Italian scholar in Romance philology, born at Soriano (Province of Rome). He studied the Romance languages and became professor of Romance philology at the University of Rome in 1876. The *Rivista di Filologia*, which he founded in 1872, with Stengel and Manzoni, ceased publication in 1876, but the *Giornale di Filologia Romanza* (1878–84) was virtually a continuation of it. Monaci published detached essays along the same line in the *Studi di Filologia Romanza* and under the following titles: *Uffizi drammatici dei disciplinati dell' Umbria*, in the *Rivista di Filologia* (1872); *Il canzoniere portoghese della Biblioteca Vaticana* (1875); *Il canzoniere portoghese Brancuti-Colocci* (1875–80); *Il canzoniere chigiano* (1878), with Molteni; *Testi antichi provenzali* (1889); *Facsimili di antichi manoscritti per uso delle scuole di filologia neolatina* (1881, 1892); *Crestomazia italiana dei primi secoli con prospetto delle flessioni grammaticali e glossario* (1889, 1912); *Sull' antica parafrasi dei disticha de moribus verseggiata da un rimatore anagnino* (1899). He also edited the *Studi romanzi* of the Società Filologica Romana (10 vols., 1903–13).

MONACO, mŏn'ȧ-kō. An independent Italian principality under the protection of the French government since 1860, and the smallest sovereign state of Europe, bounded by the Mediterranean and the French Department of Alpes-Maritimes (Map: France, S., M 5). Its area is about 8 square miles and the principality practically consists of the capital, Monaco, Monte Carlo (q.v.), and the village of Condamine, between the two towns. It is in a mountainous country, renowned for its picturesque scenery. The chief exports are oil, oranges, lemons, perfumeries, liquors, and artistic potteries, although its inhabitants are engaged chiefly in providing accommodations for tourists. In 1913 there were 1,692,258 visitors. The government of the principality is that of a constitutional hereditary monarchy. In 1911 Prince Albert granted a constitution, which established a National Council of 21 members. They are elected for four years by universal suffrage with *scrutin de liste*. The government is carried on by the Prince with the aid of a cabinet and a Council of State. There is a court of first instance and a court of justices of the peace, but no jail, all prisoners being sent to France. The judges are appointed by the Prince, mostly from members of judicial bodies in France, and the French Code has been adopted with some modifications by the principality. The police force consists of 4 officers and 82 gendarmes. There is no army and little taxation, the revenue being derived almost entirely from the profits which are received from the famous gaming tables at Monte Carlo. The principality forms a Roman Catholic bishopric, and the Roman Catholic church is recognized and supported by the state. Pop., 1908, 19,121; 1913, 22,956. The population of Monte Carlo is about 10,000.

Monaco was conferred on a member of the Genoese house of Grimaldi in 968. In 1450 the principality passed under the protection of Aragon, but, dissatisfied with the Spanish rule, it came under the protection of France in 1641. In 1731 the last male member of the house of Grimaldi was succeeded by his daughter Louise Hippolyte. She had married James de Goyon Matignon in 1715. Upon her death he acceded to the throne and added the name Grimaldi to his own. Thus the present ruling house is the Goyon-de-Matignon-Grimaldi. The National Convention annexed the principality to France in 1793. By the Treaty of Vienna it came under the protection of Sardinia. In 1861 the communes of Mentone and Roccabruna (Roquebrune) were ceded by Sardinia to France, for which the Prince of Monaco received in the following year an indemnity of 4,000,000 francs. The war which broke out in Europe in 1914 (see WAR IN EUROPE) was very disastrous for Monaco. The gaming tables were perforce deserted and thus its most profitable source of income cut off.

Bibliography. Métivier, *Monaco et ses princes* (La Flèche, 1865); H. Pemberton, *The History of Monaco, Past and Present* (London, 1867); Harris, *Monaco: pièces historiques et traités* (Nice, 1882); Boyer de St. Suzanne, *Les petits états de l'Europe: la principauté de Monaco* (Paris, 1884); Gustave Saige, *Documents historiques relatifs à la principauté de Monaco* (Monaco, 1890–91); id., *Monaco, ses origines et son histoire* (Paris, 1898); M. Moncharville, *Monaco, son histoire diplomatique: la*

question des jeux (ib., 1898); H. France, *Au pays de Cocagne: la principauté de Monaco* (ib., 1901); L. Taxil, *Monaco* (ib., 1905); E. C. Mayne, *Romance of Monaco and its Rulers* (New York, 1910); Adolphe Smith, *Monaco and Monte Carlo* (London, 1912).

MONACO. The capital of the Principality of Monaco, situated on a promontory in the Mediterranean, about midway between Nice and Mentone (Map: France, S., M 5). Its chief buildings are the palace of the Prince, with a beautiful garden, and the new cathedral, built in the Romano-Byzantine style. Near the town is the famous gambling resort of Monte Carlo (q.v.). The adjoining commune of Condamine has a railway station and some industries. Monaco is a sea-bathing resort and its climate is considered very healthful. Pop., 1913: Monaco, 2247; Condamine, 11,082.

MONACO, Albert Honoré Charles, Prince of (1848–1922). Ruler of the Principality of Monaco (q.v.) and an oceanographer. Born in Paris, he received a French education and served in the Spanish navy as ensign, but entered the French navy as lieutenant in 1870 during the Franco-German War. In 1889 he succeeded his father Charles III (1818–89). He was married twice, but divorced each time. His first wife was Lady Mary Douglas-Hamilton (later Countess Festetics), by whom he had a son, the heir apparent, Louis Honoré Charles Antoine, born at Baden-Baden in 1870; his second wife was Alice Heine, the widow of the Duke of Richelieu and a member of the family of Hamburg bankers. In 1911 he granted a constitution to the principality. The Prince of Monaco undertook a number of scientific voyages to investigate deep-sea life and sea currents; in 1899, with Thoulet and Saverweiss, he was appointed a member of the committee charged by the Geographical Congress at Berlin with the preparation of a map of the oceans (24 parts, finished 1904). On one of his trips he visited the United States (1913). He is the author of *La carrière d'un navigateur* (2d ed., 1905) and many essays on oceanographic researches.

MONACO, Lorenzo. See Lorenzo Monaco.

MO'NAD (from Lat. *monas*, from Gk. *μονάς*, unit, from *μόνος*, *monos*, single; connected with Ger. *man*, only, Lith. *mináu*, throughout). 1. In early modern philosophy, a term used to designate the ultimate elements of reality (Bruno). By Leibnitz, from whose system the name has derived importance, it is used to designate the spiritual atoms which compose the universe. (See Leibnitz.) 2. In biology, a generic term for a simplest organism defined as being without a nucleus. In the old system of Ehrenberg, *Monas* was a large genus, but it has become more and more restricted, as better methods and apparatus have resulted in the discovery of a nucleus where none was believed to occur. The forms once included in the genus are now distributed among the flagellate Infusoria on the one hand (Haeckel's Monera; see Moner) and the bacteria on the other. As it is quite probable that there is no organism without nuclear matter, the name is practically obsolete.

MONAD'NOCK. A hill or mountain which projects above the general level of an old eroded mountain surface. In the process of denudation it not infrequently happens that certain prominences by reason of their being formed of very hard resistant rocks withstand the wear much more effectually than the surrounding mountains so that they still present considerable elevations after the latter have been reduced to a nearly plane surface. Such remnant mountains are called monadnocks, after the mountain of that name in New Hampshire.

MONAD'NOCK, Grand. An isolated mountain in Cheshire County, in the southwestern corner of New Hampshire (Map: New Hampshire, E 8). It is regarded as an outlying member of the White Mountain group, is 3186 feet high, and commands a fine view from its summit.

MONAGAS, mō-nä'gȧs, José Gregorio (1795–c.1870). A President of Venezuela, brother of José Tadeo Monagas (q.v.), born in Maturín. His early life was spent as a herdsman on the plains and he served with some distinction in the War of Independence. He aided his brother in the insurrections of 1831 and 1835 and in 1850 was elected to the presidency through the support of José Tadeo. His administration was tranquil and his one service to the country was the signing of the law abolishing slavery, which was passed at the close of his term (March 24, 1854).

MONAGAS, José Tadeo (1788–1868). A Venezuelan soldier and president, born at Maturín. Having received a common education, he became manager of a large estate, and when the War of Independence broke out he joined the Patriot army and served with distinction. He led revolts against the conservative oligarchy in 1831 and 1835, but later aided this party in crushing out a liberal revolt (1846). In this latter year, with the support of ex-President Paez and the conservatives, he was elected to the presidency. Preferring to govern with the liberal element, he alienated the conservatives, who endeavored to bring charges against him in Congress. He saved himself from making a defense by instigating a riot in Congress in which a number of the conservatives were killed (Jan. 24, 1848) and opposition to his dictatorial rule was crushed. Paez started a revolt, but Monagas forced him to surrender (1849) and sent him into exile. In 1850 he secured the election of his brother José Gregorio to the presidency, but four years later he himself was again elected to this office. He carried out a revision of the constitution (1857), partly with a view to maintaining himself in power, and was reëlected again for a term of six years (April 18, 1857). The next year a revolution headed by Castro took place, and Monagas was forced to resign and to go into exile. Ten years later he returned to Venezuela, led a successful revolt against President Falcón, and was again elected President, but died before taking office.

MONAGHAN, mŏn'*a*-*gan*. An inland county in the southern part of Ulster, Ireland (Map: Ireland, E 3). Area, 496 square miles. The surface is in general undulating, with a gradual slope from southeast to northwest. The highest point is 1250 feet above the sea. It is watered by the Finn and the Blackwater. Less than half the area of the county is arable, producing cereal crops (with the exception of wheat) and flax. There are manufactures of linen; freestone and slate are quarried; cattle, sheep, and pigs are raised. The principal towns are Monaghan (q.v.), the county seat, Carrickmacross, Clones, and Castle Blayney. Pop., 1841, 200,500; 1901, 74,611; 1911, 71,455.

MONAGHAN. The capital of County Mon-

aghan, Ireland, 52 miles southwest of Belfast (Map: Ireland, E 3). Among its public buildings are the market house, courthouse, a national model school, Roman Catholic college, convent of St. Louis, and the modern cathedral of St. MacCarthain. The town is the centre of a trade in flax and grain. Two markets for agricultural produce are held weekly and there is also a monthly fair. Near by is Rossmore Park, the residence of Lord Rossmore. Pop., 1901, 2932; 1911, 4272.

MONALDESCHI, mō'nål-dĕs'kē, GIOVANNI, MARCHESE. An Italian noble of the seventeenth century, a favorite of Christina of Sweden. He was a member of a noble family of Ascoli and a leader of the French party at Rome; and after the disgrace of Pimentelli and the Spanish party at the Swedish court came into the favor of the Queen. In 1657, during her visit at the French court, she accused him of high treason and had him assassinated at Fontainebleau. The real reason for his murder is unknown. Consult Martens, *Causes célèbres du droit des gens* (2d ed., Leipzig, 1858).

MONA LISA, mō'nà lē'zà. See VINCI, LEONARDO DA.

MO'NA (Sp., Portug., It., female monkey) **MONKEY.** A west African guenon (*Cercopithecus*, or *Lasiopyga, mona*), familiar in menageries and as a pet. It is of small size, black on the back, with the face purple, except the pink lips and chin. The undersurface is white, abruptly demarked from the black mantle; the bushy whiskers are yellow; a gray band extends across the forehead; and there is an oval white spot on each side of the root of the tail. It is a docile and interesting animal. Cf. GUENON; DIANA MONKEY.

MON'ARCH. See MILKWEED BUTTERFLY.

MONARCHIANS, mŏ-när'kĭ-anz (from Gk. *μοναρχία, monarchia*, sole power, from *μόναρχος, monarchos*, monarch, from *μόνος, monos*, single + *ἄρχειν, archein*, to rule). A term of Christian theology, applied to certain persons in the early Church who objected to the orthodox Christology on the ground that it suggested two gods (or three, if the Holy Spirit was included), and who maintained, in opposition, what was called the divine 'Monarchy' (Gk. *μοναρχία*), or essential oneness of the Deity. The questions at issue were the relationship of Christ to the Father and Christ's preëxistence. If Christ was God incarnate, as the Church taught, then it must follow, said some, that God has entered the world and has lived, suffered, and died among men. Christ is indistinguishable from God the Father and is merely a form or mode of manifestation of the supreme Deity, who might reveal Himself as Father, Son, or Spirit. This doctrine was called Modalism, or, more exactly, Modalistic Monarchianism. It was also known as Patripassianism, from the fact that it represented the Father as suffering. Among its adherents were Praxeas, an Asiatic Christian, who visited Rome late in the second century and was opposed by Tertullian and by Noëtus of Smyrna, whose views were combated by Hippolytus. The most celebrated Modalist, however, was Sabellius (q.v.), who flourished early in the third century and who taught that the Trinity consisted of three successive manifestations of God in history. Eastern Modalism was commonly called Sabellianism after him, and this name ultimately came into use in the West also.

But there were some Christians who attempted, in just the opposite fashion, to answer the question how Christ was related to God. Their method was not identification but distinction. Christ they held to be a created being, a man like other men, but they believed he became the Son of God by adoption, through an impartation of divine powers, usually regarded as received at his baptism. These persons are known as Dynamic Monarchians (from Gk. *δυνάμεις*, powers), to distinguish them from the other Monarchians described above. One of the leaders of this school was Theodotus the Tanner, who came to Rome from Byzantium late in the second century and was there excommunicated by Pope Victor I. Another leader also bore the name Theodotus. He was a money changer, a disciple of Theodotus the Tanner. Artemon, in the third century, continued the same teaching. All these three appear to have been laymen. The Theodotians and Artemonites were called after them and figure prominently among the third-century heretics. Dynamic Monarchianism found an able representative in Paul, Bishop of Samosata and Prime Minister of Zenobia, Queen of Palmyra, who was excommunicated by an Asiatic synod about 268. (See PAUL OF SAMOSATA.) The Dynamic Monarchians were probably much less numerous than the Modalists.

Over against all these Monarchians of either type the main body of the Church maintained the divinity of Christ along with his personal distinction from the Father. The orthodox doctrine was that Christ is a preëxistent divine hypostasis (q.v.), who became man through the incarnation and is therefore both God and man, two natures in one person. Irenæus, Tertullian, Hippolytus, Novatian, and especially Origen, all contributed towards this doctrinal development, and in the fourth century the Monarchian controversy gave way to the Arian. (See ARIUS.) Consult: Adolf Harnack, *History of Dogma*, vol. iii (Boston, 1897); G. P. Fisher, *History of Christian Doctrine* (New York, 1896); Smith and Wace, *Dictionary of Christian Biography* (4 vols., London, 1877–87), articles "Theodotus," "Artemon," "Praxeas," "Noëtus," "Sabellius," "Paul of Samosata," etc. See CHRISTOLOGY.

MON'ARCHY (Lat. *monarchia*, from Gk. *μοναρχία*, sole power). In the strict sense of the term, that form of state in which the sovereign authority is vested in a single person. It is only when the king or chief magistrate of the community possesses the entire ruling power that he is, in the proper acceptation of the term, a monarch; but in a mere popular sense the term "monarchy" is applied to any state in which the chief executive authority is vested in a single hereditary ruler. The degenerate form of monarchy is tyranny, or government for the exclusive benefit of the ruler. When the head of the state, still possessing the status and dignity of royalty, shares the supreme power with a class of nobles, with a popular representative body, or with both, the government, though no longer in strictness monarchical, is called in popular language a mixed or limited monarchy, the term "absolute monarchy" being applied to a government properly monarchical. If the monarch in the exercise of his powers is restrained by the precepts of a constitution, the state is commonly styled a constitutional monarchy. Monarchy, although usually hereditary, has sometimes been elective, a condition generally attended with feuds and distractions, as

was the case in Poland (q.v.). Constitutional monarchy may be in its origin elective, or combine both systems, as when one family is disinherited and the sceptre declared hereditary in the hands of another under certain conditions, as occurred in England in 1688. See GOVERNMENT; KING; REPUBLIC.

MO'NAS. See MONAD.

MON'ASTERY (Lat. *monasterium*, from Gk. *μοναστήριον*, monastery, solitary dwelling, from *μοναστής*, *monastēs*, solitary man, monk, from *μονάζειν*, *monazein*, to dwell alone, from *μόνος*, *monos*, single). The generic name of the residence of any body of men (or even, though more rarely, of women) bound by monastic vows. In its strict application it is confined to the houses of monks properly so called, but is frequently used of the establishments of the mendicant and more modern orders. The older monasteries were divided into two great classes, abbeys and priories. The former name was given only to the important or mother houses, governed by an abbot, who was commonly assisted by a prior, subprior, and other functionaries. An abbey always included a church, and the English word minster, still applied to churches no longer part of a monastic establishment, had its origin in the Latin *monasterium*. A priory supposed a less extensive and less numerous community. It was governed by a prior and was originally subject to the jurisdiction of an abbey. This was the Benedictine rule; but in other orders, such as the Carthusian, the title of prior was uniformly used instead of abbot. In the military orders the names commandery and preceptory were used instead of abbey and priory. The name cloister is sometimes applied to the whole monastery, considered as an inclosed place; the term is also used, in a narrower sense, to designate the arcaded ambulatory which runs around the inner court of the buildings. Below the officials already mentioned the ordinary monks were generally divided into two great classes—choir brothers (frequently, in later times almost universally, in holy orders), so called because they were required and by their education qualified to take part in the singing of the choir offices, and lay brothers, who, instead of this duty, had the household cares of the community. For the principles of monastic life and the history of its development, see MONASTICISM; and, for the important part played by monasteries in the growth of architecture and its kindred arts, see MONASTIC ART.

MONASTERY, THE. A novel by Sir Walter Scott (1820). It is a story of the sixteenth century, of the days of Murray, the Regent, and had for its sequel *The Abbot* (q.v.).

MONAS'TIC ARCHITECTURE. The architecture of monastic and conventual institutions or communities. The Buddhists of India practiced monasticism from an early date (see INDIAN ART; ARCHITECTURE), and their *chaityas* or rock-cut chapels and *viharas* or community-buildings, many of which are also rock-cut, are mostly contemporary with the earliest Coptic monasteries, dating from between the fifth and eighth centuries A.D. Eastern orthodox monasticism has persistently retained, in the building and decoration of its chapels, refectories, etc., the Byzantine tradition down to the present day as at Mount Athos, Hagia Iriada, Rilo in the Balkans, Ani and Etchmiadzin in Armenia, and other centres.

The Western church, on the other hand, developed an architecture, as well as monastic systems of its own, especially in France, where the various branches of the Benedictine Order were particularly influential in architectural development. Amid the social and political chaos of the so-called Dark Ages it was the monasteries which, in France, England, and Germany at least, represented to the multitude most forcibly the universal power, authority, and discipline of the Church, unshaken by all the tumults about them. They became the refuges of all who wished to flee from war and feudal service, the centres of Christian learning, culture, and art; and by the middle of the eleventh century had acquired great wealth in land, men, and money; populous communities of clerical and lay brethren, for whom and by whom were built churches (abbeys), cloisters, refectories, hospitals, bakeries, hostels, and cells or houses for residence. In these the Western Romanesque style was developed to its highest expression, in all three countries, in the twelfth century. (See MONASTIC ART and ROMANESQUE ARCHITECTURE.) With the growth of settled government and the development of the royal and episcopal authorities in France, the building of great abbeys ceased, and a new movement began in France in the building of cathedrals, in which the new Gothic style gradually superseded the round-arched Romanesque. For the bibliography of this subject, see under MONASTIC ART.

MONASTIC ART. The art peculiar to the monastic orders. In the development of Christian art monasticism was at times the determining cause. The *Basilian* and other groups of monks in the East during the entire Middle Ages; the *Benedictines* in the West from the eighth to the eleventh century; the *Cistercians* during the twelfth; the *Franciscans* and *Dominicans*, especially in Italy, during the thirteenth and fourteenth centuries, produced a large proportion of the works of art of those periods. The influence of these orders was seldom exercised on the material side of the various arts, but more generally and radically on the choice and treatment of subject.

Basilian Art. The monks of the Order of St. Basil were the best organized and most numerous of the monastic aggregations in the East, and their influence upon Christian art was the most important produced by Eastern monasticism. Oriental monasteries cannot compare with the largest in the West; but, on the other hand, study of them is more interesting, because so many more remain comparatively intact and are of so early a date. The groups in the Egyptian Desert, e.g., date mainly from the fourth and fifth centuries, and some of those in Old Cairo are not much later. The usual type is an immense inclosure surrounded by a high wall like that around an Egyptian temple. Within the court the monks' cells are built against the inner edge of this wall, leaving the central space free for two or three churches, a large refectory, and a strong watch tower which contains the treasury and library. Next in age come the monasteries of the cities of central Syria (fifth and sixth centuries), with a common cloister. Scattered over Syria and Palestine, beginning with Justinian's famous monastery of St. Laba, on Mount Sinai, are monastic establishments of the Syrian monks which rivaled those of Egypt. They have been very little studied. But the

period succeeding the Iconoclastic movement is represented by some monasteries at Constantinople (e.g., St. John Stoudios), Saloniki, Chios, Daphne, and St. Luke in Greece, and especially by those of the Holy Mountain, Mount Athos, the centre of Hellenic monasticism from the eleventh century to the present day. The general plan of the Mount Athos monasteries was similar to that of the Egyptians, with the difference that a better organization had brought. The separate monasteries were dotted over the mountain, each in its inclosing wall. Their churches, treasuries, frescoes, and manuscripts have been carefully studied; they form one of the most interesting groups remaining from the Middle Ages. Some of the buildings are as early as the tenth and eleventh centuries, with mosaic pavements, decorative sculptures and mosaics, but the frescoes are all much later. The most interesting group in Thessaly are the famous monasteries of Meteora, which the visitor can reach only by being hauled in a basket to the top of a high precipitous rock. Here the buildings are not so old as those at Mount Athos. In the strong Byzantine revival under Basil the Macedonian and his successors (ninth and tenth centuries) the monks played an important part as colonists. Traces of their monasteries and hundreds of their anchoretic caves with Byzantine frescoes are found, e.g., in Calabria, Apulia, and other parts of southern Italy. Before then, in the eighth century, the Iconoclastic persecutions had driven to Italy many Basilian monks who as painters could no longer practice their art safely in the East. They gave the strongly Byzantine tinge to the art, especially the painting and decorative sculpture of the Roman school, which thence spread over the rest of Europe. There were over 20 Greek monasteries in Rome, large and small, before the eleventh century. That of Grottaferrata, near Rome, became the greatest representative of the Basilians in the West outside of southern Italy, and still has interesting early mosaics and sculptures.

While the monastic and lay artists of Europe developed their styles of architecture with but little reference to the East, the arts of ivory carving, enameling, goldsmith work, mosaic, tapestry, and embroidery were perpetuated in the Eastern monasteries and by them transmitted to the Western monks of the Carlovingian age. To the Eastern monks also was due a dominant part in perfecting the system of Christian iconography which was, in part at least, adopted in the West, including the artistic types of Christ, the Virgin, John the Baptist, the Apostles, angels, and saints, as well as the arrangement of most of the subjects of the Old and New Testaments. This influence was supreme in Italian painting, e.g., up to the time of Giotto. With the name of the monk Panselinos will always be connected that written textbook of painters used until the present day by Neo-Byzantine artists.

Benedictine Art. The earliest establishments of the founder of the Order of St. Benedict at Subiaco and Monte Cassino have left no traces to show that they had any special artistic significance. Most of the Western monasteries of the seventh century were of wood, and the life was still largely anchoretic. It was in the eighth century, as the Carlovingian era approaches, that Benedictine life became more highly organized, types of monastic buildings were created for all time, and monasteries of great wealth and power arose, taking a leading part in art. Centula, Lorsch, Fontanella, and Fulda were followed by Nanantula, Monte Cassino, Cava, Saint-Gall, Tours, Reichenau, and many other great artistic centres. The cloister, a new architectural form adapted from the atrium of the early Christian basilica, became the centre around which the monastic buildings were grouped. For the general plan and organization of the monastery and its early artistic activity, consult the article BENEDICTINES.

In the tenth century the great Benedictine reform took place at Cluny, which henceforth was the leading monastery of the order, using the establishments of Hirsau and Farfa to further her artistic and other reforms in Germany and Italy. The plans used in rebuilding and reorganizing these two monasteries were borrowed from Cluny. The revival which ensued led to an immense increase in the number of establishments. In Italy alone art became partly enfranchised, with a notable increase of lay artists, due to the great prosperity of the free communal cities.

The style of architecture practiced by the Benedictines during these centuries did not show much originality. It retained in the churches the old basilical type, with columns and wooden roof, though piers were occasionally used. The lack of close, organized union between the different monasteries of the order prevented the creation of a special Benedictine style. The work had local characteristics. In newly converted and civilized regions the monks were always the pioneers of art, and in this way, even without special style, became a paramount influence. But in fresco painting and in the minor and industrial arts the case was different. (See BENEDICTINES.) The monks partly introduced Byzantine methods and ideas, as in the school founded in the eleventh century by Desiderius at Monte Cassino, for nearly all branches of art, partly evolved a special style and iconography, as in Germany and France. The lay guilds of the late Romanesque and Gothic periods were merely offshoots from these monastic schools. The intellectual attainments of the monks peculiarly qualified them in developing systematically the themes of religious art, which they handed on to their lay successors, who had but to accept and vary them.

Cistercian Art. The Cistercian monasteries were not, like the Benedictine, centres of the industrial and minor arts; no provision was made for the practice of ivory carving, goldsmith work, enameling, illuminating manuscripts or fresco painting, mosaic work, and monumental sculpture. On the other hand, it was necessary to train a school of architects that should understand the special needs of the order and build according to its rules. This school originated in Burgundy, and as the order spread over the whole of Europe and part of the Orient during the twelfth century and became the most powerful of all monastic institutions, as well as the most perfectly organized, its architects carried the Burgundian Cistercian style over a large part of the then civilized world. Pontigny in France, Maulbronn in Germany, Fossanova in Italy, Veruela in Spain are typical establishments in good preservation of the twelfth and thirteenth centuries. The high walls, inclosing the entire establishment and insuring protection against raids, as well as

marking the cloistral limits, were entered through a monumental gateway, and contained large warehouses, barns, and stables, and often a mill, a hospital, and chapel, as well as the main quadrangle of buildings, flanked by a cemetery, garden, and orchard. Of this quadrangle the church usually occupied the left flank, facing the gateway, the dormitories being on the front and rear of the quadrangle around the cloister, on the second floor, the ground floor being occupied by a chapel and chapter house on the side near the church, a refectory and kitchen on the side opposite the church, and reception rooms, passageways, and staircases on the front.

The architectural style of these buildings was plain on principle. The church had a plain gable front without towers, and its material was of stone or brick, left undecorated by figured sculptures or frescoes. The practical element, being so strongly developed, led to a divorce of the decorative from the structural elements in architecture. Stress was laid upon forms of vaulting, and the order became associated with the substitution of tunnel, groin, and ribbed vaulting for wooden roofs throughout a large part of Europe. But the influence of the new Gothic constructive forms commenced in Burgundy towards 1160, and the Cistercian architects quickly adopted them as in harmony with their own ideas and propagated them throughout Europe. Nevertheless the order never developed the Gothic style in its entirety or to its ultimate forms, but rested satisfied with its elementary stage as more in harmony with the simple ideas of the order.

The monastic buildings of Fossanova in Italy are a good example of structures built by French Cistercian constructors imported from Burgundy; those of the neighboring Casamari exemplify the handiwork of the native artists taught by these Frenchmen. So it was everywhere, especially in Germany and England, where local peculiarities soon strongly modified the imported styles, and before the close of the thirteenth century the original strictness of the order was relaxed and, especially in France, the entire rich system of Gothic decoration adopted, with its tracery, floral sculpture, and stained glass. With the fourteenth century the decadence of the order, replaced in popularity by the Franciscans and Dominicans, removed it as a serious factor from the field of art.

Franciscan and Dominican Art. The monasteries of these orders were in or near the cities, so that the members could take part in the daily life of the people. There were ordinarily no high encircling cloistral walls, no arrangements for teaching the arts (except occasionally that of illuminating manuscripts or doing goldsmith work), no warehouses. The art of the mendicant orders was especially important in Italy. At the beginning the Cistercian style furnished models for church and cloistral architecture, but soon these borrowed traits dropped into insignificance when compared with the original features that were developed. The emphasis laid upon preaching in their churches to the masses and thus influencing public sentiment led to the creation of two new types of monastic church—that with lofty aisles and with widely spaced supports between nave and aisles and the hall-church type with no aisles. In both cases the object was to place large congregations within sight and hearing of the pulpit. San Francesco at Assisi, the mother monastery, was the model for the hall-church type; San Francesco and San Domenico at Bologna for the three-aisled type. Of the greatest churches of the thirteenth century in Italy nearly all were built by monks of these two orders—Santa Maria Novella and Santa Croce at Florence, Santa Maria dei Frari and Santi Giovanni e Paolo at Venice, Santa Maria sopra Minerva in Rome, Sant' Anastasia at Verona, San Francesco at Ascoli.

While the orders were less prominent in the architecture of the rest of Europe, they certainly popularized in Germany the use of the hall church, which became a very common type; but the predominance of cathedral architecture and the continued prosperity of the Cistercians limited their sphere.

Of even greater importance was the effect of the orders on sculpture and painting. The thought and feeling, the system and symbolism that lay behind the great schools of fresco painting of Florence, Siena, and other Italian centres, as well as the French schools of cathedral sculpture at Chartres, Rheims, Amiens, Bourges, Paris, are due to the influence of St. Francis, St. Dominic, and their successors, such as St. Bonaventura and Thomas Aquinas. The encyclopædic thinkers who furnished the ideas and directed the hand of sculptors and painters were the teachers of these orders, who also directed the thought of the universities of Europe. The frescoes in the church of San Francesco at Assisi, in the Spanish Chapel, Santa Maria Novella, Florence, the Palazzo Pubblico at Siena, and of Orvieto Cathedral, are their work, in symbolism, in teaching, in all their higher value. The bold attempt to represent the origin, character, and history of the universe in art, made by the decorators of the French Gothic cathedrals, had precisely the same source. The corresponding printed pages are to be found in Vincent of Beauvais's *Speculum Universale* and other similar literary encyclopædias. It is by reading the life and legends of St. Francis, by studying the important rôle of the preachers in the popular movements, by reading the sermons of the great preachers, that one can realize how clearly the mystic and allegorical art of the thirteenth and fourteenth centuries is a creation of these orders and merely a part of a great wave of social reform that was due largely to them. Giotto, the Gaddi, Orcagna, Andrea Pisano, and other artists, while not members of the orders, expressed their ideals.

Other Orders. Of all the Western orders only one returned in the Middle Ages to the anchoretic idea and expressed it in beautiful architectural movements. This was the Carthusian Order (Chartreux) of St. Bruno, founded in the eleventh century. The individual cell life of each member determined the form and character of the monastic buildings, which covered a great extent of ground, usually around two immense cloisters or open courts.

The secularizing of art, which began in the thirteenth century, was carried further forward by each century of the Renaissance. What the art guilds commenced humanism completed. The monastic orders exercised no influence in art after the fourteenth century, even though some individual members were prominent artists, such as Fra Angelico, Filippo Lippi, Bartolommeo, the painters; Fra Giocondo, the architect; etc.

Bibliography. The entire theme of monastic

art is so interwoven with the history of Christian art as a whole, as to have eluded treatment. Lenoir, *Architecture monastique* (Paris, 1852–56), has given a very good summary of this part of the subject; for another excellent survey of French monastic architecture, consult Viollet-le-Duc, *Dictionnaire raisonné de l'architecture française*, s. v., Architecture, Architecture monastique. Other general works are: Wiese, *Ueber das Verhältnis der Kunst zur Religion* (Berlin, 1878); Springer, *Klosterleben und Klosterkunst* (Bonn, 1886); Schlosser, *Die abendländische Klosteranlage des früheren Mittelalters* (Vienna, 1889); Kraus, *Geschichte der christlichen Kunst* (Freiburg, 1896). For the Basilians, see Brockhaus, *Die Kunst in den Athos-Klöstern* (Leipzig, 1890), Balhr, *Le monastère byzantin de Tebrassa* (Paris, 1897); Millet, *Le monastère de Daphne* (ib., 1899); Schultz and Barnsley, *The Monastery of St. Luke of Stiris in Phocis* (London, 1901); for the Benedictines, Krätzinger, *Die Benediktinerorden und die Kultur* (Heidelberg, 1876); for the Cistercians, Sharpe, *The Architecture of the Cistercians* (London, 1874); for the Dominicans and Franciscans, Enlart, *Origines françaises de l'architecture gothique en Italie* (Paris, 1894); Louis Gillet, *Histoire artistique des ordres mendiants* (Paris, 1912); for subjects often represented in monastic art, see Mrs. Jameson, *Legends of the Monastic Orders as Represented in the Fine Arts* (London, 1872); also the authorities referred to under Christian Art; Benedictines; Cistercians.

MONASTICISM, mŏ-năs'tĭ-sĭz'm. The general term used to describe the system under which those men and women live who have abandoned the world for religious reasons and live, whether separately or in community, in the pursuit of spiritual perfection. The vows under which they live (for details, see Vow) are based upon what are known as the evangelical counsels (q.v.) or maxims to guide those who are desirous of attaining perfection in this life. From their being bound by such vows, these people are known as religious (Lat. *religare*, to bind). The term "monk" is correctly applied only to the members of the older or more strictly cloistered societies, and not to the mendicant orders, such as the Dominicans and Franciscans, whose members are termed friars. The word "monk" is, however, sometimes loosely applied to any who withdraw from the world to give themselves wholly to the service of God and their neighbor under the vows of poverty, chastity, and obedience.

Forms of monasticism existed among the so-called pagan nations long before Christ. Buddha found the institution a practically essential feature of Brahmanism when he began his work about the sixth century before Christ. Among the Hindus, the Laws of Manu provide that, after the rearing of a family, members of the three upper castes may retire to a hermit life and seek truth in contemplation. Buddha created a monastic order, for whom he drew up a set of rules that contain many analogies with the rules of Christian religious orders. Among the Greeks the members of the Orphic brotherhood and the followers of Pythagoras showed marked tendencies to monasticism. In Egypt the worship of Serapis was associated with the foundation of monasteries. The largest institution of the kind was that at Memphis, which flourished just after the Alexandrian period. German antiquaries have pointed out many similarities between the old Egyptian monasticism and the later Christian monastic foundations in the same country. Among the Jews the Essenes (q.v.) seem to have had some of the characteristics of a religious order.

The first reference to the monastic life in Christian writers is considered by some to be a letter of St. Ignatius of Antioch, who in his letter to Polycarp mentions the vow of virginity. The first Christian hermits seem to have established themselves on the shores of the Red Sea, where in ante-Christian times the Therapeutæ, an order of pagan hermits, had been established. Not long afterward the desert regions of Upper Egypt became a favorite retreat for those who fled from the persecutions of the Christians so frequent during the third century, or who found the vices of the decadent Roman Empire intolerable. Among the earliest of these fathers of the desert was Paul of Thebes (q.v.), who lived for over 100 years (228–?340) on the fruit of the date tree and water, clothing himself in palm leaves. After Paul came Antony (q.v.), who was the first to gather together the scattered hermits in lauras. These first cenobites had their collections of cells in the deserts of the Thebaid. The life of St. Antony was written by Athanasius, at whose request he abandoned his solitude for a time during the troubles caused by the Arians. While the heresy was rampant, Antony established himself at Alexandria, and the fame of his sanctity, as well as his gentleness and learning, drew many disciples to him. Not a few of these new followers accompanied Antony when he again retired to the desert. His greatest disciple was Macarius of Alexandria, who died in 394 and whose reputation for wisdom and saintliness attracted many monks to the various hermitages over which he ruled. Apparently about the beginning of the fourth century monks began to live together under a common roof, and buildings began to be erected as monasteries instead of the separate cells in which the hermits had lived. Pachomius (q.v.) founded an immense monastery about 340 on the island of Tabennæ in the Nile. He drew up for his subjects a monastic rule, the first definite set of regulations of the kind on record. Many thousands of disciples flocked to him, and he founded several other monasteries for men, and one for women under the direction of his sister. All of these institutions recognized the authority of a single superior—an abbot or archimandrite. They constitute the original type of the religious order. St. Basil the Great (q.v.) made a visit to the Egyptian monasteries shortly after his student days at Athens, about the time that Pachomius was beginning his work. Basil, on his return to Asia, founded monasteries in Pontus and Cappadocia, thus acquiring the name of Father of Monasticism in the East. The Greek father drew up a set of rules, still extant, which has influenced subsequent founders of religious orders more than any other.

St. Jerome translated the rule of Pachomius into Latin for the use of his own monks at Bethlehem and of certain of the Latins in Italy. Dom Gasquet says that in the time of St. Jerome and St. Augustine the monastic life was well recognized as an integral part of the Church's system. There was no established code of rules, however, to which all the monks were bound to conform themselves; an individual

might pass from this or that house to any other in which the monastic life was led. Monasteries continued to spring up in many parts of the West during the fourth, fifth, and sixth centuries. One of the most famous of these was situated on the Iles de Lérins in the Mediterranean Sea, off the coast of France, near the present town of Cannes. Another was that founded by St. Martin of Tours at Poitiers, under the direction of St. Hilary, Bishop of that city. Many monasteries flourished in Ireland during these centuries and furnished missionary monks who spread not only Christianity, but also civilization and an awakening love for literature and the arts, among the barbarians who had overrun the continent of Europe. Columbanus, an Irish monk of the end of the sixth century, drew up a monastic rule that, because of its strictness, has been the model of many subsequent austere orders. Perpetual silence, complete abstinence from flesh meat, daily fasting, labor, reading, prayer, poverty, humility, and chastity are the essence of his prescriptions.

The monastic rule which had most influence in the West, however, was that of St. Benedict, who about 529, after a youth passed as a solitary, gathered some monks who had been attracted to his solitude at Subiaco and founded the monastery of Monte Cassino. This became the mother house of Western monasticism. Benedict founded seven other monasteries (among them one for women under the direction of his sister, St. Scholastica, at Piombiarole, about 5 miles from Monte Cassino) and deservedly bears the name of Patriarch of the Monks of the West. Benedict's rule is characterized by a wide and wise discretion. To secure the end more certainly, those who desired to walk in the path of the Gospel counsels under his guidance promised a lifelong obedience. "This was the first introduction of a *profession* for life according to the rule; and it was known to the monk who wished to fight under the law that as the rule says 'From that day it was not lawful for him to withdraw his neck from the yoke of the rule.' The result of this introduction was twofold: on the one hand it established firmly the perpetuity of the cloistral family life, that stability in the community which has since become the characteristic mark of monasticism; and on the other hand for the only will of the abbot or superior, it substituted a code of laws by which his government was to be guided." (Gasquet.) Nevertheless the rule itself shows that, though St. Benedict required obedience to his code of regulations, he never intended to forbid other customs and practices. In fact, he expressly refers his followers to the rule of St. Basil and others for further guidance.

The immediately succeeding centuries saw a wonderful development of monasticism in the West. The monasteries became the home of learning. Monks were the teachers of the world and went forth as missionary preachers into England, Germany, and the nations of northern and central Europe. Agriculture as well as civilization became their care, and the first serious attempt to do away with serfdom was under their rule. Education for women developed first in the convents and then spread to their sisters in the world, until women were better educated than at any preceding period in history. In the monasteries and convents expert nursing of the sick and wounded and the first germs of modern clinical medicine developed. Many members of royal families became monks and nuns, and the first glimmer of understanding between different orders of society appeared.

According to the rule of St. Benedict, each monastery was separate and wholly distinct, with an independent life of its own. The first serious attempt at union was made at a great assembly held at Aix-la-Chapelle in 817, under the guidance of St. Benedict of Aniane. Here rules for the better regulation of monastic life were passed. Benedict had great influence with the Emperor Louis the Pious, the son of Charlemagne. He planned to secure the most absolute uniformity among the monks of all monasteries and was seconded in his effort by the sovereign. Benedict was chosen as general. This assembly caused a reawakening of the monastic spirit throughout Europe and affected also England, where the *Concordia Regularis*, which prescribed one set of monastic customs for the whole of England, was adopted. In the next century occurs the greatest name in monastic history, that of Cluny. The ideal of Cluny was the existence of one great central monastery, with dependencies spread over many lands and forming a vast feudal hierarchy. The subordinate monasteries were dependents in the strictest sense. Their superiors were not called abbots, but priors. The superior of every house, however great, was the nominee of the abbot of Cluny; the profession of every member was made in the name and with the sanction of the abbot of Cluny. Cluny remains, in spite of the defects of its feudal character, one of the chief factors in the history of the eleventh century. The authority of Peter the Venerable, the contemporary of St. Bernard, was recognized by 2000 dependent monasteries. The Cistercian system of monasticism is the next feature of historical development. It was founded by St. Stephen Harding, an Englishman, who early left his own country to live in France. He adopted the rule of St. Benedict; the heads of other houses were abbots, but attached to the mother house by the obligation of yearly assembling at Cîteaux, while the abbot of Cîteaux had the right to visit all other monasteries and, while forbidden to interfere with the management of their temporalities without the consent of the community, could insist on reforms in discipline if he deemed them necessary. The greatest of the Cistercians was St. Bernard, who founded, with 32 young nobles, the monastery of Clairvaux.

During the Crusades came the organization of religious bodies for definite pious purposes whose members were bound by the usual obligations of monasticism, yet did not withdraw entirely from the world. The Knights of St. John (see SAINT JOHN OF JERUSALEM, KNIGHTS OF), the Knights Templars (q.v.), and the Teutonic Knights (q.v.) are the best known of these. Incited by their example, or as a result of the same spirit, many nonmilitary religious orders were founded during and just after the Crusades, with the purpose of definite work to be accomplished outside of the monasteries.

The fourth Lateran Council decreed that no further religious orders should be founded, yet the first quarter of the thirteenth century saw the rise of two great mendicant orders, those of St. Francis (see FRANCISCANS) and of St. Dominic (see DOMINICANS). The members of these orders, in spite of their vow of absolute

poverty, soon became prominent in the Church and in the universities and as poets, preachers, philosophers, writers, scientists, and teachers. The next great advance in monasticism was the foundation of the Jesuits (q.v.), a teaching, preaching missionary order with a special vow to go wherever they should be sent by the Pope. Their institute has proved the model on which most modern religious congregations have been based.

Monasticism has been, at least in the West, in constant development, always growing more closely in touch with the shifting environment in which it was placed in the course of time. The skeptical spirit of the eighteenth century was unfavorable to monastic evolution, but the nineteenth saw a reawakening. Persecution and confiscation for political and pecuniary reasons have reduced the numbers of religious communities, but under a system of true religious liberty, as in the United States, wide extension of the religious orders has come about. In the religious communities of the United States in 1915 there were 4415 brothers, 3788 priests, and 55,575 sisters. There were also many novices and postulants not included in these figures.

For further details of the monastic life, the general arrangement of monasteries, and the relation of the older orders to the development of European civilization, see the articles on the various orders, especially BENEDICTINES.

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MONASTIR, mŏn'ȧ-stēr'. A fortified seaport on the east coast of Tunis, 65 miles southeast of the city of Tunis. It is surrounded by a strong wall crowned with towers and has a number of mosques and a normal school established by the French. The chief manufactures are soap and oil, but its trade is declining. Pop., about 6000. Monastir is the ancient Ruspina.

MONASTIR, or BITOLIA. An important city in the extreme southern part of Servia, 15 miles from the Greek frontier. It is located in a broad valley of the Nije Mountains, 85 miles northwest of Saloniki, with which it is connected by rail (Map: Balkan Peninsula, C 4), and, of all Servian cities, ranks next to Belgrade in population. It is an important garrison town, with large barracks, military hospital, arsenal, etc. There are several mosques, a school of arts and sciences, and other educational institutions. The town carries on a large trade in wheat, tobacco, woolens, and skins, and makes gold and silver ware and carpets. Until the Balkan War (q.v.), Monastir was the capital of the Vilayet of Monastir in the Ottoman Empire. It surrendered to the Servians on Nov. 18, 1912, and was confirmed to them by the treaties of London and Bucharest (1913). Pop., 1905, about 60,000, of whom the majority are Mohammedans and Christian Bulgarians.

MONAUL, mō-nąl'. The Anglo-Indian name for any of the gorgeously plumaged and crested pheasants of the genus *Lophophorus*, commonly known as Impeyans, which inhabit the forests of the Himalayas. The three species are objects of sport, and their skins were formerly in demand for millinery. Stringent game laws now protect the birds from wholesale slaughter and exportation for this purpose in all locations where the British have influence.

MON'AZITE (from Gk. *μονάζειν, monazein*, to be solitary, from *μόνος, monos*, single). A phosphate of the cerium group of metals, principally cerium, lanthanum, and didymium, with varying amounts of thoria and silica. It is yellow, red, or reddish brown in color, has a resinous lustre, and crystallizes in the monoclinic system, the crystal individuals measuring only a fraction of an inch in length. Monazite is commercially valuable owing to its containing thorium, which is utilized in the form of oxide in the manufacture of Welsbach and other gas mantles. The cerium obtained from the separation of the metallic oxides is employed as cerium oxalate in pharmacy. Monazite occurs in association with the older crystalline rocks, especially granite and gneiss, in the southern Appalachians, Brazil, Norway, Silesia, and Russia, but the only important sources of the mineral are North Carolina and Brazil. The deposits in North Carolina are of placer nature and occur along the channels of the streams which have concentrated the heavier minerals in the lower layers of the sands and gravels. In Brazil the deposits are found along the seashore. The monazite is obtained by washing the sands and gravels in sluices, a process similar to gold washing. The concentrates thus obtained contain from 70 to 90 per cent of monazite, with 1.587 per cent of thoria. The output of monazite in the United States in 1912 was 1272 pounds, valued at $159. Importation in 1911, $215,700; in 1913, $87,000; chiefly from Brazil.

MONBOD'DO, JAMES BURNETT, LORD (so called, by Scottish custom, as Lord of Session) (1714–99). A Scottish judge and author, born at Monboddo, Kincardineshire. He was educated at Marischal College, Aberdeen, at Edinburgh, and, in civil law, at Groningen and was admitted a member of the Faculty of Advocates at Edinburgh in 1737. He prepared a collection of the *Decisions of the Lords of Council and Session* (1826; in Brown's *Supplement to the Dictionary of Decisions*). He was, however, far better known as a littérateur, in particular through his *Origin and Progress of Language* (6 vols., 1773–92) and *Ancient Metaphysics* (6 vols., 1779–99), in defense respectively of Greek literature and Greek philosophy, both erudite, formerly ridiculed for their eccentricities and paradoxes and now generally regarded as singularly acute in their observations and scientifically in advance of their time.

MONBUTTU, mŏn-bụt'to͞o, or MANGBATTU. A country in Central Africa, between lat. 3° and 4° N. and long. 28° and 29° E., containing about 4000 square miles, with a population once estimated at 1,500,000 (Map: Congo, E 2). It is an elevated table-land, 2500 feet above the sea, and through it the Kibaly and Gadda rivers flow to form the Welle. The soil (producing tobacco, sugar cane, sesame) is fruitful, needing little cultivation. The inhabitants are cannibals of chocolate color, practicing polygamy and circumcision and wearing garments made of bark cloth. They are skillful smiths. Since Schweinfurth visited their powerful and populous kingdom, it is said to have been almost depopulated by slave traders and Mahdists.

MONCADA, mŏn-kä'dȧ, FRANCISCO DE, CONDE DE OSUNA, MARQUÉS DE AITONA (1586–1635). A Spanish diplomat, soldier, and historian, born at Valencia. At first Ambassador at the court of the Emperor Ferdinand II, he was in 1633 appointed generalissimo of the Spanish forces in the Netherlands and twice defeated the Prince of Orange. He published a work of considerable historical value entitled *Expedición de los Catalanes y Aragoneses contra Turcos y Griegos* 1623), which has frequently been reprinted (e.g., vol. xxi of the *Biblioteca de autores españoles*, edited and annotated by Gayetano Rosell, 1852). G. Schlumberger published *Expédition des "Almugavares" ou Routiers catalans en Orient de l'an 1302 à l'an 1311* (Paris, 1903).

MONCALIERI, mŏn'kȧ-lyā'rĕ. A town in the Province of Turin, Italy, situated on the right bank of the Po, 5 miles south of Turin. The Royal Palace, built in 1470, has a picture gallery. The town has many beautiful villas, a fourteenth-century church, a Gymnasium, a meteorological institute, a theatre, brick and lime kilns, and manufactures matches. Pop. (commune), 1901, 11,561; 1911, 12,925.

MONCEAUX, môn'sô', PARC DE. A Paris park, attractively laid out in 1778 by the Duke of Orléans, afterward known as Philippe Egalité, which became a fashionable resort and a favorite place for fêtes and balls. It became national property during the Revolution, was restored to the Orléans family at the Restoration, and was finally purchased by the city of Paris and converted into a public park.

MONCEY, môn'sâ', BON ADRIEN JEANNOT DE, DUKE OF CONEGLIANO (1754–1842). A French soldier, born at Moncey (Doubs). He took an active part in the campaign of the Pyrenees in 1794 and was made a general in the same year. In the Italian campaign of 1800–01 he greatly distinguished himself, became marshal of the Empire in 1804, and after his return to France received the title of Duke of Conegliano (1808) and the grand cordon of the Legion of Honor. In the succeeding war with Spain he fought brilliantly, especially at Saragossa in 1809. Moncey advised against the invasion of Russia and did not accompany the army thither in 1812, but he was prominent in the defense of Paris against the allied forces in 1814. Louis XVIII made him a peer, and Moncey remained neutral during the events of the Hundred Days. His refusal of the presidency of the Council deputed to try Marshal Ney lost him all his honors, but a year later, after a brief imprisonment, these were returned to him. He made his last active campaign in Spain in 1823. In 1833 he was made governor of the Invalides.

MONCK, mŭnk, CHARLES STANLEY, fourth VISCOUNT (1819–94). A British administrator, born at Templemore, County Tipperary, Ireland. He graduated at Trinity College, Dublin, in 1841 and was called to the Irish bar in the same year. He was elected to Parliament as a Liberal member for Portsmouth in 1852 and was reëlected in 1855, but was unsuccessful in 1859. He was a Lord of the Treasury from 1855 to 1858 and was appointed Governor-General of Canada in 1861. At this time the legislative union of 1841 was breaking down, and in 1864 government was practically at a deadlock. Public men were looking to a confederation to solve the problems of Canadian politics. Monck's tactful management and conciliatory temper were an important factor in the crisis. Largely by his efforts the reform leader, George Brown (q.v.), was induced in 1864 to enter the famous coalition ministry which carried on the government while the plans for confederation were being put into effect. Monck had to a certain extent initiated and encouraged those plans and did much to bring them to completion. He was therefore reappointed Governor-General in 1867 on the confederation of the provinces into the Dominion, but resigned the next year. In 1871 he served on the Irish national education commission and on the commission to carry out the act for the disestablishment of the Irish church. In 1882 he was appointed on the commission for administering the Irish Land Act, but retired two years later. He succeeded his father as Viscount in the Irish peerage in 1849 and was made Viscount in the peerage of Great Britain in 1866.

MONCK, GEORGE. See MONK, GEORGE.

MONCKTON, RICHARD, BARON. See MILNES, RICHARD MONCKTON, BARON HOUGHTON.

MONCLOVA, mŏn-klō'vȧ. A town of the State of Coahuila, Mexico, situated 103 miles northwest of the capital, Saltillo, on the National Railways of Mexico, and the terminus of a branch line to Cuatro Cienegas (Map: Mexico, H 4). It is the centre of an agricultural and stock-raising district and contains some railroad shops and a big cotton factory. Monclova was settled during the last quarter of the seventeenth century and was important as the starting point for the early Spanish entradas into Texas. Under their rule it continued to be the seat of government for this portion of New Spain and during a brief period was the capital of the dual State of Coahuila and Texas. Pop., 1900, 6684; 1910, 6872.

MONCRIEFF, mŏn-krēf′, William Thomas (1794–1857). An English dramatist, born in London, son of a Strand tradesman named Thomas. The name Moncrieff he assumed for theatrical purposes. Moncrieff's first success was at Ashley's with *The Dandy Family;* and in 1820 *The Lear of Private Life,* with Junius Brutus Booth as hero, enjoyed a long run. But his most popular production was *Tom and Jerry* (1821), a dramatization of *Life in London* by Pierce Egan (q.v.), whose *Boxiana* Moncrieff had begun to publish in 1818. He managed Vauxhall Gardens in 1827 and in 1833 leased the City Theatre. Soon afterward his sight failed, and in 1843 he became totally blind. The following year he entered the Charterhouse in London. Moncrieff's theatrical reminiscences were published in the *Sunday Times* in 1851. He edited *Selections from Dramatic Works* (London, 1850), containing 24 of his own plays.

MONCRIEFF PITS. Excavations used in the system of gun mounting originated by Sir Alexander Moncrieff (1829–1906) for the heavy ordnance of coast batteries, first introduced about 1868. This system utilizes the stored energy of the recoil of the gun to the loading position to return it to the firing position. The Crozier-Buffington disappearing gun carriage, used in the United States Coast Artillery, is the modern example of this type of gun mount. The return to firing position is accomplished by the fall of weights previously raised by the recoil of the gun. See Ordnance.

MONCTON, mŭnk′ton. A town and port of entry in Westmoreland County, New Brunswick, Canada, on the Petitcodiac River, which flows into the Bay of Fundy, and the Intercolonial, National Transcontinental, and the Moncton and Buctouche railroads, 89 miles northeast of St. John (Map: New Brunswick, E 2). It is at the head of river navigation and has a fine harbor. There is a difference of 30 feet between high and low tides. The town possesses two parks. It manufactures cotton, flour, planing-mill products, leather, underwear, hats and caps, builders' materials, aërated waters, biscuits, barrels, mattresses, wire fences, foundry and machine-shop products, and wooden ware. The general offices and principal shops of the Intercolonial Railroad, and also the railway yards and shops of the National Transcontinental, are located here, and there is a large trade in lumber and agricultural products. Oil and natural gas are found in the vicinity, 20 gas wells yielding over 50,000,000 feet of gas daily. The United States is represented by a commercial agent. Pop., 1901, 9026; 1911, 11,345.

MOND, mŏnd, *Ger. pron.* mônt, Ludwig (1839–1909). A German chemist, born at Cassel, where he attended the Polytechnic School. He finished his education at the universities of Marburg and Heidelberg. In 1862 he went to England, where he was employed in a Leblanc soda manufactory, and in that connection worked out his method of recovering the sulphur that had been lost as calcium sulphide in the Leblanc soda process. Two years later he erected a similar manufactory at Utrecht. In 1867 he again returned to England, where he lived thenceforth. In 1873 he established, with Sir John Brunner as partner, a large manufactory of alkali, employing the Solvay process. He greatly improved the ammonia process of making bleaching powder and solved the problem of recovering chlorine lost in the form of chloride of calcium. (See Soda.) One use to which he put part of his great wealth was the founding in 1896 of the David Faraday Laboratory of the Royal Institution, London. He made a large collection of paintings, which are described in *The Mond Collection,* by J. P. Richter (2 vols., 1910).

MONDOÑEDO, mŏn′dō-nyā′dō. A town of northwest Spain, in the Province of Lugo, situated in a mountain valley 12 miles from the Biscayan coast (Map: Spain, B 1). It was anciently an important town. It has a cathedral begun in the thirteenth century, with a baroque façade, and then restored in the seventeenth century. There are marble quarries in the neighborhood. The town manufactures cotton and linen fabrics. Pop., 1900, 10,619; 1910, 9725.

MONDOVÌ, mŏn′dō-vē′. An episcopal town in the Province of Cuneo, Italy, on the Ellero, a branch of the Po, 42 miles south of Turin (Map: Italy, A 2). It had a university from 1560 to 1719. Among its notable structures are the cathedral of San Donato, dating from 1450, a citadel with a Gothic tower, erected in 1573, a royal lyceum, and a bishop's palace. There are three public libraries. Its educational institutions include an industrial school and a technical institute. Near by is a chapel built by Vittozzi, containing the remains of Charles Emmanuel I. There are manufactures of machinery, cloth, silk, paper, books, and earthenware. At the battle of Mondovì, on April 21, 1796, the Sardinians were totally defeated by the French. Pop. (commune), 1901, 19,255; 1911, 19,593.

MONEL (mŏn′el) **METAL.** See Nickel.

MO′NER (from Neo-Lat. *moneron,* from Gk. *μονήρης, monērēs,* solitary, from *μόνος, monos,* single + *ἀραρίνκειν, ararinkein,* to join). The simplest form of Protozoa and the nearest to what may have been the most primitive living being. The Monera of Haeckel differ from the rhizopods (Amœba, etc.) in wanting a nucleus and contractile vesicles. Their body substance is homogeneous throughout, not divided into a tenacious outer and soft inner mass, as in Amœba. They move by the contraction of the body and the irregular protrusion of portions of the body, forming either simple processes (pseudopodia) or a network of gelatinous threads. The food, as some diatom, desmid, or protozoan, is swallowed whole, being surrounded and engulfed by the body, and the protoplasmic matter then absorbed. The simplest form known, and supposed to be really a living being, is Haeckel's Protamœba. It is like an amœba, but is not known to have a nucleus and vacuoles. It reproduces by simple self-division, much as in Amœba. The individual moner—e.g., Protamœba—is simply a speck or drop of transparent, often colorless, viscid fluid. This drop of protoplasm has the power of absorbing the protoplasm of other living beings, and thus of increasing in size—i.e., growing; and in taking its food makes various movements, one or more parts of its body being more movable than others, the faculty of motion thus being for the moment specialized; it has apparently the power of selecting one kind of food in preference to another and, finally, of reproducing its kind by a process not only of simple self-division, but also of germ production. Consult Ernst Haeckel, *History of Creation,* revised by E. R. Lankester

(4th ed., 2 vols., New York, 1906). See PROTISTA.

MONESSEN, mō-nĕs′n. A borough in Westmoreland Co., Pa., 39 miles by rail south of Pittsburgh, on the Monongahela River, and on the Pennsylvania and the Pittsburgh and Lake Erie railroads (Map: Pennsylvania, B 7). There are large steel and sheet and tin plate works, foundries and machine shops, a wire-fence factory, lumber yards, box factory, brewery, and brickworks, the products of which are shipped in large quantities. A bridge spans the river at this point. The growth of Monessen has been rapid. Pop., 1900. 2197; 1910, 11,775; 1914 (U. S. est.)18,752; 1920, 18,179.

MONESTIER, mō′nĕs′tyā′, JEAN (1855–). A French civil engineer, born at Saint-Rome (Lozère). He became president of the Council of Lozère and chief engineer of bridges and highways. For a time he was Minister of Public Works and engineer of the Seine department. He was made Officer of the Legion of Honor.

MONET, mō′nā′, CLAUDE (1840–). A French landscape painter, the leader of the Impressionist school which gained its name from his painting "Impression, Rising Sun," exhibited in 1874. He was born in Paris, Nov. 14, 1840. When a youth he entered the atelier of the Classicist Gleyre, but lack of sympathy with the style of work executed there caused his withdrawal. In the beginning his fancy was strongly drawn to the work of Courbet and Corot, and certain mannerisms, which disappeared with increasing years, indicate the influence of the Barbizon school. To a certain extent he is indebted also to Manet and the Japanese. He, however, admitted no master and for the most part drew his inspiration directly from nature, apparently caring little for subject, detail, or composition. His aim is chiefly to reproduce the effects of light and air, to portray the fleeting aspect of things. To Monet the effects of complementary contrasts and color mixtures are so distinctive and certain that to those not similarly trained his representation of them appears affected and exaggerated, but when seen under subdued light and from the requisite point of distance, they show great excellence. For over 20 years he struggled against ridicule and hostile criticism before his artistic ideas were accepted. Part of that time he spent in Holland, England, and Italy before finally taking up his residence at Giverny, France. His earlier style may be studied in "The Breakfast" (Luxembourg), "Camille," "Fontainebleau Forest" (1866), "Vessels Leaving Havre" (1868), and many landscapes produced before 1875, nine of which are in the Moreau-Nelaton collection, Musée des Arts Decoratifs (Louvre). Among his later works may be mentioned: "Bordighera"—the town in the half distance, led up to by a foliaged foreground; "The Orchard"—a landscape, vibrating with light and showing well the possibilities of Monet's use of pure color; "The Sun in a Fog, Waterloo Bridge" (1904); "Palazzo Dario, Venice" (1908). "The Church of Vétheuil," "The Rocks of Belle Isle," "Saint-Lazare Station," and six other paintings are in the Luxembourg. Monet's art reached its fullest expression in his series of variations of the same theme, as in "Rouen Cathedral" (Luxembourg), "Water Lilies," and "Views of the Thames," which present a wonderful analysis of light. Consult: Théodore Duret, *Le peintre Claude Monet* (Paris, 1878), English translation, *Monet and the French Impressionists* (London, 1912); J. C. Van Dyke, in *Modern French Masters* (New York, 1896); W. H. Fuller, *Monet and his Paintings* (ib., 1899).

MONETA, mō-nā′tȧ, ERNESTO TEODORO (1833–). An Italian journalist and pacifist. He was born in Milan, where his father was a prominent patriot. As a boy he took part in the Milan uprising of 1848. He was a general-staff officer in Garibaldi's army and in 1861–67 served in the Italian army. He had been editor of *La Libera Parola*, a Turin journal, in 1860–61, and from 1867 to 1896 was director of the great Milan National-Democratic newspaper *Il Secolo*. About 1870 he became interested in the movement for international peace and formed peace societies in northern Italy, notably the Comice Internationale of Milan in 1878 and the Unione Lombarda in 1887. He was an Italian delegate to several peace congresses and in 1906 was president of the International Congress held in Milan. The next year he received the Nobel peace prize in special recognition of his book *Le guerre, le insurrezione, e la pace nel secolo XIX* (3 vols., 1903 et seq.). Moneta was made a member of the Carnegie Consultative Council. He edited *La Vita Internazionale* (1897 et seq.) and the *Almanaco pro pace*.

MON′ETARY COMMISSION OF THE UNITED STATES CONGRESS. The fall in the value of silver after 1873 was the source of much debate in the Forty-fourth Congress, and in August, 1876, a joint resolution was passed for the appointment of a commission of three Senators and three Representatives, together with experts chosen by the former, to inquire into: (1) the causes and economic effects of the decline in silver; (2) the policy of restoring the double standard; (3) the policy of retaining in circulation the legal-tender notes; and (4) the best means for resuming specie payments. The commission as organized consisted of Senators John P. Jones, Lewis V. Bogy, and George S. Boutwell; Representatives Randall L. Gibson, George Willard, and Richard P. Bland. William S. Groesbeck, of Ohio, and Prof. Francis Bowen, of Massachusetts, were the expert members of the commission, and George M. Weston, of Maine, was appointed its secretary. The meetings of the commission were held in New York and Washington in the winter of 1876–77. The majority report of the commission declared that the recent production of silver relatively to gold had not been greater than formerly, but that the decline in the value of silver had resulted mainly from the demonetization of silver in Germany, the United States, and the Scandinavian states, the closure of the mints of Europe to its coinage, the temporary diminution of the Asiatic demand, the exaggeration of the yield of the Nevada silver mines, and the fear of further action against silver coinage by the governments. The policy of adopting the gold standard was condemned in severe terms, and the unrestricted coinage of both metals was recommended. The report further stated that an attempt to introduce monometallism would result in a ruinous contest for a gold standard with the European nations, while, if silver were remonetized by the United States, the effect would be to attract that metal from other countries while it was cheap, in exchange for what the United States had to export; and that the

latter country would thus have the benefit of the rise which the commission believed would take place in its value when the temporary causes of its depression had passed. Boutwell made a minority report against remonetization of silver except on the basis of international agreement, and Prof. Francis Bowen dissented from the majority report, arguing in general for the gold basis, but declaring in favor of the remonetization of silver on adding to the quantity of pure silver in a dollar enough to make its bullion value equal to the then value of a gold dollar.

The government published a summary of this report, together with papers prepared for the commission on "Asiatic Trade and Flow of Silver to the East," "Constitutional Powers of Congress and the States with Respect to Metallic Money," "Legislation on Subsidiary Silver Coin," and "The Trade Dollar." In addition to these the government published a collection of valuable statistics gathered by the commission relating to the production, distribution, and relative value of the two metals and to the monetary systems of foreign countries.

MONETARY CONFERENCES, INTERNATIONAL. Conferences between representatives of the United States and various European Powers for the discussion of united action with reference to monetary matters were held in 1867, 1878, 1881, and 1892.

France, on completing the Latin Monetary Union (q.v.), indulged in the hope that other nations might join the union and brought the matter to the attention of other governments through diplomatic channels. France called the conference of 1867 during the exposition of that year with the thought of furthering this project. Nineteen states were represented at the conference. The first question debated was whether an existing system or a wholly new one was best adapted to secure international coinage. The answer was in favor of an existing system, and it was admitted that the system of the Latin Union would probably be best adapted to this purpose. A second question was: "Is there a possibility of establishing at this time identities or partial coincidences of monetary types on a wide scale, on the basis and with the condition of the adoption of the silver standard exclusively?" A third question repeats this inquiry for the gold standard exclusively, and a fourth for the double standards with a common ratio. These questions were discussed together, but the debate was not properly one of standards. The conference declared unanimously in favor of the gold standard as a basis of an international coinage. But in this conference the whole question of standards was incidental. Whether a unit should be adopted for all the nations or whether coincidences in the value of the coins should be effected were the most important questions considered. Finally, a resolution was adopted that all gold coins which were multiples of five francs should have legal circulation in all the contracting states. The work seemed to be complete, and the conference adjourned with mutual congratulations; but there the matter ended, as no treaties to carry out the plans were contracted.

Quite different was the purpose of the conferences of 1878, 1881, and 1892. A fall in the value of silver as compared with gold had taken place, and the silver currency threatened to depreciate seriously and perhaps endanger the monetary systems of those countries in which the double standard existed. In 1867 the ratio between silver and gold, which for many years had been below the French ratio of 1 to 15½, rose above it, and in 1874 rose above the American ratio of 1 to 16, and by 1878 had reached 1 to 17.94. In the meantime prices had begun to fall. The initiative for the conference of 1878 proceeded from the United States. The coinage law of February of that year authorized the President to invite "the governments of the countries composing the Latin Union so called, and of such other European nations as he may deem advisable, to join the United States in a conference to adopt a common ratio between gold and silver, for the purpose of establishing, internationally, the use of bimetallic money, and securing fixity of relative value between those metals." In response to the invitation of the United States the principal nations except Germany sent representatives to the conference, which met in Paris in August, 1878. Considerable solicitude was expressed at the conference lest silver should be wholly discarded, though no agreement could be reached on bimetallism. This in particular was the attitude of Great Britain, concerned as she was for the currency of India. The most bitter hostility to bimetallism was exhibited by Belgium and Switzerland, while France, their partner in the Latin Union, was distinctly in favor of it. In its advocacy of the principle the United States was handicapped by the fact that it was on a paper basis and that it was a producer of silver. The proposals of the United States were rejected, the European nations uniting in the declaration "that it is necessary to maintain in the world the monetary functions of silver as well as those of gold, but that the selection for use of one or of the other of the two metals, or of both simultaneously, should be governed by the special position of each state or of each group of states." The conference was thus without result.

In 1881 another conference was held at Paris. Events were rapidly proving that the alleged scarcity of gold was a fact. The United States began to import gold, and this drew upon the European stock. The Bank of England saw its gold reserves diminish and seemed unable to check the outflow. In France the reserve of gold in the Bank declined, while silver increased. As the proportion of silver in the metallic reserve increased doubts began to be expressed whether gold payments would be maintained. Germany saw the completion of her monetary reform indefinitely postponed by her inability to sell her stock of silver coin except at a great sacrifice. In the United States the pressure for free silver continued. France was the prime mover in this conference, though the United States joined in issuing the invitations. Great Britain exhibited great reserve in the conference, and the delegates of other states declared themselves bound by strict instructions. The discussions were able and learned, but fruitless, and the conference adjourned without result.

It was not until 1892 that another effort was made to effect monetary reform by means of a conference. In 1891 the President was authorized to call a conference. Great Britain exhibited more interest than usual, and while she declined to join a conference whose only object was the discussion of bimetallism, consented to take part in a conference to discuss an enlarged

monetary use of silver. The British government appointed delegates in sympathy with bimetallic proposals and sanctioned the appointment of pronounced bimetallists by the government of India.

The reception of the proposals of the United States on the continent of Europe was less cordial. France was especially lukewarm and did not accept the proposal that the conference should be held at Paris. Arrangements were finally made for a meeting at Brussels. Germany was noncommittal, but consented to be represented at the conference. England and the United States, as it appeared, were to be the moving forces in this conference. All was in readiness for a meeting in May, 1892, when the fear of cholera in Europe caused its postponement to November.

This delay was fatal, for in the meantime two political events had occurred which altered the attitude of the leading nations. In England the Conservative party was overthrown and gave place to the Liberals, who had little sympathy with bimetallism. The new ministry added to the delegation two men who were avowed opponents of bimetallism. In the United States the election of 1892 resulted in the defeat of the party in power. Under these circumstances the delegation from the United States could not make any binding promises for the incoming administration. Accordingly the conference had little promise of success. When it met it was proposed to discuss any plans for enlarging the use of silver, especially such as might be proposed in the conference before taking up the subject of bimetallism. This was a programme of discussion rather than of action, and after some 12 sessions of fruitless debate the conference adjourned without any action.

Consult the reports of the conferences—that for 1867 being included in the appendix of that of 1878—issued by the United States government, and H. B. Russell, *International Monetary Conferences* (New York, 1898), in which the events leading up to the conferences are carefully portrayed. See also bibliography under MONEY.

MONETT, mō-nĕt′. A city in Barry Co., Mo., 44 miles west of Springfield, on the St. Louis and San Francisco Railroad (Map: Missouri, C 5). The city is engaged in farming and stock raising. The commission form of government was adopted in March, 1914. Pop., 1900, 3115; 1910, 4177.

MONEY (OF. *moneie, monoie, monnoye,* Fr. *monnaie,* from Lat. *moneta,* money, mint, from *Moneta,* an epithet of Juno, in whose temple at Rome money was coined, from *monere,* to warn, connected with *meminisse,* to remember, Gk. *μέριμνος, merimnos,* anxious, Skt. *smar,* to remember). The medium of exchange and measure of value. Whatever fills these functions, however crudely, is money. Of all the substances which have been used as money, gold and silver take the first place, and the discussion of money usually has these in view. It is well to remember, however, that some of the humbler functions of money are to-day performed by nickel and copper, and that in times past not only other metals, tin, lead, iron, and platinum, have been used as money, but also, especially among primitive peoples, a wide variety of other objects. Jevons enumerates, among other things, furs, skins, leather, sheep, cattle, wampum, cowries, grains, olive oil, tobacco, and salt, as being in use at one time or another for this purpose. Primitive as these may be, the enumeration seems to emphasize the fact that it is not a substance per se that we designate as money, but a substance invested with a certain utility.

So important is this function in modern life that we cannot readily conceive of a society without some mechanism to perform it. And indeed from the earliest days of recorded history we find references to money, and there are few among the primitive peoples of our own time which do not possess it in rudimentary form. The difference between the highly civilized nations of modern Europe and America and their early progenitors or the savage tribes of Africa does not consist so much in the fact that we use money and they do not, as in the extent to which it is used. Even though money is recorded as known among the most primitive peoples, it is then of only occasional use, it does not penetrate into every relation of social life. Peoples whose social organization is based upon slavery and patriarchal conditions have little need for money, nor is the need great among a pastoral or agricultural people when there is little differentiation of occupation. On the other hand, among highly organized industrial peoples where nearly all produce not for individual needs but for sale in the market, money is in constant and universal demand.

The primary function of money is that of a medium of exchange; and if in the theory of money to-day this characteristic receives scant notice, it is not because it is not fundamentally important, but rather because it is comprehended with comparative ease. Other functions are all derived from the primary function, medium of exchange.

Whatever the substance used as money may be it becomes an object of universal desire. In primitive society the most widely desired object came to be used as money. The fact that an object is universally desired fits it in the first instance for use as money, but after it acquires that function it is desired not chiefly for its own sake but for its command over other things. At an early date the desire for personal adornment singled out the precious metals as money par excellence, but at the present time it is not because gold is beautiful that we desire it, but because as money it procures for us whatever we may desire.

In the second place, money is the measure of value. The acts of buying and selling fix upon the objects bought and sold relative values, and it was only a slight step to extend the conception of value to things not sold or bought, or which are not intended for sale. All things capable of sale can be valued in terms of money. All credit operations depend upon this fact. Since the value of the money in use in any society is insignificant as compared with its total wealth valued in terms of money, it has been argued that the function of money as a measure of value is far more important than its function as a medium of exchange. And in fact the further we get away from primitive conditions of trading, the more important does this derivative function become. When all wealth is valued in terms of money barter of a higher order becomes possible. In the new form of barter, however, the exchange of commodities is indirect. Modern commerce is largely based upon it, and while it is most ap-

parent in international trade, where balances only are settled by the transfer of money, it is no less widespread and fundamental in domestic trade. See BANK, BANKING; CREDIT.

From the function of a measure of value is derived a subordinate function of the greatest practical importance, viz., the function of money as a standard of value. A standard of value is simply a measure by which values at different periods are compared. The measure of value contemplates the estimation of commodities at the same time; the standard of value, their estimation at different times. The standard of value is often called the standard of deferred payments. Credit organization involves future payments. These payments are expressed in money and present goods are transferred for a promise to pay money in the future. In the ordinary transactions of mercantile life the futurity contemplated is not far distant, but in many operations, both public and private, a lapse of years is contemplated. In such contracts stability in the value of money is of the highest importance; and were it not that money has been subject to certain variations, it is quite possible that it would not have been found necessary to differentiate this function from that of a measure of value.

The substances which at various times in the world's history have fulfilled these several functions have not performed the office equally well, and gradually all except gold, silver, certain minor metals, and paper have been eliminated among advanced nations. The selection of the precious metals for this purpose is due in part to certain physical characteristics and in part to economic conditions. In the first place, they are durable, and while it is true that there is always some loss through abrasion, the process is a remarkably slow one. Secondly, they are homogeneous and divisible. If a given quantity be divided into parts, those parts will be absolutely alike, and the sum of the parts will equal the whole. Finally, they are portable, since relatively to their weight they are of high value. Other objects such as precious stones excel the metals in portability, but they do not present the other necessary qualities of divisibility and homogeneity. Furthermore, it should be remarked that the metals are relatively stable in value, a result of their durability, since the existing stock is always so much greater than the annual output that violent fluctuations in supply are avoided. Some writers have insisted that the money substance should itself possess value, and have gone so far as to speak of the necessity of intrinsic or inherent value. The use of the word intrinsic evidently indicates a confusion of thought. These writers mean that the money substance should possess a utility apart from that which it gains by virtue of its money function. It may be true that no substance without utility could have become established as money, but this initial primary utility is insignificant after it has acquired the greater utility which attaches to it as a medium of exchange and measure of value.

It has already been noted that besides the precious metals which possess in a high degree the qualities named, other substances, minor metals and paper, are used as money among advanced peoples. The rôle of the former is quite subordinate. For use in minor exchanges they are sufficiently portable and they possess the other physical qualities named. Since their quantity is limited, and provision is usually made for convertibility into money made of the precious metals, their value is not less stable than that of gold and silver. The problems of paper money are more complicated, since it is used in far greater quantities and for large payments. In portability it excels the metals, and, while it is not literally indestructible or divisible, the ease of replacement of old notes by new, or one denomination by another, is a substitute for these qualities. Its intrinsic value, i.e., its utility for nonmonetary uses, is of course a negligible quantity. Far more important is the question of the stability of its value. This question we can answer only after an investigation of the laws which govern the value of money.

There are two explanations of the value of money, one that it is fixed by the law of supply and demand, the other that it is fixed by the costs of production. These are the general explanations of value and are complementary rather than antagonistic. The first is the law of market value, the second of normal value. In the case of freely reproducible goods, while market value may at a given moment vary from normal value, it cannot maintain such variation for any length of time. Money is in a less degree freely reproduced than most of the other goods with which it can be compared. We should, therefore, without neglecting the influence of the cost of production, expect to find that in the fixation of the value of money supply and demand are the dominant factors.

Before discussing what the supply of money and the demand for it are, it may be well to call attention to the way in which the value of money is expressed. The values of all commodities are expressed in money as prices. Conversely, the prices of commodities express the value of money. We speak of prices as high or low, but we might as well speak of money as cheap or dear. Money is cheap when prices are high, and is dear when prices are low. When wheat rises from 50 cents a bushel to $1 a bushel, we say it has risen in value, but we might also say that the wheat price of money has fallen, because in the first instance it required two bushels of wheat to secure a dollar in exchange and in the second instance only one bushel. Wheat in our illustration stands for commodities in general, and, while the rise in price of one commodity does not mean that money has fallen in value, yet if all commodities rise in price we cannot escape the conclusion that it has so fallen. Prices and the value of money are therefore reciprocals.

The supply of money is the amount of money in existence. This has led some writers to say that the value of money depends upon its quantity. Other things being equal, this is true; but it does not in itself furnish an adequate explanation of the value of money. Assuming that no other influences are at work, it must be admitted that any increase in the quantity of money will lower its value and that any decrease will enhance it. There is a certain money work to be performed, a certain volume of exchanges to be transacted. If the units of money are numerous, each transaction will call for a larger number of units than when the money units are relatively few. Every increase in the world's money supply has been followed by a rising in prices or a fall in the value of money. If the fall is not commensurate with the increase in

amount, it is because the quantity of money is not the exclusive factor in fixing the value of money. Monetary legislation endeavors to adjust supply to demand by providing an automatic regulation of the quantity of money. Under a metallic-currency system we usually find provisions for the free coinage of the standard money metal. Should money increase in value, i.e., should prices fall and thus reveal an inadequate supply, free coinage will in a measure correct this by attracting to monetary use such supplies of the metal as are available for this purpose. So far as nations using the same standard are concerned there is a natural flow of the metals from one country to another which prevents any undue deficit or redundancy in any one of the countries involved. This adjustment takes place automatically through the course of trade. When currency is redundant in any country, prices will be high in that country and imports will be large relatively to exports. The settlement of the resulting unfavorable balances will diminish the currency of the country where it was formerly redundant and so diminish prices. If money is scarce in any country, prices will be low, exports large relatively to imports, and the resulting favorable balances will bring gold into the country. It is obvious, therefore, that international trade speedily corrects any local excess or deficit.

A general excess or deficit in the money supply carries with it a certain correction also, but the operation is slower. If prices rise, showing a fall in the value of money, mining enterprises become less profitable, and the additions to the volume of money will tend to grow less. On the other hand, if prices fall, showing a rise in the value of money, mining enterprises become correspondingly profitable and capital will seek employment in them. This is likely to increase the production of the metals and by increasing the supply to check the rise in value. These effects will not be immediate, as capital has great inertia, and its withdrawal from one line of activity and transfer to another cannot be instantaneous.

The value of money, as of any other commodity, is immediately dependent upon supply and demand. The supply of money admits of easy definition; but the demand for money cannot be so precisely stated. It has been paraphrased as the amount of money work to be done, but this money work cannot be expressed in statistical statements. The elements which enter into it can, however, be stated. The most important and the positive element in the case is the volume of exchanges to be accomplished. Whatever increases the volume of exchanges increases the demand for money; whatever diminishes the volume diminishes the demand. Division of labor and the evolution of a money economy are the most important factors in this increase of the money demand. Without a commensurate increase of supply, prices under such conditions must fall. A diminution in the world's demand for money is not likely, but a diminution in the local demand, effecting a temporary rise of prices before the correcting influence of international trade is felt, may and does occur.

But the volume of the exchanges is only one of several elements in determining the demand for money. The first of these is the rapidity of monetary circulation, the second the use of credit, both of which economize the use of money. It is obvious that all simultaneous cash transactions require the use of different pieces of money. But the transactions of a day or a year are not simultaneous and the same piece of money may fill its functions as a medium of exchange many times. When the circulation is sluggish the demand for money for a given volume of exchanges is far greater than when it is rapid. Savings banks, e.g., serve to increase the rapidity of circulation. They gather up the savings of the poor which would otherwise be locked up, and restore this money to circulation. In countries where savings take the form of private hoards, as is largely the case in France, more money is required per capita than in Great Britain or the United States.

Far more important in its effect upon the money demand is the use of credit (q.v.), balances only being paid in money. The country storekeeper who takes from the farmer butter and eggs on account, paying in supplies as his customer's needs arise, furnishes a homely illustration of the way in which credit minimizes the demand for money. In the larger business world the trade relations are rarely of such great simplicity, but by the mechanism of centres of credit or banks the transactions of a town or of even larger areas are reduced to a mutual exchange of goods and debts are canceled without the intervention of money. Banks and clearing houses (see those articles) are the agencies by which credit is organized.

Supply and demand as affecting the value of money are not wholly unrelated phenomena, and the explanation of monetary changes cannot be found in one element without the other. An excess of supply stimulates demand and prevents prices from rising as high as they otherwise would. A diminution of supply slackens demand and prevents prices from falling as much as they otherwise would. This interaction of supply and demand prevents changes in the money supply from producing effects in the increase or decrease of prices commensurate with the changes in the volume of money. It modifies but does not obliterate the significance of such changes.

Having considered what fixes the value of metallic money, we are now ready for the question, what determines the value of paper money? Despite differences of detail, there are for the purpose of this discussion but two classes of paper money—convertible and inconvertible. The first is secondary money, representing metallic money and deriving its value from the latter; the second is itself primary money and, like all primary or standard money, derives its value from the relation of supply and demand.

Paper money in the first instance was purely secondary or representative money. It was practically a storage receipt for gold and silver. Such receipts calling for metallic money on demand could and did serve in lieu of the latter in making exchanges. Such money offers no theoretical difficulties. Its circulation is that of metallic money in another form. The advantage of such money is that it forms a convenient mode of avoiding the cumbersomeness of metallic money. This is the function of the gold and silver certificates issued by the United States government, each of which represents a corresponding quantity of metal in the United States Treasury, and whose presence in the monetary circulation does not in the slightest degree affect its volume.

But such certificates are not the only form of

representative paper money, nor the most important. The history of banking shows that the depositaries of metallic money soon learned that under normal conditions coin would not be demanded at any one time for the full amount of the outstanding notes or certificates, and that a considerably larger sum could be kept in circulation than the metallic reserve. They began, therefore, to issue notes in excess of the reserve without infringing upon the characteristics of convertibility in coin on demand. Such money is called by the economists bank money, and it is immaterial whether it is issued by banks or by the government. Such money derives its value from the metallic currency upon which it is based, but, unlike the certificates already described, it enlarges the volume of the monetary circulation. The issue of such money economizes the use of the metals, and, in so far as it substitutes an inexpensive for an expensive substance as money, is a saving of wealth to the community.

If the principle of convertibility is not maintained, bank money becomes paper money pure and simple. It has usually been by the failure of banks or of governments to maintain the promise of redemption that such money has arisen. When this takes place paper money falls in value, or, as it is usually expressed, coin is at a premium. This would not of itself cause a disappearance of coin, but it usually happens that paper money is so multiplied in volume that coin disappears and paper becomes the sole standard. This substitution takes place by virtue of Gresham's law (q.v.). Such changes from a metallic to a paper currency are not effected without violent convulsions and much suffering; but there can be no doubt that, however ill it does the work, paper money under such circumstances performs all the functions of a medium of exchange, a measure of value, and a standard of deferred payments. Its value, like that of other money, depends upon its quantity in relation to the demand for money. As its quantity is likely to be increased without reference to the demands of trade in response to the fiscal necessities of the government, its value is unstable and uncertain. But this is not inherent in the nature of paper money; and there may be conditions, as in Austria during the greater part of the nineteenth century, under which paper money maintains a relative stability in value.

The adjustment of the monetary circulation to the needs of trade has given rise to composite money systems, in which, whatever may be the standard, gold, silver, and paper are usually combined. Under a single gold standard paper is generally used for larger payments, while silver is used for the smaller. Both are representative money in such cases. Silver is issued as token coinage. A token coin is one whose bullion value is less than its face value and whose legal power to pay debts is limited. Such coins are issued by government authority only, and pass current at their nominal values by virtue of legal enactment. In a well-ordered system, provision is usually made for the redemption of such coins in standard money when presented in specified quantities. Of such nature are the fractional silver coins of the United States and the minor coinage.

Under a single silver standard there is no theoretical reason why gold tokens should not be used for larger payments, but there is the practical reason that gold is expensive and that it is not absolutely necessary for such payments to be made in metal. Under such a standard as prevailed in Germany before 1873, paper is used for larger payments, and it was one of the objections to such a silver standard that it afforded so wide a scope for the issue of paper money.

Before the introduction of token coins nations had for centuries endeavored to secure the concurrent circulation of gold and silver under a system of bimetallism. Under such a system, if the market ratio between the two metals diverged from the legal ratio one of the metals was certain to be exported. When this occurred it always occasioned much distress if the silver were the metal exported, for it robbed the people of the small change of daily life. Hence we find among the nations which clung the longest to the bimetallic theory, that before it was abandoned measures had been taken to reduce the minor silver coins to the character of tokens in order that they might not be withdrawn from the country for export. With the introduction of token coinage and the adoption of the plan of issuing certificates to represent the larger coins the discussion of bimetallism assumed quite a different aspect. The arguments drawn from the difficulty of insuring the circulation of silver were almost entirely excluded from the discussion, which then centred upon the question whether gold alone or gold and silver in combination, provided the combination could be kept intact, furnished the better standard of value. See BIMETALLISM.

History of Money in the United States. The situation in which the early colonists in America found themselves was such that they could draw little from the monetary experience of the mother country. During the Colonial period they took from the mother country the designations pounds, shillings, and pence. Having no mines, their stock of money had to be imported, and since they drew more wealth from England than they could export to that country, it was quite impossible to accumulate a monetary stock in this way. The little that was brought over by the colonists soon found its way back to the mother country, and, in the early days especially, resort was had to various shifts to remedy the dearth of money. Various articles of food and produce were made receivable for taxes and other purposes. Of these the most widely known was the tobacco currency of Maryland and Virginia. In some of the Colonies resort was had to the wampum currency of the Indians. But far more important in their effects were the measures taken to prevent coin from leaving the country and the issue of paper money. One of the early devices resorted to was to give the English currency a higher nominal value than its face value. It was argued that, if in the Colonies a shilling piece circulated as one and a half shillings, it would not be exported. This process of rating coins had been used frequently in England for the gold coinage. The different Colonies acting independently rated the shilling at different values, and the result was a series of Colonial pounds differing from each other and from the English pound. In 1706 a proclamation of Queen Anne put a stop to this practice and fixed the nominal value of the pound in each of the Colonies at the existing rate. While the money of account was for each Colony a Colonial pound, the actual money in circulation was a motley collection of coins of

English, French, Portuguese, and Spanish origin. The Spanish dollar was the most widely known and circulated, and it thus became the term by which the currencies of the Colonies were most readily compared. In retail trade, locally in the United States, the shilling as a division of the dollar has persisted to our own day. Furthermore, as the Spanish dollar was common to all the Colonies, it was the term in which later the common obligations were expressed by the Continental Congress, and thus became the basis of our national coinage.

Of even greater importance in fixing the monetary habits of the people was the issue of paper money. The first issue was in 1690 in Massachusetts and was made to meet the expenses of an expedition against the French in Canada. The notes were received with reluctance by the people, and fell to a discount, which was removed by an act of the Colonial Legislature, which placed a premium on them, as compared with coin, in the payment of taxes. Then South Carolina issued bills in 1712, and in the first half of the eighteenth century all the Colonies followed these examples. Issued at first to meet extraordinary expenses of the governments, the public clamor for more money became so great that notes were issued later without any such plea in extenuation. In the situation of the Colonies the plea for more money to make trade easy was urged with peculiar force. In Massachusetts a series of issues had taken place; and in 1749 exchange upon London, which was normally 133 pounds Colonial for 100 pounds sterling, had risen to 1100 pounds for 100 pounds sterling. Parliament having voted £138,649 to reimburse the Colony for its share in the expedition against Louisburg, this sum was used by the Colony to redeem its paper issues at the rate of 11 to 1, and from that time onward Massachusetts was on a specie basis. Some of the Colonies, as, e.g., Rhode Island, North and South Carolina, had issued paper money far more extravagantly than Massachusetts; while others, notably Pennsylvania, had pursued a more conservative policy. In the latter Colony there were two kinds of bills—exchequer and loan bills. The first were issued by the Colonial Treasury in anticipation of taxes, but the amount outstanding is said not to have exceeded the probable receipts of two or three years. There were no sudden issues of large quantities and the amount of the issue was kept fairly uniform. The loan bills were issued to individuals on landed security, plate, or other valuable assets. With such security there was comparatively little danger of an overissue, and the records show that there were comparatively few bad debts.

In 1751 Parliament forbade the further issue of notes by the Colonies, and more or less successful efforts were made by them to redeem their outstanding notes. When, however, the Colonies united for their struggle with Great Britain the only fiscal resource which seemed open to them was the issue of paper money. The first issue was in August, 1775, for 300,000 Spanish dollars. Elaborate provision was made in the law for the redemption of this currency, and the amount fixed for which each Colony was held responsible. Other issues followed in rapid succession, and the pretense of redemption provisions was soon dropped. As much as nine millions was issued before any depreciation took place, but with the constantly expanding volume of the currency this could not last long. The following figures tell the story of the rapid multiplication and depreciation of this money:

			Price of a Spanish silver dollar in Continental currency
Issued 1776.....	20,064,464.....	January 1, 1777.....	1¼
Added 1777.....	26,426,333.....	" 1778.....	4
1778.....	66,965,269.....	" 1779.....	9
1779.....	149,703,856.....	" 1780.....	45
1780.....	82,908,320.....	" 1781...	100
1781.....	11,408,095.....	" 1782...	500
Total.....	357,476,337		

In the meantime every device known to the law was tried in vain to prevent the depreciation. The most stringent penalties enacted against those who refused to receive Continental money at its face value failed utterly to arrest the fall in value. Such enormous issues together with those of the several State governments practically destroyed the value of the paper money. As this paper was never redeemed, it was in effect a tax upon the people which caused much suffering and distress.

After the collapse of the Continental currency the circulation of the country consisted of specie, largely obtained through foreign loans, State notes, and, to a very limited extent, bank notes. In 1782 the Bank of North America, at Philadelphia, was chartered by the Continental Congress. It was a private institution with a large government subsidy and issued notes. It rendered important services to the nation, but its note issues amounted to only $400,000. Before the Federal Constitution was adopted banks of like character had been chartered in Boston, New York, and Baltimore, and bank issues acquired a recognized place in our monetary circulation.

The Federal Constitution vested the power to coin money in the central government and forbade the States making anything but gold and silver a legal tender for the payment of debt. This eliminated State issues, and from this time until the Civil War the monetary circulation consisted of United States specie, foreign specie, and bank notes.

Among the first acts of Congress was to declare the values at which foreign coins should circulate and be received at the government offices. Of these foreign coins the most common was the Spanish dollar, which as late as 1857 was received in all payments at the post offices of the United States. In 1792 a law was passed establishing a national gold and silver coinage. In the history of money prior to the gold discoveries of California specie played a subordinate part, its chief function being for small change and as a reserve for banking operations. We may therefore glance at the history of bank-note issues before taking up that of metallic currency.

While the Constitution debarred the States from issuing money, it did not prevent them from establishing banks and giving to the latter the power to issue notes as they might see fit. After the adoption of the Constitution State banks multiplied rapidly. In 1791 the Bank of the United States was chartered with a capital of $10,000,000. Its notes were received everywhere and were the natural medium of payments between different parts of the country. The bank acted as a controlling agent over the State banks, since by receiving or refusing to accept their notes it could make or mar their credit. When in 1811 its charter expired the

State banks were unrestrained in their issue of notes. In 1811 Gallatin estimated the note circulation of these banks at $46,000,000, but in 1814 it had swelled to $100,000,000, while trade was crippled by war and specie was drained from the country. Great embarrassment was felt by the government from the fact that as the only medium of exchange such State bank notes could hardly be refused in payments, while with the suspension of specie payments by the banks their value depended upon the vagaries of bank management. This state of affairs called loudly for a remedy, and the reorganization of the Bank of the United States was planned. It was eventually accomplished in 1816, and for 20 years it exercised on the whole a salutary influence upon the monetary circulation. When in 1836 its charter expired, State bank notes again ran riot and precipitated the disastrous panic of 1837. In the days of depression which followed the States generally put their banking systems in order. So long, however, as any State countenanced the loose methods which had formerly brought the whole system into disrepute, some were bound to suffer from such iniquity, but the mass of suffering was greatly reduced. This was in part due to the gold discoveries of California, which furnished the nation with a larger supply of metal than had ever been known and made it comparatively easy for the banks to maintain an adequate reserve. When the Civil War broke out the State bank system was at its best, and the agitation which culminated in 1863 in the national banking system had its origin more in the fiscal necessities of the government than in any immediate need of reform of the State banks.

The unit of value adopted in the Act of 1792 mentioned above was a dollar of 371¼ grains of pure silver—practically the Spanish dollar then current—or a gold dollar of 24.75 grains, thus providing a bimetallic system with free coinage of the two metals at a ratio of 15 to 1. There had not been for many years any material change in the production of the precious metals, and the ratio adopted corresponded fairly well with the market ratio. While no great quantity of metal was coined in the mints of the United States for the first 20 years of our history, and as before the outbreak of the War of 1812 the tide of importation was in our favor, the system worked satisfactorily. With the war and the heavy importations of merchandise which followed an export of specie began and it was found that gold was favored. This change in the market ratio was largely due to the outbreak of the revolt against the Spanish domination in South America and the slackening of supplies of silver from that region. Agitation began for a new ratio, which did not culminate in legislation until 1834. At this epoch the United States mined no silver, while a certain amount of gold, considerable for that time, was being drawn from the Appalachian gold region. When, therefore, the new ratio was adopted it was deemed wise to be upon the side of favoring gold rather than silver. Laws of 1834 and 1835 changing the weight and fineness of the coins established the ratio of 15.988 to 1, familiarly 16 to 1, although the market ratio was 15.625 to 1. The divergence was, however, too slight to affect materially the supply of silver, but in 1849 gold was discovered in California, resulting in a decreased value of gold as compared with silver. Moreover, a metallic surplus appeared in our own markets, and silver began to be exported. As all the silver in circulation was divisionary coin, it was feared that a dearth of small change would result. The exportation of silver had already seriously depleted the stock of half dollars, the largest silver coin in use, and had begun to threaten the quarter dollars when in 1853 Congress reduced the fineness of silver coins less than one dollar from 900 to 835 and made them tokens to be issued only on government account. In so doing it did not affect the status of the silver dollar, for which as before free coinage existed—an empty privilege, since the silver dollar had a higher bullion value than the gold dollar. From the establishment of the mint until 1850 the aggregate coinage of the United States was $196,000,000, and in this total gold and silver were about equally represented. In the next 10 years, 1851–60, no less than $403,000,000 were coined, of which less than $48,000,000 were silver. Such a change denotes not only that gold predominated in the metallic circulation of the period, but also that the metallic circulation itself became a thing of moment in the community.

The Civil War introduced new elements into our monetary circulation—paper money and the national bank note. Soon after the outbreak of hostilities specie payments were suspended. The government seemed to have exhausted every device of borrowing when it grasped the dangerous expedient of paper issues. Treasury notes bearing interest had several times in the history of the nation been resorted to, but it was not until the Act of Feb. 25, 1862, was passed that non-interest-bearing notes were issued. One hundred and fifty million dollars of notes were authorized and they were declared a legal tender for all debts, public and private, except duties upon imports and interest upon the public debt. Subsequent issues in July, 1862, and March, 1863, brought up the aggregate amount authorized to $450,000,000. This flood of paper money drove gold to a premium and swept away the silver subsidiary coinage. It became necessary to supply the place of the latter, and small notes called postage and later fractional currency were authorized in 1862 to the extent of $50,000,000. From the highest denominations down to three cents the monetary circulation of the nation was paper only, the issues of the United States government and the issues of the banks. In 1863 the national banking system was organized, but few banks availed themselves of the privilege of a national charter until after March 31, 1865, when a tax of 10 per cent on the circulation of State banks outstanding after Aug. 1, 1866, was enacted. This doomed the State bank notes, and banks which clung to the note-issuing privilege organized under the national law.

When peace had been declared the condition of the currency received attention. The volume of paper outstanding was reduced to $356,000,000 before 1868. In that year the fear of a monetary stringency due to contraction of the currency caused Congress to abandon this policy, and this postponed the day of redemption. In 1873 additional issues were made and the amount outstanding raised to $382,000,000, which limit was fixed as a maximum. In 1875 the Resumption Act was passed providing for a return to specie payments Jan. 1, 1879. Some slight progress towards a metallic basis had already been made by calling in the fractional

currency. The Resumption Act authorized the Secretary of the Treasury to sell bonds for the purpose of providing a gold supply sufficient to redeem the notes. It also removed the restriction which had previously rested on the volume of the national bank currency and provided that when additional bank notes were issued an amount of legal-tender notes equal to 80 per cent of such issues should be retired. The fear of contraction which had dictated a bill to repeal the entire Resumption Act, which failed only through the President's veto, succeeded in May, 1878, in abolishing this retirement provision, but not before the volume of notes had been reduced to $346,681,016, at which point the issue has remained. Much trepidation was felt lest resumption should not succeed and lest the applications for the redemption of notes should exhaust the reserve provided. But these fears proved groundless, and resumption was effected quietly and without difficulty. From 1879 the notes have been convertible into gold upon demand. No fixed reserve of gold for this purpose was prescribed by law, but the practice of the Treasury has been to keep on hand nominally at least $100,000,000 for this purpose. Whenever the reserve fell below this limit, grave concern was felt, and more than once resort was had to the issue of bonds to sustain the reserve. The Law of 1900 provides a reserve of $150,000,000 for the redemption of these notes, and provides more effective and more expeditious means for its replenishment.

Before 1862 the centre of interest and discussion in our monetary circulation lay in the notes of banks. It was then transferred to the paper issues of the government, and after 1876 to silver. During the Civil War period the United States began to produce silver as well as gold in considerable quantities, but as all our money was paper this did not affect the monetary circulation. In 1870 a revision of the coinage laws was undertaken with the purpose of codifying existing law. One of the features of the codification was the omission of the silver dollar from the list of coins. The measure was an executive one and there was considerable difficulty in securing for it the attention of Congress, which listened impatiently while its provisions were being explained. Between 1870 and 1873, when it became a law, it had been thoroughly discussed in Congress and should have been well understood. The omission of the silver dollar made the United States theoretically a gold-standard country. This law which effected the demonetization of silver was the famous "crime of 1873," concerning the passage of which the wildest statements were current at a later date. The simple fact is that at the time no one was aware of the significance of the demonetization of silver.

The agitation for the resumption of specie payment brought forward the contest between contractionists and inflationists. The latter failed in their efforts to balk the resumption policy, but the general feeling on which their argument rested, that a healthy currency must expand with the needs of the country, had to be reckoned with. This led in 1876 to the appointment of the Monetary Commission (q.v.), whose report presented in 1877 favored the free coinage of silver and thus began the long battle for that ideal. Germany had adopted the gold standard and was selling silver, the mines of the United States continued to increase their output, and silver was falling in the market below the legal ratios established by long usage in bimetallic countries. A bill for the free coinage of silver passed the House of Representatives in 1878. The Senate, however, was unwilling to accept for the United States alone the whole burden of the rehabilitation of silver, and a compromise resulted in the Bland-Allison Act, which was passed over the President's veto, Feb. 28, 1878. It provided that not less than $2,000,000 worth of silver nor more than $4,000,000 worth should be purchased monthly and coined into standard silver dollars (412½ grains of silver 900 fine), which should be a full legal tender for all debts, public and private, without exception. It also authorized the President to call an international conference for the adoption of international bimetallism at a common ratio to be agreed upon. It also permitted the issue of silver certificates in sums of $10 and upward for standard silver dollars deposited in the Treasury. No relief came from the international conference, and the coinage went on increasing in volume as the price of silver fell. Soon embarrassment was caused by the tendency of these dollars to return to the Treasury, as less than $60,000,000 were absorbed by the circulation. There was no difficulty, however, after a Law of 1886 permitted the issue of certificates in denominations of $1, $2, and $5. While the number of dollars in circulation is not large, there is no obstacle to the circulation of silver certificates.

Under the Law of 1878, which continued in force until 1890, $378,000,000 were coined. The price of silver continued to fall and with it the price of other commodities. International bimetallism as a remedy for falling prices continued to gain favor among economists, and the agitation for free silver coinage in the United States grew in strength. In 1890 again the House of Representatives passed a free-coinage bill, but a compromise worked out in the Senate was finally accepted and became law. This provided for the purchase of 4,500,000 ounces of silver monthly and the issue of Treasury notes for the cost price thereof. These notes were a legal tender, and the privilege was given to the Treasury Department to coin the silver thus purchased and replace the notes with silver certificates. The embarrassments of the Treasury and the difficulty of keeping the growing mass of silver money at a parity with gold led in 1893 to the repeal of the compulsory silver purchase provision. Under this law 168,000,000 ounces of silver had been purchased and Treasury notes to the amount of $155,000,000 issued. The repeal of the act in 1893 took place only after a severe struggle, and the friends of silver did not give up the fight. The presidential contest of 1896 was fought out on the free-coinage question and resulted in the signal defeat of the Silver party. In 1900 a new currency law was passed which squarely defined the gold dollar as the standard of value in the United States. It provided, as already stated, a larger reserve for the redemption of the legal-tender notes. The attempt to make silver dollars redeemable in gold was, however, unsuccessful. The same measure favored the expansion of the national bank note issues by permitting note issues to the amount of the par value of the bonds deposited and by reducing the tax upon the circulation of banks.

See articles BANK, BANKING; BIMETALLISM;

CURRENCY; FOREIGN MONEY; GRESHAM'S LAW; LATIN UNION; MONETARY COMMISSION; MONETARY CONFERENCES.

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MONEY ORDER. See POST OFFICE.

MON'EYWORT'. A popular name for various plants of the genus *Lysimachia* (q.v.).

MONFORTE DE LEMOS, mŏn-fôr'tā dā lā'mŏs. A town of northwest Spain, in the Province of Lugo, situated in a fertile valley, 35 miles south of Lugo, with which it has railroad connection (Map: Spain, B 1). Near by is a hill on which are the ruins of a castle of the lords of Lemos. The town has a secondary school installed in an attractive old Jesuit convent. The chief industry is cattle raising, and there are some manufactures of cloth, soap, and chocolate. Pop., 1900, 12,999; 1910, 13,838.

MONGE, mônzh, GASPARD (1746–1818). A French mathematician, born at Beaune. He was educated at Beaune and at Lyons and when only 16 years old obtained a position to teach physics and mathematics at the latter place. From there he went, in 1765, to the school of engineering at Mézières as designer. He was soon made assistant and in 1768 professor of mathematics in the military school itself. In 1780 he became a member of the Academy of Sciences at Paris, and in 1783 was appointed examiner of the naval pupils. In 1792 he was appointed Minister of Marine and the next year he took an active part in organizing the national defense. He was also active in the organization of public education, was one of the first professors in the Ecole Normale, and was one of the founders of the Ecole Polytechnique. He went with Bonaparte to Egypt in 1798, undertook the direction of the Egyptian Institute, and conducted the search for Egyptian antiquities. In 1805 he was appointed Senator, and in 1806 received the title of Comte de Péluse. After the Restoration he lost his offices and at this time he fell into a state of melancholy from which he never recovered. He is famous chiefly as the founder of descriptive geometry (see GEOMETRY), a science long kept as a government secret. But he made important contributions to other branches of mathematics as well. The development of modern geometry dates from him; he introduced into analytic geometry of three dimensions a thorough treatment of linear equations, completed the study of surfaces of the second degree which had been begun by Euler, and established the principles of the integration of partial differential equations in connection with the theory of surfaces. Following are his principal publications: *Traité élémentaire de statique* (1788; 8th ed., 1846); *Géométrie descriptive* (1795; 7th ed., 1847; new German ed. 1900); *Application de l'analyse à la géométrie des surfaces du premier et deuxième degré* (1795; 5th ed., 1850). Consult: Brisson, *Notice historique sur Monge* (Paris, 1818); Dupin, *Essai historique sur les services et les travaux scientifiques de Monge* (ib., 1819); Obenrauch, *Monge, der Begründer der darstellenden Geometrie als Wissenschaft* (Brünn, 1893–94).

MONGHYR, mon-gēr', or **MUNGHIR.** The capital of a district in Bengal, British India, on the south bank of the Ganges, 34 miles northwest of Bhagalpur (Map: India, F 4). The city proper, extending picturesquely for 6 miles along the river bank, is dominated by a fort containing the district offices and headquarters. During the eighteenth and nineteenth centuries Monghyr was noted for its manufactures of firearms, swords, and ironware, which are still in local demand. Cotton, cloth, shoes, furniture, and soap are manufactured, and there is a large trade in agricultural produce, especially butter. Pop., 1901, 35,880; 1911, 46,913.

MONGIBELLO, mŏn'jē-bĕl'lō. The Sicilian name for Etna (q.v.).

MÖNG NAI, mēng nī. An eastern state of the feudatory southern Shan States, British Burma (Map: Burma, C 2). Area, 2717 square miles. It has many mountains alternating with fertile valleys in which are raised rice, tobacco, sugar cane, and tropical fruits. There are manufactures of Shan paper. Pop., 1901, 44,252; 1911, 35,623. Capital, Möng Nai.

MON'GOL DYNASTIES (Mongol. probably from *mong*, brave). From the earliest times the tribes that became known as Mongols about the twelfth century dwelt in eastern Asia, in and about the modern Mongolia. They were organized and made a great conquering power by Genghis Khan (1162–1227). The great Asiatic Empire which was made his by conquest was divided among his sons, of whom Ogotai received

northern China and Mongolia and succeeded his father as Great Khan. Under Kublai Khan, the grandson of Genghis, who became Great Khan in 1259, the Empire was practically divided into four parts. The first, which was actually ruled by the Great Khan, included China, Korea, Mongolia, Manchuria, and Tibet, with its capital at Peking. (See CHINA; KUBLAI KHAN.) The second, the Middle Tatar Empire, given by Genghis to his son Tchagatai, included Sungaria, Transoxiana, Afghanistan, and a part of Chinese Turkestan. Its history differs in no way from that of other Asiatic states until, under a weak descendant of Tchagatai, the real power fell into the hands of the ruthless Tamerlane or Timur (q.v.), who made Samarkand the capital of his Empire. The third division of the Empire of Genghis Khan, the Empire of Kiptchak (q.v.), or the Golden Horde, was assigned to Batu, a grandson of Genghis by his eldest son Jujy. In 1237 a vast Mongol horde entered Russia (q.v.) and, after carrying destruction through that country with fire and sword and forcing the princes to do homage, pressed into Poland and Germany and on the field known as the Wahlstatt, near Liegnitz, in Silesia, defeated an army of Poles, Silesians, and Teutonic Knights in April, 1241, suffering such heavy losses, however, as to be compelled to retreat. In the same year another army under Batu Khan overwhelmed the Hungarians under their King, Béla IV. In 1242 Batu Khan was recalled to Asia by the news of the death of Ogotai. As long as the house of Batu continued the Kiptchak Mongols or Tatars held Russia in vassalage and kept eastern Europe in constant terror. They met their first defeat at the hands of the Russians in 1380; but their strength was most seriously undermined by the new Tatar invasion under Timur (q.v.) in 1389. The Empire dissolved into the separate khanates of Kazan, Astrakhan, and the Crimea. In 1480 the Russians emancipated themselves from the overlordship of the Mongols. The khans of the Crimea became vassals of the Turkish sultans in 1475. Kazan was taken into possession by Ivan the Terrible of Russia in 1552, and Astrakhan in 1554.

The fourth division included Persia, Georgia, Armenia, Khorasan, and part of Asia Minor. In 1253 Mangu, the fourth Great Khan, a grandson of Genghis, sent his brother Hulaku to govern this part of the Empire and to complete the conquest begun by Genghis. Hulaku crossed the Oxus, destroyed the sect of the Assassins (q.v.), took Bagdad, and put an end to the Abbaside caliphate (1258). He reduced Persia to complete subjection and added Mosul, Mesopotamia, Syria, and a large part of Asia Minor to the Mongol conquests. He became the founder of a dynasty known as the Ilkhans, which ruled over Persia till 1335. His religion was the pure theism of his house, and he was broadly tolerant towards both Christian and Moslem. His wife was a Christian. He established his capital at Maraghah in Azerbaijan, and there maintained a court where science and the arts were liberally cultivated. Hulaku assumed independent sovereignty upon the death of Mangu Khan. He died in 1265, and was succeeded by his son Abaka, whose ability and virtues excelled those of his father, and who had the advantage of being able to treat the country as an organizer rather than as a conqueror. The son of a Christian mother, he married a daughter of the Greek Emperor, Michael Palæologus, and is thought to have been himself a Christian. He was a devoted patron of learning. His reign was for the most part peaceful; but he expelled from his realms a Tatar army, defeating the invaders near Herat. He died in 1282. Abaka Khan was succeeded by his brother, baptized under the Christian name of Nicholas (Mongol Nikudân), who became a Mohammedan and persecuted the Christians and Mongols until he was warned to desist by his powerful uncle, Kublai Khan. When he apostatized he took the name of Ahmed. He was put to death in 1284 by Argun, the son of Abaka, who then ascended the throne. Argun followed the liberal and pro-Christian traditions of his father and grandfather. He opened diplomatic relations with Europe, whither he sent a Genoese, Buscarelli, as his agent. He proposed to make an alliance with the Pope, England, and France against the Mohammedan power. Marco Polo, the famous Venetian traveler, conducted a Mongol bride from the court of Kublai to Argun, but the latter died before their arrival, in 1291. A successor, Kai Katu, died in 1294, and the direct succession was restored by Ghazan Khan, the son of Argun. He waged a successful war with the Egyptian Sultan, and continued the friendly intercourse with Europe which his father had begun. In his later years he adopted Mohammedanism. He was a patron of literature, like his predecessors, and caused a history of the Mongols to be written by one of the scholars at his court. He made many improvements, especially in the administration of justice, and built roads and established post routes. He died in 1303. His brother and successor, Mohammed Kudah Bundah, made Es-Sultaniyeh his capital, attached himself to the Moslem sect of Ali, and died in 1316. The son of the last prince, Abu Said, was a mere child, and the common experience of absolute monarchies, a struggle for power between leading chiefs, followed his accession and introduced the seeds of weakness into the Mongol dominion. Juban, who was successful in this rivalry, married the young Khan's sister; but when Abu Said became of age he showed the spirit of his race and defeated and killed his aspiring vassal in 1327. His death in 1335 was the practical end of the Mongol monarchy in Persia. His successors until 1344 were mere puppets in the hands of ambitious chiefs, and anarchy made easy the conquests of Timur. Timur was likewise of Mongol origin and akin to the family of Genghis. The Mogul (or Mongol) dynasty in India (q.v.) was founded by one of his descendants, Baber, in 1526. Consult: Joseph Hammer-Purgstall, *Geschichte der goldenen Horde* (Budapest, 1840); id., *Geschichte der Ilchane* (Darmstadt, 1842); Yule, *Cathay and the Way Thither* (London, 1866); C. R. Markham, *History of Persia* (ib., 1874); H. H. Howorth, *History of the Mongols* (4 vols., ib., 1876–78).

MONGO'LIA. The land of the Mongols; a Chinese colonial possession, which stretches through Central Asia from Eastern Turkestan, Sungaria, and the Altai Mountains on the west to Manchuria on the east, and northward from China proper to the four Siberian provinces of Tomsk, Yeniseisk, Irkutsk, and Transbaikalia. The term is sometimes stretched to include Sungaria on the west, where many Mongols dwell, and Kokonor, which lies north of Tibet, but is separated from Mongolia proper by the Chinese

province of Kansu. The area is estimated at about 1,367,900 square miles.

Physical Features. Three physically distinct regions are recognizable: 1. A central elevated plateau known as the Desert of Gobi, 2500 to 3000 feet above the level of the sea, 500 miles or more in breadth, and extending from southwest to northeast for 1000 miles. It can hardly be described in general terms because of its diversified character. The area may be divided into a series of deserts having their own special characteristics. The Lop desert, with little break in its general level, the Kum-tagh, with a surface broken by undulations; the Hami, with a few mountain ranges; the Ordos, similar to the Lop; and Eastern Gobi, with great diversifications, are some of the areas. Extreme elevations reach in Eastern Gobi to 8000 feet; while in the Hami region a number of depressions exist, one reaching to 925 feet below sea level. Towards the west and southwest are parts overblown with loose sands, which fill the bottoms of the smaller valleys, or form fantastic, ever-changing ridges and hillocks, presenting a weird and dreary aspect, and traversable only by camels. Elsewhere, however, especially towards the Hurku Hills in the west, and in the northeastern section, are found many wide grassy plains with patches of scrub and furze and clumps of parched flowers, merging in the north into the rich pasture land and fairly wooded hill country south and east of the Kentei continuations of the Yablonoi Mountains of Siberia. 2. A still more elevated plateau from 3000 to 5000 feet above the level of the sea, lying to the northwest of this so-called desert plateau and bounded towards Sungaria and Siberia by the Altai and the Sayan Mountains. This is the region sometimes called Outer Mongolia. It is a mountainous country, clad with forests and intersected with numerous streams. The chief mountains are the Tannu, the Keutai, the Ektagh Altai, the Khangai, and the Chamur, with a general northwest to southeast trend. 3. The fertile, undulating, and well-wooded region usually called Eastern or Inner Mongolia, lying to the south and southeast of the Gobi, and intersected by the greater Khingan Mountains and their southwestern continuations. It lies along the Manchurian provinces of Kirin and Shingking, and stretches westward along the Great Wall as far as Kweihwaching (Kukuhoto). Large tracts of the Gobi desert in Inner Mongolia are being reclaimed by Chinese settlers through the simple process of irrigation.

Hydrography. With the exception of the southwest parts of the Gobi plateau, the country is fairly well watered, affording good pasturage, and even in those regions numerous rills are encountered, which, however, speedily lose themselves in the sand. Water, however, may be found almost everywhere by digging a few feet. Many lakes are scattered over most of the area; the largest, Kosogol, lies at an altitude of 5320 feet. These are drying up and from some of them thousands of tons of salt are obtained. On the extreme east, partly in Manchuria, is the Dalai-nor, and there are many lakes of less extent in southeast Mongolia. Unfortunately, these regions are so frequently wind-swept that the water holes are soon covered over or hidden by the fine dust with which the winds are laden. The drainage of the country is partly to the north, into Lake Baikal by the Eder, the Orkhon, and other tributaries of the Selengha, and partly to the northeast and east by the Onon, through the Shilka, and by the Kerulen, through the Dalai-nor and the Argun into the Amur. The extreme eastern part of Mongolia drains partly into the Amur through the Nonni and the Sungari of Manchuria, and partly to the sea by the Shira-muren, which finds its way into the Gulf of Pechili by the Liao. Many streams flow down the mountain slopes and are lost in the desert sands.

Geology and Minerals. The geology of Mongolia is only imperfectly known. The country seems to be built up of granites, gneisses, and crystalline schists of Archæan age, and there are indications of its being rich in minerals. In the Sayan Mountains immense beds and bowlders of nephrite have been found, and in the Kitoi Alps, near Lake Baikal, are great deposits of serpentine and graphite. Silver ores and graphite have also been found on the Mongolian side, and coal, apparently of Jurassic age, has been found in the Tannu Mountains and the Yenisei basin, as well as near Kukuhoto (Kweihwaching), near the great bend of the Yellow River. In the lower or central plateau red and brown conglomerates, sandstones, and clays are common, and both crystalline and mountain limestone abound in the Khingan Range.

Soil, Climate, and Vegetation. Except in the vicinity of the lakes and rivers, along the rich alluvial borderlands of the Khingan Range, and the loess deposits north of Shansi and Chihli, the soil is poor and little agriculture is possible. Authorities differ concerning the origin of the Gobi sands and they have been ascribed to lacustrine, marine, and aërial denudation. In southeast Mongolia, where the average summer temperature is 77° F., indigo, cotton, opium, and rice are produced, as well as the usual cereals, while in central Mongolia only small quantities of wheat, oats, buckwheat, and millet are grown. In the northwest agriculture is attempted only in the vicinity of the lakes and along the lower courses of the rivers. Winter lasts for from six to eight months, and in December the mercury falls in some places to 44° F. below zero. The air is dry; during the winter the cold winds from the interior prevail, while during the summer the south and southeast winds bring some moisture. At Urga, the capital, in lat. 48° 20′ N., long. 107° 30′ E., 600 miles north-northwest of Kalgan, the annual rainfall is only 9½ inches, and the mean summer temperature 64° F., and at Uliassutai, in the northwest, 5400 feet above sea level, the July temperature is 66° F. The snowfall is never great, but the icy sandstorms and snowstorms of the spring are disagreeable.

Fauna. The fauna resembles that of Siberia, in the north where the Siberian types penetrate up the valleys of the Selenga basin, and is not extensive. It is richest in fur-bearing animals, as hares, foxes, sables, and squirrels, and there are deer, marmots, black bears, kiang or mountain goats, ounces, and wolves. The wolves never run in packs, seldom attack men, and are far from brave. Droves of wild camels, ponies, asses, and mules are found, and their young are sometimes captured. Among game birds is the partridge. Except in the settled regions near China, cats and chickens are seldom seen. No encampment is complete, however, without a pack of barking, currish dogs. The camel is two-humped, but does not possess the water cells of the camels of the Arabian desert.

Industries. Mongolia has practically no manufactures. The chief industries are the rearing of flocks and herds and the breeding of horses. In the northwest, and to a less extent elsewhere, hunting is engaged in, and furs, skins, deers' horns, etc., form important articles of trade. Felt and certain kinds of woolen goods are produced, and two kinds of silk are woven in the rich agricultural districts occupied by the Chinese and the sedentary Mongols (i.e., the region between the desert and the Great Wall), whose trade is with north China. Trade centres chiefly in Urga, Kobdo, Uliassutai, and Maimaichin, opposite the Russian town of Kiakhta (840 miles north-northwest of Kalgan, q.v., also an important trade centre), and Kukuhoto or Kweihwaching, a walled Chinese town near the great bend of the Yellow River and an important point of departure for the trade with East Turkestan and Ili. Other cities are Jehol (q.v.); Lamamiao, 150 miles northeast of Peking; Pa-K'ow, 60 miles east by south of Jehol; Chi-fung-hien, 150 miles northeast of Jehol; and Hada, situated in lat. 42° 10′ N. and long 119° E. Trade is carried on mostly by barter, furs, woolen stuffs, skins, sheep, camels, horses, etc., being exchanged for salt, timber, tea, silk, cottons, sugar candy, etc. Brick tea is the chief medium of exchange. No regular currency exists in Mongolia. Chinese lump silver is in use everywhere and Chinese coins where the Chinese are found, while Russian coins and notes are accepted in outer Mongolia.

Chinese imports into Mongolia are mainly cotton sheetings and piece goods, mostly of British origin, and silks, brick tea, all sorts of metal utensils, religious articles, flour, paper, tobacco, combs, and boots. Goods from Russia include felt and cotton manufactured goods for clothing, metal and enamel ware, dressed skins, sugar, groceries, iron, tobacco, spirits, and wines. As the Mongolian has very simple tastes he is easily satisfied with inferior goods and his demands are few. The Urga government imposed a tax of 5 per cent ad valorem on imports by Chinese and 10 per cent on Chinese tobacco, wines, etc., while Russian goods are admitted free. Owing to the disturbed conditions there has been little trade recently between China and the Khalkha territory.

A very extensive and important transit trade, interrupted more or less at present, passes through Mongolia from Peking, through Kalgan and Urga to Kiakhta in Siberia, tea being the chief commodity from China. This gives considerable employment to several of the tribes as conductors of the caravans, particularly the Sunids, who occupy the central portion of the Gobi, and thousands of camels are employed. Roads—i.e., well-beaten tracks—abound, and run in all directions, except in the sandy parts, and there are usually two or more to every important place, camels going one way and ox carts another, depending on the pasturage and the water. There are few cities or towns, the Mongols being for the most part tent dwellers who usually camp on one spot all winter, but move occasionally during summer to some suitable pasturage within their own tribal limits.

Population. The population of Mongolia has been estimated at from 2,000,000 to 5,000,000. The latter number seems excessive, but it probably includes the inhabitants of Sungaria and Kokonor, as well as the very large number of Chinese who have taken up their abode here as merchants and farmers. Officially Mongolia is credited with 2,580,000 inhabitants, which makes about 2 to the square mile. Little estimates the number as low as 2,000,000, or about 1½ to the square mile.

Government. Originally the Mongolians were nomads, but at the present day they are such only in a partial sense, as each tribe now resides in a certain locality, and families change abode only twice a year, in summer and winter, and usually return to the same places.

Over each hoshun, or fief (Chin., banner), is a hereditary prince known as the jassak, whose power over his people is practically unlimited. An aimak is a group of one or more of these hoshuns, or fiefs, under the control of the senior prince of any related princely families. The Chinese call the aimak a *pu*, which means, loosely, a tribe. The league (Chin. *meng*) is a creation of the Manchu emperors to break up the Mongol tribal organization. In Khalkha the leagues are equal to the existing aimaks; in inner Mongolia the 24 aimaks form six leagues.

In 1911 the administrative divisions of Mongolia were composed as follows:

Inner Mongolia.
- The six leagues of inner Mongols.
- The Chahars.
- The Kukuhoto Tumets (Kuihuacheng Tumets).
- The Alashan Mongols (Eleuts).
- The Etsingol Old Torguts (Eleuts).

Outer Mongolia.
- The four leagues of Khalkhas.
- The Kobdo district.
- The Altai district.
- The Tannu-Urianhai lands.

The following Mongols live outside of what is generally known as Mongolia: 1. Twenty-nine hoshuns of Kokonor Mongols in the newly formed (in 1911) Chinese administrative division of Chinghai. 2. Various tribes of Mongol origin in Barga or Kulunber (the Hailar district in the northernmost Manchurian Province of Heilungkiang). 3. Mongol leagues of Unen-Sutzuktu and Batu-Setkhiltu in the Province of Sinkiang. These are Old Torguts and Hoshuts, both Eleuts. They number 13 hoshuns. 4. Some Chahars in Sinkiang, north of Ili.

The office of darga, or daruga (Chin. *meng chang*), means practically the president of a league. This office is filled by one of the jassaks and is elective. The entire number of jassaks meet periodically in a sort of diet, to settle any outstanding questions of civil, political, or economic nature which concern the league.

The jassak inherits his office as head of the hoshun, and was formerly confirmed by the Chinese Emperor. Most of the jassaks claim descent from Temu-jin (Genghis Khan) or his family. There are seven orders of nobility among these jassaks, and each prince of the inner Mongolian hoshuns had to appear once in three years at Peking for the New Year court celebrations. Theoretically the power of the jassak is unlimited over their serfs, but practically, owing to the unsatisfactory results of the system of primogeniture, they have little to do with the affairs of administration. Therefore they have the following assistants: a tusalakchi taiji (Chin. *hsieh li taiji*), a civil assistant, who administers the hoshun during

the jassak's absence, death, or minority, or until a new prince is confirmed. Generally there are two of these officials—a tzahirakchi or military assistant (Chin. *kuan chi chang ching*), who is a nontaiji chosen for his knowledge and ability; other officials for tax collecting, police duties, catching criminals, and the ordinary routine work. In the jassak's yamen all business and civil and criminal cases are decided, and records of affairs and expenditures are kept. Each jassak's hoshun is divided into a varying number of somons or sumuns, supposed to supply nominally 150 cavalrymen. Each somon is under an official called the tzangin, or tso ling.

The Mongols are very fond of titles, and in addition to the hoshun jassaks there are the taiji, of whom there are four classes, who are hereditary nobles who had not received any Manchu titles. Then there are some "sealless" princes, those who are Mongolian princes with Manchu titles but have no hoshun to administer.

Owing to the situation created by the *coup d'état* of Dec. 1, 1911, outer Mongolia is an autonomous state governed by a "sovereign" called the jebtsun dampa hutukhta (venerable sacred saint). The seat of his government is at Urga. He is assisted by a cabinet composed of the Premier and the Ministers of the Interior, Finance, Justice, War, and Foreign Affairs. The rest of Mongolia is governed from Peking by the Bureau of Mongolian and Tibetan Affairs (formerly the *Li Fan Yuen*, or Colonial Department), which sends resident officials, or ambans, as administrators to various Mongolian points.

Religion. Buddhism was introduced by Kublai Khan, and the Mongols are now strongly devoted to Lamaism (q.v.). Several males of each family become lamas or priests, and in this they are encouraged by the Chinese government. However, so many of the Mongols have entered the priestly ranks that the vitality of the race has been seriously diminished and it is even in danger of dying out. There are numerous great lamaseries in Mongolia—e.g., in the vicinity of Jehol (q.v.)—and temples are found well scattered over the country. The spiritual head of Mongolian Buddhism is the Kutukhta, or Living Buddha—next in importance to the Grand Lama of Tibet—who resides at Urga.

Social Life. The Mongols are a cheerful, good-natured, and hospitable people. They live in tents (*yurts*) of a very close-grained dark fabric, lined with felt, with a hole in the roof for escaping smoke, its occupants squatting on the felt-covered floor, supporting their backs against the boxes and chests which line the "wall." There is no furniture beyond small tables. Though Buddhists, they are not averse to flesh eating; but few except princes and nobles, or specially wealthy persons, can afford such a luxury. Their ordinary food consists of preparations of milk and millet, buckwheat flour, oatmeal, and the like. Mutton, however, is kept in the houses of the well-to-do for festive occasions, for the entertainment of guests, or to be used when prescribed medically. Except among princes and the agricultural Mongols bordering on China, chopsticks are not used—the fingers or a spoon suffice. Women are not secluded as in China, and in their marriage customs a semblance of the primitive fashion of wiving by "capture" is retained.

Language. Mongolian is an agglutinative language, belonging to the Ural-Altaic family. It is closely allied to the Manchu, and in its grammatical procedures it greatly resembles Korean. Throughout Mongolia proper it is free from dialectal differences, but slight differences exist in Kalmuck (as in Sungaria) and among the Buriatic Mongols of Siberia. It was reduced to writing in the time of Genghis Khan, the alphabet then introduced being borrowed from that of the Uighur Turks of Kashgar, who had at an earlier period borrowed theirs from the old Syriac, which had been introduced by the Nestorian missionaries. It consists of seventeen consonants, seven vowels, and five diphthongs. These are grouped on the left of a vertical stem, forming syllables which are arranged in columns read downward and from left to right. As in Korean, case is indicated by appended particles; the plural is formed by separable affixes; there is no grammatical gender; there are no relatives, and very few true conjunctions; the verb is very elaborate, the adjective uninflected; prepositions become postpositions; the governed word precedes that which governs it; and, as in China, the book language differs somewhat from the spoken. The literature is not extensive. It comprises Buddhist scriptures and some translations from the Chinese, some folklore and fairy tales, and the great history of the Eastern Mongols, written in the seventeenth century by Sanag Setsen. Both the Old and New Testaments were done into Mongolian by Stallybrass and Swan in 1836–46.

History. Little is known of the origin and early history of the Mongols. They belong to the Turko-Scythian branch of the Tatars, known in Chinese chronicles as the Hiung-nu, and are of the same stock as the Turks. Both branches of the Tatars, the Hiung-nu and the Tungusic, occupied that part of Asia now comprised in Mongolia, Manchuria, Sinkiang, and the bordering parts of Siberia and Turkestan. The Mongols are referred to in the history of the Tang dynasty (seventh century), but their early history is mythical and unreliable. In the ninth century they seem to be distinctly separated as a people from the rest of the Hiung-nu tribes. They emerge into world history with the appearance of Temu-jin, later known as Genghis Khan (q.v.). This leader united all of the nomadic Mongol tribes under his rule in 1206 A.D., and before his death in 1227 he had led his people in that great wave of bloodshed and conquest which overspread Asia and struck terror into Europe, building up an empire which included northern China, Turkestan, Mongolia, the Caucasus, and southern Russia. By 1263 the Mongols had conquered Syria, Mesopotamia, Tibet, and Indo-China. The next great figure in Mongolian history is Kublai Khan, who made Peking his capital in 1267, declared himself Emperor of China in 1280, and died in 1295. His dynasty, the Yuen, lasted in China until 1368. Driven out of China in that year by the founder of the Ming dynasty, the contemporary of Timur, the Mongolian Khalkhas retired to their former home north of the Gobi, still hoping for an opportunity to reconquer their lost territory, but a great leader did not arise. Mongolia was thus again separated from China and ruled by its own khans. Dayan Khan united all of the Mongolian territory under his rule in 1470, but when he died, in 1544, the country was divided among his 11

sons. The death of this prince is memorable, as it marks the breach between Khalkha and inner Mongolia, which hitherto had been united against the common enemy of both, the Eleuts. In 1616 the Manchus of Manchuria were united under Nurhachu, who declared war on China two years later. During this time the princes of inner Mongolia began to acknowledge the Manchurian leader as their own ruler. In 1644 the Manchus succeeded to the throne of China, with the help of certain Mongol tribes whose seats lay near the Manchurian frontier. In 1688 war broke out between the Eleuts of Sungaria and the Khalkhas, and the latter, being defeated in 1690, sought the aid and protection of China, after considering for a while whether Russian help would be more advisable. The whole of Khalkha now acknowledged the rule of China, and seven years later the operations of the Imperial armies, led in person by the Emperor Kang-hi, resulted in the utter defeat of the Eleuts and the death of their leader, Galdan. Sungaria became a Chinese possession, and all the tribes of Mongolia became vassals of the Emperor. In 1724 Kokonor was conquered by the Manchus, and the final subjugation of the Eleuts took place 30 years later. Valuable presents from time to time, the softening influence of Buddhism, the spread of Monachism, and the personal influence of the Dalai Lama of Tibet managed to preserve peace in Mongolia up to the Chinese revolution of 1911.

The opposition of the Mongols to the Chinese at the present day is due to the ever-increasing Chinese colonization of Mongolia and to the presence of Chinese military forces in that territory, which tend to destroy the autonomy of Mongolia as guaranteed by the Manchu emperors. More important, however, is the attitude of Russia. Russia desires to establish a buffer state between Siberia and China and thus prevent the flow of Chinese into her own sparsely settled territory. Her fear of the Chinese is largely economic. Neither does Russia wish to see Chinese soldiers in outer Mongolia, which would mean the proximity of a modern military force capable of threatening the Siberian Railway. In addition, there is a strong desire at present for a unity of all the Mongol races, and a legend has it that Amursana, one of the last of the Eleut princes to oppose the Manchus in 1754, will reappear and bring victory to the Mongols as in the days of Kublai Khan.

These phases of opposition to Chinese rule came to a head in 1911. The Chinese amban at Urga in that year put up barracks at Urga for the Chinese soldiers and also actively promoted Chinese immigration. These acts increased the ill-feeling between Mongol and Chinese. In July, 1911, a deputation of Mongolians went to Petrograd to solicit the assistance of the Russians in preserving Mongolian autonomy and, if possible, to establish Mongolian independence. Then the revolution in China broke out, and the Mongols took advantage of the chaotic conditions throughout the Empire to carry out a successful *coup d'état* at Urga, December, 1911. The Chinese amban, officials, and troops were forced to leave the Khalkhan district and return home, while the Mongolian hutukhta of Urga was proclaimed as ruler. January, 1912, the territory of Barga joined Khalkha in rebellion against China, for practically the same reasons, viz., fear of Chinese immigration and economic and military domination. Though the Chinese authorities of Barga peacefully withdrew, so as to give no cause for complaint, yet the territory set up a government dependent to Khalkha, and a bargut was installed at Hailar as amban, and to act as the viceroy of the hutukhta at Urga. Later the districts of Kobdo and Uliassutai also joined Khalkha in rebellion. President Yuan Shih-kai made efforts to conciliate the Mongols, but did not succeed in accomplishing much. Russia on her side encouraged the rebellious elements, and the fighting in 1913 resulted generally in favor of the Mongolian Russian-trained bands, aided by the Manchurian bandits and others.

There are three important agreements regarding the present unsettled state of Mongolian affairs. The Russo-Mongolian agreement of Nov. 3, 1912, comprises four articles, in which Russia engages to give aid towards Mongolian independence and to prevent Chinese troops or colonists from coming into Mongolia. Russian subjects and traders are given extensive privileges defined in an accompanying protocol. If Mongolia enters into any treaty with China or any other power, the present treaty cannot be altered or infringed without first obtaining the consent of Russia. In the protocol the Russians are granted the most complete freedom of trade, but no monopoly, and they may live, travel, and conduct business and manufactures in Mongolia. They may import and export all products and manufactures of Russia, Mongolia, and China duty free. Russian banks, post offices, and consulates may be established and land bought or leased. The use of rivers and roads for transport purposes is freely conceded. Disputes shall be submitted to arbitration, and a mixed tribunal shall be permanent wherever a Russian consulate is established.

In the agreement of Mongolia with Tibet, Jan. 11, 1913, the Dalai Lama, "Sovereign of Tibet," approves of the formation of an independent Mongolian state, and the "Sovereign of Mongolia" likewise approves of Tibet as an independent state. It is agreed that Buddhism is to be established on a firm footing, and mutual protection and assistance are promised by each of the new states to the other.

In the Russo-Chinese agreement of Nov. 5, 1913, China recognized the autonomy of outer Mongolia (Khalkha, the Kobdo district, and Urianghai), while Russia recognized Chinese suzerainty, and also that outer Mongolia is a part of China. The district of Barga, being in reality a part of the Manchurian Province of Heilungkiang, was not mentioned, for obvious reasons. China agreed not to send troops into outer Mongolia. Russia agreed likewise, with the exception of consular guards, and also agreed not to intervene in the administration nor to attempt colonization. China is to have representatives stationed at various places in the autonomous state.

An additional complication regarding Mongolian affairs arose in February, 1915. In the 21 demands made upon China by Japan in that year the Japanese government pressed for exclusive mining rights in eastern Mongolia, also that in the region named no railways shall be constructed without the consent of Japan, and that Japanese be given the right to settle, farm, trade, and purchase land.

The entire situation to-day is in a transitory

stage. There is a certain reaction of feeling against the Russians by the Mongols, who realize that they have not been successful in their hopes for a united Mongolia. Russia has succeeded for the time being in establishing an autonomous state in outer Mongolia, but it is certain that in the future China will attempt again to place all of Mongolia in the situation which existed during the Empire period.

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MONGOLIAN IDIOT. See MENTAL DEFECTIVES.

MONGO'LIAN RACE. That division of mankind which is characteristically Asiatic and had its primitive home on the continent of Asia, whence it has sent out branches into Europe, Africa, the islands of the Pacific, and, in the opinion of some authorities, even to the continent of America. Brinton, who termed this the Asian race, included in it the Sinitic peoples (Chinese, Tibetans, Indo-Chinese) and the Sibiric peoples (Tungusic, Mongolic, Tataric, Finnic, Arctic, and Japanese-Korean groups), while he regarded the Malayo-Polynesian peoples as a branch descended from some ancestral tribe in Asia. Keane modifies this view and regards the Malay type as distinctly Mongolic, and also has an Oceanic Mongol group (including all the peoples of Malaysia and Polynesia who are not of Indonesian, Negritic, Australasian, Papuan, or Melanesian stocks), one of the divisions of his *Homo mongolicus*. Both these scholars reject the theory which would derive the American aborigines from a Mongolian stock. Some of the earlier ethnologists saw a large Mongolian (Turanian) element in western Asia and Europe, of which fragments were to be seen in Sumerians and Hittites, Pelasgians and Etruscans, Iberians and Basques, Picts, and other isolated peoples. Abundant evidence, however, is now forthcoming that Europe and western Asia have from prehistoric times been in the possession of peoples belonging to the Mediterranean branch of the white race and their more northern and southern congeners. The view of other authorities that the Celts are largely Mongolian lacks proof, as do also the views of those archæologists who explain certain industrial and social phenomena of later prehistoric Europe by invasions of Mongolian or Mongolized peoples from Asia. Outside of the Finno-Ugrian or Ural-Altaic peoples of northeastern Europe and the later Mongol and Turko-Tataric peoples of southeastern Russia, the Magyars of Hungary, the Turks of the Balkan Peninsula, and the Huns, Avars, and Bulgars, who came in the wake of the great migration of Germanic peoples (the last named still surviving to some extent in the Slavicized Bulgarians), the Mongolian population of Europe has probably never amounted to much at any epoch, the greatest invasions having taken place in historical times during the Middle Ages. Western Asia, Europe, and northern Africa have been as characteristically the environment of the white as the great mass of the Asiatic continent has been that of the yellow race.

The members of the Mongolian race possess, as a rule, straight, coarse hair (abundant on the head, less on the face, very scanty on the body), yellowish skin, a brachycephalous (or mesocephalous) head form, prominent cheek bones, a roundish face, a small nose, and small black

eyes, with slight elevation of outer angle and vertical fold of skin over the inner canthus. Their stature is medium or below the average. The "Mongolian spots" (q.v.) are also considered by some ethnologists a differentiating characteristic of this race. Certain bodily characteristics, as the relative proportion of trunk, limbs, and head of the typical Mongolian, have led many authorities to consider this the most childlike of all the human races. Color of skin, stature, and other peculiarities of a somatic nature account for the opinion of some that the Mongolian race is nearest to the original human stock, while the white, black, brown, and red races are held to represent greater divergences from the primitive type. That the Mongolian type should be the nearest to the original race and at the same time the closest to the child, who best represents the general human type, is very probable. Physically, then, the Mongolian race is of peculiar interest. Intellectually it runs a gamut equal to that of the white race, from the lowest tribes of Siberia, through the half-civilized peoples of Central Asia and the borders of China, to the great, ancient, and almost stagnant civilization of China, and beyond that to the rapidly advancing and progressive Japanese.

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MONGOLIAN SPOTS. A term applied by anatomical anthropologists to certain temporary pigment spots, bluish, gray, or blackish in color, found particularly in the sacrolumbar region and on the buttocks of newborn children, so frequently as to be regarded as a characteristic of the Mongolian races. These spots usually disappear between the ages of two and five, although they not infrequently last until the seventh year, and are occasionally found even in adults. Some anthropologists regard these spots as the most important distinctive race characteristic of the Mongolians. They have been reported from Chinese, Japanese, Koreans, Indo-Chinese, Malays and Polynesians, Malagasy, Ainu, Tungus, Kalmucks, Mongols, as well as among Eskimos, Mexican Indians, and even in full-blooded Europeans. It has been suggested that they may be rather a mark of the Indonesian than of the Mongolian race, but at all events, in view of the fact that they are by no means confined to the Mongolian race, and may possibly turn out to be quite common even in the white race, for the present their value as a real race characteristic is very doubtful. Consult Wardle, "Evanescent Congenital Pigmentation in the Sacro-Lumbar Region," in the *American Anthropologist*, vol. iv (New York, 1901).

MONGOLIAN SUBREGION. In zoögeography, a subdivision of the Palearctic region, which includes the table-lands of Central Asia, from the Caspian Sea to Japan. Its separation from other Asiatic faunal regions is mainly on ornithological grounds, and is neither distinct nor important.

MONGOOSE, mŏn'gōōs, or **MUNGOOS** (Telugu *mangīsu*). The mongoose (*Herpestes griseus*) is a species of ichneumon (q.v.), a native of India, but introduced into other countries, notably Jamaica, for the purpose of destroying rats and other vermin, upon which it feeds. In India it is often kept about the houses to reduce the number of lizards, mice, rats, and snakes. It kills and eats the most poisonous snakes, such as the cobra, the bite of which is either avoided by the animal's agility or else is not fatal to it.

The mongoose was introduced into Jamaica in 1872, when nine specimens were imported to destroy the rats on a sugar plantation. At first they were highly beneficial, reducing the stated annual loss from rats from $500,000 to one-half that, but in less than 20 years the island was almost overrun with them. Not only did they kill rats and mice, however, but snakes, lizards, ground birds, and even poultry. At one time snakes had become so rare that they were regarded as practically exterminated, but since 1896 they are apparently on the increase. The ground doves and other terrestrial birds, partly at least by change of habit, are also adapting themselves to this new enemy and their extermination is no longer to be feared. At the present time the mongoose is common and very tame in most parts of the island and in many other islands, and is generally looked on with favor.

The mongoose is from 15 to 18 inches long and has a tail 14 to 15 inches in length, very thick at the base and tapering to a point. The fur is rather long and grizzly reddish gray. A very full account of its habits is given in the *Royal Natural History*, edited by Richard Lydekker (London, 1893–96). For the details of its history in the West Indies, consult Morris, *The Mungoose on Sugar Estates in the West Indies* (London, 1882), and *The Field* (London, July 13, 1895).

MÖNG PAI, mĕng pä'ē. A state in the central division of the southern Shan States of British Burma. The land is generally hilly, particularly in the west and south. Rice is raised on irrigated land, and there are crops of tobacco, sugar cane, cotton, and fruit. Area, 660 square miles. Pop., 1901, 19,351; 1911, 20,287. Capital, Möng Pai.

MÖNG PAN, mĕng păn. An eastern state of the southern Shan States, British Burma (Map: Burma, C 2). The centre of the state is a level plain, surrounded by hills which rise to a maximum of 5000 feet. The north part is a dense jungle which produces teak. The main habitations are in the valley of the Nam Ton. Area, 2299 square miles. Pop., 1901, 16,629; 1911, 18,554.

MONIER-WILLIAMS, mō'nĭ-ĕr-wĭl'yŭmz,

SIR MONIER (1819–99). An English Sanskrit scholar, born at Bombay. He entered Oxford University in 1837, but soon obtained an Indian writership and studied at the East India College, Haileybury, where he gained the first prize in all the Oriental subjects. He resigned his Indian appointment, however, returned to Oxford, and graduated in 1844. He taught Oriental languages at Haileybury and at Cheltenham and in 1860 became Boden professor of Sanskrit at Oxford. His main work while at Oxford was the foundation of the Indian Institute, begun in 1875 and completed in 1896, of which he was curator till his death and to which he gave a valuable manuscript collection. Among his works are: *A Practical Grammar of the Sanskrit Language* (4th ed., 1877); *An English and Sanskrit Dictionary* (1851, 1888); *Practical Hindústání Grammar* (London, 1859; 2d ed., 1868); *Indian Epic Poetry* (1863); an edition of *Sakuntalā* (2d ed., 1876) and a translation of this drama (1853; 6th ed., 1890); *A Sanskrit and English Dictionary* (1872; 2d ed., with Lenmann, Cappellu, and others, 1899); *Indian Wisdom* (4th ed., 1893), an anthology of Sanskrit literature; *Modern India and the Indians* (4th ed., 1887); *Buddhism* (1889); *Brāhmanism and Hinduism* (1883; 4th ed., 1891).

MOÑINO Y REDONDO, mō-nyē'nō ē rā-dōn'dō, JOSÉ. See FLORIDA-BLANCA, COUNT OF.

MONIS, mō-nēs' (ANTOINE EMMANUEL) ERNEST (1846–). A French statesman, born at Chateauneuf-sur-Charente. A wine manufacturer by business, he made a particularly well-known brand of cognac. He was a deputy from 1885 to 1889. After becoming Senator in 1891 he was a prominent member of the Radical Socialist party. He held the portfolio of Justice in 1899–1902 in the Waldeck-Rousseau cabinet, and, after serving as Vice President of the Senate, became Premier in March, 1911, his party having contributed largely to the defeat of the second Briand ministry. He was seriously hurt (May 21) by an aëroplane which killed his Minister of War, Berteaux. The cabinet was forced to resign June 23, 1911, when the Chamber failed to vote confidence, and Monis was succeeded by Caillaux (q.v.). In December, 1913, he became Minister of Marine in the Doumergue cabinet, from which he resigned in March, 1914, after the *Figaro* had charged that in 1911 Caillaux induced Monis to postpone the trial of Henri Rochette (for fraud in promoting) until the charge was outlawed. The committee that investigated the Rochette affair censured the actions of Monis and Caillaux, but the Chamber refused to prosecute them.

MO'NISM (Gk. *μόνος, monos*, single). A philosophical term, in its broadest sense designating all systems of philosophy which define the sum total of reality as unitary, either in organization or in substance. It is thus opposed to dualism and pluralism (qq.v.).

In this broad sense, as indicating merely the final unity of all reality, monism represents the ideal of nearly every system of philosophy, and indeed by some thinkers it is considered to be the only legitimate philosophical ideal. In the history of philosophy the first conscious effort to attain a monistic system appears in the Eleatic teachings. (See ELEATIC SCHOOL.) Among the Ionians there had been philosophers who derived all phenomena from a single primal element, but the Eleatics were the earliest to assert the immutable unity of all that is real. They did not, however, definitely fix the nature of the unitary being. That nature might be of two sorts—material or spiritual. The ancient Atomists (see ATOMISM) advanced the doctrine of a material being, while Anaxagoras (q.v.) and Plato (q.v.), although in neither case attaining a pure monism, clearly pointed the way of modern idealism.

The first thoroughgoing monism, in a more exact and restricted sense, appears in the philosophy of Spinoza (q.v.), after scholastic controversies had crystallized the conception of substance and attribute. Spinoza taught that both material and ideal phenomena are attributes of one underlying substance which forms the monistic reality. His doctrine is thus analogous to the "mind-stuff" theory (q.v.), which teaches that matter and mind are diverse aspects of one reality, and is generally identified as the modern "scientific monism." But the great difference between Spinoza's monism and the doctrine of "mind stuff" is that for the former there is only one substance, all-inclusive; for the latter atoms of mind stuff are innumerable, being one only in kind, not in number. Materialism is also monistic; while idealism, denying the reality of matter, represents the opposing, complementary form of the doctrine. Idealistic monism is itself of two types, however. On the one hand there is that type which identifies the monistic reality with the will (Schopenhauerian voluntarism); on the other there is that type which finds the nature of reality in intellect. There is still a third type in which ultimate spiritual reality is regarded as having both intellectual and volitional character. Perhaps the most famous monism is the Hegelian, which expresses the unification in logical terminology, as the reconciliation of opposites in a higher synthesis.

The term "monism" is relatively recent, having been first used by Christian Wolf (1679–1754) to designate types of thought which endeavored to do away with the dualism of body and mind. For a considerable period it was used with explicit reference to relations involved in the epistemological problem (see KNOWLEDGE, THEORY OF), but in contemporary thought it has been extended to the senses indicated above. Consult: E. H. Haeckel, *Monism as Connecting Religion and Science* (New York, 1895); id., *Riddle of the Universe at the Close of the Nineteenth Century* (ib., 1900); G. J. Romanes, *Mind and Motion and Monism* (ib., 1895); W. L. Walker, *Christian Theism and Spiritual Monism* (ib., 1906); Arthington Worsley, *Concepts of Monism* (London, 1907); and bibliographies given under IDEALISM; MATERIALISM.

MO'NITA SECRE'TA SOCI'ETA'TIS JE'SU (Lat., secret instructions of the Society of Jesus). The title of a book purporting to contain private instructions for the members of the Society of Jesus, first published at Cracow in 1614 without any author's name. It was attributed by the enemies of the Jesuits to Claudio Acquaviva, the fifth general of the order; and, though it was condemned by the Congregation of the Index in 1616 as "falsely ascribed to the society, calumnious, and full of defamatory matter," it was for a long time received as authentic by these same enemies. Its genuineness has long ceased to be defended by scholars, whatever their point of view.

Recent investigations of the Cracow Academy have made it practically certain that it was written by the man whom the Bishop of Cracow names as its suspected author in the year following its publication—Jerome Zahorowski, a former Jesuit, who had been dismissed from the order for ill conduct in 1611 and took this means of revenging himself. Consult Huber, *Der Jesuitenorden* (Berlin, 1873), and Duhr, *Jesuiten-Fabeln* (Freiburg, 1891).

MONITEUR, mô'nĕ'tĕr', Le (Fr., the monitor). A French journal founded May 5, 1789, by C. J. Panckoucke under the title *Gazette Nationale, ou le Moniteur Universel.* Its great importance as a register of events begins with the crisis of Aug. 10, 1792. Its issues for the years 1789–99 were reprinted in 32 volumes by Gallois, *L'Ancien Moniteur* (Paris, 1840–45). In Nivôse of the year VIII (1800) the *Moniteur* began to publish officially the *Actes du gouvernement.* In 1811 it took as its sole title *Moniteur Universel.* From July, 1814, to February, 1815, the official part of the journal was suspended, the government issuing irregularly a *Journal Officiel.* After this the *Moniteur* was again recognized as the government organ and so continued until 1868, when the official part was separated from the *Moniteur* and took the title *Journal Officiel.*

MON'ITOR (Lat. *monitor,* one who warns, from *monere,* to warn; so called because the lizard was supposed to give warning of the presence of the crocodile). A large, semiaquatic pleurodont lizard of the Old World, of the family Varanidæ, characterized by a long, deeply cleft, smooth tongue. The neck is relatively long and the skin is almost smooth; the tail is very long, often laterally compressed, forming a powerful swimming organ, and the teeth are large and pointed. There are nearly 30 species, all in the single genus *Varanus,* inhabiting Africa, southern Asia, and thence to Australia, but absent from Madagascar. Some species reach a length of 6 or 7 feet, and all are rapacious, seizing whatever animals they can master. Although most of them live in or around the water, others occur in dry inland regions or in the woods. The most familiar is the Nile monitor (*Varanus niloticus*), which inhabits all of Africa except the northwestern part. It is greenish gray, more or less mottled. This species spends most of its time in the water and is of service in keeping down the crocodiles, for whose eggs it searches and whose young it captures in the water. A well-known species of the East, found from northern India to the Philippines, is *Varanus salvator,* called in Ceylon kabaragoya. It is amphibious, but wanders widely in the forests and climbs trees with great agility. Consult: Tennent, *Natural History of Ceylon* (London, 1861); Mason and Theobald, *Burma: Its People and Productions* (ib., 1882); Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History,* vol. viii (Cambridge, 1901). See Plate of Lizards.

MONITOR, The. One of the most famous vessels, and the first successful ironclad, in the history of the United States navy. It was built at Greenpoint, L. I., from designs by and under the direction of John Ericsson (q.v.), was launched on Jan. 30, 1862, and on March 6, 1862, under the command of Lieut. John L. Worden, started for Hampton Roads, Va., where it arrived on the night of March 8. During this day the Confederate ironclad vessel, the *Virginia* (commonly known as the *Merrimac,* its name prior to its capture at Norfolk by the Confederates), had destroyed or disabled a large part of the Federal fleet in the harbor. On Sunday, the 9th, the *Monitor* engaged the *Virginia* in a somewhat indecisive battle lasting several hours, the *Virginia* finally withdrawing up the Elizabeth River. While the action was not fully conclusive as regards determining the relative fighting capacities of the two ships, it was tactically and practically a complete victory for the *Monitor,* as she forced her opponent to retreat in a disabled condition and fully protected the ships of the Federal fleet from her attacks. Neither vessel was very seriously injured, and only a few men were wounded on either side, Lieutenant Worden, however, being seriously injured on the *Monitor.* On May 15, 1862, in company with the *Galena,* the *Naugatuck, Port Royal,* and *Aroostook,* the *Monitor* participated in an unsuccessful attempt to capture Richmond, and on Dec. 31, 1862, while en route to Beaufort, N. C., she foundered in stormy weather off Hatteras, four officers and 17 men being drowned. The engagement between the *Monitor* and the *Virginia* (or *Merrimac*) was one of the most important and significant in the naval history of the world, demonstrating as it did the value of armored vessels and large guns, while the events of the day before showed the impotence of wooden ships and guns of average (at that time) size against armor-clads. The successful issue of the *Monitor's* one naval action greatly relieved the minds of the people of the North, whose fears of the possible depredations of the *Merrimac* had almost become panic. Thereafter to them the *Monitor* type represented all that was efficient, powerful, and perfect in naval construction and it was a long time before a just estimate of her defects as well as her good qualities was admitted except by naval officers. Consult: Bennett, *The Monitor and the Navy under Steam* (Boston, 1900); Johnson and Buel (eds.), *Battles and Leaders of the Civil War,* vol. i (New York, 1887); Wilson, *Ironclads in Action* (London, 1896); Hill, *Twenty-six Historic Ships* (New York, 1903). See the article Ship, Armored.

MONITOR BUG. A local name in California for the bloodsucking cone-nose (*Conorhinus sanguisuga*). See Cone-Nose.

MONITO'RIAL SYSTEM OF MUTUAL INSTRUCTION. A term applied to a system of school organization and instruction popular during the first half of the nineteenth century in Great Britain and to a less degree in some continental countries and in America. The practice is to be found frequently in educational history, but in its specialized sense it was employed in 1795 by Dr. Andrew Bell, superintendent of the Orphan Asylum at Madras, who made use of the more advanced boys in the school to instruct the younger pupils. In 1797, after his return to England, Bell described the practice in a work which attracted little attention. At about the same period the idea seems to have occurred, according to his own account, quite independently to Joseph Lancaster (q.v.), who improved and popularized the method. The question of priority led to long and acrimonious disputes. Hence the system is often called the Bell or the Lancastrian system of instruction. The supporters of Lancaster established the British and Foreign School So-

ciety and those of Bell the National Society, both of which may be said to have laid in the extension of the monitorial schools the foundations of the English elementary school system.

The monitorial system was at once effectual and economical. By the employment of clever boys under the direction of the master, both for the purpose of keeping order and for giving instruction, the school might be made self-operative and several hundred boys taught with the employment of only one adult superintendent. The pedagogical idea upon which the system was based was that the school life of the child is divided into two periods: in the first the child should receive all the aid that the teacher can give him consistent with the development of self-helpfulness; in the second he should be taught to apply what he has acquired to the study of other branches and to the teaching of others, when he should be thrown as much as possible upon his own resources. The original organization of such schools was: (1) the master, who was the ultimate and absolute authority; (2) the usher, who was a sort of superintendent of management and discipline; (3) the subushers, who had charge of schoolroom materials; (4) the teachers, who had general oversight of two or three classes or groups; (5) the assistants, who had charge of each group or class; (6) the tutors, who assisted each child in the preparation of his lesson. In general, all these officials under the master were pupils, the pupils of one class becoming in turn the tutors of the one below. Lancaster's improvement upon the general scheme was the division of classes into small groups and the formulation of detailed methods of instruction in the elementary branches.

Consult: Lancaster, *Improvements in Education* (London, 1805); Bell, *Elements of Tuition* (ib., 1805); Meiklejohn, *An Old Educational Reformer* (ib., 1881); Gill, *Systems of Education* (Boston, 1889); Sharpless, *English Education* (New York, 1892); David Salmon, *Joseph Lancaster, Biography* (London, 1904), containing a bibliography. See LANCASTER.

MONIUSZKO, mō-nyush'kō, STANISLAW (1820–72). A Polish composer, born in Ubiel, Government of Minsk, Russia. He perfected his musical education under Rungenhagen of Berlin, in which city he also taught for a livelihood, but subsequently settled in Vilna. He was a prolific composer. He became director of the Warsaw Opera and held a faculty position at the Warsaw Conservatory. His works include numerous songs, church music, chamber music, orchestral and instrumental pieces, and 15 national Polish operas.

MONK. See MONASTICISM.

MONK, FREDERICK DE BARTZCH (1856–1914). A Canadian lawyer and statesman, born at Montreal and educated at McGill University. He was called to the bar in 1878, became prominent in the practice of his profession in Montreal, and was elected a Conservative member of the House of Commons in 1896 and leader of the Conservative party in Quebec Province in 1900. In the House of Commons he became known as a forceful speaker both in English and in French. When the Laurier administration brought forward its naval policy for the assistance of Britain, Monk vigorously opposed it unless it was to be ratified by further and direct reference to popular vote. He also opposed the reciprocity proposals made by Sir Wilfrid Laurier and embodied in the Taft-Fielding agreement of 1911. On the defeat of the Liberals and the accession of the Conservative leader, Robert Laird Borden (q.v.), to power, Monk was appointed Minister of Public Works. He resigned in 1912.

MONK, or **MONCK,** GEORGE, first DUKE OF ALBEMARLE (1608–70). An English general who directed the national demand for the Stuart Restoration. He was born at Potheridge, Devonshire, Dec. 6, 1608. Coming under the ban of the law for thrashing a civil officer who illegally attempted to arrest his father, he volunteered for service in Spain, where he distinguished himself on secret service. In 1629 he entered the Dutch army and acquitted himself gallantly at Breda. In 1639, at the outbreak of the Scottish troubles, he was appointed lieutenant colonel and won additional renown by saving the English guns in the rout at Newburn. In 1642–43 he commanded a regiment against the Irish rebels, gained several victories, and was appointed Governor of Dublin. In the early part of the Civil War he fought as a volunteer for the King, and in the Royalist defeat at Nantwich was taken prisoner by Fairfax. Charged with high treason, he was committed to the Tower, where he remained for two years. He regained his freedom by consenting to serve in Ireland. His conduct commended itself to Cromwell, who made him lieutenant general and chief of artillery. Parliament appointed him Governor of Carrickfergus and gave him a gratuity of £500. In 1650 Cromwell took him to Scotland, and, on account of his brilliant conduct at Dunbar, left him as commander in chief to complete the subjection of that country. In 1653 he became conspicuous in a new capacity as a sea fighter and, associated with Blake and Deane, won two great naval battles over the Dutch Admiral Tromp. He took part in the commission to arrange the union of Scotland and England, and went to the former country as Governor in 1654, with much difficulty maintaining his rule against the Presbyterians. Charles II tried to secure his support, but Monk sent the letter to Cromwell. After the Protector's death Monk declared in favor of Richard Cromwell and assumed the defense of public order when Lambert's insurrection threatened a military despotism. On Jan. 1, 1660, Monk crossed the border with 6000 men, joined Fairfax at York, and entered London, February 3, without opposition. His intentions were not known until February 28, when, owing to the unsettled condition of affairs and knowing of the national wish to bring back the Stuarts, he called together the Presbyterian members expelled from Parliament in 1648 and created a majority for the King. Charles II was formally declared King on May 8. He made Monk Duke of Albemarle, Privy Councilor, Chamberlain, and Lord Lieutenant of Devon and Middlesex. In 1665, as Governor of London during the plague, Monk remained at his post when every one else had fled who could. The King then employed him against the Dutch at sea. In June, 1666, De Ruyter with an overwhelming force defeated him in a three days' battle off Dunkirk. In the month following Albemarle gained a complete and sanguinary victory over De Ruyter off the North Foreland. During the last years of his life Monk lived in a measure retired from political and social life. He died at Newhall, Essex, Jan. 3, 1670.

Bibliography. Gumble, *Life of General Monck* (London, 1671), of special importance since the author was chaplain to Monk in 1659–60 and had special opportunities for obtaining information; Thomas Skinner, *The Life of General Monk* (ib., 1724); *Thurloe State Papers* (ib., 1742); *Clarendon State Papers* (Oxford, 1786); Clarendon, *Life* (ib., 1827); F. P. G. Guizot, *Monck, or the Fall of the Republic and the Restoration of the Monarchy*, translated by Scoble (London, 1851); *Calendar of Domestic State Papers, 1649–60* (ib., 1875–86); Clarendon, *History of the Rebellion* (Oxford, 1888); Julian Corbett, *Monk* (New York, 1889), in "English Men of Action Series"; Samuel Pepys, *Diary* (London, 1893–96); C. H. Firth, *Scotland and the Commonwealth, 1751–53* (Edinburgh, 1895); S. R. Gardiner, *History of the Great Civil War* (New York, 1897); Firth, *Scotland and the Protectorate, 1654–59* (Edinburgh, 1899).

MONK, MARIA (c.1817–50). A Canadian impostor. In 1835 she claimed to have escaped from the nunnery of the Hôtel Dieu in Montreal, and told of many revolting practices alleged to have been carried on within the walls. She came to New York, and so impressed many people of standing that they continued to believe her after she was proved to be of bad character and her story to be a clumsy invention. Her tale was printed in *Awful Disclosures by Maria Monk* (1836) and *Further Disclosures* (1836). More than 200,000 copies were sold and a violent anti-Catholic agitation resulted. William L. Stone, of the New York *Commercial Advertiser*, visited Montreal and exposed her in *Maria Monk and the Nunnery of the Hôtel Dieu* (1836). For this he was abused by the Know-Nothings, who made much capital of the story.

MONK BAT. A bulldog or mastiff bat (q.v.).

MONK BIRD. The friar bird (q.v.).

MONKEY (with double diminutive ending *k-ey*, from OF. *monne*, from It. *monna*, OIt. *mona*, she-monkey, old woman, contraction of *madonna*, lady, from *mia donna*, my lady, from *mia*, from Lat. *meus*, mine, and *donna*, from Lat. *domina*, lady; apparently so called from the resemblance of a monkey's face to that of an old crone). A popular name for a large number of mammals of the order Primates. In the broadest sense a monkey is any primate except a man or a lemur. Many of these, however, are better known under more particular names, as the marmosets, apes, gibbons, etc., and it will be proper here to consider monkey as including only the members of the two families Cebidæ and Cercopithecidæ (or better, Lasiopygidæ), further excepting baboons and macaques (qq.v.), which have short tails, limbs nearly equal and not specially adapted to an arboreal life, and the muzzle projecting so that the face is more or less doglike. We may, therefore, regard the monkeys in a strict sense as including all of the Cebidæ and, of the Lasiopygidæ, all except six genera, including the baboons, geladas, black apes, macaques, and their nearest allies.

New World Monkeys. The Cebidæ are exclusively American and include not less than 9 genera and about 85 species. They are readily distinguished from the monkeys of the Old World by the presence of 36 teeth, the absence of a bony external auditory meatus, the absence of ischiatic callosities, and the presence of a broad internarial septum. On account of the latter characteristic they were at one time grouped as a suborder, the Platyrrhini, while the Old World monkeys, since they have a narrow septum, were called Catarrhini; but these terms have now largely passed out of use. The principal kinds of American monkeys are the howlers, sakis, ouakaris, titis, squirrel monkeys, spider monkeys, barrigudos, and sapajous, or capuchins. The howlers (genus *Mycetes*, or *Alouatta*) are remarkable for the extraordinary cries which they are capable of emitting, owing to the enormous enlargement of the hollow hyoid bone and vocal apparatus. The face is supplied with a long beard, the tail is long and very prehensile, and the color is very variable, though usually dark. In intelligence the howlers are ranked among the lowest of the American monkeys, although in size among the largest. The sakis are long-tailed monkeys of the genus *Pithecia*, having a well-developed thumb and the lower incisors inclined forward; they also have the rami of the mandible expanded, though not so much so as in the howlers. A number of species are known, all South American, but varying greatly in the character of the hairy coat, the beard, and the bushiness of the tail; all are arboreal, have powerful voices, and make interesting pets, some species showing great attachment to their masters. The ouakaris differ from all the other American monkeys in having a short baboon-like tail, in spite of which they are exclusively arboreal. They are limited in their range and die soon after being sent away from their own home. There are three species of the genus *Uacaria*, or *Cacajao*. The titis are small Brazilian monkeys with vertical lower incisors and a long nonprehensile tail, distinguished from the squirrel monkeys (*Chrysothrix*) by the small canine teeth and the bushy tail. These are both grouped by some authors in the genus *Saimiri*. About seven species of squirrel monkeys are known from northern South America; they have very large eyes and disproportionately long hind limbs and tail. The spider monkeys, comprising the genus *Ateles* and the aberrant woolly monkeys (*Brachyteleus*), are the most celebrated of the Cebidæ. *Ateles*, of which a dozen or more species are known, lacks a thumb and the coat is not woolly, while the members of the latter genus have a rudimentary thumb and a woolly coat. All these monkeys have the form slender, the limbs very long, and the tail extremely prehensile and naked beneath at the tip. Although so perfectly adapted to an arboreal life, they are not specially active, and the power of grasping by the hand is very imperfect, owing to the lack of a thumb. They range from southern Mexico and Central America southward to southeastern Brazil. The six species of barrigudos or true woolly monkeys (*Lagothrix*) are similar to the spider monkeys, but have a thumb and are much heavier. They rank with the howlers as the largest American monkeys. The sapajous are somewhat smaller and stouter than the spider monkeys and are the favorite species in captivity, which they bear very well. They have a thumb, and the undersurface of the tail is hairy; more than 20 species have been described, all of the genus *Cebus*.

These monkeys are all active animals, chiefly diurnal, though a few of the smaller forms are nocturnal. They live almost wholly in trees and feed upon fruits and insects chiefly, though eggs, young birds, and even some reptiles may vary the diet. They are themselves constantly

AMERICAN MONKEYS

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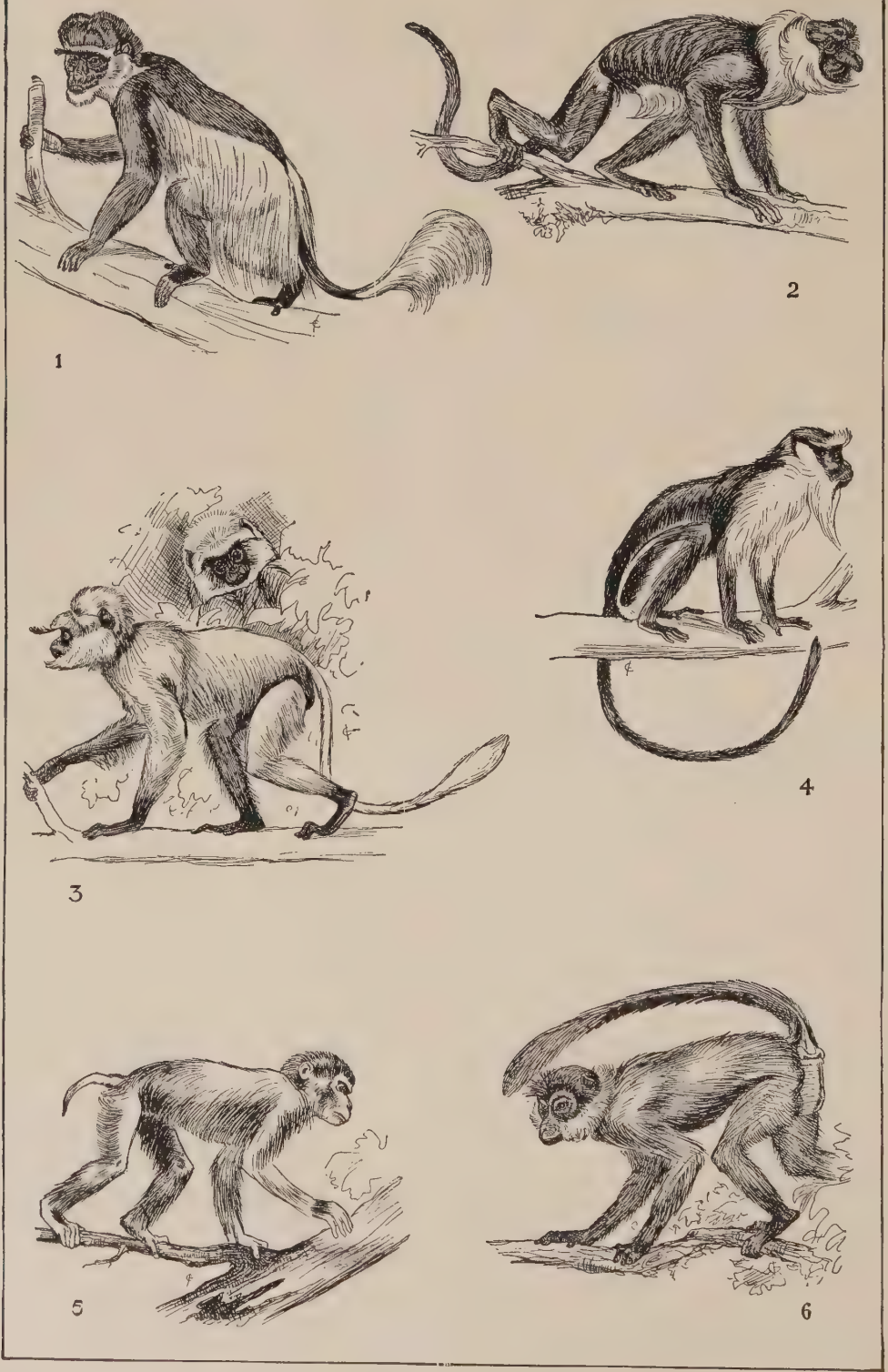
1. PINCHE MARMOSET (Œdipomidas œdipus).
2. BLACK SPIDER MONKEY (Ateleus paniscus).
3. BALD UAKARI (Cacajao calvus).
4. WEEPER SAPAJOU (Cebus capucinus).
5. BLACK HOWLER (Alouatta caraya).
6. WHITE-HEADED SAKI (Pithecia pithecia).

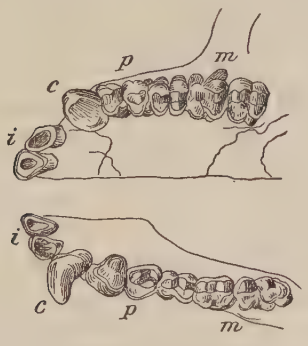
MONKEYS OF THE OLD WORLD



1. GUEREZA (Colobus abyssinicus).
2. PROBOSCIS MONKEY (Nasalis larvatus).
3. HANUMAN or SACRED MONKEY (Pygathrix entellus).
4. DIANA MONKEY (Lasiopyga diana).
5. PIG-TAILED MONKEY (Pithecus nemestrinus).
6. SOOTY MANGABEY (Cercocebus aethiops).

hunted by the Indians, who use them for food, and also use or sell the skins. The flesh of monkeys is said to be good eating, and some travelers speak in the highest terms of the meat of some of the spider monkeys. The Cebidæ are not only inferior to the Old World monkeys in size, but in intelligence do not compare with them. The sapajous are perhaps the most intelligent of the American species and in captivity make very interesting pets. Most of the monkeys seen in the United States with organ grinders are of this kind. The South American Indians shoot them with arrows, the tips of which are slightly poisoned with curare, and when the animal thus wounded has been captured, it is fed with salt, which is an antidote to the poison. The habits of monkeys are so well known that the verb "to monkey" has passed into current use as an unmistakable expression for meddlesome activity.

Old World Monkeys. Turning now to the Old World monkeys, which have 32 teeth, an external, bony auditory meatus, ischiatic callosities, and a narrow internarial septum, and leaving out of account the baboons and macaques, we face an assemblage of 10 genera and something like 185 species. Six of the genera are confined to Africa and four to Asia and the East Indies. *Cercocebus* is an African genus of four species, with teeth like a macaque, but with a long tail. *Cercopithecus*, or *Lasiopyga*, is a large African genus of over 70 species, of rather slender, long-tailed monkeys, including some of the best-known species. They are often called guenons. The thumb is of large size, both hands and feet are adapted for running as well as climbing, and the stomach is simple and not sacculated. They live in troops and make pillaging expeditions into cultivated grounds under the leadership of an old male. Of the various species of this genus which are in the market as pets, the mangabeys (q.v.) are favorites; they are usually blackish, with more or less white. The best known of African monkeys



DENTITION OF A MONKEY.

Upper and lower series of teeth, left side, of the green monkey: *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. (Cf. LANGUR.)

is the common green monkey (*Cercopithecus*, or *Lasiopyga, callitrichus*), which is of medium size and olive green in color. It is widely distributed in Africa and over 200 years ago was introduced into St. Kitts, Grenada, and some others of the Lesser Antilles, where it has been quite destructive to crops. In identifying the various less-known species of *Cercopithecus*, or *Lasiopyga*, one of the most important points is the color of the nose. *Nasalis* is a notable genus containing a single species, the proboscis monkey (q.v.) of Borneo, in which the nose is greatly prolonged into a real proboscis. This species bears captivity poorly, and few living specimens have been seen in Europe or America. *Semnopithecus*, or *Pygathrix*, includes over 50 Asiatic species, such as the well-known hanuman and the langurs (qq.v.). The last genus, *Colobus* (see GUEREZA; KING MONKEY), includes about 30 African monkeys with the thumb rudimentary or wanting. Many of them are handsomely decorated with long, silky hair, and the pelts have considerable commercial value, being used for the manufacture of women's boas, muffs, etc. The Old World monkeys do not differ essentially from the Cebidæ, but they are not so exclusively arboreal and the tail is not prehensile. In many species cheek pouches are present, in which food may be stored, and such forms have the stomach simple; but in those forms where there are no cheek pouches the stomach is sacculated in an extraordinary manner. The latter monkeys are exclusively herbivorous and live largely on shoots and leaves. Monkeys breed usually but once a year and produce only one or two young ones at a birth.

The fossil remains of monkeys have been found in the Pleistocene deposits of Brazil and as far back as the Middle Miocene of Europe.

Bibliography. Consult standard natural histories, especially the books of Jerdon, Blanford, Blyth, and Wallace on India and the East; and of Azara, Humboldt, Bates, Wallace, Tschudi, Waterton, Belt, Gosse, and Alston on South and Central America; also R. L. Garner, *The Speech of Monkeys* (New York, 1892); H. O. Forbes, *A Handbook to the Primates*, in "Allen's Naturalists' Library," vol. ii (London, 1894); R. L. Garner, *Apes and Monkeys, their Life and Language* (Boston, 1900). A recent account is D. G. Elliot, *A Review of the Primates* (New York, 1913). See APE; MAMMALIA; PRIMATES; RHESUS; TITI MONKEY.

MONKEY BREAD. A tropical tree and its edible fruit. See ADANSONIA.

MONKEY FLOWER. See Colored Plate of CALIFORNIA SHRUBS.

MONK'FISH. See ANGEL FISH; ANGLER.

MONK'HOUSE, WILLIAM COSMO (1840–1901). An English art critic and poet, born in London. He was educated at St. Paul's School. In 1857 he became a clerk in the Board of Trade and in 1893 Assistant Secretary of Finance. His verse comprises: *A Dream of Idleness and Other Poems* (1865); *Corn and Poppies* (1890); *The Christ upon the Hill* (1895). Among his publications on art are: *The Italian Pre-Raphaelites* (1887); *The Earlier English Water-Colour Painters* (1890); *In the National Gallery* (1895); *British Contemporary Artists* (1899). He also wrote *Lives* of Turner (1879) and Leigh Hunt (1893) and contributed many articles to the *Dictionary of National Biography*.

MONK SEAL. The West Indian seal (*Monachus*). See SEAL.

MONKS'HOOD. See ACONITE.

MONKS OF SAINT BASIL. See BASILIAN MONKS.

MONK'S TALE, THE. One of Chaucer's Canterbury Tales, a miniature reproduction of Boccaccio's *Falls of Illustrious Men.*

MONKSWELL, mŭnks'wĕl, ROBERT PORRETT COLLIER, first BARON (1817–86). An English judge. He was born at Plymouth and was edu-

cated at Trinity College, Cambridge. Admitted to the bar at the Inner Temple in 1843, he established his reputation as a lawyer by his brilliant defense of the Brazilian pirates in 1845. He was elected a Liberal member of Parliament for Plymouth in 1852. While counsel to the Admiralty and Judge Advocate to the fleet he gave an opinion that would have prevented the Confederate vessel *Alabama* from going to sea if it had been acted upon. (See ALABAMA CLAIMS.) He became Solicitor-General in 1863 and Attorney-General in 1868. He was made a judge of common pleas for a few days in 1871 to enable him to qualify as a member of the judicial committee of the Privy Council. This action brought popular opprobrium upon the Gladstone government, but he served in that office until his death. He was made a peer in 1885.

MONLUC, or **MONTLUC**, môn'lụk', BLAISE DE (1502–77). A French warrior, historian, and autobiographer, born in Armagnac, near Condon, now in the Department of Gers. For 50 years he was abroad, always doing something, and he remembered what he had done. He shared in the campaigns of Francis I and got leave from him for the Duke d'Enghien to start the fight at Cérisoles (1544). Under Henry II in 1555 he held off the Emperor's troops at Siena. He fought the Huguenots in Guienne. A slash in the face caused him to withdraw for two years (1570–72), and in this forced repose he wrote his *Commentaires*. He detested letters, but the example of Cæsar set him to writing of what he had done and seen. Monluc wrote admirably, with the fire of a glory-loving Gascon. He was not in the least a philosopher, though he meant his *Commentaires* to be useful to posterity. Without understanding the movements of his time, he saw distinctly what went on about him. Monluc gives an extraordinarily vivid series of pictures of his adventures in France and Italy. His *Commentaires* are highly valuable to the historians, and their style makes them delightful reading to those who are simply looking for a man. Monluc died in Estilla, near Agen. Consult: *Commentaires et lettres de Blaise de Monluc*, edited by Ruble (Paris, 1864–72); Normand, *Les mémorialistes, Monluc* (ib., 1892); Paul Courteault, *Blaise de Monluc, historien* (ib., 1908), containing a bibliography.

MONMOUTH, mŏn'mŭth. A municipal borough and market town, the capital of Monmouthshire, England, situated amid beautiful scenery, at the confluence of the Monnow and the Wye, 18 miles south of Hereford (Map: England, D 5). It has ruins of former walls with a well-preserved gateway, and its fourteenth-century church is surmounted by a lofty spire. Of its castle, the favorite residence of John of Gaunt and the birthplace of Henry V, little remains. A building said to be the study of Geoffrey of Monmouth is all that exists of the Benedictine monastery. There is a seventeenth-century grammar school. Manufactures include tin plate, lumber, and chemicals. Pop., 1901, 5095; 1911, 5269.

MONMOUTH. A city and the county seat of Warren Co., Ill., 27 miles east by north of Burlington, Iowa, on the Chicago, Burlington, and Quincy, the Minneapolis and St. Louis, and the Rock Island Southern railroads (Map: Illinois, C 4). It is the seat of Monmouth College (United Presbyterian), founded in 1856, and has the Warren County Library and fine courthouse, Federal, city hall, and high-school buildings. There are farming, coal-mining, horse-breeding, and commercial interests, controlling a large trade in grain, produce, live stock, and in the principal manufactured products, which include agricultural implements, sewer pipe, pottery, oil cans, stoneware, soap, stump pullers, gloves, boxes, and cigars. Settled in 1836, Monmouth was incorporated first in 1852. The government, under a charter of 1874, is vested in a mayor, elected biennially, and a unicameral council. The city owns and operates the water works. Pop., 1900, 7450; 1910, 9128; 1914 (U. S. est.), 9839.

MONMOUTH, BATTLE OF. A battle fought June 28, 1778, during the American Revolution, near Monmouth Courthouse, in the town of Freehold, Monmouth, Co., N. J., between an American army under General Washington and an English army under Sir Henry Clinton. The latter, evacuating Philadelphia on June 18, retreated across New Jersey and on the twenty-sixth reached Freehold, whence on the twenty-seventh he started for Sandy Hook. Washington, following closely, resolved to attack Clinton's left wing, 8000 strong, marching in the rear, and detailed Gen. Charles Lee with 6000 troops to assail its flank until he could come up with the main division. Lee advanced accordingly, but, instead of attacking, intentionally wasted time in feinting and executing futile manœuvres and, after a little skirmishing, ordered a general retreat. Washington rapidly pushed forward, rebuked Lee with great severity, and, rallying the demoralized troops, checked the advance of the British, who made determined but unsuccessful attacks on the American left under Stirling and the American right under Wayne and Greene. The English then fell back and took up a strong position, but during the night withdrew to the heights of Middletown. Though usually claimed as a victory for the Americans, the battle was strategically drawn, neither side gaining any decisive advantage. The Americans lost 362 in killed, wounded, and missing, the British 416, among whom was Lieut. Col. Henry Monckton; many on each side were prostrated by the intense heat (96° in the shade). Lee was shortly afterward tried by court-martial for his conduct, was found guilty of disobeying orders and of making a shameful retreat, and was accordingly suspended from command for a year. Consult Dawson, *Battles of the United States* (New York, 1856), and Carrington, *Battles of the American Revolution* (ib., 1876).

MONMOUTH, GEOFFREY OF. See GEOFFREY OF MONMOUTH.

MONMOUTH, JAMES, DUKE OF (1649–85). A claimant to the English throne and a leader of the Monmouth insurrection. He was the son of either Charles II or Robert Sidney by Lucy Walters, and was born at Rotterdam, April 9, 1649. Charles, who recognized the boy as his son, committed him to the care of Lord Crofts, who gave him his own name. On the Restoration, Monmouth, then Mr. James Crofts, came to England with the Queen Dowager and was lodged at the royal palaces of Hampton Court and Whitehall. He was married in 1663 to Anne, daughter of the Earl of Buccleuch, and was created Duke of Monmouth, assuming as family name his wife's name of Scott. At the period of Titus Oates's plot (1678), rumors that the Protestant Duke was the King's legiti-

mate son spread far and wide, but the King declared solemnly before the Privy Council that he had never married Lucy Walters. Monmouth was sent into Scotland in 1679 for the purpose of quelling the rebellion of the radical Presbyterians. He defeated the Covenanters at Bothwell Bridge, but his humanity to the fleeing and wounded was so conspicuous and his recommendations to pardon the prisoners were so urgent as to bring upon him the violent censure of the King and Lauderdale. He thus became the idol of the English Nonconformists. The return of the Duke of York and the exile of Monmouth soon followed. In Holland he allied himself to the leaders of the Nonconformist party, exiled like himself, and when he returned to London he was received with such demonstrations of joy as to convince him that he was the people's choice as successor to his father. In 1680 he made a quasi-royal progress through the west of England with the design probably of courting the Nonconformists, and two years afterward he traversed some of the northern counties. The King and his brother were alarmed, and Monmouth was placed for a short time under arrest. In 1684 Monmouth went to the Netherlands and remained abroad until the death of Charles, whereupon he returned to England. Landing in 1685, he assumed the title of James II and headed a rebellion against the government. News of the defeat of Argyle, who at the head of the Scottish exiles had attempted an insurrection in Scotland, made Monmouth despondent. Nevertheless on July 6 he attacked a superior royal force which, under the command of the Earl of Feversham, was encamped at Sedgemoor, near Bridgewater. When his ammunition failed the Duke fled and his troops were massacred. Monmouth was found concealed in a ditch and was brought to London. Gaining an interview with the King, he made the most humiliating submission, but in vain, even the shortest respite being refused. On July 15, 1685, he was beheaded on Tower Hill. In the Bloody Assizes under Judge Jeffreys (q.v.), Monmouth's adherents paid a fearful penalty for their participation in his rash rebellion. Consult: Grey, *Secret History of the Rye-House Plot, and of Monmouth's Rebellion in 1685* (London, 1754); Collins, *Peerage of England*, vol. iii (5th ed., ib., 1779); Roberts, *Life, Progress, and Rebellion of James, Duke of Monmouth* (ib., 1844); Fergusson, *Robert Fergusson, the Plotter, or the Secret of the Rye-House Conspiracy and the Story of a Strange Career* (Edinburgh, 1887); Hyde, *Correspondence of Henry of Clarendon and James, Earl of Abingdon, Chiefly Relating to the Monmouth Insurrection, 1863–85* (Oxford, 1896); Allan Fea, *King Monmouth* (New York, 1902).

MONMOUTH COLLEGE. A coeducational institution, opened in 1856 at Monmouth, Ill., under the control of the United Presbyterian church. The college courses are arranged in nine groups, all leading to the degree of A.B. or S.B. There are preparatory and graduate departments and schools of music and art, with a total registration in 1913–14 of 438. The library contained about 10,000 volumes. The faculty numbered 26. The campus occupies 13 acres and with the buildings is valued at about $285,000. The endowment is $284,000 and the income $345,000. The president in 1915 was T. H. McMichael, A.M., D.D.

MONMOUTHSHIRE, mŏn'mŭth-shēr. A maritime county in west England, bounded south by the estuary of the Severn, northeast by Herefordshire, east by Gloucestershire, and west by Glamorganshire (Map: England, D 5). It has a coast line of 22 miles and an area of 546.2 square miles. The surface is elevated in the north and northwest, culminating in the Sugarloaf (1955 feet). The coast districts are low and fertile, being protected by sea walls, and in the valleys of the Usk, Monnow, and Wye wheat, barley, and oats are grown. The county is celebrated for its mineral wealth and abounds in collieries and ironworks. The scenery is unusually varied and beautiful, and its picturesqueness is enhanced by numerous Roman antiquities and the feudal remains of Raglan, Caldecot, and Chepstow castles and Llanthony and Tintern abbeys. Until the reign of Henry VIII, Monmouth was part of the Kingdom of Gwent, South Wales, and the Welsh language is still spoken very widely. Chief towns, Newport, Abertillery, Ebbw Vale, Tredegar, and Nantyglo and Blaina. Capital, Monmouth. Pop., 1901, 298,076; 1911, 395,778.

MONNA VANNA, mŏn'â vân'â. An opera by Février, first produced in Paris, Jan. 13, 1909; in the United States, Dec. 4, 1913 (Boston).

MONNIER, mô'nyā', Henri Bonaventure (1805–77). A French caricaturist and author, born in Paris. He first won attention by pen sketches and lithographic illustrations of Béranger (1828), which revealed his power of catching typical traits. Thus he was led to write and illustrate such comic yet faithful records of Paris street life as *Scènes populaires* (1830) or the *Mémoires de M. Joseph Prudhomme* (1857). In 1831 he became an actor, excelling in plays of his own writing; but he soon abandoned the stage. Many of his later pictured stories have been adapted for dramatic presentation, e.g., *Un voyage en Hollande, Les bourgeois de Paris,* and *Le bonheur de vivre aux champs.* Consult Champfleury, *Henri Monnier, sa vie, son œuvre* (Paris, 1889), and Beraldi, *Les graveurs du XIXème siècle,* vol. x (ib., 1890).

MONNIER, Jean Marie Albert Marcel (1853–). A French explorer and author, born in Paris and educated at the Lycée Condorcet. In 1886–87 he explored the Andes and the Amazon. In 1891–92 he went with Captain Binger's African expedition to the Ivory Coast, and in 1894, as correspondent of the *Temps,* he began a three years' journey to French Indo-China, Japan, Korea, and China, returning from Peking to Bassora. Among his writings are: *Un printemps sur le Pacifique* (1885); *Des Andes au Pará* (1889); *Mission Binger; France noire* (1893); *Le tour d'Asie* (2 vols., 1899–1900), which received a prize from the French Academy; *Le drame chinois, juillet-août, 1900* (1900); *Itinéraires à travers l'Asie* (1901).

MONNIER, Marc (1827–85). A French writer, known mostly for his studies of Italy. He was born in Florence and passed the greater part of his life in Geneva, where he was professor at the university. His works include: *Etude historique de la conquête de la Sicile par les Sarrasins* (1847); *Lucioles* (1853), in verse; *Les amours permises* (1861); *Histoire du brigandage dans l'Italie méridionale* (1862); *La Camorra, mystères de Naples* (1863); *Pompéi et les Pompéiens* (1864); *La vie de Jésus* (1873), in verse; *Contes populaires en Italie* (1880); *Le charmeur* (1882); *Un aventurier du siècle dernier, Le comte Joseph Gorani* (1884);

Histoire de la littérature moderne; La renaissance de Dante à Luther (1884), followed by *La réforme de Luther à Shakespeare* (1885).

MO'NO. A general term used in southern California for the Shoshonean tribes.

MONOC'ACY, BATTLE OF. A battle fought at Monocacy Junction, Md., about 5 miles from Frederick, on July 9, 1864, during the Civil War, between about 6000 Federals under Gen. Lew Wallace and about 20,000 Confederates under General Early. The Federal force was defeated, but succeeded in delaying Early's march upon Washington, and thus rendered a valuable service. General Grant, in his *Memoirs*, says: "General Wallace contributed on this occasion, by the defeat of the troops under him, a greater benefit to the cause than often falls to the lot of a commander of an equal force to render by means of a victory."

MONOCEROS, mŏ-nŏs'ĕr-ŏs (Lat. *monoceros*, Gk. *μονόκερως*, unicorn, from *μόνος, monos*, single + *κέρας keras*, horn), or the **UNICORN.** A constellation lying on the celestial equator directly south of Canis Minor and east of Orion. It contains no stars brighter than the fourth magnitude, but is rich in nebulæ, clusters, and multiple stars. RW Monocerotis is an Algol variable, with a period of 1.9 days.

MONOCEROS. A gastropod. See GASTROPODA.

MON'OCHORD (Lat. *monochordos, monochordon*, from Gk. *μονόχορδον*, monochord, neut. sing. of *μονόχορδος, monochordos*, having a single chord, from *μόνος, monos*, single + *χορδή chordē*, string). A very ancient musical instrument used to determine the mathematical proportions of intervals. It consists of a single string stretched over a sounding board. Any division of this string is obtained by means of a movable bridge sliding on a graduated scale. In this manner every interval can be produced with absolute acoustic purity. During the Middle Ages the monochord was used to illustrate intervals sounding simultaneously, and for this purpose several strings, each with a separate bridge, were added. In this form it became the precursor of the clavichord (q.v.). See Plate of MUSICAL INSTRUMENTS.

MON'OCHROME (ML. *monochroma*, from Gk. *μονόχρωμος, monochrōmos*, having a single color, from *μόνος, monos*, single + *χρῶμα, chrōma*, color). A painting done in the various shades of a single color. See CAMAIEU.

MON'OCLINE (from Gk. *μόνος, monos*, single + *κλίνειν, klinein*, to incline). A geological term applied to an abrupt inclination of strata connecting the same beds lying at different levels. A monocline may be regarded as a modified form of the anticline (q.v.). Folds of this character are developed on a grand scale in the Rocky Mountain region.

MONOCLINIC (mŏn'ō-klĭn'ĭk) **SYSTEM.** See CRYSTALLOGRAPHY, and Plate of CRYSTAL FORMS.

MON'OCOT'YLE'DONS (from Gk. *μόνος, monos*, single + *κοτυληδών, kotylēdōn*, cup-shaped cavity, from *κοτύλη, kotylē*, socket). One of the two primary divisions of angiosperms, the other division being called dicotyledons. The two groups are distinguished from each other by the following four prominent characters: (1) the embryo of a monocotyledon has a single and apparently terminal cotyledon, while the embryo of a dicotyledon has two well-developed lateral cotyledons; (2) in the mature stem of most monocotyledons the vascular bundles are scattered, while in dicotyledons they are arranged so as to form a vascular cylinder inclosing pith; (3) the leaves of monocotyledons have a closed venation (i.e., veinlets do not end freely in the margin, which is usually entire), while the leaves of dicotyledons have an open venation, veinlets ending freely in the margin, which is often toothed or lobed; (4) the flowers of monocotyledons usually have their members in sets of three, while those of dicotyledons more commonly have their members in sets of five or four. These characters are by no means of equal value, the character of the embryo being the only one without numerous exceptions. There are monocotyledons with regular vascular cylinders, with open venation, and with flowers not in threes; and there are dicotyledons with scattered vascular bundles, with closed venation, and with flowers in threes. It is not so much a single character, therefore, that distinguishes a monocotyledon from a dicotyledon, as a combination of characters. Formerly monocotyledons were called endogens, but the name has been abandoned in this connection, having been given upon a misconception, and is now applied in a totally different way. Until recently the monocotyledons were supposed to represent the primitive stock of the angiosperms. This idea arose from the fact that certain leaves with parallel veins which occurred in the Mesozoic and Paleozoic formations were thought to be the leaves of monocotyledons. These have now proved to be the leaves of gymnosperms, and there is no evidence of the monocotyledons until comparatively late in the Mesozoic. In fact, it has now been proved that the dicotyledons were the primitive angiosperms and that the monocotyledons have been derived from them as a specialized branch. The principal evidence has come from the study of the vascular anatomy of the two groups. It is now known that seedling monocotyledons contain the vascular cylinder of dicotyledons; that this cylinder is retained by some adults, but that in most cases the dicotyledonous cylinder becomes gradually transformed into the cylinder of scattered bundles, which is characteristic of the adult stems of monocotyledons. The monocotyledons comprise about 20,000 species, which are grouped into 10 orders. The first six orders constitute the more primitive spiral series, in which the parts of the flower are indefinite in number, although occasionally the characteristic number three emerges. The remaining four orders constitute the cyclic series, the highly specialized monocotyledons, in which the parts of the flower are definitely in threes. The most prominent orders of the spiral series are the Pandanales, which include the screw pines and cat-tails; the Helobiales, a very characteristic aquatic or marsh line, including the pondweeds; the Glumales, or grasses and sedges, the greatest order of monocotyledons in point of numbers; the Palmales, or palms; and the Arales, or aroids, which are peculiar among monocotyledons in often having leaves resembling those of the dicotyledons. The chief cyclic orders are the Liliales, including not only lilies but also the species of the amaryllis and iris families; also Scitaminales, to which banana, ginger, and canna belong; and, finally, Orchidales, or orchids. See DISTRIBUTION OF PLANTS.

MONOCYCLIC (mŏn'ō-sīk'lĭk, -sī'klĭk) **PLANTS.** See ANNUALS.

TYPES OF MONOCOTYLEDONS

1. AN ORCHID (Lady's-slipper).
2. A LILY (Dog's-tooth violet).
3. A GRASS (Sugar-cane).
4. A PALM (Date-palm).

MONOD, mô'nô', Adolphe (1802–56). A French Protestant minister. He was born at Copenhagen, his father having been a Reformed clergyman from Geneva. He studied in Paris and Geneva and was pastor of a small Protestant congregation at Naples (1825–27). In 1828 he became pastor at Lyons, where he remained till 1831 and founded the Free Evangelical church. In 1836 he was appointed professor of theology at Montauban and held this position for 11 years. During this time he traveled in southern France, preaching and instructing the people who were attracted by the power of his discourses. In 1847 he became pastor at Paris, where he drew large crowds by his eloquent preaching. His literary works were chiefly sermons (4th ed., Paris, 1866) and *A. Monod's Farewell to his Friends and to the Church* (Eng. trans., London, 1857). Consult S. M. (a daughter), *Life and Letters of A. Monod* (London, 1885).

MONOD, Frédéric (1794–1863). A French Protestant, brother of Adolphe Monod. He was born in Monnaz, Canton of Vaud, Switzerland; was educated at Geneva; entered the ministry in 1820 and the same year succeeded his father as pastor of the National Protestant Church of France in Paris. He established in 1824 the *Archives du Christianisme,* the chief organ of the Evangelical French Protestants, and continued its editor until his death. After officiating 12 years as pastor of the oratoire, he united with Count Gasparin and others in an attempt to restore a rule of faith in the Reformed church which would exclude rationalists by making an acknowledgment of the divinity of Christ essential to membership. Failing in this, they left the National Protestant church in 1849 and organized independent congregations, which resulted in the formation of the Free Evangelical Church of France. Consult G. Monod, *La famille Monod* (Paris, 1890).

MONOD, Gabriel (1844–1912). A French historian, born at Havre. He studied at the Ecole Normale and in Italy and Germany and in 1869 began to teach at the Ecole des Hautes Etudes, where he became director of the historical-philological section and president, and from 1905 to 1910 was professor at the Collège de France. His literary output was not great, but his influence as a conscientious research scholar was wide. Monod was an editor of the *Revue Critique* and founded (1876) with Fagniez the *Revue Historique.* Of the latter journal he had entire charge after 1885. He wrote *Allemands et Français* (1871); *Etudes critiques sur les sources de l'histoire mérovingienne* (1878–85); *Jules Michelet* (1875); a very important *Bibliographie de l'histoire de France* (1888); *Les maîtres de l'histoire, Renan, Taine, Michelet* (1894); *Portraits et souvenirs* (1897); *Souvenirs d'adolescence* (1903); *Jules Michelet, études sur sa vie et ses œuvres* (1905). He also contributed largely to the reviews.

MON'ODEL'PHIA (Neo-Lat., from Gk. *μόνος, monos,* single + *δελφύς, delphys,* womb). The largest and highest of the subclasses or infraclasses of mammals, equivalent to Eutheria (q.v.). This term, now passing into disuse, refers to the fact that the vagina and uterus in the female are always single. Compare Ornithodelphia; Didelphia.

MON'ODY (Lat. *monodia,* from Gk. *μονῳδία,* solo, lament, from *μόνος, monos,* single + *ᾠδή, ōdē,* song, ode, from *ἄδειν, adein,* to sing). Originally a name for an ode sung by a single actor in a Greek tragedy, and hence its connotation of sadness, as of the dirge. In later Greek usage it became also a name for a funeral oration. In English literature it is a name for an elegy or dirge in which a single mourner expresses grief over the dead. Examples of it are Milton's *Lycidas,* Shelley's *Adonais,* Arnold's *Thyrsis.* In music it is a name for a composition in the homophonic style.

MONODY. A style of music which first was cultivated in Italy about 1600. Up to that time serious composers had always used polyphony (q.v.). The Renaissance awakened a deep interest in the works of the ancient Greek dramatists, and in Florence a number of learned musicians and literary men attempted to reconstruct the music of those plays. It was felt that the polyphonic style, employing a number of voices, was not suited to accompany the words of a drama, where distinct enunciation of every word was the prime consideration. Attempts were made to write for a solo voice with instrumental accompaniment. For this purpose famous madrigals (see Madrigal) were arranged so that one part was assigned to the voice, while the others were played on some instrument. The inadequacy of this soon made itself felt, and composers began to write original compositions for a solo voice. This new style, employing only one voice, was called *monody,* as against polyphony, a style with many voices. The instrumental part of the earliest of these compositions is exceedingly primitive, consisting of scarcely more than a figured bass (q.v.). But with the establishment of the opera the progress of monody was very rapid. Monody must not be confounded with *homophony* (q.v.), which is a later development, and which does not exclude elaborate contrapuntal work in the accompanying parts. See Aria.

MONŒ'CISM (from Gk. *μόνος, monos,* single + *οἶκος, oikos,* house). The word means primarily the condition of a single household in plants, which means that the male and the female organs occur upon the same individual. In its original application, however, it referred to the fact that in many seed plants the stamens and pistils occur upon the same individual, but this application arose from the mistaken idea that stamens and pistils are sex organs. The contrasting term is diœcism, referring to the condition in plants in which the male and female organs occur upon different individuals. The application of the term to a nonsexual condition in the flowering plants is unfortunate, for it means that monœcism in mosses and ferns refers to one fact and in flowering plants to quite a different one. Among the mosses the monœcious habit is very usual, the same sexual plant (gametophyte) bearing both sex organs (antheridium and archegonium). Among the true ferns monœcism is almost universal, the characteristic small gametophyte (prothallium) bearing both antheridium and archegonium. With the introduction of heterospory (q.v.), however, the sexual plants are absolutely differentiated, one individual being male and another female. Since all the flowering plants are heterosporous, it follows that they are essentially not monœcious in the sense of the term as used among mosses and ferns. In the application of the term to stamens and pistils, however, rather than to sex organs, the majority of flowering plants are found to be monœcious; i.e., with

the stamens and pistils not only upon the same plant, but in the same flower.

MON'OGRAM (Lat. *monogramma*, from Gk. *μονογράμματος*, *monogrammatos*, consisting of a single letter, from Gk. *μόνος*, *monos*, single + *γράμμα*, *gramma*, letter, from *γράφειν*, *graphein*, to write). A character composed of two or more letters of the alphabet, often interlaced with other lines, and used as a cipher or abbreviation of a name. A perfect monogram is one in which all the letters of the word are to be traced. The use of monograms began at a very early date. They are found on Greek coins, medals, and seals, and are particularly numerous on the coins of Macedonia and Sicily. Both on coins and in manuscripts it was the practice to present the names of states and cities by monograms, of which above 500 are known, but some have not been deciphered. Monograms occur on the family coins of Rome, but not on the coins of the earlier Roman emperors. Constantine placed on his coins one of the

earliest of Christian monograms which is to be traced in the recesses of the catacombs, composed of the first and second letters of XPιστος (Christus), a monogram which also appeared on the Labarum (q.v.) and was continued on the coins of the succeeding emperors of the East down to Alexander Comnenus and Theodorus Lascaris. We often find it combined with the first and last letters of the Greek alphabet (Rev. i. 8). Another well-known monogram is that of the name of Jesus, IHS, from the first three letters of IHΣοῦς, though sometimes explained as standing for the three Latin words *Iesus Hominum Salvator* (Jesus, Saviour of Men).

Popes, emperors, and kings of France during the Middle Ages were in the practice of using a monogram instead of signing their names. Almost all the coins of the French kings of the Carlovingian race bear their respective monograms, as also do those of Alfred and some of the other Saxon kings of England.

Painters and engravers in Germany and Italy have used monograms to a large extent as a means of distinguishing their works. In these the initial letters of their names were often interwoven with figures of a symbolical character, so as to form a rebus on the artist's name. The first typographers distinguished their publications by woodcut vignettes, whose invention is ascribed to the elder Aldus; but besides these each made use of a monogram or cipher, a series of which, well known to the bibliographer, fixes the identity of the ancient editions, German, Italian, and English, from the invention of printing down to the middle or end of the sixteenth century. For a detailed account of the monograms of early printers and others, consult: Herbert and Ames, *Typographical Antiquities* (London, 1749); Horne, *Introduction to Bibliography*, vol. ii (ib., 1814); Brulliot, *Dictionnaire des Monogrammes* (Munich, 1832–34); Duplessis and Bouchot, *Dictionnaire des marques et monogrammes de graveurs* (Paris, 1886–87); Leutsch, *Universal Monogram-Work* (Gera, 1893); A. Schiller, *Monogramme* (Ravensburg, 1897 et seq.); F. H. Rees, *Art of Monogram Designing and Engraving* (Rochester, N. Y., 1911).

MON'OGRAP'TUS (Neo-Lat., from Gk. *μόνος*, *monos*, single + *γραπτός*, *graptos*, marked with letters, from *γράφειν*, *graphein*, to write). A genus of extinct graptolites found in and characteristic of rocks of Silurian age. See GRAPTOLITE.

MO'NO LAKE. A lake in Mono Co., east central California. It lies in the Sierra Nevada and, like all inclosed lakes, is subject to changes in its water level, which, e.g., was 6380 feet in 1883, 6412 feet in 1899, and 6426 feet in 1909. It is surrounded by mountains rising 6000 to 7000 feet above its surface (Map: California, F 4). It is roughly circular in contour, its east-west axis measuring 14 miles and the north-south 10 miles; its area, including islands, is about 87 square miles. Its maximum depth is 152 feet, the average being about 61 feet. It has no outlet, and its waters are so salty that neither fish nor mollusks can live in them. Sodium carbonate and bicarbonate constitute nearly one-half of the salts held in solution, and these are therefore of considerable commercial value.

MON'OLITH (Lat. *monolithus*, from Gk. *μονόλιθος*, consisting of a single stone, from *μόνος*, *monos*, single + *λίθος*, *lithos*, stone). A monument, statue, obelisk, column, shaft, or other architectural object formed of a single stone. The obelisks of the Egyptians furnish early examples of monoliths (see OBELISK), and the Romans of the Imperial age habitually employed monolithic columnar shafts of large size and highly colored marbles and granites. (See COLUMN.) In India there are examples of monolithic temples, e.g., the Kylas at Ellora and some smaller temples at Dhumnar and other places. A monolithic block at Baalbek in Syria measures 70 by 21 by 14 feet. One of the most remarkable monoliths is the dome of the Mausoleum of Theodoric at Ravenna in Italy, 36 feet in diameter; while among modern examples may be mentioned the colossal porphyry sarcophagus of Napoleon beneath the dome of the Invalides, Paris. Monolithic tombs abounded in Lycia; two of these have been removed to the British Museum. See MEGALITHIC MONUMENTS.

MON'OMA'NIA (Neo-Lat., from Gk. *μόνος*, *monos*, single + *μανία*, *mania*, madness). A form of insanity in which there is one systematized delusion which dominates, while it does not impair, the intellect of the lunatic. The central delusion may be replaced in part by minor related delusions, and it may be concealed upon occasions or for a long period of time. Ability is not incompatible with this form of insanity. It is now termed paranoia (q.v.).

MON'OMET'ALLISM. See BIMETALLISM; MONEY.

MONO'NA, LAKE. One of the so-called Four Lakes (q.v.) of Wisconsin.

MONONGAHELA, mŏ-nŏn'gȧ-hē'lȧ. A city in Washington Co., Pa., on the Monongahela River, 31 miles south of Pittsburgh, on the Pennsylvania and the Pittsburgh and Lake Erie railroads (Map: Pennsylvania, B 7). It is in a productive coal region and is engaged largely in coal mining. The industrial establishments include glass and lamp factories, automobile-parts works, coke ovens, iron and steel works, machine shops, foundries, planing mills, paper mills, flour mills, etc. Settled as early as 1792, Monongahela was incorporated in 1873. The city has adopted the commission form of government. Pop., 1900, 5173; 1910, 7598.

MONONGAHELA, BATTLE OF THE. See BRADDOCK, EDWARD; FRENCH AND INDIAN WAR.

MONONGAHELA RIVER. One of the

head streams of the Ohio River. It is formed in the east-central part of Marion Co., W. Va., by the confluence at Fairmont of the Tygart and West Forks rivers, flows northeast across the Pennsylvania boundary to the mouth of the Cheat River, and thence north to its union at Pittsburgh, Pa., with the Allegheny, to form the Ohio River (Map: Pennsylvania, B 8). The main stream is 125 miles long, drains an area of about 7350 square miles, and is navigable throughout its length by means of dams and locks. The Tygart rises in the southern part of Randolph Co., W. Va., flows in a northerly direction, is about 100 miles long, and drains an area of about 1420 square miles. The West Fork rises in Upshur Co., W. Va., and flows northwest and then northeast to its junction with the Tygart. It is about 70 miles long. The principal tributaries of the Monongahela are the Cheat and Youghiogheny rivers. On the banks of the Monongahela, a few miles from Fort Duquesne (now Pittsburgh), the Anglo-American army of Braddock was defeated by the French and Indians on July 9, 1755.

MONO-PAVIOTSO. See SHOSHONEAN STOCK.

MONOPH'YSITES (Gk. *μονοφυσίτης, monophysitēs,* one who affirms the single nature of God, from *μόνος, monos,* single + *φύσις, physis,* nature). The name applied to a large number of Christians in the fifth and sixth centuries who maintained that Christ had only one nature, as against the orthodox doctrine that in him humanity and divinity were perfectly united without detriment to either. The Monophysites called the orthodox, by analogy, Dyophysites, i.e., believers in two natures (Gk. *δύο,* two, and *φύσις*). The controversy sprang out of the fourth-century discussions respecting the Trinity (q.v.), and the connecting link may be found in the speculations of Apollinaris of Laodicea (died 392), who held that, while the body and the lower or animal soul in Christ were those of a man, the rational soul was displaced by the divine Logos.

The Monophysite controversy passed through several preliminary stages. One of these is marked by the name of Nestorius, Patriarch of Constantinople, who held that there was a co-operation of the two natures of Christ, the human and the divine, and who was condemned by the Council of Ephesus (431), under the leadership of Cyril of Alexandria. (See NESTORIUS; EPHESUS, COUNCILS OF.) Another stage is connected with the monk Eutyches (q.v.), who held that Christ was from two natures which, after incarnation, united into one. He, too, was adjudged heretical (448), and although he was received back into fellowship by the "Robber Synod" of Ephesus (449), his vindication did not stand. Meanwhile Pope Leo I (440–461) had written to the Bishop of Constantinople his celebrated "Tome," or letter, in which he defined the Catholic doctrine of the two natures. This document was brought into requisition at the Council of Chalcedon (451), and upon it was based the official decree which set forth the orthodox Christology. According to this definition, Christ is "perfect in deity and perfect in humanity, truly God, and truly man, . . . one and the same Christ, in two natures without confusion, change, division, or separation." The adoption of the Chalcedonian decree may be regarded as terminating the theological and introducing the political period of the Monophysite controversy.

The problem at that time confronting the Empire was that of harmonizing the theologically discordant elements of the population. Christianity being the state religion, it was necessary for all to accept whatever doctrinal decisions might be reached by the proper authorities. But a large part of the Eastern church was strongly Monophysite and would not surrender its convictions in spite of the Council. The emperors themselves did not all think alike, although they all sought, if possible, to unify the opinions of their subjects. A usurper in the East, Basiliscus by name, issued a decree condemning the definition of Chalcedon (476), and while many of the Eastern clergy accepted his decree, a storm of opposition was aroused. A later Emperor, Zeno, endeavored to reach a compromise by his *Henoticon,* or instrument of union (482), which practically ignored what had been accomplished at Chalcedon and reverted to the Niceno-Constantinopolitan creed as the sole standard of orthodoxy. Pope Felix condemned the *Henoticon,* and the result was a schism between East and West, lasting for about 35 years (484–519). Before the close of the fifth century several national churches had been formed in the East, independent of Constantinople, yet patriarchal in their organization, and all professing the Monophysite faith, e.g., the Jacobites, Maronites, Armenians, Copts, Abyssinians, etc. (qq.v.). In Egypt some of the most extreme Monophysites separated from the Patriarch of Alexandria and formed a sect of their own. They were called Acephali, i.e., "without a head." Justinian (527–565), a champion of orthodoxy, attempted to induce his subjects to unite on the basis of the Chalcedonian decree, and partially succeeded, chiefly by forcing his will upon the Fifth Ecumenical Council (553). But his most important utterances on the subject pleased neither party, and by a sort of irony of fate at the close of his life he was said himself to have fallen into a heresy akin to Monophysitism. (Cf. Evagrius, *Hist. Eccles.,* iv, 39.) Only after the separation of the schismatic churches of the East, and, still more, after the rise of Mohammedanism, which forced Oriental Christians, in self-defense, to seek closer relations with Rome, did the long Monophysite struggle come to an end in the Orthodox church. The Monophysite churches continue their independent existence to the present day. The two-nature doctrine, as defined at Chalcedon, triumphed, in spite of its inherent difficulties, and remained the orthodox faith of Christendom.

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MON'OPLANE. See AËRONAUTICS.

MONOPLEGIA, mŏn'ō-plē'jĭ-ȧ. A term applied to paralysis of a single limb or set of muscles. See PARALYSIS.

MON'OPNEU'MONA (Neo-Lat. nom. pl., from Gk. *μόνος, monos,* single + *πνεύμων, pneu-*

mōn, lung). An order of fishes, so called from the simple, unified condition of the lung sac. It comprises a single family, Ceratodidæ, and genus, *Ceratodus*, in which the lateral jointed rays of the archipterygium are well developed. It represents a very ancient stock, of which only the barramunda (q.v.) of Australia now exists. Cf. DIPNOI.

MONOPO'DIAL BRANCHING (from Gk. *μονόπους, monopous*, single-footed, from *μόνος, monos*, single + *πούς, pous*, foot). The method of branching in which the axis of a plant develops continuously and the branches arise laterally. This method is in sharp contrast with dichotomous branching, in which branches arise by the forking of the apex. See BRANCHING.

MONOPOLI, mō-nŏp'ō-lē. An episcopal town in the Province of Bari delle Puglie, Italy, situated on the Adriatic Sea, 25 miles southeast of Bari (Map: Italy, F 4). It is surrounded by walls and has a fortress constructed in 1552 by Charles V and a twelfth-century cathedral. It also has a Gymnasium and a technical school. Along the coast near by are curious tombs hewn out of the rock and the ruins of an ancient city. Weaving and dyeing are the principal industries. There are also manufactures of oil and soap and trade in olive oil and wine. Pop. (commune), 1901, 22,545; 1911, 24,104.

MONOP'OLY (Lat. *monopolium*, from Gk. *μονοπώλιον*, right of exclusive sale, *μονοπωλία, monopōlia*, exclusive sale, from *μόνος, monos*, single + *πωλεῖν, pōlein*, to sell). In the strictest sense, a grant of the crown or state to a private individual or corporation of an exclusive right to carry on a certain class of business or traffic. In a general and more modern sense it signifies such control of a given class of articles or of the traffic in them as will make it possible to raise their price higher than the level of prices fixed by free competition. A typical example of a monopoly of the first class is the grant of a patent right, which in effect gives the grantee an exclusive control over the production of and traffic in the patented article; a common example of monopolies of the second class is the exclusive control of mineral or other special products of land by virtue of ownership of the land. Monopolies may be classified as public or private according as they are vested in and exercisable by the government or by private individuals, associations, or corporations.

Private monopolies may be classified as (1) legal monopolies, resting upon a grant from the government of exclusive privileges for manufacture or sale; (2) natural monopolies, which are based upon the control of a limited natural product through the ownership of land or other natural resources, or of exclusive natural facilities for transportation; and (3) capitalistic monopolies, which hold their power over prices by virtue of the fact that an enormous capital is required in certain industries, so that an established plant always has a great advantage over a new competitor. This last form of monopoly is discussed at length under TRUSTS.

Legal monopolies have generally been granted to private persons for some real or ostensible service to the commonwealth. Sometimes such a grant was made primarily for fiscal purposes. Thus, the monopoly of the issue of bank notes in England, granted in the early part of the eighteenth century to the Bank of England, was a reward for the considerable services of that corporation to the national exchequer. In early times the exclusive right of sale or production of a commodity was frequently granted to individuals in return for a fixed sum paid into the public treasury. The danger, however, of such monopolies lay in the fact that the probable profits were as a rule underestimated through the influence of favoritism, with the result that the sums secured by the treasury were not commensurate with the vexation to the public. Too frequently these exclusive privileges were granted to court favorites whose actual services to the commonwealth merited no such reward. Monopolies by grant first acquired prominence in the reign of Elizabeth, when her frequent grants of monopolies in articles of common use were regarded as a great abuse and brought forth the protests of Parliament. Such articles as salt, leather, coal, soap, cards, beer, and wine were thus monopolized, and indeed there was hardly any article of common necessity of which the sale was not thus restricted for the benefit of the great. The practice was continued until the statute 21 James I, c. 3, known as the Statute of Monopolies, was enacted by Parliament in 1623. This statute abolished all existing monopolies with certain exceptions, as patents and manufactures of war supplies and materials, and forbade the creation of monopolies except by grant made by authority of act of Parliament.

Somewhat similar in character were the special prerogatives granted about this time to the East India and other trading companies. The monopoly of trade which was a characteristic of these companies was held by many to be a feature essential to their success. It may be remarked that monopoly privileges did not prevent failure on the part of the many companies which from time to time were established by France, though they may have been a valuable adjunct to the more vigorous administration of the English and Dutch companies.

The limited monopoly for a term of years which at the present time is granted to the holders of patents and copyrights is somewhat akin in principle to those just discussed, but is justified by other considerations of public policy. It differs from them in that the objects to which such rights pertain are essentially new creations, and the exclusive privileges which they convey act as a stimulus to productions which are of public benefit. While copyright aims to secure to writers a reward for their labors, there are, in general, few restrictions upon the use of these privileges. On the other hand, the aim of patent legislation is in some countries not only to stimulate invention, but to secure the widest utilization of improved processes. The monopoly which the patent right confers cannot be used, therefore, for the exclusive benefit of its possessor. Persons who fail to provide for the commercial utilization of their patents forfeit their rights. German law, e.g., provides for an annual fee for the issuing of patents which grows larger as time progresses, and under this law ineffective patents or those which are not commercially profitable lapse and cease, to be a bar to further applications of the principle upon which they are based.

In the United States power of granting monopolies is subject to restrictions of both the United States and the various State constitutions. The question as to how far a State may grant exclusive privileges to conduct a business depends primarily upon the constitution of the State, and

hence is a question of constitutional law outside the scope of this article. The Fourteenth Amendment of the United States Constitution, which provides that "No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States, nor shall any State deprive any person of life, liberty, or property without due process of law," is a direct limitation upon the powers of a State to grant monopolies indiscriminately. It does not, however, prevent a State from giving exclusive privileges to conduct public callings upon the theory that power to regulate and control public callings was an essential right of the State, recognized at common law and not intended to be destroyed by the Fourteenth Amendment. Thus, the State may grant the exclusive right to operate public ferries, turnpikes, railroads, grain elevators, etc. Nor does the Fourteenth Amendment preclude a State from granting exclusive privileges in the proper exercise of its police power. The State may thus grant monopolies for the sale of liquor, or the erection of a slaughterhouse, or the conduct of a slaughtering business within a city. See CONSTITUTIONAL LAW; POLICE POWER; PUBLIC CALLING.

The United States Constitution expressly confers upon Congress the power of granting copyrights and patents to authors and to the originators of useful inventions. No other power to create monopoly is expressly vested in Congress, and it is probable that it is without such power, except when incidental to the exercise of powers expressly granted by the Constitution, as, e.g., the power to regulate commerce, borrow money, or collect duties and imports.

Natural monopolies exist where the conditions of the enterprise are such as to preclude competition. In a general way, economists sometimes speak of the possession of land as constituting a natural monopoly. As monopoly implies a lack of competition as well as special privilege, the term strictly applies only to cases in which the ownership of the privileges is centred in one person, or at least a very few persons capable of acting in harmony. Land and other natural resources, such as water power and mineral wealth, are so widely diffused that monopoly in a strict sense rarely arises from their ownership. The most important instances of the so-called natural monopolies arise in connection with certain public services, particularly in cities, and are usually connected with the right of way through public highways. Such services are the furnishing of gas, water, transportation, and communication in cities. As the right to make use of the city streets to lay gas and water pipes, electric conduits, or to build tramways cannot be granted to all, competition in furnishing such services is practically excluded. In some respects, particularly as concerns the right of way through municipalities, steam railroads belong in the same class. Competition among them is possible on a larger scale than among street railways, but they undoubtedly possess some elements of natural monopoly.

As the policy of the law has eliminated from our economic life legal monopolies which do not conform to the principle of public interest, so there is a growing demand that these natural monopolies shall be administered in the public interest. In its extreme form it calls for the municipalization of such enterprises, while many who are unwilling to accept this solution demand far greater caution in the granting of franchises and a much stricter supervision of the manner in which such franchises are used than has heretofore been common in American municipalities.

It can hardly be said that the price of the commodities or services controlled by a public monopoly is subject to any general law. The government may fix prices below cost of service, or it may purposely make them so high as to discourage consumption. Private monopolies, on the other hand, naturally aim to secure the greatest net profit; and the price which will yield the greatest surplus above cost may be termed monopoly price. The determination of such a price is a difficult matter in practice, since a large number of factors have to be taken into account. If the monopolized commodity is a necessity of life, as, e.g., salt, the price may be fixed very high, since high prices would not greatly diminish consumption. If, on the other hand, the commodity is an article of luxury, or one out of a group of commodities which satisfy the same want, a material rise in price will greatly limit consumption, so that while a large profit may be made on each unit sold, small sales will reduce total profits. Again, it may be that an increase in the quantity of service performed or goods produced will by no means demand a proportional outlay. In that case the monopoly may best subserve its own interests by keeping prices low. Thus, a street railway company can generally double the number of passengers carried without doubling the cost of service, and may therefore find it profitable to lower fares. See COPYRIGHT; PATENT; TRUSTS.

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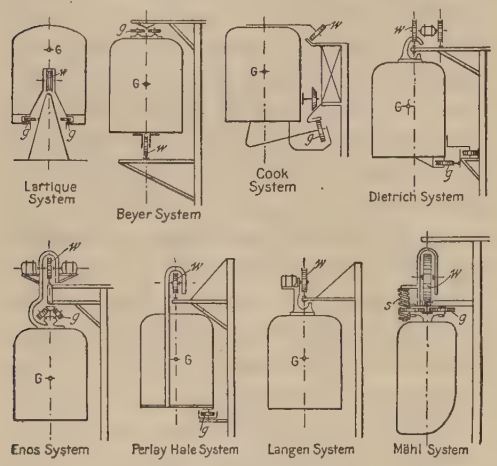
MONOP'TERAL (from Lat. *monopteros*, from Gk. *μονόπτερος*, having a single row of columns, from *μόνος, monos*, single + *πτερόν, pteron*, wing, row of columns). A circular building in Græco-Roman architecture in which a single row of columns surrounds the central space without any wall. The term is Vitruvian and not in frequent use.

MON'ORAIL. A form of track and car or carriage designed to secure economy in rails and rail support, to permit of conformity to the surface of the ground, to allow curves of small radius, and usually with the object of securing high speed of transportation. The distinguishing feature of a monorail system is that the cars are supported on a single rail, though there may

be other rails or surfaces against which auxiliary or guiding wheels may bear. The possibilities of such a system have long been realized and the idea is said to date back to 1826, when it first was suggested by an English engineer, Robinson Palmer. Nevertheless, few of the many monorail systems devised by inventors have been reduced to successful practice, except over limited distances, and usually under temporary conditions or where their novelty was a paramount consideration, as at great expositions



TYPICAL MONORAIL SYSTEMS.

G, centre of gravity of car; *W*, carrying wheel; *g*, guide wheels; *S*, spring.

or amusement parks. The accompanying diagram shows the principles of the more important systems embraced in the above-mentioned groups.

The first monorail system to find practical application was that of Charles Lartigue, who in 1882 constructed in Algeria a line where a single iron rail was carried on A-shaped supports. In 1886, in Ireland, the Listowel-Balleybunion Railway, about 9¼ miles in length, was constructed, being operated for many years as a passenger and tourist line. This railway employs steam locomotives of unique pattern with duplex boilers, one boiler arranged on either side of the main driving wheel and rail. In France in the Ria mines in the Department of Pyrénées-Orientales, a line on the Lartigue system, about 6¾ miles in length, for the transportation of ore, was electrically operated with some success, while a recent application of this general principle was a monorail line at the Genoa, Italy, Exposition of 1914.

Perhaps the most practical of all the monorail systems has proved the Barmen-Elberfeld line, built on the Langen system, 13.3 kilometers in length, with 19 stations and carrying full-sized suspended cars. This line, operated by electricity, has been able to maintain satisfactory speeds and has proved distinctly useful. For maintaining high speeds the Mahl system, which is also of the suspended type, was carefully worked out in 1914, but did not find immediate application. In this design a track single or double, at a height of from 20 to 25 feet above the ground, is carried from well-anchored steel towers and from connecting cables in the fashion of a suspension bridge. The French engineer inventor in his specifications claimed that speeds up to 180 miles per hour were possible with high-speed electric motors, each car carrying a number of independent tractor elements. Various other monorail systems have been designed and have been operated on more or less experimental lines for short distances. Some of these, as at City Island, near New York City, were abandoned after a limited period of use, while others involving novel ideas have been shown at amusement parks or experimentally without any great practical or permanent success.

Distinct from such devices, where guide wheels on auxiliary rails or surfaces are used, are monorail systems in which gyroscopic appliances are employed to secure stability, as in the case of the automobile torpedo and the aëroplane. See TORPEDO.

The principle of the gyroscope (see GYROSCOPE) has found many ingenious applications which have shown extraordinary mechanical and mathematical reasoning. Three monorail systems based on this principle stand out with distinction as having realized a certain amount of experimental success and as having been developed further than the mere model stage.

The earliest practical device of this nature was that of Louis Brennan, the inventor of the Brennan torpedo, exhibited before the Royal Society of Great Britain in the spring of 1907. It was of course not strange that an inventor of torpedoes should turn his attention to transportation problems on land, and in 1907 he showed a model car 6 feet in length running along a single rail or cableway, able to maintain its position and equilibrium notwithstanding the shifting of the load. This car was supported on a single track by a bearing wheel, and electricity was applied to operate the driving motor and to revolve the flywheels of the gyroscope at a speed of 7500 revolutions per minute. The gyroscopic apparatus amounted to but 5 per cent of the total weight of the locomotive. On November 14, 1909, there was exhibited before the Royal Society a larger car, 14 feet in length, 13 feet high, and 10 feet wide, running on a single rail and carrying 40 passengers. This car weighed 22 tons and was driven by a gasoline engine which in addition supplied power to the gyroscopes. There were two of these, each weighing three-quarters of a ton and revolving at a speed of 3000 revolutions per minute. Friction losses were cut down as far as possible, and the wheels were incased so that they revolved in a vacuum. A circular track 220 yards in circumference was used, and the car was able to maintain its equilibrium while in motion, despite the efforts of its 40 passengers to destroy the balance by shifting their positions.

Another monorail or gyroscopic car, which differed from that of Brennan in having a so-called "precession motor," carried at the rear of the gyroscopes and operated by hydraulic pressure produced by an electrically driven oil pump, was brought out about the same time by a German capitalist named Scherl, by whose name it was known, although invented by Paul Froelich in 1909. A model locomotive car 18 feet in length and 4 feet in width, mounted on two two-wheel trucks, each carrying a ¾-horse-power motor, was tested both in Germany and in the United States. In this car there were two gyroscopes whose wheels normally rotated on a vertical axis in a horizontal plane. These flywheels weighed but 125 pounds each, and

were operated by electric motors at the speed of 8000 revolutions per minute. The motors were placed at the lower end of the shaft and, as in the Brennan machine, the wheels and shafts were mounted in air-tight casings and run in a vacuum, the casings themselves being mounted on transverse axes journaled into the frame of the car so that they could be moved fore and aft in a vertical plane. These motors revolved in opposite directions, but were connected by bell-crank levers and toothed quadrants, as the working of the gyroscope is always in opposite directions.

In the Schilowsky monorail system, developed in England by a Russian inventor, the gyro wheel has its plane of rotation above the axis of the pivots on which the containing cage is mounted. By a pendulum system any lurching of the car can be controlled through the gyroscope. This system up to 1915 had not been developed beyond the experimental stage, but an automobile equipped with such gyroscopic stabilizer of this inventor, though not employing a supporting rail, was found to work with considerable success. For those interested in mathematical and mechanical discussions the monorail system with its gyroscopic control presents considerable fascination. The reader so interested can with profit consult various papers in *Engineering* (London), the *Engineer* (ib.), *Le Génie Civil* (Paris), the *Journal of the Franklin Institute* (Philadelphia), particularly volumes clxix and clxxiv, and current issues of the *Scientific American* (New York); in all of which journals progress in this field is fully recorded from time to time.

MON'OTHEISM (from Gk. *μόνος, monos*, single + *θεός, theos*, god). The belief in, and worship of, one God only. It is usually contrasted with polytheism, the belief in many gods, but it also contrasts with dualism (q.v.) and monolatry, the belief in many gods but the worship of one only. While, strictly speaking, pantheism (q.v.) is a form of monotheism, the word monotheism is used to denote a belief in a single personal or quasi-personal power. There is no satisfactory evidence of monotheism in a savage tribe; still less that monotheism was the first form of worship. Where a savage tribe has a "supreme" god, investigation shows him to be only the highest, or the closest in relation to the tribe, of many spirits. His worship is usually monolatry rather than monotheism. Monotheism always arises out of some form of polytheism. Many steps in the history of religion mark the way towards monotheism, but often the journey stopped short of the goal. The mere arrangement of gods in a hierarchy starts a movement towards monotheism; for if one becomes king, like the Greek Zeus, he may go on to absorb all divinity into himself. The growth of a single tribe or city with its one tutelary deity moves towards monotheism, as is illustrated by the Assyrian Ashur. The abstraction of the idea of deity may open the way for personification of that abstraction into a single god; some suppose Allah to have originated thus. A synthesis of gods, recognizing that they all represent a single divine force, made in Egypt and later Babylonia a movement which might, carried farther, have issued in a true monotheism. Philosophy, searching for a single cause of the world, approached a monotheism in Plato, arrived at it in Neoplatonism (q.v.), and led to the most complete pantheistic monism in Hindu philosophy. An ethical monotheism arose among the Hebrews, on the basis of monolatry, through the prophetic conception that Jehovah governed the world in the interests of moral righteousness. The Hebrews were not monotheists till the triumph of the prophetic system in the sixth century B.C. There are a few cases of a temporary monotheism, like the unsuccessful attempt of Amenophis IV (Khuen-aten) to impose his God Aten on Egypt, but the great systems of monotheism belong only to the higher religions. Christian monotheism is taken over from the Hebrew; Mohammedan monotheism was strongly influenced by Hebrew thought, though the germs of it, in the worship of Allah, seem to be Arabic. Sikhism (q.v.) and the modern reforming sects of India borrow their monotheism from Islam and Christianity. Zoroastrianism (q.v.), however dualistic it may have been in antiquity, now claims to be purely monotheistic and regards Ahriman, the evil power, as the personified name for abstract evil and in no sense as a god.

Consult: R. Flint, *Theism* (Edinburgh, 1877); Harald Höffding, *The Philosophy of Religion* (New York, 1906); Irving King, *The Development of Religion* (ib., 1910); Andrew Lang, *The Making of Religion* (ib., 3d ed., 1910); C. H. Toy, *Introduction to the History of Religion* (Boston, 1913). See DUALISM; HENOTHEISM; THEISM.

MONOTH'ELITISM, more correctly **MONOTHELETISM** (from Lat. *monothelitæ*, from Gk. *μονοθελῆται, monothelētai*, from *μόνος, monos*, single + *θελητής, thelētēs*, one who wills, from *θέλειν, thelein*, to will). The name of a seventh-century heresy which asserted the existence of one will in Christ instead of two. It was a direct outgrowth of the Monophysite heresy (see MONOPHYSITES), for if Christ had only one nature, of course he had also only one will. Orthodoxy, however, drew the logical conclusion from its two-nature doctrine, which had been formulated at Chalcedon (451), and maintained that there were two wills in Christ, corresponding to his divine and human natures respectively. The controversy over this question involved most of the Eastern church, and its influence was felt in Rome. The Emperor Heraclius (610–641), threatened by the advances of Mohammedanism and by danger from the Persians, strove to reunite his Christian subjects, who had been sadly divided over the Monophysite question and had formed schismatic churches, e.g., Armenians, Jacobites, etc. He propounded the theory of one will in Christ as a compromise, and Pope Honorius accepted it, holding two natures with one will. Sergius, Patriarch of Constantinople, and Cyrus, Patriarch of Alexandria, were also anxious to interpret the decree of Chalcedon in such a way as to persuade the Monophysites to accept it. But a monk named Sophronius, who visited Alexandria and learned what was going on, denounced the movement as a relapse into the heresy of Apollinaris, whose views had long before this period been condemned. Honorius tried to allay this strife by seeking to quiet Sophronius, thus taking a dangerously temporizing stand. But Sophronius was soon elevated to the patriarchate of Jerusalem (634), and his continued opposition to the measures of Sergius and Heraclius was now more serious. The Western church, as a whole, shared the views of Sophronius. This appeared in the action of a Roman synod in 649, which asserted the doctrine

of the two wills. After some 30 years the Eastern church was brought to the same position, and the Sixth Ecumenical Council (Constantinople, 680) adopted dyothelitism (two wills) as a Catholic dogma. The same council condemned the Monothelite leaders, Sergius and Cyrus, and along with them Pope Honorius, for not promptly suppressing the incipient heresy. This properly ends the Christological controversies which for 300 years had agitated the Church. Monothelitism found a home among the Maronites of Mount Lebanon, and their name was long synonymous in the East with Monothelites. In the twelfth century the Maronites entered the Roman communion.

Bibliography. Smith and Wace, *Dictionary of Christian Biography*, vol. iv, article "Person of Christ" (London, 1887); K. J. von Hefele, *History of the Christian Councils*, vol. v (Edinburgh, 1896); G. Owsepian, *Die Entstehungsgeschichte des Monothelitismus* (Leipzig, 1897); G. P. Fisher, *History of Christian Doctrine* (New York, 1896); Adolf Harnack, *History of Dogma*, vol. iv (Boston, 1899); Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury (London, 1912).

MON'OTREME (Neo-Lat. nom. pl., from Gk. *μόνος, monos*, single + *τρῆμα, trēma*, perforation). A mammal of the order Monotremata, which is coextensive with the subclass Prototheria and embraces the low egg-laying mammals (Ornithodelphia) duckbill and echidna (qq.v.). The term connotes the fact that in the reproductive organs of this group the orifices of the urinary canal, the intestinal canal, and the generative canal open, as in birds, into a common cloaca. See PROTOTHERIA; for fossil forms, see MAMMALIA.

MONÓVAR, mō-nō'vär. A town of southeast Spain, in the Province of Alicante, situated among the mountains, 18 miles northwest of Alicante (Map: Spain, E 3). It has a number of good buildings, a large and handsome church, and a casino with a beautiful park. Great quantities of wine are produced in the vicinity, and the town manufactures woolen and cotton textiles, leather, soap, and spirits. In the neighborhood are quarries of marble, gypsum, and building stone. Nothing is known of its history previous to 1258, when James I rescued it from the Mohammedans. Pop., 1900, 10,573; 1910, 11,243.

MONRAD, mōn'rȧd, DITLEV GOTHARD (1811–87). A Danish statesman and ecclesiastic, born in Copenhagen, the son of a Norwegian. He studied theology and Oriental philology at the University of Copenhagen, spent a year in Paris, and after the death of Frederick VI entered political journalism as author of *Flyvende politiske Blade* (1840–42). In 1846 he had settled as pastor of a parish in Laaland. He took a prominent part in the rising of 1848, and was Minister of Education in the March ministry of that year. In 1849 he was made Bishop of Laaland-Falster; but in 1854, because of his continued opposition to Orsted's ministry, he was removed. In Hall's cabinet Monrad held various posts in the Department of Education and became Minister again (1859). Hall resigned in 1863. Monrad formed a new cabinet, in which he took the portfolio of Finance. But the war with Prussia forced him from power (1864), and with his family he went to New Zealand (1865), not to return until 1869, when his property there had been destroyed in the Maori campaigns. He received his old bishopric in 1871, and from 1882 to 1886 was a member of the opposition party of the Danish Parliament. Consult the biography by Graae (Copenhagen, 1887).

MONREALE, mōn'rȧ-ä'lȧ. A city in the Province of Palermo, Sicily, 5 miles southwest of Palermo, with which it has electric-railway connection (Map: Italy, D 5). It is built on the side of a mountain above a fertile valley, and is the seat of an archbishop. Its metropolitan cathedral, dating from the twelfth century, is the finest example of the Norman-Sicilian style extant. The bronze doors are beautifully ornamented and the walls are almost completely covered with mosaics representing biblical scenes. The Benedictine monastery, with its beautiful cloisters, is now used as a school building, and has a library of 17,000 volumes. There is a trade in oil, corn, fruit, and almonds. Pop. (commune), 1901, 23,778; 1911, 20,103.

MONREALE, FRA. See MONTREAL D' ALBANO.

MONRO, mŭn-rō', ALEXANDER (PRIMUS) (1697–1767). An eminent Scottish anatomist, born in London. He graduated at Edinburgh University, to which, after studying under Cheselden and Boerhaave, he returned as first professor of anatomy. He published *Osteology: A Treatise of the Anatomy of the Human Bones* (1726; 6th ed., 1758). Consult the memoir by his son, Dr. Donald Monro, prefixed to the collected edition of his *Works* (Edinburgh, 1781).

MONRO, ALEXANDER (SECUNDUS) (1733–1817). A Scottish anatomist, younger son of Alexander Monro (Primus), whom, in 1764, he succeeded as professor of anatomy in the University of Edinburgh. He continued to lecture there until 1808, when he was succeeded by his son, Alexander Monro (Tertius). His most important work is his *Observations on the Structure and Functions of the Nervous System* (1783), in which he describes the "foramen of Monro." Consult Andrew Duncan, *Account of the Life, Writings, and Character of the Late Dr. Alexander Monro Secundus* (Edinburgh, 1818).

MONRO, DAVID BINNING (1836–1905). An English classical scholar, born at Edinburgh. He was educated at the University of Glasgow and at Brasenose and Balliol colleges, Oxford. From 1882 to his death he was provost of Oriel College, Oxford. His works include *A Grammar of the Homeric Dialect* (2d ed., 1891), a standard work; *Modes of Ancient Greek Music* (1894); an edition of the *Odyssey*, xiii–xxiv (1901), with valuable appendices, especially on aspects of the Homer Question and on the Cyclic Poets; *Homeri Opera et Reliquiæ*, a critical text of Homer (1896); and the article "Homer" in the eleventh edition of the *Encyclopædia Britannica*. Consult J. C. Wilson, *Memoir of D. B. Monro* (Oxford, 1907).

MONROE'. A city and the county seat of Walton Co., Ga., 62 miles by rail east of Atlanta, on the Gainsville Midland, the Greene County, and the Monroe railroads (Map: Georgia, C 2). There are two large cotton mills and a cottonseed-oil mill. The surrounding region is adapted to the growing of cotton, corn, oats, peaches, and vegetables. Monroe owns its water works and electric-light plant. Pop., 1900, 1846; 1910, 3029.

MONROE. A city and the parish seat of Ouachita Parish, La., 76 miles west of Vicksburg, Miss., on the Ouachita River, and on the Arkansas, Louisiana, and Gulf, the Vicks-

burg, Shreveport, and Pacific, and the St. Louis, Iron Mountain, and Southern railroads (Map: Louisiana, E 1). The Federal government building, courthouse, the St. Francis Sanitarium, city hall, city park, high schools, and salt-water natatorium are noteworthy features. A considerable cotton trade is carried on and there are large cotton compresses, cottonseed-oil mills, and extensive manufactures of automobile and wagon materials, and other lumber products, bricks, etc. The city owns and operates its water works, street railways, sewage system, markets, and electric-light plant. Monroe is one of the oldest towns in the State. During the Spanish and French domination of this territory it was known as Fort Miro, its first commander being Don Juan Filhiol, many of whose descendants still live here. The city was first incorporated in 1820. Pop., 1900, 5428; 1910, 10,209; 1914 (U. S. est.), 12,246; 1920, 12,675.

MONROE. A city and the county seat of Monroe Co., Mich., 35 miles south-southwest of Detroit, on the river Raisin, and the Michigan Central, the Pere Marquette, the Lake Shore and Michigan Southern, and the Detroit and Toledo Shore railroads (Map: Michigan, F 7). It has a home for the aged, a public library, St. Mary's Academy and College, and a fine courthouse. In Monroe is the mother house of the Sisters of the Immaculate Heart of Mary, who own valuable property here. The city is in a fertile region and is an important depot for shipment of grain and fruit. It has extensive nurseries, fisheries, and, among the industrial plants, a large boxboard factory, stove and furnace works, flour, lumber, and paper mills, canning factories, agricultural-implement works, furniture factories, etc. Monroe was chartered as a city in 1836. The commission form of government was adopted in 1914. The city owns its electric-light plant. Pop., 1900, 5043; 1910, 6893; 1920, 11,573.

Monroe was settled as Frenchtown by a company of Canadians in 1784, and received its present name, in honor of James Monroe, in 1815. It was the scene of the battle of the river Raisin, Jan. 22–23, 1813, in which 397 of the American force were killed and 537 captured, only 33 escaping, while of the British 24 were killed and 158 wounded. A number of the prisoners wounded and unable to march were left here under inadequate protection and were subsequently massacred by the Indians. This gave rise to the battle cry, "Remember the river Raisin."

MONROE. A city and the county seat of Union Co., N. C., 24 miles southeast of Charlotte, on the Seaboard Air Line Railroad (Map: North Carolina, B 3). It has gold mines of some value and the manufactories include large cotton and knitting mills, tile factory, flour and oil mills, wagon factory, lumber mills, and a buggy factory. The water works and electric-light plant are owned by the city. Pop., 1900, 2427; 1910, 4082.

MONROE. A city and the county seat of Green Co., Wis., 37 miles south by west of Madison, on the Illinois Central and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, D 6). It has extensive manufactures of Swiss, Limburger, and brick cheese and also of condensed milk, lumber, carriages, foundry and machine-shop products, boilers, etc., and enjoys considerable trade in the products of the adjacent region, which is interested chiefly in farming, stock raising, and dairying. The city maintains a public library, county courthouse, and a park. Monroe was incorporated as a village in 1859 and in 1882 was chartered as a city. The water works are owned by the municipality. Pop., 1900, 3927; 1910, 4410.

MONROE, Fort. See Fort Monroe.

MONROE, Harriet (1860–). An American poet and editor, born in Chicago. She graduated from the Visitation Academy at Georgetown, D. C., in 1879; wrote the text for the cantata for opening the Chicago Auditorium in 1891; and on Oct. 21, 1892, her *Columbian Ode* (published 1893) was read and sung at the dedication ceremonies of the World's Fair at Chicago. In 1912 she founded and became editor of *Poetry*, an endowed magazine of verse. Miss Monroe is author of *Valeria, and Other Poems* (1892); *John Wellborn Root—A Memoir* (1896); *The Passing Show—Five Modern Plays in Verse* (1903); *The Dance of the Seasons* (1911); *You and I—Poems* (1914).

MONROE, James (1758–1831). The fifth President of the United States. He was born in Westmoreland Co., Va., April 28, 1758. In 1774 he was sent to William and Mary College to be educated, but his studies were interrupted by the outbreak of the Revolutionary War, and in 1776 he left college to join the Third Virginia Regiment near New York with the rank of lieutenant. He took part in the battles of Harlem Heights, White Plains, and Trenton, in the last of which he was wounded. During the campaigns of 1777–78 he served on the staff of the Earl of Stirling (William Alexander), ranking as major and taking part in the battles of Brandywine, Germantown, and Monmouth. Although his services were highly commended by the commander in chief, Monroe was disappointed in the way in which they were rewarded, and his career in the army after 1778, when with the rank of lieutenant colonel he was commissioned to raise a new regiment in Virginia, was unimportant. It was at this time that he formed an acquaintance with Jefferson, who was then Governor of Virginia, and the event marks the beginning of an intimacy that lasted during the remainder of their lives and was destined to have a decisive influence upon the career of Monroe. In 1782, at the age of 24, he was elected to a seat in the Legislature of Virginia and became a member of the Virginia Executive Council. His next legislative service was in the Congress of the Confederation, of which he was an influential member for three successive terms from 1783 to 1786. He took a prominent part in the deliberations upon the vital questions of the period, contending vigorously for the right of Congress to regulate commerce, for the right of free navigation of the Mississippi by the United States, and for other measures designed to promote the development of the West. To inform himself of conditions in the West, he twice crossed the Alleghanies, and the information which he acquired had a marked influence upon his course in Congress. Upon his retirement from Congress in 1786 he was again chosen to a seat in the Legislature and in 1788 became a member of the State convention called to ratify the Federal Constitution. In this body he supported Patrick Henry in his futile opposition to the Constitution, making several lengthy arguments against ratification. In 1790 he was elected to a seat in the United States Senate, where he served until 1794. In the Senate he acted with the Anti-Federalists, opposing vigorously the administration

of Washington. He was nevertheless, in 1794, appointed Minister to France as the successor of Gouverneur Morris, the probable explanation of the appointment being his friendly attitude towards France and the desire of the President to offset the appointment of Jay, a stanch Federalist, as Minister to England. He arrived in France just after the fall of Robespierre and was received by the Convention, Aug. 15, 1794. In an address to the Convention he used expressions which, in view of the strained relations between the United States and France, did not meet with the approval of the administration, and, considering Jay's Treaty with England "as the most shameful transaction I have ever known of the kind," he did nothing to remedy France's attitude towards it as of the nature of a *casus belli*. He was accordingly recalled in 1796, and Charles C. Pinckney was appointed as his successor. Upon his return the reasons and propriety of his recall became the subject of a spirited controversy and caused party feeling to run high. For a time Monroe retired to private life, from which he was called to assume the governorship of Virginia in 1799, a position which he held until 1802. The accession of Jefferson to the presidency in 1801 insured Monroe's return to national politics, and in the following year he was again sent to France as an additional plenipotentiary to aid Robert R. Livingston in the negotiations already begun for the purchase of New Orleans and a district at the mouth of the Mississippi, and at the same time was instructed to negotiate with Spain for the purchase of the Floridas. After the conclusion of the treaty by which France sold Louisiana to the United States (1803), Monroe was sent as Minister to England and subsequently to Spain. A treaty was finally concluded with England, but, not being satisfactory to the President on the question of impressment and indemnity, it was never laid before the Senate. The negotiations with Spain for the cession of the Floridas were likewise unsuccessful. In 1807 Monroe returned to the United States, and his course was again the subject of controversy. Again he served in the Virginia Assembly and in 1811 was chosen a second time Governor of Virginia, but held the office only a short time, being called to the cabinet of President Madison as Secretary of State in the same year. He held this office until his elevation to the presidency in 1817 and for a time in 1814 and 1815 also acted as Secretary of War. As head of the War Department he took precautions for the defense of Washington against an attack from the British forces and won popularity by the vigorous measures which he adopted in the prosecution of military operations. In the year 1816, while in his fifty-ninth year, he was elected President of the United States, having received 183 electoral votes, against 34 cast for the Federalist candidate, Rufus King. Four years later he was re-elected, receiving every vote in the electoral college except one. This was due to the passing of the Federalist party, or, more correctly, to the breaking down of party lines, so that there were no longer Federalists or Republicans. The principal subjects which occupied the attention of the government during the eight years of Monroe's administration were the defense of the Atlantic seaboard, the encouragement of internal improvements, the Seminole War, the acquisition of Florida, the Missouri Compromise, and the relations with Europe in regard to South American affairs, which resulted in the announciation of the permanent policy of the government known as the Monroe Doctrine (q.v.). Noteworthy events of a spectacular character during his term were the tour of the President through the East and the West and the visit of Lafayette. The period of his administration was known as the "era of good feeling," on account of the general prosperity of the country and the absence of party strife. Vast internal improvements were undertaken, and the westward movement of the population was marked. Five new States—Mississippi, Illinois, Alabama, Missouri, and Maine—were admitted to the Union.

At the close of his second term Monroe retired to private life, residing in Virginia and in New York, where he died July 4, 1831. During the year preceding his death he served as a member of the Virginia Constitutional Convention, this being his last public service.

Bibliography. Monroe's *Writings* (7 vols., New York, 1898–1903) have been edited by S. M. Hamilton, librarian of the Department of State in Washington; a calendar of his *Correspondence* was published in *Bulletin No. 2* (1893) of the Bureau of Rolls and Library, State Department; also *Papers of James Monroe*, listed in chronological order by W. R. Leech (Washington, 1904). Consult also: Henry Adams, *History of the United States of America* (New York, 1889–1891); D. C. Gilman, *James Monroe*, in "American Statesmen Series" (Boston, 1909), containing a bibliography; "Monroe," in J. G. Wilson (ed.), *Presidents of the United States, 1789–1914*, vol. i (New York, 1914).

MONROE, Paul (1869–). An American educator, born at North Madison, Ind. He graduated at Franklin College, Indiana, in 1890 and from 1895 to 1897 was fellow in sociology at the University of Chicago, where he took his Ph.D. in 1897. After two years as instructor in history at Teachers College, Columbia University, he became professor of the history of education at that institution (1899). He served as president of the education section of the American Social Science Association and as president of the Society of the College Teachers of Education. By the Bureau of Insular Affairs of the United States War Department he was appointed commissioner to report on the condition of the Philippine school system (1912–13). In the latter year he received the honorary degree of LL.D. from the University of Peking. His contributions to the study of the history of education gave Dr. Monroe an international reputation, and his textbooks have helped to give the subject a position of great importance in the training of teachers in the United States. To the whole field of education, however, his greatest contribution was as editor in chief of the *Cyclopedia of Education* (5 vols., 1910–13), a work dealing with every phase of education and its related subjects. In addition he published: *Source Book in the History of Education for the Greek and Roman Period* (1901); *A Text-Book in the History of Education* (1905); *Brief Course in the History of Education* (1907); *Principles of Secondary Education* (1914), as editor; and educational articles in the New International Encyclopædia.

MONROE, Will Seymour (1863–). An American educator and author, born at Hunlock, Pa. After teaching and serving as principal and superintendent of schools, he graduated from Stanford in 1894 and then studied

abroad at German and French universities. In 1896 he became professor of psychology at the Massachusetts State Normal School, Westfield, and in 1909 accepted a similar position at the New Jersey State Normal School, Montclair. He traveled extensively in Europe and wrote various books on European countries, including *Turkey and the Turks* (1907); *In Viking Land* (1908); *Sicily, the Garden of the Mediterranean* (1909); *Bohemia and the Czechs* (1910); *Bulgaria and her People* (1914). In the educational field he is the author of several works in psychology and also on the history of education: *Child Study Outlines* (1898); *Die Entwickelung des sozialen Bewusstseins des Kindes* (1899; also in Swedish, Flemish, and Bulgarian); *The Educational Labors of Henry Barnard* (1893); *Bibliography of Education* (1897); *History of the Pestalozzian Movement in the United States* (1905). He was associate editor of Monroe's *Cyclopedia of Education* (1911).

MONROE DOCTRINE. The term applied to the policy of the United States regarding foreign interference in American affairs. It takes its name from President Monroe, who in his message to Congress in 1823 first gave it formal announcement. It is properly considered the corollary of the Washington and Jefferson policy of neutrality towards all European affairs. In modern conception it is the policy of the United States to regard any attempt on the part of a European Power to gain a foothold in this hemisphere by conquest, or to acquire any new establishment in North or South America by whatever means, as an act hostile to the United States. Although the phrase "America for the Americans" was not employed in the message, it well expresses the philosophy which Monroe assumed as a fundamental postulate. Yet it does not contravene the right of any nation to enforce indemnity for injuries to its subjects, physical or financial, however jealously the United States would view such a proceeding, but applies only to territorial aggression by foreign Powers whether temporary or permanent, and to any attempt to establish or alter governments in America whereby outside Powers might secure predominance or control. The conception of the policy is one of gradual growth, and so far as it has authority in international law it rests upon the principle of the right of a sovereign state to protect its own interests from dangerous aggression. With the wide and complex development of modern American interests, appeal to this argument is strengthened; yet the assertion of the doctrine in its extreme form is always attended with the danger of grave international complications.

The doctrine is based upon two passages in Monroe's message and has a twofold relation—a noncolonization and a nonintervention feature. The first passage referred to the boundary dispute in the Northwest, then in issue between Russia, Great Britain, and the United States, Russia having attempted to exclude foreigners from commerce and fishing in disputed territory and waters extending to the fifty-first parallel of latitude. President Monroe said: "The occasion has been judged proper for asserting as a principle in which the rights and interests of the United States are involved that the American continents, by the free and independent conditions which they have assumed and maintained are henceforth not to be considered as subjects for future colonization by any European Powers." Both the conditions which inspired the passage and its language prove that it related to an acquisition of territory by original occupation or settlement; that it did not include acquisition by gift, purchase, or like voluntary transfer, or by conquest. Further, while the application of the principle was made only to territory immediately in dispute in the Northwest, in prospective consideration it involved the vast tracts of unclaimed land on the continent still unexplored and unoccupied, upon which the establishment of a European colony with the exclusive trade policies then professed by all continental governments could not fail to prejudice the trade relations of the United States. The controversy in question was settled by the Treaty of 1825 with Russia, but the doctrine formulated was again asserted in 1826 by President J. Q. Adams in the proposed instruction of the United States delegates to the Panama Congress (q.v.), its application, however, being limited to its adoption by each separate State as a protection of the territory claimed by that State, and not committing the Powers concerned as a body to a "joint resistance against any future attempt to plant a colony." The question, however, was not considered by the Panama Congress, owing to the nonarrival of the United States delegates, and this phase of the doctrine remained in abeyance for 20 years.

The second part of the Monroe message related to the proposed action of the Holy Alliance, or, more accurately, the European Concert, as announced by the resolutions of the Congress of Verona (November, 1822), directed against the system of representative government in Europe and aiming at the reimposition of the Spanish yoke upon the South American colonies, then in a state of revolt, the independence of which the United States had already recognized. This action of the Powers threatened English commercial interests already established with these States, and England, through George Canning, promptly proposed to the United States a joint declaration by the two governments against their action; but without awaiting a reply from this government, on Oct. 9, 1823, she gave notice to the French Ambassador, Prince de Polignac, of her unfriendly attitude. There are some who contend, on the other hand, that Canning had little or nothing to do with the announcement of the doctrine and who refer to such explanation as the Canning Myth; but this idea has found little acceptance among scholars. This, followed by President Monroe's declaration, summarily checked the Powers. "We owe it, therefore," said Monroe, "to candor and the amicable relations existing between the United States and those Powers, to declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies and dependencies of any European Power we have not interfered and shall not interfere. But with the governments who have declared their independence and maintained it, and whose independence we have, on great consideration and just principles, acknowledged, we could not view any interposition for the purpose of oppressing them, or controlling in any other manner their destiny, by any European Power, in any other light than a manifestation of an unfriendly disposition towards the United States." While Monroe's

declaration was intended to meet the exigencies of the time, the principle was no novel one, but rather the embodiment of an idea that had developed with the growth of nationality and had been expressed in various forms in previous papers and correspondence of Monroe, Adams, and Jefferson. Two months before the publication of the message Jefferson had written: "Our first and fundamental maxim should be never to entangle ourselves in the broils of Europe; our second, never to suffer Europe to intermeddle with cisatlantic affairs." The declaration, having accomplished its purpose, practically disappeared in its application with respect to the Holy Alliance, and the development of the policy for the next generation was the outgrowth of the colonization feature.

It is supposed that the South American states, being in fear of European intervention in behalf of Spain, generally welcomed the announcement of the Monroe Doctrine; certainly its reception was cordial in Colombia, Brazil, and Buenos Aires. Colombia, in 1824, invited the armed assistance of the United States, but the cautious reply was given that, under the Constitution, the government could take such action only with the consent and by the authority of Congress. In Europe the doctrine was received with widely differing sentiments. In so far as the message was construed to interdict future colonization, it was generally opposed, even by Canning. Chateaubriand, Minister of Foreign Affairs in France, stated that the Powers should oppose the American policy.

In the time immediately succeeding the Monroe-Adams period the doctrine fell into disuse and disrepute in American politics, for the "Jackson men" held it as anathema because it had been championed by Adams. It was not invoked, despite the fact that there were European interventions in Uruguay and Paraguay. The doctrine was not announced with approval again until the administration of Polk, who adverted to it as the "Monroe Doctrine," and in 1845 he took the first step towards extension of the principle. The northwest boundary was again in issue, this time with Great Britain, and the administration was committed to the annexation of Texas. "It should be distinctly announced to the world," said Polk, "as our settled policy, that no future European colony or dominion shall, with our consent, be planted or established on any part of the North American continent." The doctrine was thus made to include acquisition by voluntary transfer or conquest of occupied territory, and a virtual guarantee of the status quo with reference to the territory of other American states in its application was announced, though limited to North America. Again in 1848, when the question of the occupation of Yucatan arose, Polk issued a second manifesto against the acquisition of such territory by voluntary transfer or cession. In 1853, when the Cuban annexation discussion was at its height, a resolution was introduced into the Senate combining the doctrines of Monroe and Polk; but it failed of passage. It is not a part of the statutory law of the land, though with the predominance of the interests of the United States the policy in relation to both North and South America has been generally accepted by both political parties and the people, and its principles have been given repeated recognition during the past half century in our foreign policy. President Grant, in the Santo Domingo episode of 1870, declared that, in accordance with the doctrine, there was no land on this continent subject to transfer to a European Power. The interference of the United States in Mexico, resulting in the withdrawal of the French in 1866, and President Cleveland's declaration to Great Britain in connection with the Venezuelan boundary dispute in 1895 are the notable examples of such recognition. Notwithstanding the protests of the United States government, during the progress of the Civil War, the French had secured a foothold in Mexico and attempted to install Maximilian, an Austrian prince, on a Mexican throne. With the conclusion of peace a formal demand for withdrawal was made, and General Sheridan was sent to the Mexican frontier with a large force. After some delay in negotiations the French Emperor withdrew his troops, and Maximilian was left to his fate. Although Secretary Seward did not refer to the Monroe Doctrine by name, it was generally recognized that his action was based upon it. He admitted that France might wage war with Mexico, but not that she might raise up an anti-American government. In the Venezuelan affair, representations having been made by our government that the action of Great Britain was a violation of the Monroe Doctrine, the latter yielded to the suggestion of the United States and consented to an arbitration, thus effecting an amicable settlement. President Cleveland and Secretary Olney unquestionably gave the Monroe Doctrine a broader interpretation. After affirming that the United States would not relieve any American state of its obligations as fixed by international law, Olney stated his government would allow no European Power to "forcibly deprive an American state of the right and power of self-government and of shaping for itself its own political fortunes and destinies." In addition he declared that "to-day the United States is practically sovereign on this continent, and its fiat is law upon the subjects to which it confines its interposition." Despite this extension of interpretation, the most important results of the Venezuelan incident were the official adoption of the Monroe Doctrine by Congress, in its indorsement of the executive policy, and its acceptance by Great Britain. In 1901 the doctrine was defined again by President Roosevelt, and, after stating the accepted prohibition against territorial and political aggrandizement, he said: "This doctrine has nothing to do with the commercial relations of any American Power, save that it in truth allows each of them to form such as it desires." In 1904 he said: "Brutal wrongdoing, or impotence which results in the general loosening of the ties of civilized society, may finally require intervention by some civilized nation, and in the Western Hemisphere the United States cannot ignore its duty." This statement, made with respect to conditions in Santo Domingo, was understood to mean that in case the social, political, or industrial demoralization in any American state was sufficient to warrant intervention, the Monroe Doctrine imposed that duty upon the United States. At his urgence a treaty was negotiated with Santo Domingo whereby the United States assumed management and administration of her tariffs. Since the announcement of the Roosevelt extension it has been thought necessary to intervene frequently in the affairs of the smaller

Latin American states. President Wilson, in 1913, felt it expedient to issue the warning that the United States respects only "the orderly processes of just government based upon law and not upon arbitrary or irregular force." At Mobile, in the same year, he said: "I want to take this occasion to say that the United States will never again seek one additional foot of territory by conquest." Intervention, if permitted at all, it was presumed, should be in support of "true constitutional liberty" rather than for territorial, political, or economic advantage. In this speech he also stated that the United States would oppose the granting of economic concessions by Latin-American countries to outside interests which might have influence upon the political destiny of any such country.

The Monroe Doctrine is sometimes held to commit the United States to a protectorate over other American states, requiring this country to espouse their quarrels, though unable to control their actions. It has never been within its intent to forbid European nations to employ force in the settlement of their just demands upon this continent, provided that no acquisition of territory was contemplated. In 1842 Great Britain blockaded San Juan de Nicaragua; in 1851 she laid an embargo on the western coast of Salvador; in 1894 she occupied the Nicaraguan port of Corinto; and in 1903 the combined German and English fleets, after both governments had given assurances concerning the nonpolitical character of their designs, maintained a blockade of the Venezuelan coast to secure the collection of their claims for indemnity. The requirements of the Monroe Doctrine as a national policy were fully met with the assurance to the United States of good faith on the part of the Powers concerned and that no Venezuelan territory would be taken in settlement of the indemnity. It may be noted that the United States delegates at the first Hague Conference in 1899 stated distinctly that the Monroe Doctrine was a cardinal policy of their country, a declaration which was opposed by none of the delegates present. While the building of an interoceanic canal and the position which the United States has had as a world power since the close of the war with Spain have rendered the problems attending the application of the doctrine more complex, the increased respect which it has insured our demands has greatly decreased the difficulties of its enforcement.

The attitude of Latin America to the Monroe Doctrine has in the course of time undergone many changes, the respect for it being in many cases demonstrably due to the threat of outside danger. Among certain states, such as Argentina, Brazil, and Chile, there has developed a feeling of independence of it. In 1913 Señor Zeballos, rector of the University of Buenos Aires, in a speech of welcome to ex-President Roosevelt which was widely circulated and commended in South America, asserted that certain states had acquired sufficient stability and power as no longer to require the guarantees of the doctrine. In 1906, also, President Díaz, of Mexico, declared that the doctrine belonged to no one Power, but that it was Pan-American.

Although many have expressed doubts as to the existence and utility of a Monroe Doctrine, deeming its principles obsolete and considering the imperialistic policy of the United States to be so inconsistent with such doctrine as to be destructive of it, still, regarded as a limitation upon the extension of European power and influence in the Western Hemisphere, it must be acknowledged as the settled and recognized principle of American policy.

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MONRO'VIA. The capital of the negro Republic of Liberia, west Africa, situated at the mouth of the St. Paul River, on the coast (Map: Africa, C 4). It has an unhealthful climate. There is a government college with about 200 students and another conducted by Methodist missionaries. The city is the seat of a Protestant Episcopal bishop and of an American and a Roman Catholic mission. It is also a station of the German and the South American cable companies. Its exports are palm oil and kernels, coffee, ginger, fibre, cocoa, dyewoods, and rubber, the total trade in 1912 amounting to $2,634,375, chiefly with Germany and Great Britain. Pop., including the suburb of Krutown, about 6000, including some 120 Europeans.

MONS, môns. The capital of the Province of Hainaut, Belgium, situated on the Trouille, 35 miles southwest of Brussels (Map: Belgium, B 4). It was formerly encircled by a line of fortifications, but their site is now occupied by promenades. The most interesting building in Mons is the late Gothic cathedral of St. Waltrudis (1450–1589), with reliefs, stained-glass windows, and relics of the saint. The hôtel de ville is a late Gothic building of the fifteenth century, with a façade adorned with statuettes and a baroque tower. The educational institutions comprise a military engineering college of the Belgian army, a school of mines, a normal school, a seminary for teachers, a fine library with 80,000 volumes, and an archæological museum and picture gallery. Mons lies in one of the most important coal-mining districts of Belgium, known as Borinage, and manufactures woolen and cotton goods, iron products, cloth, lace, and sugar. The trade, mostly in grain and coal, is facilitated by the Canal de Condé, which connects with the Scheldt.

Mons occupies the site of a Roman fort built by Julius Cæsar. It attained some importance in the Middle Ages and owed not a little of its prosperity to Baldwin VI, Count of Flanders, later Emperor of Constantinople, from whom it

received a charter in 1200. It was repeatedly taken during the wars of Louis XIV. Mons was captured by the Germans in the European War which broke out in 1914. It was from here that the allied Anglo-French army began its slow, steady retreat which was not stopped until the battle of the Marne (see MARNE) was fought, in sight of the outer fortifications of Paris. (See WAR IN EUROPE.) Near by are the battlefields of Malplaquet and Jemappes. Pop., 1900, 25,483; 1910, 27,828.

MONS, or TALAING. The inhabitants of the unhealthy delta regions of the rivers Irrawaddy, Sittong, and Salwen in Indo-China. They consider themselves the aborigines of the whole of Lower Burma. Their former habitat is now largely occupied by Burmese-Mon half-breeds. They are probably one of the eight groups of aborigines of Indo-China. Their language seems to belong in the same class with the Khmer, and perhaps the Khasia. See INDO-CHINESE.

MONS BRISI'ACUS. See BREISACH.

MONSEIGNEUR, môn'sā'nyĕr′ (Fr., my lord; pl. *messeigneurs*). Originally a French title applicable to royal or Imperial princes, cardinals, archbishops, and bishops of France and accorded in courtesy to the high officers of court or government and persons generally of high rank. The title was not applied to bishops until about the close of the seventeenth century, when they acquired it by concerted action in addressing each other in that way. Their title previously was simply *monsieur*. A law of the French Convention in 1801 interdicted the use of the title for bishops and archbishops and required them to confine their signature titles and their addresses to each other to the words *citoyen* or *monsieur*. Among English-speaking Roman Catholics the title is applied in its Italian form, *monsignore*, not only to bishops, but to priests who are distinguished by the honorary appointment as domestic prelates to the Pope.

MON'SELL, JOHN SAMUEL BEWLEY (1811–75). A Church of England divine and hymn writer. He was born in Londonderry, Ireland, March 2, 1811, and graduated at Trinity College, Dublin, in 1832. He was ordained priest in 1835 and died as rector of Guildford, England, April 9, 1875. He was a popular hymn writer; Julian's *Dictionary of Hymnology* gives a list of 73 of his hymns which are in current use. Aside from collections of hymns, he published various books of prose and verse. One of his prose works, *Our New Vicar* (1867; 13th ed., 1890), has had a large sale.

MONSEL'S SOLUTION. An aqueous solution of basic ferric sulphate, corresponding to about 13.6 per cent of metallic iron. It is a dark reddish-brown liquid, odorless, and strongly styptic. It is used externally as a local astringent in cases of bleeding from the nose or other mucous cavities or from superficial skin wounds. The solution promotes clotting of the blood, but the clot is very disagreeable, readily decomposes, and may give rise to septic infection. It has therefore been largely superseded as a hæmostatic by adrenalin (q.v.), but is still applied to the inflamed pharynx or tonsils. See IRON.

MONSERRAT, mŏn'sĕr-răt′ (*mons serratus*). A mountain and a monastery of Spain, situated 30 miles northwest of Barcelona, near Monistrol, a village on the Barcelona and Lerida Railway. The mountain, 4070 feet high, is strongly eroded, and the many deep ravines and steep precipices, together with its serrated summit, give it a very ragged appearance. The monastery, located at a height of 2910 feet, owes its origin to an image of the Virgin which was hidden in one of the mountain caves when the Moors invaded Spain. The popular belief asserts that the monastery was built during 880 as a home for the Virgin when, after the invaders had withdrawn and safety was again assured, the image refused to leave her mountain refuge. The mountain is rich in legendary lore, and in the mediæval German story it was believed to be the site of the castle of the Holy Grail.

MONSIEUR, *me-syĕ′*. A French title formerly addressed to persons of medium rank; now universally employed in French by all gentlemen in addressing each other. It is also used as a prefix to titles of rank and as a form of respect in mentioning a third person. In the Middle Ages the title was given to saints and as a prefix to the names of popes and of members of the royal family when alluded to in the third person. Later *Monsieur*, used without a proper name, was the special title of the oldest brother of the French King.

MONSIGNY, môn'sē'nyĕ′, PIERRE ALEXANDRE DE (1729–1817). A French composer, born at Fauquembergue, Pas-de-Calais. He received some instruction in harmony from Gianotte, in Paris, and in 1759 produced his first opera, *Les aveux indiscrets*. Its success was immediate, and Monsigny followed it up with *Le cadi dupé* (1761). From this time he had the poet Sedaine as collaborator. Together they wrote: *On ne s'avise jamais de tout* (1761); *Le roi et le fermier* (1762); *Rose et Colas* (1766); *Le déserteur* (1769); *Le faucon* (1772). After *Félix, ou l'enfant trouvé* (1777; text by Sedaine), Monsigny ceased to write. In 1813 he succeeded Grétry (q.v.) as member of the Academy. Together with the latter and Philidor (q.v.), Monsigny must be regarded as the founder of the opéra comique. Even to-day some of his works are occasionally heard in France. Consult A. Pougin, *Monsigny et son temps* (Paris, 1908).

MONS JANICULUS. See JANICULUM.

MONSON, mŭn'sŭn. A town in Hampden Co., Mass., 20 miles east of Springfield, on the Central Vermont Railroad (Map: Massachusetts, C 4). It contains the Monson Academy. Monson is essentially an agricultural community, but has granite quarries, woolen mills, and manufactories of ladies' hats. The water works are owned by the town. Pop., 1900, 3402; 1910, 4758.

MONSON, SIR EDMUND JOHN, first BARONET (1834–1909). A British diplomatist, born at Chart Lodge, Kent. He was educated at Eton and at Balliol College, Oxford, and became a fellow of All Souls in 1858. Until his resignation in 1865 he was connected with the British legations at Paris, Florence, Washington, Hanover, and Brussels. He reëntered the government service in 1869 as Consul in the Azores, became Consul General in Hungary in 1871, and during the Turkish War in 1876–77 was on special duty in Dalmatia and Montenegro. After 1879 he was successively Minister to Uruguay, Argentine and Paraguay, Denmark, Greece, and Belgium, and Ambassador to Austria (1893–96) and to France (1896–1904). In 1888 he became arbitrator of the Butterfield

claim between the United States and Denmark, which claim grew out of the treatment of two vessels belonging to the American firm of Butterfield & Co. by the Danish authorities at the island of St. Thomas in 1854–55. Monson gave his decision in favor of the Danish government in 1900. He received the G.C.V.O. in 1903 and in 1905 was made Baronet.

MONSOON' (from Fr. *monson, monçon, mousson,* It. *monsone,* Sp. *monzón,* Portug. *monção,* from Malay *mūsim,* season, year, monsoon, from Hind. *mausim,* from Ar. *mausim,* monsoon, from *masama,* to mark). In general, any wind or system of winds that changes regularly with the months or seasons. This term was brought to England from the East Indies by the Portuguese, Spanish, and Italian navigators. Its use in English first occurs in *Hakluyt's Voyages.* In India, Siam, and the East Indies there is a very regular change of the winds with the seasons. They blow from southwest or south from April to October and from northeast or north from October to April. The existence of these winds in India was first made known to the Europeans by the expeditions of Alexander the Great. Modern knowledge of the corresponding winds in Siam and the Philippines dates from the middle of the sixteenth century; similar regular seasonal changes in the wind direction characterize many portions of the globe, so that Australia, Texas, Brazil, Africa, and Europe have prevailing winds at each season of the year; yet the contrast is nowhere so strongly marked as on the south and southeast coasts of Asia and the neighboring islands. During the winter season the cool air from the interior of the continent, flowing outward and keeping near the ground, becomes a north or northeast wind as it flows southward over the China Sea into the Bay of Bengal and into the Arabian Sea. This wind even passes beyond the equator to lat. 10° S., by which time it has been deflected into a west wind and flows eastward over the northwestern coast of Australia. South of this zone of north winds are the southeast trade winds of the Southern Hemisphere. By reason of the change from winter to summer the Asiatic continent becomes heated; consequently the northeast monsoon ceases and a strong indraft takes place, and eventually, in July and August, the greater part of the air over the south Indian Ocean responds to this indraft, so that from lat. 25° S. to lat. 5° S. a strong southeast trade wind prevails. Between lat. 5° S. and 5° N. this southeast trade crosses the equator as a southerly wind and, turning towards the right, becomes the southwest monsoon wind of India, Siam, and the adjacent seas. It was for a long time considered doubtful whether the winds of the Southern Hemisphere could thus cross the equator and enter the Northern Hemisphere, but the monsoon charts published daily for many years by the government of India leave us no room to doubt this remarkable change. In the midst of the southeast trades of the south Indian Ocean occur violent typhoons, which move from the neighborhood of Java and northern Australia westward and away from the equator, turning in their course before they reach Madagascar and moving southeastward until they are lost. These typhoons generally develop in the south Indian Ocean when the northeast monsoon is at its maximum in India.

The southwest monsoon is usually accompanied by rain in portions of India and in the adjacent East Indies. The northeast monsoon brings rain to the west coast of the Bay of Bengal. In general, the locations of the rain areas vary with the direction of the wind in accordance with the rule that a wind that is forced to ascend over a hilly coast brings rain to it. Through this interchange between the seasons of northeast and southwest monsoons, all of India has an opportunity of being well watered and of raising annual crops of grain. Nevertheless it occasionally happens that the southwest monsoon fails to bring much rain; this may indeed happen for several successive years (as in 1895 and 1896 and again in 1899), by reason of which distressing famines and great loss of life are caused. Since 1880 the government meteorologists of India, H. F. Blanford and John Eliot, have devoted a great deal of attention to methods of predicting the probable character of the monsoon rains. These predictions are generally issued in the month of April and relate to the coming months of July and August. A remarkably large percentage of these predictions have been successful, but the failure of the forecasts for 1899 indicated that abnormal conditions prevailed in some distant region and has greatly stimulated the study of the relation between the Indian monsoon and the condition of the atmosphere over the whole globe.

The general statement of the conditions that bring about monsoons is discussed at length by Prof. William Ferrel in *A Treatise on the Winds* (New York, 1889). He has emphasized the important rule that monsoons are stronger in proportion as the heated interior land surface is elevated above sea level. On the coast of Jamaica, West Indies, the diurnal sea breeze is remarkably strong, owing to the steep gradient of the land as it ascends from sea level to the tops of mountains. In India the southwest monsoon develops on a grand scale because of the average elevation of the Himalayas, which stretch east and west for 1300 miles at an average altitude of 18,000 feet, and also because of the mountains and plateaus behind the Himalayas in the interior of Asia. The monsoon, like the daily land and sea breeze, depends for its intensity ultimately on the heat produced by solar radiation. Any change in the radiation will produce corresponding effects on the monsoon. E. D. Archibald, in *Nature* (June 22, 1893, London), has maintained that there are systematic monsoon variations parallel to the variations of the spots on the sun. But these changes are barely appreciable, and further investigation may modify his results.

MONS SA'CER (Lat., sacred mount). A hill near Rome, made famous by the secession thither of the Plebs in 494 B.C. It is conjecturally identified with an eminence near the Ponte Nomentano, about 3 miles from the Porta Pia, at the modern Torre di Specchia. Consult Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

MONSONI, mŏn-sō'nē, **MONSO'NEE,** or **MOOSE INDIANS.** A division of the Cree (q.v.).

MON'STER. See MONSTROSITY.

MON'STRANCE (OF. *monstrance,* from ML. *monstrantia,* monstrance, from Lat. *monstrare,* to show, from *monstrum,* portent, monster, from *monere,* to warn, admonish), or OSTENSORY. The sacred utensil employed in the Roman Catholic church for the purpose of presenting

the consecrated Host for the adoration of the people, as well while it is carried in procession as when it is exposed upon the altar on occasions of special solemnity and prayer. The use of the monstrance probably dates from the establishment of the festival of Corpus Christi in the thirteenth century. It consists of two parts, the foot or stand upon which it rests and the repository or case in which the Host is exhibited. The latter contains a small semicircular holder called the *lunula*, or crescent, in which the Host is fixed.

MONSTRELET, môn'stre-lā', ENGUERRAND DE (1390–1453). A French chronicler, probably born in Picardy. Of his life practically nothing is known. According to his own testimony, he was present at the interview between Jeanne d'Arc and the Duke of Bourgogne. In 1430 he had a civil and military office in Compiègne; later he was provost at Cambrai and bailiff at Walincourt. His *Chronique*, which covers the years 1400–44 and continues the narratives of Froissart, is a clear and exact narrative of the time, written with little charm of style. The latest edition is that of Douët d'Arcq (1857–62). There is an English translation by Thomas Johnes (1810).

MONSTROSITY (Lat. *monstrositas*, from *monstrosus*, *monstruosus*, monstrous, from *monstrum*, monster, portent), IN ANATOMY. All departures from the normal development of the human fœtus or of the young of the higher animals are now considered under the subject of teratology. These deviations from the normal may vary from the comparatively slight and common anomalies (such as harelip and supernumerary digits) to forms which are so strange and hideous that they merit beyond question the name of monsters. Although the system of Saint-Hilaire is by no means perfect and is not based on embryonic laws, yet it has the advantage of a familiar nomenclature and groups together forms which present similar external characteristics. His classification, somewhat modified by Hirst and Piersol, is the one generally accepted. Under his classification we have four general groups: *Hemiterata*, *Heterotaxics*, *Hermaphrodites*, *Monsters*.

Hemiterata. In this group are included all forms of anomalies which show unusual development, but which are not exaggerated enough to be regarded as monsters nor specific enough to be considered members of the second or third class.

This group is subdivided into:

1. *Anomalies of volume*, with general diminution or increase, as in dwarfs and giants. This abnormal development may affect only a part of the body, as the extremities, or the breasts, or the muscular system.

2. *Anomalies of form*, resulting in deformities of the head, of the stomach, or of the pelvis.

3. *Anomalies of color*, presenting the interesting condition of albinism or abnormal melanism.

4. *Anomalies of structure*, as represented by the persistent cartilaginous condition of bones or the ossification of parts that normally should consist of cartilage.

5. *Anomalies of disposition* include hernia, clubfoot, extrophy of the bladder, and curvature of the spine.

6. *Anomalies of connection* are especially varied. Bones have unusual articulations; muscles have abnormal attachments; and arteries and veins give off branches in violation of anatomical regularity.

7. *Anomalies of continuity* show an imperforate condition of vagina, rectum, or œsophagus, or a union of the kidneys, of the digits, or of the teeth.

8. *Anomalies of closure and disjunction* are illustrated by a vaginal septum and by cleft palate and harelip.

9. *Anomalies of number* embrace many varieties represented by an increase or decrease in the number of digits, teeth, breasts, or other parts.

Heterotaxics include those forms which show transposition of the internal viscera, either of the thorax or of the abdomen. Rarely we find only a single organ transposed; often all are in an abnormal position; but this change is accompanied by no interference of nutrition or of function. So at times the heart will be found on the right side or the liver on the left, and yet the individual is unconscious of any irregularity.

Hermaphrodites. Ahlfeld defines a true hermaphrodite as an individual possessing functionally active glands of both sexes, with excreting ducts and external genitals, so that the offices of both sexes can be fulfilled. Indisputable evidence of such a case has not been adduced, although there are numerous instances where glands presenting the histological characteristics of both sexes have been present in one person. False hermaphrodites present typical glands of one sex and others of a more or less mixed or modified type. They are usually masculine in sex. There are all degrees of abnormality in development, from a slight enlargement of the vesicula prostatica (the masculine uterus of Weber), without any alteration in the external genitals, to a fully developed uterus with tubes and vagina complete in a male subject. The penis in these cases is rudimentary, and a condition of hypospadias (a malformation of the penis, in which the orifice of the urethra is underneath or behind the glans) exists. The scrotum is ill developed, and the testicles remain in the abdomen. The absence of ovaries is not detected, so that the mistake in sex may naturally persist until a post-mortem examination reveals their absence and the true sexual nature of the individual is apparent.

Monsters. In this class we will first consider autositic single monsters which are capable of independent existence in the womb and are the result of an arrest in development, of fusion, or of displacement of important parts. 1. *Ectromelus.*—This group includes aborted or imperfectly formed extremities which present various degrees of shortening or else are entirely absent. Some cases show rudimentary limbs, but perfectly formed hands and feet which appear to come immediately from the trunk. 2. *Symmelus.*—The pelvis and lower extremities in the individuals of this group are imperfectly developed, and the two lower limbs are more or less fused. Sometimes this fusion is complete and the feet are wholly lacking. 3. *Celostoma.*—The individuals in this class show a varying degree of cleft in the walls of the abdomen or of the thorax and consequent eventration. Anomalies of the intestinal tracts and of the urinary and genital apparatus are frequent accompaniments. Malformations of the head are classified under the next three groups:

(4) exencephalus, (5) pseudencephalus, and (6) anencephalus. In group (4) a malformed brain exists, situated in part at least within a cranial cavity of which the walls are imperfect. In group (5) the cranium is even more rudimentary and the brain tissue is but poorly represented, while in the anencephalus the true nerve elements are wholly lacking in the mass of tissue lying within the shallow and imperfect cranial cavity. These brainless monsters are almost always feminine. In (7), the cyclocephali, the eyes approach the mid-line and more or less closely unite. These organs are poorly developed or rudimentary, and the nose is atrophied, although in certain instances a hypertrophied proboscis may arise from above the fused sockets. The lower jaw is poorly developed or wanting in (8), the octocephalic, and the ears approach each other and frequently become fused below. The mouth is, of course, distorted to an exceptional degree.

Omphalositic single monsters are embryos dependent on other embryos within the womb for their own imperfect development. The primary fœtus is usually well formed and supplies both itself and the parasite with blood by means of an extensive anastomosis of placental and umbilical vessels.

When the heart is present in omphalosites it is incomplete. The circulation is sluggish and an overgrowth of connective tissue results, with the formation of lacunæ and cysts and frequently marked œdema. The highest development of these monsters is reached in the paracephalus. In this anomaly the extremities are more or less definitely present, the head has an imperfect cranium and imperfect face, the cervical vertebræ are rudimentary, the diaphragm is defective, and the lungs are absent or else incomplete. There is, of course, no sign of life in these forms after birth.

Composite Monsters embrace all forms in which there is a reduplication of the principal parts of the body. There may be two distinct faces and heads closely fused together, or the duplicity may be only slightly suggested (diprosopus). In other cases (dicephalus) the heads may be quite distinct, and even the upper parts of the body are double, with three or four arms present. The internal organs are duplicated according to the amount of division. Although specimens of this group are seldom born alive, and still more rarely live, yet we have a well-marked instance of this class recorded in the case of the Tocci brothers (1877), who grew up and thrived for many years. In the third class (ischiopagus) two separate distinct bodies are present which are joined by the coccygeal and sacral bones. Only one case is recorded which lived beyond the third year. The pyopagi are very rare. In these, two separate bodies are so joined together in the sacral region that the two individuals stand back to back. The dipygi are cases which show a reduplication of the pelvis, of the genitals, and of the extremities. If four legs are present, they are not all equally well developed, but the two inner legs are much smaller. This division of the body from below may be carried still further (syncephalus), and if the union is simply confined to the heads, these specimens are included in the craniopagi.

In some instances the reduplication is almost complete and the union is comparatively slight, occurring at some point between the umbilicus and the lower thorax. The most famous case is that of the Siamese twins, who lived to be 63 years old. In February, 1902, the Hindu twins Rodica and Doodica, who had been joined in a fashion similar to the Siamese twins, were divided by operation in Paris, France. Rodica survived, but her sister died of tuberculosis.

Double Parasitic Monsters. In this class a more or less perfectly formed body is attached to a well-formed individual, but it has no separate existence, receiving its nourishment wholly from the other.

Triple Monsters are rare, and we know of but one case of a three-headed child—that recorded by Saint-Hilaire, born in 1832 in Catania. Consult: Saint-Hilaire, *Histoire des anomalies de l'organisation* (Paris, 1832–36); Hirst and Piersol, *Human Monstrosities* (Philadelphia, 1892); also Gould and Pyle, *Anomalies and Curiosities of Medicine* (ib., 1897). See DEFORMITIES.

MONSTROSITY. A botanical term applied to a peculiar or unusual form of an organ or of the whole body; better designated by the term "malformation" (q.v.).

MONT, MENT, or **MENTU.** An Egyptian deity, originally the local god of Hermonthis (q.v.), where he had an ancient temple. His chief characteristics were strength and valor, and "strong as Mont" and "brave as Mont" were favorite epithets of the Egyptian kings. Under the New Empire Mont became the national god of war, who fought for the armies of Egypt and gave might and victory to the King. In inscriptions of this period he is styled "Lord of Thebes, dwelling in Hermonthis." In the later theological system he was identified with the sun god under the name of Mont-Rê. With the decline of Thebes and the rise of Hermonthis to supremacy over the surrounding district, Mont gained correspondingly in importance and usurped in some measure the devotion formerly paid to Amon. Magnificent temples were dedicated to him at Karnak and at Medamut, near Thebes, by the Pharaohs of the eighteenth dynasty; and at Tud, the ancient Tuphium, are the remains of a small temple of the god built in Ptolemaic times. Mont is usually represented as a hawk-headed deity wearing upon his head the solar disk and two tall plumes. At his ancient seat of worship, Hermonthis, his sacred animal was the bull Bakh, called Bacis by the Greeks. Consult Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897), and E. A. T. Wallis Budge, *The Gods of the Egyptians* (London, 1904).

MONT, KAREL MARIE POLYDOOR DE. See POL DE MONT.

MONTAGNA, mŏn-tä'nyȧ, BARTOLOMMEO (c.1450–1523). An Italian painter of the Renaissance, founder of the school of Vicenza. He was born at Orzinuovi, near Brescia, and was influenced in his art by the Vivarini, the Bellini, and especially by Andrea Mantegna. He was active chiefly at Vicenza, and later was employed in Bassano, Verona, and Padua. His works are severe in design and ample in color after the manner of the earlier Venetians. They include the partly destroyed frescoes illustrating the life of St. Blasius, in the church of San Nazaro at Verona; a fine "Pietà" at Monte Berico, near Vicenza; "Madonna with Saints," Johnson collection, Philadelphia; "Madonna and Child" and "A Lady of Rank as Santa Bibiana," Metropolitan Museum, New York; and an altarpiece in the Brera, Milan. Others are in the

Venice Academy, the National Gallery, London, the Louvre, the Berlin Gallery, and, especially, in the gallery and churches of Vicenza.

MONTAGNAIS, môn'tȧ'nyȧ' (Fr., mountaineers). A name applied to a group of closely cognate Algonquian tribes in Quebec Province and Labrador, Canada, extending along the northern shore of the St. Lawrence River from near the entrance of the St. Maurice nearly to the Gulf and inland to the main divide. They have greatly decreased in number from sickness and starvation resulting from the destruction of their former game supply. No separate census is kept, as they are officially grouped with the Nascapi, Têtes-de-Boule, and other tribes and bands. So far as can be learned from the reports, they appear to make their principal living by hunting, fishing, making bark canoes, snowshoes, and moccasins, and acting as guides to tourists. Consult Chamberlain in Geological Survey of Canada, *Annual Archæological Report* (Ontario, 1905).

MONTAGNANA, môn'tȧ-nyä'nȧ. A town in the Province of Padua, Italy, 22 miles southwest of Padua. It is surrounded by walls and towers and has a Gothic cathedral and a sixteenth-century town hall with paintings. Its chief trade is in spun silk, wool, hemp, flax, and coarse cotton textures. It manufactures leather. Pop. (commune), 1901, 10,364; 1911, 11,176.

MONTAGNARDS, môn'tȧ'nyär' (Fr., mountaineers). The name first applied in France in 1790 to the more radical members of the National Assembly, who occupied the high seats in the rear of the amphitheatre where the Assembly met. In the Convention (q.v.) it was applied to the entire Radical Left, composed of Jacobins (q.v.) and Cordeliers (q.v.), in distinction from the more moderate Girondists (q.v.), who occupied the lower seats in the hall. The history of the Convention till June, 1793, is almost entirely the history of the struggle between the Gironde and the Mountain. The former, comprising the philosophers, statesmen, orators, scientists, and men of letters in the Convention, were republicans and liberals of the idealistic type, middle class in their sympathies and out of touch with the more revolutionary aspirations of the masses, while the Mountain was composed to a large extent of the uncompromising leaders of the Parisian groups. The Montagnards themselves, however, were filled with the vague radicalism of the philosophers of the Enlightenment, were unable to construct or unite upon any definite practical program of social amelioration, and gave way before the Thermidorian reaction. Upon the question of Louis XVI's fate, the issue between the two parties was practically fought out. Then, as in the crisis brought on by foreign invasion and internal disorder, the Girondists showed themselves irresolute. The Montagnards in condemning the King challenged all Europe, took the guidance of the Revolution into their own hands, and some time after (June 2, 1793) destroyed all opposition by arresting the leaders of the Gironde and sending them to the guillotine. The subsequent acts of the Convention were the acts of the Montagnards, under their leaders Danton, Marat, Robespierre, and Collot d'Herbois. In 1848 the Radicals under Louis Blanc and Ledru Rollin called themselves Montagnards. Consult: Jules Claretie, *Les derniers Montagnards* (Paris, 1874); Shailer Mathews, *French Revolution* (New York, 1901); Lichtenberger, *Le socialisme dans la révolution française* (Paris, 1901); also *Cambridge Modern History*, vol. viii, p. 807 (New York, 1904), for a bibliography. See Danton; French Revolution; Marat; Robespierre; Saint-Just.

MONTAGU, mŭn'tȧ-gū *or* mŏn'-, Basil (1770–1851). A British lawyer and author, natural son of John Montagu, fourth Earl of Sandwich. He was educated at the Charterhouse and at Christ's College, Cambridge, where he graduated M.A. in 1793. In 1795 he went to London, where he studied for the bar, to which he was admitted three years later, and soon afterward he began to publish works dealing with legal subjects. He interested himself particularly in relieving the conditions of the debtor class and succeeded in securing the abolition of the death penalty for certain crimes. Among his writings are: *An Enquiry Respecting the Expediency of Limiting the Creditor's Power to Refuse a Bankrupt's Certificate* (1809); *The Opinions of Different Authors upon the Punishment of Death* (1809); *An Enquiry Respecting the Mode of Issuing Commissions in Bankruptcy* (1810); *Enquiries Respecting the Insolvent Debtors' Bill, with the Opinions of Dr. Paley, Mr. Burke, and Dr. Johnson upon Imprisonment for Debt* (1816); *The Law and Practice in Bankruptcy as Altered by the New Statutes, Orders, and Decisions*, with Scrope Ayrton (2 vols., 1837; 2d ed., 1844). His edition of Bacon's works occasioned Macaulay's well-known essay in the *Edinburgh Review* (1837).

MONTAGU, Charles, first Earl of Halifax. An English poet and statesman. See Halifax, Charles Montagu, Earl of.

MONTAGU, Edward, first Earl of Sandwich. See Sandwich.

MONTAGU, Elizabeth (Robinson) (1720–1800). An English writer and society leader, born at York. In 1742 she married Edward Montagu, grandson of the first Earl of Sandwich, who on his death left her a large fortune. With abundance of wealth and possessing literary talent, she became a leader in London society, and numbered among her regular visitors Lord Lyttleton, Horace Walpole, Dr. Johnson, Burke, Garrick, and Sir Joshua Reynolds. The epithet of "bluestocking" was first applied to her gatherings. In 1760 she wrote three *Dialogues of the Dead*, published in Lord Lyttleton's work by that name, and in 1769 an *Essay on the Writings and Genius of Shakespeare, Compared with the Greek and French Dramatic Poets*, that received high praise from her contemporaries. Her correspondence in great part was published in 1809–13. Consult: Doran, *A Lady of the Last Century* (London, 1873); *Elizabeth Montagu, the Queen of the Bluestockings: Her Correspondence from 1720 to 1761* (2 vols., New York, 1906); René Huchon, *Mrs. Montagu and her Friends* (ib., 1907).

MONTAGU, John, fourth Earl of Sandwich. See Sandwich.

MONTAGU, Lady Mary Wortley (1689–1762). An English poet and letter writer, eldest daughter of Evelyn Pierrepont (afterward Duke of Kingston). She was baptized in London, May 26, 1689. From her brother's tutor or by herself she learned Latin, and read widely in English drama and romance. When a mere girl she was toasted by her father at the Kit-Cat Club, and on her appearing there was ad-

mitted a member by acclamation. Without the approval of her family she privately married (Aug. 12, 1712) Edward Wortley Montagu, a Whig member of Parliament, with whom she lived for a time in retirement. On the accession of George I she went to London with her husband. There her beauty and wit attracted unusual attention at court, and she was much admired by the wits, especially by Pope. In 1716 appeared surreptitiously her *Court Poems*, afterward called *Town Eclogues*. The same year she set out with her husband on his embassy to Constantinople. At Adrianople she became interested in inoculation for smallpox (1717) and on her return introduced the practice into England. During her travels in the East she wrote her well-known *Letters* (posthumously published), delightful in themselves and valuable for the light they throw upon the manners and customs of the time. Returning to England (1718), the Montagus soon settled near Pope at Twickenham, and Lady Mary became one of the best-known women in London society. Pope had addressed verses to her and had kept up a correspondence during her absence. The friendship was now renewed on more intimate terms, but by 1722 they quarreled. Pope seems to have made a declaration of love, which was met with a burst of laughter. Pope afterward satirized her as Sappho in various poems. Swift lampooned her in *The Capon's Tale* (1726). In the *Epilogue to the Satires* (1738) she is accused by Pope of starving a sister and forswearing a debt, and in the *Imitations of Horace* (1733) a worse charge is brought against her (first satire, 2d book, i, 84). For unknown cause she left her husband in 1739 and lived abroad for many years, chiefly in Italy. Her husband died in 1761, and the next year she returned to England, at the request of her daughter, Lady Bute. She died Aug. 21, 1762. Consult her *Works*, edited by her great-grandson, Lord Wharncliffe (London, 1837; new eds., 1887, 1893), and E. M. Symonds, *Lady M. W. Montagu and her Times* (New York, 1907). See INOCULATION.

MONTAGU, RALPH, first DUKE OF (c.1638–1709). An English diplomat. In 1665 he became master of horse to Queen Catharine and in 1669–72 and 1676–78 was Ambassador to Louis XV of France. He was married to Elizabeth Wriothesley (died 1690), the wealthy widow of the Earl of Northumberland, in 1673; succeeded his brother as Baron Montagu in 1684; and throughout all this period he was continuously active in various court intrigues. Although he enjoyed the favor of James II, he was one of the first to take the oath to William and Mary, and he was rewarded by being made Viscount Monthermer and Earl of Montagu in 1689. In 1692 he increased his favor at court by marriage to the insane but very rich Elizabeth Cavendish, widow of the Duke of Albemarle, and in 1705 he was elevated to be Marquis of Monthermer and Duke of Montagu.

MONTAGUE, mŏn′tȧ-gū. A town, including several villages, Turners Falls being industrially the most important, in Franklin Co., Mass., separated from Greenfield by the Connecticut River, and on the Boston and Maine, the New York, New Haven, and Hartford, and the Central Vermont railroads (Map: Massachusetts, B 2). It has three public libraries, the Farren Hospital, and extensive manufactures of cotton goods, paper, pulp, cutlery, hardware, water wheels and pumps, toilet articles, bricks, silk, and fishing rods. The government is administered by town meetings. The water works are the property of the municipality. There is a large power plant at Turners Falls which furnishes current to towns at considerable distances away. Montague was settled about 1716 and was incorporated as a district in 1753. Pop., 1900, 6150; 1910, 6866.

MONTAGUE, FRANCIS CHARLES (1858–). An English historian, born in London. He was educated at University College, London, and at Balliol, Oxford; was fellow of Oriel College, Oxford; and in 1884 was called to the bar. In 1893 he became Astor professor of European history at University College, London, and from 1900 on was curator of the Indian Institute at Oxford. He wrote *Limits of Individual Liberty* (1885), *Technical Education* (1887), a *Life of Sir Robert Peel* (1888), and *Elements of English Constitutional History* (1894); contributed to the *Cambridge Modern History* (vol. viii, 1904) and Longmans' *Political History of England* (vol. vii, James I to Restoration, 1907); and edited Bentham's *Fragment on Government* (1891) and Macaulay's *Essays* (1903).

MONTAGUE HOUSE. 1. A former London mansion built for the first Duke of Montague. It was bought by the government at the time of the purchase of the Sloane collection, which, with the Harleian manuscripts and the Cottonian library, was deposited in it, forming the nucleus of the British Museum. The expansion of the museum in the early part of the nineteenth century made the addition of a wing necessary, and the building was finally replaced by the present British Museum between 1823 and 1852. 2. A building in Whitehall, London, residence of the Duke of Buccleuch, containing a large collection of pictures and miniatures.

MONTAGUES. See CAPULETS AND MONTAGUES.

MONTAIGLON, môn′tā′glôn′, ANATOLE DE COURDE DE (1824–95). A French bibliographer and paleographer, born in Paris. A student at the Ecole des Chartes, he obtained his diploma as archivist in 1850, and held positions successively at the Museum of the Louvre, the Arsenal Library, and that of Ste. Geneviève, until he became professor of bibliography at the Ecole des Chartes. His numerous works, which deal chiefly with the origin of French art and literature, include: *Mémoires pour servir à l'histoire de l'académie royale de peinture* (1853); *Catalogue raisonné de l'œuvre de Claude Mellan d'Abbeville* (1858); *Notice historique et bibliographique sur Jean Pélerin, dit le Viateur* (1861); *Recueil général et complet des fabliaux des XIIIème et XIVème siècles* (9 vols., 1872–90); *Un voyageur anglais à Lyon sous Henri IV* (1881); *Procès-verbaux de l'Académie royale de peinture et de sculpture* (1888–89, 1892); *Correspondance des directeurs de l'Académie de France à Rome, etc.* (1893–99); *Bibliographie chronologique des ouvrages de Benjamin Filon* (1895); *L'Advocacie Nostre-Dame; Poème normand du XIVe siècle* (1896).

MONTAIGNE, mŏn-tān′, *Fr. pron.* môn′-tā′-ny′, MICHEL EYQUEM DE (1533–92). A great French essayist and moralist. Montaigne got his name from the Château Montaigne, near the Dordogne, in Périgord, where he was born Feb. 28, 1533. The family fortune was begun by Michel's great-grandfather, a merchant and

citizen of Bordeaux. The essayist's father turned him over to a nurse, who reared him in a hamlet on his father's estate. As he tells us himself, he was awakened in the morning with music, and his father had him so well drilled in Latin that when he went to the Collège de Guyenne at Bordeaux he astounded every one by his Latinity, though he was but six years old. The boy's mother was Antoinette de Loupes (i.e., Lopez), of a Jewish family, which had come from Spain. To judge by Saint-Aubin's engraving after the original portrait at the Château Montaigne, the essayist had an oval face, a good-sized nose, a wrinkled forehead, high cheek bones, and a smallish chin. He wore a short beard, with a moustache, and his mouth hardly suggests the sweetness of temper so apparent in his essays.

After eight years under the famous André de Govea, master of the Collège de Guyenne, then the best school in France, Montaigne seems to have studied law in Bordeaux and Toulouse till 1554. His essays, however, are scarcely the work of a lawyer, but rather of a genial, ever-inquisitive, and usually whimsical humorist. Sooner or later Montaigne skirted most of the hills of knowledge, rarely exerting himself to climb to their tops, but seeing very clearly from the level. At the Collège de Guyenne he had continued his studies in the language, literature, and history of Rome, and had taken part in the Latin plays written for him and his mates by Buchanan and Muret. This we know from Montaigne's own words; but we also learn from him that he was lazy and careless and that in reading he followed his whims. At 21, as a younger son, he was cared for by being made a member of the Cour des Aides at Périgueux, and three years later he was appointed counselor of Parliament at Bordeaux. Thus he met Etienne de la Boétie (q.v.), and there sprang up between them a friendship that lasted till La Boétie's death in 1563. At 33 Montaigne wedded Françoise de la Chassaigne, yielding to convention, for he declares he "would not have married Wisdom herself" for his own pleasure. He tells us that he lost "two or three" children in babyhood, but a daughter survived him. Montaigne had done his first literary work in 1568 by translating the *Theologia Naturalis* of Raimond Sebond, a Spaniard who had been a professor at Toulouse in the fifteenth century. This book was the text for Montaigne's most famous essay in skepticism, the *Apologie de Raimond Sebond.* In 1570 Montaigne edited the literary remains of La Boétie. After this he seldom left his estate, except for visits to Paris and an 18 months' visit to Germany, Switzerland, and Italy in 1580. Of this voyage he left an interesting diary, partly in French and partly in Italian, first published in 1774, and edited by A. d' Ancona (Città di Castello, 1889). He was elected (1581) and reëlected mayor of Bordeaux. His last years were brightened by the Platonic affection of an adopted daughter, Mademoiselle de Gournay, a Parisian, who at 19 had been attracted by his essays, of which she later prepared a valuable edition (1597). Montaigne suffered much towards the close of his life from gravel and stone. In 1592 he died of quinsy, receiving devoutly the last offices of the Church, though his mottoes *Que sais-je?* (What do I know?) and *Qu'importe?* (What matters it?) are those of an easy-going skeptic.

The essays, of which the first were written in 1572, beginning in self-analysis, finally came to take for their field the knowledge of man in general. Wholly unsystematic though they are, they show an insatiable curiosity, which seeks rather its own stimulation than the satisfaction of a definite conclusion. Montaigne drew the material for his reflections not so much from his own surroundings as from Seneca, Lucretius, and the historians, from Plutarch, Xenophon, and the anthology of Stobæus, and from the biographies of Diogenes Laërtius, as well as from Italian letter writers and historians. Behind their thoughts he often sheltered his own, preferring rather to suggest that others had doubted than that he himself was other than a royalist and a Catholic. Suspended judgment, contented detachment, and a practical epicureanism are the teachings of Montaigne, who observes that "men are tormented by what they think about things, not by the things themselves." "However specious novelty may be," says he, "I change not easily, for I fear to lose by the change. . . . So I have, by God's grace, kept without worry and turmoil of conscience the old beliefs of our religion through all the sects and divisions that our century has brought forth." His attitude was not heroic, but it proved contagious; for the anti-Christian or simply non-Christian current which can be noted in the seventeenth century, passing through Molière or through Descartes and finally reaching Voltaire, seems to have its source in Montaigne. Rationalism, Epicurean or Cartesian, is already by implication in the essays. In his own day Montaigne stood almost alone among men who were hasty in thought and quick to act. Few French works have exercised so great and lasting an influence on the writing and thought of the world as the essays of Montaigne. He stands alone and secure among the world's writers. Through Florio (q.v.), who published his admirable translation in 1603, Montaigne was known to Shakespeare, and he very slightly influenced Francis Bacon, 10 of whose essays appeared in 1597. He has fascinated great men in every civilized country and in every generation—never, perhaps, more than now.

Editions of the essays appeared in 1580, 1582, and 1588, each containing changes as well as new material. In 1595 his family, aided by Mademoiselle de Gournay and Pierre de Brach, published what they called "a new edition found after the author's death and augmented by him by a third more than was in preceding impressions." The text of 1595 forms the base of Courbet and Royer's edition (Paris, 1872–91), which has also Montaigne's letters. There is in the municipal library of Bordeaux a copy of the edition of 1588, with many autograph notes by Montaigne, differing, often considerably, from the changes in the editions of 1595. These notes were used in the not very accurate editions of Naigeon (Paris, 1802), of Desoer de l'Aulnaye (ib., 1818), and of Amaury-Duval (ib., 1820). Convenient for general use are the edition of Leclerc (ib., 1865) and, in English, that of the second William Hazlitt (4 vols., Boston, 1887). Fortunat Strowski edited *Les essais de Michel de Montaigne* (2 vols., Bordeaux, 1906–09). The essays had been translated into English by John Florio (1603) in time to be used by Shakespeare and, as it seems, by Ben Jonson also. Florio's rendering was reëdited by C. Cotton (3 vols., London, 1711),

Percival Chubb (ib., 1891), W. C. Hazlitt (with *Letters*, 4 vols., 1902), Adolphe Cohn (New York, 1907), Thomas Seccombe (London, 1908).

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MONTALEMBERT, môn'tȧ'lăn'bâr', Charles Forbes de Tyron, Count (1810–70). A French historian and publicist. He was born in London, May 29, 1810, of an ancient noble family, his father, who had been driven out by the Revolution, having entered the English service. His mother was of the Scottish family of Forbes, to which circumstance may be ascribed Montalembert's knowledge of, and strong admiration for, English social and political institutions. He began his studies at Fulham, near London, and finally, after some time spent in Stockholm with his father, who was Ambassador to Sweden, completed them in Paris. At 20, already an ardent champion of Catholicism and of popular freedom, which he hoped to see united, he joined Lamennais (q.v.) on the staff of the *Avenir* and coöperated with him in the establishment of free schools. He accompanied Lamennais on his unhappy journey to Rome, and then to Munich, and remained in close sympathy with his views, even after his master had gone further away from orthodoxy in *Paroles d'un croyant* (1834). At the end of that year, however, he broke with Lamennais and definitely submitted to the papal decisions. He still maintained his ardent desire to demonstrate the close relations of his faith and popular liberty, and took great delight in the study of mediæval history, the first fruit of which was his *Histoire de Sainte Elisabeth d'Hongrie* (1836). Three years later appeared a collection of his studies in mediæval art, which he vigorously exalted over corrupt modern standards under the title *Du vandalisme et du catholicisme*. In 1835, having now attained the required age, he took his seat in the House of Peers, where, young as he was, he stood out at once as a champion of religion. After the revolution of 1848 he was elected a member of the Constituent Assembly, and took his seat on the Right, though acting occasionally with the Left. He had a decisive influence in bringing about French intervention in Italy and the restoration of Pius IX to Rome. He was elected to the Legislative Assembly also, and for a time contrived, while he continued the same line of policy as regarded Church interests, to give a general support to the government of Louis Napoleon. His first break with that government was on the question of the proposed confiscation of the Orléans property, and after the coup d'état of Dec. 2, 1851, the breach became irreconcilable. From that time he continued to be the implacable assailant of the arbitrary repression of public opinion which characterized the measures of Napoleon III. Failing of reëlection in 1857, he devoted himself to literature, in which his eminence had been recognized by election to the Academy in 1851. In a political prosecution in 1858 he was ably defended by Berryer (q.v.). A devoted son of the Church, he clung to his early passion for freedom of thought, and took a pronounced position in favor of the view that the papal syllabus of 1864 and the declaration of infallibility were both inopportune. He died March 13, 1870. Besides a large number of articles, he left many books of great interest, of which the following have been translated into English: *Catholic Interests in the Nineteenth Century* (1852); *The Political Future of England* (1856); *Constitutional Liberty* (1858); *Pius IX and France in 1849 and 1859* (1861); *Pius IX and Lord Palmerston* (1863); *Memoir of the Abbé Lacordaire* (1863). Of these and other works a collected edition in French appeared in eight volumes (Paris, 1860–68). But to English readers he is best known by his brilliant series of historical studies, *Les moines d'occident* (5th ed., 1847–77), translated as *The Monks of the West, from St. Benedict to St. Bernard* (new ed. by Gasquet, London, 1895). Consult his *Life* by Mrs. Oliphant (London, 1872) and by De Meaux (Paris, 1897); also Lecanuet, *Montalembert d'après ses papiers et sa correspondance* (3 vols., ib., 1895–1905); Follioley, *Montalambert et Monseigneur Parisis* (Paris, 1906); Paul Thureau-Dangin, *English Catholic Revival in the Nineteenth Century* (2 vols., London, 1914).

MONTALEMBERT, Marc René, Marquis de (1714–1800). A French general. He was born at Angoulême, entered the army at 18, and served in Germany (1733) and in Italy and Bohemia (1742). He wrote much on fortification after his election to the Academy of Sciences (1747), and, in spite of opposition to his novel theories, was intrusted with the fortification of the island of Aix in 1779. He recognized the defects of the bastion system (Vauban, q.v.) of defense in fortifications, and advocated the employment of casemates for protected gunfire. His theories were first adopted by Prussia, and formed the basis of what afterward became known as the polygonal system of defense. He is also famous for his work, *La fortification perpendiculaire* (1776–86), reëdited under the title *L'Art défensif supérieur à l'offensif* (1793). See Fortification.

MONTALVÁN, mōn'tȧl-vän', Juan Pérez de (1602–38). A Spanish dramatist and novelist. With the degree of doctor of theology, he joined the priestly congregation of St. Peter at Madrid. Already a successful dramatist at 17, he passed under the influence of Lope de Vega, who urged him to the composition of his *Orfeo en lengua*

castellana (1624), a work produced in competition with Jáuregui's *Orfeo*. In the same year he produced some eight tales, *Sucesos y prodigios de amor*, which were translated into French and published at Paris as early as 1644. A prose work, the *Vida y purgatorio de San Patricio* (1627), deals with the familiar legend of St. Patrick's Purgatory, and afforded the material whence Calderón was to derive his play on the subject. A collection containing tales and other compositions more or less dramatic in form is the *Para todos* (1632). It is as a playwright that Montalván stands highest, ranking as one of the more important of the dramatists next in consequence to Lope, Calderón, Alarcón, Tirso de Molina, and Moreto. He himself prepared two editions of his pieces, published in 1638 and 1639 and reprinted in 1652. The favorite among the dramas is the *Amantes de Teruel*. Selected plays of Montalván may be found in vol. xlv of the *Biblioteca de autores españoles*. Consult G. W. Bacon, "The Life and Dramatic Works of Dr. J. P. de Montalván," in the *Revue Hispanique*, vol. xxvi (Paris, 1912), and James Fitzmaurice-Kelly, *Bibliographie de l'histoire de la littérature espagnole* (ib., 1913).

MONTALVO, García Ordóñez de. See Ordóñez de Montalvo, García.

MONTANA, mŏn-tă'nȧ (Lat., mountainous). A northwestern State of the American Union, lying between lat. 44° 26′ and 49° N. (the international boundary) and long. 104° and 116° W. It is bounded on the north by the Canadian provinces of British Columbia, Alberta, and Saskatchewan, on the east by the Dakotas, on the south by Wyoming and Idaho, and on the west by Idaho. Montana ranks third in size among the States of the Union. Its greatest length from east to west is along the forty-eighth parallel, 540 miles; and its average width from north to south is 275 miles. Its area is 146,997 square miles, of which 796 square miles are water. Glacier National Park, in northwestern Montana, has an area of 915,000 acres, 80 glaciers ranging from 5 square miles down to a few acres, and over 250 lakes. By means of good trails some of the best alpine scenery of the United States has been made available to thousands of tourists.

Topography. The eastern three-fifths of the State consist of rolling plains, lying at an elevation of from 2800 feet in the northeast to about 4000 to 5000 feet among the foothills of the Rocky Mountains, which take up the western portion. The main continental divide runs from Yellowstone Park for some distance along the southwest boundary, after which it turns eastward, and then crosses the State obliquely in a northwest direction. The general elevation of its crest is about 6500 feet, and the peaks rise from 8000 to 12,834 feet, Granite Peak representing the highest elevation. Thus, the range is considerably lower here and also less rugged than farther south in Wyoming and Colorado. A great longitudinal basin separates the Main Divide from the Bitter Root Mountains, which form the west boundary, and whose crest lies throughout between 7000 and 8000 feet above the sea. The mountain region is diversified by numerous spurs, valleys, and outlying ranges. It has been estimated that there are 30,000,000 acres of land level enough to be farmed, but much of it can be used only for dry farming.

Hydrography. The Main Divide separates the Missouri system from the Columbia River system, these two receiving the drainage of the State. The Missouri River springs from three main head streams in the extreme southwestern portion and in Yellowstone Park. It flows first northward along the eastern base of the mountains, then eastward through the great plains to the east boundary, just beyond which it receives its first large tributary, the Yellowstone, which drains the southeastern quarter. The Clark Fork of the Columbia River, with its two main branches, the Missoula and the Flathead, drains the great western basin, the latter branch flowing through Flathead Lake, the only lake of considerable size, with a length of 26 miles, an average width of 6 miles, an area of 191.8 square miles, at least 300 feet deep, at an elevation of about 2900 feet above the sea, and formed by the damming of the valley by a large Glacial moraine. Congress set aside 160 acres in this lake for a biological station, where the University of Montana conducts teaching and investigation. Both the Missouri and the Yellowstone are navigable for small boats more than 300 miles from the boundary, and the Clark Fork is also navigable for some distance into Montana. The railroads, however, have supplanted the rivers as means of communication.

Climate. The climate is in general very dry, healthful, and exhilarating. There is a great annual range of temperature, extending from 30° to 45° F. below zero to 110° F. above. At some stations the temperature has been more than 60° below zero, while the same locality may have an annual range of over 150°. The average mean temperature for the State ranges from 37° F. in the extreme northeastern part to 47° F. in certain sheltered valleys. The extreme cold winter is often tempered by the warm and dry chinook (q.v.), which blows in a northeasterly direction from the mountain ranges and absorbs a large amount of moisture from the snow it melts. Blizzards occur only in the eastern plains, and tornadoes are unknown. The rainfall is generally insufficient to support agriculture without irrigation. The western mountainous part receives from 15 to 25 inches, east of the mountains from 10 to 15 inches, most of this during the growing season.

Soil and Vegetation. The principal valleys are characterized by fine level meadows with a rich loamy soil and are occupied by extensive cattle ranges. The eastern plains are almost treeless prairies, the river courses alone being fringed with willow, cottonwood, and similar trees. There are extensive forests of conifers in the mountain region of the western half, amounting in 1908 to about 28,000 square miles, or 20 per cent of the State's area. A considerable portion of this, however, has been burned over. The national government has reserved forest areas within the State amounting (1912) to 25,200 square miles. Yellow pine, red fir, Douglas spruce, and tamarack are the principal varieties.

Fauna. Before the advent of the white man the fauna east of the mountains was representative of the great plains in general and characterized by such animals as the jack rabbit, pocket gopher, prairie dog, badger, bison, coyote, sage and short-tailed grouse, and great numbers of grasshoppers. The fauna of the western forested part includes black and grizzly bear, elk, moose, mule and white-tailed deer, marten, beaver, lynx, mountain lion, coyote, wolf, porcu-

MONTANA
SCALE OF STATUTE MILES
0 10 20 30 40 50 60 70 80 90 100
SCALE OF KILOMETERS
0 20 40 60 80 100 120 140 160
County Towns
Railroads
L. L. POATES ENGR'G CO., N.Y.
A B C D E
116° 115° 114° 113° 112° 111° Long
49° 48° 47° 46° 45° 44° 43°
1 2 3 4 5 6
LINCOLN
FLATHEAD
GLACIER NAT. PARK
TOOLE
TETON
CASCADE
LEWIS AND CLARK
MISSOULA
GRANITE
DEER LODGE
JEFFERSON
SILVERBOW
BEAVERHEAD
MADISON
BROADWATER
Kalispell
Helena
Great Falls
Fort Benton
Missoula
Hamilton
Anaconda
Butte
Boulder
Philipsburg
Dillon
Virginia City
Bozeman
Conrad
Shelby
Libby
Thompson Falls
Superior
Deer Lodge
Townsend
Choteau
Cut Bank
Valier
Flathead Lake
ROCKY MTS.
CABINET MTS.
COEUR D'ALENE MTS.
BITTER ROOT MTS.
IDAHO
Salmon
Challis
St. Anthony
Blackfoot
Crown Peak
Nez Perces Pass
Mt. Jefferson
YELLOWSTONE NATIONAL

CANADA
VALLEY
PHILLIPS
BLAINE
HILL
CHOUTEAU
LIBERTY
TOOLE
GLACIER
PONDERA
TETON
ROOSEVELT
FORT PECK INDIAN RES.
SHERIDAN
DANIELS
RICHLAND
MCCONE
DAWSON
GARFIELD
PRAIRIE
WIBAUX
FALLON
CARTER
POWDER RIVER
CUSTER
MUSSELSHELL
GOLDEN VALLEY
YELLOWSTONE
STILLWATER
CARBON
BIG HORN
CROW INDIAN RESERVATION
FT. CUSTER MIL. RES.
NORTHERN CHEYENNE IND. RES.
FT. BELKNAP IND. RES.
Havre
Chinook
Harlem
Malta
Glasgow
Wolf Point
Poplar
Brockton
Sidney
Lewistown
Roundup
Billings
Red Lodge
Miles City
Glendive
Baker
Ekalaka
Broadus
Hardin
Sheridan
Cody
Lander
Shoshone R.
Big Horn R.
Yellowstone R.
Missouri R.
Milk R.
Musselshell R.
Powder R.
Tongue R.
Rosebud Cr.
Bighorn R.
Wyoming
Montana
Dakota
Canada
Yellowstone National Park
Mammoth Hot Sprs.
Golden Gate
Prospect Pk.
Mt. Norris
Willow Park
Mt. Washburn
The Dome
Observation Pk.
Norris Sta.
Canyon Sta.
Grand Canon
Hot Springs Basin
Saddle Mt.
Norris Geyser
Cougar Cr.
Gibbon Falls
Firehole Falls
Hayden Valley
Cathedral Pk.
Great Fountain Geyser
Beach L.
Lower Geyser Basin
Excelsior Geyser
Natural Bridge
Stevenson I.
Avalanche Pk.
Prismatic L.
Upper Geyser Basin
Old Faithful Sta.
Yellowstone Lake
Grizzly Pk.
The Thumb Sta.
West Arm
Mt. Langford
Brimstone Basin
Shoshone Geyser Basin
Shoshone L.
Continental Divide
Lewis L.
Pitchstone Plateau
Heart L.
Mt. Sheridan
Mt. Hancock
Rainbow Falls
Park Boundary
State Boundary
Idaho
Wyoming
Montana
from G Green. 109°
108°
107
106°
105
104
H
J
K
L
M
G

pine, rabbit, hare, woodchuck, squirrel, chipmunk, mountain sheep, and mountain goat. The fishes are very few in kind and include trout, grayling, and whitefish. In western Montana, particularly in the Bitter Root valley, part of the ticks (*Dermacentor venustus*) are infected with a germ disease which is communicated to man by the bite of the tick and a disease, known as spotted fever, results which is fatal in a large number of cases.

Geology and Minerals. The eastern and western halves of the State differ widely in their geological structure. The eastern plains consist mainly of undisturbed strata of Cretaceous and Tertiary rocks, the latter forming the extreme eastern portion. Narrow belts of Jurassic and Carboniferous rocks skirt the Cretaceous formation on the west along the base of the mountains. The mountainous half has a complex structure, with much folding and faulting. In the south the Archean granite cores and outpourings of Tertiary lava predominate on the surface, while north of the Missouri the main range is synclinal, the peaks being of Paleozoic formation.

Building materials such as limestone, sandstone, slate, granite, sands, and clay are abundant, and there are large deposits of marble of various hues. Bituminous coal is found along the eastern base of the mountains, and extensive beds of lignite exist in the east along the Missouri and Yellowstone rivers, but only in patches farther west, while petroleum is also found. Copper is very abundant, and lead, iron, and silver ores also exist, the silver generally in conjunction with the copper. Gold has also been found in great quantities in many parts. Around the headwaters of the Missouri and Yellowstone there are numerous hot springs and geysers.

Mining. Montana is an important mineral-producing State, ranking tenth in the value of its products in 1913. In the production of copper it is surpassed only by Arizona, and in the value of the silver produced only by Nevada. The first record of the production of copper was in 1868, but Montana did not become an important contributor of this metal until 1880, since when there has been a steady and rapid increase in the output. Towards the close of 1913 the State had yielded nearly 6,200,000,000 pounds, or more than one-third of the total output for the United States since 1845, ranking first among the States. The entire output is furnished by the Butte district. The presence of copper minerals in this district had been known since the discovery of gold in 1864, and attempts were made to treat the ores as early as 1866. It was not, however, until the late seventies that Butte began to attract attention as a copper camp, and large productions did not begin until a railroad reached the district in 1881. The production of copper in 1913 was 287,828,699 pounds, valued at $44,613,448.

Silver is second in importance and is obtained chiefly as a by-product in the mining of copper. In 1913, out of a total production of 13,819,201 ounces, 10,326,364 fine ounces were from copper and copper-lead ores. The value of the production was $8,346,797. The gold output of Montana from deep mines has been steadily falling off, but the placer output is increasing. The gold output in 1913 was valued at $3,493,432. The lead production in 1913 was 5468 short tons, valued at $481,176. The production of zinc is more important than that of lead, and in 1913 this amounted to 44,337 short tons, valued at $4,965,693. There are still large tonnages of zinc undeveloped, and Montana promises to rival the most important States in the production of this metal.

The coal areas are also important. The coal fields are widely scattered and range in the quality of their output from lignite to a fair grade of bituminous coal. In point of production the most important field is in Carbon County. The production in 1913 was the largest ever made, 3,240,973 short tons, valued at $5,653,539. The number of men employed in the coal mines in 1913 was 3630.

Montana leads in the production of precious stones, this supremacy being due to the mining of sapphire, one of the few instances of gem mining carried on in the United States. The total value of the gems produced in 1913 was $244,935. Other mineral products are cement, clay manufactures, grindstones, gypsum, iron ore, lead, lime, mineral waters, sand and gravel, sand-lime brick, and stone. The total value of the mineral products in 1913 was $69,307,056.

Agriculture. The total number of farms in 1910 was 26,214, representing an aggregate area of 13,545,603 acres, about one-seventh of the entire State. The improved land in farms in 1910 was 3,640,309 acres; the average acres per farm were 516.7; and the total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, in 1910 was $347,828,770. The average value of all property per farm was $13,269 in 1910, and the average value of land per acre was $16.74.

One striking characteristic of Montana is the great area of semiarid land utilized for grazing purposes only, or left unutilized. Upon this land are located many very large farms or ranches, frequently exceeding 100,000 acres in extent. Of the total number of farms in 1910 (26,214), 23,870 were operated by owners and managers and 2344 by tenants. The great majority of farms have been acquired by their owners or operators from the government or from private corporations in the form of homesteads, Carey Act entries, desert-land entries, or entries on irrigated lands. Most of these have been acquired at a small price or on long-time credit, which has made it possible for farmers of small means to become owners. This fact accounts in the main for the small proportion of tenants. The native white farmers in 1910 numbered 18,163, foreign-born farmers 6853, and the negro and other nonwhite farmers 1196. Of the foreign-born white farmers 1320 were born in Canada and 1146 in Germany. The greater part of the remainder were born in the British Isles or the Scandinavian countries.

The following table gives the acreage, value,

PRODUCTS	Acreage	Prod. bu.	Value
Wheat.....	910,000	18,356,000	$16,704,000
Oats.....	530,000	18,550,000	7,234,000
Potatoes...	37,000	5,180,000	3,315,000
Flaxseed...	320,000	2,560,000	3,072,000
Hay.....	700,000	*1,750,000	15,225,000
Rye.....	10,000	210,000	147,000
Barley.....	70,000	2,135,000	1,132,000
Corn.....	50,000	1,400,000	1,064,000

* Tons.

and production of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture. The total value of crops in 1909 was $29,715,000, and the combined acreage was 1,848,113, representing 50.8 per cent of the total improved land in farms. About two-fifths of the total value of crops in 1909 were contributed by the cereals and another two-fifths by hay and forage. The remainder, representing 17.3 per cent of the total, consisted chiefly of potatoes and other vegetables, grains and seeds other than cereals, fruits, forest products, and sugar crops. In that year the leading crops in the order of their importance were hay and forage, oats, wheat, and potatoes. The acreage of hay and forage in 1909 was 1,135,376, and their production amounted to 1,692,656 tons, valued at $12,344,606. Oats had an acreage of 333,195 and a value of $6,148,021 for the production of 13,805,735 bushels. Wheat was not greatly below oats in its acreage, amounting to 258,377. The production was 6,251,945 bushels, valued at $5,329,389. The total acreage of potatoes and other vegetables in 1909 was 28,010 and their value $2,227,736. Excluding potatoes, the acreage of vegetables was 7300 and their value $929,000.

The principal orchard fruit produced is apples, of which there were grown, in 1909, 567,054 bushels, valued at $566,938. Other fruits grown in smaller quantities are pears, plums, prunes, and cherries. The total value of the orchard fruits in 1909 was $609,078. Strawberries are by far the most important of the small fruits. There were produced, in 1909, 406,038 quarts of strawberries, valued at $46,870. Other important small fruits are blackberries and dewberries, raspberries and loganberries, currants, gooseberries, and cranberries. The total value of small fruits in 1909 was $86,586. The growing of sugar beets is an industry of considerable importance. There were produced, in 1909, 109,434 tons, valued at $546,832.

Live Stock and Dairy Products. In its early history stock raising largely monopolized the agricultural industry. Montana still remains one of the most important stock-raising States, but the industry is of less relative importance than formerly. It is one of the leading States in the raising of sheep and the production of wool. While the herds of cattle are not as large as formerly, they are improved in breed and are more numerous. Considerable attention is also given to the raising of horses for the Eastern market. The total value of domestic animals on the farms in 1910 was $84,999,659. On Jan. 1, 1915, it was estimated that there were 791,000 cattle other than milch cows, valued at $38,759,000; milch cows numbered 114,000, valued at $8,550,000; horses 391,000, valued at $33,626,000; mules 4000, valued at $392,000; sheep 4,379,000, valued at $19,268,000. In the quantity of sheep in 1914 Montana was exceeded only by Wyoming.

The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $2,093,594. There were sold 3,584,689 gallons of milk and 1,234,263 pounds of butter. The total number of fowls on the farms in April, 1910, was 966,690, valued at $628,436.

Irrigation. Conditions in Montana make it necessary for a large proportion of its farm land to be irrigated before crops can be grown. Montana ranked second in 1909 in the total acreage of its land irrigated. There were in that year 8970 farms in which irrigation in some form was practiced, and the total acreage irrigated was 1,679,084, or about 45 per cent of the improved land in farms. The acreage included in irrigation projects in that year was 3,515,602. The length of irrigating ditches in 1909 was 18,934 miles. There were in 1914 three important irrigation projects in the course of construction by the United States government. These were the Huntley, the Milk River, and the Sun River projects. There was also the lower Yellowstone project, of which part is in Montana and part in North Dakota. The total investment in these projects exceeds $5,000,000.

COMPARATIVE SUMMARY FOR 1909 AND 1904

THE STATE — FIVE LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	677	13,694	11,655	$44,588	$10,901	$73,272	$24,092
	1904	382	10,196	8,957	52,590	8,652	66,415	25,485
Cars and general shop construction and repairs by steam-railroad companies.	1909	12	2,084	1,913	2,912	1,538	2,811	1,725
	1904	10	1,115	1,039	1,055	799	1,572	902
Flour-mill and gristmill products	1909	12	152	105	2,559	105	2,175	482
	1904	12	109	67	991	57	2,003	411
Liquors, malt	1909	21	349	246	3,040	359	2,440	1,838
	1904	23	322	250	2,175	285	1,732	1,245
Lumber and timber products	1909	155	3,452	3,106	8,544	2,185	6,334	4,469
	1904	47	2,408	2,218	4,846	1,512	3,121	2,667
Printing and publishing	1909	135	1,046	691	1,651	685	2,111	1,708
	1904	92	691	481	1,024	542	1,487	1,180

Forest Products. The area of forest land in 1914 was 18,977,580 acres, about 19 per cent of the gross area. The commercial forest covered about 7,882,000 acres and consisted of yellow pine, lodge pole, larch, red fir, hemlock, white fir, white pine, and cedar. The estimated stand for 1914 was 65,600,000 M feet B. M. There

were cut, in 1913, 357,974 M feet of rough lumber, most of which was soft wood. Most of the timber milled was Western pine and larch. In the production of the latter Montana is the leading State. There were 109 active mills in 1913. In addition to the lumber sawed in mills there were produced on the farms in 1909 forest products valued at $541,800.

Manufactures. Montana is a mining and agricultural State, and its principal manufacturing industries are those supplementary to its mining interests.

Copper mining and smelting form by far the most important manufacturing industry, but statistics for this are not shown because to do so would tend to disclose the operations of individual establishments. General information in regard to this industry will be found in the section on *Mining*. The most important industry for which figures can be shown is that connected with the manufacture of lumber and timber products. (See FOREST PRODUCTS.) Third in importance are industries connected with the manufacture and repair of cars, and fourth the manufacture of malt liquors.

The average number of wage earners in 1909 was 11,655, of whom 11,436 were males. The wage earners 16 years of age or under numbered only 30, of whom 29 were males. For the great majority of wage earners the hours of labor ranged from 54 to 60 a week in 1909. The State has six cities with a population over 10,000: Butte, Missoula, Helena, Anaconda, Great Falls, and Billings. In 1909 only 9.2 per cent of the total value of products in the State and only 15.7 per cent of the average number of wage earners were reported from these cities. Great Falls, with its large copper smelters, is the only one of the six cities in which is located a distinctively important industry.

Transportation. The eastern part is a high plateau devoted mainly to stock raising and is very sparsely settled. It has no large cities and very limited railway facilities. The western part, more largely a mining and manufacturing community, with several cities of commercial importance, has better transportation. There are no navigable rivers of any account. Colorado alone of the Rocky Mountain States excels Montana in railway mileage. Three lines, the Great Northern, the Northern Pacific, and the Chicago, Milwaukee, and St. Paul, cross the State from east to west. Each of these has a number of branch lines or feeders. There are also other lines. The total railway mileage on Nov. 1, 1914, was 4783, including main line and branches. Of this, the Great Northern had 1628 miles, the Northern Pacific 1459, the Chicago, Milwaukee, and St. Paul 1049, the Chicago, Burlington, and Quincy 135, and the Oregon Short Line 135. In many sections stages are the only means of conveyance, and in mountain regions saddle horses and pack mules are largely used. The regulation of railroad rates is in the hands of a State Railroad and Public Service Commission.

Banks. The organization of all banks is under the supervision of the State Auditor, and is controlled by stringent legislation. The first national bank was organized in 1867. On Sept. 12, 1914, there were 61 national banks, of which the aggregate capital was $5,370,000; surplus, $2,687,750; loans, $30,800,819; cash, etc., $1,057,225; and deposits, $38,577,144. The State banks on June 30, 1914, numbered 190, and their combined capital was $6,000,000; surplus, $1,101,438; cash, etc., $180,180,000; loans, $23,575,749; and deposits, $23,455,935. There were 11 loan and trust companies and 21 private banks.

Government. The present constitution was adopted by a constitutional convention on Aug. 17, 1889, and was ratified by the people the following October first. The State was admitted to the Union, Nov. 8, 1889.

Legislative.—The legislative authority is vested in a Legislative Assembly, consisting of a Senate and a House of Representatives. The House of Representatives, in 1915, consisted of 93 and the Senate of 39 members. Members of both Houses must have resided for at least 12 months prior to their election in the county or the district from which they are elected. Representatives serve for two years and Senators for four years. Sessions of the Legislature must not exceed 60 days in length. The Assembly meets every two years on the first Monday in January. The sole power of impeachment is vested in the House of Representatives and all impeachments are tried by the Senate. An amendment providing for the initiative and referendum was adopted in 1906.

Executive.—The executive department consists of the Governor, Lieutenant Governor, Secretary of State, Attorney-General, State Treasurer, State Auditor, and the Superintendent of Public Instruction, each of whom holds office for four years. The Governor, Lieutenant Governor, and Superintendent of Public Instruction must be at least 30 years of age at the time of their election. The supreme executive power is vested in the Governor. The executive machinery operates, except for the functions peculiar to each office, through a system of boards composed of the executive officers.

Judiciary.—The judicial power is vested in a supreme court, in district courts, justices of the peace, and inferior courts for incorporated towns or cities. The supreme court consists of three justices. Justices of the supreme court are elected for a term of six years. The State is divided into judicial districts, in each of which there is elected one judge of the district court, whose term is four years. The number of districts may be increased or decreased by the Assembly.

Suffrage and Elections.—Every person of the age of 21 years or over who is a citizen of the United States and has resided in the State one year immediately preceding the election at which he offers to vote is entitled to vote. There is a primary law providing for party nominations by direct vote. It is modeled on the Wisconsin law. Primaries are held 70 days preceding any general election. Nominations are made by petition. Candidates for Senator and Representative may include in their petitions statements pledging their votes for that candidate for United States Senator who shall have received the highest number of votes for that position at the general election next preceding the election of a Senator in Congress, or they may declare that such vote is considered by them as merely a recommendation and not binding. During presidential primaries voters have the opportunity to express their preference, on their party nominating ballot, for their choice for President and Vice President. A candidate's expenses are limited to 15 per cent of one year's salary of the office for which he is a candidate.

Local and Municipal Government.—In each county there are elected three commissioners for a term of six years, a county clerk, sheriff, treasurer, and other necessary officers. The primary law described above applies to the nomination of candidates for municipal officers in all cities and towns having a population of 2000 and upward. Cities and towns have the right to adopt a commission form of government.

Other Constitutional and Statutory Provisions.—The legal rate of interest is 6 per cent. It is unlawful for an employer to employ children under the age of 16 years in underground mines. A period of eight hours constitutes a day's work in all works or undertakings carried on or aided by municipal, county, or State individuals, and on all contracts by them, and in mills and smelters for the treatment of ores and in underground mines. There are acts imposing liability upon railroads for injuries sustained by employees, and a measure fixing the rate of interest which may be charged to wage earners. The granting of injunctions in suits growing out of labor disputes is prohibited. There is a blue-sky law modeled after the Kansas statute. There is provision for county local option. No city or county may issue more than one license for every 500 inhabitants, except that two saloons may be licensed in any city or town.

Finance. Previous to its admission as a State the yearly budget of Montana ranged from $30,000 to $50,000. The funded debt on Nov. 30, 1912, was $1,200,000, which consisted of four series of bonds. Three of these were for the erection of the State capitol. One is an old issue—that of $350,000—and the remaining are $500,000 issued in 1909 and $150,000 issued in 1911. The capitol-building bonds are not a direct obligation of the State, but are secured by 182,000 acres of land on which the timber is valued at more than $3,000,000. The fourth issue outstanding is that of State bonds to the amount of $200,000, issued in 1909, bearing interest at the rate of 4 per cent and redeemable at the option of the State; $75,000 of these were redeemed on Jan. 1, 1913. The floating debt is made up of outstanding warrants, amounting at the end of the fiscal year 1912 to $547,910. The per capita debt, which in 1880 was $1.79, had increased in 1912 to $3.73. The receipts during the fiscal year 1913 amounted to $4,446,953 and the disbursements to $4,808,845. There was a balance on hand at the beginning of the year of $1,401,641 and at the end of $1,039,749. The chief source of revenue is taxation, and the chief expenditures are for the State educational and charitable institutions.

Militia. The total number of males of militia age in 1910 was 23,232. The organized militia consisted of a regiment of infantry and two detachments of sanitary troops. The total strength of enlisted men was 557 and of officers 53.

Population. The population at various periods is shown by the following figures: 1870, 20,595; 1880, 39,159; 1890, 132,159; 1900, 243,329; 1910, 376,053. The est. pop. in 1914 was 432,614; 1920, 548,889. The greater part of the population is found in the western or mining section. The population per square mile in 1910 was 2.6. The urban population in places of 2500 or more in 1910 was 133,420, and the rural population was 242,633. The foreign-born population in 1910 was 91,644, and the native-born whites numbered 162,127. The largest number of foreign-born whites come from Canada, but almost equally large numbers come from Austria, Germany, Ireland, and Sweden. There is an unusually large preponderance of male population. The males in 1910 numbered 226,872 and the females 149,181. The males of voting age numbered 155,017. The largest city is Butte, which in 1910 had a population of 39,165. The other large cities with their populations in 1910 are as follows: Great Falls, 13,948; Missoula, 12,869; Helena, 12,515; Anaconda, 10,134; Billings, 10,031.

Indians. The Indians, numbering about 11,000, are chiefly Blackfeet, Chippewas, Assiniboins, Gros Ventres, Sioux, and Pend d'Oreilles. They are located on reservations which embrace about 15,000 square miles of agricultural and grazing lands and have schools at Crow, Fort Belknap, Fort Peck, and Tongue River. The average attendance at these schools in 1913 was 1140. The reservations are the Blackfeet, Crow, Flathead, Fort Belknap, Fort Peck, and Tongue River. The value of the lands exclusive of timber on these reservations in 1913 was $26,971,600, and the total tribal and individual property of the Indians on the reservations was $54,468,131.

Education. The percentage of illiteracy in 1910 was 4.8. The total number of illiterates 10 years of age or over was 14,457. Among foreign-born whites the illiterates numbered 8445, or 4.9 per cent. According to the thirteenth census there were, in 1910, 93,771 persons of school age, 6 to 20 years; and of these, 60,678 attended school in that year. The report of the State Superintendent of Public Instruction for 1914 showed a total school population in that year of 114,032. Of this number there were 85,782 enrolled in the schools during the year. The total number of teachers employed was 3878, of whom 3352 were females and 526 were males. The average salary of male teachers per month was $93.29, and of female teachers $75.55. The total disbursements for school purposes in 1914 amounted to $6,954,903.

The administration of the public-school system is in the hands of State, county, and district officers. A board of trustees has supervision of the common schools of each district. Candidates for teachers' certificates are examined by the County Board of Education. This board also examines pupils applying to enter high schools. The school districts are required to keep schools open at least three months during the year, and all children between the ages of 8 and 14 are required to attend school for the full term, and children up to 16 years of age if they are unemployed. Manual and industrial training was made a part of the curriculum in 1911. The school districts having a population of more than 5000 must establish a manual-training school. In 1914 there were 55 high schools accredited for the full course and 11 others accredited for from one to three years' work. The total attendance in these higher-grade schools was 6824.

The Montana State Normal School is at Dillon. The institutions of collegiate rank include the University of Montana at Missoula, which is a part of the educational system of the State; the Montana State School of Mines at Butte; and the Montana College of Agriculture and Mechanic Arts at Bozeman. These institutions are all coeducational and under the control of the State.

Charities and Corrections. The correctional and charitable institutions are under the supervision of the State Board of Charities and Reform, which consists of three members. The institutions include the State Prison at Deer Lodge, the State Industrial School at Miles City, a home for orphans, foundlings, and destitute children at Twin Bridges, a soldiers' home at Columbia Falls, the State Hospital for the Insane at Warm Springs, and the State School for the Deaf, Blind, and Feeble-Minded at Boulder. At the State Orphans Home the State provides generously for the maintenance and education of the children confined there. The State Industrial School at Miles City is correctional and receives children, upon commitment by the district courts, between the ages of 8 and 18 years. It is very well equipped for industrial and manual training. On Jan. 1, 1914, there were 618 prisoners in the State Prison. The Legislature of 1911 passed a law giving the district courts jurisdiction as juvenile courts. In the same year was established a State tuberculosis sanitarium, especially for miners' consumption, and there was provided at the State Insane Asylum at Warm Springs an institution for the cure of persons who are suffering from mental affliction caused by the use of drugs or intoxicants.

Religion. The majority of the Church population belong to the Roman Catholic church. Other denominations having a following are the Methodists, Presbyterians, and Episcopalians.

History. The Sieur de la Verendrye is said to have traversed the region now included in the State of Montana in 1742. In 1804 the Lewis and Clark expedition crossed Montana from the northeast to the extreme southwest, and the following year, on their return journey from the Pacific coast, descended the Missouri and the Yellowstone in two parties, meeting at the junction of the rivers near the present eastern boundary of Montana. Trading posts were erected on the Yellowstone River by Manuel Lisa in 1809, William H. Ashley in 1822, and the American Fur Company in 1829. In 1840 Father Peter John de Smet of the Society of Jesus began mission work among the Flathead Indians, and this was followed by the establishment of a permanent mission among the Indians of Bitter Root valley in September, 1841. Fort Benton was founded by the American Fur Company in 1846. Gold was discovered as early as 1852 by François Finlay, a half-breed, near the Hellgate River, but the discovery aroused little attention till 1857, when John Silverthorn appeared at Fort Benton with a large quantity of gold dust which he had obtained in the mountains. In the winter of 1860 James and Granville Stuart settled on Gold Creek in the Deer Lodge valley, attracted by the rumors of gold in that region, and in the following year they commenced mining on a small scale, having been joined in the meanwhile by three other pioneers. Rich placers were soon discovered at various points in the mountains and an active immigration set in, mining settlements springing up at Bannack City, on Grasshopper Creek, on the Bighole River, and on North Boulder Creek. In May, 1863, gold was discovered at Fairweather Gulch, near Alder Creek. The town of Virginia City sprang up near the spot, and within a year it had a population of 4000. In 1863 the Territory of Idaho, including the present Montana, was set off from Washington and Dakota, and on May 22, 1864, the Territory of Montana was erected from land taken from Idaho. The early settlers were naturally of a reckless and lawless character and, as a result, for a considerable length of time life and property were in jeopardy. The existing state of affairs was, however, remedied by the stern administration introduced by the establishment of vigilance committees. The *Montana Post*, the first newspaper in the Territory, was published at Virginia City in 1865. In 1874 the seat of government was removed from Virginia City and established at Helena. On June 25, 1876, occurred the disastrous fight between General Custer and the Sioux Indians under Sitting Bull on the Little Big Horn River.

The prosperity of the Territory was increased by the completion of the Northern Pacific Railroad in 1883, surveys for the route having been made as early as 1853 by Isaac I. Stevens under authority of Congress. In January and February, 1884, a constitutional convention framed a constitution which was ratified by the people in November, and application was made to Congress for admission into the Union. No action was taken, however, until February, 1889, when an enabling Act was passed by Congress. On Nov. 8, 1889, Montana was admitted into the Union by proclamation of the President after a State constitution had been framed and State officers elected. In national elections Montana was Republican in 1892; fusion of Democrats and Populists in 1896 and 1900; Republican again in the campaigns of 1904, 1908, and 1912. From 1907 up to and including 1914 the State suffered from industrial troubles which centred about strikes in Butte and other cities. In the former year all industries in Butte were practically at a standstill as a result of the strike of nearly all classes of labor. In the presidential election of 1908 Taft received 32,333 votes, Bryan 29,326, and Debs 5855. The Democrats succeeded in electing their candidate for Governor, Edwin L. Morris, but all the other State officers elected were Republicans. On March 30, 1909, the last spike in a new transcontinental railway, the Chicago, Milwaukee, and Puget Sound, was driven at Missoula. In 1910 the Flathead Indian reservation was thrown open for settlement. In 1911 the Legislature was in deadlock from January 1 to March 2 over the election of a United States Senator to succeed Thomas H. Carter, Republican. Although the Legislature was Democratic by six votes, Senator Carter's influence was so strong that he was able to prevent the election of the Democratic Senator during this period. Henry L. Meyers, formerly a district judge, was finally elected. In the election of November 5 of that year Wilson received 27,941 votes, Roosevelt 22,456, Taft 18,512, and Debs 10,885. For Governor, Stewart, Democratic, carried the State. A Democratic Legislature was also elected. The Socialists have for many years been increasing in political power, and in 1911 succeeded in electing a mayor in Butte. On Jan. 4, 1913, the Legislature elected Thomas J. Walsh as United States Senator to succeed Joseph M. Dixon. The most important official elected on Nov. 3, 1914, was the representative at large. The Democrats were successful in electing their candidate. An amendment providing for woman suffrage was carried in this election. The Governors of the Territory and State of Montana have been as follows:

TERRITORIAL

Sidney Edgerton	1864–65
Thomas F. Meagher (acting)	1865–66
Green Clay Smith	1866–69
James M. Ashley	1869–70
Benjamin F. Potts	1870–83
John S. Crosby	1883–84
B. Platt Carpenter	1884–85
Samuel T. Hauser	1885–86
H. P. Leslie	1886–89
Benjamin F. White	1889

STATE

Joseph K. Toole	Democrat	1889–93
John E. Rickards	Republican	1893–97
Robert B. Smith	Democrat and Populist	1897–1901
Joseph K. Toole	" " "	1901–1909
Edwin L. Norris	Democrat	1909–1913
Samuel V. Stewart		1913–1921
Joseph M. Dixon	Republican	1921–

Bibliography. *United States Geographical and Geological Survey of the Territories* (Washington, 1872–74); *Montana Historical Society Contributions* (Helena, 1877 et seq.); Bancroft, *The Northwest Coast* (San Francisco, 1884); id., *Washington, Idaho, Montana* (ib., 1890); *Mineral Resources of the United States* (Washington, 1892 et seq.); *Montana Agriculture, Labor, and Industry Bureau Annual Report* (Helena, 1893 et seq.); Evermann, "A Reconnaissance of the Streams and Lakes of Western Montana and Northwestern Wyoming," in *Bulletin of the United States Fish Commission*, vol. xi, pp. 32–60 (1893); Silloway, "Summer Birds of Flathead Lake," in *University of Montana, Bulletin No. 3*, pp. 1–83 (1901); Birdseye, "Some Common Mammals of Western Montana in Relation to Agriculture and Spotted Fever," in *United States Department of Agriculture, Farmers' Bulletin No. 484*, pp. 1–46 (Washington, 1912); Linderman, *Calendar of Historic Events in the History of Montana* (Deer Lodge, Mont., 1914). See also reports of State departments issued annually or biennially.

MONTANA, UNIVERSITY OF. A coeducational State institution at Missoula, Mont., founded in 1895. It maintains departments of literature, science, and the arts; schools of law, pharmacy, forestry, journalism, music, domestic science, commerce and accounting, and education; departments of correspondence study and university extension, and a bureau of public information. It offers graduate courses and grants the degrees of B.A., B.S., M.A., and M.S. There are also a summer school and a biological station. Tuition is free. The university had, in 1914–15, 80 instructors and a student enrollment of 861. The library contained 29,000 volumes. The endowment consists of 72 sections of land given by Congress in 1892. The income fund arises from the rental of lands unsold, from licenses to cut trees, and from the interest on the proceeds of the sales of lands invested in the permanent university fund, which is applied to the payment of bonds issued in 1897 for the construction and equipment of buildings. The income for maintenance amounted in 1914–15 to $191,290. The value of the property was $350,000, including a campus of 40 acres and buildings valued at $200,000. The president in 1915 was Edwin B. Craighead, LL.D.

MONTANA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS. A State institution for agricultural and scientific education, founded at Bozeman, Mont., in 1893. There are courses in agriculture, engineering, home economics, and science. The college has a campus of 60 acres, and also owns two farms of 160 acres each and a dry farm of 640 acres. There was originally granted to the college for its support 140,000 acres of land. Of this, 25,928 acres have been sold, 114,072 remaining unsold, and 95,075 are under lease. The receipts from the sale of land in 1913–14 amounted to $208,965 and from the sale of timber $155,890. Appropriations from the State amount to about $80,000 annually. The students in all courses in 1915 numbered about 500, and there were 50 instructors. The library contains about 14,000 volumes and 1000 unbound documents. The buildings are valued at $305,000 and the equipment at $180,400. The president in 1915 was James M. Hamilton, M.S.

MONTANELLI, môn'tä-nĕl'lê, GIUSEPPE (1813–62). An Italian author and statesman, born at Fucecchio, Jan. 21, 1813. He studied law at Pisa and began to practice there, composing meanwhile verses which appeared at Florence in 1837. He became professor of commercial law in the University of Pisa, identified himself with the Liberal party there, and with two coöperators founded *L' Italia*, a periodical. After the rising of 1849 he became one of a triumvirate, with Guerrazzi and Mazzini. When Guerrazzi became dictator, Montanelli went on a mission to Paris, where he remained for 10 years. During this period he wrote a number of his works: a dramatic poem, *La tentazione*, interesting in connection with Corducci's *Satan*, and in which George Washington figures as an interlocutor; a tragedy, *Camma;* and a few political and historical treatises; the *Schiarimenti nel processo politico contro il ministero democratico* (1852); the *Appunti storici sulla rivoluzione-italiana* (1859); and the most noteworthy of his writings, the *Memorie sull' Italia e specialmente sulla Toscana dal 1814 al 1849* (1853). He returned to Italy in 1859 and advocated the formation of a central Italian kingdom. He was a deputy to the Tuscan Assembly, but there he accomplished little, for all parties looked upon him with distrust and he found himself with hardly any adherents. In *L' Impero, il papato e la democrazia in Italia* (1859) he defended his own standpoint. Having founded the short-lived *Nuova Europa*, he entered the Italian Parliament in 1861, and died June 17, 1862. Consult: Provenzal, *Alla cara memoria di Giuseppe Montanelli* (Leghorn, 1862); Redi, *Ricordo biografico di Giuseppe Montanelli* (Florence, 1883); Orlando, "Il Montanelli poeto," in *Marzocco* (ib., 1910).

MONTAÑÉS, môn-tä-nyäs', JUAN MARTÍNEZ (c.1580–1649). A Spanish sculptor in wood, born probably at Alcalá la Real. He was a pupil of Pablo de Rojas in Granada and afterward worked in Seville. His sculptures there include a "Conception," in the cathedral, an altar with figures of saints and a life-size "Christ on the Cross," and some statues in the gallery of the city. These are fine examples of his art, which is notable for purity of style and beauty of expression. In 1635 he went to Madrid, where he made a model for an equestrian statue of Philip IV, and where Velazquez painted his portrait, which is now in the Prado Museum. Consult F. Gómez, *Historia de la escultura en España* (Madrid, 1885), and B. Haendeke, *Studien zur Geschichte der spanischen Plastik* (Strassburg, 1900).

MONTANIST. See MONTANUS.

MONTA'NUS (Lat., from Gk. *Montanós, Montanos*). A Phrygian convert to Christianity about 156. He is said to have been formerly a

priest of Cybele (q.v.). He undertook to restore the faith and practice of the primitive Church, but was finally excluded from fellowship as a heretic. Montanus taught that direct divine revelation still continued, and that he himself was the mouthpiece of the Paraclete, promised in John xiv. 16. Hence his movement is often called the new prophecy. He revived the primitive conception of the speedy return of Christ to earth, and the elect were summoned to gather at the Phrygian village of Pepuza, there to await their Lord. In view of the immediate end of the present age, asceticism was their rule of life, and martyrdom was courted. Montanus insisted upon strict ecclesiastical discipline, thus rebuking the alleged laxity and worldliness in the Church at large. He declared it wrong to grant forgiveness of mortal sin, and believed that the holiness of the Church demanded the exclusion of all offenders from membership. He denied that the hierarchy possessed any right or power to restore holiness when it had been forfeited through sin, and thus he took his stand against the theory of sacramental grace. Closely associated with Montanus were two women, Prisca (or Priscilla) and Maximilla, supposed to be endowed like himself with the spirit of ecstatic prophecy. Like the "spiritual gifts" of the apostolic age (cf. 1 Cor. xii), the prophetic spirit might rest upon any one, and this divine equipment marked out the leaders of the Church. Revelation was imparted without any activity on the prophet's part; he was passive like the lyre when struck with the plectrum. Maximilla was held to be the last of the prophets. She died in 179. Montanus' death was earlier, but the exact year is unknown. The Montanists spread rapidly, and Asiatic synods were early held against them. They were known in Rome as early as the time of Soter (165–174), who pronounced an adverse judgment upon their claims, as did several of his successors. They were excluded from the Catholic church and organized as a separate body. Their most distinguished convert was Tertullian (q.v.), whose later writings are the chief literary monuments of the Montanist movement. Excluded from the Catholic church, the Montanists did not long survive in the West, but in the East they are found as late as the sixth century, when Justinian finally suppressed them. The movement was the last protest of the ancient belief in direct inspiration against the growing ecclesiasticism of the Church, but it was largely discredited because of its extreme positions.

Consult the later writings of Tertullian, translated into English in *The Ante-Nicene Fathers*, edited by Roberts and Donaldson, vols. iii and iv (Edinburgh, 1868); Smith and Wace, *Dictionary of Christian Biography*, article "Montanus" (London, 1877–87); J. de Soyres, *Montanism and the Primitive Church* (Cambridge, 1878); Bonwetsch, *Geschichte des Montanismus* (Erlangen, 1881); Adolf Harnack, *History of Dogma*, vol. ii (Boston, 1896); Robert Rainy, *The Ancient Catholic Church* (New York, 1902).

MONTARGIS, môn'tär'zhē'. A town in the Department of Loiret, France, at the confluence of the Loing and the Vernisson, and at the junction of three canals connecting the Seine and the Loire, 47 miles east-northeast of Orléans (Map: France, N., H 5). Among its chief buildings are the thirteenth-century church of La Madeleine with a fine choir, the town hall containing an art gallery, and the remains of the former imposing twelfth-century castle, which was formerly a royal residence, and the modern town hall, library, and museum. A bronze monumental group commemorates the "Dog of Montargis," who is said to have revealed his master's murderer by constantly following him. (See AUBRY DE MONTDIDIER.) There are considerable manufactures of paper, cotton goods, asphalt, rubber, tar, chemicals, leather, shoes, and cutlery, and a good trade in sheep, grain, wax, and honey. Anciently Montargis was the capital of Gâtinais. During the English occupation it was attacked on several occasions, and successfully resisted a siege in 1427. Until the palace at Fontainebleau was built, the castle at Montargis was a favorite royal residence and became known as "the Cradle of the Children of France." It is the birthplace of Mirabeau. Pop., 1901, 12,351; 1911, 12,927.

MONTAUBAN, môn'tō'bän'. The capital of the Department of Tarn-et-Garonne, France, situated on an elevation above the confluence of the Tarn and Tescou, in a rich and beautiful country, 31 miles north of Toulouse (Map: France, S., F 4). It is a handsome, well-built town, has a Renaissance cathedral finished in 1739, a Protestant theological college, a public library, a seventeenth-century town hall with a splendid museum containing many paintings by the artist Ingres, and the ancient castle of the counts of Toulouse. The cathedral contains Ingres's famous "Vow of Louis XIII." The town is the seat of a bishop. Cloth, sugar, lumber, furniture, hats, and metal ware are manufactured, but the chief activity of the town is its trade in horses, poultry, grain, oil, and wine. Its institutions include a school of commerce, a training college, a lyceum, and a theological faculty. Montauban originated in the abbey of St. Théodard or Montauriol, built in the eighth century on the site of the Roman Mons Albanus. The town's growth dates from its founding in 1144 by Count Alphonse of Toulouse as a refuge for serfs. It suffered severely during the Albigensian wars of the thirteenth century. It was an episcopal see from 1317 to 1560, when the inhabitants who had embraced the Protestant faith destroyed the cathedral. As one of the Huguenot strongholds it was a frequent object of attack. In 1621 it was unsuccessfully besieged by the forces of Louis XIII for 86 days, but the fall of La Rochelle in 1629 entailed its submission and the destruction of its fortifications. Ingres, the artist, was born at Montauban. Pop., 1901, 30,506; 1911, 29,778.

MONTAUK, mŏn-tąk'. An Algonquian tribe formerly inhabiting the eastern end of Long Island and claiming sovereignty over most of the other tribes of the island. Their principal village was near Montauk Point. When first known they were a numerous people, but having been reduced by a pestilence in 1658 to about 500 souls, they were invaded by the Narragansett from the mainland and forced to seek shelter among the white settlers at Easthampton. A century later only 162 remained. Many of these joined a kindred band in New York about 1788, and in 1829 only about 30 were left on Long Island and these are now extinct. In 1914, 29 of this tribe were living with the Stockbridge in Wisconsin.

MONTAUK POINT. A promontory at the eastern end of Long Island, in Suffolk Co., N. Y. (Map: New York, D 2). On it are located a stone lighthouse 168 feet high, equipped with a flashing white light visible 19 (nautical) miles, a Daboll fog trumpet, and a United States life-saving station. United States and State troops had an encampment here, called Camp Wyckoff, after the Spanish-American War. The point was named from the Montauk Indians.

MONTAUSIER, môn'tō'zyā', CHARLES DE SAINTE-MAURE, MARQUIS DE (1610–90). A French soldier. He was educated at Sedan, rose rapidly in the army, and in 1645 became Governor of Saintonge and Angoumois. Although reared a Huguenot he supported the crown during the Fronde (q.v.). Wounded at Martangais in 1652, he returned to Paris. In 1663 he became Governor of Normandy, was created Duke in 1665, and served as guardian of the Dauphin from 1668 to 1679. At his direction the edition of the Latin work *Ad Usum Delphini* was published. He was a patron of Boileau and Racine and was famed for his brusque manners and his austere piety. It is supposed that he was the original of Molière's *Misanthrope.* He was the long-time suitor of Mademoiselle Julie de Rambouillet, first dame d'honneur, whom he married and for whom he prepared the *Guirlande de Julie,* a book of unpublished autograph verse by various authors.

MONTBÉLIARD, môn'bā'lyär'. A town in the Department of Doubs, France, 9 miles southwest of Belfort (Map: France, N., M 5). It lies in a valley between the Vosges and Jura mountains, at the confluence of the Allaine and the Lisaine, and on the Rhone-Rhine Canal. The strikingly situated fifteenth-century castle was an important German post during the battle of Héricourt in 1871. It forms one of a chain of fortifications extending from Belfort to Besançon. Among several public statues there is one to Cuvier, the naturalist, born here in 1769. The principal industries are watchmaking and the manufacture of hardware, machinery, tools, silk and cotton goods, agricultural instruments, lace, and timber. Wine, leather, cheese, and the famous Montbéliard cows are exported. Montbéliard belonged to Württemberg intermittently from the close of the fourteenth century to the French Revolution. Pop., 1901, 10,034; 1911, 10,392, chiefly Protestants.

MONT BLANC, môn bläN (Fr., white mountain). The highest mountain in Europe outside of the Caucasus. It forms with the bordering heights an independent elongated ridge of the western Alps, on the boundary between France (Savoy) and Italy (Piedmont) (Map: France, S., L 3). It is situated a short distance west of the Pennine Alps and north of the Graian Alps, about 40 miles south of Lake Geneva. It is composed of crystalline rocks bordered by Jurassic and Triassic strata which exhibit the fan-shaped arrangement characteristic of Alpine peaks. The highest point (15,781 feet), generally known as Mont Blanc, is in France, 7 miles south of the Swiss boundary. It is covered by an immense cap of ice more than 75 feet thick, from which glaciers extend downward in all directions, feeding the tributaries of the Rhone on the north and of the Po on the south. The largest glaciers run northward into the valley of Chamonix, the chief being the Glacier du Géant, which extends almost to the bottom of the valley and is known in its lower course as the Mer de Glace. The line of perpetual snow is at an altitude of 8600 feet. The summit is surrounded by a series of lower, steep, and needle-like crags (*aiguilles*), and the ascent is dangerous and fatiguing, many persons having perished in the attempt. The first ascent was made in 1786 by the guide Balmat, induced by a prize offered by the scientist Saussure, who himself accomplished the ascent the following year and made some of the earliest scientific observations in high altitudes. The summit is ascended by large numbers of tourists every year. French engineers have projected a railway to the summit and have already constructed it as far as Mont Lachat, 7000 feet. Two meteorological and astronomical observatories are located on Mont Blanc, one built in 1890 at an altitude of 14,324 feet, the other built in 1893 on the summit.

Bibliography. Doblhoff, *Der Montblanc* (Vienna, 1880); Güssfeldt, *Der Montblanc* (Berlin, 1894); Duparc, *Le Montblanc, au point de vue géologique et pétrographique* (Geneva, 1896); Durier, *Le Montblanc* (4th ed., Paris, 1897); Mathews, *The Annals of Mont Blanc* (London, 1898); Whymper, *Chamonix and the Range of Montblanc* (7th ed., London, 1902); and the authorities referred to under MOUNTAIN CLIMBING.

MONT BLANC RUBY. See RUBASSE.

MONTCALM DE SAINT-VÉRAN, môn'kälm' de săN-vā'räN'; *in English commonly called* mŏnt-käm', LOUIS JOSEPH, MARQUIS DE (1712–59). A distinguished French general. He was born at Candiac, near Nîmes, Feb. 29, 1712, entered the army in 1721, and became a captain in 1728. He served in Italy and Germany for many years and was wounded five times at the battle of Piacenza in 1746. In May, 1756, he was sent to Canada to command the French forces. He captured Fort Ontario at Oswego in August of the same year. The next year he forced the capitulation of Fort William Henry at the head of Lake George, with an English garrison of 2500 men, capturing 42 guns and a large amount of stores. In 1758 he defended Fort Ticonderoga with 3600 Canadians against General Abercromby at the head of 15,000 English, repulsing the latter after a determined attack (July 8). The loss of this battle would have meant the complete downfall of French power in America. Lack of troops, ammunition, and provisions, and the large reënforcements of the English, obliged Montcalm to retire all his forces the following year to Quebec, which was menaced by a powerful army under General Wolfe. Ill supported by the French government and forced to cope with disaffection among the authorities in Canada, Montcalm prepared to meet the inevitable outcome with a heroic determination which has lent so much romantic interest to his last days. The struggle around Quebec began July 31, 1759, and the siege continued for six weeks, until Wolfe's scaling of the Heights of Abraham above the city tempted the French to a battle in the field, in which the English were victorious, Sept. 13, 1759. Wolfe fell dead in the moment of victory, and Montcalm was borne from the field mortally wounded and died the following day. The city was surrendered a few days after his death, and its fall signalized the end of the French power in Canada. In 1827 Governor Dalhousie, of Canada, caused a monument to be erected in Quebec to

the joint honor of the two brave generals. The best work on Montcalm is by Parkman, "Montcalm and Wolfe," in *France and England in North America*, part vii (2 vols., Boston, 1885). Consult also: Bonnechose, *Montcalm et le Canada française* (Paris, 1877); Falgairolle, *Montcalm devant la postérité* (ib., 1886); Doughty, *The Siege of Quebec and the Battle of the Plains of Abraham* (Quebec, 1901).

MONTCEAU-LES-MINES, môn'sô'-lā'-mēn'. A town of east France, in the Department of Saône-et-Loire, on the Canal du Centre, 31 miles northwest of Mâcon (Map: France, N., K 6). It is the centre of the Blanzy coal-mining region and has iron and copper foundries, machine shops, tile and textile factories. Pop., 1901, 28,779; 1911, 26,830.

MONT CENIS, môn se-nē'. See CENIS, MONT.

MONTCHRESTIEN, môn'krā'tyăn', ANTOINE DE (c.1576–1621). A French playwright and economist. His father was an apothecary. Having left his birthplace, Falaise, the lad went to the College of Caen. In 1596 he published the tragedy of *Sophonisbe*, which was followed by *L'Ecossaise, ou Marie Stuart; Les Lacènes; David; Aman;* a revision of *Sophonisbe* called *La Carthaginoise;* and *Hector* (1604). Meanwhile Montchrestien was working on a history of Normandy, which was never printed and is now lost. A duel caused him to flee to England, whence he returned with a head full of economic theories. He started a steel mill at Aussonne-sur-Loire with a store in Paris. His *Traité d'économie politique* appeared in 1615. Our expression "political economy" is merely a translation of the phrase coined by Montchrestien. He was slain during a Huguenot stir near Falaise, Oct. 8, 1621. Consult: Duval, *Mémoire sur Antoine de Montchrestien* (Paris, 1868); Funck-Brentano, *Montchrestien, sa vie et son œuvre* (ib., 1889); Louis Petit de Julleville, *Les tragédies de Montchrestien* (ib., 1891); Sporleder, *Ueber Montchretiens "Ecossaise"* (Marburg, 1892); Lauson, *Hommes et livres* (1895); Paul Lavalley, *L'Œuvre économique d'Antoine de Montchrestien* (Caen, 1903).

MONTCLAIR'. A town in Essex Co., N. J., 5 miles north by west of Newark, on the Morris Canal and on the Lackawanna and the Erie railroads (Map: New Jersey, D 2). It is picturesquely situated on the slope of one of the ranges of the Orange Mountains, its highest point having an elevation of about 650 feet, the average elevation being about 300 feet, and is chiefly a residential town, though of some reputation as a summer resort. The heights command a fine view of New York and its harbor. The town has a hospital, two orphan asylums, a State normal school, art museum, fine high-school building, a public library, and the Montclair Military Academy. There are also a few manufactories, including paper mills and hosiery mills. Pop., 1890, 8656; 1900, 13,962; 1910, 21,550; 1914, 24,782; 1920, 28,810.

Until separately incorporated in 1868, Montclair was a part first of Newark and then of Bloomfield. The upper section was settled by Dutchmen from Hackensack and called Speertown, the lower by Englishmen from Newark and called successively Cranetown and West Bloomfield. The present name was not adopted until 1865. Consult Harris, *An Historical Sketch of Montclair* (Montclair, 1881).

MONT-DE-MARSAN, môn'-dē'-mār'săn'. Capital of the Department of Landes, southwest France, situated at the junction of the Midou and the Douze, 64 miles south of Bordeaux (Map: France, S., D 5). It has a normal school, a library, a lycée, an old castle, and fine public gardens. The chief manufactures are resins, turpentine, iron goods, lumber, and machinery, which, together with wine and live stock, are the chief exports. Pop. (commune), 1901, 11,604; 1911, 12,091.

MONT DE PIÉTÉ. See MONTS DE PIÉTÉ.

MONTDIDIER, AUBRY DE. See AUBRY DE MONTDIDIER.

MONT DORE. See DORE.

MONTEAGLE, mŭnt-ē'g'l, WILLIAM PARKER, fourth BARON, and eleventh BARON MORLEY (1575–1622). An English adventurer. He was intimate with the chief Roman Catholic families of England, showed great enthusiasm for their cause, and for participating in Essex's rebellion in London in 1601 he was imprisoned for a short time and fined £8000. But when James I ascended the throne in 1603 Parker swore allegiance to him and helped the new King to get control of the Tower of London. In 1605 he was called to Parliament as Lord Monteagle. On October 26 of that year he received a letter, probably from his wife's brother, Francis Thresham, telling him of the Gunpowder Plot (q.v.) and warning him not to attend Parliament, and he was thus enabled to avert the threatened disaster. In 1609 he became a subscriber to and a member of the council of the Virginia Company.

MONTE ALBAN, môn'tā äl'bän. A picturesque ridge rising 2000 feet above the city of Oaxaca, on the summit of which is situated one of the largest ruins in Mexico. For a distance of 2 miles the crest has been leveled, terraced, and laid out in rectangular courts whose sides run towards the four directions. Around these courts are pyramids which were once crowned with temples. Only the bottoms of walls remain in place, disclosing a cement construction. In some of the mounds are narrow, stone-lined vaults. A number of sculptured slabs, some standing erect like the stelæ of the Maya cities to the south and some built against the bases of mounds, occur at Monte Alban. In addition to representing human and grotesque figures in low relief these slabs contain columns of hieroglyphs with bar at dot numerals. These inscriptions suggest those of the Maya, but it has so far been impossible to decipher any of the dates. Monte Alban was one of the early Zapotican capitals and had apparently been abandoned for many centuries before the coming of the Spaniards. Consult Holmes, *Archæological Studies among the Ancient Cities of Mexico*, in Field Museum Publications (Chicago, 1895–97), and Batras, *Exploraciones de Monte Alban* (Mexico, 1902).

MONTEBELLO, môn'tā-bĕl'lō. A village in the Province of Pavia, Italy, 12 miles south-southwest of Pavia. There on June 9, 1800, the French under Lannes defeated the Austrians. The engagement is sometimes called the battle of Casteggio, after a neighboring town. In May, 1859, the Austrians were again defeated here by the united armies of the French and the Piedmontese. Pop., 1901, 2119; 1911, 2183.

MONTEBELLO, DUKE OF. See LANNES, JEAN.

MONTE CARLO, kär'lō. A town in the Principality of Monaco (q.v.), picturesquely situated on a beautiful and isolated elevation

rising above a bay of the Mediterranean, a little over one mile northeast of Monaco, the capital of the principality (Map: France, S., M 5). The climate is celebrated for its salubrity and mildness. The town is most attractively laid out as a pleasure resort and its scenic surroundings are celebrated. The Casino, containing the gaming rooms to which Monte Carlo owes its fame and the principality its welfare, is a splendid building amid beautiful gardens, and contains besides the *salles de jeu*, a luxuriously appointed *salle des fêtes*, a reading room, etc. The chief games played are roulette and trente-et-quarante, with stakes ranging from 5 to 6000 and from 20 to 12,000 francs respectively. The gaming tables of Monte Carlo are patronized by people from all over the world, but are forbidden to the natives of the principality. The town was founded in 1856 and has been used as a gambling resort since its foundation. In 1861 the Casino was leased for 50 years to M. François Blanc, after whose death the control of the concern passed to a joint-stock company, capitalized at 30,000,000 francs. In 1898 the company obtained an extension of its concession to 1947. The company engaged to pay to the Prince of Monaco £400,000 in 1899 and £600,000 in 1913, and to increase its annual tribute from £50,000 to £70,000 in 1907, to £80,000 in 1917, to £90,000 in 1927, and to £100,000 in 1937. The town had, in 1913, 9627 inhabitants.

MONTE CASSINO, kȧs-sē′nō. A monastery situated on a hill overlooking Cassino (q.v.) in the Province of Caserta, Italy, 45 miles northwest of Naples. It was founded by St. Benedict about 529 on the site of a temple of Apollo, and was the original home of the Benedictine Order. It was destroyed and rebuilt several times and the present buildings were erected from 1637 to 1727; they are remarkable for their noble architecture and beautiful situation. The library and archives, containing 50,000 printed books and 30,000 incunabula, are historically famous. In 1866 the monastery was enrolled as a "national monument."

Bibliography. Tosti, *Storia della badia di Montecassino* (Rome, 1889–1890); Taeggi, *Paleografia artistica di Montecassino* (Monte Cassino, 1876 et seq.); Rickenbach, *Monte-Cassino von seiner Gründung bis zu seiner höchsten Blüte unter Abt Desiderius* (Einsiedeln, 1884–85); Clausse, *Les origines bénédictines* (Paris, 1899).

MONTECATINI DI VAL DI NIEVOLE, mŏn′tȧ-kȧ-tē′nē dē văl dē nyā′vō-lā. A town in the Province of Lucca, Italy, 1180 feet above the sea, 24 miles northwest of Florence. The warm baths below the town (*Bagni di Montecatini;* pop. (commune), 1911, 5526), dating from the fourteenth century, are much frequented by invalids. Pop. (commune), 1911, 3355.

MONTE CENISIO, mŏn′tȧ chȧ-nē′zyō. See Cenis, Mont.

MONTE CIRCEO. See Circei.

MONTE CORVINO, mŏn′tȧ kôr-vē′nō, Giovanni di (c.1247–c.1328). A Franciscan missionary and traveler. In 1289 he was sent by the Pope as legate to the Great Khan of Persia. From thence he went to the Coromandel coast of India about 1291–92. He was next heard of in Peking, where he arrived before 1305. Pope Clement V created him Archbishop of Peking in 1307, and in the following year three bishops arrived to assist him. He established three mission stations in Peking and one near Amoy harbor, and enjoyed considerable success. Monte Corvino's letters were published in the *Münchner gelehrte Anzeigen*, no. 22, part iii (1855).

MONTE CRISTI, krĭs′tē. A seaport of the Dominican Republic, situated on the north coast near the Haitian frontier (Map: West Indies, E 2). The town has a large harbor 7 miles in circumference and carries on an active export trade in hides, molasses, coffee, and tobacco. It is the station of a United States consular agent. Pop., 5000.

MONTE CRISTO, krĭs′tō. A small island off the west coast of Italy, 28 miles south of the island of Elba (Map: Italy, C 3). It consists largely of a mountain of granite, rising 2000 feet above the sea, and was made a penal colony in 1874. Monte Cristo acquired fame through Dumas's novel *The Count of Monte Cristo.*

MONTE CRISTO, The Count of. The most famous romance of Alexandre Dumas (1844–45), founded on Penchet's *A Diamond and a Vengeance.* The hero, Edmond Dantès, is unjustly imprisoned in the Château d'If (see If), escapes, and after discovering a fabulous treasure on the island of Monte Cristo, pursues with his vengeance those to whom his sufferings were due.

MONTECUCCOLI, mŏn′tȧ-kōō′kō-lē, or **MONTECUCULI,** mŏn′tȧ-kōō′kų-lē, Raimondo, Count (1609–80). An Austrian general. He was born near Modena and entered the Austrian artillery as a volunteer under his uncle, Ernesto, Count Montecuccoli, in 1625. During the Thirty Years' War he was employed in various services, military and diplomatic. In 1657 he was sent to support John Casimir of Poland against the Swedes and Prince Rákóczy of Transylvania, and compelled Rákóczy to make peace with Poland and to break his alliance with the Swedes. In the following year he was made a field marshal and was sent to aid the Danes against the Swedes, in which also he was eminently successful. In 1660 he commanded the army sent to oppose the Turks, who had broken into Transylvania, and after an indecisive warfare of three years he won the great battle of St. Gotthard, on the banks of the Raab, Aug. 1, 1664, defeating Kiuprili and forcing the Turks to sign a twenty years' peace. In the war between France and Holland, in which the Emperor took part with Holland, Montecuccoli was given the command of the Imperial army in 1672. He took Bonn and, notwithstanding the endeavors of Turenne to prevent it, effected a junction with the Prince of Orange. In 1675 he was opposed to Turenne on the Rhine, and they spent months in manœuvres in which neither could gain any advantage and which ended in the death of Turenne. Montecuccoli then pursued the French across the Rhine. The Emperor Leopold made him a prince of the Empire, and the King of Naples bestowed on him the Duchy of Melfi. His memoirs were published in French (Amsterdam, 1770) and in the original Italian by Ugo Foscolo (Milan, 1807) and by Grassi (Turin, 1821). Consult also Campori, *Raimondo Montecuccoli, la sua famiglia e i suoi tempi* (Florence, 1877), and Grossmann, *Raimund Montecuccoli* (Vienna, 1878).

MONTEFIASCONE, mŏn′tȧ-fyȧs-kō′nȧ (It., bottle mountain) (Map: Italy, C 3). An episcopal town in the Province of Rome, Italy, 9 miles northwest of Viterbo. It is situated 3

miles from the railway station at an altitude of 2076 feet, commanding a magnificent view of Lake Bolsena. The ancient walls are still standing. Its chief buildings are the uncompleted cathedral of Santa Margherita, the early eleventh-century Romanesque-Gothic church of San Flaviano, and a sixteenth-century castle. Montefiascone is celebrated for its high quality of muscat wine. The town dates from the sacred Etruscan Fanum Voltumnæ. Pop. (commune), 1901, 9371; 1911, 9563.

MONTEFIORE, mŏn'tĕ-fī-ō'rĕ, CLAUDE JOSEPH GOLDSMID (1858–). An English educator and author. He was born in London of Jewish parents and was educated at Balliol College, Oxford. He devoted himself to communal work in behalf of London Jews, held various high offices in Jewish institutions in London, and with Israel Abrahams edited the *Jewish Quarterly Review.* He became president of the Anglo-Jewish Association. Montefiore delivered the Hibbert lectures for 1892 on the *Origin and Development of the Religion of the Ancient Hebrews.* With Israel Abrahams he wrote *Aspects of Judaism* (2d ed., 1895); and he is sole author of *Liberal Judaism* (1903); *The Synoptic Gospels* (1909); *Some Elements of the Religious Teachings of Jesus* (1910), the Jowett lectures.

MONTEFIORE, SIR MOSES HAYIM (1784–1885). A Jewish philanthropist. The scion of a wealthy Anglo-Italian banking family, he was born at Leghorn, Italy, Oct. 24, 1784. He was educated in London, became a member of the Stock Exchange, and in 1824, having realized a large fortune, retired from commercial pursuits and commenced a crusade for the amelioration of his race. In 1812 he married Judith Cohen, whose sister had married the head of the great Rothschild banking house. He was strenuous in his efforts to remove the civil disabilities of Jews in England, and finally, overcoming great opposition, received the honors of election as High Sheriff of Kent, and Sheriff of London in 1837, when he was knighted. In 1846 Queen Victoria made him Baronet. From 1827 to 1875 he made seven journeys to the Orient, conferring great benefits on his kindred, and being everywhere received by the rulers with the greatest marks of respect. He spent the last years of his life at Ramsgate, where, in 1865, he had endowed a Jewish college to the memory of his wife, who died in 1862. He died there July 28, 1885, in his one hundred and first year. Consult Loewe (ed.), *Diaries of Sir Moses and Lady Montefiore* (London, 1890).

MONTE'GO BAY. A seaport on the north coast of Jamaica, 18 miles west of Falmouth (Map: West Indies, C 3). It has a good harbor defended by a battery, and a general trade of some importance. A United States consular agent resides in the town. Pop., 1891, 4803; 1911, 6616.

MONTÉGUT, môn'tā'gŭ', JEAN BAPTISTE JOSEPH EMILE (1825–95). A French writer and editor, born at Limoges. He practiced law until 1847, when he entered the field of letters by an article in the *Revue des Deux Mondes* on the philosophy of Emerson. Later he translated the works of Emerson, Macaulay, and Shakespeare into French, and it is chiefly because of his introducing these writers to French readers that he is remembered. In 1857 he became an editor of the *Revue des Deux Mondes,* but resigned in 1862 to join the *Moniteur Universel.* Among his writings are: *Les Pays-Bas: Impressions de voyage et d'art* (1869); *L'Angleterre et ses colonies australes* (1879); *Poètes et artistes de l'Italie* (1881); *Esquisses littéraires* (1893).

MONTEIRO, mŏn-tā'rō, CANDIDO BORGES (1812–72). A Brazilian physician. He was born in Rio de Janeiro and, after taking his degree (1834) at the Medical School there, served the institution as professor of operative surgery and topographical surgery from 1837 to 1862. He was physician to the Emperor, and took an active part in politics, as president of the municipal chamber of the capital, as Secretary of Agriculture, Commerce, and Public Works, and as Senator.

MONTELEONE DI CALABRIA, mŏn'tā-lā-ō'nā dē kä-lä'brē-ä. An episcopal town in the Province of Catanzaro, Italy, on a hill 1575 feet above the sea, about 2 miles from the Gulf of Santa Eufemia and 70 miles north by east of Reggio di Calabria (Map: Italy, F 5). Its ruined castle was built by Frederick II and its church is adorned with sculptures by Gagini of Palermo. The town has been several times devastated by earthquakes, the last in 1905. It has a trade in silk and oil. Monteleone is on the site of the Greek Hipponium, mentioned as early as 389 B.C., and the Roman Vibo Valentia. Pop. (commune), 1901, 12,997; 1911, 13,066.

MONTÉLIMAR, môn'tā'lē'mär'. A town in the Department of Drôme, France, near the confluence of the Roubron and Jabron, 27 miles by rail south of Valence (Map: France, S., J 4). It is irregularly built on a castle-crowned hill, commanding fine prospects of the Vivarais Mountains. The former castle is now a prison. Among its chief institutions are a chamber of agriculture, a communal college, and a public library. It manufactures lumber, cabinetwork, silk, cotton, corsets, hats, chocolate, vermicelli, agricultural machinery, flour, and spirituous liquors and is famed for Montélimar nougat, an almond candy. In the vicinity coal and lignite are mined. Montélimar is on the site of the Acusium of the Romans; the thermal spring at Bondonneau, 2½ miles to the southeast, anciently used by them, was rediscovered in 1854. The town was destroyed by the Saracens and rebuilt by Montheil d'Adhémar in the tenth century. Here Calvinism was first embraced in France. Coligny besieged the town unsuccessfully in 1569, but it was taken by the Huguenots in 1587. Pop., 1901, 13,351; 1911, 13,281.

MONTELIUS, mŏn-tā'lē-ŭs, GUSTAF OSCAR AUGUSTIN (1843–1921). A Swedish antiquarian and ethnologist, born in Stockholm. He took his degree of Ph.D. at Upsala in 1869. From 1868 to 1888 he was connected with the Academy of Antiquities, in 1888 he was appointed professor in the State Historical Museum, and from 1907 to 1913 he was state antiquarian. He traveled widely and lectured in America as well as in Europe. He declined the directorship of antiquities in the Museum für Völkerkunde in Berlin and a professorship in the university there. His costly library was given (1913) to the Academy of Antiquities in Stockholm. He contributed largely to scientific periodicals and was editor of several. Among his works are: *Från järnåldern* (1869); *Sveriges forntid* (1872–75); *Lifvet i Sverige under hednatiden* (1873; 3d ed., 1905; Eng., Fr., Ger. trans.); *Sveriges historia från äldsta tid till våra dagar* (1875–77; Ger. trans., 1906);

La civilisation primitive en Italie depuis l'introduction des métaux, a great work, of which three volumes of plates (1895, 1905, 1911) and two volumes of text had appeared up to 1915.

MONTELUPO, mŏn'tȧ-lōō'pō, RAFFAELLO DA (c.1505–c.1567). An Italian sculptor and architect, the son of Baccio da Montelupo. He was a pupil of Michelangelo and frequently assisted him, but his work is usually clumsy and mannered. One of his best productions is the Rossi Monument in Santa Felicità, Florence. He made three statues for the tomb of Pope Julius II and partly built the monument to Leo X in the church of Santa Maria sopra Minerva in Rome, besides executing a figure of St. Damian in the Medici Chapel in Florence, several bas-reliefs in the Casa Santa at Loreto, and the tomb of Baldassare Turini in the duomo of Pescia. He left part of an autobiography, which is translated in Perkins, *Tuscan Sculptors* (London, 1864).

MONTEMAYOR, mŏn'tȧ-mȧ-yōr', or **MONTEMÔR**, JORGE DE (?1520–61). A Spanish poet and novelist, born at Montemôr-o-Velho, near Coimbra, Portugal. Little is known as to the details of his life. He seems to have studied music and to have traveled back and forth between Spain and Portugal, in the suite of various members of the two royal families, during the period 1543 to 1555, when he is thought to have gone to England and to the Netherlands in the train of Philip II of Spain. He perished in a duel (or was murdered) in 1561. With the exception of a couple of songs and a few lines of prose in Portuguese, contained in his famous pastoral romance, he composed wholly in Castilian. His literary renown is based on his unfinished *Diana enamorada*, a work modeled on the Italian pastoral novel and published about 1559. It mingles verse with the prose and beneath the fiction of the pastoral situation veils the love experiences of the author himself. An English version, made by Bartholomew Young in 1583 (printed in 1598), is of importance because of the influence which it had upon Sidney's *Arcadia* and upon Shakespeare's *Two Gentlemen of Verona*. As Montemayor's romance remained incomplete, several Spanish continuations of it were made. The best is that of Gaspar Gil Polo (1564). Lyrics of Montemayor are to be found not only in the *Diana*, but also in his *Cancionero* (Antwerp, 2 vols., 1544–58). An edition of Montemayor came out in 1886 at Barcelona. Consult: G. Schönherr, *Jorge de Montemayor, sein Leben und sein Schäferroman* (Halle, 1886); Domingo García Péres, *Catálogo de los autores portugueses que escribieron en castellano* (Madrid, 1890); J. Fitzmaurice-Kelly, in the *Revue Hispanique*, vol. ii (Paris, 1895); Marcelino Menéndez y Pelayo, "Orígenes de la novela," in the *Nueva biblioteca de autores españoles*, vol. i (Madrid, 1905); J. Marsan, *La pastorale dramatique en France* (Paris, 1905); D. Guimarães, *Bernardim Ribeiro* (Lisbon, 1908); H. A. Rennert, *The Spanish Pastoral Romances* (2d ed., Philadelphia, 1912).

MON'TEM CUSTOM, THE. A famous traditional custom at Eton College. Its origin is lost in obscurity; it is described in Malim's *Consuetudinarium* of 1560. Until 1758 its observance took place in January; when it was changed to Whitsun Tuesday, it was held every second or third year, and triennially from 1775, until it was abolished in 1847, owing to the disorder which attended it. It was a procession of the Eton boys, attired in fancy dresses, to a certain mound (*ad montem*, hence the name) known as Salt Hill. They were licensed to levy contributions, known as salt, from every visitor, and the receipts were given to the captain of the day, who kept what was left after the expenses of the festivity were paid to help him in his university career. For a full account, consult Sterry, *Annals of Eton College* (London, 1898), and Sir H. Maxwell Lyte, *History of Eton College* (ib., 1904). See also ETON COLLEGE.

MONTEMOLIN, mŏn'tȧ-mō-lēn', COUNT OF. See CARLOS, DON.

MONTEMÔR, J. DE. See MONTEMAYOR, J. DE.

MONTEMORELOS, mŏn'tȧ-mō-rā'lōs. A town of the State of Nuevo León, Mexico, 42 miles south of Monterrey, on the National Railways of Mexico (Map: Mexico, J 5). It lies in the midst of a fertile irrigated region, celebrated for its production of fruits, especially oranges. Its municipal population, in 1895, was about 3500.

MONTEN, mŏn'ten, DIETRICH (1799–1843). A German battle painter, born at Düsseldorf, where he began to study at the Academy in 1821. Later he became a pupil of Peter Hess in Munich, where, after a visit to Italy and study trips in other parts, he made his permanent home. The success of some battle pieces he exhibited led to his being commissioned to paint in the arcades of the Royal Garden three historical episodes, but his reputation dates more especially from his "Finis Poloniæ" (1832, National Gallery, Berlin), depicting the departure of the Poles from their country in 1831, a painting which became widely known through lithographic reproductions. Other specimens from his brush include "Death of Gustavus Adolphus at Lützen" (1835, Hanover Museum) and "Napoleon on a Reconnaissance" (New Pinakothek, Munich).

MONTENEGRO, mŏn'tȧ-nā'grō. A kingdom of Europe, situated in the western part of the Balkan Peninsula (q.v.), between lat. 41° 55′ and 43° 30′ N. and long. 18° 30′ and 20° 45′ E. (Map: Balkan Peninsula, B 3). The name Montenegro, given to the country by the Venetians, is a translation of the Slavic Crnagora (pronounced cher-nȧ-gŏ'rȧ), which signifies Black Mountain. The mountains, however, are not black, but are white or grayish. The name was not known before the reign of Crnojevic, the Black Prince, in the fifteenth century, and he is supposed to have given his name to the mountains. The country is bounded by Servia on the east, by Albania on the south, by the Austrian Province of Dalmatia on the west, and by Herzegovina on the west and north. It has a short sea frontage on the Adriatic, but no good port. The area is estimated at 5603 square miles. Montenegro is a part of the great Karst limestone plateau which, beginning in south Austria, extends along the east side of the Adriatic through Turkey and Greece. It is crowded with mountains from 2500 to over 8000 feet in height, the highest elevations being in the northeast. Nearly the whole country is covered by the Karst formation, possessing a cold climate and a few patches of cultivable land scattered among poor pastures, and has the peculiarities of similar limestone formations. Looked at from above, the land would seem to be honeycombed with cells due to the agency of

water. Rivers fully formed suddenly rise out of the rocks and disappear as suddenly. Here they have scooped out wide valleys and there they have merely produced sink holes into which they vanish. Thus, large parts of the country have little surface water, and the inhabitants use rain water or snow. The two important rivers are the Zeta and the Morača. The Zeta disappears in a chasm on the plain of Nikšić and reappears miles away at the head of the Zeta valley, the largest valley and the most fertile part of Montenegro. The Morača flows between stony banks, along which no track leads, and joins the Zeta, and their waters empty into the Lake of Scutari, on the borders of Albania.

Around the shores of the Lake of Scutari is a narrow plain, where agriculture is intensive; but there is no agriculture among the stony wastes of the Karst, and no crops are raised excepting in the alluvial valley of the Zeta and some smaller streams and along the coast. Agriculture is of the most primitive kind. Grain, tobacco, potatoes, and other vegetables are grown. The vine and fig thrive also, and the olive is produced along the narrow coastal plain. The mean annual temperature is from 61° F. in these regions to 35° F. on the higher parts of the plateau. On the whole the climate is raw except in the low-lying river valleys and along the coast. The pasture lands, poor as they are, afford grazing for cattle, goats, and sheep, which are the chief riches of the country. There are about 500,000 sheep and goats, 60,000 cattle, 8000 swine, and 3000 horses.

The flora, though sparse on the whole, includes a considerable variety, on account of the diversity of climate. Practically all the useful plants the people require are grown. Scattering beeches and oak trees are about all that relieve the monotony of the mountains except in the still almost inaccessible north, where fine oak, beech, and pine forests are found, but are valueless because of lack of roads. The fauna includes the bear, wolf, and fox, and a considerable number of aquatic and other birds. The most important fish is the bleak, a considerable quantity of which is exported.

The estimated population in 1905 was 250,000, of whom, roughly, 223,500 were Orthodox Greek, 12,500 Roman Catholic, and 14,000 Mohammedan. An estimate of 1912 placed the total at 285,000. They are thinly scattered over the lower grounds, and on the slopes of the hills their rude stone huts with one door, one window, and roof of straw stand at intervals of about a quarter of a mile; around them are little patches of wheat, barley, and potatoes. The settlements are connected with one another by bridle tracks about 3 feet broad winding over limestone bowlders and covered with a loose sliding surface of limestone blocks of all sizes. Such is the characteristic aspect of the settled parts of Montenegro outside of the towns. There are few roads except those recently built which connect Cetinje, Podgoritsa (Podgorica), and Nikshich (Nikšić) with one another and the coasts. The Montenegrins have not desired roads and for ages took care not to construct them, because they feared they would open their country. The Montenegrins are an offshoot of the Servian branch of the Slavic race. Physically they are among the largest and finest people in Europe, and the conditions of their mountain life in a poor country have developed peculiarities that make them easily distinguishable from the Servians. They are a race of warriors, always ready to take arms against external encroachments and equally ready to defend at home what they regard as their personal rights. They have thus the reputation of being excitable, quarrelsome, and violent, but every man, even the poorest, has a dignified bearing. The figures for population given above relate to the country as it was before the Balkan wars of 1912–13, the area being 3506 square miles. As a result of those wars Montenegro received a considerable accession of territory, viz., 2129 square miles (estimated)—168 square miles from the former Turkish Vilayet of Scutari and 1961 square miles from Kossovo; the inhabitants of the acquired area were estimated to number 230,000, making the total population in 1915 about 520,000. Cetinje, the capital, which is but a few miles distant from the Dalmatian seaport Cattaro, has about 5300 inhabitants (exclusive of the garrison); other towns of importance are Podgoritsa (10,000), Dulcigno (5100), Nikshich (5000), and Antivari (2400). In the new territory is Jakova (14,000).

Elementary education is free and nominally compulsory, but illiteracy, especially among females, is common. There are about 120 primary schools, an agricultural school, a few secondary schools, and a theological seminary. The government until December, 1905, was a mild paternal despotism depending on the will of the Prince, who filled all executive offices; under the absolutist régime only the best men filled every grade of offices throughout the country. In 1905, however, the Prince promulgated a constitution and summoned a National Assembly (Skupshtina) of members popularly elected. A parliamentary régime was therefore introduced. On the occasion of the fiftieth anniversary of his accession Prince Nicholas, in virtue of an enactment of the Skupshtina, assumed the title of King, Aug. 28, 1910. The country also has a complete system of local government. There are several hundred village councils, elected every three years, levying taxes, distributing charities, and appointing supervisors of education.

The state revenue amounts to between $700,000 and $800,000 a year and is derived chiefly from customs, monopolies, and land tax. Austrian, Russian, and Turkish money, weights, and measures are in use.

The external trade is small. In 1905 the imports amounted to about $944,000, and the exports to $346,000; in 1911 to $1,631,000 and $478,000. The leading exports include hides, wool, horses, cattle, olive oil, and sheep. Cattle are shipped to Malta, Austria, Italy, and France. The chief imports are salt from Turkey, petroleum from Russia (both government monopolies), maize, cottons, hardware, sugar, coffee, and rice. In 1911 over half of the imports came from Austria-Hungary. The construction of a narrow-gauge railway from Antivari to Nikshich (about 100 miles) has been begun. This line will facilitate the development of iron mines. There are reported 538 miles of telegraph line.

Army. The armed forces of Montenegro constitute a true militia. Service is universal and compulsory between the ages of 18 and 62 as follows: 2 years in the training class, 33 years in the active army, 10 years in the reserve.

The active army comprises two classes: those physically fit for all field work; those suitable only for service in the transportation, supply, and sanitary units. Each year during the two years' training service the men receive three months' instruction if assigned to the artillery, two months' if to the infantry. There is no cavalry. The active army, so-called—33-year period—may be called to the colors annually for a period of 10 or 15 days. The reserves—10-year period—are assembled once a year for muster and may also be mobilized for manœuvres. Men unable to perform military duty are taxed for the support of the army in proportion to their income.

There are three infantry divisions of three brigades each, one division of two brigades. Total battalions 56, of which three are Moslems. War strength between 30,000 and 40,000 men. Annual budget about $1,250,000, of which Russia contributes $350,000.

History. Montenegro belonged in the Middle Ages to the great Servian Kingdom, but after the power of the Servians was broken by the Turks in 1389 at the battle of Kossovo (q.v.) the Montenegrins under their Prince, who was of the royal blood of Servia, maintained their independence, though compelled to relinquish the plains about Scutari, with their chief fortress of Zabliak, and to confine themselves to the mountains (1485). In their warfare against the Turks the Montenegrins leaned upon Venice, mistress of the eastern coast of the Adriatic. In 1516 their last secular Prince resigned his office and transferred the government to the Vladika, or Bishop, and the secular and ecclesiastical authority was thereafter united in the Prince-Bishop. The dignity of Prince-Bishop was elective; by the side of the chief magistrate was a civil governor. The Ottoman rulers continued to assert their claims to Montenegro and included it in the Pashalic of Scutari; but the Montenegrins, in their rocky fastnesses, succeeded generally in asserting their independence, and more than once the Moslem invaders met with disaster. In 1696 the office of Vladika ceased to be elective. In that year the present reigning dynasty of Petrović-Njegoš was inaugurated in the person of Danilo Petrovič. For a century and a half the succession was from uncle to nephew, the Vladika not being permitted to marry. In 1710 the Montenegrins sought and obtained the protection of Russia, the Czar agreeing to grant them an annual subsidy, while they, on their part, agreed that the Vladika was to be consecrated by the Czar. In 1796 the Prince-Bishop Peter I defeated the Pasha of Scutari, who had invaded Montenegro, and for the next quarter of a century there were no more Turkish invasions. The Montenegrins rendered important aid to Russia at the beginning of the nineteenth century against the French in Dalmatia and took a prominent part in the attack on Ragusa and the capture of Curzola, but they were not allowed to realize their dream of becoming masters of the seaport of Cattaro. Peter II, who ruled from 1830 to 1851, made great efforts to civilize his people and improve their condition. He established the Senate, introduced schools, and endeavored, though unsuccessfully, to put an end to internal feuds and predatory expeditions into the neighboring provinces. In 1851 the last Prince-Bishop died, and his successor, Danilo I, in 1852 separated the religious from the secular supremacy, retaining the latter under the title of Gospodar, or Prince. In 1852 war broke out with the Turks, who, under Omer Pasha, invaded the country, but through the intervention of the Powers peace was arranged Feb. 15, 1853. In 1855 Danilo decreed civil and religious liberty for his subjects, and in the following year he went to the Paris Conference to obtain recognition of the independence of Montenegro, but his efforts were unavailing. On Aug. 11, 1860, he was assassinated by a Montenegrin whom he had exiled. In the first year of the reign of his nephew and successor, Prince Nicholas, the Montenegrins stirred up an insurrection against the Turkish rule in Herzegovina, which was soon suppressed, and in return they were so hard pressed by the Turks that they were glad to agree to a treaty (1862), by which the sovereignty of Turkey over Montenegro was recognized. The more serious insurrection that broke out in Bosnia and Herzegovina in 1875 caused Prince Nicholas, in conjunction with Prince Milan of Servia, to declare war against Turkey (July, 1876). As the Servians suffered reverses, an armistice was arranged in November; but with the entrance of Russia into the struggle in the following spring the Montenegrins renewed their war. By the Treaty of Berlin (1878) the European Powers recognized the independence of Montenegro with an enlarged territory, including Nikshich, Podgoritsa, and the port of Antivari, together with the seaboard district thereto appertaining. This was guarded by a restriction prohibiting Montenegro from having a navy and providing that its waters should be closed to ships of war of all nations. In 1880 the Great Powers, against the protests and armed resistance of the Turks, made over Dulcigno to Montenegro. In 1896 the bicentenary of the Petrović dynasty was commemorated, and in the same year Princess Helena, a daughter of Prince Nicholas, married the Italian prince who subsequently (1900) became King Victor Emmanuel III. In October, 1905, the Prince proclaimed the abolition of the autocratic system and summoned a popular National Assembly which met on December 19. The Prince thereupon promulgated a Liberal constitution to which he took an oath, and a regular parliamentary government with a responsible ministry was instituted. On Aug. 28, 1910, Prince Nicholas celebrated the golden jubilee of what had been on the whole a most successful and auspicious reign by assuming the title of King. The Montenegrins sympathized more or less openly with the Albanian insurrections of 1910–11 against Turkey and afforded a refuge for hard-pressed tribesmen, especially for the Christian Malissori. Repeated conflicts between Turks and Montenegrins on the border aroused a strong national desire for war, and it was not surprising that Montenegro joined with Greece, Bulgaria, and Servia in forming (March, 1912) the Balkan Alliance against Turkey. Montenegro preceded her allies in the formal declaration of hostilities by nine days (October, 1912). In the ensuing Balkan War (q.v.) the chief Montenegrin offensive was directed against Scutari, which capitulated on April 23, 1913; while a smaller Montenegrin force, in conjunction with a Servian army, occupied the seaports of Alessio and San Giovanni di Medua. Much ill feeling was engendered in Montenegro, as well as in Servia, by the high-handed diplomacy

and military threats which Austria-Hungary employed in order to establish an independent Albania and thereby to deprive Servia of part of her conquests and of any outlet on the Adriatic. A show of force was required from the Great Powers to compel Montenegro to surrender Scutari to the new Principality of Albania (May, 1913). In the second phase of the Balkan War, Montenegro joined with Servia, Greece, and Rumania against Bulgaria and, in accordance with the Treaty of Bucharest (Aug. 6, 1913), received from Servia, as compensation for assistance in the Balkan War, approximately a half of the Sanjak of Novi Bazar, including Plevlye, Byelopolye, Ipek, and Djakova. The Balkan War nearly doubled the territory and population of the mountain kingdom. This successful issue of the joint action of Montenegro and Servia against their hereditary Turkish enemy served immediately to turn the patriotic instincts of their common Serb nationality against their feared and hated Austro-Hungarian enemy. The Montenegrins had shared with the Servians the bitterest feeling for their northern neighbor ever since Austria-Hungary in 1908 had annexed the Serb provinces of Bosnia and Herzegovina—a feeling which the attitude of the Dual Monarchy during the Balkan War had not tended to alleviate. Montenegrins as well as Servians no doubt countenanced numerous plots in Bosnia against Hapsburg rule, and, following the assassination of the Austrian Archduke Franz Ferdinand at the Bosnian capital on June 28, 1914, and the outbreak of war between Austria-Hungary and Servia, Montenegro threw in her lot with Servia (Aug. 8, 1914) and thereby became a party to the great War in Europe (q.v.).

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MONTENOTTE, mŏn'tā-nŏt'tā. A village in the Province of Genoa, Italy, 26 miles west of Genoa. Here, on April 12, 1796, Napoleon won his first victory over the Austrians under Argenteau.

MONTÉPIN, môn'tā'păn', Xavier Aymon, Count de (1824–1902). A French writer, born at Apremont (Haut-Saône). He studied at the Ecole des Chartes, entered journalism in 1848, founded *Le Canard,* was a contributor to the antirevolutionary *Pamphlet* and *Lampion,* and with De Calonne published two satirical pamphlets, *Les trois journées de Février* and *Le gouvernement provisoire.* He wrote almost 100 works of fiction, originally published as feuilletons in the *Petit Journal,* and more than a score of plays. His plays were frequently the result of collaboration, and in several instances were based upon his own stories. Titles of the former include: *Les chevaliers du lansquenet* (1847); *L'Officier de fortune* (1857); *Le ventriloque* (1876); *Le secret de Titan* (1883); *La policière* (1897); of the latter, *Le connétable de Bourbon* and *Tabarin* (1873), with Grangé.

MONTE PINCIO, mŏn'tā pēn'chō. See Pincian Hill.

MONTEPULCIANO, mŏn'tā-pul-chä'nō. An episcopal town in the Province of Siena, Italy, 28 miles southeast of Siena (Map: Italy, C 3). It is situated 6 miles from its railway station, at an altitude of 1970 feet. It is surrounded by mediæval ramparts, has interesting houses, palaces, churches, and a cathedral of the sixteenth century built by Bartolommeo Ammanati. It contains a monument by Michelozzo. Its institutions include a technical school, Gymnasium, and library. The chief trade is in silks and wines. Pop. (commune), 1901, 15,399; 1911, 15,994.

MONTEREAU, môn't'-rō'. A town in the Department of Seine-et-Marne, France, at the confluence of the Seine and Yonne, 49 miles southeast of Paris by rail (Map: France, N., H 4). Its chief buildings are the thirteenth-century parish church and the Château of Surville. The manufactures include porcelain, pottery, brick, tile, shoes, varnish, dyes, and agricultural machinery, and there is general commerce in agricultural produce and cattle. On the bridge across the river John the Fearless, Duke of Burgundy, was assassinated in 1419, at the instigation and in the presence of the Dauphin, afterward Charles VII; and in the immediate vicinity, on Feb. 18, 1814, Napoleon gained his last victory over the Allies, an event commemorated by a bronze equestrian statue of the conqueror, on the bridge, by Pajol. Pop., 1901, 7929; 1911, 8617.

MONTEREAU, Pierre de. See Montreuil, Pierre de.

MONTEREY, mŏn'te-rā'. A city in Monterey Co., Cal., 127 miles by rail south by east of San Francisco, on Monterey Bay, on the Southern Pacific Railroad, and on the Pacific Coast and North Pacific steamship lines (Map: California, D 6). The leading industries are farming, cattle raising, fishing, and canning. Monterey is important as a resort. It has an admirable site with beautiful surroundings, an excellent harbor, a climate remarkably mild and equable, and fine facilities for bathing. There are interesting specimens of the picturesque architecture left from the Spanish occupation. Among the many points of interest are the San Carlos and Carmel missions, the old customhouse, the famous 17-mile drive, Colton Hall, in which the convention in 1849 met to frame the state constitution, and the public library. Monterey has adopted the commission form of government. Pop., 1900, 1748; 1910, 4923.

In 1770 the Spanish established here the mission and presidio of San Carlos Borromeo de Monterey. In 1818 the place was captured by insurgents. From 1840 to 1845 it was the capital of the province. It was captured and held for a day in 1842 by Commodore Jones (U. S. N.), acting under the impression that war had broken out between Mexico and the United States. In 1846 (July 7) the American flag was raised here by Commodore Sloat, and in 1847 Monterey became the seat of the military government of California. Three years later it was incorporated as a city.

MONTEREY, Battle of. After the battles of Palo Alto and Resaca de la Palma (qq.v.), during the war between the United States and Mexico, General Taylor remained for some time at Matamoros and in September, 1846, with a force of about 6700 men proceeded against Monterey, then strongly fortified and defended by some 9000 Mexicans, of whom 3000 were regulars, under General Ampudia. On September 19 he arrived before the city and on the 21st simultaneous attacks were made by Generals Worth and Garland on the fortified heights west of the city and the redoubts on the east respectively. The former succeeded, but the latter was repulsed with considerable loss. The fighting continued on the 22d and 23d, General Worth entering from the west and driving the Mexicans before him until they reached the strongly fortified position in the middle of the city. General Ampudia then made overtures of surrender and on the 24th the terms were finally fixed—the Mexicans to march out of Monterey (Mex., Monterrey) with their small arms and accoutrements, one field battery, and 21 rounds of ammunition, seven days being allowed them to evacuate; a mutual armistice of eight weeks was agreed upon; and the munitions of war and supplies, together with the city and its fortifications, were to be left in the hands of the Americans. To many the terms granted by General Taylor have appeared too generous and even by the administration at Washington much dissatisfaction was felt. His judgment was sustained, however, by competent military men and was generally approved throughout the United States both by civilians and experts. During the three days the Americans lost more than 500 in killed and wounded, the Mexicans a very much larger number, though the exact figures have never been determined. Consult: H. O. Ladd, *The War with Mexico* (New York, 1883); O. O. Howard, *General Taylor* (ib., 1892); R. M. McElroy, *The Winning of the Far West* (ib., 1914).

MONTERO RÍOS, mŏn-tā′rō rē′ōs, Eugenio (1832–1914). A Spanish statesman and jurisconsult, born at Santiago (Coruña) Nov. 13, 1832. He studied philosophy, law, and theology at Santiago and jurisprudence at Madrid. After holding the chair of ecclesiastical discipline at the universities of Oviedo and Santiago, and that of canon law at Madrid, he was elected (1869) Progressive deputy in the Constituent Cortes. In a brilliant polemic in *La Iberia*, against the Archbishop of Santiago, he discussed the fifth basis of the constitution of the state and proved himself one of the most learned canonists and theologians in Europe. One of the studies that most attracted public attention was a discourse read before the faculty of the University of Santiago, *El Ultramontanismo y el Cismontanismo.* In the Constituent Cortes, when the religious question was discussed, he made a sound and able defense of liberty of conscience. In 1870–72, while Minister of Justice in the cabinet of General Prim, he established civil marriage and the court of appeals in criminal cases, reformed the mortgage law, and brought about the adoption of a new penal code and the establishment of juries. Between 1885 and 1899 he held various cabinet, legislative, and high judicial offices, and in 1898 was appointed president of the Spanish Commission of Peace to treat with the United States Commission at Paris. On the death of Sagasta he became leader of the Liberals; served as president of the Council of Ministers (1905); and was again president of the Senate (1910). Chambers of commerce in Spain owe their establishment to him. Montero Ríos died at Madrid, May 12, 1914.

MONTE ROSA, mŏn′tă rō′zȧ. Next to Mont Blanc the highest peak in the Alps. It is situated on the boundary between Italy (Piedmont) and the Swiss Canton of Valais, where the Pennine and the Lepontine Alps meet (Map: Italy, A 1). It has eight principal peaks, all exceeding 13,000 feet in height, and the highest, the Dufour Spitze, attaining an altitude of 15,217 feet, 564 feet less than that of Mont Blanc. It is covered with glaciers on all sides and has an abrupt, almost precipitous slope on the east, while on the west the great Gorner Glacier slopes more gradually towards the base of the Matterhorn. The main structure of the mountain is gneiss, while the upper parts consist of mica slate. Iron, copper, and gold are found and several mines are worked, one at an altitude of 11,000 feet. The passes over the chain near Monte Rosa are among the loftiest and most difficult in the Alps, and the peak itself is very difficult of ascent. The climbing of this mountain was first accomplished by the Smith brothers in 1855.

MONTERREY, mŏn′tă-rā′. The capital of the State of Nuevo León, Mexico, situated 1600 feet above sea level, 160 miles west of Matamoros (Map: Mexico, J 5). It is a handsome city with well-paved and clean streets and is surrounded by beautiful gardens and orchards. The town has a fine cathedral and government buildings, and among its educational institutions are schools of law and medicine and a theological seminary. It is an important railroad centre and is second only to Mexico City in commercial activity, carrying on an extensive trade with the United States. Its industries include large smelters, an electric-light and power plant, a foundry, breweries, ice factories, and flour mills. Silver mining and agriculture are carried on in the surrounding region. Much American capital is invested in Monterrey, which is the seat of a United States consul. Pop., 1895, 45,695; 1910, 78,528. Monterrey was founded under the name of León in 1581 and received its present name in 1599. See Monterey, Battle of.

MONTES, mŏn′tȧs, Ismael (c.1856–). A Bolivian statesman and President. He was educated for the law in the University of La Paz, but in 1879 entered the army, serving with distinction in the war against Chile. Afterward he practiced law, reached the rank of colonel in the army, and in 1903 became acting Minister of War. During the insurrection of the Brazilians in the Acre region, in this latter year, Montes again distinguished himself as a military leader. In 1904 he was elected to the presidency, and because of the death of his successor, Dr. Guachalla, in 1908, before his inauguration, Montes continued in office a year beyond the regular term, pending a new election. Under his able administration the country made rapid progress along economic lines, especially in the extension of the railway system. In 1910 Montes was appointed Minister to England, and while in Europe he negotiated new loans under favorable conditions for Bolivia. He was re-elected President in 1913 and continued his energetic efforts to better the financial and

economic conditions of the country. The principal achievement of his second term was the passage of a law providing for much needed reforms in the banking system (1914).

MONTESA, mŏn-tā'sȧ, Order of our Lady of. An order founded in 1317 by James II of Aragon to take the place of the Templars after their dissolution. The city and castle of Montesa in Valencia were given to it and it was endowed with the property formerly belonging to the Templars. It acknowledged the Order of Calatrava as its superior. In 1587 it was united with the Spanish crown and is now a court order with two classes.

MONTE SAN GIULIANO, mŏn'tȧ sȧn jo͞o-lyä'nō. An episcopal town in the Province of Trapani, Sicily, situated on a mountain 2450 feet above the sea, 4 miles northeast of the town of Trapani. On the mountain (anciently Eryx, q.v.) are the remains of a famous temple of Venus, also a spring dedicated to the goddess. The town has a fourteenth-century church and remains of numerous ancient buildings. There are oil works and marble pits. Pop. (commune), 1901, 28,939; 1911, 28,663.

MONTESANO, mŏn'tē-sā'nō. A city and the county seat of Gray's Harbor Co., Wash., 48 miles by rail west by south of Olympia, at the head of tide-water navigation on the Chehalis River, and on the Chicago, Milwaukee, and St. Paul and the Northern Pacific railroads (Map: Washington, B 4). It is in a lumbering, dairying, and farming district and has salmon fisheries, a creamery, and manufactories of incubators and brooders, shingles, sash and doors, etc. There is a salmon hatchery on the Chehalis River, 3 miles above the town. Montesano contains splendid courthouse and city hall buildings. Pop., 1900, 1194; 1910, 2488.

MONTE SANT' ANGELO, mŏn'tȧ sänt än'jȧ-lō. A town in the Province of Foggia, Italy, situated near the Gulf of Manfredonia, 27 miles northeast of Foggia, on one of the Gargano mountains, 2765 feet above sea level (Map: Italy, E 4). The grotto church of St. Michael is visited yearly by many pilgrims, particularly during the festival season in May. It contains fine tombs and sculptures. Pop. (commune), 1901, 21,870; 1911, 23,012.

MONTESES, mŏn-tēs'ĕs. A general term often applied to the pagan tribes of the southern Philippines. In a more limited way it is used to designate the dwellers in the interior of Panay and Negros islands. These people represent the conservative element of the Visaya, who refused Spanish rule and Christianity and retired to the mountains. See Philippine Islands.

MONTESINOS, mōn'tȧ-sē'nôs, Fernando (c.1593–c.1655). A Spanish historian. In his youth he went to Peru and eventually became a member of the Supreme Administrative Council at Lima. While employed in this capacity he visited different parts of Peru, studying Peruvian history. The fruits of his archæological research appeared in two historical works, the *Anales Nuevas del Perú* and the *Memorias antiguas historiales del Perú,* which was translated into French and published in Paris, 1840, as volume xvii of Henri Ternaux-Compans's *Voyages, relations, et mémoires originaux,* under the title *Mémoires historiques sur l'ancien Pérou.* This latter work is now most easily consulted in the edition published in the *Colección de libros españoles raros ó curiosos,* vol. xvi, under the title *Memorias antiguas historiales y políticas del Perú,* edited by Marcos Jiménez de la Espada (Madrid, 1882).

MONTESPAN, môn't'-spän', Françoise Athénaïs de Rochechouart de Mortemart, Marquise de (1641–1707). Mistress of Louis XIV. She was born at the Château of Tonnay-Charente, the second daughter of the Duke of Mortemart. She was the wittiest and most beautiful member of a family renowned for its wit and beauty, and soon became the most popular of the Queen's ladies in waiting at Versailles. She married the Marquis de Montespan in 1663. In 1668 she became the King's mistress, sharing her power for some years with La Vallière (q.v.), whom she finally supplanted. Till 1679 she ruled the King and the court, dictated matters of policy, and was uncrowned Queen of France. From that time on she was gradually supplanted in the King's affections by Madame de Maintenon, whom she had hired as governess for the children she had borne the King. She left court about 1687, wandered disconsolately over France, and finally found peace in a convent. Of her children by the King the best known were the Duke de Maine, the Count de Toulouse, Mademoiselle de Nantes, and Mademoiselle de Blois, who married the subsequent Regent Orléans.

MONTESQUIEU, môn't'-skyē, Charles de Secondat, Baron de la Brède et de (1689–1755). One of the most celebrated politico-philosophical writers of France. He was born Jan. 18, 1689, at his father's Château of Brède, near Bordeaux, of a distinguished family of lawyers. He was a brilliant, versatile scholar, illuminating solid legal attainments by an ardent love of classics and science. In 1714 he was appointed a councilor of the Parlement of Bordeaux, and two years later, president of the Parlement. He cared nothing, however, for the routine of legal practice or for the requirements of official duty, and as his fortune was ample he was enabled to gratify his taste for study, travel, and observation without hindrance. His first published work was the famous *Lettres persanes* (1721), in which he ridicules, with exquisite humor and perspicuous criticism, the religious, political, social, and literary life of his countrymen, a proceeding involving some risk of persecution but for his device of placing his comments in the mouths of two Persians of distinction supposed to be traveling in Europe. Although he did not spare the Academy in these letters, he was made a member of it in 1728. In 1726 Montesquieu resigned his office in the Parlement of Bordeaux and spent some years in foreign countries. A two years' sojourn in England, in the course of which he moved in influential circles and had an opportunity to observe English political conditions, made him an admirer of the English political system, which inspired his greatest work, *L'Esprit des lois.* After his return to France he published his *Considérations sur les causes de la grandeur et de la décadence des Romains* (1734), a masterly review of Roman history. It was followed after a long interval by his *Dialogues de Sylla et d'Eucrate, et de Lysimaque* (1748), published under an assumed name, in which the motives and feelings of a despot are skillfully analyzed. In the same year appeared his great work, on which he had been engaged for 20 years, the *Esprit des lois,* in which he attempted to discover the relation between the laws of different

countries and their local and social circumstances. The book proved immensely popular.

The *Esprit des lois* is one of the classics of political science, one of the path-breaking works in establishing the science of politics upon an historical rather than an a priori basis. It has assured Montesquieu a place among the foremost political philosophers of all times. Without adopting Voltaire's hypereulogistic criticism, that "when the human race had lost their charters, Montesquieu rediscovered and restored them," it may be said that it was the first work in modern times in which the questions of civil liberty were ever treated in an enlightened and systematic manner. The *Esprit des lois*, next to Locke's *Essay on Government*, was probably the political work best known to the statesmen of the American Revolution and early constitutional period, and its influence was marked in the discussions attending the adoption of the Constitution. It was bitterly attacked in Montesquieu's own day for its radical attitude in regard to the Church and religion and for its alleged Anglomania, but it was admired by the reform party in France and by the Moderates of the French Revolution, though not popular in France in later days. It is divided into 31 parts. The first eight deal with laws in general, their nature and principles; the next five with laws relating to offense and defense, political liberty, and taxation; the next twelve with laws in relation to climate, soil, manners and customs, commerce, population, and religion; the twenty-sixth deals with laws in their relation to the affairs which they determine; the remaining five books, relating to Roman, French, and feudal law, are a kind of historical supplement. The collective editions of his works are numerous. The best is that of Laboulaye in seven volumes (Paris, 1875–79). All of his important works have been translated in numerous editions. The best short work on Montesquieu is Sorel, *Montesquieu*, translated by Masson (London, 1887); the standard authority is Vian, *Histoire de la vie et des œuvres de Montesquieu* (Paris, 1879). There are good essays by Doumic, Brunetière, and Zevort. Consult also: E. J. Lowell, *Eve of the French Revolution* (Boston, 1893); C. P. Ilbert, *Montesquieu* (Oxford, 1904); E. P. Dargan, *Æsthetic Doctrine of Montesquieu* (Baltimore, 1907). A complete bibliography of the literature dealing with Montesquieu has been published by L. Dangeau (Paris, 1874).

MONTESQUIOU, Robert, Count de (1855–1921). A French poet and essayist, born in Paris. His first verse, in the volume *Les chauves-souris* (1892, new ed., 1907), attracted much attention because of its unusual form, imaginative quality, and a certain fastidiousness of language, characteristic of all his writings. His poetical works include: *Le chef des odeurs suaves* (1894; new ed., 1907); *Le parcours du rêve au souvenir* (1895; new ed., 1908); *Les hortensias bleus* (1896); *Les perles rouges* (1899); *Les paons* (1901; new ed., 1908); *Prières pour tous* (1901). He also became well known as a "conférencier du salon," and in this capacity he visited the United States in 1903. His other writings include: *Roseaux pensants* (1897); *Autels privilégiés* (1899); *Professionnelles beautés* (1905); *Altesses sérénissimes* (1907); *Passiflora* (1907); *Assemblée de notables* (1909); *La petite mademoiselle* (1911); *L'Inextricable graveur Rodolphe Bresdin* (1913).

MONTESSORI, mŏn'tĕs-sō'rē, Maria (1870–). An Italian educator. She studied medicine at the University of Rome and was the first woman in Italy to secure the degree of Doctor of Medicine (1894). Her interest in education came through her experience as assistant doctor at the psychiatry clinic of the university. Here she became interested in the training of feeble-minded children, a subject on which she read a paper at the Pedagogic Congress at Turin in 1898. At the request of Signor Barcelli, then Minister of Education, she delivered a series of lectures to teachers in Rome, which led to the establishment of the Orthophrenic School for feeble-minded children. As principal of this school (1898–1900) she put into practice the ideas of Itard and Séguin (q.v.). The success of her work with idiots led her to turn her attention to the education of normal children. As a preparation for this work she returned to the University of Rome to study experimental psychology and at the same time to investigate the prevailing practices of the ordinary schools. The opportunity of putting her theories into practice offered itself in 1907 when the proposal was made to establish a school in connection with the tenements erected by the Roman Association for Good Building for working-class tenants. The first House of Childhood (Casa dei Bambini) was opened in January, 1907, and was soon followed by others. Dr. Montessori maintained her connection with these schools until 1911, when she turned her attention to experiments for extending her methods and applying them to older children. Her work attracted wide attention among laymen as well as among professional educators. She has set forth her principles in two works, *Antropologia pedagogica* (Eng. trans. by F. T. Cooper, *Pedagogic Anthropology*, New York, 1913) and *Il metodo della pedagogia scientifica applicato all' educazione infantile nelle case dei Bambini* (Eng. trans. by Anne E. George, *The Montessori Method*, New York, 1912). For bibliography see under Montessori System.

MONTESSORI SYSTEM. An educational experiment conducted in Rome by Dr. Maria Montessori (q.v.), which attracted considerable attention throughout the world between 1910 and 1912. It is difficult to estimate its value at this stage. To some educationalists it is the greatest educational advance since Fröbel; by others it is regarded merely as a restatement of the educational theory of the Rousseau-Pestalozzi-Fröbel group, with a few additions which in themselves are not of great value. For several reasons the work aroused the greatest interest in Europe and America; it came at a moment when the educational world had reached a transition period and was ready to take a step forward; the experiment in itself met with great success in the particular situation with which Dr. Montessori had to cope; finally, it has received not a little purely commercial advertising. In a very short period the movement has inspired a considerable body of literature, both popular and professional.

Dr. Montessori approached the task of educating normal children after a successful application of the principles of Itard and Séguin to the education of defective and feeble-minded. Success in this field led her to inquire into the reasons for the comparative retardation of normal pupils in the ordinary schools taught by the usual methods of instruction. After de-

voting herself to the study of experimental psychology and the observation of children she concluded that the traditional school methods were calculated to repress the pupils mentally, to insist on their passive obedience, to restrict their spontaneous activities, and to superimpose the will of the teacher on their individuality. In this way she arrived at the central principle of her system, which has perhaps attracted more attention than any other and as a restatement of an old doctrine is of more permanent value. This principle is the doctrine that the pupils should be allowed freedom to unfold themselves, that the liberty of the pupils in their spontaneous manifestations "should be encouraged, and that such liberty and spontaneity could only be attained by auto-education." The teacher in such a system ceases to be a dictator and becomes a supervisor and guide; the pupils have no other incentive to work than the joy of work without the stimulus of rewards and punishments; the impelling force comes from within and is no longer imposed from without; and concentration on attractive occupations leads to self-control without the intervention of restrictive discipline. Students of the development of the theory of education in the last century will recognize that this principle is by no means revolutionary. Dr. Montessori's contribution consists largely in carrying this principle into practice. The Houses of Childhood (Case dei Bambini) are revolutionary in having none of the earmarks of the traditional school; there are no time-tables, no prescribed lessons, and no classes. Each child is an individual and as such follows his own inclination, the function of the teacher being to put occupations in his way. The traditional restrictions in the form of fixed school furniture are removed and are replaced by light furniture that the children can easily move about. Practically the only formal lessons employed consist of a little physical exercise and marching. Dr. Montessori insists that the failure of the traditional school has been due to preconceived theory and philosophy; she claims to have no philosophy and to base her work entirely on scientific experimentation and methods. And, yet, although anthropological measurements and teachers' observations of the pupils are recorded, no known application of these appears to be made.

The second fundamental principle, which after all must be regarded as the outcome of a philosophy of education, is the emphasis on the training of the senses and muscles in the early stages of development. The aim is not, as it has been with other educational theorists, the imparting of knowledge on information through the senses, but "the refinement of differential perceptions of stimuli by means of repeated exercises." Here are introduced the occupations which furnish opportunities for auto-education. For this purpose there has been invented the "didactic apparatus," which consists of 26 items for the training of all the senses except taste and smell. The child using these items educates itself because "the didactic material contains within itself the control of error," since only one thing and that alone can be done with each piece. Among these general senses to be trained are the tactile, thermic, baric, stereognostic, visual, and chromatic. The apparatus for the training of these is supplemented by games, e.g., blindfold games for developing the sense of touch, and games in the dark for the sense of hearing and discrimination of sounds. The exercises were found to be valuable in the training of defectives, but it is questionable whether they are of equal service in the education of the normal child. So much that is claimed for this work is based on the discarded theory of formal discipline that there is here evidence that the inventor's study of psychology did not carry her very far. Another criticism is that the apparatus is in fact restrictive and does not afford adequate expression for many of the child activities. Indeed, while desiring to avoid "preconceptions," Dr. Montessori, although claiming here to be scientific, is in reality imposing an invention of her own. It must be noted that the apparatus differs from the Fröbelian gifts; it is not intended to afford opportunities for play activities but for intellectual growth alone. For Dr. Montessori does not favor play and has been quoted as saying, "If I were persuaded that children needed to play, I would provide the proper apparatus; but I am not so persuaded."

But while the didactic materials appear to be somewhat remote from practical life and processes they are supplemented by activities of practical life. Since the children in the Houses of Childhood remain at school all day opportunity is offered in training them to dress, to be of service to others, to serve meals, to wash dishes, and to be neat and clean. They are taught to dress themselves by learning how to button, lace, hook, and clasp articles of dress by the use of special apparatus consisting of light wooden frames to which are attached materials with which to perform the appropriate processes.

The features in the Montessori system that have attracted the greatest popular attention are perhaps those to which Dr. Montessori attaches least value. These are the methods of instruction in the formal studies, especially writing and reading. The sense and muscular training developed by the apparatus is made the basis of the writing lessons. The pupils learn to recognize the symbols by the use of sandpaper letters mounted on cardboard, by means of which they "establish the visual-muscular image of the alphabetical signs"; after learning the shape and contour of the letters they are trained to pick out the letters and to pronounce the sounds; lastly comes the composition of words. The muscular control is further trained by exercises for outlining and filling in geometrical figures with chalk. All the acts necessary for writing are thus mastered before actual writing is begun; after this preparation the pupil "explodes into writing," and in a period varying according to age from one to three months rapidly attains an ability that is not secured by the ordinary school methods in as many years. While this must be recognized as a great contribution, further experimentation is necessary before its value for teaching a language not so phonetic as the Italian has been proved. The methods of teaching reading and arithmetic do not contain anything of special value, or that has not been practiced before in some form or other.

Probably some more years of experimentation and observation of the results of the system must elapse before a true estimate of the Montessori doctrines can be formed. Attempts are already being made to adapt the principles, applied up to the present mainly to children between three and seven years of age, to higher

classes. Montessori schools have been established all over the world, mainly through private effort, but in Switzerland they have been established publicly by a law of 1911. Of undoubted value is the renewed emphasis on the doctrine of liberty of the pupil, which Dr. Montessori carries out more logically than did Fröbel in his kindergarten. In line with contemporary theory, too, is the insistence on scientific experiment in education rather than empiricism or preconceptions or obscurantism. But Dr. Montessori here does not seem well informed on what has already been done in scientific education or in the practice of kindergartens and infant schools. Valuable also is her contribution on the method of teaching writing. The chief criticism that may be brought against the system is its neglect of practical life activities; it is true that to a slight extent they find a place in her work, but only to a slight extent. Those activities usually associated with child life—plays and songs and stories, the constructive and inventive activities, the development of the imagination—find no place in the scheme. As compared with the attempts of John Dewey to carry into practice the doctrine of freedom and self-activity, the Montessori system fails just because Dr. Montessori's conception of education is much narrower than life and because in place of life activities she provides only a set of mechanically simple devices. But the contribution of the system will have been effective if it does nothing more than stimulate thought and criticism of the traditional practices.

Bibliography. D. F. Fisher, *A Montessori Mother* (New York, 1912); A. T. Smith, *The Montessori Method* (Washington, 1912); D. F. Fisher, *The Montessori Manual* (Chicago, 1913); E. Y. Stevens, *A Guide to the Montessori Method* (New York, 1913); F. E. Ward, *Maria Montessori and the American School* (ib., 1913); William Boyd, *From Locke to Montessori: A Critical Account of the Montessori Point of View* (ib., 1914); W. H. Kilpatrick, *The Montessori System Examined* (Boston, 1914). For Dr. Montessori's own works, see under MONTESSORI, MARIA.

MONTEVERDE, môn'tā-vâr'dā, or **MONTEVERDI,** -vâr'dē, CLAUDIO (1567–1643). An Italian composer, born at Cremona. He rebelled against the limited and arbitrary musical rules of his day and made valuable innovations, especially in harmony, so that his music approaches closely to our modern system of major and minor modes. He was a pioneer in the movement that led to modern opera, and the most important representative of the Florentine *stilo rappresentativo.* He improved and enlarged the orchestra, and in his operas treated the instruments with considerable freedom, thus anticipating a real instrumental style as distinct from the purely vocal style then exclusively in vogue. There are even attempts at dramatic characterization by means of instruments. From 1601 to 1612 he was maestro di cappella to the Duke of Mantua. In 1613 he was called in a similar capacity to San Marco in Venice, where he remained till his death. His works consisted in part of: *Orfeo* (1603); *Arianna* (1608); *Il combattimento di Tancredi e Clorinda* (1624); *Proserpina rapita* (1630); *Adone* (1639): *Le nozze di Enea con Lavinia* (1641); *Il ritorno d'Ulisse in patria* (1642); songs, motets, church music, and vespers. Consult: Emil Vogel, "Monteverde," in *Vierteljahrsschrift für Musikwissenschaft* (Leipzig, 1889), and Rafael Mitjana, *Claudio Monteverde y los orígenes de la ópera italiana* (Malaga, 1911). See OPERA.

MONTEVERDE, GIULIO (1837–). An Italian sculptor, born at Bistagno, Liguria. He studied at the Genoa Academy under Varni and afterward removed to Rome, where he became professor at the Academy and a leader of the naturalist movement in sculpture. His works are brilliant, but often lacking in spiritual and intellectual elevation. They include the groups "The Genius of Franklin" and "Jenner Inoculating his Child"; the equestrian statue of Victor Emmanuel at Bologna; the monument to Bellini at Catania; and a "Madonna and Child" in the Campo Santo, Genoa.

MONTEVIDEO, môn'tē-vĭd'ē-ō, *Sp. pron.* môn'tā-vē-dā'ō. The capital of Uruguay, situated on the north shore of the estuary of the Río de la Plata, 68 miles east of Buenos Aires (Map: Uruguay, H 4). It is built on a peninsula running westward from the mainland and inclosing the bay forming the harbor. On the west side of the entrance to the bay, opposite the city, rises the Cerro, a picturesque mountain, in connection with which the name Montevideo is derived. The ground of the peninsula rises gradually from the water on either side to the central ridge, giving the city, besides an imposing appearance, an excellent natural drainage, which, together with its pleasant climate, good water supply, sewerage system, and general sanitary conditions, makes it a very healthful place of residence. The streets are wide, straight, and well paved, and are regularly laid out both in the new and the old quarters. The latter occupies the west end of the peninsula and is the main commercial quarter. The central portion, occupying the east end of the peninsula, contains the cathedral and the chief public buildings. From the base of the peninsula the new parts of the city spread out like a fan over the heights of the mainland, with large avenues in all directions, along nearly all of which street railway lines run to the suburbs.

The principal street is that of the Décimoctavo de Julio, which runs along the central ridge of the peninsula and terminates in the Plaza de la Independencia, the principal square of the city, surrounded by prominent buildings and colonnades. Among the other squares are the Plaza Constitucion, Plaza Zabala, and Plaza Libertad, all beautified by gardens. Many of the streets are lined with shade trees, and the Prado, outside of the city, is a handsome park and promenade. The most notable edifices include the Government Building, University, Ministry of Fomento, Exchange Building, Post Office, School of Arts and Trades, Administration of the Lottery, Municipal Building, National Penitentiary, Insane Asylum, and numerous hospitals, churches, and theatres. The chief educational institution is the university, with faculties of law, medicine, mathematics, and pharmacy. There are also a seminary, a normal school, several Catholic and foreign academies, a national museum, a public library, and a large number of public schools. Its chief industry is meat packing, the products forming a large percentage of its exports. It is the port of call for all steamship lines from Europe to the Pacific, and its location is more favorable than that of Buenos Aires for becoming the principal outlet for the products of south-central South America.

In order to improve its harbor facilities a contract was let in 1899 to a French company for dredging and the construction of breakwaters and docks, involving an expenditure of $15,000,000. When this work was completed in 1909 it did not meet the requirements of the rapidly developing trade and vessels drawing more than 20 feet were still obliged to anchor in midstream. A new project was approved in 1913 providing for further improvements and the deepening of the entrance and a part of the harbor so as to admit the largest vessels, at an estimated expense of about $25,000,000. These improvements are paid for by a tax of 3 per cent on imports and 1 per cent on exports. In 1909, 94 per cent of the imports and 71 per cent of the exports of Uruguay passed through the port of Montevideo, the total value of the imports and exports of the city being respectively $34,251,069 and $32,685,267. The principal exports are wool, hides, meat and meat extracts, animal fat, and live stock, and the imports, cotton goods, iron and steel, sugar, coal, woodwork, woolen goods, wines, machinery, and chemicals. The recent rapid development of the city has been marked by an increase in the population during the past 15 years amounting to about 40 per cent, a considerable portion of which is due to immigration. In 1803 it had a population of 13,937; in 1852, 33,994; in 1860, 57,916; in 1900, 268,334; and in 1914 (est.), 377,994. Foreigners form about one-third of the population, the chief nationalities represented being the Italian, Spanish, and Brazilian.

Montevideo owes its origin to a fort built in 1717 by the Viceroy of Buenos Aires to check the encroachments of the Portuguese. The first settlements of civilians around the fort began in 1726. Its commercial importance was not recognized until 50 years afterward. In the war of independence the Spaniards maintained possession of it until 1814. In 1828 it was made the capital of the new Republic of Uruguay. Between 1842 and 1851 it was besieged at intervals by Oribe (q.v.), who was supported by the Argentine dictator, Rosas, and has since been disturbed by internal dissensions. Peaceful conditions during a number of years and its great natural advantages have contributed to its present state of prosperity. Consult: Bordoni, *Montevideo e la repubblica dell' Uruguay* (Milan, 1885); C. M. Maeso, *Tierra de promisión* (Montevideo, 1906); N. Estrada, *Uruguay contemporáneo* (Valencia, 1907); W. H. Koebel, *Uruguay* (New York, 1913).

MON'TEVID'EO. A city and the county seat of Chippewa Co., Minn., 134 miles by rail west of Minneapolis, at the confluence of the Minnesota and Chippewa rivers and on the Chicago, Milwaukee, and St. Paul Railroad (Map: Minnesota, B 6). It has a Carnegie library, a State high school, public hospital, and Windom College (Congregational), and attractive courthouse and city hall buildings. The industrial establishments include several grain elevators, flouring mills, canning, gate, and broom factories, and a creamery. There is in the vicinity a fine monument which marks the surrender of the Sioux chief Little Crow in the Indian outbreak of 1862. Pop., 1900, 2146; 1910, 3056.

MONTE VISTA, mŏn'tē vĭs'tȧ. A city in Rio Grande Co., Colo., 150 miles west of Pueblo, on the Denver and Rio Grande and the San Luis Central railroads (Map: Colorado, C 4). It contains the State Soldiers and Sailors Home. Monte Vista has extensive stock-raising interests and a large sugar refinery. The surrounding country is well irrigated and adapted to the growing of alfalfa, grains, potatoes, and sugar beets. Pop., 1900, 556; 1910, 2544.

MONTEZ, mŏn'tĕs, Lola (?1818–1861). The assumed name of Maria Dolores Eliza Rosanna Gilbert, an adventuress, born in Ireland, in 1818 according to some, in 1824 according to her own statement. When very young she married a Captain James, followed him to India, grew weary of him and came back to Europe. She appeared as a danseuse in nearly all the continental capitals, and attracted a fair amount of notoriety by her beauty and escapades. In 1847 she became the mistress of King Louis I of Bavaria, who made her Countess of Landsfeld and allowed her to have considerable influence in the government. An insurrection in 1848 drove the King from his throne and Lola from Munich. She went to London, married George Heald, a guardsman, was divorced from him quickly, and came to America in 1851. She traveled over the country, acting in a play entitled *Lola Montez in Bavaria*, married a number of times, lectured, published books, and finally settled in New York, devoting herself to rescue work. Her writings comprise *The Arts of Beauty* and *Lectures* (1858), the latter containing an autobiography.

MON'TEZU'MA. A town and the county seat of Poweshiek Co., Ia., 72 miles east of Des Moines, on the Minneapolis and St. Louis and the Chicago, Rock Island, and Pacific railroads (Map: Iowa, E 3). There are considerable manufacturing interests, and it has a foundry and machine shop, a creamery, and manufactories of cement block, etc. There are deposits of coal in the adjacent region, which is engaged chiefly in agriculture, stock raising, and dairying. The water works are owned by the town. Pop., 1900, 1210; 1910, 1172.

MONTEZUMA, mŏn'tĕ-zōō'mȧ, or **MOTECUHZOMA (I),** Ilhuicamina (?1390–1469). An Aztec warrior and Emperor of Mexico, the son of Huizilihuitl. He acquired great fame as a leader of expeditions against the neighboring nations during the reigns of his father, uncle, and brother, and assisted in the formation of the confederacy of Tezcuco, Mexico, and Tlacopan in 1423. His efficient services in the war against the Tepanecs during the reign of Izcoatl gained for him the election to the throne in 1440, and his coronation took place amidst splendid festivities accompanied by human sacrifices of captives taken in war. After his succession he began war upon the Chalcas, reducing them to subjection, but was compelled repeatedly to crush out revolts of this nation. He also undertook other conquests which extended the Mexican power to the Gulf of Mexico and the Pacific Ocean. He built temples, enlarged and beautified the city of Mexico, and began a vast system of dams for the protection of the city against inundations. During his reign the country suffered a six years' famine, nevertheless he left it in a most flourishing condition. Consult E. K. Kingsborough, *Antiquities of Mexico*, vol. ix (London, 1848), and H. H. Bancroft, *Native Races* (San Francisco, 1874–82).

MONTEZUMA (II), Xocoyotzin (1466–1520). The last Aztec ruler and Emperor of Mexico. The fact that he was an able general and a priest of the temple of the war god Huitzilopochtli brought about his election to the throne in 1503 and he was crowned amidst

festivities and human sacrifices. He was of a haughty character and readily espoused the cause of the ancient nobility against the more recently created nobles. Furthermore, his despotic rule and oppressive taxation served to alienate the merchants and poorer classes. During his reign he was occupied with expeditions of conquest, suppression of revolts, erection of temples, and extensive immolations of human victims. He undertook many campaigns against Tlascala, but never succeeded in subjecting this nation to Mexico. Better success attended his efforts towards the south, where he extended the rule of Mexico to Honduras and Nicaragua. His reign was full of signs and omens which were interpreted as indicating the end of the Aztec power, and the arrival of Cortés and the Spaniards was considered as the fulfillment of the national tradition that Quetzalcoatl, a tribal divinity or hero, would return from the rising sun, white in color and bearded. This caused Montezuma to pursue a weak and vacillating course, although he endeavored by diplomacy and rich presents to prevent the Spaniards from coming to Mexico City. He met the invaders outside the city with more gifts and made no resistance to their entry (Nov. 8, 1519). He was soon made a prisoner by Cortés, and the loss of leadership paralyzed the natives and allowed the Spaniards to make their position secure. The Mexicans, refusing longer to endure the actions of the Spaniards, revolted under the leadership of Cuitlahuatzin, Montezuma's brother. In the hope of quelling the uprising Cortés induced Montezuma to address the natives from the roof of the house occupied by the invaders, but the only result was that the subjects showered their sovereign with stones and arrows. Montezuma died a few days later, either from his wounds or at the hands of the Spaniards who now knew him to be of no further use to their cause. (See CORTES, HERNANDO.) Consult Kingsborough, *Antiquities of Mexico*, vol. ix (London, 1848), and H. H. Bancroft, *Native Races* (San Francisco, 1874–82).

MONTFAUCON, môn'fô'kôn', BERNARD DE (1655–1741). A French scholar and antiquary. He was born at the castle of Soulage in Languedoc, entered the army about 1672 and served in Germany under Turenne, but after a serious illness and in pursuance of a vow he entered the Benedictine Order (1676) at the abbey of La Daurade in Toulouse. He went to Paris in 1687 to share in the translation into Latin of the Greek church fathers and in the great Benedictine patrology, and spent three years (1698–1701) in research in Italy. The years from 1701 until his death he spent in the abbey of Saint-Germain-des-Prés. Among his works are: *Diarium Italicum* (1702); *Palæographia Græca* (1708); *L'Antiquité expliquée et représentée en figures* (1719–24); and editions of Athanasius (1698), of Origen's *Hexapla* (1713), and of John Chrysostom (1718–34). See also CANON ALEXANDRINUS. Consult De Broglie, "La Société de Saint-Germain-des-Près au XVIIIe siècle," in *Bernard de Montfaucon et les Bernardins* (Paris, 1891).

MONTFERRAT, môn'fe-rä' (It. *Monferrato*). Formerly an independent duchy of Italy, bounded by the territory of Genoa, the Po, and the Maritime Alps. It was divided into upper and lower Montferrat, the former including the cities of Mondovi, Acqui, and Alba; the latter, Alessandria, Asti, and Casale. The capital was Casale. Montferrat, after the disruption of the Frankish Empire, was ruled by its own margraves or marquises till the beginning of the fourteenth century. This house for a long time disputed the sovereignty of Piedmont with the rulers of Savoy. Some of its members, notably Boniface II (q.v.), became celebrated in connection with the Crusades. On the death of Marquis John I, in 1305, the second son of his sister, Iolande or Irene, who was Empress of Constantinople, succeeded to Montferrat, becoming the founder of the family of Montferrat-Palæologus, which became extinct in 1533. Montferrat passed in 1536 to the Gonzagas of Mantua, for whom it was erected into a duchy. In 1631 the dukes of Savoy obtained possession of a portion of Montferrat, and in 1703, with the consent of the German Emperor, Leopold I, the remaining portion passed under their sway, and was incorporated with their dominions.

MONTFERRAT, BONIFACE, COUNT OF (?–1207). An Italian soldier and Crusader. He participated in the war against Saladin and was taken prisoner at Hittin (1187). In 1201 he joined the Fourth Crusade and after the death of Theobald of Champagne was chosen its leader. He became ruler of Macedonia and Greece, under the title of King of Thessalonica, in 1204. He was killed near Mosynopolis in a battle with the Bulgarian invaders.

MONTFERRAT, MARGRAVE OF. See BONIFACE III.

MONTFORT, môn'fôr' (MONTFORT L'AMAURI). The name of a noble French house, descended from the early counts of Hainault. It took its name from a castle on a "strong mount" between Paris and Chartres. The first member of importance was Simon III, Count of Montfort l'Amauri and Evreux, who married Amicia, daughter of Robert of Beaumont, third Earl of Leicester. His second son was the famous Simon de Montfort, Count of Toulouse. This nobleman, so conspicuous in the crusade against the Albigenses (q.v.), was born about the year 1160. In 1198 he went to Palestine at the head of a troop of French knights, but failed to accomplish anything against the Saracens and was obliged to return. In 1202 he joined the Fourth Crusade, which, however, was soon diverted from its purpose (see CRUSADE), in consequence of which Montfort abandoned it and went to the Holy Land, where he did some fighting against the infidels. In 1209 he engaged in the war against the Albigenses and signalized himself by his relentless ferocity and his brilliant successes. He was invested with the territories of the leader of the Albigenses, Count Raymond VI of Toulouse. He was killed by a stone at the siege of Toulouse, June 25, 1218. His son Amauri continued the struggle, lost nearly his whole patrimony, but was recompensed by Louis VIII, who made him Constable of France. He died about 1241. The brother of Amauri was the Simon de Montfort (q.v.) famous in English history. Consult Celestin Donais, *La soumission de la vicomté de Carcasonne par Simon de Montfort* (Paris, 1884).

MONT'FORT, SIMON DE, EARL OF LEICESTER (c.1208–65). A famous English statesman. He was the third son of Simon de Montfort (see MONTFORT), the leader in the crusade against the Albigenses, and was born in France. He inherited the title of Earl of Leicester from his grandmother, Amicia de Beaumont, sister and heiress of Robert, Earl of Leicester. In 1231

Simon received the lands which his father had held, his elder brother Amauri having resigned his claim to them. In 1238 he married Eleanor, sister of King Henry III and the youthful widow of the Earl of Pembroke. In 1248 he was sent by the King to undertake the command in Gascony. He held this office until 1252, amid constant revolts; was charged with having governed badly, and quarreled frequently with the King; but he was supported by the nobles in England. After his resignation Henry III was soon compelled to ask his aid. It is probable that he was a stern, ruthless, but not an unjust governor. In 1258 the King's debts were so great and the rapacity of his foreign relatives so unbearable that the people were in a state of insurrection. The barons assembled and under the direction of Montfort held the celebrated Parliament at Oxford. They passed statutes to enforce the provisions of Magna Charta, and from this resulted the Provisions of Oxford (q.v.) and a little later followed the Provisions of Westminster (q.v.). The King swore to observe them, but sent forthwith to the Pope praying to be absolved from his oath. The bull of absolution arrived. Henry set his barons at defiance, and finally both sides agreed to submit the matter in dispute to Louis IX of France, and he rendered a decision, on Jan. 23, 1264, which upheld Henry III in all points. (See MISE OF AMIENS.) The nobles, however, would not accept the decision and took up arms. They were aided by the whole middle class, who looked up to Montfort as their champion and leader, and the war began with the battle of Northampton. At Lewes (1264) the royal forces were signally discomfited and the King taken captive. The conditions imposed upon the King were summed up in the Mise of Lewes (q.v.), and Montfort was the real ruler of the Kingdom. In summoning a Parliament for 1265 to deliberate upon the measures to be adopted at this great crisis, writs were issued to the sheriffs in 1264 by Montfort directing them to return two knights for each shire and two citizens for every borough, besides the clergy and lay barons, which is of importance in the development of the representation of the commons as an estate of the realm in Parliament. A second war broke out after the young Duke of Gloucester deserted the baronial party and joined the King. Prince Edward (afterward Edward I) encountered the barons at Evesham with a greatly superior army. When defeat was inevitable, the great leader refused to flee and fell fighting bravely (Aug. 4, 1265). The death of Montfort filled the whole land with mourning; the people bewailed their dead champion, and the Franciscans pointed to his glorified spirit in heaven, regardless of the fact that on purely political grounds he had been excommunicated from the Church in 1264. The influence of Montfort was felt after his death, and his policy, in general, was followed out by Edward I (q.v.).

Bibliography. Reinhold Pauli, *Simon de Montfort*, translated by Miss Goodwin (London, 1876); G. W. Prothero, *Simon de Montfort* (ib., 1877); Devic et Vaissète, *Histoire de Languedoc*, vol. vi (Toulouse, 1879); but especially Charles Bémont, *Simon de Montfort* (Paris, 1884); also Stubbs, *Constitutional History*, vol. ii (6th ed., Oxford, 1897); id., *Early Plantagenets* (5th ed., New York, 1901); W. H. Hutton, *Simon de Montfort and his Cause, 1251–1266* (2d ed., London, 1901); J. R. Green, *History of the English People*, vol. i (new ed., ib., 1908).

MONTGAILLARD, môn'gà'yär', MAURICE JACQUES ROQUES, COMTE DE (1761–1841). A French political adventurer, born at Montgaillard, Haute-Garonne. He served as a lieutenant of French infantry in the West Indies in 1777–83 and in 1789 was established at Paris as the secret agent of the Bourbons. He emigrated to England in 1792 and continued in the service of the Royalists. In 1796 he entered into friendly relations with Napoleon Bonaparte and subsequently was instrumental in disclosing the treason of Pichegru. For this service he received a pension of 14,000 francs (later reduced to 6000); from 1804 to 1814 he was a member of the Emperor's secret cabinet. He was one of the first to accept Louis XVIII after the Restoration. His writings include: *Etat de la France au mois de mai 1794* (1794); *Ma conduite pendant le cours de la révolution française* (1795); *De la France et de l'Europe sous le gouvernement de Bonaparte* (1804); *Mémoires politiques* (3 vols., 1805–19; new ed., 1896); *Clémence et justice* (1815); *Histoire de France depuis 1825 jusqu'à 1828* (2 vols., 1829).

MONTGOLFIER, môn'gôl'fyâ', JOSEPH MICHEL (1740–1810) and JACQUES ETIENNE (1745–99). Two French inventors, born at Vidalon-lez-Annonay in Ardèche. They were the sons of a paper manufacturer, and though Etienne studied architecture, he gave up his profession to take charge of his father's factory, as Joseph had gone into business for himself. The two brothers became interested in aëronautics (q.v.), and their fame rests upon their achievement in making the first successful balloons. For this work Louis XVI decorated Etienne with the Order of Saint-Michel, gave Joseph a pension of 1000 livres, raised their father to the nobility, and later granted the brothers 40,000 francs that they might devote their whole attention to aërial navigation. Their work was interrupted by the Revolution, and during the Reign of Terror Etienne, who had been administrator of his department, was denounced and escaped only through the devotion of his workmen. Napoleon decorated Joseph and appointed him to various offices, and the Institute in 1807 elected him a member of its section of general physics. He made several other inventions of considerable value, among them the parachute, and published *Discours sur l'aérostat* (1783); *Les voyageurs aériens* (1784); *Mémoire sur la machine aérostatique* (1784), in collaboration with his brother. Consult Turgan, *Les ballons* (Paris, 1851).

MONTGOMERIE, mônt-gŭm'e-rĭ, ALEXANDER (c.1556–c.1610). A Scottish poet. He evidently received a scholarly training and for a time held an official position at the court of James VI. Some years were spent in foreign travel. *The Cherrie and the Slae* (1597), still popular among the Scotch, gives him a conspicuous place in a period of the literature of his country which was without poetic genius. The poem lacks design, but contains many passages of homely beauty. He is also author of some sonnets and a scurrilous poem, entitled *The Flyting between Montgomery and Polwart* (1621). A collection of his works was published by Laing in 1821, and another, edited by Cranstoun for the Scottish Text Society, appeared in 1887.

MONTGOMERIE, Archibald. See Eglinton and Winton.

MONTGOM'ERY. The capital of Alabama and the county seat of Montgomery County, 180 miles by rail northeast of Mobile, on the Alabama River, at the head of navigation, and therefore one of the principal gateways to those Gulf ports nearest the Panama Canal (Map: Alabama, C 3). It is an important commercial and railroad centre, being served by the Atlantic Coast Line, the Central of Georgia, the Louisville and Nashville, the Mobile and Ohio, the Seaboard Air Line, and the Western of Alabama systems.

A large inland cotton market, its annual trade being about 500,000 bales, Montgomery is the distributing point for manufactured products throughout Alabama, northern Florida, eastern Mississippi, and southwest Georgia. There are 52 wholesale houses and 110 manufacturing concerns, including sirup factories, boiler and cooperage plants, fertilizer, show-case, confectionery, barrel, and cracker factories, marble works, railroad repair shops, carriage and wagon works, and foundries and machine shops, besides a number of mills devoted to the cotton industry. Owing to the city's accessibility to timber, and deposits of coal and iron, its industries have achieved considerable importance.

The city is built on the high river bank and has many spacious old-fashioned residences and large gardens. Its principal buildings are the State capitol, Federal building, city hall, courthouse, Pythian and Masonic temples, and the Carnegie library. Montgomery has done much to further the cultural life of its people. In the past 10 years group societies have grown rapidly; patriotic organizations and women's clubs abound; and there are a number of educational institutions, including the Woman's College of Alabama, occupying a campus of 50 acres, excellent grade schools, a fine new high school, a State normal school for colored pupils, musical studios, and several libraries. There are also more than 50 acres of public parks. Among the charitable institutions are the city infirmary, St. Margaret's Hospital, an orphanage, and a home for widows.

Montgomery has adopted the commission form of government, the municipal powers being vested in a commission of three members, who are elected by popular vote and who choose their own president. All departments, with the exception of that of education, are under the control of these men. The water works are owned and operated by the city, having been acquired in 1898. In the year 1914–15 Montgomery's receipts amounted to $1,230,000, while its payments were $1,305,000, the chief items of expenditure being $102,000 for education, $56,000 for police, $57,000 for fire, $57,000 for public health and sanitation, and $58,000 for the water works. The city's assessed valuation (1915) is about $25,000,000.

When De Soto explored the Alabama River, as early as 1540, he discovered an Indian village 3 miles below the site of the present city of Montgomery; but it was not until 1817 that white settlers began to build their cabins on the bluffs of the river, and Montgomery was founded as New Philadelphia. In 1819, with a population of 600, it was consolidated with East Alabama Town as Montgomery. Incorporated in 1837, it supplanted Tuscaloosa as the State capital in 1847. The famous Alabama Platform was adopted here Feb. 14, 1848, and Montgomery was the seat of the Confederate government from February to May, 1861. It was occupied by the Union army, April 12, 1865. Pop., 1900, 30,346; 1910, 38,136; 1914, 41,777; 1920, 43,464. Consult L. P. Powell (ed.), in *Historic Towns of the Southern States* (New York, 1900).

MONTGOMERY, Florence (1843–). An English novelist of Irish parentage. Her most popular books are for children or child lovers. They include: *A Very Simple Story* (1866); *Peggy and Other Tales* (1868); *Misunderstood* (1869); *Thrown Together* (1872); *Thwarted* (1873); *Wild Mike and his Victim* (1874); *Seaforth* (1878); *The Blue Veil* (1883); *Transformed* (1886); *The Fisherman's Daughter* (1888); *Colonel Norton* (1895); *Tony* (1897); *Prejudged* (1900); *An Unshared Secret and Other Stories* (1903); *Cats and Kitts* (1910); *Behind the Scenes in a Schoolroom* (1914).

MONTGOMERY, Fort. See Fort Montgomery.

MONTGOMERY, Gabriel, Count de (c.1530–74). A French knight of Scottish extraction. He was an officer in the Scottish Life Guard of the King of France, and in a tournament held June 29, 1559, accidentally inflicted a mortal wound on Henry II. Montgomery, although blameless, fled to Normandy, where he embraced Protestantism. On the commencement of the religious wars in 1562 he supported the Protestant cause and defended Rouen with great bravery. In the third civil war he was one of the leaders of the Protestants and gained many advantages over the Royalists in Languedoc and Béarn. During the Massacre of St. Bartholomew he happened to be at Paris, but fled to England, owing his escape to the fleetness of his horse. In April, 1573, he vainly attempted to relieve Rochelle with a small fleet. Next year, at the head of a band of Huguenots, he landed in Normandy and commenced war there; but being compelled at last to surrender the castle of Domfront, he was carried to Paris and was beheaded.

MONTGOMERY, James (1771–1854). An English poet, the son of a Moravian preacher. He was born at Irvine, Ayrshire, Scotland, Nov. 4, 1771. At the age of seven he was sent to the Moravian settlement at Fulneck, near Leeds, to prepare for the Moravian ministry. To the annoyance of the Moravians, his leisure at school was employed in the composition of epics on King Alfred and the fall of man. In 1787 he ran away, and after four years of various employment became engaged as clerk to the editor of the Sheffield *Register*. In 1794 he started the Sheffield *Iris*, which he edited till 1825. He was twice fined and imprisoned in York Castle for libel. He afterward became a moderate Conservative, and in 1835 was granted a government pension of £150. He died at Sheffield, April 30, 1854. His principal volumes of verse are: *The Wanderer of Switzerland* (1806); *The West Indies* (1809); *The World before the Flood* (1812); *Greenland* (1819); *The Pelican Island, and Other Poems* (1826). Montgomery is now chiefly remembered for his hymns (collected in 1853), of which nearly 100 are still in use. Montgomery had little depth and drew his observations from books rather than from nature. His fame is kept up, not by lovers of literature, but by lovers of religious feeling. Consult: Holland and Everett, *Memoirs* (London, 1854–56), formidably prolix; *Life* by King (ib., 1858); *Poetical Works*, edited by their author (ib., 1841; reprint, 1881) and by Carruthers (Boston, 1860).

MONTGOMERY, John Berrien (1794–

1873). An American naval officer, born in Allentown, N. J. He entered the navy as a midshipman in 1812, served in the attack on Kingston, Canada, in November of the same year and in the capture of York in April of the following year, and for gallantry on board the *Niagara* in Perry's victory on Lake Erie, Sept. 10, 1813, received a vote of thanks and a sword from Congress. In 1815 he served in Decatur's squadron in the war with Algiers, was made a lieutenant in 1818 and commander in 1839. During the Mexican War, in command of the sloop *Portsmouth*, he took possession of various places on the coast of California, blockaded Mazatlan for some months, and, with the assistance of Captain Lavalette in the *Congress*, captured Guaymas. He was made a captain in 1853 and commanded the Pacific squadron in 1860–61, retiring in December, 1861. In 1862 he was advanced to the rank of commodore on the retired list and in 1866 to that of rear admiral.

MONTGOMERY, Richard (1736–75). An American soldier. He was born near Feltrim, Ireland, Dec. 2, 1736, and was educated at St. Andrew's College and Trinity College, Dublin. In 1756 he obtained a commission as ensign in the British army, came to America with his regiment in 1757, during the French and Indian War, and displayed personal courage and military sagacity at the siege of Louisburg and in various actions. In 1760 he was made adjutant of his regiment and in 1762 was promoted to be captain. After the conquest of Canada he took part in the expedition against Havana and Martinique, and in 1765, after being stationed in New York for two years, returned to England, where he remained until 1772, when, selling his commission, he emigrated to New York. In 1775 he represented Dutchess County in the first Provincial Convention, and in June was appointed by Congress brigadier general in the Continental army. He was second in command of the expedition sent under Gen. Philip Schuyler against Canada, but, owing to the illness of Schuyler, became the actual leader in October. He at once pressed forward and before the end of November captured successively Chambly, St. Johns, and Montreal. In the next month he joined Benedict Arnold before Quebec. On December 9 Montgomery was promoted to be major general. On December 31, shortly after midnight, the assault upon the town was attempted. Montgomery scaled the Cape Diamond bastion and, pressing forward at the head of his troops, was instantly killed by the first and only volley. The undisciplined colonial troops were then overwhelmed and a precipitate retreat ensued. Montgomery's conduct and character were eulogized in Parliament by Burke, Chatham, and even Lord North; Congress recognized his services by resolutions of respect, and by its order a monument was erected in his honor in front of St. Paul's Church, New York City, where in 1818 his remains were interred with impressive ceremonies. Consult Armstrong, *Life of Richard Montgomery*, in Jared Sparks's "American Biography" (Boston, 1834).

MONTGOMERY, Robert (1807–55). An English preacher and writer of verse. He was born in Bath, graduated at Oxford in 1833, was ordained in 1835, served as pastor at Whittington, Shropshire, and of the Church of St. Jude in Glasgow, and in 1843 became minister at Percy Chapel, St. Pancras, London, where he remained for the rest of his life. He was most widely known through his numerous poetical compositions, which were extravagantly praised by readers who, enjoying their religious tone and facile versification, overlooked their defects. Condemned by literary critics, including Macaulay, they soon lost their popularity. Editions of Montgomery's verse appeared in 1839, 1840, 1841, and 1853.

MONTGOMERY, Sir Robert (1809–87). A British administrator in India. He was born in County Donegal, Ireland, and received his education at Foyle College, Londonderry, and at Wraxall Hall School, North Wiltshire, England. He entered the Bengal civil service in 1827, was actively engaged in organizing the Punjab after the annexation of that province, and at the outbreak of the Sepoy Mutiny was the highest civil officer in its capital city, Lahore. He promptly disarmed the Sepoy garrison, and thus not only saved the Punjab from the horrors which befell the neighboring provinces, but made it a rallying point from which the British began the task of reconquest. In 1858 he became chief commissioner of Oudh and the next year Lieutenant Governor of the Punjab. In 1865 he resigned and returned to England, where he was appointed one of the council of the Secretary of State for India. Consult Dodwell and Miles, *Bengal Civil Servants* (London, 1839).

MONTGOMERY, Thomas Harrison, Jr. (1873–1912). An American zoölogist. He was born in New York City and studied at the universities of Pennsylvania (1889–91) and Berlin (Ph.D., 1894). From 1898 to 1903 he was assistant professor of zoölogy at the University of Pennsylvania and professor of biology at the Wagner Free Institute of Science, Philadelphia, where he was also director of the museum (1899–1903). He held the professorship of zoology at the University of Texas from 1903 to 1908, when he took up the same duties at the University of Pennsylvania. He is author of some 80 monographs, a memoir of his father, Thomas Harrison Montgomery (1905), and *Analysis of Racial Descent in Animals* (1906).

MONTGOM'ERYSHIRE. An inland county of North Wales, between Shropshire on the east and the Welsh counties Merioneth and Cardigan on the west (Map: England, C 4). Area, 797 square miles; largely mountainous. In the valleys on the Shropshire side good crops of wheat, oats, and barley are raised. Copper, lead, and zinc are obtained; slate and limestone are quarried. The uplands provide pasturage and cattle; sheep and the pure breed of Welsh ponies called merlins are reared. The county is watered by the Severn and the Wye and a number of other small streams. The Welsh flannel manufacture is extensively carried on. Capital, Montgomery, but the county business is carried on at Welshpool and Newton alternately. Pop., 1901, 54,900; 1911, 53,146.

MONTH (AS. *mōnaþ*, Goth. *mēnōþs*, OHG. *mānōd*, Ger. *Monat;* connected with OIr. *mī*, Lett. *mēnes*, Lat. *mensis*, Gk. *μήν*, *mēn*, month, Skt. *mās*, moon, month, probably from Skt. *mā*, to measure, and ultimately connected with Eng. *moon*). Originally the period of the moon's revolution round the earth. If this is reckoned from the position of the moon among the stars to her return to the same position, the period is called a *sidereal* month and averages 27 days, 7 hours, 43 minutes, 11.5 seconds in length; but if from new moon to new moon, it is longer, being on the average 29 days, 12 hours, 44 min-

utes, 2.8 seconds; this is called a *synodic* month. (See SYNODIC.) The latter period forms one of the three natural measures of the lapse of time and ranks next to the day in importance. There are several other periods used by astronomers to which the name month is applied, as the *nodical* or *draconitic* month (27 days, 5 hours, 5 minutes, 35.8 seconds), from ascending node to ascending node (see NODE); the *anomalistic* month (27 days, 13 hours, 18 minutes, 37.4 seconds), from perigee to perigee; the *tropical* month (27 days, 7 hours, 43 minutes, 4.7 seconds), from equinox to equinox; and the *solar* month, which is the twelfth part of a solar year, consisting of 30 days, 10 hours, 29 minutes, 4 seconds. Distinct from all these is the *civil* or *calendar* month, fixed by law for ordinary purposes, and consisting of a fixed number of days—from 28 to 31—according to the particular month. The calendar months, with the number of days belonging to each, are as follows:

		Days
1.	January	31
2.	February	28
	" (leap years)	29
3.	March	31
4.	April	30
5.	May	31
6.	June	30
7.	July	31
8.	August	31
9.	September	30
10.	October	31
11.	November	30
12.	December	31

The names by which the months are designated throughout Christendom were given them by the Romans. In the earliest time the number of Roman months seems to have been ten, viz.: (1) Martius, (2) Aprilis, (3) Maius, (4) Junius; the remaining six were numbered as the fifth month, sixth month, etc.—(5) Quinctilis, (6) Sextilis, (7) Septembris, (8) Octobris, (9) Novembris, (10) Decembris. The months are thought to have been lunar; but how the year was filled out is unknown. To the time of the kings is ascribed a reform according to which were added two new months, Januarius and Februarius. February had 28 days; March, May, Quinctilis, and October, 31; the rest 29. The sum is 355, being one in excess, seeing 354 days go to the lunar year. The reason for the addition, and for making months of 31 days instead of 30, as usual, is said to have been that luck lies in odd numbers; but this explanation is only the conjecture of an ancient writer. Adjustment with the sidereal year was effected by intercalating two months, respectively of 22 and 23 days, inserted after February 23, the feast of the Terminalia (and ritual conclusion of the year), added in the course of a four-year period. The odd day still was in excess; moreover, the pontifices, who were charged with the duty of making the intercalation, were, by reasons superstitious or political, often induced to neglect their task; accordingly, the Roman months were constantly varying from their proper seasonal position and required arbitrary adjustment. In the reform of Julius Cæsar (see CALENDAR) the 10 days additional required to make a true solar year were distributed among the deficient months of 29 days; two each were given to Sextilis, December, and January; one each to April, June, September, and November. Hence our present numeration. The year was made to begin with January, shortly after the winter solstice. The month Quinctilis received the name of Julius, and later Sextilis was given that of Augustus. The Roman names were adopted throughout Europe. In the French revolutionary calendar (see CALENDAR) the months received new names, which had reference to the weather, vegetation, and harvest, but these were discarded when the revolutionary calendar went out of use. As to symbolic art, the months have borrowed from the zodiacal signs. (See ZODIAC.) In poetry they have received symbolic representation chiefly on the basis of their seasonal characteristics in central and western Europe. Consult William Hone, *Everyday Book* (London, 1838), and Chambers, *Book of Days* (new ed., ib., 1906). See CALENDAR; MOON.

MONTH. In law, both solar (or calendar) and lunar months are recognized. At the early common law, where the term was not otherwise defined, it was held to mean the lunar month of 28 days, except in case of commercial paper and other mercantile obligations, when, by the custom of merchants, it was deemed to mean the calendar month of 30 or 31 days. By statute in England the term month, where it occurs in statutes, must be interpreted to mean calendar month, but this does not alter the common-law rule as to contracts and other transactions. In the United States generally the term, unless otherwise defined, is usually construed to mean a calendar month, especially in contracts and other mercantile transactions. It is so defined by statute in New York, Massachusetts, Pennsylvania, and other States. However, in the interpretation of the word where found in statutes, it seems the common-law rule still prevails in some jurisdictions. See TIME.

MONTHOLON, môn'tô'lôn', CHARLES TRISTAN, MARQUIS DE (1783–1853). A French soldier, born in Paris. He displayed great zeal on behalf of the First Consul on the 18th Brumaire in the capacity of *chef d'escadron*, served in a number of campaigns, and was severely wounded at Wagram. Napoleon made him his chamberlain in 1809. He became brigadier general in 1814 and was appointed to the chief command in the Department of Loire. On Napoleon's abdication Montholon remained in France, held aloof from the Bourbons and joined the Emperor on his return from Elba. He was present at Waterloo and accompanied Napoleon to St. Helena, continuing his devoted attentions to him till he breathed his last, and, having been named in his will as one of his trustees, spared no exertion to carry its provisions into effect. For participating in Louis Napoleon's unsuccessful coup at Boulogne in 1840 Montholon was sentenced to 20 years' imprisonment, but was pardoned in 1848. In 1849 he was a member of the Legislative Assembly. With General Gourgaud he published *Mémoires pour servir à l'histoire de France sous Napoléon, écrits à Sainte Hélène sous sa dictée* (1823). He was also the author of *Récits de la captivité de Sainte Hélène* (1847).

MONTH'S MIND. In the Roman Catholic church, the requiem mass celebrated for a deceased person a month after death, as "year's mind" was used for an anniversary mass in a similar case. In the ancient English church it meant constant prayer for a person during the month after his death.

MONTHYON, môn'tê'ôn'. An incorrect spelling of Montyon (q.v.).

MONTI, môn'tê, ACHILLE (1863– [illegible]). An Italian physician. Born in Arcisate (Como), he studied medicine at Pavia (M.D., 1887) and

under Koch at the Institute for Infectious Diseases at Berlin (1891–92). He then traveled in Europe and the United States, was lecturer at Pavia, and became professor of pathology at Palermo (1895) and in 1899 at Pavia. Among his works are: *Il paesi di malaria et la preservazione dell' uomo* (1891); *La patalogia cellulare e la patologia parasitaria* (1891); *Le febri malariche, etc.* (1892); *Su gli scheletri di alcune scimmie rachitiche* (1900); *Su l' istopatologia dei canalicoli contorti del rene* (1903). He translated, with C. Golgi, *Elementi d' istologia normale dell' uoma*, from the German of S. L. Schenk (1889).

MONTI, Luigi (1830–1914). An Italian author and teacher, born at Palermo, Sicily. He participated in revolutionary outbreaks in 1848–49, and, having been exiled, went to Boston, Mass., in 1850. There he taught the Italian language, becoming a prominent figure in the life of Boston and Cambridge. He served as an instructor at Harvard in 1854–59, receiving an honorary A.M. in 1857; was United States Consul at Palermo in 1861–73; and returned to Boston to devote himself to teaching and literary work. He lectured at Lowell Institute, Boston, at Wellesley and Vassar colleges, and at Peabody Institute, Baltimore. Monti was the original of "the young Sicilian," in Longfellow's *Tales of a Wayside Inn*, and he married a daughter of Thomas William Parsons (q.v.), "the Poet" of the *Tales*. He translated Guerrazzi's *Beatrice Cenci* (1857), *Manfred* (1875), and *Isabella Orsini* (1881); and published *A Grammar of the Italian Language* (1855), *Adventures of a Consul Abroad* (1878), *Leone*, a novel in the "Round Robin Series" (1882). Consult H. W. Longfellow, *Tales of a Wayside Inn* (Boston, 1863), and Samuel Longfellow, *Life of Henry Wadsworth Longfellow* (Boston, 1886).

MONTI, Vincenzo (1754–1828). An Italian poet, born near Fusignano in the Province of Ferrara, Feb. 19, 1754. He studied jurisprudence very much against his will, being inclined to classical studies. In 1778 he went to Rome and stayed there some time as secretary to Prince Braschi. In 1791 Monti's evident leaning towards the ideas represented by the French Revolution brought him into bad odor, and the feeling against him was hardly allayed by the composition of the *Bassevilliana* (1793), which seemed to show his horror of the excesses due to revolutions. Finally in 1797 Monti fled from Rome and accompanied the French agent, Marmont, to Florence and Bologna. Afterward at Milan he obtained a position in the government of that region, and when the Cisalpine Republic fell he betook himself to Paris. After Napoleon's victory at Marengo he took the chair of oratory and poetry at the University of Pavia in 1802. By Napoleon's favor he held a position at the Collège de France, where he ended his tragedy, *Caio Gracco*, and began in Dantesque style a poem on the mathematician Mascheroni. When Napoleon became King of Italy Monti was made historiographer of the realm, an office which he lost in 1814, although he was permitted to retain his professorship. The rest of his life was passed in study, but was saddened by adversity. He died at Milan, Oct. 13, 1828.

The various political changes through which Monti passed reveal themselves in his literary works. The first edition of the lyrics of Monti was the *Saggio di poesie* (Leghorn, 1779); the next the *Versi* (1788). In 1783 or thereabout he began the *Feroniade*, a mythological poem in blank verse on the draining of the Pontine marshes. The work was never finished, although the poet spent the last years of his life in elaborating it. One of his most notable poems, because of its perfection of form, was the *Mascheroniana* (1801), in which the spirit of Mascheroni discourses on the misfortunes of Italy. To about 1825 belongs the *Sermone sopra la mitologia*, a manifesto in verse in favor of classicism and attacking romanticism. Although his temperament was not eminently dramatic, Monti essayed the drama with some success. The *Aristodemo* was printed at Parma in 1786 and performed at Valle di Roma in 1787. His *Galeotto Manfredi* is really a romantic drama; it was published at Rome in 1788. Monti's most successful dramatic composition is the *Caio Gracco* (Milan, 1802). His translations include versions of the *Satires* of Persius, of a fragment of the *Philoctetes* of Sophocles, and, most notable of all, of the *Iliad*. This last, published at Milan, 1810 and 1812, is pretty true to the tone of the Homeric epic. Monti's prose works are less numerous than his works in verse. Among them are the *Lezioni di eloquenza*, delivered from his chair at Pavia; the *Lettere filologiche;* the *Lettera*, addressed to Bettinelli; and the *Dialoghi*, on the Italian language. With the aid of his son-in-law, Perticari, he prepared a lexicographical work, the *Proposta di alcune correzioni ed aggiunte da Farsi al vocabolario della Crusca* (Milan, 1817–26). Consult: A. Monti, *Vincenzo Monti, ricerche storiche e letterarie* (Rome, 1873); Cantù, *Monti e l' età che fu sua* (Milan, 1879); Vicchi, *Vincenzo Monti, le lettere e la politica in Italia dal 1750 al 1830*, especially vols. vi–viii (Faenza, 1870; Rome, 1885–87).

MONTIANO Y LUYANDO, môn'tē-ä'nō ē lōō-yän'dō, Agustín de (1697–1764). A Spanish poet, born at Valladolid. His first poem, *El robo de Dina*, was written while he was a young man at Majorca. Afterward he went to Madrid, where he was connected with the Department of State for many years. He was a man of acknowledged authority in literary matters, was elected a member of the Royal Spanish Academy of the Language, and became permanent director of the Royal Academy of History, founded at Madrid in 1738. With the accession of the Bourbon King Philip V everything French was the fashion, and all Montiano's writings were designed to reorganize Spanish drama on the classic lines of Racine. His two tragedies, *Virginia* and *Ataulfo*, were too dull ever to be acted, but when published they were accompanied by two *Discursos sobre las tragedias españolas* (2 vols., Madrid, 1750), which set forth Montiano's dramatic principles and were distinctly influential.

MONTICELLI, môn'tē-chĕl'lē, Adolphe (1824–86). A French genre and portrait painter. He was born at Marseilles, studied at the Academy of Fine Arts in his native city, and when a young man went to Paris, where he lived almost continuously until 1870. He then returned to Marseilles and there passed the remainder of his life. During his last years he was demented, his imagination ran riot, and his paintings tended to become chaotic masses of color. His first manner was influenced by his study of the great Venetians, the great Dutch masters, of Delacroix and Díaz. Some splendor from each one of these sources enriched his own palette and brought to his second period remarkable color conceptions and combinations of tints.

Like Watteau, he painted "fêtes galantes," which are his favorite subjects. In them figures of gorgeously clothed men and women are grouped beneath splendid trees, or on marble steps, while dogs, horses, and other animals are introduced as accessories. Such are his "Court of Henry III" (1874), a characteristic work, and "Court Ladies" and "The Court of the Princess," both in the Metropolitan Museum of Art, New York. He is quite as effective with an Eastern subject, a scene from Boccaccio, with the landscapes of his own province, and with marines; "The Miraculous Draft of Fishes," a remarkable treatment of light effects on water; with still-life subjects and portraits. He is well represented in American collections, those of Mrs. Ichabod T. Williams, New York, Sir William Van Horne, Montreal, and especially in the Lambert collection, Paterson, N. J. Consult: Guigou, *Vingt planches d'après les tableaux originaux de Monticelli* (Paris, 1890); Gouirand, *Monticelli* (ib., 1900); Fézensac, "Monticelli," in the *Gazette des Beaux-Arts*, vol. xxv (3d series, ib., 1901); Faure, *Monticelli* (ib., 1908).

MON'TICEL'LO, mŏn'tĭ-sĕl'ō *or* -chĕl'ō (It., little mountain). The name given by Thomas Jefferson to his residence and estate in Albemarle Co., Va., about 3 miles east of Charlottesville. The mansion, designed by Jefferson himself and first occupied, though then in an unfinished condition, in 1770, stands on the summit of a hill overlooking a large extent of the neighboring country, and was long one of the finest and most picturesque residences in the South. It was Jefferson's home for 56 years, but passed out of the hands of his heirs a short time after his death. On the estate Jefferson, his wife, and two daughters were buried. Uriah P. Levy, U.S.N., who purchased Monticello 10 years after Jefferson's death, willed it to the people of the United States. The will having been successfully contested by heirs, Jefferson M. Levy, Congressman from New York, bought out the other owners. Subsequently he spent a large sum on the improvement of the estate and restored it from the 218 acres to which it had become reduced to the original 750. Beginning about 1912, Mrs. Martin W. Littleton, wife of a New York Congressman, carried on a campaign to have the government acquire the property by purchase or condemnation; the Virginia Legislature memorialized Congress on the subject; and in 1915 Secretary of State Bryan urged Mr. Levy, who had long been unwilling, to part with the property. Mr. Levy finally agreed to sell for $500,000 (less than half the supposed valuation), provided Monticello should not be turned into a museum, merely, but be used as a Virginia home for Presidents of the United States.

MONTICELLO, mŏn'tĭ-sĕl'ō. A town and the county seat of Drew Co., Ark., 40 miles west of Arkansas City, on the Arkansas, Louisiana, and Gulf and the St. Louis, Iron Mountain, and Southern railroads (Map: Arkansas, D 4). There are cotton and other manufactures and a considerable trade in fruit, cotton, and lumber. The Arkansas Baptist Orphans Home is here, also Hinemon University School and the State agricultural school. The town owns its water works, sewage system, and electric-light plant. Pop., 1900, 1579; 1910, 2274.

MONTICELLO. A city and the county seat of Jefferson Co., Fla., 31 miles east by north of Tallahassee, on the Seaboard Air Line and the Atlantic Coast Line railroads (Map: Florida, C 1). It is interested principally in fruit growing and cotton raising. Monticello is one of the oldest towns in Florida. Pop., 1900, 1076; 1910, 1829.

MONTICELLO. A city and the county seat of Piatt Co., Ill., 28 miles northeast of Decatur, on the Sangamon River and on the Wabash and the Illinois Central railroads (Map: Illinois, H 5). It has a fine courthouse, the Allerton Library, and an excellent high-school building. It is surrounded by a productive farming and stock-raising country and has a large sirup factory. The water works are owned by the city. Pop., 1900, 1982; 1910, 1981.

MONTICELLO. A city and the county seat of White Co., Ind., 21 miles west of Logansport, on the Tippecanoe River and on the Pittsburgh, Cincinnati, Chicago, and St. Louis and the Chicago, Indianapolis, and Louisville railroads (Map: Indiana, D 3). Good water power is derived from the river; and there are various manufacturing establishments, the principal of which are flouring mills, cement, tile, and agricultural-implement factories, thread mill, and a poultry-packing plant. Monticello contains a Carnegie library. The water works are owned and operated by the municipality. Pop., 1900, 2107; 1910, 2168.

MONTICELLO. A village and the county seat of Sullivan Co., N. Y., 113 miles by rail northwest of New York, on the New York, Ontario, and Western Railroad (Map: New York, A 1). There are manufactures of leather goods, gloves, and perfume, but the village is known principally as a summer resort, attracting thousands of persons annually. Besides its many hotels and boarding houses there are a high school, convent, and fine courthouse. The Mongaup Falls here afford excellent water power. Monticello was ravaged by fire in 1909, the property loss being estimated at $1,000,000. The water works are owned by the village. Pop., 1900, 1160; 1910, 1941; 1915, 2166.

MONTIGNIES-SUR-SAMBRE, môn'tē'nyĕ'-sụr-sụn'br. A town of Belgium, in the Province of Hainaut, situated 30 miles south of Brussels. It is the centre of a coal-mining region and has machine shops, blast furnaces, rolling mills, nail factories, and manufactures of chicory. Pop., 1900, 18,440; 1910, 21,748.

MONTIJO, môn-tē'hō, EUGÉNIE-MARIE DE. Empress of the French. See EUGÉNIE-MARIE DE MONTIJO.

MONTILLA, môn-tē'lyȧ. A town of south Spain, in the Province of Cordova, 23 miles south of Cordova, on the railroad between that city and Malaga (Map: Spain, C 4). It stands on a hillside rising from the south bank of a tributary of the Jenil. Manufactures of coarse linen and earthenware are carried on and oil mills are in operation. A famous white wine, called Amontillado and possessed of a peculiar flavor, is produced in the vicinity. The palace of the dukes of Medinaceli, located here, is the birthplace of Gonsalvo de Córdoba, the Great Captain. Pop., 1900, 12,943; 1910, 13,565.

MONTJOIE, môn'zhwä', or **MONTJOYE.** The name given in the Middle Ages to any hillock situated on the boundary between two territorial divisions and serving as a meeting place for hostile armies. From this the word became a common war cry. Special designations were added for each political division: e.g., Montjoie Saint-Denis for the kings of France, Montjoie Saint-George for the kings of England, etc.

Montjoie is also the surname of the king-at-arms of France.

MONTLOSIER, môn'lō'zyā', François Dominique de Reynaud, Count de (1755–1838). A French politician and publicist, born at Clermont-Ferrand, Puy-de-Dôme. In 1789 he was elected a deputy to the States-General, where he upheld the royal cause; and when the Constituent Assembly gave way to the Legislative Assembly in 1791, he emigrated and joined the royalist army at Coblenz. From 1794 to 1801 he published the *Courrier de Londres* in London, and then for a short time the *Courrier de Londres et Paris* in Paris. In 1802 he edited the *Bulletin de Paris,* conducting an anti-English agitation. At the wish of Napoleon he prepared *De la monarchie française* (3 vols., 1814), a work intended as a justification of the Empire. The clerical policies of Charles X after the Restoration aroused his anger and led him in 1826 to publish *Mémoires à consulter sur un système réligieux, politique, et tendant à renverser la religion, la société, et la trône,* which, like his other writings of the same stamp, had much influence. After the revolution of 1830 he supported the government of Louis Philippe and in 1832 he entered the House of Peers. He wrote also: *Mémoires sur la révolution française, le consulat, l'empire, la restauration, et les principaux événements qui l'ont suivie* (2 vols., 1829) and *Mystères de la vie humaine* (2 vols., 1829).

MONTLUC, môn'lụk', Blaise de. See Monluc.

MONTLUÇON, môn'lụ'sôn'. A town in the Department of Allier, France, on the Cher, 45 miles northwest of Clermont-Ferrand (Map: France, N., H 6). It is the industrial capital of Allier. The town consists of two parts—the mediæval portion on the steep right bank of the river with its hôtel de ville, formerly a convent, another abandoned convent used as a college, and its timbered houses dating from the fifteenth and sixteenth centuries, dominated by a castle-crowned hill (the ancient fortification now converted into barracks); and the newer portion extending along the left bank of the Cher, where are located the extensive manufactories of glass, steel, iron, sewing machines, chemicals, and liquors. The town owes its rapid development to the opening up of the Commentry coal field. It has a considerable trade in grain and fruit. Pop., 1901, 35,062; 1911, 33,799.

MONTMAGNY, môn'mâ'nyĕ. A town and the capital of Montmagny Co., Quebec, Canada, on the St. Lawrence River and the Intercolonial Railway, 35 miles east-northeast (direct) of Quebec (Map: Quebec, H 4). The public buildings and institutions include the courthouse, theatre, Roman Catholic college and convent, high school, customhouse, and an asylum for the aged. Among the manufacturing establishments are grist, saw, pulp, and lumber mills, carding and planing mills, and manufactories of wagons, foundry and machine-shop products, sashes and doors. Butter is also produced. The town has an electric-lighting system. Pop., 1901, 1919; 1911, 2617.

MONTMAGNY, Charles Jacques Huault de (?–c.1651). A governor of New France. His education was under Jesuit auspices and he became a Knight of Malta. Though probably appointed Governor soon after the death of Champlain in 1635, he did not arrive at Quebec until June, 1636. During his stay the strength of the colony increased, a seminary for Huron boys was founded, and the Iroquois were defeated in several skirmishes. His administration was a continued struggle to maintain the feeble French settlements against the power of the Iroquois, during which the Huron and Algonquin allies of France were almost annihilated. Mary H. Catherwood's (q.v.) *Romance of Dollard* (1889) was based on public and private papers describing the fight at Richelieu River. As a result of the fight at the mouth of the Richelieu River a peace was made at Three Rivers in 1645, but this was broken the next year. Montmagny was intensely religious, but viewed with disfavor the colony at Montreal, thinking it a mistake to divide the strength of the missionary forces. He was recalled in September, 1647.

MONTMARTRE, môn'märˈtr'. A northern district of Paris.

MONTMEDY, môn'mâ-dē'. A fortified town of the second class in the Department of Meuse, France, near the German frontier, on the Chiers, 31 miles east-southeast of Sedan. It consists of two parts, the upper containing the citadel on a commanding rock 960 feet above the sea, and the lower portion, or Bas-Médy, surrounded by a strongly fortified wall. It was in the line of the German invasion of France in 1870 and resisted bombardment in September, but succumbed to a second attack December 14. It was captured by the Germans in the European War which began in 1914. (See War in Europe.) Pop., 1901, 2600; 1911, 2774.

MONTMORENCY, mŏnt'mō-rĕn'sĭ. A village in Quebec Co., Canada, on the Quebec and Light and Power Company railways, 6 miles northeast of the city of Quebec (Map: Quebec, G 4). The celebrated Montmorency Falls (q.v.) are situated here. There is a children's hospital. A large cotton mill gives employment to over 1000 persons and there are three saw mills. The village owns its water, lighting, and sewerage systems. Pop., 1911, 1717.

MONTMORENCY, môn'mō'räN'sē'. An old and illustrious French family named from a village near Paris, whose members in 1327 received the title of first baron of France. The mythical founder of the house is Lesbius (or *Lisbius*), who is said to have died with the martyr Dionysius; the first authentic lord of Montmorency is Bouchard I, who lived in the tenth century. Matthieu II (1189–1230) is the most famous member of the family before the sixteenth century. He was called the Great Constable. In the reign of Philip Augustus he captured Château Gaillard, in Normandy, and in 1214 helped to win the battle of Bouvines; in 1226 he defeated the Albigenses; and during the regency of Queen Blanche, the mother of Louis IX, was a powerful upholder of royal power as opposed to that of the great vassals. After Matthieu's death the family divided into two houses—the baronial branch of Montmorency and the younger line of Montmorency-Laval. The former attained the title of duke with Anne de Montmorency (1493–1567). He was born at Chantilly and was educated with the princes of the royal blood. Becoming a soldier at an early age, he distinguished himself by his gallantry and military skill in the wars of Francis I, particularly at Melegnano (1515), at the defense of Mézières (1521), and in the battle of La Bicocca (1522). In 1522 he was made marshal of France and in 1525 was taken prisoner with his sovereign in the battle of Pavia. He then helped to negotiate the Treaty of Madrid, and in 1526 became

grand master of the royal household and Governor of Languedoc. In 1536 he repelled Charles V's attack on Marseilles, and in 1538 was made Constable of France. In this capacity he directed the foreign and domestic affairs of France for some years with energy and ability. His brusqueness of manner, however, made him an object of dislike to many; and the suspicions of the King having been aroused against him, he was suddenly banished from court in 1541. The next six years were passed in retirement on his estates, but with the accession of Henry II (q.v.) in 1547 he came again to the head of affairs, though he shared this power with Henry's mistress, Diana of Poitiers, and the family of Guise. In 1557 he commanded the French army which was defeated at Saint-Quentin (q.v.). Here he was taken prisoner, but was liberated by the treaty made at Cateau-Cambrésis between France and Spain in 1559. During the minority of Charles IX Montmorency with the Duke of Guise and the Marshal Saint-André composed the famous triumvirate which resisted the influence of Catharine de' Medici in state affairs. He commanded the royal army against the Huguenots, though Coligny was his nephew. He was captured at Dreux (1562), but later gained several victories over them. In 1563 he forced the English to evacuate Havre. At the battle of Saint-Denis against the Huguenots under Condé he received a fatal wound and died in Paris on the following day, Nov. 11, 1567.—HENRY II, fourth Duke of Montmorency (1595–1632), was the grandson of the Constable Anne de Montmorency and was born at Chantilly. When he was 17 years of age Louis XIII made him Admiral of France and Viceroy of Canada, and in 1613 he became Governor of Languedoc. When the Huguenot wars broke out afresh he fought successfully for the King and in 1625 took the islands of Ré and Oléron during the siege of La Rochelle. He afterward gained other victories, and in 1630 received the chief command of the French troops in Piedmont during the War of the Mantuan Succession. He defeated the Spaniards and received the marshal's baton. Having espoused, in 1632, the cause of Gaston, Duke of Orléans, brother of King Louis XIII, and opponent of Richelieu, he was declared guilty of high treason, and Marshal Schomberg defeated him at Castelnaudry (1632) and took him prisoner. He was carried to Toulouse and there sentenced to death through the influence of Richelieu. This sentence was summarily executed; in spite of powerful intercession on his behalf by various rulers, he was beheaded Oct. 30, 1632.—LAVAL MATTHIEU JEAN FÉLICITÉ, Duke of Montmorency-Laval (1766–1826), was born in Paris. He served in the American Revolution with his father; and after the outbreak of the French Revolution as a representative of the nobility in the Constituent Assembly he urged the abolition of the privileges of his order, but he became conservative after the attack on the Tuileries. After the overthrow of the constitutional monarchy of 1791 he joined Madame de Staël, with whom he was long intimate, at Coppet in Switzerland, and returned to France in 1795, then to become quite as closely attached to Madame Récamier, whose memoirs give a vivid picture of him. In 1821 Montmorency was appointed Minister of Foreign Affairs, and as representative of France at the Congress of Verona (1822) urged armed intervention in Spain in behalf of Ferdinand VII. In 1825 he was made a member of the French Academy. Consult Vetillard, *Notice sur la vie de M. le duc de Montmorency* (Le Mans, 1826).

MONTMORENCY-BOUTEVILLE. See LUXEMBOURG, DUKE OF.

MONT'MOREN'CY, FALLS OF. A picturesque cascade, 150 feet wide and 265 feet high, at the mouth of the Montmorency River, an affluent of the St. Lawrence, 6 miles northeast of Quebec, Canada (Map: Quebec, G 4). They supply the power for Quebec's electric plants and are much visited by tourists.

MONTMORENCY, FRANÇOIS XAVIER DE LAVAL-. See LAVAL-MONTMORENCY, F. X.

MONTMORENCY ET D'ANGOULÊME, DUCHESSE DE. See DIANE DE FRANCE.

MONTORO, mŏn-tō'rō. A town of south Spain, in the Province of Cordova. It is situated on a rocky peninsula formed by the south bank of the Guadalquivir, 27 miles by rail east-northeast of Cordova (Map: Spain, C 3). The river is here spanned by one of its best bridges, built in the sixteenth century by popular subscription. In spite of the uneven ground, the streets are well paved and they are lighted by electricity. One of the largest and best hospitals of south Spain is located here. There are many interesting Roman, Gothic, and Moorish remains. The chief industry is the manufacture and exportation of olive oil. Pop., 1910, 15,144.

MONTORSOLI, mŏn-tôr'sô-lê, FRA GIOVANNI ANGELICO (or ANGIOLODA) (1507–63). A Florentine sculptor and architect. He was born at Montorsoli; worked in Florence, Rome, Genoa, Bologna, and Messina; visited Paris; and died in 1563 in Florence, where he was interred in a tomb erected by himself (1561) in the chapter house of the Annunziata Church. He was for a short time connected with the Order of the Servites, whence the Fra commonly prefixed to his name. His earliest important work was at Genoa (1522–25), where he built or enlarged the Serra and Doria palaces and remodeled the interior of the church of San Mateo, to which he added a chapel with a monument to Andrea Doria. Between 1530 and 1534 he assisted Michelangelo on the Medicean Chapel, Florence, for which he carved the statue of St. Cosmas. In 1547 he went to Messina, where he executed the fountain in front of the cathedral and another near the customhouse, besides designing several chapels in the cathedral, the church of San Lorenzo, and the lighthouse.

MONTOUR, mŏn-to͝or', ESTHER. An Indian chieftainess, usually known by the name of Queen Esther. She is reputed to have been the granddaughter of Count de Frontenac, and became the wife of Eghobund, a chief of the Senecas. Owing to her strength of mind she gained great influence among her people. She several times visited Philadelphia with the delegates of the Six Nations, and is said to have comported herself on such occasions with dignity and good manners. Despite some good qualities, however, she was at heart a savage, and in the Wyoming massacre of July, 1778, tomahawked more than a dozen helpless prisoners in revenge for the death of her son, who was killed the day before. Consult Frederick Cook, *Journals of the Military Expedition of Major-General John Sullivan against the Six Nations of Indians in 1779, with Records of Centennial Celebrations* (Auburn, N. Y., 1887).

MONT PELÉE. See PELÉE, MONT.

MONTPELIER, mŏnt-pē'lyēr. A city in

Blackford Co., Ind., on the Salomonia River, 39 miles by rail south by west of Fort Wayne, on the Fort Wayne, Cincinnati, and Louisville Railroad (Map: Indiana, G 3). It is surrounded by oil wells, and has machine shops, brass and iron foundries, stone crushers, and manufactories of steel castings and shovels. Montpelier contains a Carnegie library. Pop., 1900, 3405; 1910, 2786.

MONTPELIER. A village in Williams Co., Ohio, 59 miles west of Toledo, on the St. Joseph River and on the Wabash Railroad (Map: Ohio, A 2). It contains railroad repair shops and has a large manufactory of hardware-store fixtures. The village owns its water works and electric-light plant. Pop., 1900, 1869; 1910, 2759.

MONTPELIER. A city, the capital of Vermont, and county seat of Washington County, 40 miles by rail southeast of Burlington, on the Winooski River and on the Central Vermont and the Montpelier and Wells River railroads (Map: Vermont, D 4). The handsome capitol is built of granite, its dome rising to a height of 124 feet, and surmounted by a statue representing Agriculture. Among other features of the city are the State Library, the Wood Art Gallery, the Kellogg-Hubbard Library, Washington County grammar and Montpelier high schools, the historical society, courthouse and city hall buildings, State arsenal, Federal Building, National Life Building, Montpelier Seminary, Green Mount Chapel, Heaton Hospital, and the Montpelier Country Club. The principal industries are granite working and the manufacture of saddlery, hardware, clothespins, patent medicines, crackers, and saw-mill and other machinery. The city controls an important trade with the surrounding region, which is largely agricultural, and is the centre of large insurance interests. The city owns and operates the water works. Pop., 1900, 6266; 1910, 7856. A charter to the land about Montpelier was secured in 1781, but no settlement was made until 1787. In 1791 Montpelier was organized as a town and in 1805 became the capital of the State; it was incorporated as a village in 1855, and in 1894 it was chartered as a city. Montpelier is the birthplace of Admiral George Dewey (q.v.). Consult D. P. Thompson, *History of Montpelier, 1781–1860* (Montpelier, 1860), and Hemenway, *History of the Town of Montpelier* (ib., 1882).

MONTPELLIER, môn'pĕl'lyâ'. The capital of the Department of Hérault, France, at the junction of the Lez and Merdansun, 76 miles west by north of Marseilles and 7 miles from the Mediterranean, with which it is connected by canal (Map: France, S., H 5). Seen from a distance Montpellier has an imposing appearance. Its suburbs are clean and well built, although the older portion of the town has narrow, crooked streets. Boulevards have replaced the ancient walls and mediæval fortifications, of which the only remains are the citadel and the twelfth-century Tour de la Babotte. The principal attraction is the Peyrou, or public square, on high ground commanding splendid views of the Alps, the Cévennes, the Pyrenees, and the Mediterranean. It is ornamented with a triumphal arch and equestrian statue, both commemorating Louis XIV. The water works, water tower, and aqueduct, having a double-arched structure 2893 feet long, are monumental features. The most noteworthy buildings are the theatre, the exchange, the halls of justice, the prefecture, and the observatory. Montpellier University, founded in 1289, with faculties of law, medicine, science, letters, and pharmacy, had (1913) 1958 students and a library of 125,000 volumes, including many old and rare works. There are also schools of agriculture. Montpellier has a botanical garden, founded in 1593, and one of the oldest in Europe, a public library of 130,000 volumes, and a museum, founded by the painter F. X. Fabre, containing one of the finest provincial collections of paintings and curios in France. The climate is mild, and the city is a favorite winter resort for invalids. Among the industries the making of wine is the most important. Machinery, chemicals, scales, billiard tables, candles, chocolate, paper, soap, baskets, corks, sugar, leather, cotton, and woolen goods are manufactured, and the city is noted for its fine confectionery. There is an important trade in manufactured articles, wine, olive oil, and fruits. Founded in the eighth century about a Benedictine abbey, Montpellier began to prosper in the twelfth century, when its school of medicine acquired fame. It had a stirring history in the Middle Ages, during which it was for a time under the rule of Aragon, Majorca, and Navarre, before its final union with France towards the close of the fourteenth century. Comte, the philosopher, was born at Montpellier. It was a stronghold of the Protestants during the wars of the Reformation. Pop., 1901, 75,950; 1911, 80,230. Consult: Aigrefeuille, *Histoire de Montpellier* (Montpellier, 1877–88); Guiraud, *Recherches topographiques sur Montpellier* (ib., 1895); Febre, *Histoire de Montpellier* (ib., 1897).

MONTPELLIER, University of. A French university. As early as the first half of the twelfth century the university of medicine at Montpellier was famous beyond any other in Europe save Salerno. To this, about 1160, was added a university of law by Placentinus, a distinguished doctor of law exiled from Bologna and Mantua. A university of theology grew up around a Carthusian college founded in 1263, and a university of arts came into existence somewhat earlier. Besides the colleges of the four mendicant orders, seven others were founded from time to time, and from the twelfth to the fourteenth century Montpellier was one of the great universities of Europe. Save in medicine, the fame of the university declined greatly after the latter period. It remained the chief medical school of France till modern times. Here Rabelais taught in 1537, and in the next century, during a period of Protestant supremacy, Casaubon. Under Napoleon the university was reorganized and thrown into the general scheme of national education. It comprises four faculties—law, medicine, mathematics-science, and philosophy—besides a school of pharmacy. In 1913 it had 1958 students. Its library contains nearly 125,000 volumes.

MONTPENSIER, môn'pän'syâ', Anne Marie Louise d'Orléans, Duchess of (1627–93). The daughter of Gaston d'Orléans, brother of Louis XIII of France, known as La Grande Mademoiselle. She grew up beautiful, eccentric, and ambitious. While still a child there was idle talk of a marriage with Louis XIV of France, and subsequently her matrimonial aspirations centred about the persons of the future Philip IV of Spain, the Emperor Ferdinand III, and his brother, the Archduke Leopold. All these plans miscarried, probably through the secret hostility of Cardinal Mazarin. Upon the outbreak of the troubles of the Fronde, Mademoiselle, with

her worthless father, whom she appears to have loved, remained faithful to the court, but in 1651 she embraced the cause of the great Condé, whom she originally hated most bitterly, but later seemingly sought in marriage. Her vanity and courage found delight in the rôle of party leader, which she now was enabled to play. In March, 1652, she held the city of Orléans against the royal army and then went to Paris, where her masculine decision made her for a time the leader practically of the resistance to the King. On July 2, 1652, when Condé, after stubborn fighting in the Faubourg Saint-Antoine, had been decisively beaten by Turenne, Mademoiselle saved the Prince's army from annihilation by training the guns of the Bastille on the royal forces and opening the gates of the city to receive the defeated troops. In October she was banished from the court and lived for some time in retirement. She was recalled to court in 1657 and after some years fell violently in love with the Duke of Lauzun (q.v.), a handsome and accomplished Gascon cavalier and a favorite of Louis XIV. In December, 1670, the King consented to the marriage, but within three days withdrew his sanction, owing probably to the enmity of Madame de Montespan for Mademoiselle. In the following year Lauzun was thrown into the Bastille, where he remained for 10 years in spite of the exertions of Mademoiselle, who finally obtained his freedom by ceding the County of Eu and the Principality of Dombes to the Duke of Maine, son of Madame de Montespan. There is some reason to believe that a secret marriage took place between Lauzun and Mademoiselle. It is certain that Lauzun repaid her devotion by brutal neglect and that they became totally estranged. She left *Mémoires*, first published at Amsterdam in 1729 and subsequently edited by Chéruel (Paris, 1858). A religious essay, *The Eight Beatitudes*, has been edited in 1908 by E. Rodocanachi under the title *Un ouvrage de piété inconnu*. Consult: Margerie, *La Grande Mademoiselle* (Nancy, 1869); Arvède Barine, *La Grande Mademoiselle, 1627–1652* (New York, 1902); id., *Louis XIV and la Grande Mademoiselle, 1652–1693* (ib., 1905); E. C. Price, *Princess of the Old World* (ib., 1907).

MONTPENSIER, Antoine Marie Philippe Louis d'Orléans, Duke of (1824–90), fifth son of Louis Philippe. He was educated at the Collège Henri IV and went to Africa in 1844 as lieutenant in the artillery. After a tour in the East he married, in 1846, the Infanta Luisa de Bourbon, sister of Queen Isabella II of Spain. The marriage created great excitement, Louis Philippe being generally credited with the intention to seat his son upon the throne of Spain. During the revolution of 1848 the Duke resided in England, but soon returned to Spain, taking up his residence at Seville. In 1859 he was appointed captain general of the Spanish army. During the political agitation preceding the flight of Isabella the Duke quitted Spain. Returning in 1868, under the provisional government, he offered himself as a candidate for the throne, but destroyed whatever chances for election he may have had by killing his cousin, the Infante Don Enrique de Bourbon, in a duel, March 12, 1870. His eldest daughter, Marie, was married to the Count of Paris in 1848, and his third daughter, Maria de las Mercedes, married her cousin, Alfonso XII, in 1878.

MONTREAL, mŏn'trē-ąl' (Fr., Mount Royal). The largest city in the Dominion of Canada, situated in Hochelaga County in the Province of Quebec, 180 miles by rail southwest of the city of Quebec and 420 miles by rail north of New York, on the southeast side of Montreal Island (30 miles long by 7 to 10 miles wide), at the confluence of the St. Lawrence and Ottawa rivers, 620 miles from the sea by the course of the St. Lawrence (Map: Quebec, E 5). It occupies a low tract of land between the St. Lawrence River and Mount Royal, a mountain rising to an elevation of 769 feet above the sea, which gives a picturesque background to every view of the city, the summit being laid out as a public park of 460 acres. Fine residential streets lie in terraces upon the slope. The chief business streets are St. James, St. Paul, St. Lawrence, McGill, Bleury, Craig, Notre Dame, St. Catherine, Ontario, and Wellington. The French section is on the east, the dividing line being St. Lawrence Street. Montreal is about 7 miles long and contains many public squares and parks, such as Dominion (with a statue of Sir John A. Macdonald and a monument to Canadian soldiers who fell in the Boer War), Victoria (with a fountain and a statue of Queen Victoria), St. Louis, and the Viger Gardens, Lafontaine, and Mount Royal parks. The buildings are largely of gray limestone, quarried in the vicinity, and include the church of Notre Dame, built in 1824, opposite the site of an earlier church (1672); it is one of the largest cathedrals in America, being 255 feet long by 145 feet wide, and can accommodate over 10,000 people. Its towers are 220 feet high and have a noted chime of bells. Near it is the seminary of St. Sulpice, the oldest building in Montreal (1684). Other important edifices and places of interest are the courthouse; city hall; Bank of Montreal; customhouse; the old Château de Ramezay (1705), for a time the official residence of the British governors and the headquarters of the American general and commissioners in 1775–76; the Champ de Mars, the old parade ground of the French and British troops; Jacques Cartier Square, with a statue of Nelson (1808); Bonsecours Market, 500 feet long; the church of Notre Dame de Bon Secours; St. Patrick's Church; the cathedral of St. James, on Dominion Square, a reproduction on half the scale of St. Peter's in Rome; Christ Church Cathedral (Episcopal), a fine example of Gothic architecture; St. James's Methodist Church; church of Notre Dame de Lourdes (1874); the Jesuit Church, noted for its frescoes; St. Andrew's; St. Paul's; St. George's; Erskine Presbyterian; and Mountain Street Methodist. The Windsor, Place Viger, Ritz-Carlton, and Queen's hotels are fine structures. Among other points of interest are the Fraser Institute, a public library; the art gallery; the Protestant and Roman Catholic deaf and dumb asylums; an asylum for the blind; and the convents of the Holy Names of Jesus and Mary, and Villa Maria. The most important educational institutions are McGill College (q.v.), founded in 1824 by a bequest of James McGill, also containing the Macdonald scientific laboratories, the Redpath Library, an observatory, and a natural history museum; the Montreal branch of the Roman Catholic Laval University; and the Collège de Montreal, or Petit Séminaire. There are Presbyterian, Wesleyan, and other colleges, academies, schools, and libraries; Grey Nunnery, a hospital and orphan asylum; Naza-

reth Asylum for blind children; the Hôtel Dieu, founded in 1644 by Mademoiselle Mance, an original settler of Montreal; the Royal Victoria, the Montreal General, the Notre Dame, the Children's Memorial, and the Western hospitals; and the Victoria Rifles and Royal Scots armories and the Drill Sheds. There are many publications printed in French and English. The leading dailies are the *Gazette*, founded in 1778 and continuous since 1795, the *Herald*, the *Star*, and the *Witness*.

Montreal's wealth and importance first accrued from the fur, lumber, and grain trade of the Northwest. It is now the metropolis of Canada and the chief commercial city and port of entry. Its fine harbor, with quays, wharves, and docks of solid masonry extending for miles, lies at the head of ship navigation and accommodates vessels up to 30-feet draft at low water. The construction of canals has enabled Montreal to command the navigation of the Great Lakes. The Lachine Canal was opened in 1825, the Grand Trunk Railway in 1852; the Victoria tubular bridge, built over the St. Lawrence in 1854–59, was reconstructed and enlarged as a truss bridge in 1898–99; the Champlain and St. Lawrence Railway, from Laprairie to St. John's, was opened in 1836, and the Canadian Pacific in 1886. Other railways entering Montreal are the Intercolonial, Canadian Northern, Grand Trunk Pacific, New York Central, the Central Vermont, the Rutland, the Quebec, Montreal, and Southern, and the Delaware and Hudson. Various steamship lines run to transatlantic ports, and lines also run to the chief eastern Canadian ports. The exports in 1913 amounted to $99,398,102, and the imports to $154,485,087; in 1890 they were respectively $31,660,216 and $45,934,406. In 1913 the total number of ocean-going ships entering port was 820, of a total tonnage of 2,690,535. Inland clearances numbered 13,426, of a measurement of 5,703,467 tons. The exports and manufactures include lumber, grain, flour, apples, butter, phosphates, cheese, boots, shoes, cottons, woolens, clothing, rubber goods, hardware, glass, carriages, sleighs, drugs, paints, steam engines, locomotives, railway cars, electric goods, confectionery, cement, tobacco, machinery, boilers, sewing machines, musical instruments, paper, etc. There are also saw, flour, and rolling mills, brass and iron foundries, lead works, etc., gas and electric-light plants, electric street railroads, and a costly system of water works. The value of the manufactured output in 1910 was $166,296,972, as compared with $71,099,750 in 1900, an increase of over 133 per cent. Electric power for manufacturing is supplied from Shawinigan Falls, Lachine Rapids, and Chambly Rapids. There are many banks, the chief of which is the Bank of Montreal, one of the world's greatest banks. The bank clearings in 1913 were $2,879,118,000. The climate presents great extremes of heat and cold, the temperature reaching 90° in summer and sometimes sinking to 20° below zero in winter. The winter carnivals which formerly attracted thousands of visitors to engage in gay skating tournaments, in snowshoe parades, masquerades, tobogganing, and the storming of the ice castle (generally erected in Dominion Square) by torchlight are no longer prominent as a feature of the winter diversions.

Montreal's first record dates from 1535, when Jacques Cartier ascended the St. Lawrence and found an Indian village named Hochelaga at the foot of the mountain—a name still preserved in a portion of the modern city. It was inhabited by the Hochelaga or Beaver Indians, active traders, who traversed the St. Lawrence from their district to Ottawa. When Champlain visited the spot in 1603 the Indian town had vanished, as the result of a war between the Hurons and the Iroquois; and here he established, eight years later, a trading post. In 1642 Paul de Chomedy, Sieur de Maisonneuve, for La Compagnie de Montréal founded the Ville Marie-de-Montréal on romantic ideas of religion and patriotism. The town was engaged in struggles with the Iroquois for many years and its inhabitants suffered many hardships; but in 1665 the Marquis de Tracy arrived from France with the famous Carignan-Salières Regiment, which broke the power of the red men. In 1672 the town became the centre of the fur trade and the starting point for military and exploring expeditions, from which it became known as the Mother of Cities. With Indian massacres and warfare, and strife between the religious and civil authorities, Montreal soon acquired a romantic history. In 1760 the British took the town, and their entry marked a new era. In 1775–76 it was occupied by the Continental forces, but the citizens resented Franklin's incitement to revolt against British rule. In 1844 it was made the seat of the Canadian government, but it lost the honor after the riot of 1849, when the Parliament buildings were destroyed by the mob. The British garrison was removed in 1870. In 1901 a great fire devastated four acres of the commercial portion of the city, the Board of Trade building constituting the chief loss. The damage was estimated at $4,000,000.

With its suburbs Montreal's population numbered, in 1901, 266,826, half being French, the rest of Irish, English, and Scottish descent; in 1911, 470,480; in 1915 (local est.), 570,000; including suburbs, 656,500. Three-fourths of the inhabitants are Roman Catholics, and the city is the seat of both Roman Catholic and Anglican bishops.

Consult: A. Sandham, *Ville Marie: or, Sketches of Montreal Past and Present* (Montreal, 1870); W. Maclennan, *Montreal and Some of the Makers Thereof* (ib., 1893); N. M. Hinshelwood, *Montreal and Vicinity* (ib., 1904); and the authorities referred to under CANADA.

See Plate of LACHINE RAPIDS.

MONTREAL. An island in the Province of Quebec, Canada, formed at the junction of the Ottawa with the St. Lawrence River (Map: Quebec, E 5). It is 30 miles long, 10 miles wide at its greatest breadth, and contains 197 square miles. It is of great fertility and productiveness and is celebrated for its apple orchards. Undulations, called coteaux, culminate in Mount Royal, 769 feet high. The city of Montreal is located on it.

MONTREAL D'ALBANO, mōn'trȧ-ăl' dȧl-bä'nō, or FRA MORIALE, frä mō'rē-ä'lā, or MONREALE (?–1354). A famous Italian condottiere. He was a native of Provence (France) and as a young man entered the Order of the Knights of St. John, but was expelled. He subsequently distinguished himself as a soldier under Louis I of Hungary in the wars with Naples. About 1353 he started his Great Company, a band of mercenaries, which soon became the terror of Italy. In 1354 he aided Rienzi in getting possession of Rome, but was later accused of

intriguing with Rienzi's enemies, the Colonna. He was seized and, after a short trial, beheaded on Aug. 29, 1354. Consult Ferdinand Gregorovius, *History of the City of Rome in the Middle Ages*, vol. vi (trans. from the 4th Ger. ed., London, 1898).

MONTREUIL, môn'trē'y'. A town of France in the Department of Seine, situated 5 miles east of Paris, near Vincennes. It is surrounded by large peach orchards, has gypsum quarries, and manufactures porcelain, paints, toys, pianos, gelatin, glue, soaps, glass, and chemicals. Pop. (commune), 1901, 31,673; 1911, 43,217.

MONTREUIL, Gerbert de (fl. c.1250). A French poet of the thirteenth century about whom hardly anything is known. His great work is the *Roman de la violette* (q.v.). Gerbert also wrote a long sequel to the *Perceval* of Chrestien de Troyes. This sequel is still unprinted.

MONTREUIL (MONTEREAU), Pierre de (?–1266). A French architect of the Gothic period. He was principal architect to Louis IX, for whom, in 1245–48, he built the Sainte Chapelle (q.v.), one of the finest creations of the matured Gothic style. Among other important works built by him were the refectory and the lady chapel of the monastery of Saint-Germain des Prés, destroyed during the Revolution, the original Sainte Chapelle at Vincennes (demolished 1400), and possibly the refectory of Saint-Martin des Champs at Paris. His relative, Eudes de Montreuil (died 1289), architect, engineer, and sculptor, accompanied St. Louis to the Holy Land, where he fortified Jaffa. Returning to Paris in 1254, he built there the Hospice des Quinze Vingts, the chief asylum of the blind, and a number of churches. All of these buildings were demolished during the Revolution. In 1285 he became architect to the King. For his own tomb in the church of the Cordeliers he carved a relief of himself between his two wives.

MONTREUX, môn'trē'. A parish in the Canton of Vaud, Switzerland, at the east extremity of Lake Geneva, including the villages of Vernex, Clarens, Territet, Glion, Veytaux, Colonges, Charnex, and others (Map: Switzerland, A 2). The district is noted for its romantic Alpine scenery and mild, healthful climate and is a favorite resort of tourists and invalids during fall and winter months. From Glion a rack and pinion railway leads up to the Rochers de Naye, at 5800 feet elevation, commanding a magnificent view. Near Veytaux is the celebrated castle of Chillon. Pop., 1900, 15,854; 1910, 18,800. Consult F. H. Gribble, *Montreux* (New York, 1908).

MONTROND, môn'trôn', Casimir, Count of (1768–1843). A French political agent. He served in the army up to the Revolution and then rashly stayed in Paris instead of accompanying his family in exile. In 1794 he was arrested and imprisoned, but escaped with Mademoiselle de Coigny, Duchess of Fleury, the heroine of Chénier's *Jeune captive*, whom he married, but soon divorced. It was at this time that he came under the influence of Talleyrand and became his most trusted agent. Having been persecuted by Napoleon, whose régime he severely criticized, he was exiled in 1809, finally escaping to England in 1812. Montrond was prominent in bringing about the Second Restoration. After the revolution of 1830 he lived in England, where he boasted that Louis Philippe paid him 20,000 francs a year to speak well of him in the English clubs. He returned to France and died soon afterward.

MONTROSE, mont-rōz'. A royal, municipal, and police burgh and seaport in Forfarshire, Scotland, at the mouth of the South Esk, 90 miles northeast of Edinburgh (Map: Scotland, F 3). The town stands on a level peninsula between the mouth of the river and the basin of the Esk (an expanse 7 miles in circumference and dry at low water). It has a town hall, academy, museum, house of refuge, and royal asylum. A fine suspension bridge connects the town with Rossie Island. The magnificent tower, named the Scurdyness Lighthouse, is at the mouth of the Esk. The town has one of the best golf courses in Scotland. Flax spinning is the chief industry; linen, canvas, rope, starch, soap, chemicals, machinery, leather, cabinetwork, and beer are the chief products. Fish curing and shipbuilding are also carried on. The corporation owns the water supply. The harbor, one of the best on the east coast, has quays and dry and wet docks, and affords accommodation to vessels drawing 19 feet. The principal exports are manufactured goods, agricultural produce, and fish; imports, timber and coal. The city was chartered in the twelfth century by David I and was made a royal burgh in 1352. Pop., 1901, 12,427; 1911, 12,666. Consult Mitchell, *History of Montrose* (Montrose, 1866).

MONTROSE, mŏn-trōz'. A city and the county seat of Montrose Co., Colo., 353 miles by rail southwest of Denver, on the Denver and Rio Grande Railroad and on the Uncompahgre and Gunnison rivers (Map: Colorado, B 3). It is in the Uncompahgre valley, a district made highly productive by irrigation, the government having completed the Gunnison Tunnel here, which is 6 miles long, and is engaged in farming, fruit growing, and stock raising. There are flour mills, a brick and tile plant, and municipally owned water works. Montrose has adopted the commission-manager form of government. Pop., 1900, 1217; 1910, 3254.

MONTROSE, mŏnt-rōz'. A borough and the county seat of Susquehanna Co., Pa., 46 miles north by west of Scranton, on the Lackawanna and the Lehigh Valley railroads (Map: Pennsylvania, K 2). It is known as a summer resort, having an attractive and elevated location, some 2000 feet above the sea, and contains a public library and an historical society building. There are creameries and manufactories of cut glass, boxes, sawing machinery, lumber, etc. Pop., 1900, 1827; 1910, 1914.

MONTROSE, mont-rōz', James Graham, first Marquis of (1612–50). He was the son of John, the fourth Earl of Montrose, and his family can be traced back to 1128. He studied at Glasgow and at St. Salvator's College, St. Andrews, and in 1626 succeeded to his father's earldom. After studying and traveling for some years he became involved in 1637 in the national movement, for Charles I had treated him coldly and the King's representative in Scotland, Hamilton, was vain and incapable. In 1638 was signed the National Covenant, which was to prevent the introduction of the Prayer Book and the ascendancy of the bishops in Scotland. In support of the Covenant, Montrose took up arms several times, until the Treaty of Berwick (June 18, 1639) put an end to the fighting. About this time Montrose met Charles I, and

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partly through his personal influence, and also because the Scottish Parliament had fallen under the control of the radical Presbyterians, Montrose became a supporter of the King, but changed sides again as a result of Charles's blundering policy. In May, 1641, however, he threw himself completely on the Royalist side. Argyll, the Governor of Scotland, was preparing to aid the English Parliament, yet Charles would not permit Montrose to begin an insurrection in Scotland until the Scots had actually begun the invasion of England in support of Parliament. Then, when it was too late, Montrose was appointed (1644) Lieutenant General of Scotland, and after he had made an unsuccessful inroad into Scotland from across the border he was created, on May 6, 1644, Marquis of Montrose. On August 18 he again entered Scotland, this time in disguise, and won six pitched battles over the Covenanters. Montrose's tactics and ability to meet changing conditions were a revelation to his enemies, but he was nevertheless unable to range the Lowlands on the royal side, and on Sept. 13, 1645, he was defeated at Philiphaugh by David Leslie; his army, composed of heterogeneous elements, melted away, and in 1646 Montrose escaped from the country to Bergen. He went to Paris, but could gain no support there. In 1649 Montrose again invaded Scotland, but was defeated at Invercarron on April 27, 1650, and ultimately fell into the hands of his enemies. He was executed on May 21, 1650. Montrose was an able man, of noble character; but as his armies were without discipline, he was unable to restrain their ravages, and his name and reputation have had to suffer in consequence. Consult: S. R. Gardiner, *The Great Civil War* (London, 1891); Mowbray Morris, *Montrose* (New York, 1892), in the "English Men of Action Series"; John Buchan, *The Marquis of Montrose* (ib., 1913).

MONTS, môn, Pierre du Guast, Sieur de (1560–1611). A French explorer and colonizer of Canada. He was born in Saintonge, France, of an Italian Roman Catholic family, but was converted to Protestantism and attached himself to Henry IV, who appointed him to an important office in the royal household. In 1603 the King made him governor of the French Company of Canada, which was given exclusive right to trade in furs between lat. 40° and 50° N. and the right to make land grants and govern the country, under the name of Acadia, with the title for himself of Vice Admiral and Lieutenant General. Taking with him Samuel Champlain, Poutrincourt, Biencourt, and Pontgrave as chief officers, he sailed from Havre, March 7, 1604. After exploring the Bay of Fundy they passed the winter on an island at the mouth of the St. Croix River, and in the summer of 1605 founded Port Royal on the present site of Annapolis. De Monts made Poutrincourt Governor of Port Royal, explored the Bay of Fundy, made Tadousac on the St. Lawrence his fur-trade depot, and returned to France. There he found that his monopoly had excited such lively opposition that his privileges had been withdrawn. He succeeded, however, in recovering a part on more specific conditions and continued to send out expeditions to Canada, and in the course of one of these Champlain founded the city of Quebec in 1608. After Henry IV's death, in 1610, De Monts's privileges were taken away, to his financial ruin. He died soon after in Paris. Consult: Francis Parkman, "Pioneers of France in the New World," in *France and England in North America*, part i (Boston, 1898), and *Tercentenary of De Monts' Settlement at St. Croix Island*, published by the Maine Historical Society (Portland, 1905).

MONT SAINT-MICHEL, môn săn-mê'shĕl'. A remarkable granite cone in the Bay of Cancale or Saint-Michel, off the coast of, and belonging to, the Department of Manche, France, near the mouth of the river Couesnon, here separating Brittany and Normandy, 6 miles southwest of Avranches. It was formerly isolated, but since 1879 a causeway three-quarters of a mile long connects the Mont with the mainland. Capped by an imposing mass of monastic buildings with a statue-tipped apex towering 233 feet above the level of the extensive bay, it forms the most striking feature in the landscape. The bay, left bare at low water, extends 8 miles from north to south, with a maximum width at its mouth of 15 miles, and is noted for its quicksands and the treacherous rapidity of its rising tides. The base of the Mont, 2 miles in circumference, is surrounded by sixteenth-century ramparts, towers, and bastions. A single gate gives admittance to a small village on the south slope, with mediæval houses, hostelries for pilgrims and travelers, an interesting museum, the famous Porte du Roi, Du Guesclin's observatory, and an ancient parish church. The village is built along a narrow, winding street which ends in a flight of steps leading to the summit crowned by the abbatial castle surmounted by a basilica or church with a lofty Gothic spire. The principal features of the abbey are the Crypte de l'Aquilon, almonry, cellar, and dungeons, dating from the twelfth century; the Crypte des Gros Piliers, the Salle des Chevaliers, the refectory, the graceful cloister, dormitory, and La Merveille, or north wall of the abbey, 246 feet long and 108 feet high, dating from the thirteenth century; and the châtelet, or donjon, and the Flamboyant Gothic church, dating from the fifteenth century. The Mont was the ancient Mons Tumba, an elevation, crowned by a temple of the Druids, in the Forest of Scissy, which was submerged by an inundation in the seventh century. The abbey was founded in 709 by St. Aubert, Bishop of Avranches. It became a noted pilgrimage resort and in the twelfth century was famous for its library and the learning of its monks, whose chronicles describe it as the "mons in periculo maris." The buildings date chiefly from after 1203, when the abbey was burned down by the soldiers of Philip Augustus. It successfully resisted the assaults of the English and Huguenots; was dismantled at the Revolution and converted into a political prison; and is now included among the historical monuments of France. Since 1863 it has been undergoing a process of restoration, not yet completed, which gives it a surprisingly fresh aspect. The building is the property of the Commission of Historical Monuments. Pop. (of village), 1901, 235; 1911, 232. See Carnac.

MONTS-DE-PIÉTÉ, môn-de-pyâ'tă' (Fr., funds of pity). A name applied throughout Europe to public or semipublic institutions organized to loan money to the poor at low rates of interest on goods deposited. The establishment of the monts-de-piété dates from the middle of the fifteenth century, when a certain Barnabé Terni proposed a charitable bank which should lend money without interest. To

this was given the name Monte di Pietà. The principle was adopted by Orvieto (1460), Bologna (1475), and Milan (1496). At first no interest was charged, but as it was impossible to secure sufficient funds gratuitously, a moderate rate of interest was demanded. This policy was attacked on the ground that it violated the canon law forbidding usury. In 1515 the fifth Lateran Council declared that it was permissible to take a low interest to meet the necessary expenses. Cities in other countries soon adopted the plan. In 1534 a pawn bank was started at Ypres and one at Bruges in 1572, and by 1633 they existed in some 16 cities. Their success has not been uniform, but they now do a large business, controlling practically all pawnbroking in Belgium. The rate of interest varies from 4 to 16 per cent per annum. In Holland the first mont-de-piété, the Groote Banck van Leening, was established at Amsterdam in 1614. Financially the Dutch banks have not been profitable, as the constant endeavor has been to keep the rate of interest low. In Germany, Augsburg in 1591 appropriated funds to form a loan bank (Leihhaus), and in 1618 Nuremberg followed this example. To-day public pawnshops are found in many cities. The laws fix the interest at 2 per cent per month on all sums of less than 30 marks and 1 per cent per month on larger sums.

Monts-de-piété were introduced into France at Avignon (1577), Carpentras (1612), and Aix (1635). The famous Mont-de-Piété at Paris was established in 1777 by the General Hospital, which was to have the profits. It has had a varied history, but is in successful operation to-day. It has now a central station and over 20 auxiliary stations. Since the Revolution the pawnbroking business of France has been under the direct charge of the communal and city authorities. At the head of the Paris bank is the Prefect of the Seine with a special council of lawyers who form a comité consultatif and have charge of the legal work of the institution. The interest rate is now 6 per cent per annum. In Germany and Austria-Hungary municipal pawnshops do an extensive business, and in Spain the business is conducted with savings banks. In England a Charitable Corporation began business in 1708, but this was so mismanaged that it became a subject of parliamentary investigation and was closed. The principles of the monts-de-piété were introduced into the United States by the Collateral Loan Company of Boston in 1859; they have also been adopted by the Workingmen's Loan Association of Boston (1888), the St. Bartholomew's Loan Association of New York (1894), and many others. Among the Jews there exists the Hebrew Free Loan Association of New York, which loans money without interest.

The monts-de-piété have been of great service and have always tended to keep the rates of interest low. In all countries it is the custom to restrict the articles on which loans may be made and to take the necessary precautions against fraud and loss. If the pledges are not redeemed within a given time, the goods are sold. Sometimes the owner has the right to ask for the sale of the goods. It is usual to return to the owner any sum realized above the indebtedness.

Consult: Blaize, *Des monts-de-piété et des banques de prêts* (2d ed., Paris, 1856); Vanlaer, *Les monts-de-piété en France* (ib., 1895); Patterson, "Pawnbroking in Europe and the United States," in *Department of Labor, Bulletin No. 21* (Washington, 1899). See PAWNBROKER.

MONTSERRAT. A mountain in Spain. See MONSERRAT.

MONTSERRAT, mŏnt'sĕ-răt'. One of the Leeward Islands, British West Indies, situated 34 miles northwest of Guadeloupe and 26 miles southwest of Antigua (Map: West Indies, G 3). It is triangular in shape, 11 miles long by 7 miles broad, and has an area of 32 square miles. It is of volcanic origin, and its surface is mountainous, reaching a height of 3000 feet in the volcano of Souffrière. The chief products are sugar, coffee, cacao, arrowroot, and lime juice. Its industries received a heavy blow from a destructive hurricane which swept over the island in 1899. Montserrat is subject to the general government of the Leeward Islands and is locally governed by a nominated Legislative Council. Pop., 1901, 12,215; 1911, 12,196. The capital is Plymouth, on the southwest coast, with a population (1911) of 1534. The island was discovered in 1493 by Columbus and colonized by the British in 1632.

MONTT, mônt, JORGE (1846–1922). A president of Chile. He was a captain in the navy when, in January, 1891, the relations between President Balmaceda and the Chilean Congress reached the point of active hostilities, and the fleet under his leadership declared for Congress. On January 7 the fleet, with a number of Congressmen on board, sailed for Iquique, where a provisional government was formed under the direction of a junta composed of Montt, Waldo Silva, and Ramón Barros Luco. The army remained faithful to Balmaceda, but the majority of the people were hostile. The insurgents raised an army of 10,000 men and inflicted defeats upon the Balmacedists at Concón (August 21), and Placilla (August 28), both near Valparaiso. These victories brought Balmaceda's power to an end, and the provisional government, with Montt at its head, established itself in Santiago and called for the election of a new President and Congress. This election resulted in the almost unanimous choice of Montt for President, and under his administration the parliamentary régime was firmly established. The confidence thus shown in him was amply justified by his administration. He exerted himself to mend the breach made by the civil war and granted amnesty to all who had supported Balmaceda. During his term the army and navy were reorganized, the currency of the country was placed on a gold basis, and a large measure of local autonomy was granted to the municipalities. In foreign affairs he endeavored to settle the boundary dispute between Chile and Argentina by providing for the submission of the question to Great Britain, but in this he was not entirely successful. On Sept. 18, 1896, having completed the five years of his term of office, he quietly resigned the government to Federico Errazuriz, who had been elected his successor.

MONTT, MANUEL (1809–80). A Chilean statesman and president. He was educated for the legal profession in the National Institute at Santiago, of which he served as rector from 1835 to 1840. He began his political career as an official in the Ministry of the Interior in 1837. In 1840 he was elected member of the Chamber of Deputies, of which he was chosen President. The same year he was made Minister

of the Interior, in which position he managed the presidential election of General Bulnes. During the first term of Bulnes, Montt held various portfolios, rendering especially valuable service in that of Public Instruction by the establishment of the university and the normal school. As a member of the Chamber of Deputies and as councilor of government, he continued to exercise a dominant influence in politics in the second administration of Bulnes. In 1851 Montt was successful as the administration candidate for the presidency. The defeated Liberal candidate, General Cruz, at once headed an insurrection, but this was effectively crushed in the bloody battle of Loncomilla (Dec. 8, 1851). In 1856 Montt was elected for a second term of five years. During his two administrations he devoted his energies to the economic and social betterment of the country. He established railways and telegraphs, fostered steam navigation, encouraged immigration, aided in the revision of the civil code, and extended popular education. So effectively did he impress his character upon this period that it is known in Chilean history as the Decade of Montt. Opposition to the Montt-Varista party and agitation for an amnesty led to a serious revolt in 1859, the main purpose of which was to prevent the succession of Varas to the presidency. This, however, was suppressed after considerable fighting. During his later years Montt served as president of the Supreme Court and as professor in the faculty of law and political science at the University of Santiago.

MONTT, Pedro (1846–1910). A Chilean statesman and president, born in Santiago, the son of Manuel Montt. He studied law in the National Institute at Santiago and in 1872 was elected a member of the Chamber of Deputies, in which he held a seat for nearly 30 years. In 1885 he was chosen Speaker of the Chamber, in 1886 Minister of Justice and Public Instruction, and later Minister of Industry and Public Works. He was one of the leaders of the congressional opposition to President Balmaceda (q.v.), in 1890, and upon the overthrow of the latter was sent to Washington as Minister. Returning to Chile, he was named Minister of the Interior (1894), and by his activity and policy of conciliation during the years 1899–1902 he did much to avoid an armed conflict with Argentina. In 1901 he was the unsuccessful candidate of the coalition party for the presidency, but after the election he continued his efficient services to the government. Montt was elected President by an overwhelming majority, in 1906, on the National Union ticket, receiving the support of the Liberals, Radicals, Conservatives, and Democrats. He had always been the champion of sound finances, public economy, and a conciliatory foreign policy. It was expected, moreover, that his election would bring about administrative regeneration, putting an end to the excessive parliamentary control and restoring the executive to its proper position. He helped the country to recover from the earthquake, which occurred just after his inauguration, and to weather the ensuing financial crisis. During his administration the railways were extended, the number of public schools was increased, works of sanitation were begun in various cities, and irrigation projects were undertaken. He labored energetically against the debasement of the currency and, in 1909, vetoed a measure postponing from 1910 to 1915 the putting into operation of the conversion law. This, however, was passed over his veto by Congress, which still retained much of its power over the executive. One of his last acts was the approval of the submission to arbitration on the Alsop dispute with the United States. In 1910 he obtained a leave of absence in order to take medical treatment in Germany, visited the United States, and died upon the day of his arrival in Bremen.

MONTUCLA, môn'tụ'klȧ', Jean Etienne (1725–99). A French mathematician, born at Lyons, and by profession a lawyer. He was employed by Jombert in 1765 to edit various scientific works, including *Récréations mathématiques d'Ozanam* (1778), and is chiefly remembered as author of the first great history of mathematics, the *Histoire des mathématiques* (2 vols., 1758; 2d ed., 1798; completed by Lalande and republished, 4 vols., 1799–1802). He published also *Histoire des recherches sur la quadrature du cercle* (1754; new ed., 1831).

MONTÚFAR, môn-to͞o'fär, Lorenzo (1823–98). A Guatemalan jurist, politician, and author. He studied law and was admitted to the bar in 1845. He served as rector of the University of Costa Rica, was judge of the Supreme Court and Minister of Foreign Relations of Guatemala, practiced law for a while in Lima, and served as Minister to the United States, Peru, Spain, and elsewhere. He also did journalistic work, wrote books, was a judge, taught political economy, and participated in many revolutions. Among his published works are *Crítica del gobierno servil de Guatemala* (1854), *Memorias históricas de Centro América* (1881), and *Apuntamientos sobre economia política* (1887).

MONT'VILLE. A town in New London Co., Conn., 6 miles north of New London, on the Central Vermont Railroad (Map: Connecticut, G 4). It contains the Palmer Memorial Library. There are paper mills, cotton factories, and manufactories of bed quilts and building board. A considerable amount of water power is derived from the Oxoboxo River. Pop., 1900, 2395; 1910, 2804.

MONTYON, môn'tē-ôn' (sometimes incorrectly Monthyon), Antoine Jean Baptiste Robert Auget, Baron de (1733–1820). A celebrated French philanthropist. He became an advocate and was successively a counselor to the Grand Council, master of requests to the Council of State, and intendant of Auvergne, Provence, and La Rochelle. In 1775 he became a Councilor of State, and in 1780 he was appointed chancellor to Monsieur, the brother of the King. On the outbreak of the Revolution, Montyon emigrated, and resided first in Geneva and later in England, and did not return to France until the Bourbon Restoration. He did much, during this period, to help his brother émigrés. Throughout his whole life he was generous with his wealth, relieving the poor and founding prizes for the encouragement of invention and improvement in French arts and manufactures. Many of the prizes given by the Institute of France were founded or endowed by him, and he made large and munificent gifts to the hospitals and other charitable institutions of Paris. He was a prolific writer on historical, political, and economic subjects, but his works have become antiquated, and he is chiefly remembered for his philanthropy. Consult: Franklin, *Eloge historique de Montyon* (Paris,

1834); Dumoulin, *Montyon* (ib., 1884); L. Guimbaud, *Auget de Montyon* (ib., 1909). For the different prizes endowed by Montyon, see INSTITUTE OF FRANCE.

MON'UMENT (OF., Fr. *monument*, from Lat. *monumentum*, *monimentum*, memorial, from *monere*, to warn, admonish). 1. Anything made or erected to perpetuate the memory of persons or events. The earliest forms of monument are the cairn or pile of stones, the tumulus or mound, and the single stone or pillar. From these primitive types an immense variety of forms of commemorative structures has been developed, from the megalithic menhirs, dolmens, and cromlechs to the pyramids and obelisks of Egypt and such splendid modern works as the Victor Emmanuel Monument at Rome. The Monument, in London, is the common name of the column near London Bridge which commemorates the Great Fire of 1666. Bunker Hill Monument, in Charlestown, Mass., erected in 1846, is an obelisk-like shaft in memory of the Revolutionary battle of Bunker (Breed's) Hill. The Washington Monument is a similar but loftier shaft at Washington to the memory of the first President of the United States; it is 555 feet high. The chief kinds of monuments are described under their special names. See especially ARCH, TRIUMPHAL; BRASSES, SEPULCHRAL; MAUSOLEUM; MEGALITHIC MONUMENTS; MEMORIAL ARCHITECTURE; OBELISK; PYRAMID; SEPULCHRAL MOUND; TOMB; ETC. 2. The term is also used, by extension, of any important work of architecture or sculpture, such as a church, castle, palace, monastery, etc. 3. By further extension any important remains of a past time may be referred to as a monument, including literary remains, inscriptions, etc.; thus, the King James Version of the Scriptures is a literary monument of the Jacobean period.

MO'NUMEN'TA GERMA'NIÆ HISTOR'ICA (Lat., historical monuments of Germany). A great work on the antiquities of Germany, the chief source for the history of the Middle Ages. It was begun by the Gesellschaft für ältere deutsche Geschichtskunde, founded in 1819, and after that body was dissolved the Prussian Academy of Sciences assumed charge of the enterprise, to which the German and Austrian governments gave financial support. The work proceeds under various divisions—historians, laws, archives, documents, letters, chronicles, and antiquities—of which 47 volumes were issued up to 1874. Since 1876, 20 volumes of a *New Archives* have been in publication. The first volume was published in 1826 by the Hahnsche Hofbuchhandlung in Hanover under the direction of Pertz, who was succeeded in 1874 by Waitz, and after his death in 1886 by Dümmler.

MONUMENTAL CROSS. See CROSS.

MON'UMENT PARK. A small park in El Paso Co., Colo., north of Colorado Springs, that is remarkable for its natural stone columns, which rise from its floor in great numbers. The columns are composed of sandstone in horizontal layers and bear on top, 15 to 25 feet from the base, a cap of hard ferruginous sandstone which sometimes joins two or more of the shafts into a group. They have been sculptured by the erosive processes into various shapes, some showing resemblance, more or less fanciful, to human forms, as in the Dutch Wedding. (See illustration accompanying EROSION.) It is the presence of the harder sandstone above the softer layers that has protected the latter and led to the formation of the columns.

MO'NUMEN'TUM AN'CYRA'NUM. The name given to the great inscription found at Ancyra (modern Angora, q.v.) describing the career of Augustus.

MONVEL, môn'vĕl'. The assumed name of JACQUES MARIE BOUTET (1745–1812). A French actor and dramatist, father of the famous Mesdemoiselles Mars (q.v.). He made his appearance on the stage of the Comédie Française in 1770. He was the author of some successful plays, among them *Les victimes cloîtrées*, in which he gave expression to his sympathy with the principles of the Revolution.

MONVEL, LOUIS MAURICE BOUTET DE (1850–1913). A French genre and portrait painter and illustrator, born in Orléans. He studied under Cabanel and other Classicists at the Ecole des Beaux-Arts and, after the War of 1870–71, with Carolus Duran. He began to exhibit portraits in 1873 and afterward won several medals, notably a gold one at the Paris Exposition (1900); but meanwhile he took up illustrating. Soon his individual, unmistakable style showed itself in the drawings he made for the French edition of *St. Nicholas* (1878), for *Chansons et rondes* (1883), *Chansons de France* (1884), *Nos enfants* (1886), *La civilité puérile*, the fables of La Fontaine (1888), and the exquisite black and white work in Fabre's *Xavière* (1890). His work is usually done in flat tones and is exceedingly decorative in quality. His technical training made him a faultless draftsman. The decision and beauty of his line, his strong, clear color, the charm and naïveté of his delineation of child life, have made him a conspicuous figure in this field of illustration. His "Jeanne d'Arc" (1897) is a masterpiece of composition. He also did six canvases, representing the history of the Maid, for the memorial church at Domrémy; these were widely exhibited in the United States. Another series of great beauty, on the same theme, is owned by Senator W. A. Clark. His portraits, particularly those of children and notably the daughter of Madame Réjane, are well known in America and rank among the highest. His large pictures, which include "The Apotheosis" (1884), an episode of the Commune, are less interesting. At the time of his death he was occupied with illustrations of the "Life of St. Francis of Assisi." Consult: *Modern French Masters*, edited by Van Dyke (New York, 1896); W. H. Downes, *Twelve Great Artists* (Boston, 1900); Vandoyez, in the *Gazette des Beaux-Arts*, vol. lv (Paris, 1913).

MONYPENNY, mŭn'ĭ-pĕn'ĭ, WILLIAM FLAVELLE (1866–1912). A British journalist and author, born in County Armagh, Ireland. In 1888 he graduated from Trinity College, Dublin. He was a contributor to the *Spectator* in 1891–93 and assistant editor of the *Times* in 1894–99. In the latter year he was appointed editor of the Johannesburg *Star*, which was suspended during the South African War and resumed under Monypenny's direction in 1902, but he resigned the editorship in 1903. During the war he held a commission with the Imperial Light Horse and in 1900–01 was director of civil supplies to the military governor of Johannesburg. In 1908 he became director of the London Times Publishing Company. He published *The Two Irish Nations: An Essay on Home Rule* (1913) and *The Life of Benjamin Disraeli, Earl of Beaconsfield* (3 vols., 1910–14),

the third volume of which (for the period 1846–55 of Disraeli's life) was prepared by George Earle Buckle after Monypenny's death.

MONZA, mŏn'tsȧ. A town in the Province of Milan, Italy, on the Lambro, 10 miles north-northeast of Milan (Map: Italy, B 2). The cathedral of St. John the Baptist, founded in the sixth century by Queen Theodolinda and rebuilt in the fourteenth century, contains interesting memorials of the Queen and the famous Iron Crown of Lombardy (q.v.). Other notable buildings are the church of Santa Maria in Istrada, the Gothic town hall, and the palace, the summer and autumn residence of the royal family, situated in beautiful grounds traversed by the Lambro. Its institutions include a Gymnasium, a lyceum, a technical school, and a school of industry. The town has manufactures of silk, cotton, and woolen goods, hats, leather, machines, dyestuffs, books, and church organs. It is surrounded by a fertile district, which yields abundance of grain, fruits, and wine. Monza, the ancient Modicia, has been the residence and coronation town of the kings of Lombardy since the eleventh century. It was once conspicuous for its wealth and the extent of its cloth trade. Here on July 29, 1900, King Humbert of Italy was assassinated. Pop. (commune), 1901, 42,599; 1911, 53,214.

MONZIE-LASSERRE, Paul Joseph Henri de. See Lasserre, P. J. H. de Monzie-.

MOOD (AS. *mōd*, OHG. *muot*, spirit, courage, Ger. *Mut*, courage, Goth. *mōds*, wrath; possibly connected with Gk. *μαίεσθαι*, *maiesthai*, to desire, OChurch Slav. *sŭmēti*, to dare). A weak emotion, usually of long duration. The mood, like the emotion, is made up of ideas and affection; but it does not centre about a "situation" as the emotion does. The emotion of fear, e.g., always has its object. One fears an enemy, an approaching storm, a ruined reputation. But in a mood all sorts of mental processes may demand the attention in turn and in turn pass out of consciousness, while the mood remains as a vague background to them all. In other respects, however, the mood has the characters of an emotion; the mood of cheerfulness is similar to the emotion of joy, depression to sorrow, irritability to anger, apprehension to fear; and mood, like emotion, is largely an organic consciousness. The older psychology classified acquiescence, mild surprise, expectancy, etc., as moods; but recent work upon the psychology of thought has assigned them to a separate category of "conscious attitudes." See Thought. Consult: James Sully, *The Human Mind* (New York, 1892); Oswald Külpe, *Outlines of Psychology* (ib., 1909); E. B. Titchener, *Textbook of Psychology* (ib., 1910); Wilhelm Wundt, *Physiologische Psychologie* (Leipzig, 1911).

MOOD. See Grammar; Logic.

MOO'DIE, Susanna (1803–85). A Canadian author. She was born at Bungay, Suffolk, England, her father being Thomas Strickland, Beydon Hall. Her sisters, Agnes Strickland (q.v.), Mrs. Katherine Parr Traill, Elizabeth and Jane Strickland, were authors. She married J. W. D. Moodie, a British officer, in 1821 and in 1832 emigrated with her husband to Upper Canada (Ontario), settling first near Port Hope and shortly afterward in the backwoods north of Peterborough, where she remained eight years. In 1839 she removed to Belleville, and later to Toronto, where she died. She began to write at a very early age, contributing to periodicals short poems and tales for children; and later she wrote poems, novels, and works describing conditions of Canadian life. Her publications include: *Enthusiasm* (1830), a book of poems; *Roughing It in the Bush* (1852), her best-known work, describing her pioneer life; *Life in the Clearings* (1853); *Mark Hurdlestone, the Gold Worshiper* (2 vols., 1853); *Matrimonial Speculations* (1854); *Flora Lindsay* (1854); *Geoffrey Moncton, or the Faithful Guardian* (1856); *Dorothy Chance* (1867).

MOODS, in Logic. See Syllogism.

MOO'DY, Agnes Mary (Claypole) (1870–). An American biologist, born at Clifton, Bristol, England. She graduated from Buchtel College, Ohio, in 1892, from Cornell (M.S.) in 1894, and from the University of Chicago (Ph.D.) in 1896. In the latter year she became instructor in zoölogy at Wellesley and in 1898 assistant in histology and embryology at Cornell. From 1901 to 1903 she was instructor in zoölogy and geology at Throop College. She was married to Robert Orton Moody. Her special contributions to journals of applied microscopy and morphology were on the histology of the Cayuga Lake lamprey and on the embryology of *Anurida maritima*.

MOODY, Dwight Lyman (1837–99). An American evangelist. He was born at Northfield, Mass., Feb. 5, 1837. At the age of 17 he became clerk in a shoe store in Boston. In 1856 he removed to Chicago, became active in mission work, and established a Sunday school which numbered over 1000 children. During the Civil War he was employed by the Christian Commission and subsequently as city missionary in Chicago by the Young Men's Christian Association. A church was built for him and, though unordained, he became its pastor. The building was destroyed by the fire of 1871, but a new one was erected to hold 2500 persons. In 1873 he visited Great Britain and Ireland with Ira D. Sankey, the singer, and in 1875 held a long series of meetings in Brooklyn and Philadelphia, and in 1876 in New York. Similar services followed in many large cities throughout the country. In 1882 a second visit to England was made. Most of his work was done in the provinces, but he held large meetings also at the universities of Oxford and Cambridge. He also held meetings at Paris. His later years were applied to the building up of a seminary for young women at Northfield, Mass., a training school of Christian workers in Chicago, and the Mount Hermon School for Boys at Gill, near Northfield. He died at Northfield, Dec. 22, 1899. Many of his sermons were published. Consult his biography by his son (New York, 1900).

MOODY, Granville (1812–87). An American Methodist Episcopal clergyman, born at Portland, Me., and self-educated. He entered the ministry in 1833, joining the Ohio conference. When the Civil War broke out he resigned his pastorate and entered the army as colonel of the Seventy-fourth Ohio Volunteer Infantry, which he had organized. In 1865 he was brevetted brigadier general of volunteers. His brother was a colonel in the Confederate army. Moody was an ardent temperance advocate. He was a member of the General Conferences of 1852, 1860, 1864, and 1876. His writings include *Popery and its Aims* (1875) and *A Life's Retrospect—Autobiography*, edited by Sylvester Weeks (Cincinnati, 1890).

MOODY, James (1744–1809). An American

Loyalist, born in New Jersey. In 1777 he joined the British, and for several years he was very active as a partisan leader and as a remarkably fearless and resourceful spy, performing many daring exploits in Pennsylvania and New Jersey, capturing Revolutionary officers and soldiers and intercepting dispatches. At the close of the war he went to England, and later settled in Nova Scotia. In reward for his services the English government gave him the half pay of a lieutenant and an estate. An account of his adventures, entitled *Lieutenant James Moody's Narrative of his Exertions and Sufferings in the Cause of Government since 1776*, was published in London in 1783 and in New York in 1865.

MOODY, JOHN (1868–). An American financial writer. He was born in Jersey City and was early engaged in newspaper work. From 1890 to 1900 he served in various capacities with the banking house of Spencer Trask & Co. He founded in 1900 and was editor until 1907 of *Moody's Manual of Railroads and Corporation Securities;* founded in 1905 and thereafter was editor of *Moody's Magazine*, an investor's monthly; and established in 1909 the reference publication, *Moody's Analyses of Railroad Investments*, and in 1914 *Moody's Analyses of Investments*, dealing with public utilities and industrials. He became known as a lecturer on investment values. His writings include: *The Truth about the Trusts* (1904); *The Art of Wall Street Investing* (1906); *The Investor's Primer* (1907; 3d ed., revised, 1912); *Masters of Capital in America* (1911); *How to Analyze Railroad Reports* (1912).

MOODY, WILLIAM HENRY (1853–1917). An American public official and jurist. He was born in Newbury, Essex Co., Mass., graduated at Phillips Academy (Andover, Mass.) in 1872 and at Harvard in 1876, and studied law in the office of Richard H. Dana. From 1890 to 1895, while district attorney for the Massachusetts Eastern District, he carried through successfully the prosecution of boodling aldermen in the city of Lawrence. In 1895 he was elected by the Republican party to fill the vacancy in the House of Representatives caused by the death of General Cogswell, and he was thrice reëlected. As Congressman he made a reputation by his knowledge of parliamentary procedure and by his perseverance in debate. As a member of the Committee on Appropriations he had special charge of the Sundry Civil Appropriation Bill. He was regarded as a very able man. In 1902, on the resignation of J. D. Long, President Roosevelt appointed him Secretary of the Navy. His service continued until 1904, when he was made Attorney-General. In 1906 he was appointed Associate Justice of the Supreme Court, but because of prolonged ill health he was retired by special Act of Congress in 1910.

MOODY, WILLIAM VAUGHAN (1869–1910). An American poet and playwright, born at Spencer, Ind. Graduating from Harvard University in 1893, for two years he taught English at Harvard and Radcliffe, leaving Cambridge to be instructor (1895–1901), and then (1901–07) assistant professor, of English and rhetoric at the University of Chicago. He received the degree of Litt.D. from Yale in 1908, and was a member of the American Academy of Arts and Letters. As a poet he was perhaps the most promising man of his day in America. This aspect of his work is represented by the lyrical drama *The Masque of Judgment* (1900), *Poems* (1901), and *The Fire-Bringer* (1904). In the drama he is at his best in *The Great Divide* (1907), which was a great success on its first appearance and remains one of the best American plays. His *The Faith-Healer* (1909) is also noteworthy in the drama of its day, though below the standard of its predecessor. As a part of his literary accomplishment are to be reckoned his *History of English Literature* (1907), in collaboration with R. R. Lovett, and several editions of the English classics, notably *Milton's Poems* (1899) in the "Cambridge Poets." His early death was lamented as a misfortune to American letters.

MOODY BIBLE INSTITUTE OF CHICAGO. An institution for Bible training founded in 1886 by Dwight L. Moody. The general purpose of the institute is the training of Bible teachers and missionaries. It is not endowed, but is maintained by the gifts of Christians all over the world. While in training a large percentage of the students are compelled to work a few hours each day in order to meet their expenses. In 1914 there were enrolled in the day classes 837 students representing 30 denominations, 38 States, and 30 foreign countries. In the evening classes 429 students were enrolled and in the correspondence departments 1567. The extension department enrolls hundreds of thousands throughout the United States and Canada by means of various conventions, evangelistic meetings, and correspondence courses. In 1915 the faculty contained 29 members. Since foundation the institute has enrolled 13,000 students in its three departments of instruction. Over 700 have entered the foreign-mission fields under the several denominational boards, while thousands are engaged in various Christian activities in the United States.

MOOGHA, mo͞o'gȧ. See SILKWORM.

MOOLTAN, mo͞ol-tän'. A city of British India. See MULTAN.

MOON (AS. *mōna*, Goth. *mēma*, OHG. *māno*, Ger. (with excrescent *d*) *Mond*, moon; connected with Lith. *menu*, moon, Gk. *μήν, mēn*, month, Skt. *mās*, moon, month, probably from Skt. *mā*, to measure, and ultimately connected with Eng. *month*). The satellite of our earth, revolving round the earth from west to east in a period of one month (q.v.) and accompanying the earth in its motion round the sun.

Phases of the Moon. The first peculiarity about the moon is the constant and regular change of her illuminated surface from a thin crescent to a circle, and vice versa, and a corresponding change in the time of her appearance above the horizon. These changes depend upon the position of the moon relative to the earth and the sun, for it is only the half of the moon facing the sun that is illuminated by his rays, and the whole of this illuminated portion can be seen from the earth only when the sun, earth, and moon are nearly in a straight line (the line of *syzygies*) and the earth is between the sun and moon. When the moon is in the line of syzygies, but between the earth and the sun, no part of her illuminated disk can be seen from the earth. In the former case the moon is said to be *full*, and in the latter, *new*. A few days after new moon the moon appears to be a little to the east of the sun as a thin crescent, with the horns pointing to the east, and as she increases her angular distance from the sun at the rate of about 12° daily, the crescent of light

THE MOON, FIRST QUARTER
From a Photograph by Loewy and Puiseux

becomes broader till, after the lapse of a little more than seven days, at which time she is 90° in advance of the sun, she presents the appearance of a semicircle of light. The moon is then said to have completed her first quarter. Continuing her course, she becomes gibbous; and at the fifteenth or sixteenth day from the new moon attains a position 180° in advance of the sun, and now presents the appearance known as full moon. From this point she begins to approach the sun, again appearing gibbous, and after a third period of more than seven days reaches a point 90° west of the sun and enters her last quarter. Here, again, she appears as a semicircle of light, the illuminated portion being that which was not illuminated at the end of the first quarter. The moon, now rapidly approaching the sun, resumes the crescent form, but this time with the horns pointing westward, the crescent becoming thinner and thinner, till the moon reaches the position of new moon and disappears. The earth as seen from the moon presents similar phases, and has consequently, at the time of new moon, the appearance of a round illuminated disk, and at full moon is invisible. This explains the peculiar phenomenon occasionally observed when the moon is near the sun (either before or after the new moon), of the part of the moon's face which is unilluminated by the sun appearing faintly visible, owing to the reflection upon it of strong earth light. This phenomenon is often called the new moon in the old moon's arms. At new moon the moon comes above the horizon about the same time as the sun, and sets with him, but rises each day about 50 minutes later than on the day previous, and at the end of the first quarter rises at midday and sets at midnight, continuing to lag behind the sun. When full she rises about sunset and sets about sunrise, and at the commencement of her last quarter she rises at midnight and sets at midday. The daily retardation of the moon's rising, just stated to be about 50 minutes, is subject to considerable variations. In the latitude of New York it may range from 23 minutes to 1 hour, 17 minutes. See HARVEST MOON.

Distance and Magnitude. From repeated observations of the moon's horizontal parallax (q.v.) and of the occultations by her of the fixed stars, her mean distance from the earth has been estimated at 238,840 miles and her mean angular diameter at 31′ 7″ and her actual diameter as 2163 miles, or about $\frac{3}{11}$ of the earth's diameter. Her actual distance from the earth may vary from 252,972 miles at apogee to 221,614 at perigee. Her volume is about $\frac{1}{49}$ that of the earth, her density 0.62 (that of the earth being taken as unity), and her mass $\frac{1}{81.5}$ of the earth's mass.

Orbit. The moon revolves round the earth in an elliptic orbit with the earth in one focus, the eccentricity of the ellipse being 0.05491, or more than 3¼ times that of the earth's orbit. The plane of her orbit does not coincide with the ecliptic, but is inclined to it at an angle of 5° 8′ 40″, and intersects it in two opposite points, which are called the nodes. (See NODE.) Were the moon's orbit a true ellipse, which, owing to various irregularities known as perturbations (q.v.), it is not, the lunar theory (q.v.) would be exceedingly simple; but these perturbations cause in the case of the moon a distinct and well-marked deviation from her previous course in a single month. The regression of her nodes along the ecliptic causes a continual change in the plane of her orbit, so that if, during one revolution round the earth, she occults certain stars, at the next revolution she may pass to one side of them, and will remove farther and farther from them in each successive revolution. Owing to this continual change of her orbit, the moon in course of time passes over or occults every star situated within 5° 24′ of the ecliptic. The motion of the nodes is so rapid that they perform a complete circuit of the orbit in 18.6 years. Another important change in the moon's orbit is the revolution of the line of apsides (q.v.), by which the perigee and apogee are continually changing their position relative to the earth and sun. This revolution is more than twice as rapid as that of the nodes, being performed in 8.85 solar years. This motion is analogous to the perturbations of planetary orbits, and its nature and origin are treated in the article PERTURBATIONS. Its effect upon the moon is to produce a variation in her distance from the earth, independent of that produced by her elliptic motion. Among the further disturbances or perturbations of the lunar orbit we may mention the evection (q.v.), which may displace the moon's position in the sky 1° 16′ 27″, the variation, which may amount to 39′ 31″, and the annual equation, whose maximum is 11′ 9″. See LUNAR THEORY.

Eclipses. As the moon in her course passes the sun once every month, and also places the earth between herself and the sun once a month, it is evident that if she moved in the plane of the ecliptic there would be either a total or an annular eclipse of the sun and a total eclipse of the moon every month. The inclination of her orbit, allowing her to pass the sun 5° 9′ to the north or south of his track, prevents such a frequent occurrence of eclipses. See ECLIPSE.

Rotation. The moon rotates on her axis with a velocity such that one complete revolution occupies precisely the time needed for one revolution of the moon around the earth. As a consequence of this, the moon always turns the same side towards us, and we see only one-half her surface plus a small additional amount brought into view by libration (q.v.).

Physical Features. The surface of the moon, as seen from the earth, presents a most irregular grouping of light and shade. The dark portions were named by the earlier astronomers as seas, lakes, etc., and still retain these names, although there is strong evidence against the supposition that the moon, or at least that portion of it presented to us, contains any water. The brighter parts of the moon are mountainous, as is proved by the fact of their casting shadows when the sun's rays fall upon them obliquely, and also by the ragged appearance presented by the interior illuminated border of the moon, an appearance which can only be satisfactorily accounted for on the supposition that the surface of the moon is not level, in which case the higher portions will be illuminated some time before the light reaches the level parts; and it is observed that as the illumination proceeds bright spots start up in advance of it, and when the moon is on the wane these same spots continue to shine for some time after the surrounding surface is immersed in gloom. The mountains occur either singly, when they are generally of a circular form and are called *craters*, or in groups, which are mostly annular and form a sort of wall inclosing a deep de-

pression or plain in which are situated one or more conical mountains. The craters are not infrequently 8 or 10 miles in diameter, and some measure more than 100 miles across. The principal mountains attain an altitude of about 20,000 feet, according to a micrometric measurement of the length of their shadows. The moon everywhere presents traces of volcanic agency, but no active volcanoes have yet been discovered, nor is there any sign of recent volcanic action. Through the telescope she presents a desolate appearance, without indications of animal or vegetable existence. She appears to be devoid of an atmosphere, or, if one exists, it must be of exceeding rarity, or else concentrated into cavities within the moon's rocky surfaces. Probabilities are in favor of a low surface temperature, not higher, perhaps, than that of ordinary ice. (For the influence of the moon upon terrestrial tides, see TIDES.) Recent theorists hold that very large lunar tides, caused by the earth, existed many thousands of years ago, when the moon was still in a semiplastic condition. This tidal theory can be made to account for the remarkable coincidence of the lunar axial rotation period with that of her revolution round the earth. The best lunar map based upon visual observations is that of Beer and Maedler, which was published in 1837. In 1904 Pickering published his *Photographic Atlas of the Moon* and the elaborate *Atlas photographique de la lune* of Loewy and Puiseux, begun in 1896, was completed in 1908.

Superstitions Regarding the Moon. The moon was anciently an object of worship and has remained to the present day the centre of many superstitions. The times for killing animals for food, gathering herbs, cutting down wood for fuel, sowing seeds of various kinds, were all regulated by the age of the moon. There were similarly defined periods for taking particular medicines and attempting the cure of particular diseases. In northern European countries the waning moon has been considered to have an evil influence, and full or new moon to be the most auspicious season for commencing any enterprise. Farmers and sailors still believe in the influence of changes in the lunar phases on the weather. See ASTRONOMY; SUPERSTITION.

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MOON, MOCK. See MOCK MOON; HALO.

MOON, WILLIAM (1818–94). An English philanthropist, born in Horsemonden, Kent. He was educated in London and in 1840 gave up his studies for the Church because of total blindness. Moon started a school for blind children and, finding that previous systems were too complicated, devised an embossed type for the use of the blind with only nine letters, which, by variation of position, made up a complete alphabet. Following the same method, he published pictures and maps for the blind. Moon traveled in Europe and in the United States (1882) and established loan libraries of his books and schools for home instruction. All his philanthropic efforts were largely tinged with evangelistic methods. He published *Sight for the Blind* (1873), which gives the history of his system. Consult Rutherford, *William Moon and his Work for the Blind* (London, 1898). See BLIND, EDUCATION OF THE.

MOONBILL. A local name in the United States for the ring-necked scaup duck. See SCAUP.

MOON'EY, JAMES (1861–). An American ethnologist, born at Richmond, Ind. In 1885 he became connected with the Bureau of American Ethnology at Washington. His first labor in Indian ethnography, which had occupied him since boyhood, was a tribal list containing 3000 titles. He discovered the Cherokee ritual, studied the ghost dance in 1890, and later the Kiowas. His writings include: *Myths of the Cherokees* (1888); *Sacred Formulas of the Cherokees* (1891); *Siouan Tribes of the East* (1894); *The Messiah Religion and the Ghost Dance; Calendar History of the Kiowa Indians* (1898). He was a contributor to the NEW INTERNATIONAL ENCYCLOPÆDIA.

MOONEYE, LAKE HERRING, or WHITING. Names applied to the cisco (q.v.) or whitefish.

MOONFISH (so called from its shape). 1. A fish of the family Carangidæ, allied to the pompanos and having compressed, oval, silvery bodies. The species (*Selene vomer*), called jorobado, look down, horsehead, and horsefish, is numerous on both coasts of the warmer parts of America and grows to a foot or more. It passes through a remarkable series of transformations in growth, being so thin when young as to be useless for food, though well liked as a pan fish when adult. (See Plate with article HORSE MACKEREL.) 2. A closely related fish (*Vomer setipennis*), known about New York as blunt-nosed shiner, and highly esteemed as food. Some other species are known, but their habits and manner of breeding remain obscure. 3. The opah (q.v.).

MOONFLOWER. See IPOMŒA.

MOON'GA, or **MOOGHA.** See SILKWORM.

MOONJA, mōōn'jâ, **MUNJAH, MOONYAH,** SARA, or SHUR (Anglo-Ind., from Skt. *muñja*, reed), *Saccharum sara*. An East Indian grass of the same genus as the sugar cane, growing on the banks of the Ganges and the Indus. The leaves yield a tough fibre, not thoroughly tested, but used for making rope.

MOONLIGHT SONATA, THE. A sonata by Beethoven (1802). It is the second of two sonatas forming Opus 27, C sharp minor, *Sonata quasi una fantasia*, dedicated to Countess Guicciardi. The imaginary title is probably due to Rellstab's likening the first movement to boating on Lake Lucerne by moonlight.

MOONSEED, YELLOW PARILLA (so called from the crescent-shaped seeds), *Menispermum canadense*. A North American climbing plant of the family Menispermaceæ, with peltate, roundish-cordate, and angular leaves, small clusters of white flowers, and black, kidney-shaped fruits. The cylindrical root, which attains a length of several feet and a diameter of a quarter of an inch, was formerly known in commerce as Texas sarsaparilla. It contains berberin, resin, tannin, etc., and has tonic, alterative, and diuretic properties.

MOONSHINERS. This term is a colloquialism applied in the United States to persons who manufacture illicit whisky. The scope of its application has come to be restricted usually, however, to those who reside in or near the Appalachian Mountain Range, though it is still

employed generally concerning those who make such liquor. Moonshiners of modern times come most frequently from the mountainous parts of Kentucky, Tennessee, West Virginia, Virginia, North Carolina, Georgia, and Alabama; and they are most active in Kentucky, Tennessee, and North Carolina. The whisky they produce is usually made from corn, although rye and barley, as well as peaches for brandy, are sometimes used. It is sweetened commonly, if at all, with molasses, and is called "mountain dew," possibly because of the colorless, crystalline appearance of corn whisky.

The unproductivity of the rocky soil and the absence of variety in the possible occupations have tended to make the manufacture of whisky the most profitable means of disposing of the scanty harvests, particularly if that disposition can be effected without paying the Federal tax. To the mountaineer the revenue laws are an invasion of his natural right to utilize and sell his property—a feeling which to him removes moral stigma from his chosen business. This philosophy and practice, however, have involved him in perennial struggle with the revenue officers. This conflict may be said with historical accuracy to have begun in the United States with the passage of the Alexander Hamilton Excise Law of 1791. The differences between the Pennsylvania farmers and the Washington administration about this law led finally to the so-called Whisky Insurrection of 1794, in which the government encountered an armed organization. The result then demonstrated that organized and public opposition to the law was futile; so distillers thenceforward resorted to secrecy and evasion. Although the excise law, which was opposed by public opinion, was repealed during the Jefferson administration, moonshining appeared again when the law was reënacted. The generally accepted idea of the mountaineer moonshiner is that he is secretive and suspicious of outsiders until his confidence is won, on which he becomes a generous and faithful friend, hospitable to the limit of his resources. In his seclusion and ignorance he has evolved peculiar social customs and sanctions, together with a dialect, of his own; and he is of a blood singularly unmixed with foreign elements. One seemingly ineradicable characteristic of the life is the feud, which is often conducted with savagery and implacable hatred, becoming an hereditary legacy of families and clans. The origins of such blood wars are probably too numerous for comprehension, but one fruitful cause lies in the practice of individuals of giving information respecting the illegal distilleries of their enemies to the revenue officials, which provokes reprisals. The family of the man injured, however much it may disapprove of his conduct, considers it necessary to assume his quarrel. Such has been said to have been one of the causes of the famous Breathitt County War in Kentucky.

The Commissioner of Internal Revenue reported in 1913 that "illicit distilling continues with slight abatement" and that in that fiscal year 2375 stills were seized. Of these, 2120 were located in the States mentioned above. The forces of civilization, i.e., of law and education, together with the approach and multiplication of modern industries, have slowly invaded the moonshiner's domain; and he, learning new and more profitable occupations, has been thought to be abandoning his unlawful business. But it is impossible to predict with certainty when these forces will eventually triumph.

MOON SNAKE. A Brazilian colubrine venomous snake of the genus *Scytale*. They are of small size and dull colors. Some of them are arboreal, others fully terrestrial. They hunt almost exclusively at night and feed mainly on lizards. Although their fangs (see OPISTHOGLYPHA) are large, these reptiles seem never to attack human beings.

MOONWORT. A fern. See BOTRYCHIUM.

MOONYAH. See MOONJA.

MOOR, MOORING (probably from Dutch *marren*, to tie, moor, hinder, retard, AS. *mirran, myrran, merran*, OHG. *marrjan, marren*, dialectic Ger. *marren*, to entangle, Eng. *mar*). To moor a vessel is to secure it with ropes or chains to anchors or to a wharf or to the buoys of permanent moorings. The common method of mooring with two anchors is to drop one anchor, veer chain to 60, 75, or 90 fathoms and let go the other, and then heave in on the long chain and veer on the shorter until lying with both chains equal, or with one about 15 fathoms shorter than the other. This method is generally resorted to when the anchorage ground is contracted and there is insufficient room for a ship to swing about a single anchor with a full scope of chain. In many harbors, where the anchorage space is limited, permanent moorings are laid down. These usually have buoys to which the anchor chains are attached, the ship being secured to the buoy by a hawser or short length of chain. In many European roadsteads the buoys are of no greater size than is necessary to support light chains which are attached to the real mooring cable. The light chain is used to haul the upper end of the main cable on board the ship, where it can be secured. The lower end of the cable is shackled to the ends of others leading along the bottom to the anchors, two to four in number, placed at the corners of a square or triangle or up and down stream. See ANCHOR; HAWSE; MOORING SWIVEL.

MOOR. Wet land, with peaty soil, possessing a vegetation in which mosses are usually conspicuous. Two types of moor are distinguished, the one characterized by the presence of the peat mosses or sphagnums, and on account of the tendency of this plant to grow in thick soft masses above the surrounding areas often called high moor; the other without sphagnum, known as low moor. In America high moors are usually called bogs (see BOG). Low moor is also known as meadow moor, sedge moor, swamp meadow, or fen. Here sphagnums are nearly or quite absent, although other mosses are found which contribute to the scanty peat. The bulk of the vegetation is usually made up of a variety of grasses and sedges with the addition of various herbs and such shrubs as low willows, alders, and dwarf birches, the last being more abundant at high altitudes and in northern areas. Low moors are easily transformed into tillable land that is often of excellent quality on account of the sufficient but moderate amount of peat and humus. Often upon the removal of the surplus water by drainage rich farm lands are at once available for tillage. See BOG; PEAT; SPHAGNUM; SWAMP.

MOOR, EDWARD (1771–1848). An English writer on India. He entered the service of the East India Company in 1782, but in 1790 joined the army. He retired in 1806 on a special pension and a large grant as a reward for his

bravery and for a *Digest of the Military Orders and Regulations of the Bombay Army* (1800). Moor's most valuable book was the *Hindu Pantheon* (1810; new ed. by Simpson, Madras, 1864), which is still an authority because of its unique illustrations. His *Oriental Fragments* (London, 1834) is also worthy of note.

MOOR BLACKBIRD. See RING OUZEL.

MOOR'CROFT, WILLIAM (c.1765–1825). An English veterinary surgeon and traveler, born in Lancashire. He studied medicine in Liverpool, but subsequently devoted himself to veterinary surgery. In 1808 he became veterinary surgeon to the Bengal army and superintendent of the East India Company's stud at Pûsâ, near Cawnpore. While occupying these positions he undertook a series of remarkable journeys in northern India, was the first Englishman to cross the Himalayas, vainly endeavored to penetrate Chinese Turkestan, and died while returning from Bokhara. His papers were edited by Prof. H. H. Wilson and published in 1841 under the title *Travels in the Himalayan Provinces of Hindustan and the Punjab from . . . 1819 to 1825.* Among his other writings is a translation of Valli's *Experiments in Animal Electricity* (1793).

MOORE, ADDISON WEBSTER (1866–). An American philosophical scholar, born at Plainfield, Ind. He graduated from DePauw University (A.B., 1890; A.M., 1893); studied at Cornell (1893–94); and took his Ph.D. in 1898 at the University of Chicago, with the faculty of which he had been connected for three years, and where he remained, becoming professor of philosophy in 1909. Moore was president of the Western Philosophical Association in 1911. For some years he was associated with John Dewey, to whose philosophical ideas he gave his support. See PRAGMATISM; EMPIRICISM. His writings include: *Functional versus Representational Theories of Knowledge in Locke's Essay* (1902); *Existence, Meaning, and Reality in Locke's Essay and in Present Epistemology* (1903); *Pragmatism and Its Critics* (1910).

MOORE, mōōr *or* mōr, ALBERT JOSEPH (1841–93). An English decorative and figure painter, born in York, of a family of painters. (Henry Moore, 1831–95, was his brother.) He studied for a short time at the Royal Academy Schools and began his career with a number of purely decorative works done principally for theatres and churches. He was at first inclined to follow the Pre-Raphaelites, but soon developed an original style, classic in character, though his subjects, which are usually figures of women, are not drawn from antiquity. His sentiment is purely æsthetic, never emotional or dramatic, his sense of beauty is unerring, his color harmonious and delicately brilliant, and his composition simple and decorative, with a quality that is Japanese. His best-known paintings include "Midsummer" (1887); "Blossoms" (Tate Gallery, 1881); "A Summer Night" (Liverpool Gallery); "The Open Book" and "Somnus," both in the Victoria and Albert Museum; "Dreamers" (Birmingham Gallery). For his biography, consult Baldry (London, 1894) and the *Masters in Art,* vol. ix (Boston, 1908).

MOORE, ALFRED (1755–1810). An American jurist, born in Brunswick Co., N. C., a son of Maurice Moore (q.v.). He was educated in Boston. In August, 1775, he was made captain in the First Regiment, North Carolina Line, of which his uncle, James Moore, was colonel, and took part in the defense of Charleston, S. C., in June, 1776. He resigned in March, 1777, but served in the militia against Cornwallis after the battle of Guilford Court House. In 1792 he was elected Attorney-General by the Assembly, though he knew little or no law. He was elected judge of the Superior Court in 1798, but in December of the next year was appointed by President Adams an associate justice of the Supreme Court of the United States. He resigned in 1805.

MOORE, BENJAMIN (1748–1816). An American Protestant Episcopal bishop. He was born in Newtown, Long Island, N. Y.; graduated at King's College in 1768; prepared for the ministry; and went to England, where he was ordained by the Bishop of London in 1774. Returning to America, he was appointed assistant minister in Trinity Church, New York, in the same year. In 1800 he became rector of Trinity Parish. In 1801 he was consecrated Bishop of New York and at the same time was appointed president and professor of logic and rhetoric in Columbia College. He performed the duties of both these positions till 1811, when paralysis disabled him. Bishop Moore's publications include sermons and a pamphlet in vindication of Episcopal services.

MOORE, CHARLES LEONARD (1854–). An American poet and essayist, born in Philadelphia. He became a lawyer and in 1878–79 served as United States Consul at San Antonio, Brazil. Besides contributing critically to the Chicago *Dial,* he published: *Atlas* (1881); *Poems Antique and Modern* (1883); *Book of Day Dreams* (1883); *Banquet of Palacios* (1889), a comedy; *Odes* (1896); *The Ghost of Rosalys* (1900), a poetical drama; *The Red Branch Crests—a Trilogy* (1904).

MOORE, CLARA JESSUP (1824–99). An American philanthropist and writer, born in Philadelphia. She organized in Philadelphia a hospital relief committee during the Civil War and assisted in the foundation of the Temperance Home for Children. After the death of her husband in 1878 she spent much of her time in London, where she died. She published *Miscellaneous Poems* (1875); a romance called *On Dangerous Ground* (1876); *Sensible Etiquette* (1878); *Ether the True Protoplasm* (1885); *Social Ethics and Social Duties* (1892); and other books. The book on ether was written because she believed that ether could account for the Keely motor (q.v.), to whose projector she gave liberally in order that he might develop his idea.

MOORE, CLARENCE BLOOMFIELD (1852–). An American archæologist, born in Philadelphia. He traveled in nearly every part of Europe, in Asia Minor, and in Egypt; crossed the Andes and went down the Amazon River in 1876; and made a trip around the world in 1878–79. During a period of 20 years he explored Indian mounds in nearly all the Southern States. His writings, for the most part published by the Academy of Natural Sciences in Philadelphia, include *Some Aboriginal Sites in Louisiana and in Arkansas* (1913).

MOORE, CLEMENT CLARKE (1779–1863). An American poet and educator, a son of Bishop Moore of New York. He was born in New York, graduated from Columbia College (1798), and was made professor of biblical learning in the General Theological Seminary in New York

(1821), a post that he held until 1850. The ground on which the seminary now stands was his gift. He compiled a *Hebrew and English Lexicon* (1809), and published a collection of *Poems* (1844), among which is "'Twas the Night before Christmas," or more properly, "A Visit from St. Nicholas," which has long been a favorite with young people. It was written for his children in 1822 and appeared anonymously and without his knowledge in the Troy *Sentinel*, Dec. 23, 1823. Consult Stedman, *An American Anthology* (Boston, 1900).

MOORE, Clifford Herschel (1866–). An American Latin scholar. He was born at Sudbury, Mass., and was educated at Harvard (A.B., 1889) and at Munich (Ph.D., 1897). He taught the classics at the Belmont (Cal.) School in 1889–92 and at Phillips Academy, Andover, Mass., in 1892–94. At the University of Chicago he was instructor (1894–95) and assistant professor (1895–98) of Latin; and at Harvard he served as assistant professor of Greek and Latin (1898–1905) and as professor of Latin after 1905. In 1905–06 he was professor of Latin at the American School of Classical Studies in Rome. He edited Allen's edition of Euripides' *Medea* (1899) and Horace's *Odes and Epodes* (1902); is author of *A First Latin Book* (1903) and *The Elements of Latin* (1906), with J. J. Schlicher; and contributed to the New International Encyclopædia.

MOORE, David Hastings (1838–1915). An American Methodist Episcopal bishop, born at Athens, Ohio. He graduated at Ohio University in 1860; was ordained to the ministry the same year; entered the Civil War as a private and rose to be lieutenant colonel of volunteers in the 125th Ohio Infantry. He was president of Cincinnati Wesleyan College (1875–80); president of Colorado Seminary and chancellor of the University of Denver (1880–89); and editor of the *Western Christian Advocate* from 1889 to 1900, when he was elected Bishop and sent to take charge for four years of the Methodist missions in China, Japan, and Korea. From 1904 to 1908 his official residence was Portland, Oreg.; from 1908 to 1912 Cincinnati. In 1912 he retired. He was a member of the General Conferences of 1888, 1892, 1896, and 1900, and of the North China Branch of the Royal Asiatic Society.

MOORE, Edward (1712–57). An English dramatist, born at Abingdon, Berkshire. He was a linen draper in early life, but failed in business and devoted himself to literature, *Fables for the Female Sex* (1744) being his first publication. He afterward wrote two unsuccessful comedies, *The Foundling* (1748) and *Gil Blas* (1751). These were followed by *The Gamester* (1753), the good fortune of which may have been due to Garrick's acting and his collaboration. In 1753 he became editor of the *World*, a satirical weekly, with a very talented staff, including Lord Lyttelton, Horace Walpole, and Lord Chesterfield. His *Poems, Fables, and Plays* were collected and published in 1756. The *Fables* were often reprinted with those of John Gay, and were translated into German.

MOORE, Edward (1838–1916). An English scholar, born at Cardiff. He was educated at Bromsgrove Grammar School and at Pembroke College, Oxford. For a time he was rector of Gatcombe, Isle of Wight. From 1862 to 1864 he was fellow and tutor of Queen's College, Oxford. In 1864 he became principal of St. Edmund Hall, and in 1903 he was made canon of Canterbury Cathedral. He became honorary fellow of Pembroke and Queen's colleges, and received the Dublin D.Litt. His publications comprise: *Aristotle's Ethics*, books i–iv (5th ed., 1896); *Aristotle's Poetics, with Notes* (1875); *Time References in the Divina Commedia* (1887), translated and published at Florence in 1900 with the title *Gli accenni al tempo nella Divina Commedia; Textual Criticism of the Divina Commedia* (1889); *Dante and his Early Biographers* (1890); *Tutte le opere di Dante Alighieri*, the "Oxford Dante" (1894); *Studies in Dante* (first series, 1896; second series, 1899; third series, 1903). The "Oxford Dante," by all means the best edition of Dante's works, together with Moore's other studies in the same field, placed him among the first of Dante scholars.

MOORE, Edward Caldwell (1857–). An American theologian, brother of George Foot and Frank Gardner Moore. He was born at West Chester, Pa.; graduated from Marietta College in 1877 and from Union Theological Seminary in 1884; and studied at Berlin, Göttingen, and Giessen in 1884–86, and at Brown (Ph.D., 1891). Ordained to the Presbyterian ministry in 1884, he was pastor at Yonkers, N. Y. (1886–89), and of the Central Congregational Church of Providence, R. I. (1889–1901). In the latter year he became Parkman professor of theology at Harvard, where he was university preacher in 1905–06. He lectured also at Mansfield College, Oxford, in 1894 and 1913, at Andover Theological Seminary in 1900, at Lowell Institute, Boston, in 1903, and at Yale Divinity School in 1906. In 1914 he was elected president of the American Board of Commissioners for Foreign Missions. His publications include *The New Testament in the Christian Church* (1904) and *An Outline of the History of Christian Thought since Kant* (1912).

MOORE, Edward Mott (1814–1902). An American surgeon, born at Rahway, N. J. He received his medical education in New York City and Philadelphia (M.D., University of Pennsylvania, 1838). His family had settled in Rochester, N. Y., and it was there that he made his permanent residence, although at different periods, with the title of professor of surgery, giving series of lectures at medical colleges—at Woodstock, Vt. (1842–54), at Berkshire, Mass. (1855), at Starling Medical College, Columbus, Ohio (1857), and at Buffalo Medical College (1858–83). He was president of the New York State Medical Society (1874), of which society he was one of the founders, of the American Surgical Association (1883), and of the American Medical Association (1890). For many years he was president of the board of trustees of the University of Rochester, and he is remembered as the "father" of the Rochester park system.

MOORE, Eliakim Hastings (1862–). An American mathematician, born at Marietta, Ohio. He studied at Yale (A.B., 1883; Ph.D., 1885) and at Berlin (1885–86); was instructor in mathematics at Yale (1887–89) and professor at Northwestern University (1889–92) and then at Chicago, where in 1896 he was made head of the department. He became a member of the National Academy of Sciences in 1901. The author of many important papers in advanced mathematics, among them "Introduction to a Form of General Analysis," published in

the *New Haven Mathematical Colloquium* (1910), Moore also edited the *Transactions of the American Mathematical Society* (1899–1907), and he was president of the society in 1901–03.

MOORE, Eva (1870–). An English actress, born in Brighton. She went on the stage in 1887, joined Toole's company in 1888, and married in 1891 Henry V. Esmond (q.v.), with whom she managed his play *Eliza Comes to Stay* in 1913. She had played Lady Ernestone in Esmond's *My Lady Virtue* (1903) and Wilhelmina Marr in his *Billy's Little Love Affair* (1903); and was Mabel Vaughan in *The Wilderness* (1901) and Kathie in *Old Heidelberg* (1902 and 1909) with George Alexander. In 1907 she took the name part in *Sweet Kitty Bellairs* (1907); and she played Mrs. Errol in *Little Lord Fauntleroy* and Mrs. Crowley in *The Explorer* in 1908, and the Hon. Mrs. Bayle in *Best People* and the Hon. Mrs. Rivers in *The House Opposite* in 1909.

MOORE, Frank (1828–1904). An American journalist and compiler, a brother of George Henry Moore. He was born in Concord, N. H., but removed to New York City and became a journalist and general writer. In 1869-72 he was Assistant Secretary of Legation in Paris. He edited *Songs and Ballads of the American Revolution* (1856); *Cyclopedia of American Eloquence* (1857); *Diary of the American Revolution* (2 vols., 1860); *The Rebellion Record* (12 vols., 1861–68), a collection of original material bearing on the Civil War; *Lyrics of Loyalty* (1864); *Confederate Rhymes and Rhapsodies* (1864); *Personal and Political Ballads* (1864); *Speeches of Andrew Johnson* (1865); *Life and Speeches of John Bright* (1865); *Women of the War 1861–66* (1866); *Songs and Ballads of the Southern People, 1861–65* (1887).

MOORE, Frank Frankfort (1855–). A British novelist and dramatist, born at Limerick, Ireland, and educated at the Royal Academical Institution, Belfast. His plays include: *A March Hare* (1877); *The Queen's Room* (1891); *Kitty Clive, Actress* (1895). Some of his numerous novels are: *Coral and Coconut* (1890); *The Two Clippers* (1893); *The Secret of the Court* (1895); *The Millionaires* (1898); *A Damsel or Two* (1902); *He Loved but One* (1905); *An Amateur Adventuress* (1908); *The Keeper of the Robes* (1912); *Discovering "Evelina"* (1913). His novels are generally of a sensational kind, and frequently draw upon the author's travels in two hemispheres for characters and incidents. Moore is also author of *Oliver Goldsmith* (1910) and *The Commonsense Collector: A Book of Hints on the Collecting and Housing of Antique Furniture* (1911). In 1915 he published *The Lady of the Reef*.

MOORE, Frank Gardner (1865–). An American Latin scholar, brother of Edward Caldwell and George Foot Moore. He was born at West Chester, Pa., and educated at Yale (A.B., 1886; Ph.D., 1890) and at Berlin (1890–91). He was a Latin tutor at Yale in 1888–93, assistant professor of Latin (1893–1900) and associate professor of Latin and Roman archæology (1900–08) at Dartmouth College, and professor of Latin at Trinity College, Hartford, Conn. (1908–10). In the latter year he became professor of classical philology at Columbia University. He edited the *Transactions* and the *Proceedings* of the American Philological Association, of which he became secretary in 1904. He edited also Cicero's Cato Maior (1904) and Tacitus' *Histories* (1910).

MOORE, George (1853–). An Irish novelist, the son of George Henry Moore, M.P., of Moore Hall, Ballyglass, County Mayo, Ireland. He was educated at a Catholic school in Ireland and under a tutor in London, where, at his father's wish, he prepared to enter the army. Later, in London and in Paris, he studied art. After abandoning this prospective profession he continued his Bohemian life in Paris, becoming intimate in good literary and artistic circles. In the late 1870's he returned to London and, temporarily in straitened circumstances, worked hard as a journalist, critic, and novelist, acquiring by degrees idiomatic fluency in the writing of English, which for years had been an unused tongue to him. In 1901 an interest in the movement known as the Irish literary revival (see Irish Literature, II), in which his friends Edward Martyn (q.v.) and William Butler Yeats (q.v.) bore a prominent part, took him to Dublin, where he remained for a decade, assisting in the establishment of a theatre (a feature of the revival) and identifying himself variously with its literary activities. The interference of Catholic Irish objections with the free play of ideas in art, and also, perhaps, a general failure to fit in with the aims, moods, and methods of the movement, led him to abandon his native land again in 1911, and to present the world with a record of his decade's adventures in a book of most indiscreet confessions, *Hail and Farewell* (3 vols., *Ave, Salve,* and *Vale,* New York, 1911–13). Primarily a novelist, Moore was also a critic of art and a dramatist. Following two small volumes of verse, *Flowers of Passion* (1877) and *Pagan Poems* (1881), came his first novel, *A Modern Lover* (1883), which showed him a disciple—with a difference, however—of Flaubert and Zola, and a realist in his strict regard for major and minor truth, but a realist whose work is often aglow with imaginative insight and poetic quality. Other novels followed close upon his first, but it was not until *Esther Waters* (1894) appeared that Moore's eminence among the novelists of his generation was recognized. This book, together with *A Mummer's Wife* (1884), *Evelyn Innes* (1898), and its sequel *Sister Theresa* (1901), gives Moore his claim to remembrance as a writer of fiction. *The Untilled Field* (1903), a book of stories of anti-Catholic tendency, and *The Lake* (1905), a novel, are Irish in theme and setting, and grew out of his 10 years of later residence in Ireland. In art criticism Moore's stimulating quality is found in his *Impressions and Opinions* (1890) and in *Modern Painting* (1893). In the drama his work is competent and effective, if not masterly and impressive. His plays include *The Strike at Arlingford* (1893); *The Bending of the Bough* (1900); *Diarmid and Grania,* with W. B. Yeats (unpublished, but played 1901). Other works are: *A Drama in Muslin* (1886); *Parnell and his Ireland* (1887); *Confessions of a Young Man* (1888); *Mike Fletcher* (1889); *The Celibates* (1895); *Memoirs of my Dead Self* (1906); *Hail and Farewell* (see above). Besides the last-named book, the *Confessions* and *Memoirs* also are largely autobiographical. Consult also: William Archer, *Real Conversations* (London, 1904); G. K. Chesterton, *Heretics* (New York, 1905); J. G. Huneker, *The Pathos of Distance* (ib., 1913).

MOORE, George Foot (1851–). An American Orientalist, brother of Edward Caldwell and Frank Gardner Moore. He was born at West Chester, Pa. He graduated at Yale in 1872 and at Union Theological Seminary in 1877, entered the Presbyterian ministry, and was pastor of the Putnam Presbyterian Church at Zanesville, Ohio, for five years. From 1883 to 1902 he was Hitchcock professor of Hebrew and the history of religions at Andover Theological Seminary, and at Harvard University he was professor of theology (1902–04), and thereafter Frothingham professor of the history of religion. He was for several years editor of the *Journal* of the American Oriental Society, whose president he was in 1911–12. His publications include: *A Critical and Exegetical Commentary on the Book of Judges* (1895); *The Book of Judges: A New English Translation* (1898); *The Book of Judges: Critical Edition of the Hebrew Text* (Leipzig, 1900); *The Literature of the Old Testament* (1913); *History of Religions* (vol. i, 1913); *Metempsychosis,* the Ingersoll lecture at Harvard (1914).

MOORE, George Henry (1823–92). An American historical writer and librarian, born in Concord, N. H. He removed in 1839 to New York City and in 1843 graduated at New York University. Before leaving college he had become connected with the New York Historical Society, as an assistant to his father, Jacob Bailey Moore, the librarian, and in 1849 succeeded him as its librarian. In this position he remained until 1872, when, on the opening of the Lenox Library (now a part of the New York Public Library), he became its first superintendent. Here he remained until his death. He was a frequent contributor to historical magazines and to the proceedings of historical societies. Among his best-known works are: *The Treason of Charles Lee* (1858); *The Employment of Negroes in the Revolutionary Army* (1862); *Notes on the History of Slavery in Massachusetts* (1866); *A History of the Jurisprudence of New York* (1872).

MOORE, George Thomas (1871–). An American botanist, born at Indianapolis, Ind., and educated at Wabash College (B.S., 1894) and at Harvard (A.B., 1895; Ph.D., 1900). He was plant physiologist and algologist of the Bureau of Plant Industry at Washington (1901–03), had charge of the Laboratory of Plant Physiology of the Department of Agriculture (1903–05), and was in charge of botany at the Marine Biological Laboratory at Woods Hole, Mass. He served as professor of applied botany and plant physiology at the Shaw School of Botany, Washington University, in 1909–12, and during the same period was physiologist to the Missouri Botanical Garden, of which he became director in 1912. He discovered a method of preventing the pollution of water supplies by algæ and made experiments in introducing atmospheric nitrogen by means of bacteria into the soil for crop purposes. He is author of various contributions to scientific journals and of governmental bulletins.

MOORE, Harry Humphrey (1844–). An American genre and portrait painter, born in New York City. He studied under Waugh in Philadelphia and at the Ecole des Beaux-Arts, Paris, under Gérôme. Afterward he became the pupil and friend of Fortuny in Madrid, and still later traveled and painted in Germany, Italy, and Japan. Although both deaf and dumb, he achieved success in his profession at Paris, his permanent residence. His best works include refined, sparkling Japanese studies and Spanish and Moorish scenes, such as "Gypsy Encampment, Granada," and "A Moorish Bazar." He received the Order of Charles III of Spain.

MOORE, Sir Henry (1713–69). An English Colonial Governor, born in Vere, Jamaica. He became Lieutenant Governor of his native island in 1755 and, except for a few weeks in 1759, directed the administration of Jamaica until 1762. In reward for his services in suppressing the slave insurrection of 1760 he was made Baronet. In July, 1765, he was appointed Governor of New York, where he arrived at the beginning of the trouble over the Stamp Act. Influenced by public opinion, he suspended the execution of the act. His administration was generally popular with the people on account of the moderation with which he carried out the orders of the home government during the years following the Stamp Act. He continued to hold the office of Governor until his death.

MOORE, Henry (1751–1844). A Wesleyan minister and biographer of John Wesley. He was born in a suburb of Dublin and was apprenticed to a wood carver. Impressed by the preaching of John Wesley, he frequented the Methodist meetings and joined a class in Dublin in 1777. He served from 1784 until 1786 as assistant traveling companion and amanuensis to John Wesley, and again from 1788 to 1790. Wesley made him one of his three literary executors and appointed him to be, after his death, one of the 12 ministers to regulate the services of City Road Chapel. He was president of the Wesleyan Conference in 1804 and 1823. Moore refused ordination in the Church of England, although he accepted it from Wesley assisted by two Episcopal clergymen; opposed Coke's Lichfield scheme of 1794 for the creation of a Methodist hierarchy and also the proposal brought forward in 1834 for the establishment of a theological school; and on the formation of a centenary fund in 1839 objected to the acquisition of land by the Methodist body. In conjunction with the Rev. Thomas Coke, and under the authority of the conference, he published a *Life of the Rev. John Wesley* in 1792, which, however, owing to a difference with the third literary executor, they had been obliged to prepare without access to Wesley's papers. Most of the papers were afterward obtained, and a new *Life* was published in 1824–25. Moore's other works are: *A Reply to Considerations on the Separation of the Methodists from the Established Church* (1794); *Poems, Lyrical and Miscellaneous* (1806); *Life and Death of Mrs. Ann Moore* (1813); *Thoughts on the Eternal Sonship* (1816); *The Life of Mrs. Mary Fletcher of Madeley* (2 vols., 1817; 9th ed., 1838); *A Short Account of Miss Mary Titherington of Liverpool* (1819); *Sermons* (1830), with autobiography to 1791. His life was published by Mrs. Richard Smith, with the autobiography in 1844.

MOORE, Henry (1831–95). An English marine and landscape painter, a brother of Albert Joseph Moore, born in York. He was the pupil of his father, William Moore, and studied also at the York School of Design and the Royal Academy Schools. At first an excellent animal and landscape painter, he gave himself after

1857 almost entirely to marine subjects. In rendering of wave movement, in veracity of color and texture, and in subtle atmospheric effects he has few rivals. His works include: "The Newhaven Packet" (Birmingham Gallery), "Cat's-paws off the Land" (Tate Gallery, London), "Mount's Bay" (1886, Manchester Gallery), and "Clear Shining after Rain," which won the Grand Prix at Paris in 1889. Moore was elected an academician in 1893.

MOORE, JACOB BAILEY (1797–1853). An American journalist and historical writer, born at Andover, N. H. He learned the printer's trade at Concord, engaged in editorial work and edited the *New Hampshire Journal* from 1826 to 1829, when he was elected sheriff of Merrimack County, N. H. He was a member of the Legislature in 1828. In 1839 he removed to New York and edited the *Daily Whig*. He was in the government employ in Washington, 1841–45, but returned to New York and served as librarian of the Historical Society from 1845 to 1849. From 1849 to 1853 he was postmaster of San Francisco. He published, with John Farmer: *Collections Historical and Miscellaneous* (3 vols., 1822–24), relating principally to the early history of New Hampshire; *Gazetteer of the State of New Hampshire* (1823); *Annals of the Town of Concord* (1824); *Lives of the Governors of New Plymouth and Massachusetts Bay* (1846).

MOORE, JAMES (c.1640–1729). An American Colonial soldier and official. He was said to be a son of Roger Moore, the Irish rebel, and came to South Carolina about 1665. He settled on Goose Creek (Otranto), near the Cooper River, about 15 miles north of Charleston, and soon became prominent in resisting the demands of the Lords Proprietors. He was a member of the Governor's Council in 1682 and of the Assembly in 1692 and in the latter year was excluded from pardon by name by the Proprietors. In 1695 he was a member of Governor Archdale's Council and traded extensively with the Indians. He was elected Governor by the Council in 1700 and served until the arrival of Sir Nathaniel Johnson in 1703.

MOORE, JAMES (1667–1740). An American soldier and Colonial official, born in Charleston, S. C. He saw service in various Indian expeditions, under his father, James Moore, Governor of South Carolina in 1700–03. In 1702 he fought against the Spaniards in Florida, but the expedition he commanded was not successful and left the State in debt. He conducted a victorious campaign against the Appalachian Indians in 1703, and in 1713 commanded the forces sent by Governor Craven to aid the Colony of North Carolina in its desperate struggle with the Tuscarora Indians. When the Convention threw off the proprietary government and deposed Gov. Robert Johnson in 1719, Moore was made Governor, but was succeeded by Arthur Middleton the same year. He afterward became Attorney-General of the State and an admiralty judge. He was Speaker of the Assembly in 1721–25. Ten years later he went with a pioneer colony to North Carolina and settled near Cape Fear, where he died.

MOORE, JAMES HOBART (1852–1916). An American lawyer and industrial promoter, born at Berkshire, N. Y. He was a bank clerk at Binghamton, N. Y., from 1871 to 1873, when he moved to Chicago. There he was admitted to the bar in 1881. He was associated with his brother, William Henry Moore (q.v.), in the promotion of various great industrial corporations, and was also a director of the Rock Island lines and of the American Can Company.

MOORE, JOHN (1729–1802). A Scottish physician and author, born at Stirling. He studied at the University of Glasgow, was apprenticed to a surgeon, became in 1747 surgeon's mate in the army, and served in military hospitals in the Netherlands during the War of the Austrian Succession. After further study and two years of practice at Glasgow he traveled extensively on the Continent. In 1792 he was in France during the disturbances of August and September, and in 1793–94 published his two-volume *Journal* of his residence, frequently quoted in Carlyle's *French Revolution*. His works of travel, *A View of Society and Manners in France, Switzerland, and Germany* (1779) and *A View of Society and Manners in Italy* (1781), are merely interesting in style. He wrote also a volume of *Medical Sketches* (1786), containing some results of first-hand investigation, and three dull works of fiction, *Zeluco* (1786), *Edward* (1796), and *Mordaunt* (1800), to the first of which Byron referred in the addition to the preface of *Childe Harold*. He edited (1797) the works of his friend and patient, Smollett, and wrote the memoir that introduced the edition. Prevost and Blagdon edited *Mooriana, or Selections from the Moral, Philosophical, and Miscellaneous Works of Dr. John Moore* (London, 1803). Consult the *Life* by Anderson (Edinburgh, 1820).

MOORE, SIR JOHN (1761–1809). A British general. The eldest son of Dr. John Moore (q.v.), he was born at Glasgow, Nov. 13, 1761. He entered the army when only 15 and served with distinction in Nova Scotia, Corsica, the West Indies, Ireland, and Holland. He was in Egypt with the army under Abercromby, and obtained the Order of the Bath for his services during the operations around Abukir Bay. In 1802 Moore served in Sicily and Sweden. In 1808 he was sent with a corps of 10,000 men to strengthen the English army in the Peninsula. In October he moved his army from Lisbon, with the intention of advancing by Valladolid to unite with the Spanish general Romana and threaten the communications between Madrid and France. But the apathy of the Spaniards and the successes of the French in various parts of the Peninsula soon placed him in a critical position. He had determined to make a bold advance from Salamanca to attack Soult, when the news reached him that Madrid had fallen and that Napoleon was marching to crush him at the head of 70,000 men. Moore's forces amounted to only 25,000 men and he was consequently forced to retreat. In December he began the march from Astorga to Coruña, a route of nearly 250 miles, through a desolate and mountainous country, made almost impassable by snow and rain, and harassed by the enemy. The soldiers suffered intolerable hardships, and arrived at Coruña in a very distressed state; but it was impossible to embark without fighting. On Jan. 16, 1809, the French under Soult attacked and a desperate battle ensued. Moore was struck by a cannon ball on the left shoulder and died in the moment of victory. The French were repulsed with the loss of 2000 men. Consult: J. C. Moore, *Life of Sir John Moore* (London, 1834); W. F. P. Napier, *History of the Peninsular War* (5 vols., New York, 1856);

C. B. Mayne, "Moore," in Spenser Wilkinson, *From Cromwell to Wellington* (London, 1899); *Diary*, edited by Sir J. F. Maurice (2 vols., London, 1904).

MOORE, JOHN (1826–1907). An American physician, a surgeon-general of the United States army. He was born in Indiana, entered the United States army as assistant surgeon in 1853, and served in Florida and on the Utah expedition (1857). When the Civil War broke out he was attached to the Cincinnati Marine Hospital, was promoted surgeon in 1862, and was assigned to the Army of the Potomac. In 1863 he became medical director of the Army of the Tennessee and accompanied General Sherman on his march to the sea and through the Carolinas. In 1865 he received the brevet of colonel, in 1883 he was made assistant medical purveyor with the rank of colonel, and in 1886 he was appointed surgeon-general of the army with the rank of brigadier general. He was retired for age in 1900.

MOORE, JOHN BASSETT (1860–). An American publicist, an authority on international law. He was born Dec. 3, 1860, at Smyrna, Del., graduated at the University of Virginia in 1880, studied law at Wilmington, and at 23 was admitted to the Delaware bar. Entering the Department of State as a law clerk in 1885, the next year he was appointed Third Assistant Secretary of State. During his service in this position he acted as secretary to the Conference on Samoan Affairs (1887) and to the Fisheries Conference (1887–88). After 1891 he held the chair of international law and diplomacy at Columbia, but was frequently granted leave of absence to accept appointments in the public interest. For part of 1898 he served as Assistant Secretary and Acting Secretary of State, and after the close of the war with Spain was secretary and counsel to the American Peace Commission at Paris. Subsequently Moore represented the government as agent before the United States and Dominican Arbitration Tribunal (1904), as delegate to the Fourth International American Conference at Buenos Aires and special plenipotentiary to the Chilean centenary (both 1910), and as delegate to the International Commission of Jurists at Rio de Janeiro (1912). In 1913 he accepted the post of counselor to the State Department (with power to act as Secretary of State), but the next year he resigned and resumed his duties at Columbia. A member of the Permanent Court at The Hague (from 1913), member of the Institut de Droit International and of the Institut Colonial International, president of the American Political Science Association (1914), and chairman of the Lake Mohonk Peace Conference (1914 and 1915), Moore was further honored by the degree of LL.D. from Columbian (now George Washington) University, Delaware College, Yale, the University of Chile, and Brown. His works, of the highest importance in their field, include: *Reports on Extraterritorial Crime* (1887); *Extradition and Interstate Rendition* (2 vols., 1891); *American Notes on the Conflict of Laws* (1896); *History and Digest of International Arbitrations* (6 vols., 1898); *American Diplomacy: Its Spirit and Achievements* (1905); *Digest of International Law* (8 vols., 1906); *Four Phases of American Development: Federalism, Democracy, Imperialism, Expansion* (1912). He also edited *The Works of James Buchanan* (12 vols., 1908) and became an editor of the *Political Science Quarterly* and of the *Journal du Droit International Privée*.

MOORE, JOHN PERCY (1869–). An American zoölogist, born at Williamsport, Pa. He was educated at the Central High School of Philadelphia (A.B., 1886) and at the University of Pennsylvania (B.S., 1892; Ph.D., 1896), where he was instructor in zoölogy from 1892 to 1907, assistant professor in 1907–09, and thereafter professor. In 1902 he became assistant curator of the Academy of Natural Sciences at Philadelphia. After 1890 he was repeatedly employed by the United States Fish Commission, served as instructor in biology at the Hahnemann Medical College in 1896–98, and was instructor in zoölogy at the Marine Biological Laboratory at Woods Hole, Mass., after 1901.

MOORE, JOHN WHITE (1832–1913). An American naval officer, born at Plattsburg, N. Y. He was appointed third assistant engineer in the United States navy in 1853 and was promoted to chief engineer in 1861. During the Civil War he took part in the engagements with the ram *Manassas* and in the capture of the defenses of Pensacola in 1861; in the passage and capture of Forts Jackson and St. Philip, the capture of New Orleans, the passage of the Vicksburg batteries, and the fight with the ram *Arkansas* in 1862; and in the capture of Port Hudson in 1863. He originated the use of chain cables to protect the sides of wooden ships, of a paint designed to render fighting ships less easily visible, and of the fighting tops until lately found on the masts of all large war vessels. He retired in 1894 with the rank of commodore, but during the Spanish-American War he served as an inspector in the New York Navy Yard. For his services in the Civil War he was raised to the rank of rear admiral in 1906.

MOORE, MAURICE (1735–77). An American Colonial legislator and jurist, born in Brunswick Co., N. C. He became a member of the State Assembly in 1757. From 1767 to 1773 he was one of the three judges of the Superior Court. He served as colonel of brigade in the expedition of Governor William Tryon (q.v.) against the Regulators (q.v.) in 1771. In this year he published the venomous attack on Governor Tryon signed "Atticus." He was a member of the Provincial Congresses of 1775 and 1776 and of the Constitutional Convention of 1776.

MOORE, NICHOLAS (?–1689). A chief justice of Pennsylvania, born in England. He was chairman of the first Provincial Assembly in 1682, Speaker of the Assembly in 1684, and in the same year was appointed Chief Justice. In 1685 he was impeached by the Assembly for exceeding his powers, but he was never tried by the Council. His case is peculiarly interesting as being probably the first instance of impeachment that occurred in America. Consult: W. R. Shepherd, *History of Proprietary Government in Pennsylvania* (New York, 1896, and as vol. vi of *Columbia University Studies in History, Economics, and Public Law*).

MOORE, ROBERT (1838–). An American civil engineer, born at New Castle, Pa. He graduated from Miami University in 1858 and after 1863 was engaged in civil engineering, chiefly in the location and construction of railroads. In 1877–81 he was sewer commissioner and a member of the board of public works of St. Louis, Mo., where from 1897 to 1913 he was a member of the board of education. He

was president of this board in 1905–06 and 1909–10. He became a consulting engineer and a member of the Brazos River and the Southwest Pass boards of engineers. He served as president of the American Society of Civil Engineers in 1902.

MOORE, THOMAS (1779–1852). An Irish poet, born in Dublin, May 28, 1779. In 1794 he went to Trinity College, Dublin, which had been opened to Roman Catholics in 1793. He had already shown a remarkably quick mind, a gift for music, and had written in 1793 "Lines to Zelia" and "A Pastoral Ballad." These verses appeared in the *Anthologia Hibernica*, a periodical which lived only two years. Noteworthy in his university experience was his friendship with Robert Emmet, which nearly involved him in the United Irish conspiracy. He went to London in 1799 and soon arranged for the publication by subscription of his *Anacreon* (1800). He had the good luck to find a patron in the Prince of Wales, who accepted the dedication of the poem. The *Anacreon* was followed by *Poems by the Late Thomas Little* (1801), a volume of sweet but oversensuous verse, much blamed, much applauded, and widely read. Moore's musical talents soon made him a welcome guest among the aristocracy. In 1803 he was appointed admiralty registrar at Bermuda, but, disliking the post, he intrusted it to a deputy (1804) and traveled through the United States and Canada, visiting, among other cities, New York, Washington, Baltimore, Philadelphia, and Boston. He returned to England in November, 1804. In 1806 appeared *Odes* and *Epistles*, which Jeffrey made the occasion for a savage attack on Moore's earlier erotics (*Edinburgh Review*, July, 1806). The incident led to a duel interrupted by the police (Aug. 11, 1806). After this fiasco the combatants became cordial friends. In 1807 Moore published his *Irish Melodies*, 124 in number, in 10 parts. His three satires, *Corruption* and *Intolerance* (1808) and the *Skeptic* (1809), fell flat, as they deserved to do. On the other hand, lampoons on the Regent and his favorites went from mouth to mouth and were still liked when they were gathered in *The Two-penny Post Bag* in 1813. In 1811 Moore married a young actress, Miss Bessie Dyke, with whom he seems to have lived happily. In 1815, with the aid of a library of books on Oriental themes, Moore set to work on *Lalla Rookh*, a sugared Oriental romance in verse, with which he made an immediate and striking success on its publication in 1817. About this time he became embarrassed by the defalcation of the deputy left at Bermuda and was compelled to retire for a time to the Continent. At Venice he visited Lord Byron, from whom he received the famous *Memoirs*, afterward reluctantly burned. Moore returned to England in 1822. In 1835 he was granted a literary pension of £300, which was supplemented in 1850 by a civil pension of £100.

Moore's popularity as a poet in his day wellnigh rivaled that of Byron or Scott. His fame now rests mostly upon a few of the best poems of the *Irish Melodies* (10 parts, 1807–34) and *National Airs* (1815). Since the Elizabethan age the lyric had been dissociating itself from music. Moore again united them, and so completely that it is unfair to estimate his lyrics independently. They are light, airy, and graceful, though without the passion of Byron or Shelley. Among Moore's other works are: *The Fudge Family in Paris* (1818), humorous verses; *The Loves of the Angels* (1823); *The Memoirs of Captain Rock* (1824), an attack on the Irish church; a prose romance entitled *The Epicurean* (1827); lives of Sheridan (1825), Byron (1830), Edward Fitzgerald (1831); and a *History of Ireland* (completed in 1846). The *Life of Byron*, the main source for all later biographies, is still a classic. Consult: Lord John Russell (ed.), *Memoirs, Journals, and Correspondence of Moore* (8 vols., London, 1853–56); Kent, *Poetical Works*, with memoir (ib., 1883); Gunning, *Thomas Moore, Poet and Patriot* (ib., 1900); S. L. Gwynn, *Thomas Moore* (New York, 1905); J. C. L. Clark, *Tom Moore in Bermuda* (2d ed., Boston, 1909).

MOORE, WILLIAM HENRY (1848–). An American lawyer and capitalist. He was born at Utica, N. Y., studied at Amherst College, and was admitted to the Wisconsin bar in 1872. Settling in Chicago, he made a specialty of promoting corporations and with his brother James H. Moore (q.v.) he formed in 1898–99 four great corporations, the American Can Company, the American Tin Plate Company, the American Steel Hoop Company, and the American Sheet Steel Company, known together as the "Moore group." They had a combined capital of $187,000,000; eventually they were absorbed by the United States Steel Corporation. Judge Moore promoted also the Diamond Match Company and the National Biscuit Company in 1898. He became a director of the United States Steel Corporation, the Rock Island lines, and other important corporations. "Judge" Moore, as he was called, was a familiar figure at American and English horse shows, where his coaching turnouts carried off various prizes.

MOORE, WILLIS LUTHER (1856–). An American meteorologist, born at Scranton, Pa. He was at first a reporter for the Binghamton (N. Y.) *Republican* and then was on the staff of the Burlington (Iowa) *Hawkeye*. Entering the United States Signal Corps, he rose rapidly, becoming professor of meteorology in 1894. From 1895 to 1913 he was chief of the United States Weather Bureau. He served as president of the National Geographic Society from 1905 to 1910 and materially aided in its development. His writings include a *Meteorological Almanac and Weather Guide* (1901) and *Descriptive Meteorology* (1910).

MOOREA, mō'ō-rā'ȧ, or **EIMEO,** ī'mē-ō. One of the Society Islands (q.v.), situated 25 miles west-northwest of Tahiti, in lat. 17° 30′ S. and long. 149° 50′ W. It covers an area of about 50 square miles, has several good harbors, and is very rugged but fertile. The chief products are coconuts, bananas, sugar cane, oranges, and vanilla beans; also copra and pearls. It contains a missionary station, and most of the inhabitants are Protestants.

MOOREHEAD, WARREN KING (1866–). An American archæologist and anthropologist, born in Siena, Italy. He studied at Denison University and the University of Pennsylvania and at the Smithsonian Institution; explored the mounds of the Ohio Valley; and had charge of researches in Colorado, New Mexico, and Utah. He became an assistant in the archæological department of the Columbian Exposition, soon after was appointed curator of the museum of the Ohio State University, and then became curator of the department of archæology at Phillips Academy, Andover, Mass. He wrote: *Fort Ancient* (1890); *Primitive Man in Ohio* (1892);

Prehistoric Implements (1900); *Prehistoric Relics* (1905); *Tonda: A Story of the Sioux* (1904); *Explorations in New Mexico, Arizona, Indiana* (1906); *The Stone Age in North America* (1910).

MOORE PROCESS. See section on *Metallurgy* under GOLD.

MOORE'S CREEK. A small stream in North Carolina, on the banks of which, about 20 miles from Wilmington, a battle of the American Revolution was fought on Feb. 27, 1776, between 1600 Loyalists, mostly Highland Scotch, under Brig. Gen. Donald MacDonald, and about 1000 militia and minutemen, under Gen. James Moore and Cols. Richard Caswell and Alexander Lillington. The Loyalists charged across the girders of a bridge from which the planks had been removed, but within three minutes from the beginning of the engagement the Loyalists were routed. Several of them were killed, MacDonald and about 20 others taken prisoners, while of the patriots only two were wounded. The effect of this battle, says Fiske, "was as contagious as that of Lexington had been in New England."

MOORESVILLE, mōrz'vĭl. A city in Iredell Co., N. C., 28 miles north of Charlotte, on the Southern Railroad (Map: North Carolina, B 2). It has cotton-goods factories, flour mills, lumber yards, creameries, saw mills, and manufactories of furniture, mattresses, shingles, etc. The surrounding region is well adapted to dairying and farming. Mooresville owns its water works, sewage system, and electric-light plant. Pop., 1900, 1533; 1910, 3400.

MOOR'FIELDS. A tract of marshy ground outside the old wall of London, north of the Tower. It was later called Fensbury or Finsbury, the present name of the district.

MOOR FOWL. See GROUSE.

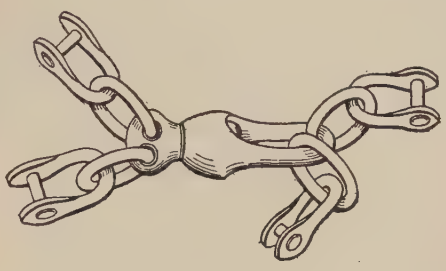
MOORGATE, mo͝or'gāt *or* mōr'gāt. The later name of a gate in the wall of Roman London leading to Moorfields. It was removed about the middle of the eighteenth century. Its name is preserved in the present Moorgate Street.

MOOR'HEAD. A city and the county seat of Clay Co., Minn., on the Red River of the North, opposite Fargo, N. D., and at the junction of the Northern Pacific and the Great Northern railroads (Map: Minnesota, A 4). It is the seat of a State normal school and of Concordia College, and contains a public library. Moorhead is an important distributing centre for the tributary agricultural country and has a large trade in wheat and potatoes. It has grain elevators, canning factories, tent and awning plant, concrete block and silo factories, brickyards, railroad yards, a foundry, and machine shops. The water works and electric-light plant are owned and operated by the municipality. Pop., 1900, 3730; 1910, 4840.

MOOR HEN. The British gallinule. See GALLINULE.

MOOR ILL. See RED WATER.

MOORING SWIVEL. A device employed to join the two chain cables by which a ship is moored so that the swinging of the vessel by the tide or wind will not cause the cables to be crossed or fouled (i.e., twisted about each other). It consists of a large and very heavy link, one end of which has been much thickened. Through this end, in the longitudinal axis of the link, a hole is bored. Through this hole passes the large swivel pin, having a heavy head on the inside to prevent its pulling out and a pair of eyes or holes in the other end, which is flattened for the purpose. Links are fitted in each of these holes, and two others are in the heavy link of the swivel. By means of shackles the four links are connected to the parts of the ship's chains,



MOORING SWIVEL.

the two on the pin to the parts leading from the anchors, the other two to the parts leading into the ship. It is difficult to take off a mooring swivel in bad weather; therefore, if a storm is expected, it is usually removed so that the vessel will be free to work her cables or heave up the anchors. See ANCHOR; HAWSE; MOOR, MOORING.

MOORISH ART. A term applied to the art of the Mohammedans in north Africa, outside of Egypt, and in Spain, though the latter phase of its development is more often called Hispano-Moresque. See MOHAMMEDAN ART.

MOORS (ML. *Morus*, Lat. *Maurus*, Gk. *Μοῦρος*, perhaps from *μαῦρος, mauros, ἀμαυρός, amauros*, dark, or perhaps from their original native name). The name given to a mixed people constituting a very important element in the population of northern Africa, especially Morocco. Their appearance indicates their origin, which is a mixture of the Mauri, Numidians, Phœnicians, Romans, and Arabs, who have successively held possession of the country. They are a well-formed race, with fine Oriental features and a mild and melancholy expression of countenance. The Moors employ the Arabic language, but with many corruptions and deviations from the original. They were conquered and converted by the Arabs at the beginning of the eighth century after a severe struggle. Having once embraced Mohammedanism, they joined the Arabs in the invasion of Spain, passing over in such numbers that in the early period of Spanish history the terms Moors, Saracens, and Arabs are used synonymously to designate the Mussulmans of the peninsula. In the tenth century Moorish domination supplanted that of the Arabs in northwestern Africa. At the close of the eleventh century the Moorish sect of the Almoravides (q.v.), who had established their sway in Morocco, invaded Spain and swept away the Arab kingdoms which had arisen on the ruins of the Caliphate of Cordova. After half a century their realm fell to pieces, and the Moorish sect of the Almohades (q.v.) became dominant in Morocco and Spain. In the meanwhile the Christian power in Spain had been steadily growing, and in 1212 the power of the Almohades was shattered in the battle of Navas de Tolosa (q.v.). What was left of Moorish dominion in the peninsula was soon consolidated in the Kingdom of Granada, which rose to a height of splendor almost rivaling that of the former Caliphate of Cordova. The kings of Granada carried on a vigorous warfare with the kings of Castile; but at length, weakened by internal discord, they succumbed in 1492 to the arms of Isabella of Castile and Ferdi-

nand of Aragon. The Moors, or at least that portion of them who refused to accept Christianity, were then expelled from Spain and began their piratical career in the Barbary states. Those who accepted the religion of their conquerors came to be known as Moriscos. They were subjected to the most rigorous supervision, and any lapses from their adopted religion were ruthlessly punished by the Inquisition. For more than three-quarters of a century they lived as peaceful subjects of Spain and constituted by far the most industrious and intelligent element in the population. The persecutions of Philip II drove them to revolt (1568–70), but the insurrection was suppressed with great cruelty by Don John of Austria, and a large number were driven from the country. The policy of oppression was continued with increased severity under Philip III, and in 1609 the Moriscos were finally expelled from the country, the loss of more than half a million of her most active citizens proving in the end a disastrous blow to Spain. The Moriscos crossed over to Africa, but were received with hostility by their kin, from whom long absence had estranged them. According to the 1910 census, there were 60,000 Moriscos in Spain.

Consult: Abu ibn Mohammed al Makarri, *The History of the Mohammedan Dynasties in Spain*, translated and annotated by P. de Gayangos (2 vols., London, 1840–43); Dozy (ed.), *Histoire de l'Afrique et de l'Espagne* (Leyden, 1848–51), translated from the Arabic of Ibn Adhari; id., *Recherches sur l'histoire politique et littéraire de l'Espagne pendant le moyen âge* (2 vols., 2d ed., Leyden, 1860); Coppée, *History of the Conquest of Spain by the Arab Moors* (2 vols., Boston, 1881); Lane-Poole, *The Moors in Spain* (London, 1886); Lea, *The Moriscos of Spain* (Philadelphia, 1901); Scott, *History of the Moorish Empire in Europe* (3 vols., ib., 1904); Fitzgerald, *In the Track of the Moors* (New York, 1905); A. G. Soler, "Caballeros españoles en Africa y africanos en España," in the *Revue Hispanique* for 1905 (vol. xii) and 1907 (vol. xvi).

MOORSHEDABAD, mo͝or'shĕ-dȧ-bäd'. A town of British India. See MURSHIDABAD.

MOO'RUP (native name). A cassowary (q.v.); often wrongly written mooruk.

MOORWORT. See ANDROMEDA; and Plate of ANEMONE, ETC.

MOOS, mōs, SALOMON (1831–95). A German aurist, born at Randegg, Grand Duchy of Baden. He studied at Heidelberg, Prague, and Vienna, in 1859 became lecturer in aural surgery at the first-named university, and in 1866 was appointed professor there. His researches in the pathology of the labyrinth of the ear were important. He first showed that the derangement of hearing and equilibrium observed in certain infectious diseases is due to the presence of microörganisms in the labyrinth. Among his publications are *Ueber Pilzinvasion des Labyrinths im Gefolge von einfacher Diphtherie* (1887) and *Untersuchungen über Mittelohrerkrankungen bei den verschiedenen Formen der Diphtherie* (1890). From 1868 he edited at Wiesbaden, in collaboration with Knapp, the *Zeitschrift für Ohrenheilkunde*, of which an edition in English was also published.

MOOSE (Algonquian *musu*, Knisteneaux *mouswah*, wood eater). The popular name for the deer of the genus *Alces*, the largest quadruped of North America. The male, called bull moose, is much larger than the female (cow) and stands 6 feet high or more at the shoulders, while the weight may exceed half a ton. The head is very large and bears antlers of remarkable size and shape. They consist of an imperfectly separated anterior and posterior part, and in the female and in the yearling male are only knobs an inch high. The ungainly aspect of the head is greatly increased by the large nostrils and by the large, hairy muzzle, which is almost long and muscular enough to be a proboscis, and it practically serves that purpose in gathering leaves, lichens, and twigs. The neck is short and stout, but the legs are very long, so that the animal cannot accommodate itself to feeding from the ground and consequently seeks its food on shrubs and trees. The front legs are considerably longer than the rear ones, and this makes its gait, whether slow or fast, extremely awkward. The color of the moose is generally some shade of brown, the legs yellowish, but the pelage varies with age and season and may be strongly grayish. During the summer moose are solitary in their habits, except that the young are usually found with the mother. The breeding season begins in September, and mating goes on through the fall. At this season the bulls lose their natural timidity, become savage, and will readily attack any animal or even man, if their rage is aroused.

During the winter the moose often gather in small herds and form moose yards by trampling down the snow over a limited area, so that the shrubs and young trees become available for food. The young are born in the spring or early summer, one or two at a birth, and remain with the mother until the third year. Moose are among the very finest of game animals and have been so eagerly sought, not only for sport, but for meat, which is highly prized, that their numbers have been greatly reduced in all the settled parts of America. They are hunted in the late summer and early fall, oftentimes by means of jack lights, as are other deer; but later in the season they are generally captured after being called within gunshot, the call being a rude trumpet made of a roll of birch bark, through which the voice of the animal is imitated. In winter moose are often followed on snowshoes. When taken young, moose are easily tamed, and there are many instances recorded of their use as draft animals.

The elk (*Alces malchis*, or *alces*) of the Old World is quite distinct from the moose (*Alces americana*). In the Old World the elk is found throughout the forested portions of northern and central Europe; it is at present confined, in the region west of Russia, to the milder parts of the Scandinavian peninsula and eastern Germany. Recently the moose of the Yukon valley, called the Alaskan moose (*Alces gigas*), has been separated as a distinct species. The differences between these species are, however, very slight, consisting of slight variations in the palmation of the horns, the color of the pelage, and the size. The Alaskan moose is undoubtedly the largest form known. It is found in northwestern British Columbia, Yukon, and Alaska as far north as the Arctic Ocean and westward to the Yukon delta and along the south coast as far as Katmai. The common moose of America is found throughout Canada and southward into Maine, Minnesota, and the northern Rocky Mountains. In 1915 moose were protected throughout the United States ex-

cept in Minnesota, where there was an open season—for bull moose only—from November 10 to 30. In the United States the moose is at present found in five States: Maine, Minnesota, Montana, Wyoming, and Idaho. There are 550 in the Yellowstone Park. In northern Minnesota a national moose preserve of over 900,000 acres has been formed, with an estimated population of 10,000 head. This and the great New Brunswick preserve will save the American moose, and the restricted Kenai peninsula in Alaska will preserve from extinction the giant moose of that region. Consult authorities mentioned under DEER; see HUNTING BIG GAME; Plate of DEER OF NORTH AMERICA.

MOOSE, LOYAL ORDER OF. A secret, beneficiary society, paying sick and funeral benefits; founded to furnish an organization affording the advantages of brotherhood without the necessity of purchasing life insurance or enlisting in any other common cause. It was founded in 1888 by Dr. J. H. Wilson at Louisville, Ky. The first lodge was established at Cincinnati, Ohio. At Mooseheart, near Aurora, Ill., the society owns 1000 acres, on which are extensive buildings comprising a plant variously referred to as a farm, home, and vocational school, with arrangements to care for orphans of members and dependent members of the order. The society is governed by a Supreme Lodge. It has 1610 subordinate lodges and about 615,864 members.

MOOSE BIRD (so called from its frequent companionship with the moose). A local name in eastern Canada for the Canada jay. See JAY.

MOOSE FLY. A biting fly (*Hæmatobia alcis*) closely allied to the horn fly (q.v.). It is a very annoying parasite of the moose in the great cranberry swamps of northern Minnesota and elsewhere. Unlike other external parasites of animals, it does not leave the body of the host as long as it remains unskinned.

MOOSE'HEAD LAKE. An irregular body of water on the border of Somerset and Piscataquis counties, Me. (Map: Maine, C 3). It is the largest lake in New England, being about 35 miles in extreme length and 12 miles in maximum width and having an area of about 115 square miles. It receives the Roach and Moose rivers, and its outlet is the Kennebec River. It lies at an elevation of 1026 feet above sea level, in the midst of a wild and sparsely inhabited forest region where moose and deer are still found. A railroad now runs along the south shore through Greenville, and steamboats have for many years plied on the lake.

MOOSE'JAW. The chief city of the electoral division of Moosejaw, Saskatchewan, Canada, situated on Moosejaw River and on the Canadian Pacific, Grand Trunk Pacific, and Canadian Northern railways (Map: Saskatchewan, E 7), about 400 miles west of Winnipeg. Its buildings and institutions include the city hall, courthouse, land-titles office, public library, two business colleges, and collegiate institute. Among its industrial establishments are lumber yards, bridge and iron works, flour mills, and manufactories of sashes and doors, automobiles and tractors, faced and pressed bricks, tiles and pottery, mattresses, tents, brushes and brooms. The city possesses three parks, an electric street railway, and electric power available for manufacturing. It owns its electric-lighting and water systems, with incinerator plant. It is situated in a fertile wheat-growing district. Pop., 1901, 1558; 1911, 13,823.

MOOSEWOOD. See LEATHERWOOD.

MOOSIC, mōō'sĭk. A borough in Lackawanna Co., Pa., 6 miles south of Scranton, on the Lackawanna River and on the Delaware and Hudson, the Central of New Jersey, the Lackawanna and Wyoming Valley, and the Wilkes-Barre and Eastern railroads (Map: Pennsylvania, K 4). It is in a coal-mining region, and there are manufactories of canvas gloves and silk products. Pop., 1900, 1227; 1910, 3964.

MOO'SOMIN. A town, port of entry, and the judicial centre of the electoral division of Qu'appelle, Saskatchewan, Canada, on the Canadian Pacific Railway (Map: Saskatchewan, J 7). It has a normal school, collegiate institute, a school of music, and general hospital. There is a government creamery. The town, which was incorporated in 1889, is the centre of a rich mixed farming district. It is district headquarters for the Royal Northwest Mounted Police. Pop., 1911, 1143.

MOOT (AS. *mōt*, meeting, assembly; connected with *mētan*, to meet). The name given in Anglo-Saxon England to the meetings of the tribe or district and the like. In these moots was transacted a great part of the public business, whether executive, legislative, or judicial. The best known of these assemblies is the one which was attended by the great men of the whole nation or tribe and was known as the moot of the wise men or Witenagemot (q.v.). But smaller districts, like the shire, the hundred, and the township, also held moots, which were usually attended by all the freemen of the district. The place of meeting of such an assembly was also frequently termed moot. Consult William Stubbs, *Constitutional History of England*, vol. i (6th ed., Oxford, 1897).

MOPSUESTIA, THEODORE OF. See THEODORE OF MOPSUESTIA.

MOP'SUS (Lat., from Gk. Μόψος). 1. In Greek mythology, a seer, one of the Thessalian Lapithæ, the son of Apollo by Himantis, or of Ampyx by Chloris. He took part in the combat between the Centaurs and Lapithæ, in the Calydonian Hunt, and in the Argonautic Expedition, during which he was killed by a snake in Libya, which sprang from the blood of the Gorgon Medusa. (See GORGO.) After his death he was honored as an oracular hero. 2. A renowned seer, the son of Apollo and Manto, daughter of Tiresias. At Colophon he surpassed Calchas in prophecy. With Amphilochus he was credited with having built the Cilician city Mallos, where both the founders perished in a dispute over its possession.

MOQUEGUA, mō-kā'gwȧ. A coast department of Peru, bounded by the Department of Arequipa on the north, Puno on the east, Tacna (disputed with Chile) on the south, and the Pacific Ocean on the west (Map: Peru, C 7). Its area is 5549 square miles. It is traversed by the main range of the Andes, whose slopes are the most fertile and populous portions of the department. The coast region is a rainless desert. Vineyards cover large parts of the cultivated areas, and wine and brandy are the chief products. The mining of copper, marble, silver, sulphur, borax, and coal is carried on to some extent. Pop. (est.), 31,920. The capital, Moquegua, is situated in the centre of the province, about 68 miles by rail from the port of Ilo. Founded in 1626, it suffered frequently from de-

structive earthquakes and was entirely destroyed by the last upheaval, which occurred in August, 1868. Its population is estimated at 5000.

MOQUELUMNAN, mō'ke-lŭm'nan. See MIWOK STOCK.

MOQUI, or **MOKI,** mō'kĕ. A tribe of North American Indians. See HOPI.

MOR, mōr, or **MORO VAN DASHORST,** mō'rō vän däs'hōrst, ANTONIS (?1512–c.78). An eminent Dutch portrait painter. He was born at Utrecht and studied under Jan Scorel and in Italy. His rise to eminence was rapid. He secured the patronage of Emperor Charles V and was appointed court painter by Philip II. He visited Italy, Spain, and England and was frequently employed by the Duke of Alva at Brussels. About 1568 he settled in Antwerp, where he died between 1576 and 1578. Mor was the finest portrait painter of his day north of the Alps and, though strongly influenced by Titian, developed a masterly individual style, distinguished by warmth of color and powerful characterization. Among his most celebrated portraits are: "Queen Mary of England" (Prado, Madrid); "Portrait of a Goldsmith" (The Hague Gallery); "Alexander Farnese" (Parma Gallery); "Hubert Goltzius" (Brussels Gallery); "Duke of Alva" (Hispanic Society, New York). He is also well represented in the galleries of Berlin, Vienna, Cassel, Florence, and St. Petersburg, in the Louvre, and in many private collections in England. Consult the monograph by Hymans (Brussels, 1910).

MORA, mō'rȧ (Guiana name). Certain species of trees of the genus *Mora* of the family Leguminosæ, especially *Mora excelsa.* The timber, which is exported as mora wood, is darker than mahogany. It is valued for shipbuilding and is said to be equal to oak of the finest quality, being one of the eight woods rated as first class. *Mora excelsa* is said to be one of the largest trees in British Guiana, often attaining a height of 150 to 200 feet. In addition to its use in shipbuilding the wood is said to be well adapted for use as railroad ties and paving blocks. It resists dry rot well, but is subject to the attack of marine worms if used under water.

MORA, mō'rȧ, José (1638–1725). A Spanish sculptor, pupil of the versatile Alonso Cano. Some of his best work is found in the Capilla del Cardenal in the mosque at Cordova and in the Cartuja near Granada. Consult B. Haendeke, *Studien zur Geschichte der spanischen Plastik* (Strassburg, 1900).

MORA, (FRANCIS) LUIS (1874–). An American figure and portrait painter. He was born in Montevideo, Uruguay, and studied at the Boston Museum Art School under Benson and Tarbell and at the Art Students' League, New York, under Mowbray. After some time spent in illustrating magazines he received in 1900 his first important commission, a large decorative panel in the public library, Lynn, Mass. Success came early. Among his numerous prizes are gold medals from the Philadelphia Art Club (1901) and Pennsylvania Fine Arts Society, Philadelphia (1902), first Hallgarten prize, National Academy of Design (1905), Evans prize, Salmagundi Club (1908), and the Shaw prize, National Academy (1910). He was elected a member of the Academy in 1906 and also became a member of the American Water Color Society and the Architectural League. Mora made himself one of the most prominent of the younger American painters of his day. His art, though essentially modern in feeling and treatment, is reminiscent of the old Spanish masters and shows the influence of his independent studies in Spain. A facile brushman and a good draftsman, he excels especially in his treatment of color, which, while rich and glowing, shows refinement and at times much delicacy in tone values. Good examples of his work are: "The Letter"; "The Mendicants" (1906); "Spanish Café" (1906); "Vacation Time" (water color, 1907); "The American Gladiators" (1908); "After the Bull Fight, Granada" (1910); "The Studio Tea" (1911); "Summer Morning" (1912); "The Cruise of the Ellira"; "Evening News" (1914). His figure compositions are perhaps his happiest efforts. He exercised a wide influence as a teacher in the Art Students' League and in the New York School of Art.

MORA'CEÆ (Neo-Lat. nom. pl., from Lat. *morus,* mulberry), or MULBERRY FAMILY. A family of dicotyledonous shrubs and trees comprising about 1000 species, natives of temperate and tropical regions. The largest genus is *Ficus* (fig), which includes nearly 700 species. The representatives of the family in North America are the genera *Morus* (mulberry) and *Maclura* (osage orange). The native mulberry is *Morus rubra* (red mulberry), which occurs in rich soil throughout the eastern United States. *Morus alba* (white mulberry) was introduced from the Old World for feeding silkworms and has escaped from cultivation. The genus *Maclura* contains a single species and is a native of the south-central United States, being much planted for hedges. Some of the Moraceæ are valuable for their fruit, some for their caoutchouc, obtained from their milky juice, and others for their fibre and timber. Among the well-known genera not mentioned above are *Artocarpus* (breadfruit), *Castilloa* (rubber tree), and *Antiaris* (upas tree).

MORADABAD, mō-rŭd'ȧ-bäd'. A city of British India. See MURADABAD.

MORAES, mō-rīsh', FRANCISCO DE (c.1500–72). A Portuguese author. Of his life we know only that he was treasurer of the household of John III, member of the suite of the Portuguese Ambassador to Paris, Francisco de Noronha (thus residing in France at least from 1540 to 1544), and Knight Commander of the Portuguese Order of Christ. In 1572 he was murdered at Evora. His great work was the famous romance of chivalry *Palmeirim de Inglaterra* (next to *Amadis de Gaula* the greatest chivalresque novel in the world), which he perhaps wrote as early as 1544 and while in France. The first Portuguese edition did not appear until 1567, however, and as in the meanwhile a Spanish version had appeared in 1548, Moraes was long deprived of the credit of authorship, and his original was called a translation. (See HURTADO DE TOLEDO, LUÍS.) In 1904 the true state of the case was shown by W. E. Purser, of Dublin, in his masterly study *Palmerin of England.* For bibliography, see W. E. Purser, as above, and Inocencio F. da Silva's Portuguese Bibliography.

MORAES BARROS, mō-rīsh' bär'rōs, PRUDENTE (1841–1902). A Brazilian politician, born at Itû, São Paulo. Having studied law, he entered the National Legislature of the Empire in 1885 and became a leader of the Re-

publican party. Upon the establishment of the Republic he was appointed Governor of the State of São Paulo (1889) and later was President of the first National Congress. In the election of the first President, held by this body, he was defeated by Fonseca (1891), but in 1894 he became the administration candidate and was elected, being the first civilian President. He upheld civil rights, suppressed the prætorian system of government, and checked the power of the military party. He crushed out the revolt in Rio Grande do Sul (1894–95), but in November, 1896, obtained a leave of absence on account of his health. A threatened military revolt caused him to reassume the presidency four months later, thus preventing a coup d'état. In 1897 he brought to a successful conclusion the campaign against the revolt headed by Antonio Conselheiro. An unsuccessful attempt was made on his life in this same year. In the presidential elections of 1898 he supported the candidacy of Manoel Campos Salles, who became his successor.

MORAINE, mô-rān′ (Fr., from It. *mora,* heap of stones, from Bavarian Ger. *mur,* débris). An accumulation of earth and stone carried forward by a glacier. When such materials are heaped up along the margins of a glacier, the lines of débris are called *lateral moraines.* The confluence of glaciers causes a coalescing of the inner lateral moraines, which are then carried forward as *medial moraines.* Débris frozen in the lower part of the glacier and pushed along its bed is called the *ground moraine.* Finally, the materials transported in the various ways accumulate at the lower end of the glacier in irregular mounds constituting *terminal moraines.* The morainal deposits that resulted from the ice invasion of Pleistocene time are conspicuous features of the landscape in the northern sections of North America and Europe. They are especially marked along the southern border of the area covered by the ice and in places where the latter remained stationary for a long time in the stages of general advance and retreat. The great terminal moraine can be traced nearly across the continent by the lines of kames, drumlins, and other deposits of glacial materials which still retain their original forms and structures. In the east the moraine begins in Nantucket and thence extends across Long Island and Staten Island into New Jersey; crossing the latter State it enters Pennsylvania and follows a northwesterly direction to the New York border and then turns southwest through western Pennsylvania to pass into Ohio, where it reaches nearly as far south as Cincinnati. It then follows a sinuous line across Indiana, Illinois, and Iowa, thence bearing off to the northwest to cross the Dakotas and Montana and to pass into Canada. See GLACIER; PLEISTOCENE.

MORALES, mô-rä′lās, LUÍS DE, called EL DIVINO (c.1510–86). A Spanish painter, born at Badajoz. He is said to have studied in Valladolid or Toledo, but was probably self-taught. His work shows the influence of the early Flemish and of the Milanese school, but is essentially Spanish in its stern and melancholy religious sentiment. He possessed a strong feeling for color and painted with minute finish, but later developed exaggerated mannerisms. His subjects are always religious—hence his sobriquet. Among his finest works are an impressive "Pietà," in the Madrid Academy; a charming "Madonna and Child," in the Bosch collection, Madrid; "Presentation in the Temple" and a "Mater Dolorosa," in the Prado; a fine altarpiece, in the church of Arroyo del Puerco (Estremadura); a "Madonna," in the New York Hispanic Society; an "Ecce Homo," in the gallery of the New York Historical Society.

MORAL′ITY (OF. *moralite,* Fr. *moralité,* from Lat. *moralitas,* morality, character, from *moralis,* relating to manners, from *mos,* custom). The third stage in the development of the modern drama, following upon the mystery and the miracle play (qq.v.). Essentially the morality was ethical teaching cast in dramatic form. According to the usual plot, various personages, each representing a virtue or a vice, contend for dominion over an abstraction called Mankind. The virtues usually win. The serious character of the play was relieved by comic scenes and buffoonery. The leading Vice, a sort of clown, in time became the centre of attraction and is thought to have been the origin of the Fool of Shakespeare's plays. Besides the virtues and vices, however, allegorical personages were introduced, such as Riches, Good Deeds, Death; in fact, any human condition or quality. The French moralities adhered less strictly to these purely abstract qualities, and even the later English authors are more apt to use historical characters celebrated for the vice or virtue in question, as Aristides instead of abstract Justice. Later still, as the passions of the Reformation were stirred up, actual men and women were shown under very thin disguises. In other ways the morality was a distinct advance towards the regular drama. There being no prescribed plot as in the mysteries and miracle plays, it was necessary to create one, with a clear end towards which the action of the characters was to lead up. So close, in fact, did the morality come to the regular drama that it did not cease to be acted in England until almost the end of the reign of Elizabeth. In 1902 and 1903 *Everyman,* perhaps the best morality in English, was performed successfully in England and in the United States by a company of English players under Ben Greet. Though this play lacks swiftness of action, its sincerity is unbroken; its moralizing does not fall into platitudes, and various scenes, e.g., the appeal to Riches, are poignantly dramatic. For bibliography, see MYSTERY.

MORAL PHILOSOPHY. See ETHICS.

MORAN′. A family of American painters. EDWARD (1829–1901), a marine painter, was born in Bolton, Lancashire, England, but removed with his parents in 1844 to Philadelphia, where he became a pupil of James Hamilton and of Paul Weber. After 1862 he studied in England, where he was strongly influenced by Turner, and later on the Continent, returning to reside first in Philadelphia and then in New York from 1869. Among his best works are: "Outward Bound"; "Launch of the Life-Boat" (1865); "Coming Storm in New York Bay"; "Foggy Morning"; "Melodies of the Sea" (1890); "The South Coast of England" (1900). He completed in 1899 a series of 13 historical paintings representing epochs in United States marine history from the landing of Leif Ericson (c.1000) to Admiral Dewey's return (1899). Exhibited at the Metropolitan Museum, New

York, in 1904, they attracted wide attention. (Consult the monograph by their owner, Theodore Sutro, New York, 1905.) Moran was an associate of the National Academy and a member of the Society of American Artists and of the Pennsylvania Academy of Fine Arts.—Edward's son, PERCY MORAN (1862–), became known especially as a painter of Colonial subjects and for his portraits of women. He took the Hallgarten prize in 1886 and the gold medal of the American Art Association in 1888. His "Castle Garden, New York" is in the Wilstach collection, Philadelphia.—Another son, LÉON (1864–), likewise a painter, treats chiefly historical genre subjects.

PETER MORAN (1842–1914), a painter, etcher, and illustrator, studied painting and etching in Philadelphia under his brothers, Thomas and Edward, continuing his studies in England. His taste led him to pastoral and quiet scenes in country life and especially to animal painting. Among his paintings are: "Return of the Herd," which received a medal at the Centennial Exhibition; "Santa Barbara Mission"; "Pueblo of Zia, New Mexico." He was one of the earliest American etchers and received a medal at the Centennial of 1876 for etchings of animals.

THOMAS MORAN (1837–), an etcher, illustrator, and landscape painter, was a younger brother and a pupil of Edward in Philadelphia. During an apprenticeship to a wood engraver he devoted himself to water colors with success, then studied oil painting under James Hamilton and later in Paris and Italy. After his return to the United States in 1871 he made sketches in the Yellowstone, from which he produced the painting "Grand Cañon of the Yellowstone," now filling a panel in the capitol at Washington. In 1873 he joined the United States exploring expedition, conducted by Maj. J. W. Powell, which surveyed the cañons of the Colorado River, and on his return completed a picture of "The Chasm of the Colorado," which was purchased by Congress as a companion of the Yellowstone picture. He established himself in New York and was elected a member of the National Academy in 1884. Among his smaller pieces are "The First Ship," "Ruins on the Nile," and others, in the Wilstach collection, Philadelphia, and "Bringing Home the Cattle," in the Buffalo Museum. Moran designed the illustrations on wood for the reports of both Hayden's and Powell's explorations. His style is a strong souvenir of the works of the English painter Turner, in the iridescent play of color of which he is very fond. He paints the momentary and evanescent phases of nature with much facility of hand and sound scientific knowledge. Both he and his wife and pupil, MARY NIMMO MORAN (1842–), became prominent etchers and members of the British Society of Painter-Etchers.

MORAN, PATRICK FRANCIS, CARDINAL (1830–1911). An Irish Roman Catholic prelate, born at Leighlinbridge, County Carlow. He studied at the Irish College of St. Agatha at Rome and was ordained by special dispensation as to age in 1853. He then served as vice president of the Irish College and as professor of Hebrew in the College of the Propaganda in Rome; in 1866–72 was private secretary to his uncle, Cardinal Cullen, in Ireland; served as Bishop of Ossory in 1872–84; and in 1874–84 held the chair of Hebrew and Scripture at Clonliffe College, Dublin. He went to Australia in 1884 as Archbishop of Sydney, and in the following year he was appointed the first Australian Cardinal. His publications include: *Essays on the Origin of the Irish Church* (1863); *History of the Catholic Archbishops of London* (1864); *Historical Sketch of the Persecutions Suffered by the Catholics of Ireland under Cromwell and the Puritans* (1865); *Irish Saints in Great Britain* (1879); *Letters on the Anglican Reformation* (1890); *History of the Catholic Church in Australia* (1894); *Reunion of Christendom and its Critics* (1896).

MORANDO, mō-rän'dō, PAOLO. See CAVAZZOLA, PAOLO.

MORAN-OLDEN, mō'rän-ōl'den, FANNY (1855–1905). A German soprano singer, born at Oldenburg. She appeared first in Dresden as a concert singer in 1877. The following year she made her début in opera in Frankfort with such success that she afterward sang only in leading rôles. In 1879 she married Karl Moran, leading tenor of the Frankfort Opera. From 1884 to 1891 she was a member of the Leipzig Opera. In 1889–90 she sang the great Wagner rôles at the Metropolitan Opera House. The remarkable range of her voice enabled her to sing rôles so diverse as Elisabeth in *Tannhäuser* and Ortrud in *Lohengrin.*

MORANT, mō-rănt', SIR ROBERT LAURIE (1863–1920). An English educator, born in London and educated at Winchester and at New College, Oxford, where he graduated in 1885. After several years in educational work in England he became tutor to the royal family of Siam and organizer of education in that country. In 1895, after a period of social and educational work in the East End of London, he became Assistant Director of Special Inquiries and Reports in the English Education Department and contributed several reports to this series on education in France, Switzerland, and England. Appointed in 1903 permanent Secretary of the reconstructed English Board of Education, he gave to the administrative control of that board a direction which has been regarded by some as the entering wedge of bureaucracy in England and by others as a necessary step in the development of a strong national system of education. It was his large administrative ability that led in 1911 to his appointment as chairman of the new board of commissioners to administer the National Insurance Act.

MORA STONES. A group of stones near Upsala, Sweden, interesting on account of their historical associations. The kings of Sweden on their election anciently swore fidelity to the laws of the land near these stones, after which the judges, on behalf of the people, took the oath of allegiance to the monarch, whose name was then inscribed on one of the stones. In 1770 the remaining 10 stones were protected by an inclosing building.

MORAT, mō'rà'. A town in the Canton of Fribourg, Switzerland, on the Lake of Morat, 8½ miles north by west of Fribourg (Map: Switzerland, B 2). It is famous for the victory of the Swiss and their allies, 25,000 in number, over Charles the Bold (q.v.), Duke of Burgundy, with an army of 35,000 men, June 22, 1476.

MORATÍN, mō'rà-tēn', LEANDRO FERNÁNDEZ DE (1760–1828). A Spanish dramatist, born in Madrid, the son of Nicolás Fernández de Moratín. A year spent at Paris (as secretary to the Count of Cabarrús, who had been sent on a

difficult mission) had much influence upon the artistic development of the young poet, who was later to make the Molièresque drama successful in Spain. Returning to Madrid in 1788, he gained the favor of the powerful Godoy and was allowed to have his play in verse, *El viejo y la niña*, produced upon the stage at Madrid in 1790. This drama was followed by a more important piece (in prose), the *Café*, also called the *Comedia nueva* (1792), a sharp satire upon the wretched playwrights of the day. At the expense of the government Moratín went abroad to study the foreign stage. From Paris he passed on to London, and after a year in that metropolis, where he began his translation of *Hamlet* (published in 1798), he journeyed through Holland, Flanders, Germany, Switzerland, and Italy. After his return he was for a while a member of the bureau established to reform the theatre. His third comedy, *El barón*, originally written as a zarzuela or vaudeville, was performed in 1803, and the next year witnessed the appearance of a third comedy in verse, the *Mojigata* (The Female Hypocrite). With the *Sí de las niñas*, the second of his prose comedies, he reached the height of his power and fame. Molière was the guiding star of Moratín the Younger in all his dramatic compositions. Yet Moratín displays originality, for he excellently describes the manners of his time and handles dialogue with skill. Though he adhered to the French system of unities, he also adopted certain peculiarities of the native Spanish stage, dividing his plays into three acts, using the favorite short romance verse, and introducing some truly Spanish intrigue into his plots. Taking him for all in all, he was the best dramatist that Spain had had since the *Siglo de oro*. In 1812 Moratín brought out *La escuela de los maridos*, a successful translation of Molière's *Ecole des maris*. At Barcelona, in 1814, there was a representation of his *Médico á palos*, a version of Molière's *Médecin malgré lui*. He was at Bayonne and Bordeaux after 1821, and at Bordeaux he finished his historical account of the Spanish stage, *Orígenes del teatro español*. He died in Paris in 1828. His works may be read in *Biblioteca de autores españoles* (3d ed., vol. ii, Madrid, 1850); his *Obras póstumas* (3 vols., ib., 1867–68); and Ford's edition of the *Sí de las niñas* (Boston, 1899).

MORATÍN, Nicolás Fernández de (1737–80). A Spanish playwright, called the Elder, born in Madrid. He was a teacher as well as a man of letters and had a chair of poetry in the Imperial College. The chief significance of the work of the elder Moratín lies in the fact that he contributed to the success of the principles of literary art imported from France. Spanish literature had greatly degenerated when this reform movement to which Moratín belonged undertook to improve matters by following the rigid rules of French classicism. Moratín illustrated these rules in a comedy, *La petimetra* (printed in 1762), and a tragedy, *Lucrecia*, neither of which appeared upon the stage. His drama *Hormesinda* and his tragedy *Guzmán el bueno* were performed with some success. Of his other productions there may be mentioned the *Diana*, a short poem on the chase; the narrative, or *epic* poem as he called it, *Las naves de Cortés destruidas*, celebrating the burning of his ships by the Conquistador; and the *quintillas* on a bullfight, which are probably his best and his best-known work. Consult his works in volume ii of the *Biblioteca de autores españoles* (Madrid, 1850) and the poem on the bullfight in J. D. M. Ford, *A Spanish Anthology* (New York, 1901).

MORATORIUM, mŏr'ȧ-tō'rĭ-ŭm (Neo-Lat., neut. sing. of Lat. *moratorius*, relating to delay, from *mora*, delay). An extension of time for the payment of commercial or financial obligations. A moratorium usually takes the form of a legal decree, either by the executive or by the lawmaking body, and may vary as to its scope according to the terms of the decree. In the early history of banking, especially in undeveloped countries, a moratorium frequently applied to the redemption of bank notes in coin and amounted to the suspension of specie payments. With the wider employment of commercial instruments of exchange, however, the chief importance of a moratorium has come to relate to its effect upon bills of exchange, drafts, and bank deposits. While it may extend to all classes of obligations, recent instances of the moratorium have generally excluded from its operations the payment of rent and other household and personal obligations not of a banking character. The language of the Law of Jan. 27, 1910, passed by the French Chambers on the occasion of the floods in Paris was as follows:

"In case of the mobilization of the army, flood, or public calamity, or of the interruption of the public services managed by the government or by the departments or communes, or subject to their control, the Council of Ministers may by decree extend, for the whole or a part of the territory involved, the time within which protests and other acts required to preserve recourse for all negotiable instruments shall be made.

"During the sessions of the Chambers the extensions provided for by this article shall not exceed 30 days; between sessions the extension may be renewed one or several times."

Prior to the European War of 1914, moratoria had been limited chiefly to occasions of public calamities, like the earthquake at Messina in 1908 or the floods in Paris in 1910. It will be observed that the French law quoted extends the recognized occasions for such action to the interruption of railway and tramway communication by strikes, where the lines are operated by the governments. Such delays were authorized also in the Balkan states during the wars in 1912–13. At the outbreak of the War in Europe, however, moratoria were declared more generally than on any previous occasion in modern history. Owing to the cessation of remittances from abroad to meet bills of exchange due in London, a moratorium was declared by the British government on August 4 for 30 days, applying only to bills of exchange running for long terms. This moratorium was twice extended, but finally expired without causing disturbance on November 4. In the meantime, however, the government had authorized the Bank of England to rediscount drafts and bills of exchange drawn prior to August 4 and had given a guarantee to the bank against loss. In France a moratorium was declared, which was continued for several months. In Germany the declaration of a moratorium was avoided in form, but it was provided that balances claimed by foreigners residing abroad, including bills of exchange, could not be sued for in the courts for three months,

but exceptions might be granted for entire nations as well as for individuals. A moratorium was declared for various periods by Italy, Russia, Belgium, Austria-Hungary, Switzerland, Sweden, Norway, Denmark, Portugal, Bulgaria, and other European countries. The cutting off of the credit accommodations usually extended by European bankers compelled such a declaration in Brazil, which continued for several months, and in several other countries of South and Central America.

A moratorium has an important bearing upon the liability on bills of exchange and promissory notes, because its usual effect is that the liability of indorsers on such instruments shall continue in spite of the failure of the holder to present them for payment or to make the usual legal protest in case of nonpayment at maturity. Prior to the international conferences at The Hague on the uniform law of bills of exchange, in 1910 and 1912, no legal recognition was given in several important European countries, including Germany and Switzerland, to obstacles which might prevent presentment and protest of a bill of exchange within the time required by law. By the protocol of the uniform law on bills of exchange, which was signed by the continental Powers on July 23, 1912, the principle was recognized that insurmountable obstacles might arise to the presentment of a bill, and rules were established governing the obligations of the parties in such cases. These regulations involved a possible delay of 30 days, in case the obstacle to presentment was not sooner removed, during which the holder was not permitted to exercise recourse against the indorsers or against the drawer, but an amicable adjustment of the obligation might be made.

It was recognized that it was not within the authority of an international treaty to provide fully for the cases in which the public authority might extend by moratorium the time for presentment and protest of paper, and it was declared that such public acts were binding upon foreign countries only so far as the courts of such countries chose to take them into consideration in passing upon facts. The Protocol of 1912 was ratified by Germany and a few other countries, but was not in actual operation in the majority of continental countries at the outbreak of the war in 1914. Great Britain and the United States were not signers, because of the differences between continental and Anglo-Saxon systems of jurisprudence, but were sympathetic with the adoption of the uniform law among the continental countries and willing to give such weight to its operation in the case of international instruments of exchange as was permissible under their own legal systems.

Consult Reports of the American Delegation to the Conferences on Bills of Exchange and Cheques, Senate Document No. 768, 61st Cong., 3d Sess., and Senate Document No. 162, 63rd Cong., 1st Sess. (Washington, 1913–14); also W. G. S. Schwabe, *Effect of War on Stock Exchange Transactions* (London, 1915).

MORAVA, mō'rä-vä. The largest river of Servia. It is formed by the union at Stolač, Servia, of the southern and the western Morava (Ibar), the former rising on the slopes of Kara Dagh in the newly acquired Servian possessions and the latter near the boundary of Servia with Montenegro (Map: Balkan Peninsula, C 3). The united stream enters the Danube 30 miles east of Belgrade. The Morava is about 240 miles long and is navigable for small boats 50 miles from its mouth.

MORA'VIA (Ger. *Mähren*). A margraviate and crownland of Austria, bounded by Prussian Silesia, Austrian Silesia, Hungary, Lower Austria, and Bohemia (Map: Austria, E 2). Area, 8580 square miles. It is traversed along the northern boundary by the Sudetic Mountains, along the eastern boundary by the Carpathians and the White Mountains, and along the western boundary by the Bohemian-Moravian highlands, which descend in terraces towards the valley of the March. Moravia belongs to the basin of the Danube, and is watered by its tributary, the March, which flows through the centre of the country from north to south. The climate is generally mild. The mean annual temperature is 48° at Brünn. The principal minerals are coal, lignite, graphite, and iron. The output of coal in 1911 was 2,040,574 metric tons and, in 1912, 2,208,853 tons. The mineral output in 1911 was valued at 23,925,206 kronen and, in 1912, at 25,770,847 kronen, over 7 per cent of the value of the mineral production of Austria.

Agriculture is the principal industry, Moravia being one of the foremost cereal-producing parts of Austria. The principal products are rye, oats, barley, wheat, corn, and flax, sugar beets, clover, hay, and grapes. Stock raising is carried on extensively. Among manufactures the woolen industry is especially developed. Other manufactures are those of linen, yarn, cotton goods, leather, sugar, spirits, machinery, railway supplies, tobacco products, etc. The railways had a total mileage of 1311 miles in 1911.

The Landtag is composed of the Prince-Archbishop of Olmütz, the Bishop of Brünn, 30 representatives of the landed aristocracy, 31 representatives of the towns, 6 representatives of the chambers of commerce and industries of Brünn and Olmütz, and 31 representatives of the rural districts. The representatives of the rural districts are indirectly elected. In the Lower House of the Austrian Reichsrat Moravia is represented by 49 members.

At the head of the administration is the Governor, representing the crown. The crownland has a system of district courts, and at Brünn a court of second instance, from which appeals can be made to the Supreme Court at Vienna. Moravia is well provided with educational institutions, and over 98 per cent of its school population attend school. Capital, Brünn (q.v.). In 1890 the population was 2,276,870 (102 per square kilometer); in 1900, 2,437,706 (110); in 1910 (census of December 31), 2,622,271 (118). In 1912 the estimated population was 2,651,300. Of Austrian subjects (2,604,857) in 1910, those whose vernacular was returned as Moravian, Bohemian, or Slovak numbered 1,868,971 (71.75 per cent); German, 719,435 (27.62); Polish, 14,924 (0.57). Roman Catholics in 1910 numbered 2,502,808 (95.45 per cent); Evangelicals (Augsburg and Helvetian), 74,391 (2.83); Jews, 41,148 (1.57). Population of the larger towns in 1910: Brünn, 125,737; Mährisch Ostrau, 36,754; Prossnitz, 31,462; Iglau, 25,914; Witkowitz, 23,151; Olmütz, 22,245; Prerau, 20,669; Znaim, 18,825; Kremsier, 16,528; Oderfurt, 16,462.

History. Moravia was anciently occupied by the Boii and later by the Quadi, who left the country at the time of the great migration of nations. They were succeeded by other Ger-

manic peoples, whose sojourn was temporary, and in the sixth century the region was occupied by Slavs. These peoples took the name of Moravians, from the river Morava. Charles the Great, the ruler of the Franks, held them under nominal subjection, and their King, Samoslav, received baptism; but Christianity was first formally established in the second half of the ninth century by Cyril and Methodius. The ninth century witnessed repeated wars between the Germans and the Moravians. Svatopluk, who ruled over the Moravians from about 870 to 894, built up an extensive but short-lived realm, which soon after his death was crippled by the onslaught of the Magyars. From 1029 Moravia was generally united with Bohemia, either as an integral part of that realm or as a fief ruled by margraves. On the death of Louis II, at the battle of Mohács, in 1526, Moravia, with all the other Bohemian lands, passed under the rule of the house of Austria. In 1849 it was formally separated from Bohemia and declared a distinct province and crownland.

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MORA'VIANS, called also THE UNITED BRETHREN (UNITAS FRATRUM) and THE MORAVIAN CHURCH. An evangelical church which arose in Bohemia and Moravia among followers of John Huss (q.v.); originally known as Bohemian Brethren (q.v.). They secured the episcopacy from the Austrian Waldenses in 1467. Fraternizing with the Reformers of both Germany and Switzerland, they increased rapidly, and after the Schmalkaldic War established a third province in Poland. By 1617 they numbered at least 200,000. With the granting of the Bohemian charter, in 1609, they obtained a legal status, but were systematically suppressed and exiled during and after the Thirty Years' War. Their Polish province, with its centre at Lissa, now acquired importance, and a number of parishes were founded in Hungary. But the Peace of Westphalia excluded Austrian lands from the benefits of religious liberty, and in 1656 Lissa was destroyed in the war between Poland and Sweden. The Polish parishes were gradually absorbed by other Protestant bodies. Meanwhile a "hidden seed" of the Unitas Fratrum remained in Bohemia and Moravia, and their bishop, Johann Amos Comenius (q.v.), republished their history, confession, and discipline, and took steps to perpetuate the episcopate. Hence for about 50 years clergymen who at the same time served parishes of the Reformed church were consecrated bishops of the Unitas Fratrum.

A revival of religious life among the "hidden seed" in Moravia led the awakened to abandon their homes and secretly flee to Saxony to secure religious liberty. Here, in 1722, they began to build the town of Herrnhut on the estate of Count Zinzendorf (q.v.), who had granted them an asylum. Herrnhut became the rallying place for descendants of the Brethren, several hundred of whom migrated from Austrian lands. They introduced the discipline handed down by Comenius, and in 1735 the episcopate was transmitted from its surviving representatives, Jablonski and Sitkovius. The development of the Unitas Fratrum now took a new form. Zinzendorf became the leading bishop and strove to subordinate denominationalism to the promotion of Christian life. He did not permit the church to expand, as other churches expand, nor distinctly to sever connection in every respect with the state church; but established on the Continent, in Britain, and in America an "exclusive system" by which it was attempted to secure a membership solely of converted men and women. Their culture in spiritual life was promoted by exceedingly close supervision, by an abundant supply of the means of grace—daily services and services for the several divisions of the congregation distributively—and by an effort to separate them from the rest of the world. The members of the establishments were indefatigable in missions among the heathen, maintained schools for young people not of their communion, and conducted the so-called Diaspora, or inner mission, among members of the state churches of Germany, the Baltic Provinces, Scandinavian lands, Holland, and Switzerland, seeking the conversion of individuals without drawing them from their former communion.

Though the "exclusive system" was wholly abandoned in America in 1856, and practically so in Britain, while in Germany it has been much modified, the three chief forms of activity continue. Missions among the heathen are maintained in Labrador and Alaska, among the Indians of North America, among the negroes of the West Indies, in Nicaragua, British and Dutch Guiana, Cape Colony, German East Africa, Australia, and among Tibetan people of the Western Himalayas. A home for lepers is maintained near Jerusalem. Thirty-three schools are carried on, in addition to colleges and theological seminaries. The mission in Greenland, maintained since 1733, was transferred to the Danish Lutheran church in 1900.

The Moravian church now consists of four provinces—the German, the British, and the American, North and South—which are united as one body in regard to doctrine, ritual, discipline, and mission work. Internally each province is independent, its affairs being administered by a synod, which elects a provincial executive board consisting of bishops and other ministers. This board appoints the ministers to the various congregations. The executive boards of the four provinces constitute the Directing Board of the Unity. Every 10 years a general synod convenes, each province and the missions having representatives. This synod takes cognizance of the life, doctrine, and activity of the entire church, elects the mission board, and to it the mission board is responsible.

The Moravian church has a complete ritual, including services for the Lord's Day and other forms, but allows free prayer in public worship; its music, vocal and instrumental, is highly developed. It perpetuates the three orders of the ministry, but its bishops, who alone ordain, do not exercise administrative functions ipso facto. It observes the Christian year; admits new converts by confirmation; receives members of other churches by certificate;

encourages lay work; and exercises strict discipline. The cardinal points of Moravian teaching are those held in common by all evangelical churches. Eight cardinal points in regard to which the teaching of Holy Scripture is plain have been repeatedly reaffirmed by the General Synod in the language of Scripture. As formulated by the General Synod of 1899 these doctrines teach: (*a*) total depravity of human nature; (*b*) the love of God the Father, who has "chosen us in Christ"; (*c*) the real Godhead and real humanity of Jesus Christ; (*d*) reconciliation and justification through the sacrifice of Jesus Christ; (*e*) the Holy Ghost and the operation of His grace; (*f*) good works as the fruit of the Spirit; (*g*) the fellowship of believers; (*h*) the second coming of Christ and the resurrection. These truths are held not as a rigidly formulated confession, but as the Moravian conception of the main contents of Christian doctrine. The resuscitated Moravian church has never issued a confession of faith, as such.

The Moravian Church in America. Moravian emigrants went to Georgia in 1735; but five years afterward they removed to Pennsylvania, where they built the towns of Bethlehem and Nazareth. A form of communism was temporarily adopted as a quick mode of subduing the wilderness and at the same time promoting missions. The lands were the property of the church, and the farms and industries were carried on for its benefit; but he who had means of his own retained them; there was no common treasury. This system, "the Economy," continued for 20 years. Each member was pledged to devote his time and powers as they might be best applied for the spread of the gospel, and missionaries went to the Indians of New York, Connecticut, and Pennsylvania, and later Ohio. Though "the Economy" was of short duration, the American division of the church was administered from Germany, and the exclusive policy prevailed until 1856. According to statistics compiled in 1914, the American provinces reported 20,133 communicants and a total membership of 29,375. There were 124 congregations and 110 ministers actively engaged. In the home provinces, including the Bohemian-Moravian mission, there were 45,551 members; in the foreign missions 14 provinces, 156 stations, 187 outstations, and 1503 preaching places, with 367 missionaries, exclusive of secretaries, etc., 111 native missionaries and 2059 other native agents. The communicant membership of the missions was 35,238, with a total membership of 100,606 and a grand total in care of the missionaries of 107,379.

The American Moravians have a theological seminary, founded in 1807, at first as a department added to the academy at Nazareth, begun in 1759, and known as Nazareth Hall. It has been situated at Bethlehem since 1858. A collegiate department preparatory to the theological proper was inaugurated at an early period. Buildings have been erected valued at $120,000, exclusive of the ground. The endowment fund is now $125,000. A six years' course of study is pursued, three and one-half years classical and two and one-half theological. Five professors constitute the permanent faculty. The number of students varies from 50 to 70.

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MORAWETZ, mŏr'ȧ-wĕts, Victor (1859–). An American lawyer and economist, born in Baltimore. He studied at foreign universities and graduated from Harvard Law School in 1879. Admitted to the bar in 1880, he became attorney for railroad and other corporate interests. He was general counsel and director of the Atchison, Topeka, and Santa Fe and became director of the Norfolk and Western Railway, the New York National Bank of Commerce, etc. The honorary degree of LL.D. was conferred on him by Williams College in 1914. He is author of *Law of Private Corporations* (1882; 2d ed., 1886); *The Banking and Currency Problem in the United States* (1909; 2d ed., 1909); an address on *Evolution of the Interpretation of the Sherman Law* (1914).

MORAY, mō'râ. Any of a large group (suborder Calocephali, of order Apodes) of eel-like fishes, especially one of the family Murænidæ and genus *Muræna*. They are degenerate, aberrant eels, distinguished by their small round gill openings and the absence of pectoral fins. They inhabit warm and especially tropical seas, particularly about coral reefs. They are brightly colored, often of large size, and always voracious and pugnacious. Ten or twelve genera are known, embracing about 120 species, among which the true morays (genus *Muræna*) are characterized by the presence of two pairs of nasal barbules. The muræna of the Romans, or murry (*Muræna helena*), abounds in the Mediterranean, and is sometimes of large size, 4 feet or more in length, golden yellow in front and purple towards the tail, beautifully banded and mottled. Its flesh is white and highly esteemed. It prefers salt water, but can accommodate itself to a fresh-water pond. The ancient Romans kept and fed it in vivaria. The story of Vedius Pollio feeding his murænas with offending slaves is well known. Two species of this genus are found in American waters. The common spotted moray, or hamlet, the most numerous eel in the West Indies, is *Lycodontis moringa*, and is yellowish in color, thickly spotted and marbled with dark markings. A larger one (5 to 6 feet) is the greenish-black moray, or morena verde (*Lycodontis funebris*), the biggest and most ferocious of the eels of the American tropics (both coasts), and one well known

about the Florida reefs. The so-called conger eel of California (*Lycodontis mordax*) is a food fish of some local importance. See Plate of EELS, CONGERS, AND MORAYS.

MORAY, mŭr'â, JAMES STUART, EARL OF. See MURRAY.

MORAY FIRTH. An arm of the North Sea, extending southwestward into the northeast part of Scotland (Map: Scotland, E 2). It is 16 miles wide at the entrance and about 40 miles long. It forms a good harbor and is navigable for large steamers as far as Inverness. The inner channel, southwest of Fort George, is called Inverness Firth. The name Moray Firth is sometimes extended to the whole of the large, triangular indentation of the shore between Kinnaird and Duncansby heads, having a width of 75 miles.

MORAYSHIRE, mŭr'â-shēr. A maritime county of Scotland. See ELGINSHIRE.

MORAZÁN, mō'rä-thän', FRANCISCO (1799–1842). A soldier and statesman, born in Teguagalpa, Honduras. He was a member of a French West Indian family and entered politics when his country became independent of Spain, in 1821. He became Secretary General (1824) and took part in the organization of the new government. He also played an important part at the head of the troops in putting down the demonstrations of the various revolutionary factions, and was in 1830 elected President of the Central American Confederation. In this office he became the foremost representative of liberal principles, as opposed to the reactionary policy of the old Spanish party, whose stronghold was Guatemala. He expelled the archbishop and the friars who were inciting the pro-Spanish faction to revolt, and abolished the most important Church privileges. In 1832 he suppressed an insurrection against the federal government in Salvador. In 1838 a formidable revolution again broke out, headed by Carrera, leader of the conservatives in Guatemala. Morazán, after defending the federal government with courage and ability, felt that the tide was too strong to struggle against; he therefore resigned his office, April 5, 1840, and went to Peru. There he organized a force and in 1842 invaded Costa Rica, hoping to reorganize the Confederation. He overthrew the government without difficulty and was enthusiastically elected Governor. His popularity, however, was short-lived. His advocacy of the Central American Confederation led to another insurrection. He was taken prisoner, court-martialed, and shot, Sept. 15, 1842. Consult H. H. Bancroft, *History of Central America*, vol. iii (San Francisco, 1887).

MORBIHAN, môr'bē'ăN'. A department of west France, situated along the south coast of the peninsula of Brittany (Map: France, N., C 5). It is hilly in the north, very sparsely wooded, while the central portion is distinguished by a marshy tract known as the Landes de la Lanvaux. The belt near the sea is fertile. Only one-third of its area, which covers 2739 square miles, is cultivated, producing cereals, flax, hemp, and apples. Cattle and bees are raised. Iron ore is found, but there are no industries or commerce of any importance save at the naval base, Lorient. There is much fishing along the entire coast. Pop., 1901, 563,468; 1911, 578,400. Capital, Vannes.

MORBILLI, môr-bĭl'lī. See MEASLES.

MOR'BUS SA'CER. See EPILEPSY.

MOR'DANTS (OF., Fr. *mordant*, from Lat. *mordens*, pres. p. of *mordere*, to bite). Substances used in dyeing for the purpose of fixing colors on textile fabrics. The manner in which mordants act has been described under DYEING. It remains to enumerate here the most important mordants employed by the dyer. Among *basic mordants* may be mentioned alum, aluminium sulphate, ferrous acetate, ferrous sulphate, ferric sulphate, ferric acetate, ferric nitrate, stannous chloride (tin crystals), stannic chloride (the solution is known commercially as cotton spirits), stannic oxide (produced by soaking cotton in a solution of sodium stannate and then passing it through dilute sulphuric acid), potassium (or sodium) bichromate, chromium acetate, and chrome alum. Among the acid mordants may be mentioned tannic acid and the so-called fatty acids. The latter are applied first in the form of their sodium or potassium salts (soaps) dissolved in water; then the fabric is passed through a solution of aluminium sulphate, which combines with the fatty acids to form insoluble aluminium salts on the fibre; finally when a basic dyestuff is applied the aluminium salts react with it, their acids combining to yield permanent colors. See DYEING; LAKES.

MORDAUNT, môr'dŭnt, CHARLES, EARL OF PETERBOROUGH. See PETERBOROUGH.

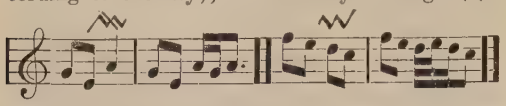
MORDAUNT, FRANK (1841–1906). An American actor, born at Burlington, Vt. After playing as an amateur in New York, he joined the theatrical profession in 1859. He supported Mary Anderson in 1878; then Edwin Booth, taking the parts of the King in *Hamlet* and Kent in *King Lear*. Among his later rôles were Tommaso in *Mr. Barnes of New York* (1888), Nicholas Vanalstyne in *The Henrietta* (1889), and General Kendrick in *The Heart of Maryland* (1895).

MORDECAI, môr'de-kī, ALFRED (1804–87). An American soldier and military writer, born at Warrenton, N. C. He graduated at West Point in 1823 and remained there the two following years as assistant professor of philosophy and engineering. He was an assistant engineer in fort construction in Virginia (1825–28) and assistant to the chief engineer at Washington. In 1839–60 he was a member of the Board of Ordnance at Washington. For his services in the Mexican War he was made brevet major (1848) and later was promoted major of ordnance (1854). At the outbreak of the Civil War he resigned from the United States army. From 1863 to 1866 he was assistant engineer of the Mexico and Pacific Railroad. In 1867 he became secretary and treasurer of the canal and coal companies controlled by the Pennsylvania Railroad. Mordecai was sent abroad in 1840 and 1855 to investigate European arsenals, ordnance and military organization. In 1860 he assisted in revising the curriculum at West Point. His publications are: *A Digest of Military Laws* (1833); *Report of Experiments on Gunpowder* (1845, 1849); *Artillery for the United States Land Service* (1849); *Ordnance Manual for the Use of the Officers of the United States Army* (1841; 2d ed., 1850); *Report on Military Commission to Europe* (1861).

MOR'DEN. A town and a judicial centre of the electoral district of Lisgar, Manitoba, Canada, situated on Cheval Creek and on the Canadian Pacific and the Great Northern railways, 64 miles southwest (direct) of Winnipeg (Map: Manitoba, E 4). It has a courthouse

and jail, general hospital, isolation hospital, and nurses' home. There are several grain elevators, flour mills, cement-block and pump plants, and a creamery. The surrounding district has cement deposits. The town owns its electric-lighting plant. Pop., 1911, 1130.

MOR'DENT. A musical embellishment consisting of a rapid alternation of the principal note and its second below, indicated by the sign ; or the second above (major or minor, according to the key), indicated by the sign .



MORD'VINS, or MORDVA. A mixed Finno-Turkish people numbering about 1,000,000, living in the heart of Russia between the Volga and Oka. In height they average 1.639 meters and are brachycephalic (cephalic index, 83.8). They are divided into two main branches, the Ersa or northern and Moksha or southern. They are finely built and have dark hair—darker in the south than in the north—and blue eyes. Agriculture is their principal occupation, but they are excellent carpenters and woodworkers, selling great quantities of wooden vessels and other objects, and they are noted for beekeeping. Nominally the Mordvins have accepted Christianity, but many interesting pagan customs are preserved among them. The women especially preserve their old national costume, wearing embroidered jackets and skirts, an elaborate coiffure, large earrings, and necklaces. Consult: Mainov, "Rezultaty antropologitcheskih izsledovanii sredi Mordvy-Erzy," in *Memoirs of the Imperial Geographic Society*, ethnographic division, vol. xi (St. Petersburg, 1883); Heikel, *Trachten und Muster der Mordvinen* (Leipzig, 1897); Smirnov, *Les populations finnoises de la Volga* (French trans., Paris, 1898); the grammatical studies of Ahlquist (1861), Wiedemann (1865), Budenz (1876), and Paasonen (1903); and papers in the *Journal de la Societé Finno-ougrienne* and *Finnish-ugrische Forschungen*.

MORE, mōr, HANNAH (1745–1833). An English author, born at Stapleton, near Bristol, Feb. 2, 1745. She was well educated, scribbled essays and verse as a girl, and wrote a pastoral drama (1762). She became acquainted with Garrick, Burke, Reynolds, and Dr. Johnson, and was encouraged by Garrick to write two tragedies, *Percy* (1777) and *The Fatal Falsehood* (1779), both of which met with some success. About 1780 she withdrew from society, built a cottage at Cowslip Green, 10 miles from Bristol, and began writing moral and religious works. *Sacred Dramas* (1782) were succeeded by the extensively read *Thoughts on the Importance of the Manners of the Great to General Society* (1788). With the aid of her sisters she established Sunday schools in the neighboring districts. A successful tract called *Village Politics* (1793) led to the famous *Cheap Repository Tracts* (1795–98), of which 2,000,000 were circulated the first year. Her religious novel *Cœlebs in Search of a Wife* (1809) ran through eight editions the first year, and was still more popular in the United States. She died at Clifton, Sept. 7, 1833. Consult: H. Thompson, *Life of Hannah More* (London, 1838); E. P. Terhune (Marion Harland, pseud.), *Hannah More* (New York, 1900); C. M. Yonge, *Hannah More*, in "Eminent Women Series" (new ed., Boston, 1912).

MORE, HENRY (1614–87). An English theologian. He was born at Grantham, Lincolnshire, of Calvinist parents, but became a warm adherent of the Church of England. After some years at Eton he went to Christ's College, Cambridge, where he pursued the study of philosophy, especially the Platonic writers. About 1639 he took holy orders and lived henceforth a quiet life within the courts of his college, refusing all preferments. His numerous works represent the mysticism of the Cambridge Platonists (q.v.), to which group he belonged. His poems, including the "Song of the Soul," were collected and published as *Philosophical Poems* (1647). The characteristic principles of his philosophy are to be found in the *Divine Dialogues* (1668). Complete editions of his *Opera Theologica* appeared in 1675, and of his *Opera Philosophica* in 1678. Consult his *Life* by Ward (London, 1710) and an analysis of his life and works in Principal Tulloch's *Rational Theology*, vol. ii (Edinburgh, 1872). See the literature noted under CAMBRIDGE PLATONISTS.

MORE, LOUIS TRENCHARD (1870–). An American physicist, brother of Paul Elmer More. He was born in St. Louis, graduated there from Washington University in 1892, and studied at Johns Hopkins, where he took his Ph.D. in 1895. He served as instructor in physics at Worcester Polytechnic Institute in 1896 and as instructor and adjunct professor of physics at the University of Nebraska from 1896 to 1900. In the latter year he became professor of physics at the University of Cincinnati, where he was also dean in 1910–13. Besides papers dealing with electricity, magnetism, light, and sound, he published *The Limitations of Science* (1915).

MORE, PAUL ELMER (1864–). An American essayist, whose scholarly equipment, philosophical grasp, and effectiveness of method have placed him in the front rank of American literary critics. A brother of Louis Trenchard More, he was born in St. Louis, graduated from Washington University, took his A.M. degree at Harvard in 1893, and taught Sanskrit at Harvard for a year and Sanskrit and classical literature at Bryn Mawr from 1895 to 1897. From 1901 to 1903 he was literary editor of the *Independent* and from 1903 to 1914 he held the same position on the New York *Evening Post*. In 1909, in addition, he became editor of the *Nation*, whose high standard he maintained and to which he contributed many valuable reviews and essays in literary criticism. In 1914 he resigned his editorship, though retaining an advisory connection. The body of his critical work is contained in his *Shelburne Essays* (1904 et seq.; vol. viii, 1913), which cover much of English literature and include excursions into other literatures. These volumes take their title from the town of Shelburne, N. H., where the author with a dog and his books for companions spent two years of study. In addition to the eight volumes of essays named above, his work includes: *Helena and Occasional Poems* (1890); *The Great Refusal: Letters of a Dreamer in Gotham* (1894); *A Century of Indian Epigrams* (1898); a translation of the *Prometheus Bound* of Æschylus (1899); *Benjamin Franklin* (1900); *The Jessica Letters* (1904), with Corra Harris (q.v.); *Nietzsche* (1912).

MORE, SIR THOMAS (1478–1535). An English author and statesman. He was born in

London and was educated first at St. Anthony's School, near his home, but at 13 was placed in the household of Cardinal Morton. Morton quickly recognized his gifts and predicted that he would "prove a marvelous man." His interest a year or two later sent the boy to Oxford, where he entered at Canterbury Hall, afterward merged in Christ Church. Here he laid the foundations of the scholarship which made him such an admirable type of the Renaissance learning, under Linacre and Grocyn. Though he left Oxford after two years and studied law at New Inn and Lincoln's Inn, he kept up his literary studies and his friendship with these men and with Erasmus, Colet, and Lilly; with Erasmus, in particular, whom he met in 1497 on his first visit to England, he had a close friendship which was only terminated by death. More at one time thought of becoming a priest and in these days lived a very austere and ascetic life. He lectured on St. Augustine's *De Civitate Dei;* and it is possible that his meditations on the City of God may have suggested his own famous conception of an ideal community in the *Utopia.* Though he abandoned his idea of taking orders about 1503, he remained a fine specimen of the devout layman all his life, though a sharp critic of any shortcomings in the clergy.

In 1504 he entered Parliament and soon gained fame by opposing a large grant of money to the King, Henry VII, whose hostility compelled him to retire to private life. His law practice, however, brought him a large income. When Henry VIII came to the throne he was made undersheriff of London and engaged in a number of important commercial missions, during his absence in Flanders on one of which he began his *Utopia,* published 1516. He was made justice of the peace in 1515, and two years later master of requests, an office which brought him into frequent contact with the King, to whose council he was admitted in the same year. He was knighted in 1521 and continued a prominent figure at court. Attracting the notice of Wolsey, he was recommended by the Cardinal as Speaker of the House of Commons and was elected in 1523.

Though, like Erasmus and Colet, he had much at heart a reform of the Church in practical matters, he had no sympathy with the violent measures of Luther and his followers, and in 1523 appeared as a champion of his sovereign against the German reformer. Thenceforward until his death he was constantly in the lists against the supporters of the new doctrines. On Wolsey's fall in 1529 More was appointed to succeed him as Chancellor, the holding of the office by any but a great ecclesiastic being an unheard-of innovation. He held the office only two years and a half, and then resigned it, foreseeing that his conscience would bring him to an open struggle with the King, whom he had already opposed at several stages of the gradual breach with Rome.

The inevitable conflict came in the spring of 1534, when subscription was required to the act of succession, including a renunciation of the jurisdiction of "any foreign potentate." More flatly refused to take the oath, and was committed to the Tower, where he remained a prisoner until his death. He was brought to trial on a charge of treason, was convicted by the most flagrant perjury and injustice, and was sentenced to be hanged at Tyburn. The King commuted the sentence to beheading. On July 6 he was executed in the Tower, retaining the calmness and wit which had marked his life to the last. His execution shocked the whole of Europe, and Charles V declared that he would rather have lost his best friend than such a counselor. More was beatified by Leo XIII in 1886, together with other English martyrs.

More is to-day best known as the author of the *Utopia* (q.v.). It was written in Latin, so as to reach the learned world, and is full of dramatic skill and fertile invention. The earliest English version, of which five scholarly reprints were published between 1869 and 1893, appeared in 1551, but earlier than this it had been translated into German, Dutch, and Italian. More's English works, principally of a controversial or devotional character, are marked by forcible, nervous, simple style and by an abundance of witty illustration. His *History of Richard III* (first correctly printed in 1557), though incomplete, is notable among the beginnings of modern history in English, and his early biography of Pico della Mirandola (1510) is characteristic of his devotion to the Renaissance ideal.

Bibliography. The basis for all biographies of More is the *Life* by his son-in-law, William Roper, first printed at Paris in 1626, with numerous subsequent editions, a recent one in the "King's Classics" (London, 1903); Cresacre More, his great-grandson, published a fuller biography about 1631 (last ed., London, 1828). Consult also Anne Manning, *The Household of Sir Thomas More* (London, 1851; new ed., New York, 1908); Désiré Nisard, *Renaissance et réforme* (Paris, 1877); T. E. Bridgett, *Life of Sir Thomas More* (London, 1891); W. H. Hutton, *Life and Writings of Sir Thomas More* (ib., 1895); Sir Sidney Lee, in *Great Englishmen of the Sixteenth Century* (New York, 1904); Henri Brémond, *Sir Thomas More,* translated by Harold Child (London, 1904), containing a bibliography; Frederick Seebohm, in *Oxford Reformers* (New York, 1911); *The Book of Sir Thomas More,* in the Malone Society Reprints (London, 1911); Randall Davies, *The Greatest House at Chelsey* (New York, 1914). See COMMUNISM.

MORE'A. The peninsular portion of Greece, connected with the northern half of the country by the narrow Isthmus of Corinth. It was known in ancient times as the Peloponnesus (q.v.), but has been known by its present name since the Middle Ages, if not from as early a period as the fourth century (Map: Greece, D 6). This name is usually said to be derived from *morus,* a mulberry—the outline of the peninsula bearing a resemblance to the leaf of that tree. Others, however, such as Fallmerayer, trace it back to the Slavic word *more,* the sea, which nearly encircles the Morea. See GREECE.

MOREA. One of the Society Islands. See MOOREA.

MORÉAS, mô'rā'ä', JEAN (1856–1910). A French poet and novelist, born in Athens, his real name being Papadiamantopoulos. In 1877 he settled in Paris and about 1882 began to publish his verse in some of the newer reviews. His first volume, *Les syrtes* (1884), cleverly parodied by Beauclair under the title *Les déliquescences,* "par Adoré Floupette, poéte décadent," brought on his school the title of "decadent." In 1886 Moréas published *Les cantilènes.* Moréas repudiated his earlier manner in 1892 for that of the school of Romance, which urged a return to the verbal richness of

old French poetry. For such a task the "grammarian poet" with his thorough knowledge of early French diction and metre was peculiarly fitted. Moréas wrote also: *Le pélegrin passionné* (1891); *Eriphile* (1894); *Les stances* (1898–1902; 2d ed., 1906); *Premières poésies* (1907), combining *Les syrtes* and *Les cantilènes; Esquisses et souvenirs* (1908). With Paul Adam he wrote *Le thé chez Miranda* (1886) and *Les demoiselles Goubert* (1887), practically all he did as a novelist. His tragedy *Iphigénie* was first played in 1903. In 1889 he had written the symbolistic manifesto in *Les premières armes du symbolisme*. See SYMBOLISTS.

MOREAU, mô'rō', GUSTAVE (1826–98). A French painter, born in Paris, where he studied under Picot and Chassériau. In Italy he was influenced by Leonardo da Vinci, Mantegna, and other early Renaissance masters. He exhibited little, and did not become known until towards the end of his life. The only modern painter with whom he can be compared is Burne-Jones. He left his 800 or more works in water color and oil to his native city to form the Musée Moreau in the Rue de la Rochefoucauld. There his "Prometheus" (1869), "Hesiod and the Muses," "The Apparition," "Leda," "Micornes," and many like subjects furnish fine examples of the weird, morbid imagination, suppressed passion, and brilliant, glittering color that distinguish his peculiar style. In the Luxembourg Museum are "Orpheus," "Jason," the "Rape of Europa," and "Calvary," one of a cycle of religious paintings. From 1892 to 1898 he was a professor in the Ecole des Beaux-Arts. He received the cross of the Legion of Honor in 1875. Consult: Flat, *Le Musée Gustave Moreau* (Paris, 1905); Muther, *A History of Modern Painting* (New York, 1907); Loisel, *L'Inspiration chrétienne du peintre Gustave Moreau* (Paris, 1912).

MOREAU, HÉGÉSIPPE (1810–38). A French poet. He was born in Paris, worked as a typesetter and teacher, and then turned his attention to literature. He suffered the greatest privations and died in a hospital just as his talent began to be appreciated. His works comprise: *La Voulzie*, elegies, and *Contes à ma sœur*, prose romances reminiscent of Nodier, of which the most notable is "Le gui de chêne." His works appeared under the title of *Myosotis* (1838), and his correspondence in the first volume of his *Œuvres complètes* (1890–91).

MOREAU, JEAN VICTOR (1763–1813). A celebrated French general of the revolutionary and Napoleonic period. He was born Aug. 11, 1763, at Morlaix in Brittany, and studied law at Rennes. In 1789 he embraced the cause of the Revolution, and was later chosen to command the battalion of volunteers from his native town. He served under Dumouriez in 1793 and displayed such military talent that in 1794 he was made a general of division. His father was put to death by the guillotine, but Moreau decided that he could not withdraw from the service of his country. When Pichegru (q.v.) fell under suspicion in 1796 the Directory appointed Moreau to the chief command on the Rhine and Moselle. He crossed the Rhine at Kehl, defeated Latour at Rastatt and the Archduke Charles at Neresheim, and drove the Austrians back to the Danube; but, owing to the defeat of Jourdan at Würzburg, he found himself in danger of being cut off from the Rhine, and was obliged to make a desperate effort to regain that river, which he accomplished in the face of great difficulties, fighting two unsuccessful battles at Emmendingen and Hüningen in October. A suspicion of participation in the plots of Pichegru led to his being deprived of his command in 1797, but in 1799 he succeeded Scherer in the command of the army in Italy. By a retreat conducted with consummate skill he saved the French army from destruction, though defeated April 27, 1799, by Suvaroff at Cassano. The Directory deprived him of the chief command and gave it to Joubert, but Moreau remained with the army, and after the death of Joubert at Novi, Aug. 15, 1799, again assumed the command and conducted the troops back to France. The disinterestedness of Moreau's character, his military talent, and his political moderation brought him great popularity. He assisted Bonaparte on the 18th Brumaire and, receiving the command of the Army of the Rhine, gained victory after victory over the Austrians in the campaign of 1800 and on December 3 won the great and decisive battle of Hohenlinden (q.v.). A strong feeling of mutual distrust now arose between Moreau and Bonaparte, and the former retired to his country seat, which became the gathering place of the discontented. He was accused of participation in the plot of Pichegru and Cadoudal (q.v.) against the life of the First Consul, and was arrested, brought to trial, and found guilty on June 10, 1804, although the evidence against him was worthless. But Bonaparte could not venture to condemn him to death, and a sentence of two years' imprisonment was therefore pronounced, which was commuted into banishment. Moreau went to America, where he settled first in New Jersey and later at Morrisville, Pa. Regarding with great dissatisfaction the whole of Bonaparte's career, in 1813 he joined the Emperor of Russia and the King of Prussia in the march against Dresden, where, as he stood with the Emperor Alexander on a height at Räcknitz on August 27, a French cannon ball broke both his legs. Amputation was performed, but he died at Laun in Bohemia, Sept. 2, 1813, and was buried in St. Petersburg. Consult: Beauchamp, *Vie politique, militaire et privée du général Moreau* (Paris, 1814; Eng. trans., London, 1814); Chateauneuf, *Histoire du général Moreau* (Paris, 1814); C. Jahmus, *General Moreau* (Berlin, 1814); Paul Swinin, *Some Details Concerning General Moreau and his Last Moments* (London, 1814).

MOREAU, MARIE JULES EMILE (1852–). A French dramatist, born at Brienon (Yonne). Among his writings are: *Parthénice* (1877); *Camille Desmoulins* (1879); *Bonne année* (1882); *Un divorce* (1884); *Gerfaut* (1886); *Pallas Athéné* (1887), which received the French Academy's grand prize for poetry; *La peur de l'être* (1889); *Le drapeau* (1890); *Madame Sans-Gêne* (1893); *Le capitaine Floréal* (1895); *Madame de Lavalette* (1899); *Eglé* and *Le vert-galant* (1907); *La reine Elisabeth* (1912). In his *Le procès de Jeanne d'Arc* (1909) the rôle of Jeanne was created by Sarah Bernhardt.

MOREAU DE SAINT-MÉRY, de săn-mâ'rē', MÉDÉRIC LOUIS ELIE (1750–1819). A French statesman, born in Martinique. He was a member of the Constituent Assembly in 1790. From 1793 to 1799 he was in the United States because his moderate views brought him into conflict with the Jacobins. He set up as a book-

seller in Philadelphia. He was a Councilor of State in 1800, and administrator of Parma, Piacenza, and Guastalla in 1802–06. Falling out of favor with Napoleon, he lived in poverty till 1817, when Louis XVIII pensioned him. He published *Lois et constitutions des colonies françaises de l'Amérique de 1550 à 1785* and *Description de Saint-Dominique* (Philadelphia, 1796–98). Consult Moreau de Saint-Méry's *Diary of a Voyage to the United States* (New Haven, Conn., 1913), edited, with biographical sketch, by S. L. Mims.

MOREAU-VAUTHIER, mō'rō'-vō'tyâ', Gabriel Jean Paul (1871–). A French sculptor, born in Paris. He received several medals and prizes at various expositions, beginning to exhibit as early as 1891. Among his works are: "Dante" (1895); "Flora" (1896); "Sphinx" (1897); "Bretonne" (1898); "The City of Paris," a monumental door (Exposition, 1900); "The Seasons," "Embraces" (1903); "Nymphs and Satyrs," decorative panels (1905); "War," "Faun and Nymph" (1906); the Châlons Monument (1907). He made a number of marble and bronze pieces, "Bacchante," "Nereid," "Molière," "Fortune," "Plenty," for the Elysée Palace, the hôtel de ville, and Père Lachaise Cemetery.

MORECAMBE, mōr'kam. A popular watering place in Lancashire, England, on Morecambe Bay, 3½ miles northwest of Lancaster (Map: England, D 2). It has a pier, promenade, aquarium, people's palace, pavilions, and a golf course. Its climate is mild and healthful. Pop., 1901, 11,798; 1911, 12,131.

MORECAMBE BAY. An inlet of the Irish Sea, on the northwest coast of England (Map: England, C 2). It is about 17 miles long, 10 miles in average breadth, and very shallow.

MOREEN. See Moire.

MOREL, mōr'ĕl (Fr. *morille*, from OHG. *morhela*, Ger. *Morchel*, mushroom, dim. of OHG. *morahā, morhā*, Ger. *Möhre*, carrot), *Morchella.* The common name of *Morchella esculenta*, which is prized as an edible mushroom, although it is not a mushroom. The genus belongs to the Ascomycetes (q.v.), and the ascocarp is a remarkable fleshy structure, rising above the ground from a usually subterranean mycelium. The surface of this stalked and more or less conical structure is reticulated with irregular pitlike depressions which are lined with the hymenium (q.v.). Morels are reckoned among the best of esculent fungi. The common morel, perhaps the best known, is found in America and in many parts of middle and southern Europe. Its stalk is only about an inch long; the pileus is roundish, oval, oblong, or conical, yellowish or brown. Fresh or dried it is nutritious and not difficult to digest, but is chiefly used in sauces and gravies, on account of its pleasant flavor. See Ascomycetes, and Colored Plate of Edible Fungi with the article Fungi.

MOREL EAR. See Stigma.

MOREL-FATIO, Alfred Paul Victor (1850–). The leading French Hispanist of his time. He was born at Strassburg and completed his studies at the Ecole des Chartes, Paris. From 1875 to 1880 he was attaché of the department of manuscripts of the Bibliothèque Nationale, during which period he prepared his excellent *Catalogue des manuscrits espagnols et portugais de la Bibliothèque Nationale.* For the next five years he was professor at the Ecole Supérieure des Lettres at Algiers. In 1885 he returned to Paris to accept the chair of languages and literatures of southern Europe in the Collège de France. He became also assistant director of Romance philology at the Ecole Pratique des Hautes-Etudes, and secretary of the Ecole des Chartes. In these positions he exercised a great influence over students from many lands, and by his writings he influenced a wide public. In 1894 he was Taylorian lecturer at Oxford University. By Spaniards he came to be regarded as the foreign scholar who best understood that nation. He was elected corresponding member of the Spanish Royal Academy of the Language, and was appointed a Knight Commander of the Order of Charles III, and in his own country became an officer of public instruction, a member of the Institute of France (1910), and a Knight of the Legion of Honor. In addition to the *Catalogue* previously mentioned, the following are the most important of his many publications: translation of the *Grammaire des langues romanes* by Friedrich Diez (1874–76); a critical edition of Calderón's *Mágico prodigioso* (1877); *L'Espagne au XVIe et au XVIIe siècle* (1878); *Libro de los fechos et conquistas del principado de la Morea . . . Chronique de Morée aux XIIIe et XIVe siècles* (1885); *Vie de Lazarillo de Tormes; Etudes sur l'Espagne* (3 vols., 1888–1904; 2d ed. of vols. i and ii, 1895 and 1906); "El Libro de Alijandre," in *Gesellschaft für romanische Literatur*, vol. x (1906); *Recueil des instructions données aux ambassadeurs de France en Espagne; Historiographie de Charles-Quint* (1913). After 1874 Morel-Fatio was a contributor to the *Romania*, and after 1899 one of the directors of the *Bulletin Hispanique.*

MORELIA, mō-rā'lê-à, or Valladolid, vä'lyâ-dō-lēd'. The capital of the State of Michoacan, Mexico, situated in a mountainous region, 6300 feet above sea level and 130 miles west-northwest of Mexico City (Map: Mexico, H 8). The town lies in a fertile valley and is regularly built with many squares and two paseos or promenades. It has a fine cathedral, built in Plateresque style and completed in 1745, and a state capitol built of hewn stone in Byzantine style; other notable buildings are the city hall, the courthouse, and the public library. It has also a number of educational institutions, the most important being the theological seminary and the Colegio San Nicolas de Hidalgo. A good water supply is obtained by a handsome aqueduct, 4 miles long, which was completed in 1789. The chief industries of the town are the manufacture of cotton and woolen goods, palm hats, sugar, pulque, and cheese. Pop., 1900, 37,278; 1910, 40,042. Morelia was founded under the name Valladolid in 1541, and the present name was given it in honor of Morelos. See Morelos y Pavon.

MOR'ELL, George Webb (1815–83). An American soldier, also an engineer and lawyer. He was born at Cooperstown, N. Y., graduated with the highest honors in his class at West Point in 1835, served as assistant engineer from 1835 to 1837, and in June, 1837, left the service to take up railroad building. He became assistant engineer first of the projected Charleston and Cincinnati Railroad and then of the Michigan Central Railroad (1837–40), after which he went to New York City and was admitted to the bar. He was later commissioner of the United States Circuit Court for the southern district of New York (1854–61). After the

outbreak of the Civil War he served for a few months as a colonel of New York militia and chief of staff of Major General Sanford, became a brigadier general of volunteers in August, 1861, served under McClellan throughout the Peninsular campaign, and in July, 1862, was appointed major general of volunteers, though the commission, not being sent to the Senate for confirmation, lapsed in March of the following year. Morell participated in the second battle of Bull Run and in the Maryland campaign of September, 1862, and commanded the forces guarding the upper Potomac from Oct. 30 to Dec. 16, 1862, and the draft rendezvous at Indianapolis, Ind., from December, 1863, to August, 1864. In December, 1864, he was mustered out of service, and afterward until his death lived as a farmer near Tarrytown, N. Y.

MORELL, JOHN DANIEL (1816–91). An English philosopher, born at Little Baddow, Essex. He graduated at Glasgow University in 1840, took his M.A. degree a year later, and then went to Bonn, where he studied theology and philosophy. After his return he became Independent minister at Gosport, but three years later (1845) resigned the position. In 1846 he published his *Historical and Critical View of the Speculative Philosophy of Europe in the Nineteenth Century,* which was highly praised and which led Lord Lansdowne to appoint him inspector of schools, an office which he held until 1876. In 1849 appeared his *Philosophy of Religion,* a work that was widely discussed. Among his other publications are: *On the Philosophical Tendencies of the Age* (1848); *A Grammar of the English Language* (1857); *On the Progress of Society in England as Affected by the Advancement of National Education* (1859); *Philosophical Fragments* (1878). In philosophy he was an eclectic, but inclined towards idealism, while in religion he gradually outgrew the narrow limits of his earlier belief until he came into sympathy with all branches of the Christian Church. Consult R. M. Theobald, *Memorials of J. D. Morell* (London, 1891).

MORELLA, mō-rā'lyȧ. A strongly fortified town of east Spain, in the Province of Castellón, situated among the mountains, 50 miles west of the mouth of the Ebro (Map: Spain, E 2). It is built on a steep hill in the midst of a rough and inaccessible country and is surrounded by walls and towers, the wall being tripled on one side. Pop., 1900, 7078; 1910, 6722.

MORELLA, COUNT OF. See CABRERA, RAMÓN.

MOREL-LADEUIL, mō'rĕl'-lȧ'dē'y', LEONARD (1820–88). A French goldsmith and sculptor. He was born at Clermont-Ferrand, was apprenticed in Paris to Antoine Veclite, from whom he learned the art of repoussé, and also studied sculpture under J. J. Feuchère. In 1859 he accepted an offer to work for the English goldsmith's firm of Elkington in Birmingham. Two tazzas in repoussé silver, the vase "Modern Inventions," and the beautiful repoussé table "Dreams" (1862), presented as a wedding gift to the Princess of Wales, soon placed him at the head of his profession. After three years he removed to London, remaining altogether a quarter of a century in England. Skill in execution, grace and harmony in composition, purity of style, refined feeling for ornament, and a sense of the dramatic made Morel one of the greatest masters in the art of repoussé. Among his celebrated works, besides those already mentioned, are the "Shield of Empire" (1852, Royal Artillery Officers' Mess, Woolwich); "Milton Shield," in steel and silver repoussé (South Kensington Museum); a "Pompeian Lady at her Toilet" (plaque executed for the Philadelphia Centennial, 1876); "The Bunyan Shield"; and the Shakespearean plaques, "Merry Wives of Windsor," "Much Ado about Nothing," and "The Merchant of Venice." Consult Morel, *L'Œuvre de Morel-Ladeuil* (Paris, 1904).

MORELLET, mō'r'-lȧ', ANDRÉ, ABBÉ (1727–1819). A French author, born in Lyons. After graduating at the Sorbonne as licentiate in theology he came into possession of a small annuity and thenceforth lived in Paris. He was in sympathy with, and was one of the last of, the Encyclopédistes and was a personal friend of Voltaire. He was made a member of the Academy in 1785, entered the reorganized Institute in 1803, and in 1808 was named deputy from the Seine. He belonged to the school of Turgot in political economy. His numerous works are more remarkable for eloquence, force, and biting wit than for original thought. Among his most powerful pamphlets are: *Théorie du paradoxe* (1775), against Linguet; *Préface de la comédie des philosophes, ou La vision de Charles Palissot* (1760), directed against the Bastille; *Le cri des familles* (1795), a protest against the confiscation of property owned by those condemned by the revolutionary tribunals; *Mélanges de littérature et de philosophie au XVIIIème siècle* (4 vols., 1818), in volume ii of which is "L'Avis de Franklin aux faiseurs de constitution." His other works include *Mémoires sur le XVIIIème siècle et sur la Révolution* (1821). He also translated numerous essays from English, Italian, and Latin. Many of his pamphlets were translated into English.

MORELLI, mō-rĕl'lē, DOMENICO (1826–1901). An Italian historical painter, born in Naples. He studied at the Naples Academy and for a short time in Rome under Overbeck. He was afterward professor at the Naples Academy and, with Philippo Palizzi, became a leader of the Realist movement in Italy, where the younger generation was strongly influenced by his independent and progressive spirit, his love of light and resplendent color, and his bizarre imagination. His most important paintings are "Tasso Reading his Poem to the Three Eleanoras" and the "Iconoclasts," both in the Royal collection, Capodimonte; "Mahomet Praying," in the Trieste Museum; "The Madonna of the Golden Stair"; "Christ in the Wilderness," in the Galleria Moderna, Rome; and "The Temptation of St. Antony." Consult Willard, *Sketch of the Life and Works of Domenico Morelli* (Boston, 1895).

MORELLI, GIOVANNI (1816–91). An Italian art critic, whose researches and attributions were epoch-making for Italian painting. He was born in Verona, passed his youth in Bergamo, studied medicine at Munich, Erlangen, and Berlin, and in 1838 assisted Agassiz in his investigations of glaciers. He took a prominent part as a leader of the volunteers in the Italian revolution of 1848, and was sent as national Envoy to the German Parliament at Frankfort. He was a member of the Italian Parliament in 1860–70 and was made a Senator of the Kingdom in 1873. It was on his recommendation that the government appointed a commission to prepare a law for the conservation of works of art in Italy and to prevent their alienation by

heads of religious and public institutions. Although he refused the post of Minister of the Fine Arts and the directorship of the Florence galleries, he did much to reform the administration of Italian museums and galleries. He is best known for his critical work on Italian painting, published in a popular dialogue form under the pseudonym Ivan Lermoliev. Published at first in the periodicals of Germany, to the scholars of which country his appeal was chiefly directed, it is embodied in *Die Werke italienischer Meister in den Galerien von München, Dresden, und Berlin* (1880). This was subsequently amplified to *Kunstkritische Studien über italienische Malerei* (1890–93), and translated into English by Ffoulkes under the title *Italian Painters: Critical Studies of their Works* (2 vols., 1892). His principles of art criticism, which have since been generally adopted for the identification of Italian and indeed of all paintings, consider not only the important features of facial form and expression, but even emphasize the less important features, such as the hands, and ears, which the painter would render in a certain habitual fashion, little influenced by the model before him. Morelli left an important collection of paintings, rich in the Lombard schools, to Bergamo, which he considered his home.

MORELLY, mŏ'r'-lĕ'. A French Socialist of the middle of the eighteenth century. He was born at Vitry-le-Français, taught there, and became an abbé, but of his life nothing more definite is known. His works include *Le prince, les délices du cœur* (1751), in which he describes a ruler who makes his people happy and contented through practical adaption of theoretical philosophy; a poem, *Naufrage des îles flottantes* (1753), which describes an ideal government ruled by the laws of nature; *Le code de la nature* (1755–60), a work long attributed to Diderot, and the forerunner of modern communism. Consult Lichtenberger, *Le socialisme au XVIIIème siècle* (Paris, 1895).

MORELOS, mō-rā'lōs. One of the smallest states of Mexico, situated in the interior and bounded by the State of Mexico with the Federal District on the north and west, Guerrero on the west and south, and Puebla on the east (Map: Mexico, J 8). Area, 2734 square miles. It lies on the south slope of the great central plateau, and its northern part is extremely mountainous. The centre and the south comprise fertile valleys, which are devoted to agriculture. The climate in the north is cold and in the centre and south is hot. The principal agricultural products are sugar cane, rice, coffee, cereals, and fruits. The chief industry is the manufacture of sugar. The first sugar plantation and sugar mill in Mexico were established by Cortés in Morelos. It was the scene of much of the activity of Zapata during the revolutions of 1910 and the years following. The state is traversed by two railway lines and has a considerable trade. Pop., 1900, 160,115; 1910, 179,594. Capital, Cuernavaca (q.v.).

MORELOS. A city of Mexico. See CUAUTLA DE MORELOS.

MORELOS Y PAVON, mō-rā'lōs ē pä-vōn', JOSÉ MARÍA (1765–1815). A Mexican patriot and general, born at Valladolid (now Morelia), Michoacan. Left an orphan by poor parents, he spent the years of early manhood as a mule driver and was 32 years of age before he began his education in the College of San Nicolás, of which Hidalgo was then rector. Having progressed rapidly in his studies, he entered holy orders and became the curé of Carácuaro and Nircupétaro, where he was serving when in 1810 his old rector began the revolt against Spain. He decided to follow the fortunes of Hidalgo and at once won a reputation as a brave fighter and a safe leader. Upon the death of Hidalgo Morelos became the leader of the insurrection and during the following winter (1811–12) waged a successful campaign against the Spaniards in the south and west. From Feb. 19 to May 2, 1812, he, with 4000 men, was besieged in Cuautla by a superior force of Loyalists, but succeeded in escaping with most of his army. He captured Orizaba (Oct. 28, 1812), took Oaxaca by storm (November 25), and successfully besieged and entered Acapulco (Aug. 19, 1813). For the purpose of organizing an independent Mexican government he called a congress at Chilpancingo (September 14), which named him generalissimo of the Patriot army and abolished slavery and religious tithes. On Nov. 6, 1813, Morelos issued, in the name of the Congress of Anáhuac, a Declaration of Independence, declaring that the Congress "has recovered its usurped sovereignty" and that "the dependence upon the Spanish throne is broken and dissolved forever." His star now began to wane. He was defeated by Iturbide at Valladolid (Dec. 23, 1813) and again at Puruarán (Jan. 5, 1814). He retired to Acapulco, but was forced to abandon the town upon the approach of the enemy. The Royalists now drove the revolutionists from place to place, and finally in the battle of Tesmalaca Morelos was defeated and taken prisoner. He was taken to Mexico City, where he was condemned by the Inquisition as "an unconfessed heretic and a traitor to God, the King, and the Pope" and was ordered to be degraded from the priesthood. The military court-martial condemned him to death and he was shot, Dec. 22, 1815. His remains at present repose in the cathedral in Mexico City, and his name and that of Hidalgo are revered throughout the country as the earliest martyrs to the cause of Mexican independence.

MOREN'DO (It., dying away). A musical term, equivalent to decrescendo (q.v.).

MORENO, GABRIEL GARCÍA. See GARCÍA MORENO, GABRIEL.

MORE'PORK. 1. In Australia, a caprimulgine bird (*Podargus cuvieri*, or *strigoides*) of Australia and Tasmania. Like many other nightjars, this bird has a peculiar cry, of two syllables, resembling the words *more pork*, whence the name. It is also called frogmouth on account of its immense opening of the bill. It is remarkable for a habit, when alarmed, of stiffening itself in a fixed attitude, sometimes flat on the log, or rock, or fence rail, where it happens to be, and sometimes erect. Then, as it is dull gray, it looks like an excrescence or projection from the surface, and so escapes casual observation. An extended discourse, illustrated by photographic pictures, will be found upon this example of protective mimicry in Saville-Kent's *Naturalist in Australia* (London, 1897). Several species belong to the genus—all large birds and remarkable in structure for the possession of a pair of powder-down patches on the back at the base of the tail. See Plate with NIGHTJAR.

2. In New Zealand, an owl (*Spiloglaux novæ-zealandiæ*).

MORÉRI, mō'rā'rē', Louis (1643–80). A French scholar, born at Bargemont (Provence). He entered the Church and was made chaplain to the Bishop of Apt in 1673. He published the first edition of his *Grand dictionnaire historique ou le mélange curieux de l'histoire sacrée et profane* at Lyons in 1674. This work is still of importance from a biographical point of view, and has often been translated. The twentieth edition, printed in Paris in 1759, and comprising 10 volumes, is considered the best.

MORESNET, môr'nā'. A town and neutral territory of about 1½ square miles on the borders of Belgium and Prussia and under the double protectorate of those countries, about 5 miles southwest of Aix-la-Chapelle. On either side of its borders are the villages of Prussian Moresnet and Belgian Moresnet. It is mountainous and has valuable zinc deposits. It received an independent constitution after the Vienna Congress of 1815. It attained self-government in 1841 with a burgomaster alternately appointed by Belgium and Prussia. Its population consists of German, Flemish, Dutch, and French. Each inhabitant may choose whether he will do military service and seek legal redress in Germany or in Belgium. Pop. (est.), 3400.

MORETON (mōr'ton) **BAY.** A harbor on the east coast of Queensland, Australia, formed inside the islands of Stradbroke and Moreton (Map: Queensland, H 9). It is about 40 miles long by 17 miles wide and receives the waters of six navigable rivers. Among them is the Brisbane, with the city of Brisbane 25 miles from its mouth.

MORETON BAY CHESTNUT (*Castanospermum australe*). An Australian tree of the family Leguminosæ, which attains a height of about 100 feet, has widespreading branches, pinnate leaves, large racemes of beautiful red and yellow flowers, and pods 6 to 7 inches in length. The seeds are soaked for several days in water, dried and roasted, when they taste like chestnuts, hence the name.

MORETON BAY PINE. See Araucaria.

MORETO Y CABAÑA, mō-rā'tō ē kä-bä'nyä, Agustín (c.1618–69). A Spanish dramatist, born at Madrid. He studied at Alcalá de Henares and then went to Madrid, where he found a friend and patron in Calderón. A volume of his plays appeared at Madrid in 1654. Although inferior to Lope de Vega and to Calderón, he yet takes rank as one of the best dramatists of the latter part of the *siglo de oro*, or golden age. He achieved his real success in the category of dramas styled *comedias de capa y espada*, i.e., dramas of intrigue. Moreto's masterpiece is the play *El desdén con el desdén* (Scorn for Scorn). Borrowing the idea from Lope's *Milagros del desprecio*, he produced a work better artistically than that of the master and most brilliant. In his *Princesse d'Elide* Molière imitated the *Desdén con el desdén*. Another excellent play is *El lindo Don Diego*. Of his historical dramas one of the most interesting is the *Rico hombre de Alcalá*, dealing with Pedro the Cruel as the justice-loving King. Consult: *Comedias escogidas* of Moreto in *Biblioteca de autores españoles*, vol. xxxix (Madrid, 1873), which also has L. Fernández Guerra y Orbe's essay on him, and *Biblioteca de autores españoles*, vol. lviii (ib., 1884), for his *Gran casa de Austria y divina Margarita* (*Auto Sacramental*); E. Gigas, *Studien og Essays* (Copenhagen, 1898); E. Carrara, *Studio sul teatro ispano-veneto di Carlo Gozzi* (Cagliari, 1910); Cristóbal Pérez Pastor, *Bibliografía Madrileña, Parte iii* (Madrid, 1907); Jaime Mariscal de Gante, *Los autos sacramentales desde sus orígenes hasta mediados del siglo XVIII* (Madrid, 1911).

MORETTO DA BRESCIA, mō-rĕt'tō dä brĕsh'ä (1498–1554). An Italian painter of the Renaissance, the chief master of the Brescian school. His real name was Alessandro Bonvicino and he was born at Brescia, where he obtained his early art education under Fioravante Ferramola. Later he was influenced by Savoldo, Romanino, Lotto, and Titian. In frescoes executed in the chapel of San Giovanni Evangelista at Brescia, painted as early as 1523, he showed himself strong in conception and handling of form and endowed with a genius for color harmony. His works are pervaded by a characteristic cool silvery tone with a fine play of light and shade; they have great simplicity of expression and poetic sentiment. Although by the introduction of secular portrait groups into some of his religious compositions he foreshadows Paul Veronese, he differs from that painter in the gravity of his conception and his reverent religious feeling. Between 1521 and 1544 Moretto executed many paintings in and about Brescia, where his works may best be studied. Among the finest are "Fair Ladies on a Parapet" and "The Vision of Moses," Martenengo Gallery; "Elijah," San Giovanni Evangelista; "Mary Appearing to a Shepherd Boy," in the church of Paitone (Province of Brescia). In 1544 he painted his celebrated "Christ in the House of the Pharisee" for Santa Maria della Pietà, Venice, a work virile in presentation and pleasing in composition. Among other important works are a splendidly heroic "St. Justina," in the Vienna Gallery; an impressive "Entombment" and "Christ in the Desert," in the Metropolitan Museum, New York; a "Madonna with Doves," in the Johnson collection, Philadelphia. His finest portrait is that of an "Ecclesiastic," in the Munich Pinakothek. There are also typical examples in the Berlin Gallery, the National Gallery, London, the Brera, Milan, and the Louvre. Moretto died at Brescia in 1554. Among his pupils the most important was Giambattista Moroni, of Bergamo. Consult Berenson, *North Italian Painters of the Renaissance* (New York, 1907); "Moretto da Brescia," in *Masters of Art*, vol. ix (Boston, 1908); *The Masterpieces of Moretto da Brescia*, in "Painters' Series" (New York, 1910).

MORET Y PRENDERGAST, mō'rĕ' ē prĕn'dĕr-gäst', Segismundo (1838–1913). A Spanish statesman, born at Cadiz. He studied at Madrid University, where he subsequently held the chair of political economy and finance. He was elected to the Chamber of Deputies in 1863, was Minister of the Colonies under General Prim, of Finance under King Amadeus, and of the Interior under Alfonso XII. In 1871 he had been sent as Ambassador to London. In 1885 he was Minister of State, and later again Minister of the Interior. In 1893 he became Minister of Public Works and ad interim Minister of State, taking the place of the Marqués de la Vega de Armijo, who had become President of the Congress. The next year he was made Minister of State. From 1895 to 1898 and again at the time of his death he was

president of the Ateneo Científico, Literario, y Artístico of Madrid. In 1897–98 he was again Minister of the Colonies. Later he served as president of the Congress (1901–02). He became head of a Liberal cabinet in December, 1905. His term of office was signalized by the meeting of the Algeciras Conference (see MOROCCO) and the marriage of Alfonso XIII. He resigned in August, 1906, but was again president of the Council of Ministers in 1909–10. His ability was recognized by his election to membership in the Royal Academy of Moral and Political Sciences and in the Royal Spanish Academy of the Language. He received also the grand cross of the Order of Charles III of Spain. Consult Luís Antón del Olmet and Arturo García Carraffa, "Moret," in *Los grandes españoles*, vol. v (Madrid, 1913).

MO'REY, SAMUEL (1762–1843). An American inventor, chiefly remembered for his attempts to solve the problems of steam navigation. He was born at Hebron, Conn., and lived in Orford, N. H., and Fairlee, Vt. In 1793, after several years of experimenting, he succeeded in constructing a small steamboat, which was propelled at a speed of about four miles an hour by a paddle wheel, which was first put at the prow and later at the stern. It was exhibited on both the Connecticut River and the Hudson. Chancellor Livingston is said to have encouraged Morey by large conditional promises and to have offered him $7000 for a patent covering navigation in the waters about New York; the offer was declined. In 1795 Morey patented a crank-motion steam engine for use in boats. Two years afterward he built at Bordentown, N. J., a boat with a paddle wheel on each side and operated it successfully on the Delaware. He seemed, in fact, to have had the problems of steam navigation practically solved; but misfortunes prevented him from following up his success, and to Robert Fulton went the honor that might otherwise have been Morey's.

MOREY, WILLIAM CAREY (1843–). An American professor and writer on history and political science, born at North Attleboro, Mass. He entered the University of Rochester, but left to volunteer in the Civil War. At its close, having been brevetted major and lieutenant colonel, he returned to college and graduated in 1868. For a year he studied at Rochester Theological Seminary, in 1870–72 he was professor of history and English literature at Kalamazoo College (Michigan), and thereafter he was a member of the faculty of his alma mater, as professor of Latin (1872–77), professor of Latin and history (1877–83), and then professor of history and political science. The degree of D.C.L. was conferred on him by Denison and Rochester. He published, besides numerous papers to be had in reprints: *Outlines of Roman Law* (1884); *Papers and Addresses of Martin B. Anderson* (1895); *Outlines of Roman History* (1900); *The Government of New York* (1902); *Outlines of Greek History* (1903); *Outlines of Ancient History* (1906), revised as *Ancient Peoples* (1915).

MOREY FORGERY. In American political history, the forgery, during the presidential campaign of 1880, of the name of James A. Garfield, the Republican candidate for the presidency, to a letter which was widely used for campaign purposes. The letter, which favored Chinese immigration and purported to be addressed to "H. L. Morey, Lynn, Mass.," was made public in *Truth*, a New York paper, on Oct. 20, 1880, and on the 23d what purported to be a facsimile of the letter was published in the same paper. Garfield immediately denounced the letter as a forgery, but extensive use was made of it by the Democratic campaign managers, and many votes were supposed to have been turned by it from the Republican ticket, especially in the West. Consult Davenport, *History of the Morey Letter* (New York, 1884).

MOR'FILL, WILLIAM RICHARD (1834–1909). An English Slavic scholar. He was educated at Oriel College, Oxford, where he graduated with a first-class in classics in 1855 and in 1889 became reader of Russian. He became professor of Slavonic languages and was appointed curator of the Taylor Institute. His excellent works on Slavic literature, language, and history include: grammars of Polish (1884), Servian (1887), Russian (1889), Bulgarian (1897), and Czech (1898); *Russia* (1880); *Slavonic Literature* (1883); *Story of Russia* (1891; 5th ed., rev., 1904); *Story of Poland* (1893); and a *History of Russia from the Birth of Peter the Great to Nicholas II* (1902).

MORGAGNI, môr-gä'nyĕ, GIOVANNI BATTISTA (1682–1771). A celebrated Italian pathological anatomist, born at Forli in Romagna. He studied at Bologna, graduating in both medicine and philosophy in 1701. In his twenty-third year he assumed the presidency of an independent medical school. In 1715 he was appointed to fill the chair of anatomy at Padua, where he remained and performed his life work as a pathologist. He is generally regarded as the founder of pathological anatomy, and his book on the *Seats and Causes of Disease* has remained a classic. Morgagni became known wherever the art of medicine was known and practiced. He was made a fellow of the Royal Society of London in 1724; of the French Academy of Science in 1731; of the Imperial Academy of St. Petersburg in 1735; and of the Academy of Berlin in 1754. His more important works are: *Adversaria Anatomica*, published in six parts, the first at Bologna and Padua (1706–19; Leyden, 1741); *In Aurelium Celsum et Quintum Serenum* (Padua, 1704, 1721); *Opuscula Miscellanea* (Leyden, 1763); *De Sedibus et Causis Morborum per Anatomen Indagatis* (Bassano, 1761). His *Opera Omnia* appeared at Bassano in 1765.

MORGAN. See MORGAN THE FAY.

MORGAN, (JAMES) APPLETON (1845–). An American lawyer and author, born in Portland, Me. He graduated at Racine College, Wisconsin (1867), and in law at Columbia (1869), and practiced from 1871 to 1886 in New York. There he founded (1885) the Shakespeare Society, of which he served as president until 1910. He edited, in 20 volumes, the *Bankside Shakespeare* (1888–92), wherein the oldest versions of the text are compared with a view to showing how the plays as they now stand are a growth from the originals, which Shakespeare himself modified, as did others after his death. In defense of his theory Morgan had already published *The Shakespearean Myth* (1880); *A Study in the Warwickshire Dialect* (1884); *Shakespeare in Fact and Criticism* (1884); *Some Shakespearean Commentators* (1885); *Digesta Shakespeareana* (1887). The *Bankside Restoration Shakespeare* appeared in 1905–08 (5 vols.), and in 1911 Morgan published as his autobiography *Forty Years*

of Shakespeare Study and Controversy (Somerville, N. J.). He also published *Macaronic Poetry* (1870), an anthology; *The Law of Literature* (1874); *Legal Maxims* (1877); a genealogy of his family (1880 et seq.); *The People and the Railways* (1888); *Society and the Fad* (1890); and edited several legal works, including *Addison on Contracts* (1875); *Best on the Principles of Evidence* (1876); *Forsyth on Trial by Jury* (1876).

MORGAN, Charles Hill (1831–1911). An American mechanical engineer and manufacturer. He was born at Rochester, N. Y., and was educated at Lancaster and Clinton (Mass.) academies. He worked as a draftsman in 1855–60, was in business at Philadelphia in 1860–64, and then served as superintendent (1864–87) and director (1876–87) of the Washburn and Moen Company, Worcester, Mass. Thereafter he was consulting engineer of the American Wire Company of Cleveland, Ohio, of which he later became vice president and director. He became president of the Morgan Spring Company in 1881 and of the Morgan Construction Company in 1891. In 1900 he served as president of the American Society of Mechanical Engineers.

MORGAN, Conwy Lloyd (1852–). A British zoölogist and psychologist, born in London. He was educated at the Royal Grammar School, Guildford, and at the Royal College of Science. In 1878–83 he was lecturer in English and physical science at the Diocesan College, Rondebosch, Cape Colony. In 1884 he became professor of zoölogy and geology in University College, Bristol, where he was principal from 1887 to 1909 and professor of psychology after 1901. His publications include: *Animal Biology* (1887); *Animal Life and Intelligence* (1890); *Animal Sketches* (1891); *Psychology for Teachers* (1895; rev. ed., 1909); *Habit and Instinct* (1896); *Animal Behavior* (1900); *Introduction to Comparative Psychology* (1901); *The Interpretation of Nature* (1905); *Instinct and Experience* (1912); *Spencer's Philosophy of Science* (1913).

MORGAN, Daniel (1736–1802). An American soldier prominent in the Revolutionary War. He was born in Hunterdon Co., N. J., of Welsh ancestry, removed to Virginia in 1753, served as a teamster under Braddock in 1755, and during an Indian campaign three years later was seriously wounded. He moved to Winchester in 1762 and occupied himself with farming and stock raising, but served as a lieutenant in Pontiac's War and as a captain in Lord Dunmore's War. In 1775 he was put in command of a company of Virginia riflemen, with whom he joined Washington at Cambridge in July. Accompanying Arnold's expedition against Quebec, he served with great efficiency and gallantry, both on the march and in the attack of Dec. 31, 1775, when he was captured by the enemy. He was regularly exchanged before the close of 1776; was appointed colonel of a Virginia regiment, and in 1777 played a most important part in the campaign against Burgoyne. At the first battle of Saratoga (September 19) he was, until Arnold's arrival late in the day, the ranking officer in the field; and in the second battle (October 7) he also took a prominent part. In 1778 he served in New Jersey under Washington, and in June, 1779, dissatisfied with the policy of Congress as regards promotions, he resigned; though in September, 1780, he joined Gates at Hillsboro, N. C., as a brigadier general. He was conspicuous for his ability and energy throughout the Southern campaign, and was in chief command at the battle of Cowpens (q.v.), where he defeated Tarleton. Only 200 of the British escaped, and Morgan by forced marches rejoined Greene, in spite of the vigorous efforts of Cornwallis to head him off. Owing to bodily infirmities he was forced to withdraw from the army in August, 1781. After the war he devoted himself chiefly to farming, though in 1794 for a time, during the Whisky Insurrection, he served as a major general, and in 1796 he was elected to Congress, serving in that body as a Federalist Representative from 1797 to 1799. He died at Winchester, Va., July 6, 1802. Consult Graham, *Life of General Daniel Morgan of the Virginia Line* (New York, 1856), and McConkey, *The Hero of Cowpens* (2d ed., ib., 1885).

MORGAN, Edwin Dennison (1811–83). An American politician, Governor of New York from 1859 to 1863. He was born at Washington, Berkshire Co., Mass.; in 1828 he removed to Hartford, Conn., and in 1836 he settled in New York City, where he met with great success as a merchant. From 1849 to 1853 he was a member of the State Senate. He was a delegate to the first national convention of the Republican party at Philadelphia and was one of the vice presidents of that assembly. His high standing as a business man led to his being chosen chairman of the Republican National Committee. He retained the position until 1864 and ably managed the first three national campaigns in which the party participated. In 1858 he was elected Governor of New York, being the first Republican executive of the State, and was reëlected in 1860. In the latter term it fell to him to supervise and control the sending of New York's quota of troops to the front in defense of the Union, and when he left office in 1863 more than 223,000 volunteers had been enlisted in the Federal service. In 1861, in order that he might better carry out the administration's desires, New York State was made a military district, and he was placed in command with rank of major general of volunteers. From 1863 to 1869 he was a member of the United States Senate, and in 1872 he was again made chairman of the Republican National Committee. He was one of the ablest and most efficient of the "war governors." He gave liberally to Union Theological Seminary, Williams College, and other institutions.

MORGAN, Edwin Vernon (1865–). An American diplomat, born at Aurora, N. Y. He graduated in 1890 from Harvard University, where he was an assistant in history in 1892–94; studied at Berlin in 1891–92 and 1894–95; and was instructor in history at Adelbert College (Western Reserve University), in 1895–98. In 1899 he was secretary to the Samoan High Commission, and afterward he held diplomatic and consular positions at Seoul (Korea), St. Petersburg, and Dalny (Manchuria). He served as United States Minister to Korea in 1905, to Cuba in 1905–10, to Uruguay and Paraguay in 1910–11, and to Portugal in 1911–12. In the latter year he was appointed the first Ambassador from the United States to Brazil.

MORGAN, Fort. See Fort Morgan.

MORGAN, G(eorge) Campbell (1863–). A British Congregational preacher, born in Tetbury, Gloucester, the son of a clergyman. He

was educated in the Douglas School at Cheltenham, was a master in the Jewish Collegiate School at Birmingham from 1883 to 1886, and after two years as a mission preacher was ordained to the Congregational ministry in 1889. He was pastor of churches at Stone (1889–91) and Rugeley (1891–93) in Staffordshire; the Westminster Road Church in Birmingham (1893–97) and the church in New Court, Tollington Park, London (1897–1901). He was well known in America, especially at the Northfield conferences, and in 1901–04 was extension lecturer for the Northfield Bible Conference. In 1904 he became pastor of the Westminster Congregational Chapel, Buckingham Gate, London, and in 1911 also became president of Cheshunt College, Cambridge. He edited the *Westminster Bible Record* and the *Westminster Pulpit*. Among his books are *The Life of the Christian* (1904), *The Analyzed Bible* (1910), and *God, Humanity, and the War* (1914), sermons.

MORGAN, Sir George Osborne (1826–97). An English lawyer and Liberal politician. He was born at Gothenburg, Sweden, studied at Oxford, where he won the Newdigate prize in 1846, graduated at Worcester in 1848, and was civil-law fellow at University College, Oxford, where he was intimate with Arthur Penrhyn Stanley, Sellar, and Clough. Morgan was called to the bar in 1853. He was elected to the House of Commons in 1868, and zealously befriended ecclesiastical and educational reform and the amendment of English land laws. In 1880 he was appointed Judge-Advocate-General during Gladstone's ministry, and in this post carried an army discipline bill which did away with flogging (1881). He was Undersecretary for the Colonies in 1886, remained in the House of Commons until his death, and held the leadership of the Welsh party. He was made Baronet in 1892.

MORGAN, George Washington (1820–93). An American soldier, born in Washington Co., Pa. In 1836 he left college to fight in the Texan War of Independence. In 1841 he entered West Point, but left in 1843, was admitted to the bar and began the practice of law at Mount Vernon, Ohio. Upon the breaking out of the Mexican War he was appointed colonel of the Second Ohio Volunteers, and later became colonel of the Fifteenth United States Infantry. For gallantry at Contreras and Churubusco the Ohio Legislature on his return brevetted him brigadier general and gave him a vote of thanks. He was appointed United States Consul to Marseilles in 1856, and from 1858 to 1861 was United States Minister to Portugal. Returning home upon the breaking out of the Civil War, he was made brigadier general of volunteers, and served for a time under General Buell. He was then put in command of the Seventh Division of the Army of the Ohio, was with Sherman at Vicksburg, and later led the expedition that captured Fort Hindman in Arkansas. Owing to ill health he resigned from the army in 1863. He was the Democratic candidate for Governor of Ohio in 1865, but was defeated. From 1869 to 1873 he served in Congress and was a member of the House committees on foreign affairs, military affairs, and reconstruction. In 1876 he was a delegate at large to the Democratic National Convention at St. Louis.

MORGAN, Sir Henry (c.1635–88). A British buccaneer, born at Llanrhymny, Glamorganshire, Wales. He is said to have been kidnaped at Bristol when a boy and sold as a servant in Barbados, whence after a time he worked his way to Jamaica. There he joined the buccaneers, participated in several of their expeditions, and by 1663 was in command of a privateer of his own. In 1666 he commanded a ship under Edward Mansfield, who captured Santa Catalina, and after the death of that leader Morgan was chosen admiral of the buccaneers. In 1668 he was sent by Modyford, Lieutenant Governor of Jamaica, to Cuba. He took and sacked Puerto Príncipe, and then sailed to Puerto Bello, Panama, which he captured after a brilliant attack. After levying a heavy ransom Morgan sailed for Jamaica. Later in the year he led an expedition which ravaged the entire Cuban coast, and in January, 1669, with a fleet of eight ships, he started on his famous expedition against Maracaibo. The capture and sack of the town was followed by the greatest excesses on the part of the buccaneers, who were surprised in their orgies by the arrival of three Spanish ships of war. Morgan assembled his half-drunken comrades, manned his ships, and after parleying with the Spanish commander suddenly attacked him, totally defeated him, and escaped. Returning to Jamaica, he was lightly reproved by Modyford, and was at once commissioned "commander in chief of all the ships of war in Jamaica." In August, 1670, he ravaged the Cuban and mainland coasts, and in January, 1671, he captured and plundered the city of Panama, one of the richest in Spanish America. On February 14 Morgan withdrew and embarked for Jamaica. The attack had been made after a peace had been arranged between England and Spain, and in April, 1672, Morgan was sent to England on a British frigate; but he took enough gold along with him to secure his vindication, eventually receiving knighthood and high favors from the King, and in December, 1674, was sent back to Jamaica with Lord Vaughan, the new Governor, as Lieutenant Governor and commander in chief of his Majesty's forces in the colony. There he spent the remainder of his life in comparative quiet, and at two different periods served as acting Governor.

Consult: A. O. Exquemeling, *Buccaneers of America* (1684), an interesting contemporary account by one of Morgan's lieutenants, reprinted in the "Adventure Series" (London, 1891); Philip Ayres, *The Voyages and Adventures of Capt. Barth, Sharp, and Others to the South Sea . . . to which is added The True Relation of Sir Henry Morgan, his Expedition against the Spaniards in the West Indies, and his Taking Panama . . .* (London, 1684); James Burney, *History of Buccaneers in America* (ib., 1816; reprinted 1902); F. R. Stockton, *Buccaneers and Pirates of our Coast* (New York, 1898); Appleton Morgan, *Genealogical History of the Family of Morgan* (ib., 1897–1902).

MORGAN, Henry James (1842–1913). A Canadian biographer and historian, born in Quebec. He was educated at Morrin College in his native city and in 1860 entered the public service. In 1873 he became chief clerk in the Department of State and in 1895 retired on a pension. Among his publications are the *Canadian Parliamentary Companion*, established in 1862 and issued until 1876; the *Dominion An-*

nual Register and Review (1878–86); *Tour of H. R. H. the Prince of Wales in Canada and the United States* (1860); *Sketches of Celebrated Canadians* (1862); *The Industrial Politics of America* (1864); *The Place British Americans have Won in History* (1866); *Bibliotheca Canadensis, or A Manual of Canadian Literature* (1867); *The Bench and Bar of Canada* (1878); *Canadian Men and Women of the Time* (1898; new ed., 1912); *Ad Multos Annos: A Tribute to Sir Charles Tupper* (1900); *Types of Canadian Women* (1903); *Canadian Life in Town and Country* (1905), with Lawrence J. Burpee.

MORGAN, môr'gäN', Jacques Jean Marie (1857–). A French archæologist, born at Huisseau-sur-Cosson, Loir-et-Cher. He was educated at the Paris Ecole des Mines and, after a trip in the Indies (1882) and an expedition through the peninsula of Malacca (1884), he spent five years in southern Russia, the Caucasus, and Turkey. In 1892 he was sent to Egypt as director general of the French antiquarian service. There he made valuable discoveries at Ombos and Karnak. Transferred to Persia in 1897, he explored the Pushti Kuh Range and Mesopotamia, discovering the Hammurapi stele. He was in Persia during the troubles of 1905–06. His works include: *Géologie de la Bohème* (1882); *Mission scientifique au Caucase* (1890); *Mission scientifique en Perse* (1894–97); *Recherches sur les origines de l'Egypte* (1896–97); *Compte rendu sommaire des travaux archéologiques, etc.* (1898); *Mémoires de la délégation en Perse* (10 vols., 1901–08); *Les premières civilisations* (1909); *Etude sur la décadence de l'écriture grecque dans l'empire perse sous la dynastie des Arsacides, etc.* (1913).

MORGAN, John (1735–89). An American physician, born in Philadelphia. He graduated from the College of Philadelphia (now University of Pennsylvania) in 1757 and later studied medicine with Dr. John Redman and in London and Edinburgh (M.D., 1763). After visiting Paris, Holland, and Italy, he returned in 1765 to Philadelphia, where he established himself. He was one of the founders of the medical department of the College of Philadelphia and served as professor of the theory and practice of medicine till 1783. Appointed by Congress (1775) physician in chief to the American army and director general of the military hospitals, he joined General Washington in Cambridge. There he found the army without medical supplies and appliances and the medical staff itself of the lowest quality. His endeavor to reorganize the department by making the passing of examinations necessary before entering the army as surgeon made him many enemies and in 1777 he was dismissed by Congress without reason. In 1779, however, upon investigation of a committee, the same body honorably discharged him. He returned to Philadelphia. Dr. Morgan was the first in America to advocate the separation of medicine and pharmacy. His writings include: *A Discourse upon the Introduction of Medical Schools in America* (1765); *Four Dissertations on the Reciprocal Advantages of a Perpetual Union between Great Britain and the American Colonies* (1766); *A Recommendation of Inoculation according to Baron Dimsdale's Method* (1776); *A Vindication of his Public Character in the Station of Director General of the Military Hospitals, etc.* (1777).

MORGAN, John Hartman (1876–). A British publicist and educator, son of a Welsh Congregational minister. He studied at the University College of South Wales, at Balliol College, Oxford, and at Berlin; was a journalist, writing leaders for the Manchester *Guardian* in 1904–05; in 1905 became a London University extension lecturer and lecturer at the London School of Economics; and after two years as lecturer, in 1908 became professor of constitutional law at University College, London. He was Liberal candidate for Parliament for Birmingham in January, 1910, and for West Edinburgh in December of the same year. Besides contributions to the reviews he edited Hallam's *Constitutional History* and wrote: *The House of Lords and the Constitution* (1910); *The Place of a Second Chamber in the Constitution* (1910); *The New Irish Constitution* (1912). In 1915 appeared his translation, with critical introduction and notes, of *The War Book of the German General Staff.*

MORGAN, John Hunt (1825–64). An American soldier, prominent on the Confederate side in the Civil War. He was born at Huntsville, Ala. About five years later his father removed to a farm near Lexington, Ky. During the Mexican War Morgan became first lieutenant of Colonel Marshall's Kentucky regiment of cavalry, but saw little active service. Though he had a prosperous manufacturing business, in 1861 he abandoned it and escaped to the Confederate lines with about 200 men and the guns of the militia company of which he was captain. At first he did irregular duty, chiefly scouting, but was later made captain and placed in command of three companies of cavalry called Morgan's Squadron. With these he did duty in Kentucky and Tennessee, and to some extent in Alabama. He organized the Second Cavalry at Chattanooga in April, 1862, becoming colonel. During the summer he served with General Bragg in Tennessee and captured Lexington, Ky. His success in daring and unexpected raids was so great that he was placed in charge of a cavalry brigade, and after promotion to brigadier general made the "Christmas Raid" into Kentucky, for which he was thanked by the Confederate Congress. In June, 1863, he was ordered to attempt to draw off Rosecrans from Tennessee by an expedition into Kentucky. He exceeded his orders, and, breaking through the Union line in Kentucky, he marched north and northwest to the Ohio River and crossed to the Indiana side. He had with him about 3000 cavalry or mounted infantry and four field-pieces of artillery. He swept around Cincinnati, closely pursued by Generals Hobson and Shackelford and opposed everywhere by the militia. A sudden rise in the Ohio River allowed gunboats to reach Buffington Island and prevented him from recrossing the river. Here about 700 of his men were taken prisoners, two companies succeeded in crossing the river, and he with the remainder set out towards the Pennsylvania border to join General Lee. After an exciting chase he was captured at a place 3 miles south of New Lisbon, Ohio, and was afterward confined in the Ohio State Prison at Columbus. On November 27, with a few companions, he escaped and reached the Confederate lines in safety. In January, 1864, he was authorized to reorganize his cavalry and was assigned to the Department of Southwest Virginia. When relieved he resumed his independent command and captured Mount Sterling and Cynthiana in

Kentucky in June, but was badly defeated by General Burbridge. On September 4, in Greenville, Tenn., he was betrayed by an inmate of the house in which he was sleeping and was shot while attempting to escape. General Morgan cared little for formal military tactics, but in ability to strike silently and unexpectedly and escape before an alarm could be raised he has been excelled by few leaders of cavalry. While he destroyed public property, burned bridges, and usually took the best horses in the country, the outrages committed by him have been much exaggerated. Consult Johnson and Buel (eds.), *The Battles and Leaders of the Civil War* (New York, 1887), and B. W. Duke, *Morgan's Cavalry* (new ed., ib., 1906).

MORGAN, JOHN LIVINGSTON RUTGERS (1872–). An American chemist. Born at New Brunswick, N. J., he graduated from Rutgers College in 1892 and from the University of Munich (Ph.D.) in 1895. He taught chemistry at Stevens Institute in 1895–96 and at the Brooklyn Polytechnic in 1896–97. At Columbia University he served as tutor from 1897 to 1901, as adjunct professor of physical chemistry in 1901–05, and thereafter as professor. He translated from the German of G. Helm *The Principles of Mathematical Chemistry* (1897), and is author of *The Theory of Solution and its Results* (1897); *The Elements of Physical Chemistry* (1899; 5th ed., revised, 1914); *Physical Chemistry for Electrical Engineers* (1906; 2d ed., 1909); and contributions to chemical journals.

MORGAN, JOHN PIERPONT (1837–1913). An American financier and art collector, the son of Junius Spencer Morgan and the grandson of John Pierpont (qq.v.). He was born at Hartford, Conn., April 17, 1837, and died at Rome, March 31, 1913, while abroad for his health. Educated at the English High School, Boston, and at the University of Göttingen, Germany, in 1857 he entered the banking house of Duncan, Sherman & Co. in New York City. In 1860 he became American agent for George Peabody & Co. of London, in 1864 a partner in the firm of Dabney, Morgan & Co., dealers in investment securities, and in 1871 a member of Drexel, Morgan & Co., afterward J. P. Morgan & Co. In the field of international banking and investment he early became a prominent figure, but it was to his leadership in the movement for controlling enterprise in the interest of finance that he owed his later financial primacy. The panic of 1893 greatly disturbed American railway finance, and since the Morgan house had been largely engaged in dealing in railway securities, it was natural that Mr. Morgan should be drawn into the work of reorganizing the embarrassed corporations. In this period Mr. Morgan gained still greater prominence through his organization of a syndicate to take up the issue of bonds negotiated by President Cleveland for the protection of the gold reserve. A second phase of Mr. Morgan's activity consisted in the reorganization of industrial corporations under the form of holding companies. The United States Steel Corporation was the most successful of the industrial organizations created through his efforts. Against his success here must be set the practical failure of the shipping combination and, in the same period, his failure in the Northern Securities Company. In the last decade of his life Mr. Morgan exerted a large influence in the direction of consolidating banking interests through the organization of communities of interest, etc. His work as a financier was characterized by a breadth of vision beyond that of any other American financier, and at times by a large public spirit, as in his work to restore financial stability after the panic of 1893 and his successful efforts to avert widespread disaster in 1907. At the same time it must be admitted that he subordinated other interests unduly to the financial interest. Because of the financial advantages of the mammoth corporation, he exerted his influence to create such corporations even where the legality of the proceeding was very doubtful, as in the Northern Securities case, or where technical conditions did not favor the attempt, as in the case of the shipping combination and the extension of the control of the New York, New Haven, and Hartford Railroad over all competing or coöperating transportation concerns in southern New England. On account of the heavy outlays involved in many of his consolidations and the minor technical advantages offered by them, the effect of much of his activity was to increase financial instability, although the contrary was his aim. The subordination of industry to finance through the placing of bankers upon the directorates of railway and industrial corporations, while calculated to insure financial stability, carried with it incidental disadvantages which led to a powerful popular movement against "interlocking directorates" (q.v.). Several years before his death he gained control of the Equitable Life Assurance Society. In 1912 Mr. Morgan testified before the Pujo Banking and Currency Committee of the House of Representatives, appointed to investigate an alleged "money trust" in Wall Street. It was thought by many that the strain he was under at this time had a permanently harmful effect on his health. The testimony was published in the same year (New York).

During his life Mr. Morgan gave liberally: to Harvard Medical School (more than $1,000,000); to Yale; to various institutions in Hartford, especially the Morgan Memorial Building (which he built) and Trinity College; to the cathedral of St. John the Divine, New York, in connection with which he built a Synod Hall; to his church (St. George's, Stuyvesant Square) for buildings and institutional work; to the Lying-in Hospital, New York (site, buildings, and funds—a total of about $1,500,000); and probably millions in unannounced gifts. His will, however, was not notable for benefactions. The great bulk of his estate, including his art collections, was left to his son J. Pierpont Morgan, Jr. (q.v.). Mr. Morgan owned one of the finest of steam yachts and in 1897–99 was commodore of the New York Yacht Club. The *Columbia*, which twice successfully defended the *America's* cup, was built, equipped, and maintained by him. A trustee of Columbia University, treasurer of the Peabody Educational Fund, and identified with numerous public enterprises, Mr. Morgan received the degree of LL.D. from Yale in 1908 and from Harvard in 1910, and in 1911 was decorated with the grand cross of the Red Eagle of Germany.

Mr. Morgan was the greatest art collector of his day, his collections being the largest, most varied, and many of them individually the most important, owned by a single individual. Indeed, the London *Times* once said of him: "J.

Pierpont Morgan is probably the greatest collector of things splendid and beautiful and rare who has ever lived. There is no one with whom we can compare him, except, perhaps, Lorenzo de' Medici, and he surpasses even that prince in the catholicity of his taste." It should be said that it was the historic and romantic aspects of art rather than the æsthetic that claimed his attention. Among the treasures which he reserved for private enjoyment were a unique collection of important manuscripts and rare and handsomely bound editions of books, for which he built a very beautiful library adjoining his home in New York. In 1913 most of his other collections were placed on exhibition, as a loan, in the Metropolitan Museum of Art (q.v.), of which he was president and to which he gave much of his personal attention. Thirteen galleries had been arranged to house the many rare specimens of Byzantine and Gothic enamels and ivories, small bronzes and marbles of the Italian Renaissance, ecclesiastical metal work, rock crystals, a large collection of Flemish tapestries, one of the finest collections of miniatures in the world, and many paintings by masters of the first rank, particularly old English masters. The important wing of decorative arts in the Museum was made possible by Mr. Morgan's loans and generous donations. His vast collection of porcelains, probably the finest in America, as well as the French furniture and objects of decorative art and the paintings of the celebrated Fragonard room, were sold by his son, early in 1915, the paintings to H. C. Frick (q.v.). Elaborate catalogues of most of his collections were published at the expense of the elder Morgan. For a brief description, consult the catalogue published by the Metropolitan Museum of Art (New York, 1914). For much valuable material on Mr. Morgan's life and his importance in various fields, consult the New York *Evening Post* for March 31, 1913.

MORGAN, JOHN PIERPONT (1867–). An American banker, son of John Pierpont Morgan (1837–1913). He was born in New York City and graduated from Harvard University in 1889. He became a member of J. P. Morgan & Co., New York, and of Morgan, Grenfell & Co., London, and a director or officer in many corporations. Upon his father's death he inherited the major portion of his great fortune, including his art collections, and succeeded him as director of the New York Central and Hudson River Railroad. He became a trustee of the New York Trade School and governor of the Peabody Donation Fund of London. In 1913 he was elected a director of the New York, New Haven, and Hartford, but he resigned the next year, when the financial methods of that railroad became generally known and criticized. His house was responsible for very large loans to foreign governments during the European War (1914 et seq.) and also served as chief agent for Belgian relief funds. In 1915 Mr. Morgan sold control of the Equitable Life Assurance Society to Gen. T. Coleman Du Pont, of the powder-manufacturing family. In July of the same year, while at his country place on Long Island, he was shot (but not seriously injured) by a war-crazed fanatic.

His sister, ANNE MORGAN, devoted herself to philanthropic and social work, especially in connection with the woman's department of the National Civic Federation. Her activity in a variety of good causes brought her a medal from the National Institute of Social Science in 1915. She published *The American Girl* (1915).

MORGAN, JOHN TYLER (1824–1907). An American statesman, born at Athens, Tenn. He was educated in Alabama, whither he removed with his parents in 1833. There he studied law and in 1845 was admitted to the bar. He early won wide repute as a lawyer and campaign speaker, and in 1861 was a delegate from Dallas County to the Alabama State Convention which passed the ordinance of secession, and in May of the same year he enlisted as a private in the Fifth Alabama Infantry, of which he ultimately became lieutenant colonel. In 1862 he recruited the Fifty-first Alabama Regiment and became its colonel. In the next year he was promoted to be brigadier general and in this capacity served with considerable distinction under General Johnston. After the war he resumed his law practice at Selma, Ala., and again entered politics in 1876 as an elector at large on the Tilden ticket. In 1877 he was elected to the United States Senate, of which body he remained a member, receiving his sixth election in 1907. He was one of the foremost leaders of the Democratic party in debate, and, as such, showed himself interested in a great variety of subjects. In 1892 he was appointed a member of the Board of Arbitration to settle the Bering Sea fisheries dispute; and in 1898 he served on the commission to prepare a system of laws for the Hawaiian Islands. For a number of years he was chairman of the committee on foreign relations. During the agitation concerning Cuba, he was an eloquent and popular champion of Cuban freedom. As chairman of the committee on interoceanic canals he strongly favored the Nicaraguan route in preference to that across Panama—a position which caused his removal from the chairmanship.

MORGAN, JUNIUS SPENCER (1813–90). An American financier, born at West Springfield (now Holyoke), Mass. He was the father of John Pierpont Morgan. From about 1836 to 1853 J. S. Morgan was in the dry-goods business, for the last two years of this period as member of the firm of J. M. Beebe, Morgan & Co. of Boston, a large house. In 1854 he became a partner in the English banking house of George Peabody & Co. Ten years later he succeeded Peabody as head of the firm and changed its name to J. S. Morgan & Co. Under his direction it became one of the leading private concerns of its kind in the world. Morgan left about $10,000,000. He gave largely to Trinity College, Hartford. In 1836 he married Juliet, the daughter of John Pierpont (q.v.).

MORGAN, LADY (SYDNEY OWENSON) (?1783–1859). A novelist, daughter of Robert Owenson, a theatrical manager. She was born in Dublin on Christmas Day, 1785, if we are to believe her. Croker mischievously alleged that she was born on the Dublin packet in 1775. For a while she mingled with theatrical people or with the mixed society frequented by her father in Dublin. Her father's affairs becoming involved, the clever girl resolved to support the family, first as governess and then as author. In 1812 she married Sir Thomas Charles Morgan, a distinguished surgeon. Though the Morgans lived for the most part in Dublin, they made two continental tours, and often visited London, where they settled in 1839. For her services to literature a government pension was granted to Lady Morgan in 1837. She died

April 14, 1859. Throughout her life Lady Morgan was widely known in society for her wit and her affectations. Her works, comprising novels, travels, and biographies, were savagely attacked by the reviewers, but they brought her a considerable fortune. They were indeed ephemeral, the novels gushing and sentimental or perfervidly patriotic and satirical. Among her novels are: *St. Clair, or the Heiress of Desmond* (1801), a sorry imitation of Goethe's *Sorrows of Werther; The Wild Irish Girl*, a silly rhapsodical book not without descriptive power (1806); *O'Donnell* (1814), Lady Morgan's protest, in the way of fiction, against the penal laws; *Florence M'Carthy* (1816); *The O'Briens and the O'Flahertys* (1827). Of her travels, *France* (1817) was much read and criticized. Her main right to consideration is that she wrote English words for Irish melodies, an example soon followed to their great advantage by Thomas Moore and Stevenson. Consult Fitzpatrick, *Lady Morgan* (London, 1860); *Memoirs of Lady Morgan* (an autobiography), edited by Dixon (ib., 1862); H. S. Krans, *Irish Life in Irish Fiction* (New York, 1903).

MORGAN, Lewis Henry (1818–81). An American ethnologist, born near Aurora, N. Y., Nov. 21, 1818. He graduated from Union College in 1840, and after a course in law, completed in 1844, he formed a successful partnership with his classmate, afterward Judge George F. Danforth, in the city of Rochester. Upon leaving college he organized a society of young men in Aurora styled the Grand Order of the Iroquois. The limits of the Grand Order were to be the territory anciently occupied by the Iroquois, and branch societies were to be established wherever an Iroquois tribe was known to have lived, with chapters standing for the Indian gentes. To show his profound interest in the organization, young Morgan went and lived among the existing tribes, in order to master their social organizations and forms of government. Morgan's scientific interests assumed a more substantial form in the now celebrated work, *The League of the Ho-dé-no-sau-nee or Iroquois* (1851; new ed. by H. M. Lloyd, 1904), in which the author, unconscious of the immense diffusion of the system, traced the social organization, government, daily occupations, and customs of this wonderful league. During this early period Morgan also studied and described the Iroquois art products and implements of daily life in the cabinet of natural history in Albany.

In 1856 Morgan made the acquaintance of Henry and Agassiz, who warmly urged him to continue his studies. In 1858, during a visit to Marquette on business, Morgan discovered, in visiting a camp of Ojibwa, that their system of kinship was essentially the same as among the Iroquois. This was the revelation that determined Morgan's enduring fame. In 1868 the Smithsonian Institution published the result of eight years' uninterrupted research, travel, and correspondence, his *Systems of Consanguinity and Affinity of the Human Family*, a work essential to all studies on primitive sociology. His *Ancient Society* (1877) was a comprehensive and philosophical work, the result of 20 years' pursuit of a unique and engrossing inquiry. This book has exerted a well-nigh unparalleled influence on the conceptions of historians, sociologists, and students of kindred branches of knowledge, while through the championship of such men as Bebel and Engels it has likewise become a popular classic in Socialistic circles. Morgan was not wholly absorbed in ethnological work, but also engaged in political life, serving twice as a member of the New York Legislature. In 1880 he was elected president of the American Association for the Advancement of Science. Besides the works already mentioned he published *The American Beaver and his Works* (1868) and *Houses and House Life of the American Aborigines* (1881). He left $80,000 to help establish a woman's college at the University of Rochester. His death occurred Dec. 17, 1881.

Estimates of Morgan's work have ranged from servile adulation to withering contempt. He was certainly an accurate, painstaking recorder of facts, with a Darwinian faculty for collating related data, and an undoubted sense for the importance of phenomena others neglected. It has been truly said by Dr. Rivers that in the range of science hardly any discovery can be put down more certainly to the credit of one man than Morgan's discovery of the classificatory system of relationship. On the other hand, Morgan fell under the influence of the earlier evolutionists and thus came to sketch a unilinear scheme of cultural development, with a fixed sequence of stages, which is not in accord with the results of later inquiry. Deficient in logical rigor, he failed to realize the inconsistencies in his schemes of evolution and lacked a sense for form, so that his greatest work, *Systems of Consanguinity and Affinity*, is most unattractive, because of its diffuseness, irrelevancy, and clumsy arrangement. Nevertheless, his place in the history of anthropology will ever remain a high one since his labors have been the point of departure for most modern speculation and concrete research on social evolution.

MORGAN, Matthew Somerville (1839–90). An Anglo-American graphic artist and scene painter, born in London. He was first a scene painter alone, but afterward became artist and correspondent for the *Illustrated London News* and subsequently editor and proprietor of the *Tomahawk*. Many of his best comic drawings were done for this journal. Morgan, Burnand, Gilbert, and others founded *Fun*, to which Morgan contributed a number of cartoons on the American Civil War. He came to America in 1870 as special artist for Frank Leslie, the publisher, and was a theatrical manager in New York City for several years. He also managed a lithograph concern in Cincinnati (1880–85), and while there established the Matt Morgan Pottery Company and formed the Art Students' League. His influence in America was greatest in the domain of the poster and of scene painting, in which he showed great skill and originality.

MORGAN, Maud (1864–). An American harpist. She was born in New York City and studied music under her father, George Washbourne Morgan, Alfred Toulmin, and the Belgian harpist, Chevalier Charles Oberthur. She made her début as a harpist in a concert with Ole Bull in 1875; thereafter appeared in all the important American cities; was conductor of the Lenox Choral Society for seven years; and after 1895 served as harpist in Grace Church, New York.

MORGAN, Morris Hicky (1859–1910). An American classical scholar, born at Providence, R. I. At Harvard, where he graduated in 1881

and took the degree of Ph.D. in 1887, he became tutor, then assistant professor, and in 1899 succeeded F. D. Allen in the chair of classical philology. He devoted himself especially to the study of the Roman satirist Persius, Vitruvius, the Roman engineer and architect of the time of Augustus, and to various phases of Roman life. Evidence of his interest in Persius is seen in his *A Bibliography of Persius* (1909). He published papers on Vitruvius in various periodicals and in his *Addresses and Essays* (1910); and his translation of this author, nearly complete at his death, was published, with illustrations and original designs by H. L. Warren, in 1914. He edited also *Eight Orations of Lysias* (1895), and was editor, with W. W. Goodwin and J. W. White, of a school edition of Xenophon, *Anabasis* i–iv, which contains an admirable *Dictionary to the Anabasis*, by Morgan and White (1891, 1896). Consult H. W. Prescott, *Classical Philology*, vol. ii, p. 357 (Chicago, 1910), and B. L. Gildersleeve, *American Journal of Philology*, vol. xxxi, pp. 243–244 (Baltimore, 1910).

MORGAN, Tali Esen (1858–). An American choral conductor. He was born at Llangynwyd, Wales, but came to the United States in 1876. In 1879 he was publisher of the *Cambro-American* at Scranton, Pa., and for six years he edited a prohibition organ, *The People.* He began as a musical conductor in 1874, was engaged by Walter Damrosch in 1887, and after 1888 had charge of the Ocean Grove (N. J.) Festival under Anton Seidl. In 1898 he became manager and director of the Ocean Grove Summer Music Festivals, and later served as conductor of the New York Festival Chorus. He became editor and publisher of the *American Musical Times* and president of the International Correspondence School of Music.

MORGAN, Thomas Hunt (1866–). An American zoölogist, born at Lexington, Ky. He graduated at the State College of Kentucky in 1886 and received his Ph.D. degree at Johns Hopkins in 1891. He was professor of biology at Bryn Mawr College from 1891 to 1904 and thereafter professor of experimental zoölogy at Columbia University. He served as president of the American Society of Naturalists in 1909. His work includes highly important researches in the fields of embryology, regeneration, and heredity, published in various monographs and in such books as *The Development of the Frog's Egg* (1897); *Regeneration* (1901); *Evolution and Adaptation* (1903); *Experimental Zoölogy* (1907); *Heredity and Sex* (1913; new ed., 1915).

MORGAN, William (c.1775–c.1826). An American Mason, whose disappearance under peculiar circumstances in 1826 caused the organization of the Antimasonic party. He was born probably in Culpeper Co., Va., and is said to have served under General Jackson in the defense of New Orleans, and afterward settled in York, Upper Canada, removing thence to Batavia, N. Y. In 1826, shortly after news had spread abroad that he intended, in conjunction with one David C. Miller, to publish a book exposing the secrets of Freemasonry, he suddenly disappeared and, despite much search, was never seen again. It was charged that he had been kidnaped and murdered by Masons, but whether this was true is not known certainly to this day. He was traced with some degree of certainty to Fort Niagara, whither he was said to have been conveyed by Masons in a closed carriage and where he was said to have been imprisoned for a time. It was alleged that, refusing to withdraw his book or to give an oath of secrecy, Morgan was finally drowned by his abductors in Lake Ontario. A body found near Fort Niagara was for some time supposed to be his, but was later shown to be that of another man. It was in reference to this body that Thurlow Weed, recognizing the political value of the Antimasonic excitement, remarked that it was "a good enough Morgan until after election"—a phrase which has since been frequently used in American politics. Concerning Morgan's disappearance, which caused profound excitement throughout the North, much has been written. His book, *Illustrations of Freemasonry, by One of the Fraternity who has Devoted Thirty Years to the Subject*, was published in 1826, and was republished at various times thereafter, sometimes under the title *Freemasonry Exposed and Explained* (new ed., 1912). Consult: Robert Morris, *History of the Morgan Affair* (New York, 1852); S. D. Greene, *The Broken Seal, or Morgan's Abduction and Murder* (Boston, 1870); Mackey and Singleton, *History of Freemasonry*, vol. vi (New York, 1898). See Antimasons.

MORGAN, Sir William (1829–83). An Australian statesman, born in Wilshampstead, England. He went to South Australia in 1848, made some money in the Bendigo gold diggings in 1851, and then settled at Adelaide as a merchant. An independent politician, he was elected to the Legislative Council in 1869 and in 1875 represented the cabinet in that body. After the defeat of the Colton ministry in 1877, which was largely due to Morgan's efforts, he was Chief Secretary under Boucant, and from 1878 to 1881 was Premier, showing much ability and honesty. He was styled the "Cobden of South Australia."

MORGANATIC MARRIAGE (ML. *morganaticus*, relating to the morning, from OHG. *morgan*, Ger. *Morgen*, AS. *morgen*, morning; perhaps connected with OChurch Slav. *mĭrknati*, to become dark, *mrakŭ*, darkness, or with Lith. *merkti*, to blink, Gk. *μαρμαίρειν*, *marmairein*, to shine). When a member of a reigning house, who by law can contract a perfect marriage only with a woman of equal rank, wishes to marry a woman of inferior rank, he may contract what is called a morganatic marriage. In Germany those families that were reigning families at the close of the eighteenth century and that have retained their rank in spite of the loss of political power—the so-called "mediatized houses" or "high nobility"—are similarly restricted in the matter of marriage; and members of these families may also contract morganatic marriages.

A morganatic marriage is not a mere concubinage, nor may it exist simultaneously with a perfect marriage. From the ecclesiastical point of view and from certain legal points of view it is a perfect marriage. It is defective chiefly in public law. The morganatic wife does not acquire and the children do not inherit the rank of the husband and father, although, when the husband is a reigning prince, it is usual to give to the morganatic wife and her children titles of nobility. The children do not succeed to the father's public position, or to the property which goes with that position, or to family property (entailed estates). In some states neither the morganatic wife

nor her children have rights of succession even in the private property of the husband and father, except by testamentary provision or by antenuptial settlements.

The roots of the morganatic marriage go back to early German law. A perfect marriage was concluded only when the husband bought the *mundium*, or marital authority, over his wife, at first by a payment to the father or guardian, later by a settlement upon the wife, which was frequently described as "widowhood." A further gift or settlement upon the wife might be made in the form of a "morning gift" (*Morgengabe, dos morganatica*). In the case of an imperfect marriage without *mundium* only the morning gift was made. The Church, however, treated the imperfect marriage as a marriage, although it was unable to determine the civil results. When an ecclesiastical ceremony took place it was not unusual for the man to give the bride his left hand, whence the name "left-hand marriage." For the history of the morganatic marriage, consult Schröder, *Deutsche Rechtsgeschichte* (1889), pp. 293, 294, and works there cited. For modern law, Niebelschütz, *De Matrimoniis ad Morganaticam* (1851).

MORGAN CITY. A city and port of entry in St. Mary Parish, La., 70 miles west by south of New Orleans, on Morgan's Louisiana and Texas Railroad (Map: Louisiana, G 7). It is on the Intercoastal Canal, on Berwick Bay, and on the Atchafalaya River, which extends from Grand Lake to the Gulf of Mexico, 20 miles distant; has regular steamship connection with important Gulf ports, and has extensive sugar, lumber, fish and oyster, and truck-gardening interests. A trade is also carried on in live stock, fur and hides, moss, canned goods, and sirup. Among the city's noteworthy features are the city hall, courthouse, and high-school buildings, Elks Home, Lawrence Park, and Forts Star and Buchanan. The water works and sewage system are owned by the municipality. Here, on June 23, 1863, Richard Taylor, with about 3000 Confederates, captured the Federal garrison of about 1000, secured property worth $2,000,000, and recaptured a large number of refugee blacks. The city was soon afterward abandoned by the Confederates and reoccupied by Federals. Pop., 1900, 2332; 1910, 5477.

MOR'GANFIELD. A city and the county seat of Union Co., Ky., 23 miles southwest of Henderson, on the Illinois Central and the Louisville and Nashville railroads (Map: Kentucky, C 4). It has tobacco stemmeries and manufactories of carriages and wagons, gates, furniture, tile, brick, flour, etc. St. Vincent's Academy (Roman Catholic) is here, and there is a fine high-school building. The water works are owned and operated by the city. Pop., 1900, 2046; 1910, 2725.

MOR'GANITE. A rose-red variety of beryl (q.v.).

MORGANNWG, môr'gân-nōōg, Iolo. See Williams, Edward.

MORGAN PARK. Formerly a village in Cook Co., Ill., and a residential and educational suburb of Chicago, from the centre of which it was 14 miles distant. Morgan Park was first incorporated in 1884 and became a part of the city of Chicago in April, 1914.

MORGANTE MAGGIORE, môr-gän'tā mâ-jō'rā, It. A metrical romance by Luigi Pulci (q.v.).

MOR'GAN THE FAY. An important figure in mediæval romance, whose origin is probably to be traced to Celtic mythology. In the *Vita Merlini*, ascribed to Geoffrey of Monmouth, she is mentioned as the eldest of nine sisters who inhabit the fortunate "Insula Pomorum." She is said to be very learned in the art of healing and to be endowed besides with the mysterious powers of changing shape and of flying like a bird. To her, according to the same account, the wounded Arthur was borne after the battle of Camlan. Morgan played a similar part in romances of other cycles. Thus, in the story of "Ogier le Danois" she receives the aged Ogier in the island of Avalon and restores him to youth; and in the "Orlando Innamorato" of Boiardo there is a long account of her splendid abode at the bottom of a lake. In Italy her name has been popularly applied to a form of mirage. (See Fata Morgana.) In the Celtic romances she is said to be a sister of King Arthur. The origin of her name and character is uncertain. It has been proposed to identify the nine sisters of the "Insula Pomorum" with the nine priestesses of Sena described in the ancient account of Pomponius Mela. From a different point of view Morgan has been connected with the Irish *Muirgen*, better known by the name *Liban*. *Morgan*, like *Muirgen*, may mean "sea-born," and both persons have something to do with the world beneath the waves. But this theory (proposed by Professor Rhys) will not account for all the features of the story. The whole subject has been investigated in a study by Dr. L. A. Paton, who holds that Morgan's name and part, at least, of her characteristics are derived from the Irish *Morrigu*, a kind of battle goddess. Consult Miss Paton's dissertation, *Studies in the Fairy Mythology of Arthurian Romance* (Boston, 1903). For Rhys's view consult his *Arthurian Legend* (London, 1887).

MOR'GANTON. A city and the county seat of Burke Co., N. C., 60 miles by rail east of Asheville, on the Southern Railroad (Map: North Carolina, A 2). It has the State Hospital for the Insane and the North Carolina School for the Deaf and Dumb. It has considerable reputation as a health resort, and contains a private sanitarium. Among the principal manufactories are cotton mills, tanneries, lumber mills, canning and furniture factories, and machine shops. In the vicinity there are deposits of gold and silver. Morganton has adopted the Commission form of government. The water works and electric-light plant are owned by the city. Pop., 1900, 1938; 1910, 2712.

MOR'GANTOWN. A city and the county seat of Monongalia Co., W. Va., 101 miles by rail south of Pittsburgh, Pa., on the Monongahela River and on the Baltimore and Ohio and the Morgantown and Kingwood railroads (Map: West Virginia, D 2). It has a fine courthouse and the West Virginia University (q.v.), established in 1868. There are extensive glassworks, furniture factories, tin-plate, planing, and flour mills, and brick and tile works. The city is in a rich agricultural, timber, natural-gas, and mineral country, coal, iron, limestone, timber, clay, and glass sand being found in large quantities. Cheat River, near here, is a resort of great scenic beauty. Morgantown was incorporated in 1783 by the Legislature of Virginia. Its growth has been rapid. Pop., 1900, 1895; 1910, 9150; 1914 (U. S. est.), 12,239; 1920, 12,127.

MORGARTEN, môr'gär-ten. A mountain slope on the boundary of the cantons of Schwyz and Zug, Switzerland, celebrated as the scene of a victory won by the Swiss forest cantons over a numerically superior force of Austrians, Nov. 15, 1315. The cantons had formed a league in 1291 and took the side of the Emperor Lewis the Bavarian in his struggle against Frederick, the Hapsburg claimant. The latter's brother, Duke Leopold, determined to punish the Swiss who had been subject to the Hapsburg. Little is known of the events of the battle.

MORGEN, môr'gen, CURT VON (1858–). A German soldier and explorer, born at Neisse (Silesia), Prussia. He was educated for the army at Wahlstatt and Berlin and in 1889 took charge of an expedition for the exploration of Kamerun. On November 5 he left Kribi on the coast of Batanga. He discovered the Mbam River, the principal tributary of the Sanaga, and proceeded along the Sanaga as far as Malimba. On June 2, 1890, he again set out from Kribi. During this second expedition he penetrated to Tibati, and thence to Ibi on the Benue, from which point he descended the river to Akassa, on the coast. He returned to Europe, but went again to Africa in 1894 and in 1896–97 fought with the English army against the Mahdi, and in the latter year witnessed the Græco-Turkish War from the headquarters of the Ottoman army. From 1897 to 1901 he acted as military attaché of the German embassy at Constantinople. In 1904 he was raised to the nobility and in 1912 became major general and commander of the Eighty-first Infantry Brigade.

MORGENSTERN, môr'gen-stĕrn, CHRISTIAN (1805–67). A German landscape painter and etcher, born in Hamburg. He studied in his native city under Bendixen, and, after visiting Norway and studying for a time at the Academy of Copenhagen, settled in 1830 at Munich. His early work, in its simplicity and intimate feeling, was unique for that day in Germany and exercised a strong influence over the Munich landscape school. His best paintings are quiet, homely scenes, in sunshine or moonlight, of the Bavarian plateau, the beauties of which he was the first to discover. His mountain landscapes are less noteworthy. He also painted Alsatian views and marines. Among his works in public galleries are: "Mill in Sainte Marie Valley, Alsace" (1836, Hamburg Gallery); "April Day on Lake Starnberg" (1853, Leipzig Museum); "Norwegian Marine" and "Moonlight in Patenkirchen" (both in New Pinakothek, Munich).

MORGENSTERN, LINA (BAUER) (1830–1909). A German social reformer, born at Breslau. At 18 she had organized a league to aid poor school children of Breslau and shortly after her marriage to Dr. Theodor Morgenstern in 1854 a league to aid workingmen, and in 1859 she founded the Berlin Kindergarten Association, of which she was president in 1860–66. The Berlin Public Kitchens established by her in 1866 to relieve economic distress were imitated in other large German cities and constitute her most notable achievement. Frau Morgenstern founded also a society for the protection of illegitimate children, an academy for the instruction of young women in useful arts (1869), the Berlin Workingwomen's Union, and the Berlin Housekeepers' Union (1873). She is author of *Die kleinen Menschen—101 Geschichten* (2d ed., 1864); *Der Kindergarten und die Schule* (1874); *Die Frauen des 19. Jahrhunderts* (3 vols., 1888–91); *Frauenarbeit in Deutschland* (2 vols., 1893); *Das Paradies der Kindheit* (5th ed., 1889); *Universalkochbuch* (7th ed., 1898); *Hilfsbuch zur Gründung, Leitung, und Kontrolle von Volksküchen* (3d ed., 1900); *Der häusliche Beruf* (6th ed., 1902).

MORGENTHAU, HENRY (1856–). An American lawyer, business man, and diplomat, born at Mannheim, Germany. He came to the United States in 1865, studied at the College of the City of New York, and graduated from Columbia Law School in 1877. He was a member of the law firm of Lachman, Morgenthau, & Goldsmith, New York, from 1879 to 1899; served as president of the Central Realty Bond and Trust Company from 1899 to 1905 and of the Henry Morgenthau Company (a realty firm) in 1905–13; and became president of the Herald Square Realty Company and director of the Underwood Typewriter Company. He was president of Mount Sinai Hospital, of the Bronx House settlement, and of the Free Synagogue in New York. An active and prominent member of the Democratic party, a liberal contributor to its funds, and an enthusiastic supporter of Woodrow Wilson, he was made chairman of the finance committee of the Democratic National Committee in the campaign of 1912, and in the following year he was appointed Ambassador to Turkey. After that country had entered the European War in support of Germany and Austria, Morgenthau assumed charge of the British interests in Turkey and won commendation for his vigorous insistance on the observance by the Turkish government of the rights of British refugees.

MORGES, môrzh. A town in the Canton of Vaud, Switzerland, 6 miles west of Lausanne, on Lake Geneva and on a branch of the Jura-Simplon Railway (Map: Switzerland, A 2). There are Reformed and Catholic churches, a college with a Realschule, a casino with a library and a museum of natural history, an industrial school, and a high school for girls. The town contains an old château (twelfth century), once the seat of the Bernese governors and now used as an arsenal, and near by is the château of Vufflens, said to have been erected by Queen Bertha of Swabia. The chief industry is wine making. Pop., 1900, 4438; 1910, 4594, about 500 of whom are Roman Catholics.

MORGHEN, môr'gĕn, RAFFAELLO (1758–1833). An Italian line engraver. He was born at Florence, June 19, 1758, the son of Filippo Morghen, who was his first teacher. He also studied at Rome under Volpato, whose daughter he married in 1781. Morghen worked in conjunction with his father-in-law, assisting him in his engravings of Raphael's paintings, among which "The Miracle of Bolsena" is entirely by Morghen. He was appointed professor at the Academy in Florence in 1793, became a member of the French Institute in 1803, and visited Paris in 1812, at the invitation of Napoleon, who conferred many honors upon him. His best-known works include Francis de Moncade, after Van Dyck; the "Aurora," after Guido Reni; "Madonna della Sedia" and "Transfiguration," after Raphael; "Diana Hunting," after Domenichino; the "Last Supper," after Leonardo. Of special interest also are his portraits of Dante, Petrarch, Boccaccio, Ariosto, Tasso, Alfieri, Raphael, etc. Though possessing great suavity and purity of line and high finish, his work is lacking in color and in spirit, and his great reputation has now

somewhat declined. His life and all his works, comprising 252 plates, are fully described by his pupil Palmerini in *Catalogo delle opere d' intaglio di Raffaello Morghen* (Florence, 1824). See Plate of PETRARCH.

MORGIANA, môr'gī-ä'nȧ. A female slave, belonging to Cassius and then to his brother, in "Ali Baba and the Forty Thieves," a story in the *Arabian Nights Entertainments.*

MORGUE (Fr., originally the inner wicket of a prison, where prisoners were kept for some time, that the jailers and turnkeys might view them at their leisure, so as to be able to recognize them when occasion required, from *morguer,* to look at solemnly or sourly, to defy). The name designates a building, erected for this purpose, where the unknown dead found in the territory of a city are kept for a certain period for identification. There is no general rule for the preservation of such bodies, but usually they are placed on ice while the clothes and other property are exposed for view also, together with a short history of the circumstances of finding the body. If there are no legal complications, the body, upon proper identification, is turned over to the claimant. Unclaimed bodies are given to medical institutions or buried at the expense of the city. The name was first given to a building in Paris which in the middle of the fifth century was part of the Châtelet and was used for the keeping and identification of unknown corpses. In 1804 the morgue, after the prisons in the Châtelet had been closed in 1792, was removed to an old, two-story building on the Quai du Marché Neuf, and in 1864 to a building erected for this purpose and situated on the extreme point of the Ile de la Cité. Morgues have been established in all large cities—in Boston, in 1851; in New York, in 1866; in Brooklyn, in 1870; in Chicago, in 1872; in St. Louis, in 1874; etc.

MORHOF, mōr'hōf, DANIEL GEORG (1639–91). A German literary historian, born at Wismar. He studied law and the humanities at Rostock, where in 1660 he became professor of poetry. In 1665 he was called to the chair of oratory and poetry at Kiel and in 1673 became also professor of history and in 1680 librarian. His *Opera Poetica* (1677) and *Deutsche Gedichte* (1682) are valueless, but his two prose works, *Unterricht von der Deutschen Sprache und Poesie* (1682) and *Polyhistor* (1688) are of considerable interest in the history of literature. The former contains perhaps the first historical treatment of German grammar and a review of what was then modern European literature. The *Polyhistor,* which deals with general literature and is encyclopædic in scope, marks the first systematic study in Germany of the history of literature. Consult article by Liliencron in the *Allgemeine deutsche Biographie,* vol. xxii, pp. 236 et seq.; also Eymer, *Morhof und sein Polyhistor* (Vienna, 1893).

MORI, mō'rē. The surname of the lords of Chosu in Japan. The chief of the clan was foremost in the antiforeign agitation which sought to close Japan again to the world (1858–67), after the demand for admission made by Commodore Perry, and in 1863 became known through his action in firing upon Dutch and American merchantmen passing through the Straits of Shimonoseki. In consequence, a squadron was formed and the town of Shimonoseki was bombarded. This helped to convince the Japanese that resistance was impossible and that the ancient policy of seclusion must be reversed. Mori continued the agitation, however, directing it against the government of the Shogun, and was one of the chief factors in the restoration of the Emperor to supreme power. Since the revolution of 1868 the clansmen of Chosu have been highly influential in the government, and as active in the adoption of Western civilization as they had been previously in opposition to its introduction.

MORI, ARINORI, or YUREI (1848–89). A native of Satsuma, Japan, and one of the group of young samurai who were prominent in advocating the thorough modernization of the Empire after the restoration of the Emperor. Educated in England, he adopted modern manners in life and thought and broke completely with the past. He held various high positions in the diplomatic and civil services and became finally Minister of Education. He was raised to the peerage in 1889, with the title viscount. When the constitution of Japan was promulgated, giving the Empire its place among progressive peoples, he was assassinated in his own house by a Shinto fanatic, who charged him with violating the sanctity of the shrine in Ise by lifting the curtain before the holy place with his cane.

MORI'AH. The name of the land whither Abraham was commanded to go to sacrifice his son Isaac upon a mountain, according to the Masoretic text of Gen. xxii. 2, and of the mountain upon which Solomon built the temple, according to 2 Chron. iii. 1. It is possible that the Chronicler understood the passage in Genesis as affirming that Abraham's sacrifice was made in Jerusalem. He no doubt found "the mountain of Moriah" as a designation of Zion, and it may already in his time have been popularly interpreted to mean "the mountain of vision," as it was by the Samaritan translator, Symmachus, and by Jerome. At an earlier time it may have been pronounced *moreh Yah* and signified "Yah is an oracle giver," or "the Moriah" may have meant "the oracle." How old this name of the temple mountain is cannot be determined. If the Masoretic text is sound, Gen. xxii. 2 refers to one of the mountains "in the land of Moriah." This particular shrine seems to be called *Yahwe yireh* (Yahwe sees) or *Yahwe yereh* (Yahwe gives oracles). The divine name, however, is not certain, and it may have been *Yireh El* or *Yereh El.* Cheyne looks for this sanctuary in the Negeb (q.v.), and Gunkel thinks that it is identical with the Jeruel near Tekoa mentioned in 2 Chron. xx. 16, though he admits that the distance from Beersheba does not preclude the identification with Jerusalem, and regards Ariel, a name of Jerusalem, as a corruption of Jeruel. It is possible that *Yahwe yereh* is an explanation of the meaning of Moriah, or that "the Moriah," "the oracle," is an appellative designation of a sanctuary also known by the kindred name Jeruel. But it is not certain that the original text in Gen. xxii. 2 had "the land of Moriah." The Syriac version suggests that the original reading was "the land of the Amorites." "Amorites" corresponds to the Assyrian Amurru or Martu, and the dropping of the prosthetic aleph can be easily accounted for. This explanation has the advantage of being based on very excellent ancient testimony to the pre-Masoretic text. Consult: August Dillmann, *Die Genesis* (6th ed., Leipzig, 1892); H. Gunkel, *Genesis* (Göttingen, 1901; 3d ed., 1910); T. K. Cheyne, article "Moriah," in *Encyclopædia Biblica,* vol. iii (New

York, 1902); S. R. Driver, *Genesis* (7th ed., London, 1909); John Skinner, *Genesis* (ib., 1911).

MORIALE, Fra. See Montreal d' Albano.

MORIER, mō'rĭ-ēr, James Justinian (c.1780–1849). A British diplomat, author, and traveler, born at Smyrna. He was educated at Harrow and in 1807 became private secretary in Sir Harford Jones's mission to the Persian court. On May 7, 1809, three months after his arrival at Teheran, he was sent home with dispatches and performed a famous journey; of this he afterward published an account under the title *A Journey through Persia, Armenia, and Asia Minor to Constantinople in the Years 1808 and 1809* (1812). This book enjoyed a great vogue in Great Britain and was translated into French (1813) and German (1815). In 1818 he wrote also *A Second Journey through Persia.* In 1810 he went back to Teheran as Secretary of Legation under Sir Gore Ouseley, and after the latter's return to England in 1814 Morier acted for a time as British representative at the court of Persia. He was recalled in 1815. In 1817 he was pensioned by the government and devoted most of his time thenceforth to literature, in which pursuit he attained such success that Sir Walter Scott styled him the best novelist of the day. His best novels are *The Adventures of Hajji Baba of Ispahan* (1824; new ed., 1914); *Zohrab the Hostage* (1832); *Ayesha, the Maid of Kars* (1834).

MORIER, Sir Robert Burnett David (1826–93). An English diplomatist, born in Paris (where his father was Consul General) and educated at Balliol College, Oxford. After holding several other diplomatic offices, he was appointed chargé d'affaires at Stuttgart in 1871 and at Munich in 1872, whence he was transferred to Lisbon as English Minister (1876) and later to Madrid (1881–84). By close observation, which included not only diplomatic life but the character and opinions of the unofficial classes, he acquired an exceptional knowledge of and insight into German politics. He was often consulted by British statesmen in regard to foreign affairs. When he was Ambassador to St. Petersburg (1884–91) he and Bismarck were bitter enemies, and in 1888 Count Herbert Bismarck charged Morier with furnishing information to Bazaine at the outbreak of the Franco-Prussian War. Time showed that Morier had been innocent and that French spies had gained the information in question. Bismarck's dislike of him sprang from his strong belief that Morier held political secrets which might impede or nullify his (Bismarck's) plans. For this there was some basis in a series of able political letters in the London *Times*, which were attributed to Morier. In 1891 he was transferred to Rome, but was forced by urgent business to remain in Russia, where he did much to smooth relations between that country and England. His health broke down and he died in Montreux, Switzerland.

MORIGI DA CARAVAGGIO, mō'rē-gē dȧ kȧ'rȧ-väd'jō. See Caravaggio, M. A.

MÖRIKE, mē'rĭ-ke, Eduard (1804–75). A German poet. He was born at Ludwigsburg, studied theology at Tübingen, and served as clergyman in many small parishes from 1826 to 1851. From 1851 to 1866 he was professor of German literature in a seminary at Stuttgart. One of the most prominent members of the Swabian school, he first appeared in 1832 with the fantastic tale *Maler Nolten* (revised 1853–75; finished by Julius Klaiber in 1877; 3d ed., 1890), which revealed his imaginative power. His collected *Gedichte* (1838; 11th ed., 1894) are marked not only by the idyllic cast common to the Swabian group, but also by a delicate humor and a classical finish peculiarly their own. His fame now rests on his lyrics and ballads. The exquisitely wrought novelette *Mozart auf der Reise nach Prag* (1856) is one of his finest achievements. His further work includes the *Idylle vom Bodensee* (1846) and the caprice *Das stuttgarter Hutzelmännlein* (1855). Many of the poems are to-day established folk songs. Among the best known are "Frühling lässt sein blaues Band," "Fragst du mich, woher die bange Liebe," and the ballad "Schön Rotraut." Consult the biographies by Notter (Stuttgart, 1875), Klaiber (ib., 1876), Maync (ib., 1901), Fischer (Berlin, 1901), and Windegg (Stuttgart, 1904); also H. Ilgenstein, *Goethe und Mörike* (Berlin, 1903).

MÖRIKOFER, mē'rĭ-kō'fĕr, Johann Kaspar (1799–1877). A Swiss literary and ecclesiastical historian, born at Frauenfeld. He studied at Zurich, taught in his birthplace, and was pastor at Gottlieben from 1851 to 1869. His historical works have scientific value and literary charm; they include *Die schweizerische Mundart im Verhältnis zur hochdeutschen Schriftsprache* (1838); *Klopstock in Zurich* (1851); *Die schweizerische Litteratur des achtzehnten Jahrhunderts* (1861); *Ulrich Zwingli nach den urkundlichen Quellen* (1867–69); *Geschichte der evangelischen Flüchtlinge in der Schweiz* (1876). Consult *Allgemeine deutsche Biographie*, vol. xxii, pp. 258 et seq., and vol. xxiv, pp. 787 et seq.

MORILLO, mō-rē'lyō, Pablo, Count of Cartagena and Marquis de la Puerta (1778–1837). A Spanish general. He was born in Fuentesecas in the Province of Toro and entered the Spanish navy in 1791. During the war against Napoleon he raised a guerrilla corps, at the head of which he soon acquired fame and became lieutenant general. In 1815 he was placed in command of 10,000 men and sent to South America to conquer the insurgent provinces of Venezuela and New Granada. He captured Carácas, Cartagena, and Bogotá, but met reverses later and was compelled to sign the armistice of Truxillo with Bolívar (1820). He returned to Spain, joined the court party, and was believed to be one of the authors of an insurrection of the guards in 1822. After this he went over to the patriots, obtained command of an army corps, changed back again, and submitted to the French (1823). Exiled by Ferdinand, he was recalled in 1832 and led an army against the Carlists. He published his *Mémoires*, translated into French by Ernest de Blossville (Paris, 1826), and two other documents, *Manifiesto que hace á la nación española . . . Pablo Morillo . . . con motivo de las calumnias . . . publicadas . . . en la Gaceta de la Isla de León* (Madrid, 1821) and *Contestación . . . al dictamen que . . . ha presentado la mayoría de la comisión de medidas* (Madrid, 1823). The best biography is that by Antonio Rodríguez Villa, *Don Pablo de Morillo . . . estudio biográfico documentado* (Madrid, 1908–1910).

MORIN, mō'răN', Arthur Jules (1795–1880). A French soldier and mathematician, born in Paris. He studied at the Ecole Polytechnique and at the Ecole d'Application in Metz. Commissioned in 1819 lieutenant in an engineer battalion, Morin rose to the rank of general of

a division in 1855. He was professor at the Conservatoire des Arts et Métiers, and after 1852 its director. In 1843 he became a member of the Academy of Sciences. His researches and inventions contributed materially to the progress of mechanics. The results of his labors are embodied in memoirs published in the *Comptes rendus de l'Académie des sciences de Paris*, and in a number of separate publications, among which are: *Hydraulique* (1837; 3d ed., 1865); *Aide-mémoire de mécanique pratique* (1838; 6th ed., 1871); *Notions fundamentales de mécanique et données d'expérience* (1850; 3d ed., 1860; Eng. trans. by J. Bennet, *Fundamental Ideas of Mechanics and Experimental Data, etc.* New York, 1860); *Etudes sur la ventilation* (1863); *Salubrité des habitations* (1868; 2d ed., 1874).

MORIN, Augustin Norbert (1803–65). A Canadian jurist and statesman, born at St. Michel, Quebec, and educated at Quebec Seminary. He studied law in Montreal and in 1828 was admitted to the bar. Elected to the Legislative Assembly of Quebec in 1830, he soon became conspicuous as a Liberal and in 1834 was deputed by the Assembly to go to England with Denis Benjamin Viger (q.v.) and inform the ministry in London as to the political condition of the province. After the union of Upper and Lower Canada in 1841 he was elected to the Canada Legislative Assembly and was Commissioner of Crownlands in the La Fontaine-Baldwin administration (1842–43). He was again a member of the Assembly (1844–48) and was Speaker thereof in 1848–51. His political probity and experience had made him one of the most respected men in Canadian public life and after La Fontaine's retirement he became the leader of the French-Canadian Liberals. As he agreed with the programme of the Upper Canada Liberals he joined with Mr. (afterward Sir Francis) Hincks (q.v.) in forming the Hincks-Morin administration, Morin being Provincial Secretary for Lower Canada and head of the cabinet ministers from that province. Later he held the portfolio of Crownlands. In 1854 the ministry was defeated by reason of the delay in settling the questions of clergy reserves and seigniorial tenure (see Canada, *History*) and also by the vigorous opposition of a section of the Upper Canada Liberals (Reformers) under the leadership of George Brown. Morin resigned, but as his influence in Lower Canada was still strong, he afterward joined Sir Allan MacNab in forming the MacNab-Morin administration, a coalition of Liberals and Conservatives formed to carry through the delayed measures, a purpose that was attained. In 1855 Morin was made a judge of the Superior Court of Quebec, which office he retained until a short time before his death. In 1859 he was appointed a commissioner for codifying the laws of Lower Canada. Consult J. C. Dent, *The Last Forty Years* (2 vols., Toronto, 1881), and Sir F. Hincks, *Reminiscences* (Montreal, 1884).

MORIN, mô-rĕn′, Enrico Constantino (1841–1910). An Italian naval officer and statesman, born in Genoa. He became vice admiral (1893). In 1886 he was elected to the Chamber of Deputies, from 1888 to 1891 was Undersecretary of State in the Ministry of Marine, and from 1893 to 1896 was Minister of Marine. In 1900 he became Senator and again Minister of Marine. In April, 1903, he assumed charge also of the Ministry of Foreign Affairs, but retired with the rest of the Zanardelli cabinet in November of the same year.

MORIN, mŏ′răn′, Jean, or Johannes Morinus (1591–1659). A French Catholic theologian and Orientalist, born at Blois of Protestant parents. He was educated at Leyden and at Paris, where he was converted to the Catholic church. In 1618 he joined the Oratorians. He was head of the College of Angers, and in 1640 was summoned to Rome by Urban VIII to assist in discussing the union of the Greek and Roman churches. He was suddenly recalled by Richelieu, who possibly feared that Morin would speak ill of him at Rome. Besides his works on Church history, and more important, Morin wrote on textual criticism: *Exercitationes Biblicæ de Hebræi Græcique Textus Sinceritate* (vol. i, Paris, 1633; vols. i, ii, ib., 1669), a work that proved to be of epoch-making significance, urging the priority and superiority of the Samaritan Pentateuch and the Greek version; *Opuscula Hebræo-Samaritica* (1657), with grammar and lexicon; and in the Paris polyglot, the first edition of the Samaritan Pentateuch and Targum. Consult E. Ruyters, "Jean Morin" in *Annuaire de l'université catholique de Louvain* (Louvain, 1910).

MO'RINE, Alfred Bishop (1857–). A Canadian journalist and statesman. He was born at Port Medway, Nova Scotia, and was educated at Dalhousie University. After a few years' experience as the Ottawa correspondent for Nova Scotia and New Brunswick newspapers he went to Newfoundland and edited the St. John's *Mercury* (1883–85) and *Herald* (1889–91). He was an Independent member for Bonavista in the Newfoundland Assembly in 1886–1906. During that period he had an important share in presenting the views of Newfoundland to the British government respecting the French rights on the west shore of the island. For this purpose he was a delegate to England in 1891, and in 1898 successfully represented the Newfoundland administration in London in the attempt to have British commissioners inquire and report upon French rights in the island. The negotiations thus set on foot resulted in the treaty between Britain and France in 1904, by which the difficulties which had existed in regard to Newfoundland since the Treaty of Utrecht (1713) were amicably settled. Morine was Colonial Secretary of Newfoundland in 1894, Receiver-General in 1897, and later Minister of Marine and Fisheries. In 1906 he removed to Toronto. In 1911 he was appointed chairman of the royal commission to investigate the Canadian civil service. He published *The Mining Law of Canada* and *Canadian Notes to Russell on Crimes.*

MORIOKA, mō′rē-ō′kä. The capital of the Prefecture of Iwate, Japan, situated in a mountainous district in the northern part of Hondo, about 40 miles from the coast (Map: Japan, G 4). It is celebrated for its kettles, silk goods, fruits, and vegetables. Pop., 1898, 32,989; 1903, 31,861; 1908, 36,012.

MORIORI, mō′rē-ō′rē. The aborigines of the Chatham Islands, linguistically and somatically close kinsmen of the Maori (q.v.). Their crania are distinctly more Polynesian than Melanesian, and some authorities see traces of race mixture in certain osteological peculiarities. Some anthropologists regard the Moriori as only a branch of the Maori, who reached the Chatham Islands before tattooing had come into general use or the carving and ornamentation of the New

Zealand Maori had taken on their characteristic development. Tradition, supported by other indications, suggests two migrations to these islands, one before and the other after Maori art had become matured. The flat stone clubs of the Chatham Islanders are supposed to go back to the dark people who preceded them. The best stone axes of the Moriori exceed in fineness of polish those of the Maori. The general conclusion is that the culture of the Chatham Islanders is an outspur of that of New Zealand. Such marked peculiarities as exist are due to the poverty and limitations of the group. The influence of the antecedent "dark race" is more marked there than in New Zealand itself. In 1831 they are said to have numbered 1200 to 1500; but the inroads of Maori from the Taranaki district of New Zealand in 1832–35 led almost to their extermination and there were but 200 left in 1868. The Moriori were large, powerful men, darker in color than the New Zealanders, and distinguished by broader and more hooked noses and almond-shaped eyes. In 1911 the islands were reported to contain but one pure-blooded Moriori, 218 Maori, and 234 Europeans. Consult E. Tregear, *The Maori Race* (Wanganui, 1904).

MORISCOS, mō-rē'skōs (Sp., Moorish men). The name given in Spain after 1492 to those Moors who through intimidation or force were brought over to Christianity. See MOORS; SPAIN.

MOR'ISON, JAMES (1816–93). A Scottish clergyman. He was born at Bathgate, Linlithgowshire, was educated at Edinburgh, and in 1839 was licensed by the United Secession Church. Two years later, however, he was deposed for preaching "universal atonement." With three other ministers of like beliefs, and their followers, Morison founded (1843) the Evangelical Union (q.v.). At the same time he established a theological academy, of which he continued principal until his death. He also served as minister at Kilmarnock, and from 1853 to 1884 in Glasgow, where he died. Consult his *Life* by A. Adamson (London, 1898).

MOR'ISON, JAMES AUGUSTUS COTTER (1832–88). An English author, born in London. His childhood was spent in Paris (1834–40) and he gained an intimate knowledge of French. An Oxford graduate (1859), he wrote frequently for the *Saturday Review*, and in 1863 brought out a *Life of St. Bernard*, followed by sketches of *Gibbon* (1878), *Macaulay* (1882), and *Madame de Maintenon* (1885), while his last work, *The Service of Man: An Essay towards the Religion of the Future* (1887; 5th ed., 1892), was the outcome of his Positivist beliefs.

MORISON, ROBERT (1620–83). A British botanist, born at Aberdeen. He graduated at the university of his native city in 1638, but the next year, having espoused and fought for the Royalist cause, he was compelled to flee to France. There he studied anatomy, zoölogy, botany, mineralogy, and chemistry, and in 1648 graduated in medicine at Angers. A year or two later Gaston, Duke of Orléans, appointed him one of his physicians, a position which he held until the Duke's death in 1660, and in which he made such a reputation that after the Restoration Charles II appointed him his senior physician, King's botanist, and superintendent of all the royal gardens. In 1669 he became professor of botany at Oxford. His great service to botany was in reviving the study of systematic botany upon an extensive scale, a study which had lapsed since the days of Cesalpino and Bauhin. Among his works are: *Præludia Botanica* (1669); *Plantarum Umbelliferarum Distributio Nova* (1672); *Plantarum Historiæ Universalis Oxoniensis, Pars Secunda* (1680). Consult: Pulteney, *Sketches of the Progress of Botany* (London, 1790); Tournefort, *Eléments de botanique* (Lyons, 1797; in Latin, Paris, 1700); Franchet, *Flore de Loire-et-Cher;* Sachs, *History of Botany* (Oxford, 1906).

MORITZ, mō'rīts, KARL PHILIPP (1756–93). A German author, prominent in the Sturm-und-Drang period. He was born at Hameln, of poor parents. He taught for a short time at Dessau (1777), then at a military orphanage at Potsdam (1778), and soon after in Berlin. In 1786 he went to Italy, and in Rome became acquainted with Goethe, who recommended him to Duke Karl August, by whose influence Moritz was elected to the Berlin Academy, and in 1789 became professor of antiquities in the Academy of Art in Berlin. His adventurous life can to a great degree be reconstructed from the semi-biographical novels, *Anton Reiser* (1785–90) and *Andreas Hartknopf* (1786). He wrote, besides: *Versuch einer deutschen Prosodie* (1786); *Ueber die bildende Nachahmung des Schönen* (1788); *Götterlehre* (1791); *Reisen eines Deutschen in England* (1783); *Reisen eines Deutschen in Italien* (1792–93). Consult: Dessoir, *Moritz als Aesthetiker* (Berlin, 1889); Hans Glogau, *Anton Reiser* (Marburg, 1903); Hugo Eibisch, *Anton Reisers kritische Autobiographie* (Leipzig, 1909).

MORLAIX, môr'lâ'. A seaport in the Department of Finistère, France, on the estuary of the Dossen, 4 miles from the sea and 33 miles east-northeast of Brest (Map: France, N., B 4). The estuary is spanned by a fine railway viaduct 934 feet long and 190 feet high. The town has a mediæval aspect, with its sixteenth-century church of St. Mélaine, narrow winding streets, and quaintly gabled timbered houses. The port is accessible to ships of 400 tons' burden. A considerable coastwise trade is carried on in leather, paper, grain, and horses. The industrial establishments include paper mills, an important government tobacco factory, and manufactures of candles, kegs, and wooden shoes. Pop., 1901, 16,086; 1911, 15,262. Morlaix dates from the Roman occupation. In 1187 it was besieged and captured by Henry II of England. In 1522 it was taken by the troops of Henry VIII of England, but recaptured by the French in a night attack, when 600 Englishmen were killed.

MOR'LAKS. A Slavonic people belonging to the southern branch and living along the coast of Dalmatia, Austria-Hungary. They settled in this locality during the great southern migration of the Serbs from the Carpathian region in the sixth and seventh centuries. They are a hardy, seafaring people, who furnish the best material for the Austrian navy, and are prominent in the commerce of the Adriatic. They are generally classed with the Dalmatians. See DALMATIA.

MOR'LAND, GEORGE (1763–1804). An English genre, animal, and landscape painter. He was born in London, the son of Henry Morland (c.1730–97), painter, engraver, and picture dealer, from whom he inherited his talent and received his artistic training. At the age of 10 he exhibited sketches at the Royal Academy, and at 17 he had attained a reputation

as a copyist, especially of the Dutch and Flemish masters, at the same time producing original compositions, such as the "Angler's Repast." After a rupture with his father he set up on his own account in 1784 or 1785 and dashed into a career of dissipation and prodigality, supporting himself by the sale of his pictures, painted with marvelous rapidity and cleverness. He lived with a picture dealer and became the companion of hostlers, potboys, jockeys, pawnbrokers, and similar worthies. In 1786, after his return from a short visit to France, he married the sister of the engraver William Ward, and for a time reformed. At this period he painted moralities in the style of Hogarth, notably the "Lætitia" series; but he soon returned to his profligate life and in 1791 produced his masterpiece, the "Interior of a Stable," now in the National Gallery, London. He became popular and dealers flocked to him. Sometimes he painted two pictures a day, and once a large landscape with six figures in six hours. Every demand for money, tavern score, or bill was paid by a picture worth many times the charge. His subjects were scenes in humble life in town and country—cottages, stables, inn yards, pastoral scenes, and domestic animals, especially pigs. In this last-named subject no painter has equaled him, as witness the examples in the galleries of the New York Public Library and of Budapest. Altogether he painted 4000 pictures, 250 of which were engraved. He was imprisoned for debt from 1799 to 1802 and died in a sponging house in Holborn, Oct. 27, 1804. His epitaph on himself was, "Here lies a drunken dog." He was generous, good-natured, and industrious despite his faults.

After a period of neglect Morland is now ranked among the best masters of genre and animals, rivaling in his best work the Dutch artists on whom he modeled his style. He was a very facile brushman; his composition is remarkably good, his color is rich and harmonious, and his treatment, if light, is delicate and skillful. His presentation is realistic and truthful. The National Gallery possesses altogether eight paintings by Morland, including, besides the "Interior of a Stable," "Cowherd and Milkmaid," "The Fortune Teller," and "Roadside Inn"; in the South Kensington Museum are ten, the best known being "The Reckoning." The Museum of Glasgow has a "River Scene" and three seacoast landscapes. In the New York Historical Society are his "Old English Sportsman" and "Dogs Fighting"; in the New York Public Library, "Midday Meal"; and in the Corcoran Gallery, Washington, "The Farmhouse." The Louvre possesses "The Halt." His self-portrait is in the National Portrait Gallery, London.

Bibliography. William Collins, *Memoirs of a Picture* (London, 1803); Blagden and Hassell, *Memoirs of George Morland* (ib., 1806); and the monographs by Ralph Richardson (ib., 1895) and J. T. Nettleship (ib., 1898); also G. C. Williamson, *George Morland* (ib., 1904); D. H. Wilson, *George Morland* (New York, 1907); Gilbey and Cuming, *George Morland* (ib., 1907).

MORLAND, Sir Samuel (1625–95). An English diplomat, mathematician, and inventor. He was born in Sulhampstead, Berkshire, and studied at Winchester School and at Magdalene College, Cambridge. His first political affiliations were with the Parliamentary party. Morland's first mission of importance was to the Duke of Savoy in 1655 to protest against the massacre of the Waldensians. In this he was successful. Morland brought back with him materials, mostly clumsy forgeries, for a history of this sect, which he published in 1658. His discovery of a political plot in which Cromwell and some of his chief supporters were alleged to be concerned alienated his sympathies from the Parliamentary party and he afterward favored the restoration of Charles II. After the Restoration in 1660 Morland received the title of Baronet and many promises from the King which were only partly fulfilled. He devoted himself more and more to the study of mathematics and mechanics and invented a speaking trumpet, a capstan, and some calculating machines. The King furnished money to aid him in his experiments. Towards the close of his life Morland devoted himself specially to experiments in hydrostatics and hydraulics. He invented and improved pumps and water engines, notably the plunger pump, and improved the fire engine then in use. Familiar with the power of steam, as well as its other properties, he undoubtedly proved that it could be usefully employed. In some ways he anticipated the discoveries of James Watt (q.v.). He received medals for his researches and inventions, and published several scientific works. In one of the latter is a virtual description of the steam engine, the date, 1682, being considered by some authorities as that of the invention of this engine, though it was not patented by Savery (q.v.) until 1698.

MOR'LEY. A municipal borough in the West Riding of Yorkshire, England, 4 miles south-southwest of Leeds. The new town hall is a handsome building, opened in 1895, and the municipality owns its water works, gas and electric-lighting plants, maintains public baths, parks, and recreation grounds. It has important manufactures of woolens and mill machinery. There are coal mines and stone quarries. Morley is mentioned in *Domesday*. It was incorporated in 1885. Pop., 1901, 23,636; 1911, 24,282. Consult Smith, *Morley, Ancient and Modern* (London, 1886).

MORLEY, Baron. See Monteagle, Baron.

MORLEY, Edward Williams (1838–). An American chemist, born at Newark, N. J. He graduated from Williams College in 1860 and from 1869 to his retirement in 1906 was professor of chemistry at Adelbert College, Western Reserve University. With this post he also held (1873–88) a chair of chemistry at the Cleveland Medical College. He was associated with A. A. Michelson (q.v.) in researches on the relative motion of ether and matter and also in the determination of the meter in terms of the wave length of light. His determination of the ratio of the atomic weights of oxygen and hydrogen was a classic contribution to scientific knowledge. He was president of the American Association for the Advancement of Science (1895) and of the American Chemical Society (1899); became a member of the National Academy of Sciences and a Fellow of the American Academy of Arts and Sciences; in 1912 he was honorary president of the eighth International Congress of Applied Chemistry; and received honorary degrees from various institutions, including Williams, Lafayette, Yale, and Pittsburgh.

MORLEY, FRANK (1860–). An American mathematician. He was born at Woodbridge, Suffolk, England, and graduated M.A. from King's College, Cambridge, in 1886. He served as master of Bath College in 1884–87, and then, coming to the United States, he taught mathematics at Haverford College, Pa., from 1887 to 1900, when he became professor of mathematics at Johns Hopkins University. He became editor of the *American Journal of Mathematics.* His publications include *Elementary Treatise on the Theory of Functions,* (1893), with James Harkness; and *Introduction to the Theory of Analytic Functions* (1898).

MORLEY, HENRY (1822–94). An English author, born in London, Sept. 15, 1822. He was educated at a Moravian school at Neuwied on the Rhine and at King's College, London (1838–43); practiced medicine at Madeley in Shropshire (1844–48); and, having been fleeced by a colleague, he started a school on Moravian methods at Manchester, but after two years he started it afresh at Liverpool. A series of ironical essays entitled *How to Make Home Unhealthy* attracted the attention of Dickens and eventually led to Morley's settling in London and taking a hand in *Household Words* and *All the Year Round* (1850–65). He also became connected with the *Examiner* as subeditor and then as editor (1856–64). Meanwhile he was appointed lecturer in English at King's College (1857–65) and then professor of English at University College, London (1865–89). He died May 14, 1894. Chief among Morley's works are: *A Defense of Ignorance* (1851), a bit of irony; *Lives* of Palissy the Potter (1852), Jerome Cardan (1854), Cornelius Agrippa (1856), and Clement Marot (1870); *Memoirs of Bartholomew Fair* (1857); two volumes of fairy tales (1859–60); *English Writers,* to Dunbar (1864–67), rewritten and brought down to the seventeenth century (11 vols., 1887–95); *A First Sketch of English Literature* (1873; revised, 1886); *English Literature in the Reign of Victoria* (1881). His editorial work includes the *Library of English Literature* (5 vols., 1875–81); *Universal Library* (63 vols., 1883–88); *Cassell's National Library* (214 vols., 1886–90); the *Carisbrooke Library,* a series of reprints (14 vols., 1889–91); *Companion Poets* (9 vols., 1891–92). Though Morley was not a critic and editor of the first rank, he had scholarship, catholic tastes, and a talent for finding the best in things, and he performed a most valuable service in making easily accessible the treasures of English literature.

MORLEY, JOHN. See MORLEY OF BLACKBURN.

MORLEY, MRS. The name adopted by Queen Anne in her correspondence with the Duchess of Marlborough. See FREEMAN, MRS.

MORLEY, SAMUEL (1809–86). An English politician and hosiery manufacturer, born at Homerton (now part of London). He became manager in 1840 and sole owner in 1855 of his father's hosiery warehouse in London, and in 1860 he took over the Nottingham hosiery business established by his father and uncle. He erected several modern knitting mills and accumulated a great fortune. His home at Stamford Hill became a frequent meeting place of radical politicians and of dissenting ministers. He was a Liberal member of Parliament for Nottingham in 1865–66 and for Bristol in 1868–85, giving his enthusiastic support to Gladstone, who offered him a peerage in 1885. He became one of the proprietors of the chief Liberal newspaper, the London *Daily News,* whose price he caused to be reduced to a penny.

MORLEY, THOMAS (1557–1603). An English musician and composer. The place of his birth cannot be definitely fixed, but it is supposed that he was born in London and educated at St. Paul's Cathedral. According to his own statement he also studied under Bird. In 1588 he became bachelor of music at Oxford and in 1591 was deputy chorister at St. Paul's, taking his regular turn of duty as organist. In 1592 he was made epistler of the Chapel Royal. He strove hard during his entire career for the advancement of English music, and devoted himself exclusively to the development of vocal music. His principal work and that upon which his reputation is chiefly based was *A Plaine and Easie Introduction to Practicall Musicke,* published in 1597. It was the first practical work on music issued in England; was translated into German and published throughout the German states by Trost of Halberstadt about 1660. In England it remained an authority up to so late a period as 1770. He wrote many compositions for the Church, none of them, however, being printed in his lifetime. Tallis's monopoly of music printing expired in 1596, and two years later Morley obtained a similar one, and under his license "William Barley, Thomas Est, alias Snodham, Peter Short, John Windet, and others" printed several books as the "assigne of Thomas Morley." He resigned from the Chapel Royal in 1602. That he was an excellent musician his ballets and madrigals prove. He was also superior in melodic invention to any of his predecessors.

MORLEY OF BLACKBURN, JOHN, first VISCOUNT (1838–). An English statesman and author, born at Blackburn, Lancashire, Dec. 24, 1838. Having taken his degree at Lincoln College, Oxford (1859), he went to London to devote himself to literature. He soon became editor of the *Literary Gazette,* at that time in such a state of decrepitude that Morley, with all his energy and talent, could not quicken it to new life. Morley's writings early showed the influence of Auguste Comte, and he became known as an agnostic philosopher. From 1868 to 1870 he edited for a short period the daily *Morning Star.* In 1867 he succeeded Lewes as editor of the *Fortnightly Review,* which he conducted brilliantly till 1883, becoming, in that year, editor of *Macmillan's Magazine.* In 1873 he was called to the bar at Lincoln's Inn. Under his guidanee the Macmillans issued after 1878 the "English Men of Letters Series," to which Morley contributed a short but excellent *Life of Edmund Burke* (1879). His *Burke,* an historical study, had appeared in 1867. In 1880 he began ably to edit the *Pall Mall Gazette;* in 1881 published his *Life of Cobden;* and in 1883, after two failures, was at a by-election returned to Parliament for Newcastle-upon-Tyne. He soon became prominent, and in 1886 was Chief Secretary for Ireland under Gladstone, thus getting an insight into Gladstonian politics and character to be shown later in his monumental *Life of Gladstone* (1903). Morley sympathized with the Irish Nationalists, but, unlike Gladstone, he was unhampered by pledges and opinions. After the defeat of the Liberals in 1886 he was half in politics, half in

letters, till Gladstone's return to power restored him to his secretaryship (1892–95). Morley's anti-imperialistic views helped to lose him his seat in 1895, but he was elected from the Montrose Burghs in February, 1896, and this constituency he continued to represent until his elevation to the peerage in 1908. In 1898 and afterward he upheld the Boers. From 1905 to 1910 he was Secretary of State for India and then for four years Lord President of the Council. He resigned from the cabinet in August, 1914, because, with convictions opposed to war, he desired no part in the responsibility for British action against Germany after the invasion of Belgium. Numerous honors came to Morley—the Order of Merit, the chancellorship of Victoria University, degrees from Oxford, Cambridge, Edinburgh, Glasgow, and St. Andrews, etc. The rich historical library of Lord Acton, which Andrew Carnegie presented in 1902 to Morley, the latter gave, a few months afterward, to Cambridge. His place as a leading English writer and a philosophical radical with the full and frank courage of his convictions was firmly established by the works above mentioned and also by his *Critical Miscellanies* (two series, 1871 and 1877); *Voltaire* (1871); *Rousseau* (1873); *The Struggle for National Education* (1873); *On Compromise* (1874); *Diderot and the Encyclopædists* (1878); *Walpole* (1889); *Studies in Literature* (1891); *Cromwell* (1900); *Literary Essays* (1906); *Notes on Politics* (1914).

MOR'MOLUCOI'DES (Neo-Lat. nom. pl., from *mormoluca*, glowworm, from Gk. μορμολύκειον, *mormolykeion*, μορμολύκιον, *mormolykion*, hobgoblin, from μορμολύττεσθαι, *mormolyttesthai*, to frighten, from μορμώ, *mormō*, bugbear + εἶδος, *eidos*, form). The oldest known fossil insect larva, found in the shale of the Newark formation of the Jura-Triassic system in New Jersey, Connecticut, and Massachusetts. In general appearance it resembles the larva of the modern firefly, though it is considerably larger, being quite three-quarters of an inch in length. It is considered to be the young of a neuropteran insect allied to the modern dobsons (Sialidæ).

MOR'MON, Book of. A book issued at Palmyra, N. Y., 1829, by Joseph Smith, Jr., who professed to have been led to its discovery by an angel. He claimed it was written on gold plates in reformed Egyptian characters, and accompanied by the Urim and Thummim by means of which he translated it. It purports to be the sacred writings of a series of prophets and a sacred history of two nations occupying this continent from the time of the Tower of Babel till about four hundred years after Christ. It is considered equally sacred with the Bible by Latter-Day Saints. See Mormons.

MORMON CRICKET. Either of the wingless migratory crickets, *Anabrus simplex* and *Anabrus purpurescens*. These are large, peculiarly shaped crickets, which occasionally multiply so greatly in their native home in the foothills of the Rocky Mountains that they migrate to the plains below and destroy all cultivated crops. As they are wingless, they move but slowly, and may often be checked by ditches. A plowed field in their course forms a difficult barrier, and an approaching army may be destroyed by means of heavy rollers. They are pugnacious and will fight among themselves, and are to a certain extent carnivorous, devouring their injured comrades. For many years they have been especially abundant and injurious in portions of Montana and Idaho.

MORMONS, or more properly The Church of Jesus Christ of Latter-Day Saints. A religious sect which originated in the United States. Its early history is that of its founder, Joseph Smith, Jr., who was born in the town of Sharon, Windsor Co., Vt., Dec. 23, 1805. His father engaged in several occupations, including those of farmer and well digger. Some writers assert that he was a "water witch," i.e., had the ability to locate with a forked wand hidden streams of water. Belief in this form of divination was then common, and still persists in some localities. Joseph's mother displayed great interest in religious matters, and it is said that she early announced the coming of a prophet in her own family. In 1816 the Smiths migrated to the semiwilderness of western New York and after a short residence in the village of Palmyra, Wayne County, settled upon a piece of land 6 miles south of that place on the border of Manchester, Ontario County. There they seem to have led a hand-to-mouth existence. Their neighbors were poor, plain, but generally religious folk of the frontier type.

It appears that Joseph Smith, Jr., had no special preparation for the calling of prophet. He received little education, but was taught to read, write, and cipher. He himself later testified that he was "a rough stone" and desired "the learning of heaven alone." From time to time he journeyed into Pennsylvania, where in 1827 he became engaged to the daughter of a respectable farmer and married her.

According to his own account, Smith had already begun to have visions. The first of these occurred in the spring of 1820 when the boy prophet was only 14 years old. It was a time of great religious excitement, and Joseph, with others of the Smith family, was more or less affected by revival meetings. His attention was attracted strongly to the text, "If any of you lack wisdom, let him ask of God, that giveth to all men liberally, and upbraideth not, and it shall be given him" (Jas. i. 5). He determined to ask of God "which of all the sects was right—and which I should join." He retired to a place in the woods, knelt in fervent prayer, and presently beheld "a pillar of light exactly over my head, above the brightness of the sun, which descended gradually until it fell upon me. . . . When the light rested upon me I saw two personages, whose brightness and glory defy all description, standing above me in the air. One of them spake unto me, calling me by name, and said, pointing to the other, 'This is my Beloved Son. Hear Him!'" When Joseph got sufficient command of himself, he asked concerning the various sects and was told that all were wrong, that he must join none, for all their creeds were an abomination in His sight.

Book of Mormon. One night three and a half years later (Sept. 21, 1823) Joseph experienced a second vision. An angel named Moroni thrice appeared to him and revealed the hiding place of certain golden plates containing the history of the ancient peoples of America. Next day Moroni again appeared to Smith; and the boy made a journey to the hill Cumorah, near Manchester, where he found the wondrous plates, but was not permitted by the angel to carry them away. On each twenty-second of September for three years thereafter Smith visited the hill and saw the plates, but was each time informed

by Moroni that the time was not ripe for their removal. On Sept. 22, 1827, however, some months after Smith's marriage, the custodian angel delivered the records into Smith's keeping with permission to reveal what was not "sealed." The message was written in a strange language upon golden plates, bound in a volume and closed with three clasps.

The years 1828–29 were devoted mainly to the translation of the graven characters on the golden plates. According to Smith, he used in this work two transparent crystals, set in rims of silver and fastened to a breastplate, constituting the Urim and Thummim of the ancient Hebrews. Smith was aided in the work by his wife, Emma Hale Smith, and by Martin Harris and Oliver Cowdery. Cowdery was a schoolmaster, and Harris was a farmer, who had been, in turn, Quaker, Universalist, Baptist, and Presbyterian. Harris's wife temporarily interrupted the work by destroying a portion of the manuscript, but the task was at last completed, and the book was published at Palmyra early in 1830. The necessary money was obtained by Harris's mortgaging his farm. The title given the work was *Book of Mormon*. The price was fixed at $1.25 a volume, and Joseph Smith, Sr., for a time went about the country selling it. The golden plates were safely kept till the day the heavenly messenger called for them, when they were delivered into his hands.

The *Book of Mormon* purports to unfold in biblical language the history of ancient America from about the time of the dispersion from the Tower of Babel to the beginning of the fifth century of the Christian era. The first inhabitants were called Jaredites and came directly from Babel. The second race were principally Israelites and came from Jerusalem about 600 B.C. and supplanted the Jaredites. The Saviour made his appearance after his resurrection and gave the gospel to these people. Generations later the Nephites, the principal nation of the second race, were cut off on account of their wickedness; the remnant are the Indians who now inhabit the country. Mormon, a prophet and the last of the Nephite leaders, having written an abridgment of the history, prophecies, and revelations of these various peoples, the abridgment, as completed by his son Moroni, was hidden in the earth, whence it should come forth in the last days and be united with the Bible and thus accomplish the purpose of God. The last days were here, and the prophet had been found in the person of Joseph Smith.

Various theories have been advanced by Gentile writers in attempting to explain the genesis of the *Book of Mormon*. Some writers have conjectured that Sidney Rigdon, an eccentric Disciple minister, was the real deus ex machina and that perhaps he took as a basis a manuscript historical romance written some years before by one Solomon Spaulding, a graduate of Dartmouth, who had been, in turn, preacher, teacher, iron founder, and amateur archæologist. These skeptics assume that Smith could hardly read or write, and think it probable that Rigdon furnished him a manuscript from which Smith read while pretending, behind a screen, to decipher the "reformed Egyptian" hieroglyphics of the Golden Book by the aid of the Urim and Thummim. But no evidence has ever been found that Smith and Rigdon had ever met or had communication prior to the publication of the *Book of Mormon*. The recovery in 1885 of the alleged original of Spaulding's manuscript in Hawaii (now in the library at Oberlin College) has been to Mormons, however, conclusive proof of its nonconnection with their sacred book, for there is no real resemblance between the two.

Critics of the *Book of Mormon* itself declare that, in addition to private affairs inadvertently incorporated, they detect, in scriptural paraphrase, descriptions of the current agitations against Romanism, Freemasonry, infidelity, and even references to the so-called Washingtonian movement for total abstinence. The then widely prevalent theory that the Indians were the lost ten tribes of Israel is also embodied. The Nephites were not merely the modern Indians in disguise, but in their mental habits they are said to resemble local sectarians.

Organization of the Church. According to the Mormon narrative, while Smith and Cowdery were still engaged in the work of translating the *Book of Mormon*, a heavenly visitant, who was none other than John the Baptist, appeared (May 15, 1829) to them and conferred upon them the priesthood after the order of Aaron; and less than a year later the Apostles Peter, James, and John appeared and conferred upon Joseph and Oliver the priesthood after the order of Melchizedek. Thus empowered Smith and Cowdery presently began to preach and baptize. Six members were required by the laws of New York to effect a legal organization. The two elders associated with themselves Hyrum Smith, Samuel H. Smith, Peter Whitmer, Jr., and David Whitmer, and, April 6, 1830, organized at Fayette, N. Y., the religious body that was subsequently (1834) called the Church of Jesus Christ of Latter-Day Saints. (See also Reorganized Church of Jesus Christ of Latter-Day Saints.) Several other persons had been baptized, but only these six were included in the original organization. "Thus was founded," writes the church historian, Orson F. Whitney, "the Church of Jesus Christ of Latter-Day Saints. Thus arose, as a system, what the world terms Mormonism—universally regarded as the most remarkable religious movement of modern times; detested and denounced throughout Christendom as a dangerous and soul-destroying imposture, but revered and defended by its disciples as the wonderful work of the Almighty, the veritable 'marvelous work and a wonder,' foretold by Isaiah and other ancient seers, which was to prepare the world, by the preaching of the restored gospel and the founding of the Latter-Day Zion, for the Messiah's second coming and the advent of the millennium."

The times were favorable for the new church. The land was still filled with doctrinal disputes; denomination set itself against denomination and creed made war on creed. Belief in ghosts and witches still lingered; there was much talk of signs and seasons, God's ways and Satan's ways; stories of visions and miracles were accepted with credulity; the second advent and the millennium were confidently expected by many. In 1831 the fanatic William Miller unlocked the prophetical numbers and with illustrative charts on which were depicted Nebuchadnezzar's image and apocalyptic beasts proclaimed to a doomed world that at some time between March 21, 1843, and March 21, 1844, Christ would appear and summon all on earth to judgment. In 1832 John Jay Shiperd and Philo Penfield Stewart founded the Oberlin colony in

northern Ohio to serve God and to hold property only in His interests. Jemima Wilkinson prophesied at Crooked Lake; the Fox Sisters started spiritualism only 10 miles from Joseph Smith's house; the return of apostolic gifts, of apostolic church organization, of divine recognition, was fervently hoped for by the local Quakers, Primitive Baptists, and Restorationists. It was an American era of revivals, of mental feverishness, of discontent with the hard realities of social existence, of readiness to embrace new ideals and new experiments.

Kirtland-Missouri Period. The Mormon faith soon won converts. Missionaries were sent to neighboring States and to Indian tribes. Locally, however, the new faith aroused little but hostility and derision; but, early in 1831, in obedience to a "revelation," the church removed to Kirtland, Ohio, where Sidney Rigdon had already gathered a communistic congregation. These people proved athirst for the new religion and adopted it with avidity. Converts came from all directions, and the church soon numbered nearly 2000 members. Kirtland soon presented the appearance of a modern Mecca. The prophet, with Sidney Rigdon and others, continued preaching the gospel in the face of all kinds of difficulties. In spite of numerous apostasies, especially in 1836, the faith still spread and revelation followed revelation. In 1833 the presidency of the church, consisting of Joseph Smith, Jr., Sidney Rigdon, and Frederick G. Williams, was organized, and in 1835 the apostolate of 12 was established. In 1837 the first foreign missionaries were sent to England. A temple costing about $40,000 was built at Kirtland, and the people prided themselves in building up a clean and wholesome civic and economic community.

But Kirtland was to be a "stake" only. By revelation it was decided at some time to build a temple at Independence, Jackson Co., Mo., and the place was blessed to this end. But Missourians disliked the religious teachings of the Saints; moreover, they were rendered suspicious by their antislavery notions and by the printing of the *Book of Commandments*, in which Missouri was called "the land of your inheritance, which is now the land of your enemies." "The Mormons must go!" became the general cry. Late in 1833 the Saints were forcibly driven from their Zion and took refuge in Clay, Lafayette, and Van Buren counties. But there, also, they suffered new persecutions, and finally petitioned the State Legislature to assign them a place of residence. The thinly settled region that became Caldwell County was designated, and there the Saints founded the town of Far West. Meanwhile affairs at Kirtland had gone badly. The financial panic of 1837 involved some of the leaders in legal difficulties. Rebellion broke out and, early in 1838, Smith and Rigdon fled to Far West, where, in July, the corner stone of a new temple was laid. Here the tithing system was adopted. New troubles soon arose, however. Gentile mobs attacked the faithful, and the faithful retaliated in kind. The militia were called out. Governor Boggs, long a Mormon hater, issued an order that the "Mormons must be treated as enemies, and must be exterminated or driven from the State, if necessary for the public peace." Throwing law to the winds, the Missourians fell upon the Mormons and forced them (1838) to leave the State. Smith, Rigdon, and other leaders were arrested on a charge of treason and other offenses, but some months later managed to escape. The Mormons vainly appealed to Congress to redress their wrongs.

Nauvoo Period. Upon the rich eastern bank of the Mississippi, in Hancock Co., Ill., a few miles above Warsaw, the oft-harried Saints pitched their tents and solemnly consecrated a place of residence. Here, as by magic, arose Nauvoo, the "Place Beautiful." Saw mills, flour mills, factories, and foundries were soon in busy operation, and for the fourth time a temple was begun. The city grew apace. By 1840, when the Harrison campaign was in full tide, Smith had too many votes at his disposal to be ignored, and Abraham Lincoln, one of the Whig electors, thought it worth his while to see that the prophet and his people had the right kind of political literature. The Saints threw their votes to the Whigs, though, to show their power and keep the Democrats in good humor, they scratched the last name on the Whig electoral ticket and substituted that of a Democrat. The Whig Legislature recognized the substantial aid thus rendered by granting to Nauvoo a charter that clothed the council with almost unlimited power. The bidding for the political support of the Saints was so keen that not a single vote was recorded against the grant of the charter, Stephen A. Douglas lending his dexterous management of the Democratic members. The mayor was both executive and judiciary. Hancock County and its perquisites were ignored, and the Nauvoo Legion was organized and officered, a military force subject to no State authority but the Governor.

It was at Nauvoo, according to the Utah church, that by revelation the institution of polygamy was revived. The *Book of Mormon* had declared, "Behold, David and Solomon truly had many wives and concubines, which thing was abominable before me, saith the Lord," and had forbidden the faithful to have more than one wife. At Kirtland and in Missouri some of the Saints had tried to take a liberal view of the marriage relation, but such tendencies were restrained by the church authorities. At Nauvoo, however, Joseph Smith had a "revelation" (July 12, 1843) in favor of the practice of polygamy, and he and other leaders practiced the doctrine of "celestial marriage" and largely increased their households. Aware, however, that the announcement of such a doctrine to the world would cause a great uproar, the leaders of the church endeavored to keep it secret, and it was not formally promulgated until 1852, when the Mormons were safely ensconced in their desert stronghold beyond the Rockies. Polygamy was not merely permissible, but was urged upon those able to support more than one wife. It was a part of the doctrine that no woman can enter heaven unless sealed "for time and eternity" to some devout member of the Mormon church, and that space is filled with spirits seeking some "tabernacle of clay" by means of which they may attain salvation. Mormons justified polygamy not only because authorized by their prophets, but because it was sanctioned by the Old Testament.

At one time during the Nauvoo period as many as seven of the twelve apostles were engaged in preaching and publishing in England, and in 1842 eight ships were chartered to transport converts to America. By this time the prophet's followers were numbered by the thousands. He

was at the height of his fame. In both secular and spiritual affairs he was looked to as a leader, and, as the culmination of his interest in civic, political, and economic questions, he announced himself (February, 1844) a candidate for the presidency of the United States. His position, however, was not without danger, and the seeds that were to result in his destruction were already germinating. In the spring of 1842 Governor Boggs was shot and wounded, and suspicion turned against Smith as the instigator of the crime. He was arrested, but was freed by the municipal court on a writ of habeas corpus, and all attempts to take him to Missouri for trial failed. John C. Bennett, whom the people had made mayor of Nauvoo and major general of the legion, withdrew from the church and began a vindictive attack upon its members. The Gentile neighbors felt that the legion menaced the peace of Illinois, and it was said that the Saints expected to conquer Missouri and ultimately the whole country. Newspapers took up the anti-Mormon movement; Democrats and Whigs, who in turn had secured the votes of the Saints, looked upon them as uncertain allies and dangerous enemies; the orthodox churches stood in solid phalanx against the new doctrine.

The plural-wife doctrine stirred up considerable opposition among the Mormons themselves, and a number of prominent members, including Dr. R. D. Foster, William and Wilson Law, and Sylvester Emmons, decided to establish a newspaper in Nauvoo to combat the new order of things. In its first and only number the *Expositor*, as the paper was called, denounced (June 7, 1844) polygamy openly, condemned Smith's political aspirations as preposterous, and demanded reforms. The paper was suppressed by Mayor Smith and the city council as a public nuisance, the press was broken up, the type was pied, and all that was combustible was burned. This act precipitated a Mormon catastrophe. The owners of the *Expositor* obtained a writ at Carthage, Ill., for the removal to that place of Smith and the Nauvoo council on a charge of riot. When the writ was presented the Nauvoo municipal court granted a writ of habeas corpus, and a Mormon justice of the peace heard the case and discharged (June 17) the accused. But public indignation ran high among the Gentiles about Nauvoo, and a movement began to drive out the Saints. Both sides took up arms. The prophet started to flee to the West, but decided to return, and with his brother Hyrum was lodged in Carthage jail on a charge of treason. About 1200 militia gathered in Carthage, while another large force assembled at Warsaw. Governor Ford, who had pledged the prophet protection, ordered the militia to disband, with the exception of three companies, two of which were to guard the jail, while the third accompanied the Governor on a trip of investigation to Nauvoo. When Ford left Carthage a mob composed of militiamen and a few Missourians easily overpowered the not unwilling prison guard of nine men and battered down the door behind which the prophet and his brother were confined with two friends, Taylor and Richards, who were voluntarily bearing them company. Hyrum Smith was instantly killed; Taylor was disabled; the prophet, seeing that the end had come, defended himself valiantly with a six-barreled pistol. After wounding three of his assailants and being severely wounded himself, he ran to the open window and leaped into the yard below. There the mob completed their bloody work.

Brigham Young and the Migration to Utah. Most of the Mormons accepted the leadership of Brigham Young. Young was a native of Whitingham, Windham Co., Vt., and at the time of the prophet's death was 43 years old. In his youth he had worked as a farmer, carpenter, painter, and glazier, and received little education. He embraced the Mormon faith in 1832 and gradually rose in authority, until, in 1839, he became president of the quorum of 12 apostles, to whom Smith is said to have given his "keys" of presidency. Young conducted the driven Saints successfully from Missouri to Illinois, and in the crisis following the prophet's death was hailed as head of the church by the people and later was sustained as president of the church according to the practice that the head of the 12 apostles should become president of the church on the death of the former president. Possessed of exuberant vitality, confident in himself and his cause, Young was gifted with great wisdom. It was well for the Saints that it was so, for their church had fallen upon perilous times. In January, 1845, the Nauvoo charter was repealed, and popular hostility continued so bitter that the Mormons agreed to leave the State the following spring. The property that could not be carried away was sold for what it would bring, or abandoned entirely; great numbers of wagons were built, tents and wagon covers made; wheelwrights, carpenters, and blacksmiths were busy day and night. Early in 1846, harried by their enemies, driven almost at the point of the sword, the Saints turned their backs upon the just completed temple, crossed the Father of Waters, and went their way westward "in pursuit of the ever-mocking phantom of home." The emigration of so many people was necessarily a slow one. The following winter found them scattered from the Mississippi to the Missouri, their main encampment being on the eastern bank of the latter river at the winter quarters now called Florence. On the way the men had hunted, had worked for the Iowa people, and at some of the camps had raised crops of corn. Naturally there was much suffering, especially from hunger and ague, but the march was well regulated, and the leaders did all in their power to keep up the spirits of their people. Dances were frequently held, and "the visiting Iowans looked on in amazement, to see these exiles from comfortable homes enjoying themselves on the open prairie, the highest dignitaries leading in Virginia reels and Copenhagen jigs." The Mexican War had begun that year, and over 500 of the Mormons volunteered and accompanied Col. Stephen W. Kearny (q.v.) to Santa Fe and California. The bounty money paid these men was mostly turned over to their brethren and proved of great assistance.

In April, 1847, a pioneer band composed of 143 men, three women, and two children set out under the leadership of Young to select a place for new homes. On June 26 they reached South Pass. On July 21 Erastus Snow and Orson Pratt, who were in advance, caught sight of Great Salt Lake and broke into loud hosannas. Next day an advance party camped on the site of the present Salt Lake City and sent back word of their discovery to Brigham Young. "We found the land so dry," says Snow, "that

to plough it was impossible, and in attempting to do so some of the ploughs were broken. We therefore had to distribute the water over the land before it could be worked." To many of the Saints the aspect of their Promised Land was discouraging, for it was a desolate, treeless plain, with sagebrush almost the only vegetation. Nevertheless, when the Mormon leader reached a point on Big Mountain whence he could survey the valley, he recognized its possibilities and said: "It is enough. This is the place."

Crops were planted, a town that was named Great Salt Lake City was laid out, a temple site was selected, and a fort was built. Members of the Mormon battalion who had followed Kearny rejoined their brethren from time to time. A party that had gone from New York by way of Cape Horn and California journeyed thither across the Sierras. The Saints who had been left behind by the pioneer expedition came to Utah in well-organized companies, and before the end of 1848 the population of the valley numbered more than 5000. At first there was much suffering from lack of food, clothing, and shelter; plagues of crickets and locusts threatened the crops; but soon there was an abundance for all. The discovery of gold in California and the wild rush across the plains that followed enabled the thrifty Saints to sell their surplus produce at high prices, while some of them grew rich as carriers of the gold seekers and their goods. Missionary work was continued abroad, and a fund was established for assisting poor converts to Utah. Some hundreds of the immigrants made the long journey from the Missouri, pulling handcarts containing their young children and worldly possessions. Many died on the way. By 1852 the population was variously estimated at from 25,000 to 30,000.

On March 10, 1849, a convention adopted a constitution for a State to be called Deseret (the honeybee). Two days later a provisional government was organized with Brigham Young as Governor. The general assembly met in July and sent a memorial to Congress asking for admission to the Union. The plea was refused, the Territory of Utah was organized instead, and Young was appointed Governor. Some feeling of ill will grew up between the non-Mormon members of the government and the Mormons. Outside of Utah opposition to Mormonism was greatly increased by Young's publication in 1852 of Smith's "revelation" on the eternity of the marriage covenant, including plurality of wives. The Republican National Convention of 1856 proclaimed it "the duty of Congress to prohibit in the Territories those twin relics of barbarism—polygamy and slavery." Soon after his inauguration President Buchanan directed the organization of a military force to march to Utah and uphold the Federal authority, and appointed Alfred Cumming of Georgia to succeed Young. In his message to Congress he declared (Dec. 8, 1857) it "sufficient to say that all the officers of the United States, with the single exception of two Indian agents, have found it necessary for their own safety to withdraw from the Territory, and there no longer remained any government in Utah but the despotism of Brigham Young." But the information on which President Buchanan based his message was found by government officials themselves to be incorrect. By many in the East it was believed the Mormon issue was brought up to take attention from the slavery question. The military expedition, led by Col. Albert Sidney Johnston (q.v.), reached the borders of Utah in the fall of 1857 and spent the winter encamped among the mountains. On September 11 occurred, about 300 miles south of Salt Lake City, the famous Mountain Meadows Massacre (q.v.), news of which was a long time in reaching the East. A conflict between the Mormons and the troops seemed probable, and the Mormons did, in fact, destroy some supply trains; but in the spring of 1858 Cumming was peaceably installed as Governor and the so-called Mormon War came to an end.

Brigham Young was never again Governor, yet such was his influence as head of the church that he usually managed to dominate the affairs of the Territory. Young died in 1877, leaving a fortune valued at about one million dollars. Some observers had prophesied that after his death Mormonism would decline, but it caused no more change "than does the death of a pope in the Church of Rome." Young's character has been variously interpreted. Mormon writers represent him as a wise and able patriarch, steadfast in adversity, who led his people out of the Valley of Despair into the Promised Land and there acted as their faithful guide and counselor. Whatever may be the differences of opinion concerning his private life or his religious beliefs, historians are united in considering him as the greatest colonizer of modern times.

Crusade against Polygamy. Agitation against polygamy resulted in the passage by Congress in 1862 of the Morrill Act, directed against the practice, but nothing practical was accomplished by this legislation. The Cullom Bill of 1869 was opposed by Delegate Hooper of Utah on the ground that the Mormon views of the marriage relation were an essential part of their religious faith and therefore secured by constitutional guarantee against infringement. In 1871 indictments were found against Young and others for lascivious cohabitation, but only an Englishman named Thomas Hawkins was convicted. The Poland Act of 1874 declared the common law in force in Utah, placed all civil, chancery, and criminal cases under the jurisdiction of the Federal courts, empowered the United States marshals to draw the grand and petit juries, and provided that in cases of adultery, bigamy, or polygamy, a juror could be challenged if he practiced polygamy or believed in its righteousness. By the aid of this law George Reynolds, private secretary to Brigham Young, was convicted of bigamy, and when the case was appealed to the Supreme Court, that body ruled that religious belief cannot be accepted as justification for an overt act made criminal by the law of the land. In 1882 the stringent Edmunds Law forbade polygamy under heavy penalties and provided that no polygamist should be allowed to vote in any Territory or to hold office under the United States. An amendment to this law (1887) strengthened it in several particulars and dissolved the corporation known as the Church of Jesus Christ of Latter-Day Saints. Within two years after the passage of the Edmunds act about 12,000 voters were disfranchised; and within eight years 468 persons, mostly in the rural districts, were convicted of polygamy or unlawful cohabitation. Many Mormon leaders went into hiding or fled from the Territory. At first the

church vigorously opposed the enforcement of the law, one argument much used being that the law broke up existing families. But in 1890, when the Supreme Court had affirmed the decision of the lower court confiscating the property of the church and declaring the church to be an organized rebellion, the fourth president, Wilford Woodruff, issued a manifesto advising Mormons "to refrain from contracting any marriage forbidden by the law of the land." In 1893 President Harrison issued a proclamation granting amnesty and pardon to all persons liable to the penalty of the Edmunds Law who had abstained from violating it since Nov. 1, 1890, but on condition that they should in future obey the laws of the United States. Three years later, after having repeatedly applied for admission for nearly half a century, Utah was admitted to statehood, but the enabling act stipulated that "polygamous or plural marriages are forever prohibited." Whether this restriction would be adjudged constitutional is doubtful, but the prohibition was incorporated into the State constitution as well. Congress passed an act restoring the confiscated property to the church.

In 1898 Brigham H. Roberts, who was known to be a polygamist, was elected to the national House of Representatives, but was refused a seat. When in 1903 the Utah Legislature elected Reed Smoot to the United States Senate, a determined effort was made to deprive him of his seat. Smoot was a monogamist, but he was an apostle of the church, and charges were filed against him on the ground that the first presidency of the 12 apostles, as a body, "has not abandoned belief in polygamy . . . on the contrary, as the ruling authorities of the church promulgate in the most solemn manner the doctrine of polygamy, etc." The inquiry developed some interesting facts concerning polygamy, and the sixth president of the church, Joseph F. Smith, admitted on the witness stand that he had continued to live with his four wives since the manifesto of 1890 and that they had borne him children since that date. Smoot himself emphatically denied that he had taken any obligation as a Mormon apostle that was inconsistent with his oath as Senator, and submitted figures to show that polygamy was on the decline. After a long investigation the Senate voted (Feb. 20, 1907) not to unseat him, and constitutional lawyers are generally agreed that the decision was a correct one. According to the census of religious bodies made in 1906 by the United States government and published in final form in 1910 the number of communicants embraced in the body of Latter-Day Saints in 1906 was 256,647. In 1890 the number of communicants was 166,125, showing an increase from 1890 to 1906 of 90,522, or 54.5 per cent.

The Mormon church had in 1915 a following of about 500,000 souls. Of these the majority are in Utah, but there are many in Idaho, Arizona, Wyoming, Colorado, and other States. There are also colonies in Mexico and Canada, besides members in every civilized country of the world. Many converts to the faith are made every year in foreign lands and in the United States. The Mormon church as an organization does not enter into politics. Its members, however, take an interest in political and civic problems. It may appear to the outside world that the hierarchy of the church dominates in political affairs because of the fact that every man holds some office in the priesthood which he bears. However, every man is free to take part in politics and to join any national political party that he wishes. The great national parties, Democratic and Republican, have at different times been successful at the polls in Utah.

In November, 1911, an election was held in Salt Lake City under a new commission form of government. In this election the American party's candidate for mayor was defeated by the candidate supported by the Citizens' ticket. It may be inferred, therefore, that the charge often made that Mormons invariably control political matters in Utah is not sustained by the results of these elections.

The Mormons in Utah. The notable industrial and social developments which have accompanied the upbuilding of the Mormon body politic have, perhaps, been too little noticed by non-Mormon writers. Prof. Levi Edgar Young, of the University of Utah, contributes the following account of the industrial, educational, and economic progress of the Mormon people from their beginnings to the present time.

The Mormon people arrived in the valley of the Great Salt Lake July 24, 1847. Here was begun the building up of a united social, economic, and political organization, which in time produced a splendid type of intellectual society and a solid foundation for a prosperous State. The settlers of Utah were a distinct type of authoritative society, accepting as right a prophet and leader who to them has divine authority. It is a demo-theocratic government, for all its people have perfect freedom, politically, socially, and intellectually.

Agriculture became the principal pursuit, and the desert waste was transformed into beautiful private gardens. Agriculture became from the first the keynote to Utah's history and development. Then came manufactures, such as iron foundries, leather, starch, cotton, woolen, shoe, and sugar factories; but those engaged in manufacturing did not lessen the number of hands engaged in the raising of wheat, corn, alfalfa, and potatoes. The modern system of irrigation was used, the first in American history.

In 1850 Millard Fillmore signed the act creating the Territory of Utah, and appointed Brigham Young Governor. Every village in Utah was the distinct Teutonic type of town government. Every town was systematically laid out, with broad streets and walks. This system implied an abundance of land, and the head of each family owned his own home. In the town meeting all the people met to discuss the affairs pertaining to the entire community—the moral, economic, political, and religious. These towns have grown into beautiful cities.

The Mormon people established in Utah the first university west of the Missouri River, as well as the first newspaper, and as early as 1851 established a public-school system. In 1852 they built a theatre, and in 1862 the Salt Lake Theatre was opened, which was the first of its kind in the West. The Mormons built edifices, now world-famed, such as the famous temple and tabernacle at Salt Lake City. They have maintained with the State school system splendid denominational schools, and in every ward, about 700 in number, there are to be found literary societies for the youth that have a wide influence in creating a high educational standard. In 1850 a library of books, worth $5000,

was brought across the plains by ox teams. From that day to the present there have been libraries in the towns and cities of Utah.

In 1862 the overland telegraph was completed to Salt Lake City, and the first message flashed over the wires from Utah was to Hon. J. H. Wade, president of the Pacific Telegraph Company, and was signed by Brigham Young. It read: "Utah has not seceded, but is firm for the Constitution and laws of our country."

In 1850 the first territorial legislature met in Salt Lake City, and during the session a memorial was drawn up asking Congress to construct a transcontinental railroad. A few years afterward, 1869, the Union Pacific and Central Pacific roads were completed, a work in which the people of Utah took an active part.

To-day the economic, social, and intellectual condition of the State is up to the standard demanded by the best of Americanism.

Doctrines and Hierarchy. According to the present official handbook, the religion of the Latter-Day Saints consists of doctrines, commandments, ordinances, and rites revealed from God to the present age. The first principle is faith in God and in Jesus Christ; the next is repentance from all sin; then follows baptism for the remission of sin, as a preparation for the Holy Ghost, bestowed by the laying on of hands. Obedience to these principles is necessary to membership in the church. There having been no communication with heaven for hundreds of years, the world was without divine authority to administer gospel ordinances until Joseph Smith, who was ordained to the lesser or Aaronic priesthood and to the higher or Melchizedek priesthood, received the holy apostleship and the keys of the kingdom with power to seal on earth so that it might be sealed in heaven. Revelations for the whole church are given through its president, who is its earthly head and holds the keys of the kingdom.

Among the later revelations of the church are the doctrines of baptism for the dead and celestial marriage. As there was no authority among men to administer the ordinances of the gospel from the days of the early apostles or shortly after to the time of the restoration of the priesthood to Joseph Smith the prophet, all the baptisms during the intervening period were void. Friends of the dead, however, are permitted to take their names and be baptized in their stead. Other ordinances may also be admitted by proxy, the living in behalf of the dead. According to the revelation on celestial marriage, all unions entered into without divine authority are dissolved by death. Celestial marriage is marriage unto all eternity and is entered into by those who have obeyed the gospel and become the sons and daughters of God by adoption. The woman is given to the man, and they become one flesh. That which is thus sealed on earth is sealed in heaven, and is as valid as though performed in person by the Deity. Wives thus sealed to a man, and their children by him, are his in heaven after the resurrection.

The Mormon hierarchy is as follows: Joseph Smith and Oliver Cowdery were the first two elders and apostles in the church. Smith, who bore the title of prophet, seer, and revelator, stood at the head of the Melchizedek priesthood, of which three presiding high priests, chosen by the body, form a quorum of the presidency of the church. The president of the church and his two counselors form the first presidency. The twelve apostles form a quorum equal in authority and power to the three presidents. The twelve are a traveling presiding high council, under the direction of the presidency of the church, to build up the church and regulate its affairs in all nations. The seventies are also called to preach the gospel and form a quorum equal in authority to that of the twelve. The seventy elders have seven presidents to preside over them, chosen out of the seventy. There are now 192 of these quorums of seventies. In addition to these officers of the Melchizedek priesthood are high priests and elders. The officers of the Aaronic or lesser priesthood are priests, teachers, and deacons. In 1915 there were 71 "stakes" of Zion in the church. Over each stake there is a presidency consisting of a president and two counselors, who are high priests. This presidency bears the same relation to the stake that the first presidency bears to the whole church. A high council in each stake, consisting of twelve members, who are also high priests, acts for the stake as the traveling presiding high council acts for the church in all the world. It is the province of the high priests to preside, while the special calling of the seventy is to travel and preach the gospel and build up the church. See Reorganized Church of Jesus Christ of Latter-Day Saints.

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MORMYRIDÆ (Neo-Lat. nom. pl., from *Mormyrus*, from Gk. μορμύρος, *mormyros*, sort of sea fish). A family of malacopterous fishes, allied to the pike family, but according to Cope forming a separate group, Scyphophori, having rather long, compressed bodies and a slender tail, swelling out at the origin of the caudal fin. The skin of the head is naked, envelops the gill covers and gill rays, and leaves only a slit for gill opening, and the color is dark. The mouth is small. All the dozen or more species inhabit the rivers of northern Africa and are nocturnal in their activities. The beaked or sharp-nosed mormyrus (*Mormyrus petersi*) is regarded as one of the best fishes of the Nile and is distinguished by the production of the lower jaw into an elongated fleshy appendage. It is caught by lines baited with worms, and is represented on many Egyptian monuments.

MORNAY, môr'nâ', PHILIPPE DE. A Huguenot statesman. See DU PLESSIS-MORNAY, PHILIPPE.

MORNING-GLORY. Various species of *Ipomœa*, especially *Ipomœa purpurea*, cultivated for their large funnel-shaped, diversely colored flowers, which open in the early morning and close during the heat of the day. The garden varieties are propagated from seeds sown in sunny situations in ordinary garden soil. Their large and abundant, roundish heart-shaped leaves make an excellent screen, the vines often attaining a height of 10 feet or more by midsummer. See CONVOLVULUS; IPOMŒA; and Plate of DICOTYLEDONS.

MORNY, môr'nê', CHARLES AUGUSTE LOUIS JOSEPH DE, DUKE (1811–65). A noted French politician of the Second Empire. He was the illegitimate son of Queen Hortense and of the Comte de Flahault, and consequently half brother to Louis Napoleon (later Napoleon III). He was born in Paris, Oct. 23, 1811. The secret of his parentage was well kept for a time and the Comte de Morny received 800,000 francs to adopt him; but he was educated by his grandmother, Madame de Souza-Flahault; and Queen Hortense left him at her death, in 1837, an annuity of 40,000 francs. Morny took a nominal part in the revolution of July, 1830, and entered the army in 1832 as a sublieutenant. He served with some distinction in Algeria, being made a Chevalier of the Legion of Honor; but he soon abandoned military life and in 1838 made his appearance as a manufacturer of beetroot sugar and published a pamphlet on the subject. From that time he was involved in all sorts of commercial and financial speculations. Chosen a deputy in 1842, he became the leader of fashion at Paris, but his financial schemes began to go wrong, and after the revolution of 1848 he attached himself to the cause of his half brother and was one of the prime instigators of the subtle and treasonable policy which culminated in the *coup d'état* of 1851. The morning after the deed was done Morny was made Minister of the Interior. This office he soon resigned, however, and in 1854 he became President of the Corps Législatif, and was Ambassador to Russia during 1856–57, where he married the rich and handsome Princess Troubetzkoi. Morny was created Duke in 1862, and continued his gay and extravagant life up to the time of his death on March 10, 1865. His character was sketched by Alphonse Daudet, who was his secretary, as the Duc de Mora in *Le nabab*. An extract from his memoirs appeared under the title *Une ambassade en Russie* (1856). Consult: De la Guerronière, *Etudes et portraits politiques* (Paris, 1856); Castille, *M. de Morny* (Paris, 1859); A. L. Imbert de Saint-Amand, *The Court of the Second Empire* (Eng. trans. by E. G. Martin, New York, 1898); F. A. Loliée, *Le duc de Morny, the Brother of an Emperor and the Maker of an Empire* (Eng. trans., ib., 1910).

MORO, mō'rō. All the inhabitants of the Philippine Islands who profess the Mohammedan faith are known as Moro. In reality they constitute several tribes with wide variation in dialects and lesser differences in customs and degree of civilization. Some of these people live in settled villages on or near the coast, along rivers or about the shores of lakes, where, in addition to their universal industry of fishing, they carry on a little farming and some manufacture in cloth, brass, and steel. From these, who form the highest type, they grade down to the so-called sea gypsies, who wander from place to place, often living for months in their rude outrigger boats. The Moro is essentially a warrior and makes war on slight provocation. He is not an open, fair fighter, but resorts to cowardly means of attack, and often exhibits great cruelty towards his captives.

Their homes are raised high on poles, often near or above the water. The timbers are lashed together with rattan, and the sides and roof are made of palm leaves sewed together. The furnishings of the average home are very scant, but the *datos*, or men of wealth, often have quantities of brass and other valuable objects on display.

Polygamy is sanctioned by their religion and is universal. Slavery is also a recognized institution and the desire for slaves is one of the chief incentives for raids against neighboring tribes. Since these captives soon became merged into the population, a large element of foreign blood has thus been introduced. Chinese and Arabian traders who have settled on the coasts have also influenced the physical type, as well as culture.

The government is patriarchal, the most prominent member of the order being called a *dato*, *sultan*, or *rajah*. He has extensive powers over his followers, who may vary from a

few dozen to several thousand. Nominally the Sultan of Sulu is the supreme ruler of this people, but his actual power outside his personal following is very small.

The greater part of this people are now found in the island of the Sulu Archipelago, southern Palawan, and the districts bordering on Lakes Lanao and Baluan, the banks of the Cottabato River, and the northwestern and western coasts of Mindanao.

Consult N. M. Saleeby, *History of Sulu* (Manila, 1908). See PHILIPPINE ISLANDS.

MO'ROC. See HONEY GUIDE.

MOROCCO, mŏ-rŏk'ō, or **MAROCCO,** called by the natives *Maghrib el Aksa* (the extreme west) or briefly *Maghrib.* An empire or sultanate in the northwest of Africa, under French protection, bounded on the east by Algeria and on the north and west by the Mediterranean Sea, the Strait of Gibraltar, and the Atlantic Ocean. It extends southward into the Sahara, but the boundary in that direction is not exactly determined (Map: Africa, D 1). The Treaty of 1912 gave the French protection over 95 per cent of the country, the Spanish over about 5 per cent, and left about 140 square miles about Tangier as an international zone. Recent estimates give Morocco 219,000 square miles.

Topography. The country is generally mountainous, the Atlas (q.v.) Range, which attains an elevation of nearly 15,000 feet, traversing it in several parallel chains from southwest to northeast, separating the Saharan waste from the more arable land along the Mediterranean, and sending out numerous spurs to both the coast country and the desert. There are, however, many level tracts, especially at the western and eastern extremities and on the borders of the desert. Through the heart of north Morocco extending east and west is a depression, passing just north of Fez, the northern capital, to Oran, Algeria. The central range of the Atlas forms the water parting, separating the streams which flow into the Atlantic and Mediterranean from those which run southward to the desert. The former rivers have the shorter course and less volume, but they are perennial; while the latter become dry in summer, and even when running are lost in the sands of the Sahara. The chief river is the Muluya, with its tributary the Sharef, which drains the northeast of the country and falls into the Mediterranean after a course of 400 miles. The Muluya is of much commercial importance. The Sebu was found in 1905 to be navigable for light boats from the Atlantic to near Fez, 125 miles. The Kus, Bu-Regreg, Um er-Rabia, Tensift, Sus, and Assaka drain the central and western districts and fall into the Atlantic; the Dra, Ziz, Ghir, and other streams irrigate the dry plains of Tafilelt, the first mentioned emptying into the Atlantic Ocean. The other rivers are lost in the desert. All the rivers flowing to the sea are obstructed at their mouths by sand bars, some of which, the French found in 1905, may easily be removed.

Climate. The climate between the central range of the Atlas and the sea, under the influence of marine winds, is temperate, the thermometer seldom falling lower than 40° F., or rising above 90° F., and during the winter months the westerlies bring to this area 20 to 30 inches of rain; but in the southeastern districts extremes of heat and cold prevail and rain is there unknown. The entire country is very healthful and has been recommended and used as a health resort. Malaria, the pest of the other Atlas lands, is almost unknown. Good pasturage is found as far south as Cape Juby, along the Atlantic coast; but dryness prevails throughout the Atlas region, though the winter precipitation covers the mountain tops with snow. This fact, together with the infrequence of wide valleys, makes the mountain region unfavorable for a large population. The settlement among the mountains is confined to the valleys where irrigation is possible and to the lower slopes. In the Saharan steppes cultivation is impossible, excepting in the many small oases where streams, fed by the mountain snows, bring surface or underground supplies of water.

Flora. The flora is richer in flowers and shrubs than in trees. The forests that once covered western Barbary have disappeared and Morocco is largely a treeless country, though some well-wooded valleys are found among the northern ranges. The cedar, mimosa, cypress, and cork oak have commercial value. The date and oil palms, the fig tree, pomegranate, oranges and lemons, apricots, peaches, the almond, and other varieties of fruit and nut trees are all important.

Fauna. The wild animals include the leopard, bear, hyena, and wild hog. The bustard, partridge, and waterfowl abound. The domestic animals comprise the dromedary and the horse, both bred extensively, and mules, asses, cattle, fat-tailed sheep, and goats.

Mineral Resources. The country is rich in iron ore, antimony, and rock salt (north of Fez), and gold and silver, as well as other minerals, are reported. Native hostility has hitherto prevented European enterprise from developing these resources to any considerable extent.

Agriculture. Agriculture and stock raising are almost the only industries. The alluvial soil of the wide plains of the west and east is especially adapted to the cultivation of cereals, and could be brought to a high degree of productiveness by the application of modern agricultural methods. In 1904–05 the French sent several expeditions inland from the Atlantic to study resources, and their reports emphasize earlier ideas as to the value of agricultural and grazing prospects. The chief agricultural products, besides wheat, barley, and other cereals, are olives, dates, oranges, figs, and other kinds of southern fruit, as well as numerous varieties of vegetables. Cotton and sugar cane, once extensively cultivated, have now entirely disappeared, and the cultivation of tobacco is greatly hindered by the adverse sentiment towards its use. The manufacturing industries of Morocco are chiefly devoted to the production of leather, pottery, textiles, including carpets, metal goods of copper and brass, and silver filigree. Fezes are chiefly imported from Austria.

Commerce. The chief exports are hides and skins, barley, wheat, eggs, wool, almonds, cattle, etc. Imports include cotton goods, sugar, tea, provisions, hardware, etc. Purchases of clothing stuffs and metal wares from Europe are constantly increasing. The commerce with Europe is carried on through the ports of Tangier, Tetuan, Laraish, Rabat, Mogador, Mazagan, Casablanca, and Safi, all of them, with the exception of Tetuan, situated on the Atlantic. Fez in the north and the city of Morocco in the south are the centres of the interior caravan trade. The commercial statistics of the country are very

incomplete, but the value of the trade passing through the ports in 1911 was: imports 94,279,000 francs, exports 83,600,000 francs; in 1912, imports 152,497,000 francs and exports 75,047,000 francs. In recent years the foreign trade has shown a tendency to increase. In 1912 imports from and exports to the United Kingdom were valued at 50,725,000 and 15,617,000 francs respectively; France, 49,953,000 and 15,540,000; Germany, 13,209,000 and 17,839,000. As wagon roads and bridges are unknown, commodities can be moved only at large expense.

Government. By the Franco-Moroccan Treaty of March 30, 1912, the Empire of Morocco became a French protectorate, excepting Tangier with surrounding territory, which, nominally Moroccan, became an "international sphere," and excepting the "Spanish zone" in the north, which, together with Ifni, on the coast at the south, was recognized by France in the Franco-Spanish Treaty of Nov. 27, 1912. The shereefian government continues, subject to the control of the French and Spaniards in their respective territories. The French administration, whose seat is at Fez and whose head is the resident commissioner general, may veto any loan or concession, control the relations of natives with foreigners, etc. It is under the Foreign Office at Paris. The Spanish zone is administered, under the control of a Spanish high commissioner, by a khalifa chosen by the Moorish Sultan from two candidates named by the Spanish government.

Prior to the establishment of the French and Spanish protectorates Morocco was an absolute despotism, under a sultan supreme alike in temporal and spiritual affairs. For some years, however, the Sultan and his officials had been subjected to strong external influence, and in 1906 an agreement was concluded between the interested European powers, together with the United States, and the Sultan, which provided for a Moorish police force under command of provincial governors assisted by French and Spanish officers, for a state bank, for tax reform, for purchase of land by foreigners, for certain modern methods of government, etc. The revenue (for which no reliable statistics were available) was derived from monopolies, taxes, customs, and gifts. Taxes were collected with little system, each taxgatherer being obliged to deliver a certain sum regardless of the amount collected. Refusal or reluctance to pay taxes was often followed by harsh measures—reprisals or punitive expeditions. An impartial and well-regulated system of administration of justice was naturally out of the question. The evidence of a Jew or a Christian against a Mohammedan was considered invalid by the native judges. The army of the Sultan in the French protectorate is under French control.

Army. The army was being reorganized in 1915 by the French and was under the command of a French general. Service was to be compulsory, substitution being permitted, and for a period of four years. The garrison at Fez was to consist of two battalions of infantry, two squadrons of cavalry, and a mountain battery. In addition to this garrison, there are nine battalions of infantry, five squadrons, four mountain batteries, one engineer battalion, and certain staff or administrative troops. Companies, squadrons, and batteries are commanded by French officers, a certain proportion of the noncommissioned officers also being French. In 1915 the compulsory feature of service had not become an accomplished fact but was being gradually introduced among the many different tribes composing the population.

Population. Estimates of the number of inhabitants vary widely; the population is often stated at 5,000,000 to 10,000,000, though undoubtedly the latter figure is much too large. One of the most recent estimates is as follows: in the French protectorate, 3,000,000; in the Spanish protectorate, 404,000; in the territory of Tangier, 60,000; total, 3,464,000. The aboriginal Berbers, who dwell in the mountainous districts but whose blood is more or less interfused in the population as a whole, form the most numerous and important race. Arabs inhabit the plains; here also, as well as in the towns, dwell the "Moors," a mixture of Berber, Arabic, and often other elements, and Arabic in culture. There are probably about 150,000 Jews; the Spanish-speaking Jews are the most progressive and prosperous element in the population. There is a considerable negro and mulatto population. Europeans number about 20,000. Education is in a very backward condition, though most males have an opportunity of learning to read the Koran. Excepting the Jews, the natives are among the strictest of Mohammedans. The native capitals are Fez (with over 100,000 inhabitants), Morocco (about 80,000), and Mekinez (about 24,000).

History. Morocco was a Roman province, called Mauretania, and shared in the vicissitudes of the other Roman provinces of northern Africa during the decline of the Empire. It was reached by the tide of Arabian Mohammedan invasion, in 682, but was reduced to submission and to Mohammedanism only after a spirited resistance. Its people participated in the conquest of Spain. For a number of centuries its history is the rise and fall of successive dynasties, of which the most celebrated were the Almoravides and the Almohades (qq.v.), who passed over into Spain and established their power in that country. In fact, during the later Middle Ages Morocco was the source whence new reënforcements were constantly drawn for the declining power of the Moors in Spain. Moorish dominion in Spain came to an end in 1492 with the surrender of Granada to Ferdinand and Isabella by Sultan Boabdil el Chico, and Morocco began to gain strength as an empire through the accession of the Spanish Moors and Jews. Since 1213 the country had been under the reign of the Beni Marin Berbers, who retained their hold until 1524. Then followed the unimportant Saadi period, lasting to 1550, in which year began the dynasty of the Hassani Shereefs, who reigned until 1649. The most important event of this period was the "Battle of the Three Kings" at El Kasar el Kebir in 1578. The deposed Sultan, Mohammed XI, had called upon the Portuguese for aid against the reigning Sultan, Abd el Malek. With 17,000 troops Dom Sebastian, of Portugal, marched upon El Kasar, accompanied by Mohammed XI. The forces of Dom Sebastian and Mohammed XI were annihilated, and all three rulers lost their lives. This battle ended Portuguese influence in Morocco and greatly strengthened the Empire. In 1577 the first foreign ambassador appointed to Morocco was accredited by the English Queen to the "King of Marucos and Fesse." In the same year Henry III of France created a consulate of Morocco and Fez. The Filali period began in 1649 and still continues in the present Sultan. In 1662 the

English occupied Tangier. The city was abandoned in 1684 because of the continuous assaults of the Moors and the interference of home politicians. This evacuation was considered by the Moors to be the most glorious victory of the Sultan, Mulai Ismail, who was one of the most notable of Moorish sultans. His death threw the country into a state of anarchy which lasted for several decades. In 1787 was signed the first treaty between the United States and Morocco, Washington and Mohammed XVIII being the signatories. In 1781 the first United States Consul to Morocco was appointed. War was declared by Morocco upon the United States in 1802 because of the war of the United States with Tripoli. Peace was declared by the Sultan before the news of this declaration reached America. In the seventeenth century the Moorish Empire included most of what is now Algeria and extended south to Guinea. The continuous breaking off of pieces of territory by European nations has reduced it to its present area of about 250,000 square miles, with the southern boundary undefined. Stimulated by the success of Abd el Khader in Algeria the Sultan Abd er Rahman in 1830 entered into negotiations with him and made an unsuccessful attempt to seize the city of Tlemçen, on the Morocco-Algerian border. The resultant treaty with France, which Abd er Rahman signed in 1832, included a clause promising that he would in no way support or communicate with Abd el Khader. When Abd el Khader sought refuge in Morocco in 1844 the French used this act as a reason to occupy the town of Oujdah. Tangier and Mogador were bombarded by the French, and finally the Moors were defeated at the battle of Isly. A treaty of peace followed. A few years later, owing to the differences which had arisen as a result of the loose provisions of the treaty, the French bombarded the port of Sallee. Thereupon their demands were granted. In 1880 a conference of the European powers took place in Madrid for the purpose of establishing the status of foreign residents and the rights and duties of foreign diplomatic and consular representatives in the Empire of the Moors. The code drawn up by this conference was a wise one, and its provisions operated for peace and prosperity up to the time of the Algeciras Conference in 1906. Unlike the Act of Algeciras, it was designed for this purpose. The rapid development of Algeria and the gaining of Tunisia stimulated French interest and gave rise to the dream of a vast North African empire. The development of trade routes in Algeria, which extended into Morocco, had shown France the desirability of this western empire of Islam. Coupled with this was added confidence in her diplomatic ability and in the possibility of coming to an understanding with England concerning African colonial affairs. Undoubtedly the contact between the English and French statesmen brought about by the Egyptian affair made France the gainer by at least a hint concerning what England would permit in Morocco. In 1894 Mulai el Hassan III died, and his son, Mulai Abd ul Aziz, came to the throne. The new Sultan had certain marked leanings towards European standards. These were held in check by Bu Hamed, his Grand Vizier, who had been the chief adviser of his father. But in 1900 Bu Hamed died, and the young ruler was free to attempt to introduce European standards into the administration of the country. A certain portion of the populace objected to this procedure, realizing that it placed their country more at the mercy of European exploiters and took it farther away from Islamic standards. By supporting the Sultan, France permitted the opposition against him to become overwhelming. In the latter part of 1893 trouble broke out between the Rîf tribesmen and the Spanish forces, as a result of which the Moorish government was forced to pay Spain an indemnity of 20,000,000 pesetas, giving a lien upon certain customs duties. In 1901 the oases of Timmimum and T'uat were occupied by the French. In 1902 an uprising under the leadership of Bu Hamara, who improperly claimed to be an older brother of the Sultan and therefore the rightful ruler, gained serious proportions. By 1903 native authority in Morocco had become so weakened by European intrigue that the Sultan asserted himself and dismissed the foreign advisers at his court. Thus two steps had been taken: the revolutionary element had been enabled to continue its opposition; the Sultan had been placed in a position where his return to native standards could not redeem him in the eyes of the Moors, and would condemn him in the eyes of Europe. Under European stimulus a situation more or less comparable to anarchy had thus been created. The seriousness of the situation reached its climax in 1904 with the capture by Raisuli of Ion Perdicaris, a naturalized American citizen. The kidnaping was perpetrated by Raisuli purely as a political move to protect himself from his enemies who had gained the upper hand and were about to have him disgraced and imprisoned. Although a large ransom was paid for the release of Perdicaris, Raisuli's real profit in the transaction was that he was given the governorship of Tangier, and his enemies were degraded or imprisoned. On April 8, 1904, an agreement of vital importance to Morocco was entered into by France and England. The generally disturbed condition of the country was recognized by France as her opportunity to intervene. Intervention resulted in an agreement whereby England, in exchange for a free hand in Egypt, granted the same right to France in Morocco. This agreement was the precursor of the Algeciras convention. The French government promised to make no effort to change the political status of the country, and to maintain British commerce on a footing of absolute equality with its own. France in 1904 faced an alliance with Germany or an alliance with England. That with England meant acceptance of British control of Egypt; that with Germany meant the giving up of all thought of the recovery of Alsace and Lorraine. It was finally decided to treat with England, and under Delcassé the agreement was concluded. The outbreak of the Russo-Japanese war seriously disturbed the balance of power in Europe. Emperor William took advantage of the fact. The war had freed him of anxiety concerning his eastern frontiers, and in the first part of 1905 the Russian disasters in Manchuria led him to a more or less open demonstration of his intentions concerning imperialism in the East and his desire to gain the friendship of Islam. Germany had declared, relative to the Anglo-French convention of April, 1904, that Germany's interests in Morocco were purely commercial and that consequently she had no pressing interests there.

On Oct. 3, 1904, agreement was reached between France and Spain confirmatory of the

Anglo-French agreement and, further, providing for the establishment of a Spanish zone of influence in the country north of El Kasar el Kebir. The hypothetical line drawn at this time as the line of demarcation between the French and Spanish zones later became the line of penetration of the French military forces.

The ground having been cleared for French domination of Morocco and the ultimate establishment of a protectorate, a French diplomatic mission to the Sultan was arranged. It arrived in Fez in January, 1905, and presented to the Sultan a comprehensive programme of reforms. This programme, which took away practically every independent power from the Sultan, clearly demonstrated France's intentions.

Germany immediately executed a coup d'état. On March 31 the German Emperor arrived unexpectedly in Tangier and during his visit gave voice to the determination that German interests in Morocco would be protected. This announcement not only again threw Morocco into the European tangle, but struck directly at the Anglo-French agreement of 1904. War was imminent. In May Count Von Tattenbach, German Minister at Lisbon, visited the Sultan to take advantage of the favorable impression made by the Emperor's words and to gain special privileges for Germany. He was successful to the extent that on May 28 the French programme of reform was rejected in toto on the ground that any reforms proposed for Morocco must emanate from a conference of the signatories of the Treaty of Madrid. By German influence the Sultan was induced to request the holding of such a conference. The French foreign Minister, Delcassé, having thus failed in his Moroccan plans, and having brought the country to the verge of warfare with Germany, resigned (June 6). Rouvier, his successor, in order to avert war, reached an agreement with Prince Rodalin, the German delegate, on June 8, concerning the conference requested by the Sultan. Subsequent German activities in Morocco urged the French to haste, and on September 28 the plans of the conference were agreed upon and it was called to open Jan. 16, 1906, at Algeciras, Spain.

The delegates to this conference were from France, Germany, Austria-Hungary, Belgium, Spain, Great Britain, Italy, the Netherlands, Portugal, Russia, Sweden, the United States, and Morocco. The Act was signed at Algeciras on April 7, 1906, and was proclaimed Jan. 22, 1907. According to the Act, as published, the conference was "inspired by the interest attaching itself to the reign of order, peace, and prosperity in Morocco, and recognizing that the attainment thereof can only be effected by means of the introduction of reforms based upon the simple principle of the sovereignty and independence of his Majesty the Sultan, the integrity of his domains, and economic liberty without any inequality." Briefly the programme outlined by the Act covered: (i) a declaration relative to the organization of the police; (ii) a regulation concerning the detection and repression of the contraband of arms; (iii) an act of concession for a Moroccan state bank; (iv) a declaration concerning a better return of the taxes and the creation of new revenues; (v) a regulation concerning the customs of the Empire and the repression of fraud and smuggling; (vi) a declaration relative to public services and public works. In this conference Austria alone supported the German claims, and German diplomacy was outmanœuvred, inasmuch as the Act opened the way to French control of Morocco. The French agreements with England and with Spain were partially nullified, but on the other hand France was given powers which, by a liberal interpretation of the Act, might be, and eventually were, developed into the right to regulate practically all Moorish affairs. To Spain the policing of the ports of Tetuan and Larache was given; to France the ports of Mogador, Saffi, Mazagan, and Rabat; Tangier and Casablanca to a joint French and Spanish police. It was arranged that in the Imperial Bank France should own three shares of capital as against one share for each of the other countries. A committee of customs to revise the customs duties was provided for; a committee on public works to expend a sum equal to 2½ per cent of the customs duties; and such other committees as were needed were arranged for. The United States Senate ratified the Act on Dec. 12, 1906, and the President on December 14. The United States, however, added an additional protocol declining to assume any responsibility for the enforcement of the provisions of the Act.

In 1907 a French agent, Dr. Mauchamp, was killed by natives in Marakesh. Demand was immediately made by France upon the Moorish government for the punishment of the guilty persons, and until this demand was complied with Algerian troops who had seized and occupied the city of Oujdah on the Morocco-Algerian border were to remain there. The latter part of July the French construction company engaged in the harbor works at Casablanca insisted upon running a construction railroad through a Moorish cemetery, as a result of which natives attacked the French and Spanish workmen and killed a number of them. On August 5 the town was shelled by French warships. Several thousand native Jews and Moors were killed. The occupation of Casablanca followed, and soon the entire Shawia district was under French control. This was in pursuance of the right granted France by the Act of Algeciras to keep order in Morocco. In the summer of 1907 Mulai el Hafid, half brother of Sultan Abd ul Aziz, and the latter's Viceroy in Marakèsh, proclaimed himself Sultan and defeated the troops of Abd ul Aziz near Settat. Abd ul Aziz left Fez and sought the protection of the French warships at Rabat, later going to Tangier to retire into private life. Mulai el Hafid, having been supported by the French, was amenable to their suggestions, and under one pretext or another their military operations were extended inland from Casablanca until in 1911 an uprising in Fez, in which a number of French officers lost their lives, resulted in the sending of a strong body of troops to the capital. In 1910 two of the Mannesman brothers, German capitalists and diplomatic agents, personal friends of the Kaiser, succeeded in buying from the Sultan concessions covering about one-fifth of the area of the country.

In 1908 Spain had found itself involved in a "little war" with the natives in the Melilla district, where Spanish capitalists had extensive iron interests. In 1911, following the example of France, Spain sent troops to the town of Larache. This aroused the French, and Spain was forced to abandon the stand she had taken. In midsummer of this year another Moroccan crisis threatened when the German warship *Panther* was sent to Agadir in southern Morocco, where the Mannesman interests had become so impor-

tant. The officers of the *Panther* entertained the most powerful kaids of south Morocco on board ship and promised them Germany's support in resisting French control. War in Europe was again imminent. France and Germany both massed troops on the border; Belgian troops were rushed to the forts of Namur, Liége, and Derviers; and England became active as an ally of France. At the same time Spain sent 3000 troops to Melilla. On September 10 Germany replied to the French proposals concerning Morocco and asked that every claim of German subjects to concessions in that country should be recognized by France; that no new enterprises should be started under the French protectorate without being internationalized equally, and for a free hand in Morocco. The second provision concerned the Mannesman concessions. On November 3 a Franco-German accord was published in which Germany recognized the right of France to establish a protectorate in Morocco; both nations engaged to obtain the adhesion to this accord of the other signatories of the Act of Algeciras; France ceded to Germany, as compensation, about 250,000 square kilometers in the northern French Congo, touching the German Kameruns. France retained the right to run railroad lines across German territory to connect different parts of French Central Africa; France and Germany agreed to submit to The Hague tribunal all difficulties resulting from the accord; France agreed to safeguard the economic equality and commercial liberty for which provision was made in existing treaties, and it was mutually agreed to take over the rights and obligations in connection with the companies holding commercial concessions in Morocco. In April, 1912, a Franco-Spanish agreement was consummated concerning the administration of the country—in the Spanish zone under a Spanish high commissioner to act in conjunction with the French Governor-General at Fez. On March 12 the Franco-German agreement was ratified, confirming the French right to establish a protectorate which was formally established in 1913. This was a great diplomatic defeat for Germany and caused bitter feeling in German official and industrial circles. Soon after that the German army was increased, which was followed by the passing of the three-years military law in France; this prepared the way for the Great European War of 1914. On May 30 Fez was attacked by native tribes and additional French troops were sent to that point. In 1913 Mulai Abd el Hafid abdicated and Mulai Yusef became Sultan at the dictation of French statesmen. In 1914 the line separating the French and Spanish zones had been extended from Casablanca to Fez and eastward therefrom to Taza. From Oujdah French troops had progressed westward to Taza and in the latter part of the year Taza surrendered. The dividing line was complete. The breaking out of the European War brought disturbances in Morocco, as Germany had come to be looked upon as a friend of Islam.

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MOROCCO, MAROCCO, or **MARAKESH,** mä'rȧ-kĕsh'. One of the capitals of the Sultanate of Morocco. It is situated on the north slope of the Great Atlas Range, 90 miles from the Atlantic coast and 250 miles southwest of Fez (Map: Africa, D 1). Its location in a large plain near the foot of the Atlas is very favorable, the elevation being estimated at from about 1400 to over 1600 feet. The city has a healthful though hot climate, but is in a very backward and dilapidated condition. It covers a large area, surrounded by a wall, now more or less in ruins, with a height of 25 to 30 feet and a length of about 7½ miles. A large part of the space within is occupied by gardens, open areas, and market places, but in the built-up portions the streets are narrow, crooked, and dirty, and the houses are ill-kept, mostly one-storied, lime-and-earth buildings, with unglazed window openings. There are 19 mosques. A notable feature is the tower of the Kutubia Mosque, 230 feet high and of the type of the Giralda at Seville; this is almost the only stone edifice in the city. The Imperial Palace comprises an irregular conglomeration of buildings and gardens in the southern part of the city, covering 180 acres and surrounded by a wall. Of late years it is but seldom visited by the Sultan. The only industry of note is the manufacture of morocco leather. There is still considerable local trade carried on with the surrounding country and with the port of Mogador (q.v.). Traffic is largely in the hands of the Jews, who live under repressive conditions in a separate quarter of the city. The number of inhabitants is not known with certainty, but is commonly estimated at 50,000 to 75,000; however, the *Annuaire du Maroc* (Algiers) states the population at 80,000, of whom about 17,000 are Jews and 500 Europeans. The people are turbulent in disposition, and crimes of violence are common. Morocco was founded about 1070. It reached the height of its prosperity in the thirteenth and fourteenth centuries, when its population is said to have been 700,000. It was then a famous Mohammedan seat of learning. Its decline was brought about by several centuries of civil wars and rebellions.

MOROCCO GUM. See GUMS.

MOROCCO LEATHER. See LEATHER.

MORÓN, or **MORÓN DE LA FRONTERA,** mō'rōn' dȧ lȧ frōn-tā'rȧ. A town of south Spain,

in the Province of Seville, 32 miles southeast of the city of that name, on the Guadaira (Map: Spain, C 4). On one of the high and steep hills surrounding the town are the remains of a once almost impregnable castle erected by the Moors on Roman foundations and surrounded by triple walls and towers. The castle was occupied by the French in 1810 and was blown up by them on their departure. The inhabitants are engaged in the production of olive oil and in the vicinity are marble quarries and mines of red hematite. Pop., 1900, 14,459; 1910, 17,099.

MO'RON. See MENTAL DEFECTIVES.

MORONG, mō'rŏng. A town of central Luzon, Philippines, capital of the Province of Rizal. It is situated on the north shore of the Laguna de Bay, 19 miles east-southeast of Manila. Pop., 1903, 5276. It is a busy industrial town.

MORONG, THOMAS (1827–94). An American botanist, born at Cahaba, Ala. The family removed to Massachusetts while he was a boy, and he graduated at Amherst in 1848. He studied law, but later entered Andover Theological Seminary, and completed his studies in 1853. During his early life he was devoted to botany as an amateur, and in 1888 he undertook an extended voyage of exploration and botanical collection in South America and visited Argentina, Paraguay, and Chile. Upon his return, in 1890, he was made curator of the herbarium of Columbia College, in New York City. In conjunction with Dr. N. L. Britton he published *An Enumeration of the Plants Collected by Dr. Thomas Morong in Paraguay, 1888–90.* He was one of the contributors to the *International Encyclopædia.*

MORONI, mō-rō'nē, or **MORONE,** GIAMBATTISTA (c.1525–78). An Italian portrait painter of the Brescian school, born at Albino, near Bergamo. He was a pupil of Moretto and was also influenced by Lotto. Moroni is the only painter produced by the Italian Renaissance who painted solely portraits. He is an excellent draftsman, and his portraits are direct and characteristic likenesses. In his best works, like the portraits of a "Tailor" (National Gallery, London) and "Bartolommeo Bonga" (Metropolitan Museum, New York), he is likewise a colorist of the first rank. Though it is always vital, much of his work, like the double portrait of a "Gentleman and his Wife" (Metropolitan Museum, New York), is hard and dry in effect. Other good examples of his work are "Widower with Two Children" (Dublin Gallery); "Old Man and Boy" (Boston Museum); portrait of a "Lady" (Walters Gallery, Baltimore); full-length portrait of a "Man" (Gardner collection, Boston); portrait of a "Man" (Wilstach collection, Philadelphia). A large number of his works are in the Brescia, and he is also well represented in the galleries of Milan, Florence, Vienna, and Berlin. His art is too literal for success in religious painting, in which he is a follower of Moretto.

MOROSINI, mō'rō-zē'nē, originally MOROSI. A family of Venetian nobles, dating from the eighth century. Four of the family became doges, three of its women wives of doges and two others queens (Tommasina of Hungary and Constance of Servia), and many of them occupied other public positions. The first celebrated member of the family was DOMENICO MOROSINI, Doge from 1148 to 1156.—MARINO MOROSINI was Doge from 1249 to 1252.—MICHELE MOROSINI, Doge for less than a year (1382), was celebrated as a financier.—ANDREA MOROSINI (1558–1618) became historiographer of the Republic (1598) and held several public offices, besides being one of the Council of Ten. He wrote a history of Venice from 1521 to 1615, first published in 1623, and *Imprese ed espedizioni di Terra Santa e l' acquisto fatto dell' imperio di Constantinopoli dalla repubblica di Venezia* (1627), a history of the Fourth Crusade.—FRANCESCO MOROSINI (1618–94) gallantly but unsuccessfully defended the fortress of Candia against the Turks in 1667–69. About 20 years later he conquered nearly all of the Morea, which gained him the surname of Il Peloponnesiaco. He was elected Doge in 1688. Consult: Morosini, *Francesco Morosini il Peloponnesiaco* (Venice, 1885); Bruzzo, *F. Morosini nella guerra di Candia e nella conquista di Morea* (Forli, 1890); Cicogna-Soranzo, *Bibliografia veneziana* (Venice, 1857, 1885).

MOROT, mō'rō', AIMÉ NICOLAS (1850–1913). A French historical and portrait painter, born at Nancy. He studied under Cabanel and at the Ecole des Beaux-Arts, where he was awarded the Prix de Rome in 1873. He is best known for his portraits of members of the fashionable and artistic world of Paris, including Prince d'Arenberg, Edouard Dumont, and E. Hébert (1905, Luxembourg). They are excellent likenesses, correctly painted, and cool in color. His battle pieces display great action and force. One of his earliest works, "The Battle of Aquæ Sextiæ," is in the Nancy Museum; "Rezonville, Aug. 16, 1870" is in the Luxembourg, and "Charge at Reichsoffen" is at Versailles. He became Officer of the Legion of Honor and member of the Institute.

MOROTOCO, mō'rō-tō'kō. One of a group of sedentary agricultural tribes residing about the Oxuquis River, on the border of the Chaco region, in southeastern Bolivia. The entire group constitutes a distinct linguistic stock, the Samucan. The Morotoco are remarkable in being apparently ruled by the women. The men do the household drudgery, although they are tall and robust and daring hunters. The women refuse to have more than two children, strangling any born above that number. Consult Kersten, in *International Archiv für Ethnographie* (Leyden, 1904).

MORO VAN DASHORST. See MOR.

MOR'PETH. A market town and a parliamentary and municipal borough in Northumberland, England, on the Wansbeck, 17 miles north of Newcastle (Map: England, E 1). The principal buildings are the fourteenth-century parish church of St. Mary, the old clock tower, the free grammar school of Edward VI, founded in 1552, and the town hall, erected by Sir John Vanbrugh. The town owns remunerative property, the markets, and provides a free water supply. It has flannel manufactures, iron foundries, collieries, quarries, machine shops, brick kilns, tanneries, and malt works. It is an important market for cattle. There are remains of a castle and gateway. Morpeth was a Saxon town of importance before the Conquest and was granted corporate privileges by Charles II. Pop., 1901, 6158; 1911, 7433.

MORPHE'A (Neo-Lat., from Gk. μορφή, *morphē*, form). A chronic skin disease, sometimes called circumscribed scleroderma or Addison's keloid, consisting of patches, rounded or irregular in outline, pale yellow or brown in color, and sometimes following the course of a

superficial nerve. It occurs usually in young adult women, on the breasts, face, and neck.

MORPHEUS, môr'fûs (Lat., from Gk. *Μορφεύς*, shaper, fashioner; cf. Gk. *μορφή*, *morphē*, form, shape). In classic mythology, the son of Somnus (Sleep), called the Shaper because he shapes or molds the dreams that visit the sleeper. He is first mentioned by Ovid, *Metamorphoses*, xi, 633 ff., and is represented as an old man with wings, pouring somniferous vapor out of a horn. Consult C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

MORPHINE, môr'fĭn *or* -fēn, or **MORPHIA,** môr'fĭ-â (from Lat. *Morpheus*, god of dreams), $C_{17}H_{19}NO_3 + H_2O_1$. The most important of the 20 or more alkaloids existing in opium, of which it constitutes one-eighth to one-sixteenth by weight. Good opium should contain at least 9 per cent of morphine when assayed. In physiological activity one-fourth of a grain of morphine equals one grain of opium. It was first isolated in 1816 by Sertürner, a chemist of Hanover. It occurs in combination with meconic and sometimes sulphuric acid, as colorless, shining, prismatic crystals, odorless, and having a bitter taste. It is soluble in 1040 parts of water at 176° F. and in 6 of alcohol at 140° F., less soluble in ether and chloroform, and insoluble in benzene. The following are the common tests for morphine: Concentrated nitric acid when applied to morphine or its salt gives an orange color, changing to yellow; when it is mixed with iodic acid iodine is liberated, which may be recognized by the well-known starch test; a neutral solution of a morphine salt produces a blue color with a neutral solution of ferric chloride. Morphine combines with acids to form crystallizable salts, which are readily soluble in water and alcohol. Of these the sulphate, hydrochlorate (or muriate), and acetate are used in medicine. Apomorphine (q.v.), a powerful emetic, is prepared by heating morphine for some hours with an excess of hydrochloric acid.

The therapeutic uses of morphine and its salts are similar to those of opium (q.v.), but morphine acts more certainly and quickly and is more readily absorbed than opium, is more suitable for hypodermic use and is less apt to constipate and cause gastric disturbances.

The habitual taking of morphine is not uncommon. Those addicted to this habit become dependent for a comfortable existence on the drug and gradually increase the dose until enormous amounts are taken. The habit can be effectually treated only in institutions where the patient can be kept under constant surveillance. See Alkaloids; Drug Addictions.

MOR'PHOGEN'ESIS (Neo-Lat., from Gk. *μορφή*, *morphē*, form + *γένεσις*, *genesis*, origin, from *γίγνεσθαι*, *gignesthai*, to become). A term proposed by Haeckel, who divides morphology (q.v.) into the two coördinated branches of anatomy and morphogenesis or morphogeny. Morphogenesis is the equivalent of embryology or developmental history. It takes into account the gradual development and building up of the form of the adult, i.e., the series of changes and the mode by which the body and its organs become shaped. Haeckel further subdivides morphogenesis into ontogeny (q.v.) and phylogeny (q.v.). Consult Ernst Haeckel, *Generelle Morphologie der Organismen* (2 vols., Berlin, 1866), new edition under title of *Prinzipien der generellen Morphologie der Organismen* (ib., 1906).

MORPHOL'OGY (from Gk. *μορφή*, *morphē*, form + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). In zoölogy, the science of form and structure of animals. It is based on comparative anatomy and embryology and lays the foundation for physiology. We cannot well understand the structure or anatomy of the fully grown animal unless we have the history of the development of the organism as a whole and of the separate organs. The morphologist, whose methods of study are based on observation and comparison, must not only be a comparative anatomist, but also an embryologist. He should not only be acquainted with the individual development (ontogeny, q.v.), but also that of the class or phylum to which the organism belongs (phylogeny, q.v.). Moreover, as the existing living beings are the descendants of long lines of ancestry, the morphologist should have at his command all the available facts as to the fossil relatives of existing forms. Though we owe the word "morphology" to Goethe, it was first brought into its present extended use by the zoologists J. Müller and Leuckart. But long before the middle of the last century the general morphology of organisms was in part discussed by Oken, Carus, Goethe, Geoffroy Saint-Hilaire, Lamarck, Cuvier, Savigny, Owen, and Agassiz. For example, Goethe compared the flowering plant to an axis bearing modified or metamorphosed parts or leaves; Savigny discovered that the mouth parts or appendages of the heads of insects were modified legs; and Carus, Audouin, and Strauss-Durckheim perceived that their head was composed of a number of segments. Goethe, and also Oken, described a segmental structure in the vertebrate skull—a theory entirely abandoned by modern morphologists. That portion of the history of zoölogy called the Period of Morphology was signalized by the brilliant results in developmental work of Von Baer, Pander, J. Müller, Rathke, followed by the later researches of Schwann, Schleiden, Koelliker, Huxley, Vogt, Gegenbaur, Haeckel, and their followers. As the result we see numerous morphological problems either solved or in a fair way of solution.

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MORPHOLOGY OF PLANTS. The study which treats of the structure of plants. Morphology began as a study of the gross structures of mature plants, but to this there have been added the minute structures, the development of tissues and of organs, the ontogeny of individuals (often called embryology), and finally the evolution of the plant kingdom. (See Botany.) That part of morphology which deals with tissues is usually called anatomy, the term "morphology" being reserved for the reproductive

structures in general. This distinction, however, is artificial, especially since vascular anatomy is joined with the reproductive structures in elucidating the evolution of plants. An outline of morphology, therefore, is an outline of the evolution of plants.

Thallophytes. The two principal groups, algæ (q.v.) and fungi (q.v.), must be considered separately, since they hold very different relations to the evolution of plants.

Algæ.—The algæ are the primitive plants, in the sense that they preceded the other groups historically. All of their structures are related to water as a medium, so that the plant kingdom, so far as the present flora is concerned, began in water. The simplest body is a single cell, but in the group the body advances from the single cell, through cell colonies of various kinds, to many-celled individuals. The prevailing forms of the many-celled bodies among the algæ are simple or branching filaments, usually anchored. Among the higher algæ the body often becomes differentiated into different regions, notably among the marine forms. Among the brown seaweeds, e.g., the body of the kelps is differentiated into holdfast, stipe, and leaf-like expansions. The simplest form of reproduction is vegetative multiplication, in which new individuals are formed by ordinary cell division. In addition to this, algæ developed reproduction by means of spores, which in most cases are swimming cells (zoöspores). Among the algæ there appears also sexual reproduction, at first the gametes seeming to be alike, then differentiating in appearance, so that they are recognized as sperms and eggs. The two kinds of gametes at first are produced by ordinary vegetative cells, but later special cells produce them, known as oögonia and antheridia.

Fungi.—The fungi are notably dependent plants, in the sense that they depend upon other plants and upon animals for their food supply, the lack of chlorophyll forbidding food manufacture. Fungi secure food in two ways: as parasites they obtain it from living bodies; while as saprophytes they obtain it from material that has been produced by a living body and is no longer connected with it. For example, when the rust fungus attacks wheat, it is obtaining food from living plants; but when a mold fungus attacks bread, it is obtaining food from material produced by living plants, but no longer connected with them. It is evident that fungi may be very useful, as are the soil fungi, or they may be very injurious, as are the disease-producing fungi. The bodies of fungi range from single cells (as the bacteria) to filamentous bodies (the mycelia of true fungi), and many of the higher forms become quite complex. The reproductive methods are also the same as those of algæ, viz., vegetative multiplication, spore reproduction, and sexual reproduction with its differentiations. Among the higher fungi, however, the sexual reproduction becomes less and less obvious, and in some cases it may have disappeared. While the algæ may be said to represent the foundation upon which the plant kingdom has been built, the fungi hold no relation to the higher groups, but in general are regarded simply as degenerate algæ.

Bryophytes. The bryophytes represent the first land plants, having been derived from algæ that acquired the land habit, which means exposure to air as a medium. The danger of this exposure is the loss of water by the plant, and the structures and habits of land plants are explained by this fact. Among the bryophytes the liverworts (Hepaticæ, q.v.) are the important genetic group, having been derived from the algæ and having given rise to the higher plants. The mosses (Musci, q.v.), on the other hand, represent a specialized branch from the liverworts, distinguished from the latter by the leaf shoot and the much more complex spore case. The establishment of the land habit made possible the further development of plants on the land surface. In consequence of this change in the conditions of living, the plant bodies of liverworts are much more compact and possess protective structures against excessive loss of water by evaporation. Not only are the working bodies protected, but the sexual cells are jacketed, so that the sex organs (antheridia and archegonia) are many-celled. The most significant result of the land habit was the establishment of an alternation of generations (q.v.), so that sporophyte and gametophyte alternate regularly in the life history. Among bryophytes the gametophyte is the conspicuous generation, because it manufactures food in addition to producing sex organs, and the sporophyte is dependent upon it. In one group of bryophytes (*Anthoceros*) the sporophyte is green, so that the possibility of an independent sporophyte is evident. The further progress of the plant kingdom is dependent upon independent sporophytes, because the free display of green tissue by a gametophyte means conditions unfavorable for the swimming of sperms necessary to fertilization, while the free display of green tissue by a sporophyte means conditions favorable also for the dispersal of spores.

Pteridophytes. The pteridophytes represent the first vascular plants, the vascular system having been developed in connection with an independent sporophyte. The so-called vessels are thick-walled, tubular cells that extend through the sporophyte and are equipped to conduct water. Associated with the vascular system are the first roots among plants—organs for the intake of water—and also the first sporophyte leaves. The vascular system, roots, and leaves represent one mechanism, each part of which is necessarily related to the other parts. Among the pteridophytes, the chief living representatives of which are the club mosses (Lycopodiales, q.v.), the horsetails (Equisetales, see EQUISETUM), and the ferns (Filicales, see FERN), the conspicuous and independent sporophyte is in sharp contrast with the very inconspicuous gametophyte. Among ferns, e.g., the gametophyte (prothallium) is a very small, liverwort-like body, often not larger than the head of a pin. It is among the pteridophytes that the structure called the strobilus (q.v.) appears, a structure that is the precursor of the flower. The strobilus is not a feature of all pteridophytes, not appearing among ferns, but it is a structure begun by the group. Another important fact associated with the pteridophytes is the appearance of heterospory (q.v.), for this is the precursor of the seed. This means a differentiation of spores into two kinds, one kind (microspores) producing the male gametophytes, and the other kind (megaspores) producing the female gametophytes. Another accompaniment of heterospory is that the gametophytes are dependent and so small that they remain within the spores that produce them, thus disappearing from ordinary observation.

Spermatophytes. The seed plants are the most conspicuous plants of the present flora, for they make up nearly all the vegetation commonly observed. They have developed as two great groups: the gymnosperms, in which the seeds are exposed; and the angiosperms, in which the seeds are inclosed. The gymnosperms are the ancient seed plants that are now much less numerous than the more modern angiosperms.

Gymnosperms.—The gymnosperms represent the first seed plants, continuing and advancing the structures of the ferns, from which they differ chiefly in the presence of seeds. The vascular system is notably developed, resulting in larger sporophyte bodies and in a larger display of foliage. The early gymnosperms did not have strobili (cones), resembling the ferns in this feature, but all other gymnosperms have strobili as a very conspicuous structure. The important fact about gymnosperms is the existence of seeds. A seed is derived from an ovule, and an ovule is a megasporangium. The difference between an ovule and other megasporangia is that the ovule retains its megaspores instead of shedding them. This retention of the megaspore means that the female gametophyte develops within the ovule, that fertilization occurs there, and that the embryo sporophyte develops there. When all of these structures within the ovule become incased by a hard coat (testa), the total structure is a seed. Among gymnosperms the transportation of pollen (pollination) is effected by the wind, and after fertilization the egg develops an embryo, which then passes into a dormant stage. Activity is resumed when the conditions for seed germination are present.

Angiosperms.—The angiosperms are far more varied and abundant than are the gymnosperms and constitute the conspicuous vegetation of the land surface. Three features of the group stand out conspicuously in contrast with the gymnosperms. The first feature is the inclosed ovule, the inclosing structure being the carpel. This means that the pollen grains containing the male gametophytes cannot reach the ovule, but are received by a special region of the surface of the carpel (stigma). This means further that the pollen tube must traverse the style, enter the cavity of the ovary, reach the tip of an ovule, and then penetrate the tip of the ovule until the egg is reached. The second feature is the appearance of the flower, which differs from a strobilus in having another set of members added to the sporophylls, and this set (perianth) is usually differentiated into sepals (calyx) and petals (corolla). The third feature is related closely to the second, for it is the development of insect pollination. Many angiosperms retain the old method of wind pollination, but insect pollination is a conspicuous feature of the group, and it is associated with the remarkably diversified development of the flowers. It should also be stated that among angiosperms the male and female gametophytes are reduced to their lowest terms, the former being represented by three nuclei within the pollen grain, and the latter at the fertilization stage by seven free cells within the ovule, one of which is the egg.

Vascular System. The use of the vascular system in interpreting the evolution of vascular plants demands that its important features should be indicated. In a cross section of a vascular stem two very distinct regions are observed, viz., the cortex and a central cylinder called the stele. It is in the stele that the vascular cylinder of the stem develops. This cylinder always comprises two regions, known as xylem (wood) and phloëm (bast), the former being the water-conducting region. Each of these regions is characterized by its vessels, the vessels of the xylem being tracheids or tracheæ, while those of the phloëm are sieve vessels. In general, the xylem of pteridophytes and gymnosperms consists of tracheids, while that of angiosperms is characterized by tracheæ.

There are three types of vascular cylinder which represent different stages in the evolution of vascular plants. The most primitive type of cylinder is called the protostele, which is a solid cylinder, in which the phloëm completely surrounds the xylem. This type of cylinder is characteristic of all roots and of the stems of the most primitive pteridophytes, such as the club mosses. A second type of vascular cylinder is the amphiphloic siphonostele (solenostele), which is a hollow cylinder (i.e., incloses a pith region) in which the phloëm occurs on both sides of the xylem. This type of cylinder is characteristic of the stems of ferns, among which a modification of it is found, called the polystele. The polystele simply means an amphiphloic siphonostele which in the adult plant breaks up into separate and more or less scattered strands, thus breaking up the appearance of a hollow cylinder. The maidenhair fern is an excellent illustration of the amphiphloic siphonostele, while the common bracken illustrates the polystele. A third type of vascular cylinder is the ectophloic siphonostele, which is a hollow cylinder in which all the phloëm is external to the xylem, i.e., the xylem is in contact with the pith. This type of cylinder is characteristic of all the seed plants, and for this reason is regarded as the most advanced type. It also has its polystelic modification among the monocotyledons, in which the hollow cylinder is broken up into separate and scattered bundles as the plant matures. For this reason the monocotyledons are described as having scattered bundles, but all young monocotyledons have vascular cylinders. One of the characteristic features of the ectophloic siphonostele is the development of a cambium layer between xylem and phloëm which makes possible an increase of the stem in diameter.

In most cylinders the vascular tissues are not continuous, but occur in separate strands or bundles, separated from one another by undifferentiated tissue, called pith rays, which extend from the pith to the cortex. In this way the pith rays seem to differentiate the cylinder into vascular units, which have been called vascular bundles. The character of these bundles varies in the evolution of vascular plants, according to the relation between xylem and phloëm. There are four such arrangements: (1) radial, in which xylem and phloëm occur in alternating radii, an arrangement characteristic of roots; (2) concentric, in which the phloëm completely surrounds the xylem, an arrangement characteristic of the stems of pteridophytes; (3) collateral, in which xylem and phloëm occur side by side upon the same radius, the xylem being towards the pith and the phloëm towards the cortex, an arrangement characteristic of the stems of gymnosperms and dicotyledons; (4) amphivasal, in which the xylem completely incloses the phloëm, an arrangement characteristic of the stems of monocotyledons.

Another feature of the vascular system which

has proved to be significant in the evolution of vascular plants is the relation of the first-formed xylem to that which develops later. At their first appearance in the stele, the vascular elements are laid down at certain definite points, these first elements being called the protoxylem. From these protoxylem strands the later xylem (metaxylem) extends. The three situations developed in the evolution of the vascular system are as follows: (1) exarch, in which the protoxylem occurs at the periphery of the stele, and consequently all the metaxylem is centripetal; (2) mesarch, in which the protoxylem occurs more or less within the stele, so that the metaxylem develops both centripetally and centrifugally; (3) endarch, in which the protoxylem develops only centrifugally. The exarch condition is characteristic of all roots and of most protosteles; the mesarch condition is characteristic of ferns; while the endarch condition is characteristic of all seed plants.

The various combinations of cylinder type, bundle type, and protoxylem position indicate the relative advancement of any group of vascular plants. Many other features of the vascular system are being used for the same general purpose, and since the vascular tissue is the most persistent of all plant tissues, it is through vascular anatomy that we have become acquainted definitely with the history of vascular plants.

The best conception of the present condition of plant morphology may be obtained by reading the general articles on BRYOPHYTES; PTERIDOPHYTES; SPERMATOPHYTES; THALLOPHYTES; and the more special articles on ALGÆ; ANGIOSPERMS; EQUISETUM; FERN; FUNGI; GYMNOSPERMS; HEPATICÆ; LYCOPODIALES; and MUSCI. A still more detailed account of plant structures may be obtained from the separate titles which deal with the prominent phenomena and organs, such as ALTERNATION OF GENERATIONS; ANTHERIDIUM; ARCHEGONIUM; HETEROSPORY; LEAF; ROOT; SEED; SPORE; STEM.

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MORPHOT'ROPISM (from Gk. *μορφή, morphē*, form + *τροπή, tropē*, a turning, from *τρέπειν, trepein*, to turn). The study of the phenomenon of the small but distinct change in crystalline form produced by the replacement of a chemical element or radical group in a substance by another closely related to it. By comparing the crystal forms of a series of closely related substances the part played by each constituent substance may be inferred, especially when the substitution methods of organic chemistry are applied to substances having very large chemical molecules. See CRYSTALLOGRAPHY.

MOR'PHY, PAUL CHARLES (1837–84). An American chess player, born in New Orleans, La. He was remarkably precocious, especially as a chess player, and before he was 13 had defeated many well-known amateurs. He studied law for several years at the College of South Carolina, playing chess only occasionally. At the first American Chess Congress, which assembled in New York in 1857, Morphy defeated with ease the best players that could be brought to meet him. He visited Europe in 1858, and in England beat Löwenthal, Boden, and Bird, and performed the most astonishing feats in simultaneous games without the board. In Paris he won five out of eight games with Harrwitz, and continued his exhibitions of blindfold playing. After his return to the United States, in 1859, he won seven out of eleven games with the visiting German expert Anderssen. He was admitted to the bar and began the practice of law in New Orleans. The strain occasioned by his blindfold contests, however, had been too great for his mental faculties, and, though he abandoned chess altogether, he was soon forced to relinquish all mental occupation and died in retirement. During the comparatively short period of his activity Morphy displayed a skill that was inexplicable. He was at no time a close student of chess and he played without preparation and with little hesitation; but an analysis of his games reveals combinations remarkable for finesse, depth, elegance, and soundness. These qualities, combined with a wonderful memory, made him perhaps the most remarkable chess player in modern times. Consult Löwenthal, *Morphy's Games of Chess* (London, 1860).

MORRA. An Italian game. See LA MORRA.

MOR'RILL, JUSTIN SMITH (1810–98). An American legislator and political leader. He was born at Strafford, Vt., and after an elementary education was engaged in business and farming until 1855, though he gave much time to study. As an antislavery Whig he was elected to Congress in 1854, was five times re-elected, in 1867 took a seat in the Senate and served continuously until his death, a record up to that time. During the latter part of his service in the House he was the leading member of the Committee on Ways and Means, of which he was chairman from 1865 to 1867, and chairman of the Subcommittee on Tariff and Taxation. In the Senate he was a member after 1867, and chairman for many years, of the Committee on Finance. He will be remembered chiefly for his connection with two important measures. In 1857 he introduced a bill for the establishment, through the aid of public land grants, of State colleges throughout the country primarily for the purpose of teaching agriculture and the mechanic arts, other subjects, however, not to be excluded. This bill was vetoed by President Buchanan, but became a law in 1862 through the signature of President Lincoln. By virtue of this act and the supplementary Second Morrill Act, so called (1890), there had been established, by 1915, 67 institutions

giving instruction to 69,000 students. Morrill also framed and introduced in the House the Morrill Tariff Act of 1861. (See TARIFF.) He opposed government paper money (and especially the Legal Tender Act of 1861–62), and the annexation to the United States of outlying territory. He published *The Self-Consciousness of Noted Persons* (1886). Consult: F. W. Taussig, *Tariff History of the United States* (New York, 1888; 5th ed., 1910); G. W. Atherton, *Legislative Career of Justin S. Morrill* (Washington, 1901); E. J. James, *Origin of the Land Grant Act of 1862* (Urbana, Ill., 1910).

MORRILL, LOT MYRICK (1813–83). An American legislator and cabinet officer, born at Belgrade, Me. He became a student at Waterville (now Colby) College in 1833, but left before graduating to enter a law office at Readfield. In 1837 he was admitted to the bar, and for several years practiced in partnership with Timothy O. Howe. In 1841 he removed to Augusta, where he won wide distinction as a lawyer and public speaker. Although strongly opposed to the extension of slavery, he was in all other matters in perfect agreement with the Democratic party, and became one of the leaders of the Maine Democracy. In 1853 and 1854 he was elected to the Lower House of the State Legislature, and in 1856 was elected to the State Senate. After Buchanan's nomination, disapproving of his party's platform, he resigned from the Democratic State Committee and allied himself with the Republican party. He was elected Governor of the State by that party in 1857 and was reëlected in 1858 and 1859. In 1861 he was chosen United States Senator to succeed Hannibal Hamlin. Reëlected for a full term in 1863, he was defeated by a single vote in 1868 by Hamlin, but in the following year was elected to succeed William P. Fessenden for the remaining part of the latter's term. In 1871 he was again elected to the Senate, but in 1876 resigned to enter the cabinet of President Grant as Secretary of the Treasury. This portfolio he held until after the inauguration of President Hayes in 1877. Thereafter until his death he was collector of customs for the Portland (Me.) district.

MOR'RILLTON. A city and the county seat of Conway Co., Ark., 51 miles by rail northwest of Little Rock, on the Arkansas River and on a branch of the St. Louis, Iron Mountain, and Southern Railroad (Map: Arkansas, C 2). It has a trade in cotton and live stock and manufactures of cottonseed oil, woolens, machine-shop products, lumber, furniture, etc. The water works and electric-light plant are owned by the municipality. Pop., 1890, 1644; 1900, 1707; 1910, 2424.

MOR'RIS. A city and the county seat of Grundy Co., Ill., 62 miles southwest of Chicago, on the Illinois River, the Illinois and Michigan Canal, and the Chicago, Rock Island, and Pacific and the Chicago, Ottawa, and Peoria railroads (Map: Illinois, H 3). It has St. Angela's Academy, a Roman Catholic institution for women. The city is the centre of a considerable trade in grain and cattle, and there are mines of bituminous coal and manufactories of oatmeal, hardware, paper car wheels, leather, cut glass, fibre board, novelties, bricks, and tile. The water works are owned by the municipality. Morris was settled in 1834 and incorporated first in 1857. Pop., 1900, 4273; 1910, 4563.

MORRIS. A city and the county seat of Stevens Co., Minn., 157 miles west by north of St. Paul, on the Northern Pacific and the Great Northern railroads (Map: Minnesota, B 5). It is near the Pomme de Terre River, which furnishes good water power. Situated in a fertile agricultural region, Morris carries on a large trade in produce, and has several grain elevators and flour mills. It is the seat of the West Central School of Agriculture and the Assumption School (Roman Catholic), and contains a fine high school, general hospital, and a Carnegie library. The water works are owned by the city. Morris adopted the commission form of government in 1913. Pop., 1900, 1934; 1910, 1685.

MOR'RIS, ALEXANDER (1826–89). A Canadian statesman, born at Perth, Ontario. He was educated at the University of Glasgow and at McGill University, Montreal, and was called to the bar in 1851. Elected in 1861 a Conservative member of the Canada Legislative Assembly, he strongly supported the movement for the confederation of the British-American provinces (1862–66). In 1867 he was elected to the first Dominion Parliament and in 1869 was appointed Minister of Inland Revenue in the first administration of Sir John A. Macdonald. He was made Chief Justice of the Court of Queen's Bench of Manitoba in 1872, but in December of the same year he resigned and became Lieutenant Governor of Manitoba and the Northwest Territories (1872–76). He returned to Ontario in 1877 and was a member of the Ontario Legislature (1878–86). He published: *Canada and her Resources* (1855); *Treaties of Canada with the Indians of the North-West* (1880); *Nova Britannia* (1884), a volume of speeches and lectures on Confederation.

MORRIS, BENJAMIN WISTAR (1819–1906). An American Protestant Episcopal clergyman. He was born at Wellsboro, Pa., graduated from the General Theological Seminary in 1846, and in 1847 was ordained priest. He was stationed as rector at Sunbury, Manayunk, and Germantown, all in Pennsylvania. In 1868 he was consecrated Bishop of Oregon and Washington, his diocese subsequently being restricted to the former State. During his incumbency he actively advanced the educational and philanthropical interests of his diocese, being instrumental in establishing St. Helen's Hall, a boarding and day school for girls, the Bishop Scott Academy, and the Good Samaritan Hospital in Portland. He published *Presbyterian, Baptist, and Methodist Testimony to Confirmation* (1860).

MORRIS, CHARLES (1745–1838). An English song writer of Welsh origin. He was reared by his mother, went to America in the Seventeenth Foot in 1764, and on his return to England he was for many years punch maker and bard of the famous Beefsteak Society, a convivial club founded in 1735. He associated with the party of Fox, for which he wrote many political songs, as "Billy Pitt and the Farmer." Neglected by his Whig friends, he composed the lament, "The Old Whig Poet to his Buff Waistcoat." Morris met the Prince of Wales and was a frequent guest at Carlton House, where he was known as "the sun of the table." Among his best-known pieces are: "The Town and the Country," "A Reason Fair to Fill my Glass," "The Triumph of Venus," and "Ad Poculum." The Prince granted him an annuity of £200, and the Beefsteak Society gave him a villa near Dorking, where he passed his last years, living

to be 93. His songs were gathered under the title *Lyra Urbanica* (1840; 2d ed., 1844).

MORRIS, CHARLES (1784–1856). An American naval officer, born at Woodstock, Conn. He entered the United States navy as a midshipman in 1799 and took an active part in the operations against Tripoli. In the famous recapture and destruction of the *Philadelphia* young Morris was the first of the boarders to reach the deck of that vessel. In 1807 he was promoted lieutenant and in 1811 became first lieutenant of the *Constitution.* Morris was given great credit for his work in the escape of the *Constitution* from a British squadron, and a month later he particularly distinguished himself in the capture of the British frigate *Guerrière* and was dangerously wounded. Promoted captain, he was given command of the new sloop of war *Adams,* 28 guns. After a successful cruise in which he captured a number of merchantmen and boldly chased others into British ports, he was in turn chased by British frigates of superior force. Forced into the Penobscot, he was blockaded by a British squadron. While damages were being repaired the *Adams* was attacked by a strong British force and to save her from capture she was destroyed. In 1815 Morris commanded the frigate *Congress* in the second squadron sent against Algiers, but these vessels arrived too late to take part in active operations. In 1816 he was ordered to proceed to Oregon in the *Congress* and take possession of the country about the Columbia River; but before starting his destination was changed to the Gulf of Mexico, the Spanish colonies of Central and South America being then in a state of revolution. After Commodore Perry's death in 1819 Morris succeeded him in the command of the South American squadron. In 1825 he carried Lafayette back to France in the *Brandywine.* For 13 years he was one of the navy commissioners, and for a considerable time superintendent of the Naval Academy. At the time of his death in 1856 he was chief of the Bureau of Ordnance and Hydrography. Commodore Morris was a most distinguished, brave, able, and energetic officer and by his work and example did much to build up the navy and infuse into it an unconquerable spirit. Consult his *Autobiography* (Annapolis, 1880).

MORRIS, CHARLES D'URBAN (1827–86). An American classical scholar and educator, born at Charmouth, Dorset, England. His grandmother was Mary Philipse Morris (q.v.). He was educated at Worcester College, Oxford, and, after three years as a scholar at Lincoln College, was a fellow of Oriel (1851–54). In 1853 he came to New York, was rector of Trinity School until 1856, and then founded the Mohegan School, near Peekskill. From the University of the City of New York he went in 1876 to Johns Hopkins as collegiate professor of Latin and Greek. His publications, which are marked by many original pedagogical methods, include: *A Compendious Grammar of Attic Greek* (1869; 4th ed., 1876); a *Latin Grammar* (1870; 4th ed., 1876); an edition of Thucydides, book i (completed by J. W. White, Boston, 1887); papers in learned periodicals; and several Latin and Greek primers and readers.

MORRIS, CLARA (1849–). An American actress, especially noted for her success in the interpretation of emotional rôles. She was born in Toronto, Canada (her real name being Morrison), but was reared in Cleveland, Ohio, where at the Academy of Music she became a member of the ballet and afterward leading actress. Later she played in Cincinnati. She went to New York in 1870 as a member of Daly's company. In 1872 she made a sensation in *L'Article 47.* Conspicuous among her subsequent successes were those won in *Alixe* (1873), *Camille* (1874), and *Miss Multon* (1876). Miss Morris became known as an actress distinguished for spontaneity and naturalness. She was married to F. C. Harriott in 1874. For some years after 1885 she devoted herself mainly to literary work, writing: *Little Jim Crow, and Other Stories of Children* (1899); *A Silent Singer* (1899); *Life on the Stage: My Personal Experiences and Recollections* (1901); *A Pasteboard Crown* (1902); *Stage Confidences* (1902); *The Trouble Woman* (1904), fiction; *The Life of a Star* (1906); *Left in Charge* (1907); *New East Lynne* (1908); *A Strange Surprise* (1910); *Dressing Room Receptions* (1911). Miss Morris's old age was embittered by poverty and the complete blindness which overtook her in 1910. In 1913, the house in which she had lived in Yonkers for 37 years having been sold, she moved to Whitestone, L. I. Consult McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (ib., 1886).

MORRIS, SIR DANIEL (1844–). A British agriculturist, born at Loughor, Glamorgan, Wales, and educated at Cheltenham, the Royal College of Science, South Kensington, and Trinity College, Dublin. In 1877 he was appointed assistant director of the Royal Botanic Gardens, Ceylon, and in 1879 director of the Botanic Department of Jamaica. He was assistant director of the Royal Botanic Gardens, Kew, England, from 1886 to 1898, during which time he visited the West Indies and other colonies on several special missions connected with the improvement of their agriculture. While Imperial Commissioner of the West Indian Department of Agriculture (1898–1908) he was active in inaugurating agricultural reforms. Among the successful enterprises undertaken by him was the reëstablishment of the cultivation of Sea Island cotton in the West Indies. After his retirement from active duty he served as scientific adviser in tropical agriculture to the Colonial Office. Morris published numerous papers on horticulture, economic botany, and agriculture, especially as related to the West Indies. From 1899 to 1908 he was editor of the *West Indian Bulletin,* the *Quarterly Journal of the Imperial Department of Agriculture,* and from 1902 to 1908 of the *Agricultural News,* Barbados. In 1893 he was made C.M.G. and in 1903 K.C.M.G., and he received the Victoria medal of horticulture.

MORRIS, DINAH. In George Eliot's *Adam Bede,* the character which really becomes the centre of interest for the novel.

MORRIS, EDWARD JOY (1815–81). An American legislator, diplomat, and author, born in Philadelphia. He graduated at Harvard in 1836 and began the practice of the law in Philadelphia. He was a member of the Pennsylvania State Assembly in 1841–43, and in November, 1842, was elected as a Whig to the Twenty-eighth Congress, serving from 1843 to 1845. From 1850 to 1854 he was chargé d'affaires for the United States at Naples. After his return he took a leading part in the movement for the or-

ganization of the Republican party in Pennsylvania, and in 1856–58 was a Republican member of Congress. From 1858 to 1870 he was United States Minister to Turkey. He was a frequent contributor to American magazines for many years, and published *Notes of a Tour through Turkey, Greece, Egypt, and Arabia Petræa to the Holy Land* (2 vols., 1842). He translated, with copious notes and additions, *The Turkish Empire, Social and Political* (1854), from the German of Alfred de Besse. He also translated Theodore Mügge's *Afraja, or Life and Love in Norway* (1854), and Ferdinand Gregorovius' *Corsica, Picturesque, Historical, and Social* (1856).

MORRIS, Edward Parmelee (1853–). An American Latinist. He was born at Auburn, N. Y., graduated at Yale in 1874, and afterward studied at the universities of Leipzig and Jena. He was professor of Greek at Drury College (1879–84) and professor of Latin at Williams (1885–91), and after 1891 professor of Latin at Yale. He was editor of Plautus's *Mostellaria* (1880), *Pseudolus* (1890), and *Captives* and *Trinummus* (1898), and of Horace's *Satires* (1909) and *Epistles* (1911). He wrote also various philological monographs and reviews, especially in connection with Plautus and Latin syntax, and the important volume *On Principles and Methods in Latin Syntax* (1902).

MORRIS, Sir Edward Patrick (1859–): A Newfoundland lawyer and statesman, born at St. John's, and educated at the University of Ottawa. He was called to the bar and entered politics in 1885, being elected a Liberal member of the Newfoundland Legislature. He became a member of the cabinet of Sir William Whiteway in 1889, and was acting Attorney-General during the greater part of 1890–95. During the popular agitation for a law ratifying the railway contract undertaken by Sir Robert Gillespie Reid (q.v.), Morris headed an Independent Liberal movement (1898–1900) favoring the contract. In 1903–07 he was Minister of Justice and Attorney-General in the cabinet of Sir Robert Bond (q.v.); in 1907–09 leader of the Liberal Opposition; and then became Premier of Newfoundland. He was a delegate to the conference at Ottawa to discuss the entrance of Newfoundland into the Dominion of Canada (1895); to the British Colonial Office respecting the French shore question (1897 and 1901); to the Imperial Defense Conference, London (1909), the Imperial Conference (1911), and The Hague Arbitration Tribunal (1910). In 1904 he was knighted and in 1911 was made a member of the Imperial Privy Council. He edited the *Newfoundland Law Reports, 1800–1904* (St. John's, 1905), known as *Morris' Reports.*

MORRIS, George Pope (1802–64). An American journalist and poet, born in Philadelphia. He founded with Samuel Woodworth (q.v.) in New York the *Mirror* (1823–42), a literary weekly, which became the *New Mirror*, and the *Evening Mirror.* In these journals appeared much early work of Bryant, Halleck, Poe, Paulding, Willis, Hoffman, and others, making these periodicals important elements in the literary development of the time. Morris also founded the *National Press* (1845), out of which was developed the *Home Journal* (1846), in which Willis, who had long been associated with Morris, again collaborated. His *Briarcliff* (1825), founded on Revolutionary incidents and events, was a popular success. His *Poems*, collected for the last time in 1860, contained the familiar ballads, "Woodman, Spare that Tree" (founded on a real incident), "My Mother's Bible," "We Were Boys Together," and "A Long Time Ago." Morris died in New York, July 6, 1864. Consult J. G. Wilson, *Bryant and his Friends* (New York, 1886).

MORRIS, George Sylvester (1840–89). An American educator and philosophical writer, born at Norwich, Vt. He graduated in 1861 at Dartmouth College, served in the Federal army during the first two years of the Civil War, and was a tutor at Dartmouth in 1863–64. After spending several years in Germany in the study of philosophy and theology, he was appointed, in 1870, professor of modern languages and literature in the University of Michigan, and in 1881–89 was professor of logic, ethics, and the history of philosophy. From 1878 to 1885 he also lectured on ethics and the history of philosophy at Johns Hopkins University. He published: a translation of Ueberweg's *History of Philosophy* (2 vols., 1872–74); an edition of Gregg's *Philosophical Classics* (1875); *British Thought and Thinkers* (1880); *Kant's Critique of Pure Reason: A Critical Exposition* (1882); *Philosophy and Christianity* (1883); *Hegel's Philosophy of the State and of History* (1887).

MORRIS, George Upham (1830–75). An American naval officer, born in Massachusetts. He entered the navy in 1846, was commissioned lieutenant in 1855, and still held that rank when Commander William Radford's absence on March 8, 1862, left him the senior officer on the *Cumberland* during its battle with the Confederate ram *Merrimac.* Lieutenant Morris's gallantry in fighting his ship until she sank with her flags still flying aroused the greatest enthusiasm in the North, and earned his promotion to the grade of lieutenant commander (1862). In May, 1862, when commanding the *Port Royal*, a steam gunboat, he participated in a battle with a nine-gun Confederate battery on the James River, and was afterward wounded in an attack on Fort Darling. He also took part in the attack on Fort Powell, Grant's Pass (1864). He was commissioned commander in 1866, and in 1874 retired from active service on account of ill health.

MORRIS, Gouverneur (1752–1816). An American statesman and diplomat. He was born at Morrisania, N. Y., Jan. 31, 1752, and graduated at King's (now Columbia) College in 1768. He studied law and was admitted to the bar in 1771. In 1775 he was chosen to represent Westchester County in the first Provincial Congress of New York, and took a prominent part in the advocacy of the American cause. He served in two succeeding Congresses in the same and the following year. He was one of the recognized leaders of the congresses; served on nearly all the important committees, among them the committee that drafted the constitution of the State of New York; and with Jay and Livingston had much to do with framing the plan of government for the State. In 1777, when only 25 years of age, he was elected to the Continental Congress, in which he served until 1780. Immediately upon taking his seat he was appointed on a committee to investigate the condition of the army at Valley Forge, and afterward devoted his energies to securing the adoption by Congress of Washington's plans for the organization and pay of the army. His

ability won for him the chairmanship of the committee to confer with the British commissioners on reconciliation who arrived in 1778. As chairman of the committee to publish an address to the people of the Colonies on the existing condition of affairs he drew up a masterly account of the causes of the war, the efforts that had been made to achieve independence, and the transactions with the British commissioners. The address was entitled *Observations on the American Revolution.* In 1779 he was chairman of three other important committees and performed the whole duties of each. During his career in Congress Morris drew up several reports and papers on finance which showed marked ability. His services were recognized by his appointment as assistant superintendent of finance in 1781, a position which he held with great credit until 1785. It was in this capacity that he drew up a scheme for a system of coinage which, though not adopted at the time, ultimately became the basis of the present system. He represented Pennsylvania in the Constitutional Convention of 1787 at Philadelphia, took a leading part in the debates of that body, and the published proceedings showed that he made more speeches than any other member, always championing a strong national government. He urged the proportional representation of the States in the Senate, and favored a freehold suffrage, a good-behavior tenure for the executive, and representation in Congress apportioned according to the number of free inhabitants. In 1789 Morris went to France on private business, and was in Paris at the outbreak of the French Revolution. He kept a diary during his stay, and wrote letters which threw much light on the character of the events which he witnessed. In 1790 he went to London as private agent to the British government to conduct negotiations regarding the unfulfilled stipulations of the Treaty of 1783. His mission was not successful, and he again returned to the Continent. In 1792, while still in Europe, he was appointed Minister to France, and served in that capacity during the stormy scenes of the two ensuing years. In 1794 the French government requested and obtained his recall. He remained in Europe until 1798. In 1800 he was elected from New York to the United States Senate, where he acted with the Federalists. After his retirement from the Senate in 1803 he took great interest in the Erie Canal project, and served as chairman of the Canal Commission from 1810 to the time of his death, which occurred Nov. 6, 1816. His biography has been written for the "American Statesmen Series" by Theodore Roosevelt (Boston, 1900). An elaborate biography was prepared by Jared Sparks (3 vols., Boston, 1832). Morris's diary and letters have been published in two volumes (New York, 1888). Consult also H. C. Lodge, in *Historical and Political Essays* (Boston, 1892).

MORRIS, Gouverneur (1876–). An American novelist and short-story writer, born in New York City and educated at Yale (B.A., 1898). He began as a contributor of fiction to magazines, and so continued, writing also: *A Bunch of Grapes* (1897); *Tom Beauling* (1901); *Aladdin O'Brien* (1902); *The Pagan's Progress* (1904); *Ellen and her Man* (1904); *The Footprint and Other Stories* (1908); *Putting on the Screws* (1909); *Spread Eagle and Other Stories* (1910); *The Voice in the Rice* (1910); *It and Other Stories* (1912); *If You Touch them they Vanish* (1913); *The Incandescent Lily and Other Stories* (1914).

MORRIS, Sir Henry (1844–). An English physician, born at Petworth, Sussex. He was educated at Epsom College, University College, and Guy's Hospital and established himself in London. He served as surgeon and lecturer in anatomy and surgery at Middlesex Hospital Medical College, examiner in surgery, University of London, examiner in anatomy, University of Durham, chairman of the court of examiners, Royal College of Surgeons, president of the Royal College of Surgeons (1906–09), president of the Royal Society of Medicine (1910–12), etc. In 1909 he was made Baronet. Among his writings are: *Anatomy of the Joints of Man* (1879); *Surgical Diseases of the Kidney* (1885); *Gynecology* (1891); *Injuries and Diseases of the Genital and Urinary Organs* (1895); *On the Origin and Progress of Renal Surgery* (1898); *Treatise on Human Anatomy* (1898; 4th ed., 1907), with others; *On Treatment of Inoperable Cancer* (1902); *Looking Back—Christian Science Refuted* (1909); *"Suggestion" in Relation to the Treatment of Disease* (1910).

MORRIS, Henry W. (1806–63). An American naval officer. He was born in New York City, entered the United States navy in 1819, and became a captain in 1856. For some time after the outbreak of the Civil War he was in Washington superintending the construction of the *Pensacola,* which vessel, when completed in January, 1862, he took safely by the Confederate batteries on the Potomac. He then joined the Federal blockading squadron in the Gulf of Mexico, distinguishing himself in the attacks upon Forts Jackson and St. Philip, and after the capture of New Orleans was in command for a short time of the squadron stationed there. He was made commander in July, 1862. His health giving way, he went to New York, where soon afterward he died.

MORRIS, James. See Morris, William (1786–1858).

MORRIS, John (1826–93). An English Jesuit, born at Ootacamund, Madras, India. He went to England, studied at Harrow and at Trinity College, Cambridge; but after a year (1845–46), having become a Catholic, he went to Rome to complete his training there in the English College. He was made canon of Northampton in 1852, and from that year to 1855 was vice rector of the English College at Rome. Again returning to England, he acted as private secretary to Cardinal Wiseman and his successor, Cardinal Manning. In 1867 he became a member of the Society of Jesus. Morris was rector of St. Ignatius' College, Malta (1877–78); professor of canon law and Church history in St. Bruno's College, near St. Asaph (1879), and from 1880 to 1886 rector and master of novices at Roehampton. His principal published works are: *Condition of Catholics under James I* (1871); *The Troubles of our Catholic Forefathers* (1875); *The Letter-Books of Sir Amias Paulet* (1874); *Cardinal Wiseman's Last Illness* (1871); *The Life of Father John Gerard* (3d ed., 1881); *The Life and Martyrdom of St. Thomas Becket* (2d ed., 1885). Consult J. H. Pollen, *Life and Letters of Father John Morris* (London, 1896).

MORRIS, John Gottlieb (1803–95). An American clergyman, born at York, Pa. He graduated at Dickinson College in 1823, then

studied theology at Princeton and at Gettysburg Seminary, and in 1827 was licensed as a preacher. In the same year he went to Baltimore, where he founded the Trinity English Lutheran Church, of which he continued to be pastor until 1860, when he became librarian of the Peabody Institute. In 1860 to 1864 he was librarian of the Peabody Institute at Baltimore. In 1864 he became pastor of the Third English Lutheran Church, and in 1874 accepted a call to Lutherville, Md., where he was actively interested in the founding of the College for Women. He was president, in 1877, of the first Lutheran church diet at Philadelphia. He held a number of academic positions, founded the Lutheran Historical Society at Gettysburg, Pa., presided over the General Synod in 1843 and in 1883, contributed frequently to scientific and religious journals, edited the *Lutheran Observer* (1823–34), and wrote a number of books, among which may be mentioned *Life of John Arndt* (1853); *Life of Catherine de Bora* (1856); *Quaint Sayings and Doings Concerning Luther* (1859); *Fifty Years in the Lutheran Ministry* (1878).

MORRIS, Lewis (1671–1746). An American Colonial Governor. He was born at Morrisania, N. Y., the son of Richard Morris, a captain in Cromwell's army, who had emigrated to the West Indies after the Restoration and a few years later purchased a tract of 500 acres of land on the north bank of the Harlem River, in the region later named Morrisania, after his family. Although left an orphan in infancy Lewis was well educated under the direction of his uncle, by whom the Morrisania estate to which he fell sole heir in 1691 was increased to nearly 3000 acres. He also inherited a large estate in New Jersey, in which Colony he was appointed, in 1692, judge of the court of common right. After the union of East and West Jersey and the establishment of New Jersey as a royal colony, he was continually prominent in public affairs, serving for many years in both the Colonial Council and the Assembly. He served for a time as Chief Justice of both New Jersey and New York, was appointed acting Governor of New Jersey in 1731, and from 1738 until his death was Governor of the Colony. Consult W. W. Spooner, *Historic Families of America* (New York, 1907).

MORRIS, Lewis (1726–98). An American patriot during the Revolutionary War and one of the signers of the Declaration of Independence. He was born at Morrisania, N. Y., graduated at Yale in 1746, and as early as 1767 became conspicuous as an opponent of the restrictive measures of the British ministry. He was elected to the Continental Congress in 1775, and at the close of the session was sent west to secure, if possible, the adherence of the Indians, remaining for some time at Pittsburgh and corresponding with Congress. In 1776 he again sat in Congress, did important work on committees, and was one of the signers of the Declaration of Independence. His disinterested support of the American cause and his sturdy independence brought upon him the destruction of much of his property by the British army. Giving up his seat in 1777 in favor of his half brother, Gouverneur Morris (q.v.), he returned to his estate, and subsequently served as a member of the New York Legislature and as major general of the State militia.

MORRIS, Sir Lewis (1833–1907). An English poet, born at Carmarthen, Wales. After graduating from Jesus College, Oxford (B.A. 1855; M.A. 1858), he studied law, was called to the bar at Lincoln's Inn (1861), and practiced as a conveyancer till 1880. Especially interested in higher education in Wales, he served on the governing boards of three Welsh colleges. On several occasions he stood for Parliament in the Liberal interest, but without success. In 1895 he was knighted. His verse comprises *Songs of Two Worlds* (3 vols., 1871, 1874, 1875), sonorous and optimistic verse; the *Epic of Hades* (1877), blank-verse monologues; *Gwen: A Drama in Monologue* (1879); the *Ode of Life* (1880); *Songs Unsung* (1883), the first volume to be issued under the author's own name; *Gycia: A Drama* (1886); *Songs of Britain* (1887); *A Vision of Saints* (1890); *Songs without Notes* (1894); *Idylls and Lyrics* (1896); *Harvest-Tide* (1901); *The New Rambler from Desk to Platform* (1905). To the critic Morris is a writer of slight and easy verse on pretentious themes.

MORRIS, Mary (Philipse) (1730–1825). One of the celebrated Philipse family, born in the Philipse manor house on the Hudson. She possessed much personal beauty and charm, and, according to an insufficiently supported tradition, she received and declined an offer of marriage from Washington, whom she met in 1756 while visiting her brother-in-law Beverly Robinson in New York. Two years later she married Capt. Roger Morris, an English officer, and lived for many years in an elegant mansion—known as the Roger Morris House and later as the Jumel mansion—on the outskirts of New York. When the Revolution broke out she remained loyal to the crown, and as a result she was attainted of treason and in 1776 her property was confiscated. In 1809 her children sold their reversionary rights in the confiscated property to John Jacob Astor for $100,000. In recognition of her loyalty, the English government made her a grant of $85,000. Mrs. Morris accompanied her husband to England and died at York. Her mansion was Washington's headquarters from Sept. 16 to Oct. 21, 1776. Here he made plans to defend the Heights and to block the passage of the Hudson River. The house was purchased in 1810 by Stephen Jumel, a French wine merchant, and for some time was the resort of French émigrés. Jumel's widow occupied the house until her death in 1865, and for many years thereafter Nelson Chase, the husband of Mme. Jumel's niece, lived there. In 1903 it was acquired by New York City to be used as a museum of historic relics.

MORRIS, May (?–). An English worker in arts and crafts, daughter of William Morris (1834–96). She was born at Upton, Kent, attended Notting Hill High School, and studied art with her father. She devoted herself to the designing of embroidery and jewelry and later lectured widely on these and similar subjects in England and America. Miss Morris was one of the founders and later became chairman of the Women's Guild of Arts. She edited, with introductions, her father's collected works (24 vols., 1910–14).

MORRIS, Michael, Baron Killanin (1827–1901). An Irish jurist. He was born in Galway, studied at Trinity College, Dublin, and was called to the Irish bar in 1849. His great popularity made his advance in politics very rapid. He was elected to the House of Com-

mons in 1865 as a Conservative; was named Solicitor-General for Ireland in 1866, Attorney-General in the same year, a puisne judge of the Irish Court of Common Pleas in the following year; and after the abolition of his later post of Chief Justice of Common Pleas, he became Lord Chief Justice of Ireland in 1887. His great popularity was due to a kindly nature, a contempt for legal subtleties and technicalities, and an abounding wit whose expression was flavored with a rich Galway brogue. When asked once at a London dinner party to explain Irish disaffection, he replied that it was a case of "a quick-witted people ruled against its will by a stupid people"—an epigram that has become historic. In 1900 Morris retired from the bench, and the same year was made an hereditary baron in the peerage of the United Kingdom.

MORRIS, Richard (1833–94). An English philologist. He was born at Bermondsey, was educated at St. John's College, Battersea, in 1869 became lecturer on the English language and literature in King's College School, and in 1871 took holy orders. Four years later he was made headmaster of the Royal Masonic Institution for Boys at Wood Green, Middlesex, from which he retired in 1888 to become master of the grammar school of Dedham, Essex. He edited a number of publications for the Early English Text Society, the Chaucer Society (notably his *Chaucer* in six volumes, 2d ed., 1891), and the Philological Society; and in 1874 was elected president of the latter. Besides his editions of early English works, he published: *The Etymology of Local Names* (1857); *Specimens of Early English* (1867); *Historical Outlines of English Accidence* (1872; 2d ed. by Kellner and Bradley, 1895); *Elementary Lessons in Historical English Grammar* (1874); *Primer of English Grammar* (1874). From 1882 to 1888 he turned his attention to Pali and edited four of the extensive Buddhist texts for the Pali Text Society.

MORRIS, Robert (1734–1806). An eminent American financier and one of the signers of the Declaration of Independence. He was born at Liverpool, England, Jan. 31, 1734. At the age of 14 he was sent to America and placed in the counting house of Charles Willing, a rich Philadelphia merchant, whose partner he became in 1754, continuing as such until 1793. The firm of Willing & Morris became one of the leading mercantile establishments in America, and by the outbreak of the Revolutionary War Morris had already acquired a large fortune. Although naturally averse to a rupture with Great Britain, he sacrificed his personal interests, signed the nonimportation agreement of 1765, and served as a member of the citizens' committee that compelled the stamp distributor for Philadelphia practically to relinquish his office. In June, 1775, he became a member of the Pennsylvania Committee of Safety; in October of the same year he was elected to a seat in the Legislature of Pennsylvania (to which he was reëlected in 1776), and in November he was appointed by that body a delegate to the Continental Congress. All three of these offices were held by him at the same time. As a member of Congress he served on several important committees and signed the Declaration of Independence, although he had opposed Lee's resolution of June 7 and absented himself from the congressional hall on July 4, when the final vote was taken. At the expiration of his term in Congress, in 1778, he was elected again to the State Legislature, but on account of miscellaneous charges against him in connection with his mercantile operations, he failed of reëlection in the following year. In October, 1780, however, he was returned to the Legislature for the fourth time. It was at this time that the fortunes of the Colonial army reached their lowest ebb. Charleston had fallen; Gates had been defeated by Cornwallis; Arnold's treachery cast gloom on the country. Munitions and supplies were sadly wanting, and Continental currency had depreciated until it was worth but little more than the paper on which it was printed. In this almost desperate situation, Congress resolved to supersede the old treasury board by a superintendent of finance. Morris was chosen to the position Feb. 20, 1781, at a salary of $6000 a year, and received large powers over the finances of the Confederation. His chief programme was to relieve the situation by import duties, loans and subsidies from France, and to inaugurate a policy of retrenchment. He was unable, however, to carry out the first part of his scheme on account of the refusal of the States to confer the necessary power upon Congress for the laying of import duties. On several occasions he succeeded in borrowing large sums on his personal credit, without which some of the important campaigns of the war would have been impossible. Thus the means which enabled Washington and Greene to carry out the campaign of 1781 were raised mainly by his exertions. In 1781, with the approval of Congress, he founded the Bank of North America and became a large stockholder in it. This institution became of great service to the American cause and was, to a certain extent, under the control of Morris. He continued to hold the difficult and vexatious office of Superintendent of Finance until November, 1784, when he resigned it with a sense of relief. In the same year the Pennsylvania Legislature had annulled the charter of the bank, and in order to obtain its reëstablishment Morris secured an election to the Legislature in 1785 and succeeded in having the charter renewed in 1786. In the latter year he was again elected to the Legislature, and in 1787 became a member of the Constitutional Convention at Philadelphia. He had the honor to nominate Washington for the presidency of the Convention, but did not take a prominent part in the proceedings of that body. Upon the organization of the new government, President Washington offered him the position of Secretary of the Treasury. He declined the offer and recommended Alexander Hamilton, who was appointed. At the same time, however, he accepted a seat in the United States Senate, where he served without special distinction until 1795. Unfortunate business speculations proved disastrous, and on Feb. 16, 1798, he entered a debtor's prison in Philadelphia, where he was confined until Aug. 26, 1801. He died May 8, 1806. Consult: A. S. Bolles, *The Financial Administration of Robert Morris* (New York, 1878); W. G. Sumner, *The Financier and the Finances of the American Revolution* (ib., 1891); id., *Robert Morris* (ib., 1892). The best biography is E. P. Oberholtzer, *Robert Morris, Patriot and Financier* (New York, 1903), which is based upon the Robert Morris papers in the Library of Congress.

MORRIS, Thomas (1776–1844). An American antislavery leader, born in Augusta Co.,

Va. His father removed to Ohio in 1795. While working on a farm in Clermont County he studied law, and was admitted to the bar in 1804. From 1806 to 1830 he was a member of the Ohio State Legislature. In 1832 he was elected to the United States Senate as a Democrat. He very soon took ground on the slavery question, however, in radical opposition to that held by the majority of his party. He willingly presented antislavery petitions and ardently defended the right of petition in the Senate. He also spoke strongly against Texan annexation. In 1838, when Calhoun introduced a series of resolutions touching the constitutional status of slavery, Morris introduced a set of alternative resolutions embodying a rational and explicit statement of the views of the antislavery men. On the expiration of his term as Senator his constituents, to whom his views on the slavery question had been displeasing in the extreme, discarded him for Benjamin Tappan. In January, 1840, at the Democratic State Convention, he was read out of the party, and later in the year associated himself politically with the new Liberty party (q.v.) movement. In May, 1841, he was nominated for Vice President on the Liberty party ticket, on which James G. Birney had been named for President. These nominations, which were for the campaign of 1844, were confirmed at the Buffalo convention of the party in 1843. Consult B. F. Morris, *Life of Thomas Morris* (Cincinnati, 1856), and Smith, *The Liberty and Free-Soil Parties in the Northwest* (New York, 1897).

MORRIS, Thomas Asbury (1794–1874). An American Methodist Episcopal bishop, born near Charleston, W. Va. His educational advantages were limited. He was originally of Baptist training, but entered the Methodist ministry in 1816. From 1834 to 1836 he was editor of the *Western Christian Advocate.* Elected Bishop in 1836, for several years he was the senior Bishop of the church. He was a member of the General Conferences of 1824, 1828, 1832, and 1836. His writings include: *A Discourse on Methodist Church Polity* (1859; later eds.); *Sermons on Various Subjects* (1841, 1859); *Miscellany, Essays, Sketches, etc.* (1854); *A Semi-Centennial Sermon* (1864). Consult J. F. Marlay, *The Life of Thomas A. Morris* (New York, 1875).

MORRIS, William (1786–1858). A Canadian statesman. He was born at Paisley, Scotland, was brought by his parents to Lower Canada (Quebec) in 1801, and a few years later entered business in Montreal. During the War of 1812–15 he served both in the militia and in the navy, and shortly after peace was signed resumed business at Perth. He was a member of the Upper Canada Assembly (1820–36), and in the former year became prominent by moving and carrying a series of resolutions claiming for the clergy of the Church of Scotland a share in the lands reserved by law for the use of the Protestant clergy, but hitherto monopolized by the Church of England. His name thereafter was prominently identified with the struggle for the secularization of the clergy reserves. He was selected in that behalf to be the bearer of a petition to the British government, and in 1837 went to England for that purpose. Morris was appointed a member of the Legislative Council in 1836. During the rebellion of 1837–38 in Upper Canada he served the government as colonel of militia. In 1844 he was appointed Receiver General in the administration of which William Henry Draper (q.v.) was the chief figure. In 1846 he became President of the Executive Council, retaining that office in the succeeding Sherwood-Daly ministry (1847–48).

His brother, James Morris (1798–1865), was elected to the Upper Canada Assembly in 1837 and to the Canada Legislative Assembly in 1841. He was appointed to the Legislative Council in 1844, was Postmaster-General in the Hincks-Morin administration (1851), Speaker of the Legislative Assembly (1853–54), Speaker of the Legislative Council (1858), and Receiver General in the Macdonald-Sicotte administration (1862–63).

MORRIS, William (1834–96). An English poet, artist, and Socialist. He was born at Walthamstow near London, March 24, 1834. Morris's early boyhood was spent in the romantic region near Epping Forest, where he showed at the outset his love for nature. He was educated at Marlborough College, and at Exeter College, Oxford. Here he mingled little in the college life, but he read swiftly and widely, thus quickly storing in his strong memory a stock of knowledge which he put to use. In 1854 he was near turning to Roman Catholicism as an escape from religious perplexities, but the impulse passed. He mastered Church history and Anglican theology, but soon left them in a new enthusiasm for Carlyle, Ruskin, and Kingsley. It was in 1854 that Morris first visited France, whither he went again a year later with his friend Edward Burne-Jones (q.v.). On this tour he fell so wholly under the spell of French Gothic that he gave up his earlier purpose of founding a religious brotherhood and became an architect. In 1859 he married Jane Burden of Oxford, who had sat as his model and was a noted beauty. After trying his hand at architecture and painting, Morris with Rossetti, Burne-Jones, and other friends, established, in 1861, a firm in London for designing and manufacturing artistic furniture and household decorations. As time went on Morris took up the manufacture of tapestry and other textiles, dyeing, book illumination, and printing. The old firm of decorative art was dissolved in 1875, and in 1881 Morris transferred his works to Merton Abbey in Surrey. In 1890 he founded the famous Kelmscott Press at Hammersmith. There many beautiful books were printed, and thence, after 1893, he issued books of his own in verse and prose. For the practical advancement of the lesser arts, and of the doctrine that all things should be made beautiful, Morris did more than any other man of his time. At Oxford he showed his literary talent in several contributions in verse and prose to the *Oxford and Cambridge Magazine,* which he maintained (1856). Two years later he published the *Defense of Guenevere, and Other Poems.* This volume marks a date in later romanticism; and never again did Morris surpass it in force and concentration. Afterward he turned for his subjects to Roman, Greek, Norse, Old French, and other mediæval stories, which he clothed in verse with great facility. By the *Life and Death of Jason* (1867) and *The Earthly Paradise* (1868–70) he proved himself one of the best story-tellers since Chaucer, his avowed master. In the summer of 1871 he made a trip through Iceland. In 1876 appeared *Sigurd the Volsung and the Fall of the Niblungs,* a narrative poem approaching the dignity of an epic.

Morris wrote many romances in prose or in prose and verse combined; among these are the *House of the Wolfings* (1889), *The Roots of the Mountains* (1890), *The Story of the Glittering Plain* (1890), and *The Well at the World's End* (1896). In 1890 he published *News from Nowhere*, a romantic pastoral, picturing the England of a possible remote future, happy in a realized Socialism. As a translator he succeeded capitally in his renderings from the sagas, and his English translations of the *Æneid* and the *Odyssey* have, with their defects, fine qualities. In 1885 he became an active Socialist, delivering lectures to workmen and contributing to the *Commonweal*, the organ of the Socialistic League. He died Oct. 3, 1896, leaving to the world a splendid example of the man who devotes his wealth and his genius to the bettering of visible things and to the spreading of fine and generous ideals. A collection of various of his papers, entitled *Architecture, Industry, and Wealth*, appeared posthumously in 1903.

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MORRIS DANCE (from OF. *morisque, morésque*, Fr. *moresque*, from Sp. *morisco*, Moorish, from *moro*, Moor). An obsolete English dance of Moorish origin. It seems to have been introduced into England about the time of Edward III, but it did not become universally popular until the time of Henry VII. When danced in connection with May Day it was an elaborate costume dance, and the characters of Robin Hood, Friar Tuck, Maid Marian, Little John, a dragon, and hobbyhorse were introduced. The costumes of the performers were generally decorated with scores of small bells which were tuned in musical intervals. There were several variations of the morris dance, the two most notable being a sword dance, where the performers leaped over swords, and a ribbon dance, in which the girls danced back and forth between colored streamers. At the Restoration the morris dance was revived for a time, but soon died out. Several modern English composers have used it as an idealized dance form, generally in 4-4 time.

MORRIS ISLAND. An island at the southern entrance to the harbor of Charleston, S. C. (Map: South Carolina, E 4). Three small batteries on Cumming's Point, at the northern end of Morris Island, took part in the bombardment of Fort Sumter on April 12–13, 1861. Later the works were strengthened and called Battery Gregg, and Battery Wagner was constructed to the south. In the spring of 1863 Admiral Du Pont and General Hunter made unsuccessful attempts to reduce these defenses. When these officers were succeeded by Admiral Dahlgren and General Gilmore, early in July, a landing was effected on the southern part of the island, but on the 11th and 18th desperate assaults failed. A regular siege was established and five parallels were constructed. The guns of Fort Sumter, which were trained to protect the island, were silenced by the Federal fleet, and on September 7 General Beauregard ordered the evacuation of the island.

MOR'RISON. A city and the county seat of Whiteside Co., Ill., 124 miles west of Chicago, on the Chicago and Northwestern Railroad (Map: Illinois, D 2). It is surrounded by a region interested largely in farming, stock raising, and dairying, and manufactures refrigerators, school furniture, flour, carriages, and condensed milk; and there are two greenhouses. It has a public museum and library. Pop., 1900, 2308; 1910, 2410.

MORRISON, ARTHUR (1863–). An English novelist, widely known for the realism with which he depicts London life, and known also as a collector of objects of art and as a writer on Oriental art. A collection of paintings by Chinese and Japanese old masters, made by him, is now in the British Museum. His writings comprise: *Tales of Mean Streets* (1894); *Martin Hewitt, Investigator* (1894); *Chronicles of Martin Hewitt* (1895); *Adventures of Martin Hewitt* (1896); *The Dorrington Deed-Box* (1897); *To London Town* (1899); *Cunning Murrell* (1900); *The Hole in the Wall* (1902); *Divers Vanities* (1905); *Green Ginger* (1909); *The Painters of Japan* (1911); and the plays *That Brute Simmons* (1904), with H. C. Sargent, and *A Stroke of Business* (1907), with H. W. C. Newte.

MORRISON, FRANK (1859–). An American labor leader. He was born at Franktown, Ontario, was educated in the schools of Walkerton, Ontario, became a printer in 1873, and graduated in 1894 from the Lake Forest University Law School, where he also studied in 1895. In 1897 he became secretary of the American Federation of Labor. He was one of the three officials of the American Federation of Labor who were made defendants in the Buck Stove case. For a history of the case see MITCHELL, JOHN; and consult H. W. Laidler, *Boycotts and the Labor Struggle* (New York, 1914).

MORRISON, GEORGE ERNEST (1862–1920). A British journalist, born at Geelong, Victoria, Australia. He studied for some time at Melbourne University and completed his education at Edinburgh in 1887. In the meanwhile he had seen adventure in the South Sea islands, had crossed Australia on foot from north to south (1882–83), and had been seriously wounded in New Guinea. After further travels in America and in Morocco, where he was for some time court physician, and after a short sojourn in Australia, he went to China, walked from Shanghai to Rangoon (1894), traveled in Siam and southern China as correspondent to the London *Times* (1895–96), and in 1897 became correspondent of the *Times* at Peking, where he was present during the Boxer disturbances of 1900. His views on Chinese affairs,

gained by travel and study in every province of China, are authoritative. In 1912 he was appointed political adviser to the President of the Chinese Republic. He wrote *An Australian in China* (1895).

MORRISON, James Dow (1844–). An American Protestant Episcopal bishop, born of Scottish parents in Waddington, N. Y. He received his early education in Canada, graduating from McGill University, Montreal, in 1865. He was minister at Hemmingford, Canada, in 1869–71, and later at Herkimer, N. Y., and Ogdensburg, where he was Archdeacon from 1881 until 1897. In the latter year he was consecrated first Protestant Episcopal Missionary Bishop of Duluth. In 1907 he organized the diocese of Duluth, of which he became Diocesan Bishop. In 1898 he was Paddock lecturer at the General Theological Seminary, New York. He published *Fundamental Church Principles* (1900).

MORRISON, Robert (1782–1834). The first Protestant missionary to China, born at Buller's Green, Morpeth, England. He learned the trade of boot-tree maker after leaving school. In 1797 he was converted, joined the Presbyterian church, and began to improve himself by study. In 1803 he was admitted to Hoxton Independent Academy, and in the following year entered the Mission College of Gosport. Morrison, having been ordained, was sent out in 1807 as the first missionary. Under the protection of some merchants from the United States settled at Canton, he assumed Chinese dress and began the study of Chinese. In 1809 he was appointed translator to the East India Company's factory here, and while in this position he prepared a *Grammar of the Chinese Language*, published in 1815. Between 1815 and 1823 appeared the six thick quarto volumes of his *Dictionary of the Chinese Language*. He also produced several vocabularies of Canton-English and English-Canton. His *New Testament* in Chinese was published in 1815, and the *Old Testament* appeared in 1818. In that year he founded the Anglo-Chinese College at Malacca. It was removed to Hongkong in 1845. Consult the *Memoir* by his widow (2 vols., London, 1839) and W. J. Townsend, *Robert Morrison, Pioneer of Chinese Missions* (New York, 1888).

MORRISON, William (1785–1866). A Canadian explorer and fur trader, born at Montreal. He began trapping and trading at Fond du Lac in 1802, joined the Northwest Company in 1805, and made extensive explorations in the Northwest territories. After John Jacob Astor gained control in 1818 of fur trading in the United States, Morrison worked for him until 1826. He afterward returned to Lower Canada. Morrison claimed to have explored during the winter of 1803–04 Lac La Biche, or Elk Lake, which was in 1832 identified as the source of the Mississippi by Schoolcraft and renamed Itasca. Consult *Minnesota Historical Society Collections* (vol. i, St. Paul, 1872; vol. vii, Minneapolis, 1893; vol. viii, St. Paul, 1898).

MORRISON, William Ralls (1824–1909). An American lawyer and legislator, born in Monroe Co., Ill. He was educated at McKendree College, but left before graduation to enlist as a private in an Illinois volunteer regiment for the Mexican War, and participated in most of the battles of Taylor's campaign. After his return he studied law, was admitted to the bar, and from 1855 to 1859 was a Democratic member of the Lower House of the Illinois Legislature, serving as Speaker in the last year. At the outbreak of the Civil War he organized and became colonel of the Forty-ninth Illinois Infantry, fighting at Fort Donelson and serving until December, 1863, when he resigned to take his seat as a War Democrat in the Thirty-eighth Congress; he had been elected while at the front in the preceding year. He practiced law from 1865 until 1873, and from that year until 1887 was again a member of the House. During his congressional career he attained wide distinction as an advocate of a radical reduction in the tariff, but was never able to secure the support of enough members of his own party to assure the passage of bills which as chairman of the Ways and Means Committee he introduced in 1876, 1884, and 1886. The Morrison Bill of 1884, embodying the famous "horizontal" tariff scheme, which proposed a straight (or horizontal) reduction of 20 per cent from the tariff of 1883, was defeated by a slender majority formed of Republicans and protectionist Democrats led by Samuel J. Randall (q.v.). In 1885 Morrison was defeated for election to the United States Senate by John A. Logan by one vote, and in the following year failed of reëlection to the House. He was appointed by President Cleveland a member of the Interstate Commerce Commission in 1887, and served until 1897, for the last six years as chairman.

MOR'RISTOWN. A town and the county seat of Morris Co., N. J., 22 miles by rail west of Newark, on the Delaware, Lackawanna, and Western, the Morristown and Erie, and the New Jersey and Pennsylvania railroads (Map: New Jersey, C 2). Among the features of the town are Memorial and All Souls' hospitals, Randolph Military Academy, the Young Men's Christian Association and Young Men's Catholic Association buildings, a public park with a soldiers monument, and a large public library and lyceum, occupying a handsome edifice. Here is the site of Fort Nonsense, erected by Washington and marked by a memorial monument. Four miles from the town, at Morris Plains, is the State Hospital for the Insane, which cost nearly $3,000,000, has accommodations for 1500 patients, and is one of the largest institutions of its character in the United States. Morristown is in the rose and peach belt of the State, on a table-land surrounded by hills rising nearly 700 feet above sea level, and is chiefly a fashionable residential place with large villas. The only industrial establishments of any importance are hosiery mills and a high-pressure wire factory. Its comparatively dry and bracing winter climate attracts invalids. The government, as provided under the original charter of incorporation, is vested in a mayor and a municipal council, of which the executive is a member. The school commissioners are chosen by popular vote. Pop., 1900, 11,267; 1910, 12,507; 1920, 12,548.

Settled about 1710, Morristown was known as West Hanover until in 1740 it received its present name in honor of Lewis Morris, then Governor of New Jersey. During the Revolution Washington made his headquarters here from January to May, 1777, and again from December, 1779, to June, 1780, occupying during the latter period the old Ford mansion, which now belongs to the Washington Association and in which numerous Revolutionary

relics are exhibited. At the old Speedwell Ironworks here the shaft of the *Savannah*, the first steamboat to cross the Atlantic, was cast, and here, from 1837 to 1843, Professor Morse and Alfred Vail perfected the electric telegraph. Morristown was incorporated in 1865. Consult Colles, *Authors and Writers Associated with Morristown, etc.* (Morristown, 1893), and Sherman, *Historic Morristown* (ib., 1906).

MORRISTOWN. A city and the county seat of Hamblen Co., Tenn., 42 miles northeast of Knoxville, on the Southern and the Knoxville and Bristol railroads (Map: Tennessee, G 2). It is the seat of the Morristown Normal and Industrial College, a Methodist Episcopal institution for negroes. Morristown is the commercial centre of a rich agricultural region, and is an important poultry and stock market, the value of the annual shipments being $3,000,000. The manufactures include flour, stoves, threshing machines, hosiery, butter, hardwood tops and panels, furniture, gloves, vinegar, harness and saddles, tinware, acetylene-lighting plants, monuments, concrete building blocks, wagons, leather, brooms, and sash and blinds; and there are quarries of variegated marble and zinc, lead, and iron mines in the vicinity. The city owns and operates its water works and electric-light and sewage plants. Pop., 1900, 2973; 1910, 4007.

MORRISTOWN. A town, including the village of Morrisville, Lamoille Co., Vt., 50 miles by rail east by north of Burlington, on the Lamoille River and on the St. Johnsbury and Lake Champlain Railroad (Map: Vermont, C 3). It contains a Carnegie library and the People's Academy. Morristown is in a rich agricultural and dairying country, butter, eggs, cream, potatoes, and hay being the chief products. The water works and electric-light plant are owned by the village of Morrisville. Pop., 1900, 2583; 1910, 2652.

MORRO, EL. See NATIONAL MONUMENTS.

MORROW, PRINCE ALBERT (1846–1912). An American dermatologist, born at Mt. Vernon, Christian Co., Ky. He graduated as M.D. from University Medical College (later part of New York University) in 1874. Settling in New York City, he was clinical professor of venereal diseases (1884–90) and clinical professor of genito-urinary diseases (1886–90) at the university and at Bellevue Hospital Medical College. He took active part in the public-welfare movement and was president of the American Society for Sanitary and Moral Prophylaxis from its organization in 1905. He contributed many articles to the medical journals and was one of the editors of the *Journal of Cutaneous and Genito-Urinary Diseases.* Among his works may be mentioned: *Venereal Memoranda* (1885; 2d ed., 1905); *Drug Eruptions* (1887); *Atlas of Skin and Venereal Diseases* (1888–89); *System of Genito-Urinary Diseases, Syphilology, and Dermatology* (3 vols., 1892–94); *Leprosy* (1899); *Social Diseases and Marriage* (1904).

MORROW, WILLIAM W. (1843–). An American lawyer and jurist, born near Milton, Wayne Co., Ind., and educated in the public schools of Illinois and California. Admitted to the bar in 1869, he served as assistant United States attorney for California (1870–74), as attorney of the State Board of Harbor Commissioners (1880–83), and as special counsel for the United States before the French and American Claims Commissions (1881–83) and before the Alabama Claims Commission (1882–85). From 1879 to 1882 he was chairman of the Republican State Central Committee, in 1884 chairman of the California delegation to the Republican National Convention, and a member of the Forty-ninth to the Fifty-first Congresses (1885–91). After serving as United States district judge for the northern district of California in 1891–97, Morrow became judge of the United States Circuit Court and then of the Circuit Court of Appeals for the ninth judicial circuit. In 1905 he was one of the incorporators of the American National Red Cross Society.

MORS. The largest island in the Limfjord, in northwest Jutland, Denmark (Map: Denmark, B 2). Its area is 139 square miles. It is in marked contrast with the surrounding mainland, being much more fertile and having a somewhat elevated (250 feet) interior, with steep coasts. Pop., 1901, 22,237; 1911, 24,270. The chief town is Nykjöbing, with 6918 inhabitants (1911).

MORSE (probably from Icel. *mar*, sea + *ros*, horse, cf. Norw. *rosmar*, walrus; less plausibly from Russ. *moryŭ*, *morzhŭ*, morse, from *more*, sea). An old name for the Atlantic walrus (q.v.).

MORSE. See COSTUME, ECCLESIASTICAL.

MORSE, CHARLES WYMAN (1856–). An American financier, born in Bath, Me. He graduated from Bowdoin College in 1877, having more than paid his way through college by sending ice to a New York brewery company. Later he engaged in the shipping business in Maine, moving in 1880 to Brooklyn and then to New York City. Here he established an ice business which finally, in 1899, under the name of the American Ice Company, expanded to include the areas of Philadelphia and Baltimore. This company practically secured a monopoly in New York. Through political affiliations it obtained exclusive wharfage rights, enabling it to raise prices until the public clamor caused an investigation. The scandalous condition then revealed was regarded as one of the causes of the overthrow of Tammany Hall in 1901. In the meanwhile Morse had sold his holdings, making a profit, it was claimed, of over $12,000,000. He then turned to the shipping business. His efforts to secure a monopoly of the American coastwise transportation service resulted in the combination under one control of the Clyde Steamship Company, the Mallory line, the Metropolitan Steamship Company, the Hudson Navigation Company, the Ward line, and others. Morse also entered the publishing business and was influential in establishing the Butterick Company, of which he was first vice president. To finance his vast industrial undertakings, and especially to make possible a spectacular manipulation of American Ice, Consolidated Steamship, and United Copper stocks, he secured control of a chain of nine banks, using methods afterward considered questionable. Because of his connection with several of the banks which failed during the panic of 1907 and the general belief that in a measure Morse was responsible for the panic, his methods and transactions came up for review in the Federal courts. The National Bank of North America (New York), of which he was vice president, was closed in January, 1908. The indictment charged that he had criminally

misapplied the funds of this bank (and so of others also), that "he had entered upon a career of reckless and forbidden speculation," and that he had concealed his unlawful practices by making false entries in the books. Later in the same year he was convicted and sentenced to 15 years' penal servitude in Atlanta Penitentiary; higher courts sustained this decision. The case attracted general attention, but opinions regarding the outcome were various. Many, regarding it as a salutary lesson to those who were conducting big business illegally, rejoiced in the ability of the government to convict a rich man. Others thought that, while Morse was guilty, such actions as his were common in Wall Street and that his offense was more technical than real. The case was important in that it gave an impetus to the antitrust movement. After Morse had served a part of his sentence, his health was reported to have been undermined, and efforts were made, particularly by his wife, to obtain a pardon, which was granted by President Taft in 1912. A sojourn abroad enabled him to recuperate rapidly and he returned to the United States the next year. From then on he was involved in suits by persons who had lost on American Ice stock, etc.; but he again acquired corporate interests, becoming president of the Hudson Navigation Company.

MORSE, Edward Sylvester (1838–). An American zoölogist and Orientalist, born at Portland, Me. For three years he studied at the Lawrence Scientific School, Harvard, under Louis Agassiz. He was professor of comparative anatomy and zoölogy at Bowdoin College (1871–74), lecturer at Harvard (1872–73), and professor at the Imperial University, Tokyo, Japan (1877–80). Thereafter he served as director of the Peabody Museum at Salem, Mass., of which he had been a founder. Morse became known also as a popular lecturer on natural history and Oriental travel. His reputation as a zoölogist was early established by his studies of brachiopods, which proved them not to be mollusks, and he was elected a member of the National Academy of Sciences, also corresponding or honorary member of many foreign scientific and Oriental societies, a fellow of the American Academy of Arts and Sciences, and president of the American Association for the Advancement of Science (1886). While in Japan Morse interested himself greatly in the art, antiquities, social customs, and folklore of the people and made a collection of pottery, etc., which was bought by the Museum of Fine Arts, Boston. A catalogue, prepared by Morse, who had been made keeper of the collection in 1892, appeared in 1901. In 1898 he was decorated with the Order of the Rising Sun; as an expert on Japanese ceramics, he served on the jury of awards at the Chicago, Buffalo, and St. Louis expositions; and in 1911 he was president of the American Association of Museums. His writings include: *First Book of Zoölogy* (1875); *Japanese Homes and their Surroundings* (1886); *On the Older Forms of Terra-Cotta Roofing Tiles* (1892); *Glimpses of China and Chinese Homes* (1902); *Mars and its Mystery* (1906); besides numerous articles contributed to scientific journals.

MORSE, Harmon Northrop (1848–). An American chemist, born at Cambridge, Vt. He graduated from Amherst College in 1873 and from the University of Göttingen (Ph.D.) in 1875. He was an assistant in chemistry at Amherst in 1875–76, and at Johns Hopkins University served as associate professor of chemistry in 1876–91, as professor of analytical chemistry from 1891 to 1908, and thereafter as professor of inorganic analytical chemistry and director of the chemistry laboratory. His researches in osmotic pressure are of importance. He published *Exercises in Quantitative Chemistry* (1905) and *The Osmotic Pressure of Aqueous Solutions* (1914).

MORSE, Harry Wheeler (1873–). An American physicist, born at San Diego, Cal. He graduated at Leland Stanford Junior University in 1897 and at Leipzig (Ph.D.) in 1901. He was instructor (1902–10) and assistant professor (1910–12) in physics at Harvard University and served as professor of chemistry (1912–13) at the University of California. In 1913 he was placed in charge of the scientific work of the Western Precipitation Company at Los Angeles, Cal. He is translator of Ostwald's *Letters to a Painter on the Theory and Practice of Painting* (1906) and *Fundamental Principles of Chemistry* (1907); coauthor of *Ostwald and Morse's Elementary Modern Chemistry* (1907); and author of *Chemistry and Physics of the Lead Accumulator* (1912) and monographs on spectroscopy.

MORSE, Hosea Ballou (1855–). An American author and authority on Chinese affairs, born at Brookfield, Nova Scotia. His ancestors had settled at Dedham, Mass., as early as 1636. Graduating from Harvard in 1874, Morse entered the Chinese Imperial Customs Service as an assistant. He was made Deputy Commissioner in 1887 and Commissioner in 1896, and from 1903 till his retirement in 1907 was Statistical Secretary (Commissioner of Customs) to the Inspector General of Customs (Chief of the Department of Statistics, Printing, and Supplies). In 1885 he was sent by Imperial decree on a special mission regarding the peace settlement between China and France. From 1885 to 1887 he was also concerned with the reorganization of the China Merchants' Steam Navigation Company. In 1889, again by special Imperial decree, he was appointed Commissioner in connection with the opening of Hunan Province to foreign trade. He was highly honored by the Manchu government; became president of the American Association of China, vice president of the China branch of the Royal Asiatic Society, and chairman of the board of directors of the Y. M. C. A. at Shanghai; and received the degree of LL.D. from Western Reserve University in 1913. His writings include: *Currency of China* (1906); *Trade and Administration of the Chinese Empire* (1908; rev. ed., 1913); *Guilds of China* (1909); *International Relations of the Chinese Empire, 1834–1860* (1910).

MORSE, John Torrey (1840–). An American biographer. He graduated at Harvard College in 1860, lectured there on history (1876–79), was coeditor with Henry Cabot Lodge of the *International Review*, and practiced law in Boston. From 1879 to 1891 he was an overseer of Harvard. He was honored with membership in the National Institute of Arts and Letters. His books include: *Treatise on the Law Relating to Banks and Banking* (1870); *Law of Arbitration and Award* (1872); *Famous Trials* (1874); *Life of Alexander Hamilton* (2 vols., 1876); *Life and Letters of Oliver Wendell*

Holmes (2 vols., 1896); in "American Statesmen Series" (which was edited by him) the lives of *John Quincy Adams* (1882), *Thomas Jefferson* (1883), *John Adams* (1884), *Benjamin Franklin* (1889), and *Abraham Lincoln* (2 vols., 1893); *Life and Letters of Colonel Henry Lee* (1906).

MORSE, Richard Cary (1841–). An American leader in the Young Men's Christian Association. He was born at Hudson, N. Y., and was educated at Yale (A.B., 1862), and at Princeton and Union theological seminaries. He was assistant editor of the New York *Observer* in 1867–69, and was then ordained to the Presbyterian ministry. As general secretary of the international committee of the Y. M. C. A. after 1869, he became prominently identified with the extension and supervision of the work in North America, and after 1872, in its interest, made several trips to England, the Continent, Australia, China, Japan, Korea, and India. He was chosen one of the two American members of the World's Student Christian Federation. His writings include: *Robert R. McBurney: A Memorial* (1899); *Polity of Young Men's Christian Associations* (1904); *Fifty Years of Federation of the Young Men's Christian Associations of North America* (1905); *History of the North American Young Men's Christian Associations* (1913).

MORSE, Samuel Finley Breese (1791–1872). An American artist and inventor. He was born at Charlestown, Mass., April 27, 1791, and graduated at Yale College in 1810. While in college he painted "miniatures on ivory at $5 and profiles at $1." Later, with the American painter Washington Allston, he visited England and studied there with Allston and with Benjamin West. In 1813 he received the gold medal of the Adelphi Society of Arts for a plaster model of the "Dying Hercules," which he had used in painting a large picture exhibited the same year at the Royal Academy. Returning to New York in 1815, he became in 1826 the first president of the National Academy of Design and was appointed in 1835 professor of the arts of design in the University of the City of New York. During this period he was constantly working on commissions, among his sitters being James Monroe, Chancellor Kent, Fitz-Greene Halleck, and Lafayette. He did not give his entire attention to art, but was interested in chemistry and especially in electrical and galvanic experiments; his interest doubtless being awakened in the subject of electromagnetism through conversations with Prof. J. Freeman Dana, who lectured in New York on that subject in 1826–27 and exhibited an electromagnet. Morse first conceived the idea of the telegraph while on board the packet ship *Sully* on his way from Europe to America in 1832, while discussing the then recent discovery in France of a method for obtaining the electric spark from the magnet. Before the close of that year a portion of the apparatus which he had devised had been constructed in New York, but it was not until three years later that, in a room at the University, he showed the telegraph operating with half a mile of wire. In September, 1837, he made a public exhibition of his discovery and in that year filed his caveat at Washington. No result followed his appeal to Congress for aid during that session, and Professor Morse visited Europe with the hope of enlisting the interests of foreign governments in his invention. In this attempt he was unsuccessful, and he returned to New York, where, as well as in Washington, he struggled under serious privations during the four years which elapsed before he obtained (1843) congressional aid. In that year, after he had almost yielded to despair, Congress at midnight, in the last moments of the session, appropriated $30,000 for an experimental line between Washington and Baltimore. After this aid had been granted, Morse succeeded after many difficulties in establishing a working telegraph line, and the first message, "What hath God wrought?" was sent from the rooms of the United States Supreme Court in the capitol at Washington to Baltimore on May 24, 1844. From this time the telegraph was an assured success, but Professor Morse was frequently involved in litigation to maintain his rights under his patents. He also was engaged in numerous controversies. But the number and character of the honors heaped upon Professor Morse on account of his invaluable invention have probably never been equaled in the case of any other American. See Telegraph.

Professor Morse set up the first daguerreotype apparatus and with Prof. John W. Draper was associated in taking the first daguerreotypes in America; he also laid the first submarine telegraph line (in New York harbor in 1842); and from him, in a letter to the Secretary of the Treasury of the United States in 1843, seems to have come the first suggestion of an Atlantic telegraph. His last public act was the unveiling of a statue of Benjamin Franklin in Printing House Square, New York. He died in New York, April 2, 1872. Consult Prime, *Life of S. F. B. Morse* (New York, 1875), and E. L. Morse (ed.), his son, *Samuel Finley Breese Morse, his Letters and Journals* (2 vols., Boston, 1914).

MORSE, Sidney Edwards (1794–1871). An American journalist, geographer, and inventor, a brother of Samuel F. B. Morse. He was born in Charlestown, Mass., graduated at Yale in 1811, studied theology at Andover and law at Litchfield, Conn., and in 1815 established the Boston *Recorder*, a weekly religious newspaper, which he edited for more than a year. In 1820 he published a small geography and in 1823 a larger one called *A New System of Modern Geography*, of which more than 500,000 copies were ultimately sold. The success of the book was partly due to the later use in it of superior map prints in color produced by a new process called cerography, which he, with the assistance of Henry A. Munson, developed in 1839. In 1823, with his brother Richard, he established the New York *Observer*, another religious weekly, and he continued to be its chief editor and proprietor until 1858. He afterward invented an instrument called a bathyometer, for ascertaining sea depths, exhibited at the Paris Exposition of 1869 and in New York City in 1870. Besides his works on geography he published *Premium Questions on Slavery* (1860).

MORSELLI, môr-sĕl'lē, Enrico Agostino (1852–). An Italian alienist and neurologist, born at Modena. He graduated at the university of that city in 1874, studied psychiatry at Reggio under Livi and anthropology at Florence under Mantegazza, and subsequently became professor of psychiatry in the Turin medical school and physician in charge of the insane asylum in the same city. In 1889 he

was called to Genoa to fill the chair of mental and nervous diseases; in 1910 he became also professor of experimental psychology. Among his many works are: *Il trasfusione de sangue* (1876; 2d ed., 1886); *Il suicidio* (1879; Eng. trans., *Suicide*, 1882); *Critica e riforma del metodo in antropologia* (1880); *Il magnetismo animale* (1886); *Antropologia generale* (1887–1911); *Carlo Darwin e il darwinismo, etc.* (1892); *Manuele di semeiotica delle malatie mentali* (1898); *Linda e Tullio Murri* (1905); *Psicologia e spiritismo* (1908). Morselli became coeditor of the *Rivista sperimentale di Freniatria e di Medicina Legale* in 1875 and of the *Archivo di Psichiatrica* in 1885.

MORSHANSK, môr-shänsk'. An important commercial town in the Government of Tambov, Russia, situated near the river Tsna, about 60 miles north-northeast of the city of Tambov (Map: Russia, F 4). It produces tallow, soap, and spirits on a large scale and is the seat of an extensive trade in agricultural products and live stock. Pop., 1897, 27,756; 1911, 31,802.

MORTAL'ITY, STATISTICS OF. See LIFE INSURANCE; VITAL STATISTICS.

MORTAL SIN. In Roman Catholic theology, the name given to the graver class of sins, in distinction from venial sins (q.v.). For a sin to be mortal it must be a conscious violation of a known divine law, decided upon deliberately by a free will, a deliberate choice of an end of action apart from God, and it must usually be in a matter of importance, because trivial matters do not usually determine supreme choices. Mortal sin, as its name implies, is believed to destroy absolutely the divine life of grace in the soul and render it deserving of eternal punishment, unless remitted by perfect contrition or by attrition in conjunction with the sacrament of penance (q.v.).

MORTAR (OF., Fr. *mortier*, from Lat. *mortarium*, mortar; connected with *marcus*, hammer, Skt. *mar*, to crush). A mixture or paste of cement or lime and sand. Mortars may be classified, according to the nature of the cementing substance used, into common lime mortar and cement mortar.

Lime Mortar. Mortar made of common lime is extensively used because of its intrinsic cheapness and the ease with which it can be prepared. It sets or becomes hard only in air, however, and should consequently not be used under water, in wet places, or in freezing weather. Its small strength compared with cement mortar, however, limits its use to structures in which great strength is not required. In making lime mortar the proportions of the mixture are usually about one volume of lime to from two and one-half to three volumes of sand, with four parts of sand as a maximum, the rule being to add sand until the mortar works well with a trowel. The lime is placed in a layer in a shallow box or in a depression scooped out of the sand and then sprinkled with a quantity of water from two and one-half to three times the volume of the lime. This being done, the lime should be left to slack undisturbed. It is generally held by engineers that the lime should be slacked at least 24 hours before it is mixed with the sand. This is frequently not done, through haste or carelessness, in common building operations. It is also important that all the water required for slacking should be added to the lime at one time, since the addition of water after slacking has begun retards that process and results in the production of a lumpy mortar. After the lime has been slacked the sand is spread in a layer over its top and the two materials are mixed and remixed by means of a hoe or shovel until a uniform paste is secured. The mortar is then ready for use. Formerly all brick was laid in lime mortar, but now, except for small buildings, it has been largely supplanted either by a cement mortar or a cement mortar with lime paste.

Cement Mortar. The most valuable of all mortars are those made with natural or Portland cements, the latter being preferable (see CEMENT), as a binding material. The proportions of the ingredients that are most commonly used are one part cement and two or three parts sand. To make the mixture, about half the sand is spread in a layer over the bottom of the mixing box; the cement is then spread in a layer over this sand bed and is in turn covered with the remainder of the sand. The mass of cement and sand is then turned and re-turned with a shovel until the two ingredients are thoroughly intermingled. Water is then added to the mixture, which is again turned by the shovel. To cause the mortar to be handled on a trowel more easily and to make it more plastic and smooth lime paste may be added to cement mortar in moderate proportions. Where cement mortar is used for bricklaying with all the voids filled, there results a monolithic mass which will break through the bricks themselves as readily as through the joints. To make colored cement mortars various substances are added, but the effect is to make the mortar weaker, and often the color is not permanent.

Pointing Mortar. A special mortar for protecting the joints in masonry, either a rich mixture of Portland cement and sand or neat cement.

Grout. A thin or liquid mixture of lime or cement is called grout. It is used to fill up small interstices by pouring it upon the masonry, into the voids of which it is expected to find its way.

Water-Tight Mortar is made of varying proportions of Portland cement, sand, and lime.

Consult: Heath, *A Manual of Lime and Cement* (New York, 1893); I. O. Baker, *A Treatise on Masonry Construction* (10th ed., ib, 1909); M. A. Howe, *Masonry* (ib., 1915). See BRICKWORK; BUILDING; CEMENT; MASONRY.

MORTAR. A cannon designed to reach its target from above by employing a very steep angle of fall of projectile. For instance, as a coast-defense weapon the mortar is used to attack the deck instead of the armored sides of a ship. In the field it may be used to attack the overhead cover of land fortifications, to search trenches, or to reach the personnel protected by very steep cover. Relatively to calibre the mortar is shorter than the howitzer or gun; uses angles of elevation as great as 70 degrees; secures change in range by varying both the projectile charge of powder and the angle of elevation. In the United States service, mortars are used only in the coast-defense service; calibre 12-inch, range about 12,000 yards, weight of projectile 1000 pounds. In Europe mortars of various calibres, from 3-inch up to 16.5-inch, were used in the field during the European War of 1914. The ordnance surprise of this war was the great German 42-centimeter (16.5-inch) mortar used in the reduction of the Liége forts.

The length of this powerful weapon was about 24 feet, diameter of bore 16½ inches, weight of shell 1760 pounds, bursting charge 400 pounds high explosive, ranges used from 8300 to 15,000 meters. The gun and carriage were drawn by large tractors. At Namur the great Austrian 12-inch Skoda mortars were used, also German 8.3-inch and smaller. See HOWITZER; COAST ARTILLERY; HEAVY FIELD ARTILLERY; ORDNANCE; ARTILLERY.

MORTARA, môr-tä'rȧ. A town in the Province of Pavia, Italy, situated on the Arbogna, 25 miles southwest of Milan (Map: Italy, B 2). Its Gothic church of San Lorenzo contains paintings by Lanini and Ferrari. There is a technical school and a theatre. Manufactures of machines and hats are carried on. Cheese is produced. At the battle of Mortara, March 21, 1849, the Austrians defeated the Sardinians. Pop. (commune), 1901, 8631; 1911, 10,468.

MORTARA, EDGAR. A Jewish boy whose alleged abduction excited much interest in Europe in 1858 and following years. He was the son of Momolo Mortara, a resident of Bologna, and was forcibly taken from his father's house on June 23, 1858, by the authorities on the ground that he had been baptized into Christianity by a Roman Catholic maidservant. The efforts of the parents to recover the boy aroused much sympathy, even from some Catholic rulers in Europe, but were unsuccessful. Apparently of his own choice he remained with the church authorities, was educated for the priesthood, became an Augustinian monk, and has preached as a missionary in the German cities and in New York. A drama by Moos, *Mortara, or the Pope and his Inquisitors* (Cincinnati, 1860), was founded on the case. Consult *The True Story of the Jewish Boy Edgar Mortara* (London, 1860).

MORTAR VESSEL. A vessel fitted for carrying and operating a mortar. Such a vessel requires good beam and a strong deck to resist the recoil of the mortar. During the Civil War schooners were used as mortar vessels. In Europe ketch-built vessels were largely used for this purpose, the so-called bomb ketch being a frequent adjunct to a fleet in conducting operations against land defenses. Mortars are no longer used, high-angle fire being obtained from longer guns, so that mortar vessels are obsolete.

MORTE D'ARTHUR, môrt där'tur' (OF., the death of Arthur). The name applied, in slightly varying forms, to several versions of the Arthurian legend and cognate stories. (See ARTHUR.) There are two English metrical romances of the name, each existing in a single manuscript and probably based on French originals. But in more than one way the most important work bearing this name is the celebrated redaction or blending by Sir Thomas Malory of French and English romances. It was completed in 1469 and first printed, by Caxton, in 1485. Of this edition but two copies exist, the only perfect one in New York; a scholarly reprint of it, with valuable editorial matter, was made by Sommer (London, 1889). The book probably did more than any other influence to nationalize the Arthurian legend, and the poets, from Spenser to Tennyson (in the *Idylls of the King*), have drawn abundantly on its treasures. The best modern editions, besides that mentioned above, are by Israel Gollancz, "Temple Classics" (4 vols., New York, 1900); Edward Strachey (ib., 1907); the Everyman edition (2 vols., ib., 1908); Ernest Rhys (ib., 1909). Consult: J. L. Weston, *Survey of Arthurian Romance* (1905); G. H. Maynadier, *Arthur of the English Poets* (Boston, 1907); H. O. Sommer (ed.), *Vulgate Version Arthurian Romances*, published by the Carnegie Institution (Washington, 1909–12).

MORTEMART, môrt'mȧr', FRANÇOIS ATHÉNAÏS DE ROCHECHOUART DE. See MONTESPAN, MARQUISE DE.

MORTGAGE, môr'gȧj (OF. *mortgaige, morgage*, Fr. *mortgage*, from *mort*, from Lat. *mortuus*, dead, from *mori*, Skt. *mar*, to die + *gage*, ML. *vadium, wadium*, from Goth. *wadi*, OHG. *wetti*, Ger. *Wette*, AS. *wedd*, archaic Eng. *wed*, Lat. *vas*, pledge, Lith. *vaduti*, to redeem a pledge). In English and American law, the conveyance or transfer of property, either real or personal, as security for the payment of a debt or the performance of a legal obligation.

The debtor or obligor may, and usually does, retain possession of the property mortgaged—the validity of the security not depending upon possession as in the case of pledge (q.v.) and common-law lien (q.v.). This method of securing performance of an obligation was known to the ancient law; and under the civil law the distinction was well settled between *hypotheca*, in which the property given as security remained in the possession of the debtor, and *pignus*, in which the property given as security was surrendered to the creditor.

The giving of security by mortgage first became of importance at common law after the passage of the Statute *Quia Emptores* (18 Edw. I), by which the restraints on alienation of lands held in fee were removed. Mortgages were then in form conditional grants, a form of gift or limitation peculiarly adapted to the giving of security without necessarily changing the possession of the security. At common law the owner of real estate might grant to another any estate in fee with the right on the part of the grantor or his heirs to reënter upon the property and revest the title in the grantor or his heirs upon the happening of a specified condition.

By making the condition of reëntry the payment of money or the performance of an obligation due from the grantor to the grantee, all the essentials of a common-law mortgage were created. Upon payment of the sum due when due, the condition of the grant or conveyance was satisfied, and title was thereby revested in the grantor or mortgagor. But if the mortgagor failed to pay the mortgage debt when due, performance of the condition thereafter became impossible, and the mortgagor thereby lost all claim upon the mortgaged property.

Equity early exercised its jurisdiction to mitigate the harsh operation of this common-law rule by allowing the mortgagor who had failed to perform his obligation upon the due date (or the law day, as it was called) to redeem the mortgaged property upon payment of the sum due with interest. This right of the mortgagor was known as his equity of redemption and was unlimited in point of time. But as this unlimited right of redemption of the mortgage rendered it impossible for the mortgagee to realize on his security, equity also gave to the mortgagee the right to cut off the right of redemption by foreclosure, which was an equitable suit asking a judicial declaration that the right to redeem had been forfeited.

The modern law of mortgages, then, combines both legal and equitable doctrines; and many of its peculiarities, both of form and substance, will be explained by reference to the historical development of the law. While the mortgage in modern practice may, for most purposes, be regarded only as a lien created in favor of the mortgagee, it is still in form a conveyance vesting the title of the property in the mortgagee, and, in the absence of statute, it is generally the rule that no mortgage valid at law can be created without a conveyance.

It is usual to incorporate in the mortgage a clause providing for the defeasance of the title upon payment of the mortgage indebtedness, but, as will appear, even that is not essential. In some States statutes have been passed authorizing a mortgage which is not a conveyance in form, but which for all practical purposes has the same effect as the common-law mortgage as modified by equity. One important consequence arising from the fact that at common law the mortgagee acquired a title was that his mortgage was valid against an innocent purchaser of the property for value without notice of the mortgage, which could not have been the result had the mortgage been a mere lien or right in personam against the mortgagor. See EQUITY.

This rule has been modified in the United States by statutes universally adopted requiring mortgagees and purchasers of property generally to record their documents of title in order to protect them against claims of purchasers without notice.

When the intention of an agreement is to create a mortgage, although it is not in effect a conveyance and consequently not a legal mortgage, equity will enforce the agreement against the mortgagor or third parties having notice of the agreement as though it were a valid mortgage.

Thus, where the owner of real estate deposited his title deeds of the property with another for the purpose of securing a debt or obligation, the English courts of equity have recognized in the transaction a valid mortgage. This doctrine of creating a mortgage by pledge of title deeds has not been recognized in the United States, except, perhaps, in the State of New York. When a conveyance is absolute on its face, equity will inquire into all the circumstances of the transfer of title and, if it appear that the transfer was made only for the purpose of giving security, will treat the transaction as a mortgage and allow the grantor to redeem the property upon payment of the mortgage indebtedness. All mortgages, however, whether express or implied from the circumstances, are to be distinguished from conditional sales, which are agreements to sell and transfer title to the property upon the happening of a certain event. It will be observed that the position of a mortgagor is closely analogous to that of a conditional vendor who has agreed to sell property upon payment of a certain sum. There is, however, one important distinction between the two relations. In the case of conditional sales there is no existing indebtedness. The vendee is under no obligation to pay money to the vendor before electing to purchase, while the mortgagor is so bound. In determining in any given case whether the transaction is a conditional sale or a mortgage, courts will scrutinize the evidence with great care and in case of doubt will hold the transaction to be a mortgage. From the nature of the mortgage it seems probable that a legal liability independent of the mortgage itself is not essential to its validity, but in general all mortgages are accompanied by some form of legal obligation for the performance of which the mortgage is given as security. This is usually a promissory note or bond payable to the mortgagee, and, where the purpose is to issue numerous bonds secured by one mortgage, the practice is to make the mortgage or conveyance to a trustee, who holds the property as security for all the bondholders. Railroad mortgages are usually of this kind. If the note or bond is illegal or if there is any illegality in the mortgage transaction, the mortgage is invalid.

Mortgages are sometimes given to secure future advances to be made by the mortgagee. Such mortgages are everywhere valid and enforceable as between the mortgagor and mortgagee, but in some States they are held not to be valid against third parties, except as to advances actually made, of which the third party has actual or constructive notice at the time of acquiring an interest in the property. In a number of States, statutes provide that mortgages for future advances shall have no validity against third persons.

Any legal property, either real or personal, may be mortgaged, even including future or inchoate property, as crops planted but not yet grown, which the common law regards as being capable of present ownership. But a mortgage of property not yet acquired by the mortgagor could have no validity at common law on the principle that "a man cannot grant that which he hath not." Mortgages of this character as well as mortgages of equitable interests are, however, recognized and enforced by the courts of equity when the rights of innocent third parties are not involved. Such mortgages are now generally regarded as valid between mortgagor and mortgagee, but there is a variety of views held in the several States as to their validity against third parties—some courts, as those of Massachusetts, holding that they can have no validity even against creditors of the mortgagor unless the mortgaged property is delivered to the mortgagee, and some, as those of New Jersey, holding that they are valid against all parties having notice of the mortgage.

The mortgage, besides a description of the mortgaged property and the mortgage indebtedness, may, and usually does, contain clauses providing that the whole debt shall become due and payable upon failure to pay interest or taxes and assessments upon the mortgaged property. The mortgage may also include a power of sale enabling the mortgagee to sell the mortgaged property without foreclosure upon the mortgagor's failure to pay the debt. In some States such a provision is made inoperative by statutes which require foreclosure of the mortgage exclusively by judicial proceedings, and in others the power of sale is regulated by requiring due notice by public advertisement or by requiring that the sale itself shall be public. A stipulation that the mortgagor shall have no right to redeem will be disregarded by the courts upon the same principle that courts of equity disregard the condition of forfeiture of the common-law mortgage, viz., that equity will relieve a mortgagor from an oppressive condition or stipulation.

The estate of the mortgagor in possession has been likened to a tenancy at will or by suffer-

ance, and as between himself and the mortgagee, the analogy is very close. At common law the mortgagee having the title could take possession at will, the sole right of the mortgagor, if the mortgagee exercised this right, being to redeem by payment of the mortgage indebtedness on the due date. But as to all others, the mortgagee in possession is clothed with substantial ownership. He is entitled to the rents, issues, and profits of the mortgaged property; he may sell or encumber it subject to the mortgage, and upon his death the property goes to his heirs at law.

In many States the mortgagee's common-law right to take possession of the mortgaged property by ejectment or other appropriate action has been cut off by statute, and he can only secure possession of the mortgaged property after default and through foreclosure.

Although the mortgagee holds the title to the mortgaged property, the law recognizes that he holds it as an incident to his claim against the debtor, which is personal property. The mortgagee's estate, therefore, in both real and personal property, is regarded as personal property only and passes, upon his death, to his personal representative and not to his heirs.

In general, the mortgagee out of possession is in the position of one having a mere lien or personal claim against the mortgagor. But the mortgagee in possession of the mortgaged property, who was at common law substantially in the position of owner of the property, is compelled by equity to account for the rents, issues, and profits and to apply them upon the mortgage indebtedness.

Both the mortgagor and the mortgagee may freely assign their interests. It is not unusual for the assignee of the mortgagor to assume the mortgage indebtedness by the instrument of assignment, and it is the general rule that the mortgagee may enforce this undertaking either upon the theory of subrogation or that the mortgagee may sue upon a contract made for his benefit.

When several mortgages are given upon the same property they have priority in the order of their creation unless otherwise provided. This rule may be varied by the operation of recording acts, which usually give priority to mortgages in the order in which they were recorded.

A mortgage is extinguished by payment of the mortgage indebtedness or by a legal tender of the amount due on the day when due. Tender after that time has no effect at common law, and in equity the only effect is to prevent interest accruing. A mortgage may also be terminated by a release thereof by the mortgagor or by a merger resulting from the union of the mortgage estate and the equity of redemption in the same person. If the merger is accomplished by a conveyance of the mortgaged property by the mortgagor to the mortgagee, the courts will scrutinize the transaction with the greatest care and, if there appear to have been any oppression or undue influence on the part of the mortgagee, will allow the mortgagor to redeem. See MERGER.

A mortgage is extinguished by the final judgment or decree in an action to foreclose the mortgaged property or in an action to redeem it from the mortgagee. See FORECLOSURE; EQUITY OF REDEMPTION.

Courts have always favored the mortgagor's right to redeem, and at any time before the extinction of the mortgage will allow him to compel a cancellation and surrender of the mortgage upon payment of the mortgage indebtedness with interest and, as an incident to the redemption, will compel the mortgagee to account for rents or profits which he has received. Consult: D. H. Pingrey, *Treatise on the Law of Chattel Mortgages* (Newark, N. J., 1891); id., *On the Law of Mortgages of Real Property* (2 vols., Philadelphia, 1893); Coote, *Treatise on the Law of Mortgages* (7th ed., London, 1904); L. A. Jones, *Treatise on the Law of Mortgages of Real Property* (6th ed., Indianapolis, 1904); id., *Personal Property* (5th ed., ib., 1908); and the authorities referred to under REAL PROPERTY. See also CHATTEL MORTGAGE.

MORTGAGE BANKS. Institutions designed to furnish long-term credit on real security. In 1686 a plan for a bank to issue bills on real-estate security was approved by the Governor and Council of Massachusetts Bay. The plan fell through, but a number of similar schemes were launched in Colonial America, such as the Public Loan Office of Pennsylvania (1722), the New London Society of Connecticut (1732), the Land Bank scheme of Massachusetts Bay Province (1740). These and similar schemes all failed, on account of improper financial methods. The first really successful enterprise of the kind was the Silesian Landschaft, created by Frederick the Great in 1769. The plan of operation involved the organization of all the noble landholders of the province into essentially a mutual-credit association. All lands were appraised by the association, and the amount that each landowner might borrow was fixed. Upon application any member might obtain debentures, secured by the collective property of the association, through the sale of which he might obtain the funds required. The King granted to the association a subsidy of $216,000, later increased to $432,000. This association is still in existence and in 1912 had loans outstanding to an aggregate of $97,919,605. Similar associations were founded in a number of the Prussian provinces during the eighteenth century: Kür and Neumark, 1774; Pomerania, 1781; West Prussia, 1787; East Prussia, 1788; Lüneburg, 1790. The general principles of mutual credit, the issue of debentures based on the collective property of the association, etc., were the same. The effect of the plan was to mobilize real credits. The debentures, unlike mortgages on specific tracts of land, enjoy a national market. This feature was further emphasized by the creation in 1873 of the Central Landschaft of Prussia, which correlates the activities of seven Landschafts and one communal credit association. Besides the Landschafts there are found in Germany a large number of other land-credit banks.

In France the most important mortgage-credit institution is the Crédit Foncier, founded in 1852, with a capital now amounting to $45,000,000. The Crédit Foncier lends on mortgages, either repayable at long term by annuities or at short term with or without amortization. Loanable funds it raises through the sale of debentures secured by its collective assets.

Mortgage banks of a character similar to the German and French banks have been established in most European and several non-European countries. They enable the borrower on real

security to secure loans at low interest, repayable usually at his option, and with maximum term of 30 years in Finland, 33 in Chile, 36½ in New Zealand, 42 in Australia, 50 in Italy and Japan, 54½ in Austria, 55½ in Russia, 56½ in Germany and Sweden, 57 in Switzerland, 60 in Denmark, 63 in Hungary, and 75 in France. For the most part such institutions are primarily designed for the aid of agriculture, but they are extensively employed for financing the purchase and improvement of urban property as well. See RURAL CREDIT.

MORTGAGES, TACKING OF. See TACKING OF MORTGAGES.

MORTIER, môr'tyā', EDOUARD ADOLPHE CASIMIR JOSEPH, Duke of Treviso (1768–1835). A French marshal. He was born at Cateau-Cambrésis, Feb. 13, 1768. His father was a deputy to the States-General in 1789, and though Mortier was educated for a business career, he entered the service of the Republic as a sublieutenant of carbineers in 1791. He rose rapidly and in 1793 became adjutant general. After greatly distinguishing himself under Moreau and Kléber, he was made a general of division in 1799. In 1803 he was in command in Hanover and in the administration of that country showed the utmost probity and sagacity. Created a marshal of the Empire in 1804 and placed in charge of an army corps in 1805, Mortier showed his military genius by holding in check a superior force of Russians at Leoben. In 1806 he occupied Hanover, Hesse-Cassel, and Hamburg and defeated the Swedes in several encounters. He commanded the left wing of the French army at Friedland and after the Peace of Tilsit was intrusted with the government of Silesia and created Duke of Treviso. Sent to Spain in 1808, he took part in the siege of Saragossa and defeated the Spaniards at Ocaña (Nov. 19, 1809). After sharing in the Russian campaign of 1812 Mortier took a decisive part in the battle of Lützen (May 2, 1813) and in all the subsequent military events of 1813–14. When Napoleon's cause was lost, Mortier at last gave in his adhesion to the government of Louis XVIII. During the period of the Hundred Days, Mortier first saw the King safely out of France and then joined his old leader. After the Second Bourbon Restoration he was crossed off the list of peers for refusing to sit on the court-martial of Ney. He became a member of the Chamber of Deputies in 1816 and was restored to the Chamber of Peers in 1819. After the revolution of 1830 he was made Ambassador at St. Petersburg, became Grand Chancellor of the Legion of Honor in 1833 and Minister of War and President of the Council in 1834–35. He was killed on the Boulevard du Temple, July 28, 1835, by a missile from the infernal machine of Fieschi (q.v.).

MORTILLET, môr'tē'yā', LOUIS LAURENT GABRIEL DE (1821–98). A French anthropologist, born at Meylau, Isère. His interest in prehistoric archæology dates from a trip to Italy in 1858, and he began to study the Swiss lake dwellings. In 1864, after his return to France, he founded a review, *Matériaux pour l'Histoire Positive et Philosophique de l'Homme*, and in 1868 became an assistant, and later conservator, at the Museum of Saint-Germain. In 1876, with Broca, he planned the Ecole d'Anthropologie. He also was active in politics, mayor of Saint-Germain-en-Laye, and in 1885 deputy from Seine-et-Oise, as a strong anti-clerical. His published works include: *Le signe de la croix avant le christianisme* (1866); *Les habitations lacustres du lac du Bourget* (1867); *Origine du bronze* (1876); *Le préhistorique* (1882); *Origines de la chasse, de la pêche et de l'agriculture* (1890); *Formation de la nation française* (1897).

MOR'TIMER, EARL OF OXFORD AND. See HARLEY, ROBERT.

MORTIMER, JAMES (1832–1911). An American diplomat and playwright. After leaving Annapolis he served in the navy for a time and then entered journalism at Philadelphia. In 1850 he started the Frankford *Journal*, but shortly afterward became an attaché of the American Legation at Paris. He spent some years as secretary to the United States Minister at St. Petersburg and finally became Paris correspondent of American newspapers. Mortimer contributed also to the Paris press, and some of his articles brought him to the favorable notice of Napoleon III. He served as a messenger between the Emperor and the Empress Eugénie, and the Emperor provided the funds with which he started the London *Figaro* in 1870. He produced about 35 plays in London, including *Joy is Dangerous;* an adaptation, *Heartsease*, in which Madame Modjeska made her first London appearance in 1880; his best-known comedy, *Gloriana*, first played in 1891 and revived under the title *The Artful Valet;* and *My Bachelor Past.*

MORTIMER, ROGER DE (?1287–1330). First Earl of March and eighth Baron of Wigmore. For some years he was a faithful adherent of Edward II of England and from 1316 to 1321 his representative in Ireland to oppose Edward Bruce; but soon after he was recalled in 1321 Mortimer joined the insurgent barons who were hostile to the Despensers. In 1322 Mortimer submitted to Edward and was imprisoned in the Tower of London, but escaped to France two years later. There he met and fascinated Queen Isabella, wife of Edward, became her paramour, and determined upon the overthrow of the King. With a small force the two landed on the English coast in 1326 and were soon joined by large numbers of the discontented nobles and common people. The King was defeated, taken prisoner, and probably murdered in his prison in 1327. Mortimer took the title of Earl of March in 1328 and received confiscated estates and offices of immense value, while his creatures controlled the administration. Edward III was a minor, and, though a council held the regency, Mortimer's influence was supreme. Mortimer became very unpopular when he made the Shameful Peace with the Scots in 1328. Finally Edward III resolved to be King in fact as well as in name, had the Earl of March seized at Nottingham Castle, and summoned a new Parliament. Mortimer was tried on charges of treason, condemned, and in 1330 hanged, drawn, and quartered. (See Edward III.) Consult William Longman, *Edward III*, vol. i (London, 1869), and William Stubbs, *Constitutional History*, vol. ii (6th ed., Oxford, 1897).

MORTIMER'S CROSS, BATTLE OF. See EDWARD IV; ROSES, WARS OF THE.

MORT'MAIN (OF. *mortemain*, from ML. *mortua manus*, dead hand), STATUTES OF. In England, the acts of Parliament prohibiting or restricting the alienation of lands to corporations. The term "mortmain" is applied to the perpetual tenure of lands by corporations, par-

ticularly religious corporations, whose members and officers, being ecclesiastics, were by the common law deemed civilly dead, *civiliter mortuus*, and hence the derivation of the term as signifying land held by the dead hand of the Church. In later times the term has been applied to the tenure of lands by corporations generally, whether ecclesiastical or lay.

Mortmain first became a matter for the serious attention of English legislators and lawyers as early as the reign of Edward I. The policy of the various ecclesiastical corporations of acquiring large holdings of land and retaining them became a menace to the well-being of the state, partly because it afforded a ready means of accumulating wealth and power which were held in strict allegiance to the Church, whose interests were often in conflict with those of the civil authority, but primarily because the ownership of land by ecclesiastical corporations was inconsistent with feudal tenure. The feudal system presupposed the holding of land by a tenant who could render to his overlord certain fixed services, military or other, and certain dues, known as incidents, under certain circumstances. The most important of these incidents were: (a) *Aids.*—Assessments levied by the lord on his freehold tenants for knighting the lord's eldest son, marrying off his eldest daughter, and ransoming his body from captivity. (b) *Relief.*—The sum which an heir was required to pay to the lord upon coming into his ancestor's tenancy. (c) *Wardship.*—The right of the lord to become the guardian of the infant heir of his tenant and take the profits of the estate during the heir's minority. (d) *Marriage.*—The right of the lord to dispose of the tenant's daughter in marriage. (e) *Escheat.*—The right of the lord to the freehold upon the death of the tenant without heirs.

It is apparent that the acquisition of land by an ecclesiastical corporation, which could not die or contract marriage and which had none of the other attributes of a natural person, struck at the very basis of the feudal system and was regarded with jealousy by the great lords and the civil officers of the crown. The result was a series of legislative enactments, extending over a period of nearly 600 years, having for their purpose the restraint of alienation in mortmain. No sooner did the will of the state find expression in appropriate legislation for this purpose than the powerful influence of the Church was exerted to evade or nullify it by judicial interpretation or by resort to legal fictions invented by skillful lawyers and urged by them upon the courts with such success that ultimately new legislation became necessary. To this historic struggle between the Church and the landed aristocracy are attributable many of the peculiarities of the law of real property to this day.

The earliest statute relating to the subject after the fall of the Western Empire was an edict of the Emperor Frederick Barbarossa in 1158 prohibiting conveyances to Church corporations. In England there have been enacted in all 21 statutes affecting the power to alienate in mortmain. The earliest of these (a provision contained in Magna Charta, c. 43, that there should be no transfer of land to Church corporations by a tenant without the consent of his lord) seems to have fallen into disuse or to have been evaded by conveyances direct to the officers of the religious houses, who held the property "to the use," i.e., for the benefit, of such houses.

The next statute of importance, and the first to curb effectively the acquisition of land by the ecclesiastical corporations, was the Statute *De Religiosis* (7 Edw. I, St. ii, c. 13), passed in 1279.

This statute made all alienations in mortmain unlawful and made the provision effective by enacting that all such conveyances should work a forfeiture to the lord of the land attempted to be conveyed. The lawyers of the time, however, soon devised a method for evading the statute by the invention of the common recovery (q.v.), a fictitious suit brought against the would-be grantor, to which the courts gave the effect of a conveyance. This development in the common law was met by a new legislative enactment (13 Edw. I, c. 32) in 1285, which forbade alienation of lands in mortmain by common recovery and attached the same penalty to such alienation as in case of the conveyances forbidden by the Statute *De Religiosis.* The Statute *Quia Emptores* (18 Edw. I, c. 1), which removed some of the common-law restraints upon alienation, expressly excluded from its operation all alienation in mortmain.

These statutes in time were evaded by the practice of conveying lands to a layman, to be by him held for the use or benefit of an ecclesiastical corporation, which obligation came to be enforced by the Chancellor. The use was the forerunner of the modern trust and the basis of equity jurisdiction over trusts. In 1391 this practice was forbidden on pain of forfeiture, unless such conveyance to uses was licensed by the King (15 Rich. II, c. 5).

The Statute of Wills, allowing testators to dispose of their property by will, did not in terms permit the testator to devise real estate to a corporation. By judicial interpretation, however, the power was established to devise lands to corporations for charitable purposes.

From this period down almost to the present time statutes have been enacted modifying or further restraining the power of alienation to corporations, whenever judicial interpretation or the ingenious devices of lawyers made such enactments necessary.

The Statute of 9 Geo. II, c. 36 (1736), is noteworthy in that it shows that the policy on which the Statute of Mortmain had hitherto been based had then changed somewhat. This statute, reciting that "public mischief had greatly increased by many large and improvident dispositions made by languishing and dying persons to charitable uses, to take place after their deaths, to the disinherison of their lawful heirs," enacted that in future no lands or sums of money to be laid out in land should be given to any person or body unless such gift or conveyance should be made or executed in presence of two witnesses 12 months before the death of the donor or grantor and be enrolled in the Court of Chancery within six months after the execution. Under this act, therefore, a person on his deathbed cannot in England give land, or money to buy land, for a charitable purpose. It can only be done in the life of the donor at least 12 months before his death, and the property must be completely alienated so that he has no further control over it.

All the English statutes of mortmain were revised and consolidated by the Statute of 51 and 52 Vict., c. 42. In general this statute still restricts alienation to corporations, but it

makes numerous exceptions in favor of gifts to churches, public parks, museums, and for educational, literary, and scientific purposes. Gifts to charity by will are regulated by the Statute of 54 and 55 Vict., c. 73, which in general permits such gifts of land to charities if the land be sold within one year from the testator's death. Throughout the period of mortmain legislation it was possible for the crown to grant a mortmain license enabling a corporation to purchase and hold lands, a prerogative which at times was freely exercised and sometimes grossly abused.

Owing generally to the absence of great religious corporations in the United States and to the fact that the feudal system never obtained a foothold there, the mortmain acts were not reënacted, with possibly one or two exceptions. Pennsylvania has a mortmain act, and New York has a statute which, like the Statute of 9 Geo. II, seems calculated rather to restrain a testator from making unwise and improvident gifts to charity than to prevent landholding by corporations. The statute provides that a testator who leaves surviving him a wife, child, or parent shall not devise or bequeath more than one-half of his estate to a charitable corporation, and no such devise or bequest shall be valid unless made more than two months before the death of the testator.

In many States business corporations may not receive real estate by devise, but generally charitable corporations may do so; and in most States there is no restraint upon conveyance of lands inter vivos to corporations, unless the charter of the corporation or the general law under which it is created limits the total amount of land which the corporation may hold. Consult Antony Highmore, *View of the History of Mortmain* (London, 1809), and J. Rawlinson, *Notes on the Mortmain Acts* (ib., 1877). See CHARITABLE TRUSTS; TRUST; USES; and consult the authorities there referred to, and also under REAL ESTATE.

MORTO DA FELTRE, môr'tô dȧ fĕl'trȧ (c.1474–c.1519). An Italian painter, born at Feltre. His fame rests upon Vasari's statement that he was the first to use classic arabesques in ornamentation. Of his life nothing certain is known, nor do any authenticated works by him survive. Cambruzzo, a seventeenth-century historian of Feltre, identified him with Pietro Luzzi (also called Zarato) of that town, who was an assistant of Giorgione at Venice. Luzzi is recorded as having been at Rome in 1495, at Florence in 1506, and at Venice in 1508. He is known to have decorated with frescoes the town hall, the church of San Stefano, and two houses in his native town. According to the usual account, Morto was killed fighting in the Venetian army at the battle of Zara; but if he be identical with Luzzi, he cannot have died till after 1519, in which year the latter was active in his native town.

MORTON, môr'ton, CHARLES (1627–98). An English clergyman and educator, born at Pendavy, Cornwall, and educated at Wadham College, Oxford. He renounced the Royalist traditions of his family and became a Puritan, though he did not leave the Anglican communion until 1662. He opened what proved to be the leading school for English Dissenters at Stoke Newington, near London, which he maintained until 1685, having Daniel Defoe among his pupils, besides several others who became prominent as dissenting ministers. Contrary to the custom of the universities, he made his pupils write their dissertations and hold their disputations in English—a practice which, Defoe affirms, made his pupils excel in English those of any other school. Tormented by proceedings against him in the ecclesiastical courts, Morton emigrated to New England in 1686. He settled first at Charlestown, Mass., and became the pastor of a church there. He became connected with Harvard College, and two of his manuscript works—*A System of Logic* and *Compendium Physicæ*—were used as textbooks. He was made the first vice president of the college and hoped to succeed Increase Mather as president. His death prevented the fulfillment of this ambition. Though a man of great ability, both in theology and mathematics, he shared in the prevalent superstition against witchcraft and encouraged those who brought about the prosecutions at Salem. Consult Josiah Quincy, *History of Harvard University* (Cambridge, Mass., 1840), and I. Parker, *Dissenting Academies in England* (Cambridge, 1914).

MORTON, GEORGE (c.1585–c.1628). An English colonist in America. He was born in England, joined the Puritans at an early age, and removed to Holland with his brother, Thomas Morton, settling at Leyden, where for some years prior to 1620 he was an agent of the London Puritans. In the latter year he sailed for New England in the ship *Ann*, in charge of a party of new Puritan settlers for the Plymouth Colony. He remained at Plymouth several years and then returned to England. The book known as *Mourt's Relation* (1622), which was the first published account of the New England settlement, comprising a journal of the first 12 months of the Plymouth Colony, has the name G. Mourt subscribed to the preface, and for that reason has been ascribed to Morton. Careful investigators, however, among them Dr. H. M. Dexter, who reprinted the work with critical and historical notes in 1864, while agreeing that the name G. Mourt evidently referred to George Morton, are inclined to think that the account itself was the work of Bradford and Winslow.

MORTON, HENRY (1836–1902). An American scientist and educator. He was born in New York and was educated at the University of Pennsylvania. He first studied law, but afterward took up chemistry, and in 1863 became professor of chemistry in the Philadelphia Dental College. In 1869 he took the chair of chemistry in the University of Pennsylvania. In 1870 he became president of Stevens Institute of Technology, at Hoboken, N. J., towards the endowment of which he contributed over $60,000. Morton took part in two eclipse expeditions, conducted important investigations in spectroscopy, and while a member of the Lighthouse Board (1878–85) carried out valuable experiments on electric lighting, fog signals, illuminating buoys, etc. His publications include numerous papers in scientific periodicals and the *Student's Practical Chemistry* (written jointly with Leeds and published in 1868).

MORTON, JAMES DOUGLAS, fourth EARL OF (?1530–81). Regent of Scotland. The second son of Sir George Douglas of Pittendriech, in 1553 he succeeded in right of his wife, Elizabeth, daughter of the third Earl of Douglas, to the title and estates of the earldom. He early favored the cause of the Reformation, and in 1557 was one of the original Lords of the Con-

gregation. Sworn a Privy Councilor in 1561, he was appointed Lord High Chancellor of Scotland, Jan. 7, 1563. As one of the chief conspirators against Rizzio (q.v.), he fled with his associates to England, but obtained his pardon from the Queen. Though privy to the design for the murder of Darnley, on the marriage of the Queen to Bothwell he joined the confederacy of the nobles against her. After Mary's imprisonment in the castle of Lochleven he was restored to the office of High Chancellor, of which he had been deprived, and constituted Lord High Admiral of Scotland. On the death of the Earl of Mar, in October, 1572, he was elected Regent of the Kingdom. His rule, chiefly directed towards the benefit of the masses and towards the formation of a Protestant league with England, in anticipation of the union of the two kingdoms, made him obnoxious to many of the nobles, and as the young King, James VI, desired to assume the reins of government, Morton resigned the regency in March, 1578. Two months later, however, he obtained possession of the castle of Stirling, with the person of the King, and for a time recovered his authority. Intrigue, however, was active against him; he was accused of having participated in the murder of Darnley, and was beheaded at Edinburgh, June 2, 1581, bearing himself with dignity and composure and maintaining his innocence of "art and part" in the murder of the King's father. Consult Crawford, *Crown and State Officers of Scotland* (Edinburgh, 1726), and Andrew Lang, *History of Scotland* (ib., 1900–07).

MORTON, James Saint Clair (1829–64). An American soldier, a son of Samuel George Morton (q.v.). He was born in Philadelphia, graduated at West Point in 1851, and from 1855 to 1857 was assistant professor of engineering in that institution. In 1860 he conducted an exploration for a railway route across Central America for the government; in 1861 he joined the United States volunteers, was put in charge of the construction of the fortifications of Tortugas, and was promoted captain; in 1862 he became chief engineer of the Army of the Ohio, and later in the year was transferred to a like position in the Army of the Cumberland. In the same year he was promoted brigadier general of volunteers. He commanded a brigade at Stone River, was wounded at Chickamauga, and was made major of engineers in July, 1863. As chief engineer of the Ninth Army Corps he participated in Grant's Virginia campaign, and was killed while leading the assault on Petersburg. In recognition of his gallantry in this engagement Congress voted, after his death, that he be ranked as a brigadier general in the regular army. Previous to the war he published a number of works on fortification and engineering.

MORTON, John (?1420–1500). Archbishop of Canterbury and Cardinal. He was born in Dorset and educated at Cerne Abbey, a Benedictine foundation, and at Balliol College, Oxford. Having studied law, he took orders and began to practice in the Court of Arches, the ecclesiastical tribunal of the Archbishop of Canterbury. Here he attracted the attention of Archbishop Bourchier, who presented him to Henry VI, and the latter gave him valuable ecclesiastical benefices. Though he had followed for a time the fortunes of the Lancastrians, Edward IV took him into favor, made him Master of the Rolls in 1473, and in 1479 Bishop of Ely. He was not in favor with Richard III, who arrested him and committed him to the custody of the Duke of Buckingham, from whom he escaped and fled to the Earl of Richmond on the Continent. He is said to have suggested the union of the houses of York and Lancaster by the marriage of Richmond with the daughter of Edward IV. Henry VII on his accession made Morton a member of the Privy Council, and on the death of Cardinal Bourchier, in 1486, he was promoted to the see of Canterbury. In 1487 he was appointed Lord Chancellor, and in 1493 Pope Alexander VI made him Cardinal. Morton was the chief councilor of Henry VII, and hence has been held responsible, perhaps unjustly, for Henry's avarice. (See Morton's Fork.) He died Oct. 12, 1500. The history of Richard III which bears the name of Sir Thomas More was probably written in Latin by Morton. Near Ely he drained a part of the fens by Morton's Dyke. Consult: Hook, *Lives of the Archbishops of Canterbury*, vol. v (London, 1867); James Gairdner, *Henry VII* (ib., 1889); id., *Lollardy and the Reformation in England* (2 vols., ib., 1908).

MORTON, John (1724–77). One of the signers of the Declaration of Independence, born of Swedish ancestry, in Ridley Township, Chester Co., Pa. He was a surveyor for some years, but subsequently became a lawyer. He was for several years a member of the Pennsylvania Assembly, and in 1765 was chosen a delegate to the Stamp Act Congress. From 1766 to 1770 he was high sheriff of Chester County. During all this period he continued to serve in the Pennsylvania Assembly, and from 1772 to 1775 was Speaker of that body. He was an earnest champion of the rights of the Colonies in the pre-Revolutionary controversies, and was active in furthering the cause of the Revolution after the outbreak of hostilities. In 1774 he was elected a member of the Continental Congress, and remained a member of that body until his death, taking a leading part in the debates and helping to frame the Articles of Confederation.

MORTON, John Maddison (1811–91). An English writer of farces, best known as the author of *Box and Cox* (1847), which, thanks to its ingenious and laughter-provoking incidents, made a great hit in its day. He was born in Pangbourne, the son of Thomas Morton (c.1764–1838), who was also a playwright—the author of *Columbus, or A World Discovered* (1792), *A Roland for an Oliver* (1819), etc. To pay his way through the world proved, despite his literary efforts, an insoluble problem for the younger Morton, and he died a pensioner at the Charterhouse. He was the author of plays enough to put him among the most prolific of dramatists. He had a knack for adapting French pieces, and was phenomenally fortunate in fitting the play to the player. Consult the list of plays given under "Morton" in the *Dictionary of National Biography*, vol. xxxix (London, 1894).

MORTON, Julius Sterling (1832–1902). An American journalist and politician, born at Adams, Jefferson Co., N. Y. He received his early education in the Methodist Episcopal Academy at Albion, Mich., to which State his parents had moved, and in 1850 he entered the University of Michigan. He completed his course at Union College, graduating in 1854, and in the year following settled in Nebraska, first at Bellevue and later at Nebraska City, where he founded and edited the Nebraska City *News*, the first newspaper to be established in the State. In 1856 and 1857 he was elected to the Nebraska

Territorial Legislature, and in 1858 was appointed by President Buchanan Secretary of the Territory, and upon the resignation of Gov. W. A. Richardson a few months later became acting Governor and local representative of the administration in the bitter struggle in the Territory. In 1866 he was the Democratic candidate for Governor, but was defeated. From that time until 1881, when he was again a candidate for Governor, he took no part in politics. In 1893 he entered the cabinet of President Cleveland as Secretary of Agriculture, remaining in office until 1897. Upon the advent of William Jennings Bryan into Nebraska politics he became one of his most active opponents and identified himself with the Cleveland gold wing of the Democratic party. In 1901 he was appointed by President McKinley one of the United States Commissioners for the Louisiana Purchase Exposition. He was a student of forestry, the originator of "Arbor Day," and president of numerous agricultural societies. At the time of his death he was editing a weekly paper entitled the *Conservative* in which he opposed most of the doctrines advocated in Bryan's *Commoner*. He wrote an *Illustrated History of Nebraska*, published in 1905.

MORTON, Levi Parsons (1824–1920). An American banker and political leader. He was born at Shoreham, Vt., and was educated at the academy in that town. In 1843 he established himself in a mercantile business in Hanover, N. H. In 1850 he removed to Boston, where he entered the banking business, and four years later he settled in New York City, where he was successful from the start. In 1863 he founded the banking house of Levi P. Morton & Co., later Morton, Bliss & Co., which became one of the most successful private banking firms in the country. A London branch, Morton, Rose & Co., was subsequently established. In 1878 Morton was elected to Congress as a Republican, and after being reëlected in 1880, he was from 1881 until 1885 United States Minister to France, undertaking there negotiations concerning tariff rates and recognition of American corporations. In 1888 he was the successful candidate for Vice President on the Republican ticket. In 1895–96 he was Governor of New York, being most prominently associated, as such, with the abolition of the local-trustee system of school government. After retiring from public life, he continued his banking business and became interested in insurance companies. He made New York City his residence.

MORTON, Marcus (1784–1864). An American lawyer and politician, born at Freetown, Mass. He graduated at Brown University in 1804 and at the Litchfield (Conn.) Law School, was admitted to the bar in 1807, and established himself in the practice of his profession at Taunton, Mass., where he remained for the rest of his life. From 1817 until 1821 he was a Democratic member of Congress. In 1823 he was a member of the Governor's Council, in 1824 was Lieutenant Governor, and in 1825 began a notable career as judge of the Supreme Court of Massachusetts. He remained on the bench until 1839, when he was the candidate of the Democratic party for Governor, and was elected by one vote over Edward Everett, the Whig nominee, although the Whigs carried the State electoral ticket. In 1840 he failed of reëlection, but in 1842 was again elected. From 1845 to 1848 he was collector of the port of Boston. In the same year he became a violent opponent of the Democratic policy as to slavery extension, and took a leading part in the organization of the Free Soil party, by which he was elected to the State Legislature for one term. Later he identified himself with the national Republican party and loyally supported the United States government during the Civil War.

MORTON, Nathaniel (1613–85). An American Colonial historian, born of English blood in Leyden, Holland. He came to Plymouth, Mass., in 1623 and dwelt there till his death. On the death of his father he was taken into the family of Governor Bradford, whose wife was his maternal aunt, and early helped the Governor in public business. He was secretary of the court of the Colony from 1645 till his death. In 1669, at the request of the commissioners of the New England Colonies, he compiled and published at Cambridge, Mass., his *New England's Memorial, or a Brief Relation of the Most Remarkable and Memorable Passages of the Providence of God Manifested to the Planters of New England, etc.*, a work which was reprinted in England and several times in the Colonies and was the chief authority for the events of which it treated until the discovery in 1855 of Bradford's *History of Plymouth*, on which, together with the journals of Winslow, Morton, who had little originality, drew largely. Morton also wrote a *Synopsis of the Church History of Plymouth* (1680) and obituary poems of the style then in vogue.

MORTON, Oliver Perry (1823–77). An American political leader, best known as the War Governor of Indiana. He was born in Salisbury, Wayne Co., Ind., Aug. 4, 1823, attended the Wayne County Seminary, spent two years at Miami University, studied law, and in 1847 was admitted to practice. He soon became a prominent member of the Indiana bar, and in 1852 was elected circuit judge. He entered politics as a Democrat, but opposition to the Kansas-Nebraska Bill led him on May 2, 1854, to withdraw from the Democratic State Convention; and ultimately he assisted in the formation of the Republican party, to whose first national convention he was a delegate. In 1856 the People's party, as the Republican party in Indiana was at first called, nominated him for Governor, but after a close contest he was defeated. Four years later he was elected Lieutenant Governor, and, upon the Governor's election as United States Senator, Morton became Governor, Jan. 16, 1861. Upon the outbreak of the Civil War he threw himself with extraordinary energy and success into the work of raising troops. The election of 1862, however, resulted in the choice of a Democratic Legislature and Democratic State officers, who bitterly opposed the war and threw obstacles in his way. His task was still further complicated by the presence in the State of a large secret society called the Knights of the Golden Circle (q.v.), which resisted the draft, encouraged desertion, and even plotted the assassination of the Governor and the carrying of Indiana out of the Union. But Morton triumphed over all difficulties. He borrowed sufficient money on his own personal responsibility to meet the exigencies of the situation; put down the treasonable associations and brought the leaders to trial; and he secured the triumph of his party and his own reëlection as Governor in 1864. In the opinion of such men as Chase and Stanton his services during this period were greater than those rendered by

any other of the great war governors. Shortly after the close of the war Morton was stricken with paralysis and was obliged to go to Europe. On his return to the United States he resumed his duties as Governor. In 1867 he was elected United States Senator and was reëlected in 1873. In the Senate he became a recognized leader of the Republicans and, despite his poor health, accomplished a prodigious amount of work, serving on the committees on foreign relations, agriculture, military affairs, private land claims, and privileges and elections. At first an opponent of suffrage for the freedmen, he ultimately did much to promote the passage of the Fifteenth Amendment. He was one of President Grant's chief advisers, and sustained the administration in the unsuccessful attempt to carry through the Senate the proposed treaty for the annexation of Santo Domingo. In return for this last service the English mission was offered to him, but he refused it. In 1873, on the death of Chief Justice Chase, he declined also to become Chief Justice of the Supreme Court. At the Republican National Convention in 1876 he was a strong candidate for the presidential nomination and received 124 votes on the first ballot. He subsequently served on the Electoral Commission (q.v.). At this time his infirmities were such that he required assistance in moving about, and had to be carried from the lobby of the Senate chamber to his carriage. He died at Indianapolis, Nov. 1, 1877, as the result of an attack of paralysis. Morton possessed a powerful intellect, a determined will, and high executive ability, and was an orator of great popularity and force. An admirable biography has been written by W. D. Foulke (2 vols., Indianapolis, 1899).

MORTON, PAUL (1857–1911). An American financier and railroad and cabinet official, son of Julius S. Morton, born at Detroit, Mich. He was educated in the public schools of Nebraska City, was then employed as clerk by the Burlington and Missouri Railroad and later in the freight and transportation department of the Chicago, Burlington, and Quincy, where he was promoted eventually to be general freight agent. From 1890 to 1896 he was vice president of the Colorado Fuel and Iron Company and of the White Breast Fuel Company. In 1896 he was made third vice president of the Atchison, Topeka, and Santa Fe Railroad, and in 1898 second vice president, with charge of the freight traffic. During his eight years' incumbency he became widely known for his ability in handling transportation problems. In politics he was a stanch Democrat until 1896, when he became a Republican on the silver issue. In 1903 Morton became prominent because of his fearless testimony regarding railroad rebates, which were then under general investigation by the Federal authorities. His conduct received the attention and approval of President Roosevelt, who in 1904 appointed him Secretary of the Navy; in this capacity he served for a year. He was invited, after the Armstrong Committee investigation in 1906, to become president of the Equitable Life Assurance Society. He reorganized this company and brought about meetings of the executive officers of other organizations to provide uniform rates and tariffs. See HYDE, HENRY BALDWIN; HYDE, JAMES HAZEN; LIFE INSURANCE.

MORTON, SAMUEL GEORGE (1799–1851). An American physician and natural scientist, born in Philadelphia. He studied medicine under Dr. Joseph Parrish and was assisted by Dr. Richard Harlan, the natural historian, from whom he gained a strong taste for general science. He graduated M.D. from the University of Pennsylvania in 1820, and after three years of European study received a degree from Edinburgh University. Beginning practice in Philadelphia in 1824, he soon attained a prominent position. In 1839 he was appointed professor of anatomy in the University of Pennsylvania, which chair he continued to fill until 1843. While abroad Morton studied the geology of Scotland, and on his return presented to the Academy of Science a collection of the greenstone rocks of that country. In 1827 he published an *Analysis of Tubular Spar from Bucks County,* in 1828 *Geological Observations,* and in 1834 *Synopsis of the Organic Remains of the Cretaceous Group of the United States.* He was besides an ethnologist of wide note, the author of *An Inquiry into the Distinctive Characteristics of the Aboriginal Race of America* (1840; 2d ed., 1844) and of *Some Observations on the Ethnography and Archæology of the American Aborigines* (1846). The owner of a very large collection of skulls from all races of the world (now in the museum of the Philadelphia Academy of Natural Sciences), Morton wrote: *Crania Americana* (1839); *Catalogue of Skulls of Man, etc.* (1840; 3d ed., 1849); *Crania Egyptica* (4 vols., 1844); etc. His medical works include: *De Corporis Dolore* (1823); *Illustrations of Pulmonary Consumption* (1834); an American edition of Mackintosh's *Principles of Pathology and Practice of Physic* (1836; 4th ed., 1844); *An Illustrated System of Human Anatomy* (1849). In still another field were his *Hybridity in Animals and Plants* (1847) and *Additional Observation on Hybridity* (1851). Consult C. D. Meigs, *A Memoir of Samuel George Morton* (Philadelphia, 1851).

MORTON, THOMAS. See MORTON, JOHN MADDISON.

MORTON, THOMAS (1564–1659). An English prelate and controversialist, born in York and educated at St. John's College, Cambridge. He was ordained a priest in 1594 and became chaplain to Lord Huntingdon. Upon the death of Elizabeth he became chaplain to the Earl of Rutland. In his first work, *Apologia Catholica* (1605), he defended the Church of England and attacked the Jesuits, which he continued to do throughout his life. A royal chaplain, he was also successively Bishop of Chester (1615–18), of Lichfield and Coventry (1618–32), and of Durham (1632–59). Morton was one of the outstanding figures of the Church of England at a time when firmness and moderation in her bishops were needed to win Puritans and Catholics to her fold and to loyalty to the crown. His opposition to Catholic doctrine was unyielding, although while Bishop of Chester he appeased the Catholic laity by allowing them Sunday amusements. As a controversialist he was thought worthy to enter the lists with Cardinal Bellarmine (q.v.). Towards Protestant nonconformists he was more liberal. He had no sympathy with Archbishop Laud (q.v.) and was even willing to meet the Presbyterians half way by admitting that ordination by presbyters was valid in cases of necessity. When the Parliament was victorious against Charles I, Morton had to meet his share of the popular odium against the Established church. In 1641 he was mobbed by the people and was one of the 12 bishops impeached, though on slight grounds,

by the Parliament for high treason. Morton suffered four months' imprisonment and never resumed his seat in the House of Lords. The last years of his life were spent in the household of an old friend, Sir Christopher Yelverton. His works include: *A Treatise of the Threefolde State of Man* (1596); *An Exact Discoverie of Romish Doctrine* (1605); *A Defence of the Innocency of the Three Ceremonies of the Church of England* (1609); *A Catholic Appeal for Protestants* (1610); *The Grand Imposture of the Church of Rome* (1628); *The Necessity of Christian Subjection* (1643); *Ezekiel's Wheels: A Treatise Concerning Divine Providence* (1653); *A Treatise of the Nature of God* (1669).

MORTON, Thomas (c.1590–1646). An English adventurer, by profession an attorney. He visited New England with Weston's expedition in 1622, and in 1625 he returned with Captain Wollaston's colony, which settled at Mount Wollaston, within the present limits of Quincy, Mass. After Wollaston's departure to Virginia the next year, Morton ousted Fitcher, who had been left in charge, and changed the name of the settlement to Ma-re-Mount or Merry-Mount. He began to trade with the Indians, and the settlement became the rendezvous for the reckless and dissolute. In 1627 he erected a Maypole 80 feet high, and the revels lasted for days. When this and the fact that he was supplying the Indians with firearms in defiance of King James's proclamation of 1622 became known at Plymouth, a remonstrance was sent to him. In 1628 he was captured by Capt. Miles Standish and sent back to England with charges. There he ingratiated himself with Sir Ferdinando Gorges. Meanwhile Endecott visited Merry-Mount, cut down the Maypole, and renamed the place Mount Dagon. In 1629 Morton returned to Plymouth and to Merry-Mount. In 1630 he was again arrested after several unsuccessful attempts, and was placed in the stocks, while his house was burned and his property seized, on a charge of disorderly conduct and oppression of the Indians. When sent to England he again joined the Gorges claimants and furnished much information against the Massachusetts Colony. When the New England Council surrendered its charter in 1635 and divided the territory, Morton was appointed solicitor to press the confirmation of the deeds and the revocation of the Massachusetts charter. Only want of money prevented the destruction of the Colony. In 1637 he published the *New English Canaan,* which had probably been written in 1634–35. The first part is an account of the Indians, the second a description of the country, and the third a confused, somewhat humorous account of the "precise separatists" of Plymouth and Massachusetts Bay. In 1643 he again appeared in Plymouth and remained through the winter. He then appeared in Maine and Rhode Island. In 1644 he was captured by the Massachusetts authorities, kept in prison a year, and fined £100 on charge of having made a complaint of the Colonies to the council. He was released without payment of the fine, and died in Maine. Morton's life and his settlement at Merry-Mount form the subject of John Lothrop Motley's novels, *Morton's Hope* (1839) and *Merry-Mount* (1849), and one of Hawthorne's short stories is entitled *The Maypole of Merry-Mount.* Motley's book has been reprinted with an elaborate memoir and full notes by C. F. Adams, in the "Prince Society Publications," vol. ix (Boston, 1883). Consult C. F. Adams, *Three Episodes of Massachusetts History* (2 vols., Boston, 1893).

MORTON, Thomas George (1835–1903). An American surgeon. He was born in Philadelphia, graduated M.D. from the University of Pennsylvania in 1856, and practiced in his native city. During the Civil War he was actively engaged in the establishment of hospitals and as consulting military surgeon in Philadelphia. After the war he paid special attention to orthopedics. He was the first to describe metatarsalgia (Morton's disease) in 1876—*A Peculiar and Painful Affection of the Fourth Metatarso-Phalangeal Articulation.* Among his writings are "Transfusion of Blood, etc.," in Seguin's *Series of American Clinical Lectures* (1877) and, with W. M. Hunt and others, *Surgery in Pennsylvania Hospital* (1880).

MORTON, William James (1845–). An American physician, son of William T. G. Morton. He was born in Boston and graduated at Harvard in 1867 and at Harvard Medical School in 1872, taking the Boylston prize for his thesis on Anæsthetics. From 1873 to 1874 he studied at Vienna, going from there to Kimberley in South Africa, where he built up a practice and engaged in diamond mining. After two more years of European study he settled in New York. Here he was for a time editor of the *Journal of Nervous and Mental Diseases;* was adjunct professor of nervous diseases at the New York Postgraduate Medical School from 1882 to 1885. In 1890 he became professor of nervous diseases and electrotherapeutics at the New York Postgraduate Medical School. His name is connected with advances in electrotherapeutics. In January, 1913, with Julian Hawthorne (q.v.), he was convicted of fraudulent use of the mails in promoting worthless Canadian mines, and was sentenced to serve in Atlanta Penitentiary, his term to expire a year and a day from the beginning of the trial (Nov. 25, 1912). Released in October, he was later pardoned by President Wilson, had his civil rights restored, and was readmitted to practice.

MORTON, William Thomas Green (1819–68). An American dentist, probably the first to recognize the general anæsthetic properties of sulphuric ether. He was born at Charlton, Mass. In 1840 he took up the study of dentistry at the Baltimore College of Dental Surgery, then recently established by the new Society of American Dental Surgeons. On his return to Boston in 1842 to practice Morton's attention was drawn towards medicine, and in 1844 he began study with Dr. Charles T. Jackson, of Boston, and continued in Harvard Medical School. He did not complete his course, but was afterward awarded an honorary M.D. by the present College of Physicians and Surgeons, Baltimore. The art of dentistry was at that time in a transition stage, and Morton's inventive genius devised many improvements, especially a new solder by which teeth could be attached to gold plates. In Dr. Jackson's laboratory Morton became acquainted with the value of sulphuric ether as a local anæsthetic and used it first in dental operations. After a series of experiments on animals, he finally succeeded in proving the efficacy of vaporized ether as an anæsthetic during the extraction of teeth. Previously anodynes had been used—alcoholic stimulants, laudanum, and the galvanic current. Making known his results to Dr. John C. War-

ren, he administered ether at the latter's request in the Massachusetts General Hospital on Oct. 16, 1846, the operation being that of removing a tumor from the jaw. At the suggestion of Dr. Oliver Wendell Holmes the new form of narcosis was called anæsthesia, and Dr. Henry J. Bigelow reported the discovery in the *Boston Medical and Surgical Journal* on Nov. 18, 1846. Dr. Morton obtained a patent for the use of ether, under the name of letheon, in 1846, a month after the operation in the hospital, and a month after this another patent, in England. Dr. Jackson also claimed the honor of having made the discovery. The French Academy awarded 2500 francs each to Jackson and Morton, but the latter declined to accept his share. However, in 1852, he received the Montyon prize in medicine and surgery. Congress offered him $100,000 for his patent, but he refused to sell it, and became involved in many suits with the government and individuals. In fact the rest of his short life was spent in futile contests, literary and legal, in regard to his patent. He was the father of William J. Morton (q.v.).

MORTON'S DISEASE. See METATARSALGIA.

MORTON'S FORK. A famous dilemma said to have been proposed by the chancellor of Henry VII of England, John Morton (q.v.). In 1491 Henry resorted to the unconstitutional method of obtaining money by a benevolence (q.v.), and Morton in carrying out the scheme is supposed to have told those who lived well that their opulence was proved by their large expenditure; while those who spent little were told they must have saved considerable by their economy. Either class could well afford to assist the sovereign.

MORTUARY CUSTOMS. Observances connected with death and burial. The care of the dying and of the dead is a marked feature of religion among all peoples, from the lowest to the highest, and is associated most closely with spirit belief and custom. It is possible to treat the subject ethnically, enumerating and classifying peoples by their mortuary customs, or culturally, studying the genesis and development of each class of actions and beliefs involved. The latter method is here adopted. Mortuary customs, for the convenience of study, may be considered under the following heads, which by their characteristics as well as by their presence or absence are worthy of note.

1. Customs concerning the dying.
2. Treatment of the corpse, including the posture of the body, bathing, cutting, decapitating, embalming, or cremating the corpse, or scraping the bones.
3. Clothing or wrappings of the corpse.
4. Incasement of the corpse in the crate, basket, jar, box, or other receptacle which may answer to the coffin. In this, protection and convenience of carrying are the ends desired.
5. Watching the corpse, including the wake and funeral feast.
6. Bearing the corpse to the place intended for it, the funeral, with all its apparatus, processions, and rites.
7. Disposal of the corpse.
8. Post-mortem ceremonies, passing under the general term "mourning."
9. Cult of and for the dead, beliefs about the dead, the ghost, necromancy.
10. Memorials for the dead, mementos preserved or worn, and monuments of every kind.
11. Ascriptions to the dead, epitaphs, mortuary sayings, and literature.

Customs Concerning the Dying. In the belief of many of the lower races death from natural causes is a thing unknown; it is always the act of some god or personage, designed and chiefly malevolent. Every disease and every death among the Polynesians is held to be caused by the gods for some crime against taboo or as the result of some offering by an enemy. Hence the neglect and cruel treatment of the sick. Even death caused by poison is thought to be due to the displeasure of the gods.

Care for the dying can scarcely be said to exist among savages, although the most strenuous efforts of the magician and friends are put forth to exorcise the destroying spirit and thus to restore the patient. The moment hope has departed, the preparations for burial are begun almost before the breath has left the body. So strong is the belief in the necessary connection between magic and death among the Australians that when a man believes he has been "pointed at" or run through with a magic spear that has been "sung" he is likely to die. Well-authenticated cases are on record in which the slightest ailment or wound has resulted fatally because the victim was convinced that the instrument had been charmed by magic. For many forms of conjuring there is no remedy. In others a cure is possible by the aid of a magician belonging to the totem of the person who "pointed" at the sick man. The practices of the medicine men are almost universally the same. They make the same passes, suck the wound, and mutter incantations, and the imagination of the patient often effects a cure.

Treatment of the Corpse. No sooner has life become extinct than the preparation of the body begins. For economy's sake most primitive tribes double the corpse into the smallest compass, the chin resting on the knees. Even among such an advanced people as the ancient Peruvians this custom of packing the body into the smallest compass prevailed, a strong rope being used to draw the limbs into place and bind them fast. It has been said that the motive in this is to imitate the posture of the unborn infant, but aside from the fact that crouching is a common position in life among savages, economy of space in the grave or tomb has much to do with the custom.

Embalming the dead was at first only a natural process. There are regions where the arid climate desiccates all flesh, as on the western plains of the United States and in Peru, Egypt, and Arabia. The drying up of the body suggested to the primitive mind religious ceremonies which found their culmination in the all-absorbing mortuary cult of Egypt. The Polynesians when first discovered had an elaborate ceremony of embalming their dead priests. The brains and intestines were removed, and all moisture was carefully wiped from the body, which was anointed with fragrant oils and dried in the sun. It was then clothed and seated in a little house erected for the purpose, where a table was set before it for food, fruits, and flowers. Here also belong such ceremonies as calling the dead, anointing, closing the eyes and lips, bathing, kissing, placing coin in the mouth, all of which have symbolical meanings with reference to the future well-being of the dead, as well as to the immediate relations of the ghost with the living.

Clothing or Wrappings of the Corpse. Scarcely any people consigns its dead to the last resting place naked. The corpse is clad either

with the clothing worn in life, or the best attire, or special grave cloths, shrouds, or winding sheets. Furthermore, masks are frequently placed over the whole body or over the face. Among the very lowest peoples the corpse may be put away naked, but this takes place only among those tribes that wear no clothing. The preparation of a special shroud has its prototype even among very primitive races, and begins with the chiefs or leading men, who in life wear an official or professional dress. The order of the development of cerements seems to have been: first, the disposal of the body naked; second, dressing the corpse as in life in order to take up the new life in the spirit world at once; third, arraying it in its best clothing, to make a good impression on the ghosts among whom it goes; fourth, wrapping it in a shroud for sentimental reasons. Among the Egyptians the corpse was wrapped with narrow strips of linen. In Turkestan a similar practice is now in vogue, in Kimbondo leather is used, and in Mashonaland the toes and fingers are tied up each in a separate piece of cloth.

Incasement of the Corpse. The receptacles for the dead body are of many sorts. Among the ancient Aleuts the corpse was doubled up and fully clothed. It was then crated, hung on the wall of a cave, or set in a safe place on the floor. The Eskimo employ tough walrus hide as a case for the dead. The Pacific coast tribes, wherever the giant cedar grows, make boxes or hollow logs for the corpse. The plains Indians crated the bodies of the dead and all their belongings before placing them on the platforms, and the old cave people of Utah packed them in burden baskets.

The southern Indians made hurdles of cane and rolled them about the corpse. Farther south no coffin was needed, for the bodies were exposed in *quiobogons*, or dead houses, until the flesh was gone, after which the bones were buried in the earth or in jars. Some of the ancient mound builders made a stone box or coffin in the grave for the bones.

A common motive among primitive tribes in using the coffin was to hold the bones together for burial. Custom demanded it and the ever-watchful and jealous ghost required it. Again, the coffin or its substitute guarded the corpse from ravenous beasts and birds of prey, and it may also be possible that among some tribes the dead are boxed up to prevent them from escaping or being spirited away by unfriendly ghosts. In many tribes the habitation motive prevails; the coffin or tomb is regarded as the house of the dead.

Watching the Corpse. Between death and burial the spirit or the double of the dead hovers around the body and expects the most rigid adherence to custom. This belief is the origin of the widespread custom of lykewake, or watching the corpse. Among many primitive tribes the dead are not hurried to burial, but the ceremonies of mourning begin around the corpse. The Polynesians placed the body of the dead on a bierlike frame covered with white tapa, which was decorated with flowers, or upon a bed of fragrant leaves. Relatives sat around lamenting and cutting themselves with sharks' teeth. Vigils about the dead are widespread among the white races. The folklore of the civilized world abounds in customs during the day or two that intervene between death and burial. The watch feast, or wake, has dwindled to a company of a few friends. Salt is placed on the breast of the dead, a candle burns night and day at the head of the coffin. The sin eater takes bread and publicly devours it for the misdeeds of the deceased.

Removing the Corpse to the Place Intended for it. The funeral proper is one of the most solemn of rites the world over. Among many tribes the corpse must be taken out of the dwelling through the roof or by some roundabout way, in order that the ghost may get bewildered and not return. The procession to the grave, among savages, has changed little in the course of centuries. Usually, mutilations of a more or less cruel character are then observed by certain persons, while among other tribes only a small number carry the dead away and are thereafter unclean.

Disposal of the Corpse. The disposal of the corpse does not necessarily mean interment. We may distinguish five methods which have undergone countless modifications as outgrowths of race, climate, soil, and grade of culture. 1. *Exposure.*—The bodies are not sealed up, but are left to destruction on the ground (rare), or are hidden in clefts, caves, or grottoes; in the hut where the death took place; on trees, posts, scaffolds, or platforms; in boxes or canoes; in log pens, or dead houses; or in towers of silence. 2. *Aquatic Burial.*—The corpse is placed on the water or under the water, as among the Hindus, who consign dead bodies to the Ganges. 3. *Inhumation.*—The corpse is buried in a single grave, which is often shelved or recessed; in pits or golgothas; in cairns, or under mounds or tumuli; under the floor of the home or in consecrated structures. 4. *Encystment.*—The body is inclosed in rude boxes of wood, stone, or other materials, which are placed in dolmens, vaults, sepulchres, house tombs, cistvaens, or mausoleums. 5. *Cremation.*—The corpse is burned and the ashes are abandoned, scattered, buried, boxed, or inurned.

In this connection belongs the custom of making deposits with the dead. No other part of this complicated series of customs comes so near to the world of shades. Thus, in Dahomey the bodies of wives and slaves were sacrificed without number, and in the days of knighthood the horse and armor accompanied the warrior. It is through these relics found with the dead that archæology is to a large extent possible. Most extinct peoples were without the art of writing; but stone implements, pottery, objects in bone and metal, and even textile fabrics reveal enough to enable the archæologist to reconstruct ancient society. Among some American tribes articles of use were punctured or broken before being placed in the grave. One of the tribe who robbed a grave would not be tolerated, but an inimical tribe might be tempted. The Polynesians would rob sacred inclosures of the enemies' dead in time of war and steal the bones of distinguished men to make tools, fish hooks, and other degrading implements. To avoid this, bones were carried to the caverns far away and hidden in clefts of rocks. In the Fiji Islands favorite wives as well as slaves were strangled on the death of a chief in order that they might wait upon him and be happy with him in the spirit world. To this they gladly submitted, not only in the prospect of greater happiness, but to avoid unspeakable miseries in after life. See BURIAL; CREMATION OF THE DEAD.

Post-Mortem Ceremonies. These may be

grouped together under the general head of mourning, including both what is done and what is left undone in dress, conduct, etiquette, and rites. As soon as a burial takes place among the Australians and other savage races the camp is burned down, everything in it is destroyed, and the people move to another place. During the mourning period no person may mention the name of the dead except in case of necessity, when it must be done in a whisper for fear of annoying the ghost. If the ghost should hear the name mentioned it would come to the conclusion that the relatives were not properly mourning, and they would be in consequence liable to his vengeance; for, if their grief were genuine, it would cause them too much pain to hear his name mentioned to allow them to speak it.

Many seemingly absurd customs about the graves or tombs of the dead are easily explained when it is kept in mind that the dead are not regarded as really dead. Putting rags or parts of torn clothing about the tombs, or on trees near by, as a notice to the ghost that the appropriate rending of garments had taken place, is one of these customs. A complete list of them would fill a volume. It is enough to mention the tolling of bells, choice and fashions of mourning, cutting one's flesh, calling the dead, turning pictures towards the wall, feeding the dead, scrupulous care of the grave, hired mourners, and the imperative customs as to who shall mourn, when, how long, and how, sacrifices at the grave, naming the dead, and the widow's lot.

Cult of and for the Dead. The ghostly world of savages is never far away. The anthropomorphism of nature does not end with this life. The dead go at once to some place on the earth or under the earth where the most congenial occupations are renewed. When the ghost of the Polynesian leaves the body it is drawn out through the head as the sword is pulled out from the scabbard. Evil powers also lie in wait for the ghost to seize it when it is drawn out. Arriving safely at the place of the blessed, it is devoured by the gods, cannibalism being in full vogue above.

Not in savagery only, but in all races, ages, and grades of culture, this belief in the nearness of lost ones is held. More than this, reincarnation and metempsychosis are believed to be possible. The savage woman complacently murders her babe, thinking that the same one will enter into the mother's womb and be born again. As the dead are not considered dead, but are even more powerful as ghosts than they were as men, a complex and wide-reaching cult of almost universal extent has been evolved, which has for its object the propitiation and gratification of the spirits of the dead. See DEMONOLOGY; GHOSTS.

Memorials for the Dead. Combined with the fear of the dead is a desire, primarily, perhaps, based on anxiety to propitiate the ghost by a proof of suitable mourning and later founded on real affection, to preserve the memory of the departed. The Andamanese widow carefully dries the skull of her deceased husband, paints it with ochre, decorates it with rude lacework, and wears it for a memorial about the neck. Analogous synecdochic preservation of the dead is almost universal among primitive peoples. The Eskimo place by the side of the grave the huge jaw of a whale. The northern Pacific tribes set up great posts of cedar. The ancient people of the Mississippi valley built mounds of earth and stone. In Easter Island images cut in lava were memorials. The Tahitians set up little models of their houses about 6 feet high, where the body of a chief clothed and rubbed with aromatic substances was laid while offerings were made. These all tell the same story. As culture advanced monuments (see MONUMENT) became more elaborate, and the modern cemetery differs from the primitive memorials in degree rather than in kind.

Ascriptions to the Dead. The custom of eulogizing the dead is extremely primitive and ancient. The Polynesians had professional bards who composed elegies which were committed to memory and preserved. These were recited on special occasions when the dead were mentioned. The American Indians had a solemn style of speech for such occasions quite above the grasp of the ordinary man, while the great epics of Greece and Rome abound in passages over the dead of deepest pathos. Here, too, belongs the entire body of epitaphs, or memorial inscriptions placed on tombs in honor of the dead who are laid in them. See EPITAPH.

A summary of the ethnographic data has been begun by Frazer in *The Belief in Immortality; and the Worship of the Dead*, of which vol. i (New York, 1913) deals with Australia, the Torres Straits, New Guinea, and Melanesia. For North America, consult Yarrow, "Mortuary Customs of the North American Indians," in *Bureau of American Ethnology, First Annual Report* (Washington, 1881).

MORUNGEN, HEINRICH VON. See HEINRICH VON MORUNGEN.

MORVEAU, LOUIS BERNARD GUYTON DE. See GUYTON DE MORVEAU, L. B., BARON.

MORVI, môr-vē'. A native Gujarat state of Bombay, India, on the north side of the Kathiawar Peninsula. Area, 822 square miles (Map: India, B 4). Two-fifths of the land is under cultivation, producing grain, sugar cane, and cotton. Salt and cotton textiles are manufactured. The chief port is on the Gulf of Cutch. Pop., 1911, 14,962. Capital, Morvi.

MORYSON, mŏr'ĭ-son, FYNES (1566–1630). An English traveler, remembered for the partial account of his travels—he sojourned in Ireland, Scotland, several countries of Europe, and in the Holy Land—entitled *An Itinerary* (1617), planned to be in five parts, only three of which were originally printed, the fourth part being preserved in manuscript in the library of Corpus Christi College, Oxford, and a portion of it getting into print in Charles Hughes's *Shakespeare's Europe* (1903). The value of the work to social historians led to the reprinting of other portions of the *Itinerary*—in *History of Ireland 1599–1603* (1735) and in the *Carisbrooke Library* volume (edited by Henry Morley), *Ireland under Elizabeth and James I, Described by Spenser, Sir John Davies, and Fynes Moryson* (1890).

MOSAIC, mō-zā'ĭk (ML. *mosaïcus*, Gk. *μουσαῖος, mousaios*, mosaic, artistic, relating to the Muses, from *μοῦσα, mousa*, Muse). A branch of fine art which was especially prominent during the Middle Ages, though not unknown to antiquity, and is still practiced to a limited extent. Mosaic work, when it attained full growth, had various branches. It was used: (1) on floors; (2) on walls; (3) on detached objects, monuments or furniture. It consisted of the grouping of pieces of marble, glass, or enamel so as to form ornamental or figured compositions. In the *opus sectile* the thin marble plates

were cut so as to follow the outlines of the design, and it is not properly a branch of mosaic. *Opus tessellatum* is the technical term usually applied to mosaic of small cubes (tessellæ) of marble or stone in simple patterns, usually used for pavements. For wall compositions, architectural details, and furniture, though marbles were at first used almost exclusively, the possibility of producing a greater variety of shades in artificial enamels led to their exclusive use on walls as early as the fifth century and in furniture after the eleventh century. The term *opus musivum* is usually applied to such work on wall and ceiling. The cubes used for figures were usually smaller than those used for decorative work. Some are as small as 3 millimeters, more than 100,000 being contained in a square meter. Gilt cubes were made by inclosing the gold leaf between two pieces of white glass. The cubes were colored with metallic oxides. Colored glass was first cut into long narrow sticks and these again broken into the cubes, which were sorted into their separate cases, according to colors and shades, like printers' type. To execute a wall composition the mosaicist prepared his cartoons; the mason plastered as large a section of the wall as could be covered in a day; the mosaicist stenciled or dotted his cartoon on the wet plaster and then rapidly fastened to it the mosaic cubes. The surfaces were flattened, washed, and burnished. In the best work the cubes are not absolutely even or adjacent, so that mechanical effects are avoided.

Early History. Both the Egyptians and Assyrians used mosaic in jewelry and furniture, particularly on ivory grounds. Mosaic designs were used by the Egyptians and also by the Greeks to embellish columns, tiles, and various architectural members. The earliest survivals of Greek mosaics at Delos and Olympia date from the Roman period. They came into prominence for the reproductions in permanent form of famous paintings on the floors of public and private buildings, a practice which the Romans learned from the Greeks. We even hear that scenes from the Trojan War were represented on floors of the great ship of Hiero of Syracuse. A famous floor at Pompeii represents in a grand composition a scene of Alexander's victory at Issus, full of action and variety. Even larger and more complicated is the Nile scene of a floor found at Palestrina, with its inundated city, its fishing and other genre scenes.

Roman. Although the Romans were not ignorant of the use of glass cubes on walls, they never developed this branch of mosaic work; the fountains and niches at Pompeii and Ostia are almost the only surviving examples. But in their pavements they showed the greatest variety, from the simple crude geometric designs in black and white to the exquisite gradations of color and form in such works as the Capitoline doves, the landscapes from Hadrian's villa in Rome and Berlin, the Pompeian actors by Dioscorides in Naples, the portraits of poets and philosophers at Cologne, and many more. Midway between stand such colossal works as the gladiator pavement of the Baths of Caracalla. Roman mosaic pavements of artistic value have been found not only throughout Italy, but in France, Spain, Germany, Hungary, north Africa, Syria, and Asia Minor.

Early Christian. In the fourth century Christian artists perceived the value for church interiors of the rich coloring and permanency of mosaic. No form of painting harmonizes so well with architecture. Mosaics were placed nearly always in the apses and on the triumphal arches of the early Christian basilicas, and in important cases upon the walls of the nave, and sometimes both on the inside and outside walls of the façades. The interiors of mausoleums and baptisteries were covered with them on dome, walls, and apse. While the upper part of the walls was decorated in this way with figured mosaic composition, the geometric mosaics or *opus sectile* were used on the dadoes below, and the marble geometric mosaics covered the floors. In the later Middle Ages the twisted columns, sepulchral monuments, altar canopies, pulpits, choir screens, and other details were entirely inlaid in geometric designs, in the East and in Italy. The wealth of works is concentrated in Italy and in the purely Hellenic world. Rome and Ravenna had special schools with offshoots at Naples, Milan, Grado, and Parenzo. Constantinople and Thessalonica, also, were independent centres, radiating over Greek lands.

Rome preserves the earliest Christian works at Santa Costanza, similar to catacomb frescoes, and at Santa Pudenziana the counterpart of the Christian sarcophagi with Christ and the Apostles. The earliest series where mosaic painting attempts a great scheme of subjects taken from the Old and New Testaments is in Santa Maria Maggiore in Rome, on apse, triumphal arch, and nave. The mosaics over the chancel arch of St. Paul's, representing subjects from the Apocalypse, date from the fifth century. In both cases the composition is still confused; the art has not yet found itself. It was from Greek artists that the solution came, in the introduction of the uniform gold background, against which the figures stood out clearly, as compared with the old white ground. At Ravenna we see this style in its earliest glory in the two baptisteries (fifth century), and especially in the mausoleum of Galla Placidia (440) and later in the church of Sant' Apollinare Nuovo (c.500–550). The latter monument has its entire main walls covered with a triple row of mosaics. Thoroughly Greek also is the culminating work of the sixth century, the decoration of San Vitale, also at Ravenna, with its two great historic panels of Justinian and Theodora, the Byzantine court and the ecclesiastical grandees.

Meanwhile the Roman school had somewhat fallen from its supremacy, for the only great work after St. Paul's was the mosaic of saints Cosmas and Damianus (530), after which Rome suffered from the wars between the Goths and Byzantines and the attacks of the Lombards. The decline reached Ravenna in the seventh century, as is shown at Sant' Apollinare in Classe, and continued in Rome, with Italo-Byzantine stiffness, as in the works at San Lorenzo, Sant' Agnese, and San Venanzio. The coloring is still superb, but the figures are rigid and staring.

Mediæval. The Carolingian era saw a revival in both East and West about the year 800, which lasted for less than a century in Italy, but continued in the East from Basil the Macedonian to the capture of Constantinople by the Crusaders in 1204. In Rome the mosaics of the church of Santa Prassede, especially the scenes from the Apocalypse, are a masterpiece, while Santi Nereo ed Achilleo and San Marco are of secondary importance. The art did not then spread beyond Rome, as in the earlier period. Only in the Orient was it still supreme. The

real revival of the art in the West came in the eleventh century and was due to Byzantine influence and imported Byzantine artists. The two great schools were that of Sicily and Campania, with its masterpieces of Cefalù, Palermo, and Monreale, and that of Venice, represented at San Marco, Torcello, and Murano. In variety of subject, in splendor of color, and in sheer amount, these works surpass the mosaics of the fifth and sixth centuries.

The Roman school took part in this revival, but mingled antique traditions with Byzantinism, and retained a freedom and beauty of decoration and detail foreign to the other schools. It can best be studied at San Clemente, Santa Maria in Trastevere, Santa Maria Maggiore, and St. John Lateran. In some of these works we can trace the first steps in the great revival of painting usually connected with the names of Cimabue and Giotto.

Meanwhile the mediæval mosaicists had been executing pavements far more beautiful than any geometric floors of antiquity. The Byzantine school, as usual, took the lead, and the exquisite designs and coloring of the pavements of San Marco and the Torcello Cathedral at Venice are but repetitions of the pavements of the churches of Constantinople, Saloniki, Mount Athos, Chios, and elsewhere. The Italian school, though centring at Rome, did similar work in Campania and Sicily. The small marble cubes were worked in patterns around large circular, square, long, or polygonal slabs of porphyry, serpentine, verde antico, rosso antico, or other rich marbles which formed the centre of each design.

It was not long before the geometric designs of the floors were transferred to the various details and objects in the church interiors, thus forming a perfectly harmonious whole. The altar fronts and canopies at Ferentino, the canopies at Santa Cecilia and San Paolo at Rome, the choir seats at Cività Castellana and San Lorenzo at Rome, the pulpits at Alba Fucense, San Lorenzo, Palermo, Salerno, and Ravello, the choir screens at the two latter cathedrals and at Alba, the Paschal candlesticks at Anagni, Ferentino, Santa Cecilia, and Salerno, the episcopal thrones at San Lorenzo and Fondi, the sepulchral monuments at San Francesco in Viterbo, at the cathedral of Perugia, at Orvieto, at Assisi, Rome (Santa Maria Maggiore, Sopra Minerva, Ara Cœli, etc.), are a few among hundreds which made the interiors of churches wonderfully rich in this part of Italy.

The mosaic in geometrical patterns even invaded the field of architecture. The portals were surrounded by it; it formed the main decoration of the colonnaded porticoes, and even of the cloisters. The cloisters of San Paolo and of the Lateran at Rome would lose all their beauty if their columns and friezes were divested of the color and design given them by mosaics. Even Tuscan church architecture felt this influence to the extent of obtaining a faintly similar effect by *opus sectile* with broader design—as at Pisa (baptistery) and San Miniato, near Florence.

None of the European countries besides Italy and Greece used mosaics. An occasional work is found in Germany, France, or England; but, as at Westminster Abbey, it is the work of an Italian or a Greek. Only in Russia, as at Kiev and Novgorod, can we trace the existence of a regular branch of the art.

Mohammedan. The art passed from the Byzantine Greeks in the East to the Mohammedans and was used by them for pavements and the revetments of walls in nearly all the schools, especially in Egypt, Spain, and Syria. Figured mosaics were substantially forbidden by the law of the Prophet, so that decorative, and especially geometric, patterns were alone used. Mosques, fountains, palaces, baths, and other buildings, between the tenth and fifteenth centuries, had them in profusion. The mosques of Cairo (see MOSQUE) contain an unbroken series which is paralleled in the old Coptic churches of the city. It is probable, in fact, that most of the mosaicists of the mosques were Christian Copts. The Alhambra at Granada contains dadoes of this geometric ornament, though here and in Syria, and especially in Persia, it was less used than the enameled tiles.

Renaissance and Modern. With the rise of the Giottesque school early in the fourteenth century the golden age of mosaic painting ended, frescoes taking its place. Such works as appear on the façades of Orvieto and Siena cathedrals by Orcagna and his contemporaries in the fourteenth century are purely decorative. Henceforth mosaic loses its individuality and seeks to imitate the delicate soft tones of fresco and then of oil. Great artists like Raphael (Santa Maria del Popolo, Rome), Titian, and Tintoretto (San Marco, Venice) furnished cartoons to be carried out by mosaicists, who are no longer artists, but mechanics. The atelier of the Vatican, busy producing altarpieces for St. Peter in exact imitation of masterpieces in oils, multiplying shades and minimizing the size of the mosaic cubes, has perfected this mechanical method. The atelier at Venice is the only other modern centre of importance. These modern artisans, in their restorations of mediæval mosaics, have done immense damage by trying to improve the originals. They no longer apply the cubes directly to the wall, but set them up in portable compartments, transferring the whole design to the walls by mechanical means.

During recent years the art has experienced a revival of a more independent character, especially in the United States. The improvements in the manufacture of glass, especially of the iridescent varieties, and the possibility of cutting glass into the exact forms of the design, have changed the character of the art, making it possible to follow exactly the design and the colors of nature. The Tiffany studios in New York have been chiefly instrumental in making these improvements. Among the best examples of American mosaic are the chancel of the crypt of the cathedral of St. John the Divine in New York, designed by Louis Tiffany; several designs in the Wade Memorial Chapel and the Huntingdon Mortuary Chapel, both in Cleveland, Ohio, and elsewhere, by Frederick Wilson; and the colossal mosaic curtain, 2500 square feet, of the National Theatre, Mexico—all products of the Tiffany studios.

It is interesting to note that the ancient Americans, especially the Incas and Mexicans, practiced mosaic. The Aztecs, who learned from their predecessors, the Toltecs, thus adorned their ceremonial masques of the gods, knife handles, and objects of adornment, substituting turquoises and shell for cubes of glass, which they did not possess. The best collection of ancient American mosaics is in the British Museum.

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MOSAIC DISEASE. See TOBACCO.

MOSAIC GOLD. See GOLD.

MOSAIC WOOL. See RUGS.

MO'SASAU'RIA (Neo-Lat., from Lat. *Mosa*, the river Meuse + Gk. *σαῦρος, sauros*, lizard). An order of extinct marine reptiles—the Pythonomorpha of Cope. The reptiles possessed the slenderness of a snake combined with strong paddles, such as those of the whale, together with many lizard-like characters. The first specimen of a nearly perfect head skeleton was discovered in 1780 in the upper chalk of St. Pietersberg in Holland, on the Meuse River. A few other specimens have been found in the Cretaceous of England and Europe. In North America this reptile seems to have attained its most flourishing existence, for over 50 species, included in several genera, have been found. The Cretaceous of New Jersey has yielded 15 species. The Yale College collection contains a great number of specimens. *Mosasaurus princeps* from New Jersey is estimated to have been 40 feet long, and *Tylosaurus dyspelor* from Kansas was about 30 feet in length. Consult: A. C. Marsh, "Cretaceous Vertebrates of the West," in *United States Geological Survey Reports* (Washington, 1875); F. A. Lucas, "Animals of the Past," in *American Museum of Natural History, Handbook Series, No. 4* (New York, 1913); S. W. Williston, *Water Reptiles of the Past and Present* (Chicago, 1914).

MOSBY, mōz'bĭ, JOHN SINGLETON (1833–1916). An American soldier in the Confederate service, born at Edgemont, Powhatan Co., Va. He was educated at the University of Virginia, studied law, and was practicing his profession at Bristol, Washington County, Va., at the outbreak of the Civil War. After serving under Joseph E. Johnston in the Shenandoah valley in the winter of 1861–62, he was appointed by Gen. J. E. B. Stuart an independent scout, and guided that officer's cavalry in a bold raid in the rear of McClellan's army on the Chickahominy in June, 1862. Returning to Richmond after a short captivity early in 1863, Mosby recruited an independent body of cavalry for scouting and raiding purposes, and he then began his remarkable career as a leader of an irregular force of cavalry known as rangers, which frequently disbanded when hard pressed, only to reassemble at a signal and renew operations, practically guerrilla in character. The force was subsequently organized as a regular branch of the Confederate service as the Forty-third Battalion of Virginia Cavalry. His most brilliant exploit was the capture, in March, 1863, of Brigadier General Stoughton, U.S.A., at that officer's headquarters at Fairfax Courthouse, which he accomplished by a raid inside the Federal lines. Promoted to be major as a reward for this capture, he followed Lee's army into Pennsylvania in June, 1863, and worried the flanks of the Federal army as it moved southward after Gettysburg. In January, 1864, he was repulsed with considerable loss in a night attack on Harper's Ferry. In May he harassed the rear of Grant's army as it advanced on Fredericksburg, and later made a long raid in Maryland. In August he made one of the most important captures of his career, consisting of Sheridan's entire supply train, which he surprised near Berryville. In September he was wounded at Falls Church, but in the following month was again in the saddle, captured two Federal paymasters with $168,000 in greenbacks, tore up the Baltimore and Ohio Railway tracks, destroyed rolling stock, and made a prisoner of Brigadier General Duffié. In December, 1864, he was promoted to be colonel. After being disabled for a short time by a wound, he continued his operations until Lee's surrender, when he disbanded his troops and surrendered. On account of his methods there was much feeling against him, but through General Grant's intercession he was paroled. After the war he opened a law office at Warrenton, Va., and became a member of the Republican party, which he thought could best settle the question of reconstruction satisfactorily. From 1878 to 1885 he was United States Consul at Hongkong. On his return to America he established himself in law practice for a while in San Francisco. From 1904 to 1910 he was assistant attorney in the Department of Justice, Washington. He published an account of his exploits entitled *War Reminiscences and Stuart's Cavalry Campaign* (1887) and *Stuart's Cavalry in the Gettysburg Campaign* (1911). Consult: John Scott, *Partisan Life with Mosby* (New York, 1867); J. H. Alexander, *Mosby's Men* (New York, 1907); J. J. Williamson, *Mosby's Rangers* (ib., 1909).

MOSCHELES, mō'she-lēs, FELIX (1833–). An English painter and author, son of Ignaz Moscheles. He was born in London and studied art in Paris and under Van Lerius in Antwerp. Afterward he exhibited in Antwerp, at the Paris Salon, and at the Academy and Grosvenor and New galleries in London. His works include genre scenes and portraits of Mazzini, Gounod, Browning, Rubinstein, Stanley, and Grover Cleveland. His publications include *Felix Mendelssohn's Letters to Ignaz and Charlotte Moscheles.* (1888); *In Bohemia with Du Maurier* (1897); *Fragments of an Autobiography* (1902). Active in the cause of international arbitration and peace, he wrote and lectured concerning it; and he became president of the International Arbitration and Peace Association.

MOSCHELES, IGNAZ (1794–1870). An Austrian piano virtuoso and composer, born in Prague, of Jewish parentage. After a course of study at the Prague Conservatory he went to Vienna, where he became a pupil of Albrechtsberger and Salieri. He was a remarkable improvisator and won his greatest successes as much by that gift as by the more important discovery of the "singing tone" by which he secured modifications of tone and variations in tone color by means of touch—an art subse-

quently developed by Liszt and his school. Although he was very successful in his tours of Russia, Holland, Germany, and France, his greatest fame was won in London, in which city he took up his residence in 1821. He did not, however, sever his connection with the Continent, for in 1824 he was giving lessons in Berlin, where he numbered Mendelssohn among his pupils, and formed a friendship with him that was of great mutual profit. He was of much assistance to Mendelssohn when that master first visited England, and was in turn persuaded to join Mendelssohn in the management of the newly formed Leipzig Conservatory (1843). In 1846 he settled permanently in Leipzig, where he taught at the conservatory until his death. With the exception of a collection of studies which are still highly esteemed, his compositions are forgotten. His works include piano concertos, arrangements, instrumental chamber music, sonatas, and numerous études, about 140 opus numbers altogether. He died in Leipzig. Consult *Aus Moscheles' Leben: Nach Briefen und Tagebüchern herausgegeben* (Leipzig, 1872); English translation by A. D. Coleridge.

MOSCHEROSCH, mō'she-rōsh, JOHANN MICHAEL (1601–69). A German satirist of the seventeenth century. He came of an old Spanish family and was born at Willstett, near Strassburg, and wrote under the name Philander von Sittewald. He studied in Strassburg, and held various diplomatic positions. He was admitted to the Fruchtbringende Gesellschaft in 1645 with the name of "Dreamer," and about 1640 published his "Book of Visions," *Wunderliche und wahrhaftige Geschichte Philanders von Sittewalt*, a sharp satire of the times, apparently patterned after Quevedo's *Sueños*. Consult: Nickels, *Moscherosch als Pädagog* (Leipzig, 1883); Pariser, *Beiträge zu einer Biographie von Moscherosch* (Munich, 1891); Erich Schmidt, *Charakteristiken*, vol. i (2d ed., Berlin, 1902); Kürschner, *Deutsche Nationalliteratur*, vol. xxxii.

MOSCHI, mŏs'kī (Lat., from Gk. Μόσχοι, *Moschoi*). An ancient people of Asia Minor, living south of the Caucasus. According to Herodotus (iii, 94; vii, 78) they dwelt between the sources of the Phasis and the Cyrus, east of the Euxine. Under the appellation of the Mushkaia, or Mushki, they appear in the Assyrian inscriptions as carrying on war against Tiglath-pileser I (c.1140–1105 B.C.), who defeated their forces and overthrew their five kings, and as paying tribute to Asurnazirpal III (885–860 B.C.). Mita, King of Mushki (possibly Midas of Phrygia), was in alliance with the kings of Urartu (see CHALDIANS) and Tabal. Mushku is also mentioned in the inscriptions of Sargon II (722–705 B.C.). According to Sayce most of the Hittite hieroglyphic inscriptions come from the Hittite Empire established by the Moschi about 1200 B.C., of which Tyana was the capital. The name of the Moschi is often coupled with that of Tabal or the Tabareni. In the Bible they are spoken of as Meshech and Tubal. Consult Friedrich Delitzsch, *Wo lag das Paradies?* (Leipzig, 1881), and A. H. Sayce, in *Expository Times* (London, November, 1914).

MOSCHINÆ, mŏs-kī'nē. See CERVIDÆ.

MOSCHUS, mŏs'kŭs (Lat., from Gk Μόσχος, *Moschos*). A Greek bucolic poet of the middle of the second century B.C., a native of Syracuse in Sicily. He was a pupil at Alexandria of Aristarchus of Samothrace (q.v.), and himself wrote a prose work on Greek grammar. We possess his "Rape of Europa" (Εὐρώπη) and his epigram "Cupid the Runaway" (Ἔρως Δραπέτης). To him also was long ascribed the "Lament for Bion" (Ἐπιτάφιος Βίωνος), a poem in hexameter verse; this Bion was Bion of Smyrna (q.v.), whom some wrongly regarded as teacher of Moschus. But modern scholars have held that the poem was written rather in the time of Sulla. His poems were united in antiquity with those of Theocritus and Bion, and appear with them in modern editions also (cf., e.g., that of Wilamowitz-Moellendorff, Oxford, 1905). His extant poems were translated by Lang (London, 1896) and by J. M. Edmonds, *The Greek Bucolic Poets* (London, 1912). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1913).

MOSCOSO DE ALVARADO, mŏs-kō'sō dā äl'vä-rä'dō, LUÍS DE (1505–c.61). A Spanish soldier and explorer in America. He was born in Badajoz, and was a kinsman of Pedro de Alvarado, whom he followed to Peru (1534). Four years afterward, with De Soto, he started for Florida, and succeeded him in command in 1542. After terrible privations and with decimated forces he reached Mexico in 1543. There Mendoza received him kindly. In 1551 Moscoso accompanied Mendoza to Peru, where he died.

MOSCOW, mŏs'kō (Russ. *Moskva*). A government of central Russia, bounded by the Government of Tver on the northwest, Vladimir on the northeast, Riazan on the east, Tula and Kaluga on the south, and Smolensk on the west (Map: Russia, E 3). Area, 12,859 square miles. It occupies a portion of the central plateau of Russia, and slopes eastward towards the Oka. It belongs to the basin of the Volga and is watered by that river and the Oka on the boundaries, and by the Kliama, Moskva, and other rivers in the interior. Geologically the government belongs to the Moscow coal basin, the carboniferous formation being covered up with various clays, sandstone, and marble. The soil is loamy and not very fertile. About 40 per cent of the area is clothed in forests, mostly belonging to private persons.

Agriculture is highly developed and the farm products are of great diversity. Rye, potatoes, and oats are the staples. Gardening is carried on extensively, and vegetables are raised in quantities sufficient to be exported to St. Petersburg and Kronstadt. Stock raising is also important.

Moscow is the leading manufacturing government of Russia. In 1913 its manufacturing establishments exceeded 2400, employing over 200,000 hands. The value of the output of that year was approximately $200,000,000. The chief products are textiles (especially cotton and silk); of cotton factories alone there were in that year some 350, with more than 100,000 workers, and an output valued at about $55,000,000. Other important products are machinery, brick, chemicals, knit goods, etc. The house industry is still very important and has reached here a higher degree of development than in any other part of Russia. It exists throughout the government, groups of villages being engaged in the manufacturing of one product. The articles manufactured in this way are of a very wide range, including leather and leather products, hats, pins, brushes, cheap

chromos, carriages and wagons, lace, gloves, etc. It is estimated that agriculture furnishes on the average only about 40 per cent of the income of a peasant family in the government.

The commerce in the products of the house industry is of great extent and is centred chiefly in the city of Moscow. The government is well supplied with transportation facilities, being traversed by six of the most important railway lines of the Empire. Education is poorly provided for. The proportion of illiterate is estimated at 80 per cent. Pop., 1912, 3,303,400, chiefly Great Russians (99.6 per cent in rural districts). Capital, Moscow.

MOSCOW. The second capital and historically the most famous city of the Russian Empire, capital of the military district and government of the same name, and the second largest city of Russia. It is situated on the river Moskva (a tributary of the Oka) in lat. 55° 45′ N. and long. 37° 37′ E., 400 miles southeast of St. Petersburg, at an altitude of from 500 to 850 feet above the level of the sea (Map: Russia, E 3). It has a rather cold climate, the annual temperature being 40.1° F., ranging from a mean of 14° in January to 66.5° in July. The summers are quite warm (in July temperature reaches 100° F.), and the winters dry and cold, snow remaining on the ground most of the season.

The city is irregularly built. On the north bank of the river rises the Kremlin, the acropolis of old Moscow, for many centuries the centre of the political and religious life of Russia and still the most venerated place in the heart of every Russian. It was the nucleus of the modern city and contained in the early periods of the history of Moscow the palace of the Czar, the chief churches and monasteries, and the palaces of the nobility. As the city developed, the merchants and the numerous artisans began to settle outside of the walls. Thus grew up the commercial quarter east of the Kremlin, known as the Kitai Gorod (Chinatown), still constituting the commercial centre of Moscow, and numerous small communities independent in their internal administration and composed mostly of members of the same trade. These divisions are still retained to a large extent in the parishes into which the city is divided. They were subsequently grouped together and surrounded by walls, and now form the Byely Gorod (white town), surrounding the Kremlin and the Kitai Gorod, and the Zemlianoy Gorod (earthen town), inclosing all the above-mentioned quarters as well as Zamoskvoretchye, on the southern bank of the river. There is also a fourth inclosure, Kramer-Kollezh (earthen wall), surrounding the outer parts of the city and forming the limits of Moscow proper. Only the walls of the Kremlin and of the Kitai Gorod have been preserved, all others having been converted into boulevards and avenues. See KREMLIN for illustration.

Although one of the oldest cities of Russia, Moscow has preserved comparatively few architectural monuments outside of its churches and monasteries, most of the old buildings having perished in the destructive conflagrations which figure so prominently in the history of the city. With the introduction of Western civilization into Russia by Peter the Great and his successors, the Russian style of architecture gradually disappeared in practically all the secular and private buildings, and the application of Western standards not infrequently produced very peculiar effects. Under Alexander II a revival of Russian architecture was inaugurated and a number of successful restorations have since been made. The chief interest of Moscow, as already stated, is centred in the Kremlin, both for its historical associations and for its churches and monasteries, with their semibarbaric splendor and curious architecture. The Kremlin is nearly triangular in shape and surrounded by a wall about a mile and a half long. The wall is surmounted by 18 towers and pierced by five gates, among which is the Spasskiya Vorota (Gate of the Redeemer), one of the most revered historical places of Russia, and associated with many of the chief events of national history. Within the walls of the Kremlin the most famous edifice is the Uspensky Sobor (Cathedral of the Assumption), in which all the Russian monarchs since Ivan IV have been crowned. The present building was erected by Aristotele Fioraventi in the fifteenth century on the site of an older church founded in 1326. It is Lombardo-Byzantine in style, with Indian cupolas. The semidark interior is adorned with numerous icons, covered with gems and precious metals. They are of great antiquity, one of them being attributed to St. Luke. The treasury of the cathedral, one of the richest in Russia, contains many valuable Bibles, manuscripts, and sacred vessels, as well as numerous relics of saints. The cathedral of St. Michael the Archangel is the former burial place of the Russian monarchs. It dates, in its present form, from the beginning of the sixteenth century and is surmounted by five domes, the central one being of gilt. The interior is richly decorated and its walls are covered with the portraits of the Russian monarchs interred there. In the partly Gothic Cathedral of the Ascension, founded in 1397, the walls and the thick pillars are covered with portraits of saints and Greek philosophers, and the floor is made of semiprecious stones of various colors.

One of the sights of the Kremlin is the tower of Ivan the Great, 322 feet high and crowned by a gilt dome; it contains 34 bells, weighing altogether about 580,000 pounds. In former times the Kremlin contained numerous monasteries and convents, of which only a few have been retained. The most interesting of these are the Maiden Convent, for centuries the burial place of the Russian princesses, and the Tchudov Monastery, an institution of great historical importance as well as a great factor in the development of ecclesiastical learning in Russia. Near the tower of Ivan the Great stand two objects very famous in Russia. One is the Czar Bell, cast in 1735 and now resting on a stone pedestal. Part of the bell, broken off during the fire of 1737, lies near by. It is over 60 feet in circumference around the rim, 19 feet high, and weighs about 200 tons. The other, near the Museum of Arms, is the Czar Cannon, cast in 1586, and weighing nearly 40 tons. The palaces of the Kremlin are mostly modern, and only a few portions of the old abode of the Russian monarchs have survived. The great palace, completed in 1849, is a vast building of white stone with a gilt cupola, and possessing numerous magnificent halls devoted to the different orders of Russia. Attached to it are the living rooms of the old Russian rulers, known as the Terem and dating from the seventeenth century. They are of great architectural value

and well preserved. Connected with the palace are the old banquet hall known as Granovitaya Palata, with its red stoop, from which Russian monarchs used to address the populace; and the Oruzhaynaya Palata (hall of arms), containing immense treasures, such as crowns, sceptres, thrones, costumes, banners, armor, gold and silver plate, carriages. The palace of the patriarch, built by Nikon in 1655, has one of the most valuable libraries in Russia and a treasury of fabulous wealth. The arsenal of the Kremlin is one of the largest in the world.

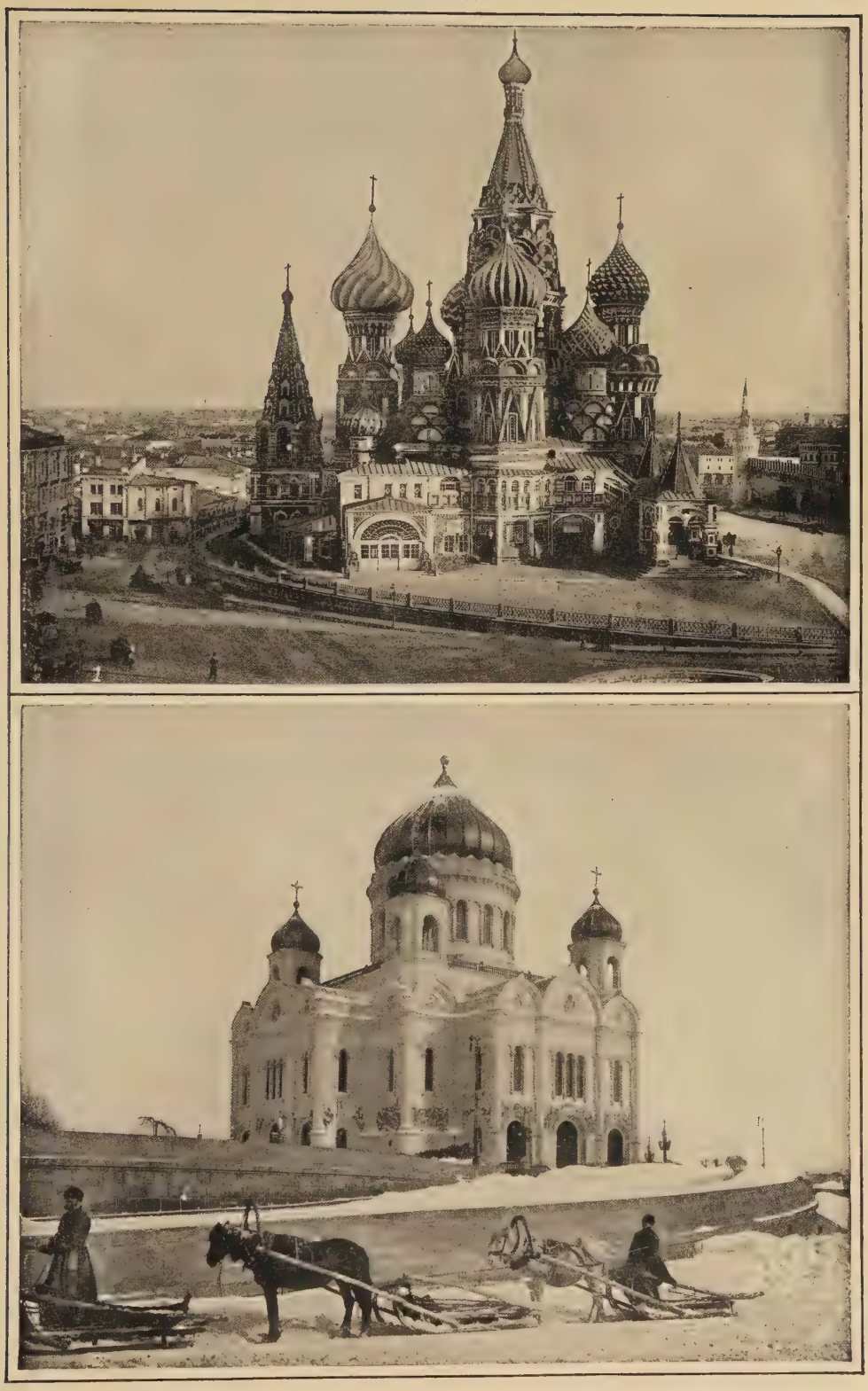
The Kitai Gorod, adjoining the Kremlin, also has many historical associations. Especially noteworthy is the Red Square, used repeatedly as a camp by the besieging Mongols, as a forum by the Russian monarchs, and as a place of execution. Facing the Red Square is the cathedral of Vasili the Beatified, which for mixture of styles, colors, and architectural lines has few equals in the civilized world. It was built by an Italian architect at the command of Ivan the Terrible in 1554 to commemorate the conquest of Kazan, and consists of a number of separate buildings under separate cupolas, differing from each other in form, dimension, and glaring colorings. The interior does not differ essentially from those of the other great churches of Moscow, being dark, close, and covered with paintings, gold, and gems in great profusion. Contrasting favorably with the cathedral of Vasili the Beatified is the modern church of the Saviour, consecrated in 1881 in commemoration of the destruction of Napoleon's Grand Army in 1812. It is Lombardo-Byzantine in style, cruciform, and well proportioned, built of white marble and surmounted with five cupolas. The paintings and the marble reliefs of the interior have been executed by the best artists of Russia.

In the centre of the Red Square stands the monument to Minin and Pozharsky, who liberated Moscow from the Poles in 1612. The Greek Monastery of St. Nicholas in the Kitai Gorod deserves special mention for its influence on education in Russia. It was under the auspices of the monks of St. Nicholas that the first Russian academy for classical education was established in the seventeenth century. It numbered among its pupils Lomonosov and others prominent in the literary and the political life of the country. The Kitai Gorod possesses a number of old residences of the boyars (see BOYAR), of which the most interesting is the family house of the Romanovs, faithfully restored in 1859. The Gostiny Dvor, the centre of the retail trade of Moscow, is architecturally also very interesting. Other noteworthy secular buildings and monuments are the Petrovsky Palace, occupied by Napoleon during his stay at Moscow, the town hall (duma), the Sukharev Tower (1692–95) with the reservoir, the triumphal arch, etc. Moscow has extensive markets, of which probably the most interesting is the Tolkuchy, where second-hand clothes are sold. In the most northern quarter of the Zemlianoy Gorod are still found many stately, though somewhat decayed, mansions of the old nobility, while Zamoskvoretchye, on the opposite side of the river, is the stronghold of the wealthy merchant class.

Economically, Moscow is exceedingly important, both with regard to industries and commerce. The manufacturing industries date from the time when the city was the residence of the court and attracted skilled artisans from all over Russia as well as from foreign countries. At present Moscow is the second-largest manufacturing city of the Empire and the centre of the textile industries, furnishing a considerable portion of the cotton goods for the Asiatic trade. The textile industry ranks first, with over 200 factories, 50,000 workers, and an output exceeding $100,000,000. Next to textiles are foodstuffs, metal products, paper, leather and wood products, and machinery. As early as the fourteenth century Moscow was an important commercial centre. Its trade grew up with the political power of the Principality of Moscow, and received a great stimulus from the settlement of the Novgorod merchants. The advantageous position of the city at the convergence of six railway lines, which connect it with every part of European Russia as well as with Siberia, has played an important part in its commercial development. Manufactures, agricultural products from the southern and the central provinces of Russia, minerals from the coast, and tea from Asia, all find their way to Moscow and go partly to supply the local demand and partly to supply the trade with the interior or with foreign countries. The rise of St. Petersburg had at first a detrimental effect on the foreign trade of Moscow, but the development of the Asiatic trade, of which Moscow is the natural centre, has more than compensated for the loss in any other direction. The trade by water is important. About 338,000 tons of goods are imported annually, other chief imports being tea, iron and steel products, raw silk, indigo, cotton yarn, etc.

Moscow is administered by a governor general, who is also at the head of the military district of Moscow. The municipal council of 160 members is elected by owners of real estate and merchants of the first class, and has an executive committee of six members. Both the municipal council and the executive committee are presided over by the mayor (*golová*), who, unlike the mayors of all other Russian towns save St. Petersburg, is appointed by the government from two candidates suggested by the council.

The budget of the city for 1914 exceeded $21,000,000, more than half of which was derived from municipal undertakings, whose number is rapidly increasing in Moscow. The chief items of revenue are real estate and internal taxes, which yield about one-quarter of the revenue, subvention from the Imperial government, the zemstvo, and returns from municipal property and enterprises. About one-third of the revenue is spent on sanitation, while the amount expended on education has greatly increased since 1913, due to the passage of a universal education bill. In 1913 this approximated $2,500,000. The municipality owns the water works, slaughterhouses (with cold-storage facilities), baths, and a number of lodging houses, while municipal bakeries and market places are under consideration. In regard to facilities for local transportation Moscow is far behind most European cities of equal size and importance, but is making rapid progress in this direction as in many others. Moscow has many prominent educational establishments. Besides the university (see MOSCOW, UNIVERSITY OF) there are a theological seminary, a technical school, an agricultural institute, an institute for the study of Oriental languages, schools of art, painting, and architecture, a school of engineering, two



1. CATHEDRAL OF VASILI THE BEATIFIED
2. CHURCH OF THE SAVIOUR

seminaries for teachers, a number of dramatic schools, a commercial institute, 21 Gymnasia, five Realschulen, a school of Church music, and numerous other special schools. Libraries are numerous. The most important museums and collections are the Rumiantzev Museum, consisting of a fine library and collections of paintings, sculptures, ethnography, etc.; the historical museum, and the Tretiakov Gallery of modern paintings, now belonging to the city. A number of prominent scientific organizations have their home at Moscow, including the society of naturalists and the society of Russian history and antiquities. The numerous archives of Moscow are also noteworthy. The benevolent institutions, especially the foundling asylum, are among the largest in Russia. The theatres of Moscow, especially the "small theatre," have played a prominent part in the development of Russian drama. The periodical publications of Moscow are numerous, and the book trade of the city, especially that handling popular publications, is very extensive.

The population of Moscow has increased from 602,000 in 1871 to 1,635,000 in 1913; and 1,817,100 in 1915. The predominance of males is very marked. About 50 per cent of the population belong to the peasantry. The Greek Orthodox inhabitants constitute about 94 per cent of the total population of Moscow, as compared with 84 per cent in St. Petersburg. There are 2 per cent of Lutherans and 1 per cent Roman Catholics. The environs of the city are replete with historical interest and contain many estates of the old nobility and royal favorites, among which may be mentioned the Petrovsko-Razumovskoye, with its extensive park and academy of agriculture. There are also many large, picturesque parks and groves, where the masses amuse themselves on holidays. Of these the Petrovsky Park, northwest of the city, is one of the most frequented. No city is so typically Russian, so expressive of the character and peculiarities of its inhabitants, and so dear to the heart of every Russian, as this old city, affectionately known as "Little Mother Moscow."

History. The site of the city was probably inhabited long before the twelfth century, but the first mention of Moscow dates from 1147, when it was the estate of the Suzdal Prince Yuri Dolgoruki. The city began to rise with the Principality of Moscow under Daniel, the son of Alexander Nevski, in the thirteenth century, and especially under Ivan Kalita (1328–40), who with the aid of the Mongols succeeded in annexing many of the minor principalities to Moscow, and greatly embellished the capital. In 1325 the Metropolitan Peter transferred his seat to Moscow from Vladimir-on-the-Kliasma, thereby laying the foundation of its future position as the religious capital of Russia. In 1363 the city was besieged by Olgierd, the Grand Duke of Lithuania, and in 1382 it was burned by the Khan Tokhtamish. With the union of the Russian principalities under Ivan III (1462–1505) Moscow became the capital of Russia and began to assume the proportions and appearance of a large city. In 1520, during the reign of Vassili Ivanovitch (1505–33), the city is said to have had 45,000 dwelling houses. But the growth of the city was often interrupted by the invasions of the Tatars, conflagrations, and pests. It also suffered from internal dissensions and revolts during the seventeenth century, notably the Polish occupation in 1610–12, the revolt of the people against the corrupt favorites of the Czar, the riots following the introduction of religious reforms by Nikon, and the rise of the Streltsi (q.v.) against the reforms of Peter the Great. Peter found Moscow unfavorable for the introduction of his reforms, and transferred the court to St. Petersburg. The University of Moscow was founded in 1755. On Sept. 14, 1812, Moscow, almost entirely deserted and with its treasures and archives removed to Vladimir, was occupied by the army of Napoleon, seven days after his disastrous victory at Borodino (q.v.). On the following day the Emperor made his entry into the city. On the night of the 15th to the 16th, in accordance with a prearranged plan, fires were started in several parts of the city, and soon the entire place was in flames, so that on September 16 Napoleon was compelled to remove his headquarters from the Kremlin. On October 19 the French began their fatal retreat from the city. On May 18, 1896, Moscow was the scene of a fearful disaster, brought about by the distribution of gifts at a popular festival arranged in honor of the coronation of Nicholas II. Over 2000 people were crushed to death and many more wounded. The city was a centre of revolutionary disturbances in 1905–06. On Feb. 17, 1905, Grand Duke Sergius was assassinated in the Kremlin. Zemstvo congresses assembled in September and November. On December 21 the revolutionaries rose in armed revolt, and there was fighting for a week before the insurrection was suppressed. Five thousand are supposed to have perished.

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MOSCOW. A city and the county seat of Latah Co., Idaho, 94 miles south-southeast of Spokane, Wash., on the Northern Pacific and the Oregon-Washington Railroad and Navigation Company lines (Map: Idaho, A 3). It is the seat of the agricultural and mining schools of the University of Idaho (q.v.), and has a Carnegie library and fine high-school and Federal buildings. Mining, farming, fruit growing, stock raising, and lumbering are the leading industries, and there are some manufactures. The water works are owned by the city. Pop., 1900, 2484; 1910, 3670.

MOSCOW, University of. The oldest and largest institution of higher learning in Russia, organized in 1755. At its inception it consisted of three faculties—law, medicine, and philosophy—with a total staff of 10 professors, mostly brought from western Europe. The curriculum was very limited in its scope until 1807, when it was reorganized by Alexander I. At the burning of Moscow in 1812 the university buildings were destroyed. The most valuable collections, however, had been previously removed. Instruction, suspended for a while, was resumed in 1813, and new buildings were erected in 1816–19. In 1835 the number of chairs was increased to 35 and a uniform four years' course established for all departments. In 1841 the Medicosurgical Academy was united with the University. The liberal University Act of 1863

gave the professors and students a certain amount of self-government, which was abolished during the reactionary régime of Alexander III in 1884. In 1902 Moscow University consisted of the following faculties: (1) medicine, (2) law, (3) physical and natural sciences, (4) historico-philological faculties. It offers four-year courses leading to the degree of candidate. In the medical school, however, the course covers five years, the regular degree being physician. The degrees of master, doctor of the various sciences, and M.D. are conferred for special investigation. The university library contains nearly 400,000 volumes and 29,000 pamphlets. The departmental libraries, laboratories, observatories, museums, etc., number altogether 33. The medical department has 25 special institutes, clinics, and hospitals. The number of students in 1913 was 9760. The expenditures of the university amounted to 2,595,075 rubles. As the majority of the students come from the poorer classes, the number of scholarships is very large, and they provide for about one-tenth of the students. The university is under direct supervision of the Minister of Public Instruction, who appoints the rector. There is a university council, but its powers are limited.

MOSEILIMA, mō-sī'lē-mȧ (Ar. *Musailimah*, from the proper name *Muslimah*, from *salima*, to be safe). One of the most important of the rival prophets who came forward in Arabia when Mohammed had stirred the religious thought of the people. He belonged to the tribe of the Beni Henifah, of Yamama in Nejd. The traditions about his life and age are extremely contradictory and legendary. It appears, however, tolerably certain that he had risen to a certain eminence in his tribe, probably at first only as a religious teacher, before Mohammed assumed his prophetical office. He seems to have proposed to divide the religious leadership with Mohammed, a suggestion which the latter contemptuously refused. He never undertook to supplant Mohammed. After the death of the Prophet, Moseilima set up the standard of open opposition and was defeated and killed in a desperate battle by Khalid, who had been sent against him by Abu Bekr. His "heresy" was stamped out, and only a few scattered supporters escaped to El Hasa and Basra, where they may have laid the foundation of the later Karmathian creed. See MOHAMMEDAN SECTS.

MOSELEY, mōz'lĭ, EDWARD AUGUSTUS (1846–1911). An American economist and authority on railroads, born at Newburyport, Mass. After 1862 he made several voyages on vessels engaged in East Indian trade. Later he studied law, was admitted to practice before the Supreme Court of the United States, and served in the Massachusetts Legislature. When the Interstate Commerce Law was passed in 1887, Moseley became secretary of the Interstate Commerce Commission, which he helped to organize. During the American occupation of Cuba he assisted in drafting railroad laws for that island. In 1902 he was one of the assistant recorders of the Anthracite Coal Strike Commission. His publications include: *Arbitration as Applied to Railway Corporations and their Employees* (1893); *Federal Supremacy* (1907); and various pamphlets.

MOSELEY, HENRY (1801–72). An English mathematician, born at Newcastle-under-Lyme. He graduated at St. John's College, Cambridge, studied theology and was ordained a priest of the Church of England in 1828, and in 1831–44 was professor of natural and experimental philosophy and astronomy at King's College, London. In the latter year he was made an inspector of normal schools. In 1853 he was appointed canon of Bristol Cathedral and two years afterward became chaplain to the Queen. Moseley, in a paper published in the *Philosophical Transactions of the Royal Society* in 1850, announced the formulæ for the dynamical stability of warships, which have come into common use. His works include: *A Treatise on Mechanics, Applied to the Arts* (1834); *Astro-Theology* (1838; 3d ed., 1860); *Lectures on Astronomy* (1839; 4th ed., 1854); *The Mechanical Principles of Engineering and Architecture* (1843; 2d ed., 1855), his most important book, edited by Prof. Dennis Hart Mahan (q.v.), for the use of students at West Point, and translated into German by Professor Schefler, of Brunswick; *Theoretical and Practical Papers on Bridges* (1843).

MOSEL'LA. The name of a Latin poem, by Ausonius (q.v.).

MOSELLE, mō-zĕl', Ger. MOSEL, mō'zel. One of the principal affluents of the Rhine. It rises on the west slope of the Vosges Mountains in the northeast corner of France, flows northwestward to the French boundary, then northward past Metz and Thionville, after which it turns to the northeast, and with many windings through the Prussian Rhine Province, being for a time the boundary between the Grand Duchy of Luxemburg and Germany, enters the Rhine at Coblenz (Map: Germany, B 3). Throughout the greater part of its length the Moselle runs through a narrow valley occupied by fertile fields and meadows and inclosed by steep hills and mountains, in many places becoming rocky cliffs. In the lower valley the hills are vine-clad, producing the celebrated Moselle wines, noted for their delicate aromatic flavor. Numerous ruins and historic landmarks also make the valley notable. The total length of the river is 314 miles; it is navigable downward from Frouard for small vessels. From Metz to the frontier it is canalized. Two lines of steamers ply regularly between Coblenz and Treves. The stream was followed in the fall of 1914 by the Army of the Moselle in the attempt of the Germans to reach Paris. See WAR IN EUROPE. Consult W. M. Davis, *Geographical Essays: The Seine, the Meuse, and the Moselle* (Boston, 1909), and Charles Tower, *Along Germany's River of Romance: The Moselle* (New York, 1913).

MOSEN, mō'zen, JULIUS (1803–67). A German author, born at Marieney in the Vogtland, Saxony. He attended the University of Jena, where Goethe awarded him the first prize for his competitive anniversary poem on Karl August's fiftieth birthday; completed his studies at Leipzig in 1826–28; and from 1828 to 1831 was in the office of an advocate at Markneukirchen. In 1834 he settled in Dresden as a lawyer and became prominent in literature. He went to Oldenburg in 1844 under appointment from Grand Duke Paul Frederick August as dramaturgist of the Hoftheater with title of councilor. His activity in that post was interrupted by illness, and from 1850 he was pensioned. His first public success was achieved by the epic *Lied vom Ritter Wahn* (1831), based on the Italian legend of *Il cavaliere Senso*, and his reputation was much increased by *Ahasver*

(1838), a second poem in that kind, whose large, historical action is somewhat impeded by its philosophy. The *Gedichte* of 1836 (2d ed., 1843) include the well-known ballads, long since established as Volkslieder, "Andreas Hofer," "Der Trompeter an der Katzbach," and "Die letzten Zehn vom vierten Regiment," descriptive of an episode in the Polish contest for independence. Of his works of fiction the best, perhaps, are the *Bilder im Moose* (2 vols., 1846), short stories, finished in workmanship. His dramas were overweighted with the rhetorical exposition of his ideas on politics and history. *Otto III.* (appeared with three others as *Theater*, 1842) was the most important. As dramaturgist, he did much to further German drama, especially Shakespearean presentations. An excellent collective edition of his works is that issued by his son in 1880 (6 vols., Leipzig). Consult the anonymous biography, *Julius Mosen* (Oldenburg, 1878); *Allgemeine deutsche Biographie*, vol. xxii (Leipzig, 1885); Julius Mosen, *Erinnerungen* (Plauen, 1893).

MOSENTHAL, mō'zen-tăl, JOSEPH (1834–96). A German-American musician, born at Cassel. He studied under his father and Spohr and in 1853 came to America, where he played the organ in Calvary Church, New York City, from 1860 to 1887. He was conductor of the Mendelssohn Glee Club in New York City from 1867 to 1896, played a first violin in the Philharmonic Orchestra for 40 years, a second violin in the Mason and Thomas Quartet for 12, and composed much Church music, such as the psalm "The Earth is the Lord's," and part songs for male voices, *Thanatopsis*, *Blest Pair of Sirens*, and *Music of the Sea*.

MOSENTHAL, SALOMON HERMANN VON (1821–77). A German dramatist. He was born at Cassel, studied at Marburg, and in 1850 became an official in the Ministry of Public Instruction at Vienna and was soon afterward appointed ministerial archivist. His investiture with the Order of the Iron Crown in 1871 conferred knighthood upon him. He is chiefly known by the dramas *Deborah* (1850; numerous later editions known in English as *Leah the Forsaken*) and *Der Sonnenwendhof* (1856), which have been represented with success and translated into several languages. His plays show mastery of stage technique and effective situations, but are somewhat hollow and rhetorical. He also wrote the libretti for a number of well-known operas, notably Nicolai's *Die lustigen Weiber von Windsor* (1849) and Goldmark's *Die Königen von Saba* (1875). His collected works were published in six volumes in 1877–78. Consult: *Allgemeine deutsche Biographie*, vol. xxii (Leipzig, 1885); Keller, *Nachgelassene Schriften* (Berlin, 1893); Hebbel, *Litteraturbriefe* (ib., 1901).

MÖSER, mē'zēr, ALBERT (1835–1900). A German lyric poet. He was born at Göttingen and, after studying there, became a teacher of the classical languages in Dresden. His odes, sonnets, and songs attained great popularity, especially a ballad, *Die Rose von Mars la Tour*, and are marked by much melody, by a dreamy reflective manner, and occasionally by great skill in the reproduction of classical metres. His *Gedichte* were published in 1865. Consult article by M. Schneidewin, in the *Preussische Jahrbücher*, vol. cxxi (Berlin, 1905).

MOSER, mō'zēr, GUSTAV VON (1825–1903). A popular German dramatist, born at Spandau, May 11, 1825. Trained for the army, he entered it in 1843, and served till 1856, when he married the daughter of a wealthy landed proprietor. After an unfortunate venture in comedy, *Der weibliche Hussar*, he devoted himself to agriculture till a happy meeting with the Berlin stage director Wallner brought him back to the stage in 1861 for a career of almost unbroken popular success. Of about 100 comedies and farces, written some alone and some in coöperation with L'Arronge, Heiden, Schönthan, and others, the most noteworthy are: *Das Stiftungsfest* (1873); *Ultimo* (1873); *Der Veilchenfresser* (1876); *Der Bibliothekar* (1878); *Krieg im Frieden* (1880). He also wrote a number of plays in collaboration with others. A uniform edition of Moser's works in 22 volumes was published in 1872–94. Consult Hans von Moser, *Gustav von Moser: Vom Lieutenant zum Lustspieldichter* (Wismar, 1908).

MOSER, JOHANN JAKOB (1701–85). A German publicist, born in Stuttgart. He studied at the University of Tübingen, where in 1720 he became extraordinary professor of law. In consequence of some difficulties with the censor he resigned this position in 1732 and in 1736 answered a call to the University of Frankfort-on-the-Oder. Here he incurred the displeasure of Frederick William I, and in 1739 was again compelled to resign. In 1747 he became Privy Councilor and chief of the chancery in the service of the Landgrave of Hesse-Homburg, but two years later he went to Hanau and in 1751 returned to his native city, where he entered the service of the Duke of Württemberg. In 1759, being held responsible for certain manifestoes directed against the Duke, he was imprisoned in the fortress of Hohentwiel, where he remained for five years. After his release his offices were restored to him. Among his works are: *Deutsches Staatsrecht* (53 vols., 1737–54); *Neues deutsches Staatsrecht* (21 vols., 1766–75; 2 more vols. and index, 1781–82); *Deutsches Staatsarchiv* (13 vols., 1751–57); *Lebensgeschichte* (3d ed., 4 vols., 1777–83). Consult Wächter, *J. J. Moser* (Stuttgart, 1885).

MÖSER, mē'zēr, JUSTUS (1720–94). A German historian and publicist, born at Osnabrück. He studied law at Jena and Göttingen and in 1747 was chosen *advocatus patriæ*. He was sent to England in 1763 on financial business of the allies. During the minority of the Duke Frederick of York, who afterward became Bishop of Osnabrück, Möser was the principal adviser of the Regent. He founded in 1766 the weekly *Die Osnabrückischen Intelligenzblätter*, from which he reprinted *Patriotische Phantasien* (in 4 vols., 1774–76), a series of brilliant and valuable essays. His *Osnabrückische Geschichte* (1768; 3d ed., 1819) is an anticipation of the best results of the modern German historical methods. His collected works, edited by Abeken (Berlin, 1842–44), include a biography by Nicolai and Möser's poetry. Consult: Kreyssig, *Justus Möser* (Berlin, 1857); *Allgemeine deutsche Biographie*, vol. xxii (Leipzig, 1885); Rupprecht, *J. Mösers soziale und volkswirtschaftliche Anschauungen* (Stuttgart, 1892); K. Mollenbauer, *Mösers Anteil an der Wiederbelebung des deutschen Geistes* (Brunswick, 1896).

MOSES (Heb. *Mosheh*, Aram. *Musheh*, Ar. *Musa*, Gk. Μωυσῆς, *Mōysēs*, or Μωσῆς, *Mōsēs*). The deliverer of Israel from Egyptian bondage, recipient of the Law, and author of the Pen-

tateuch, according to Hebrew tradition. If the name is Hebrew, it comes from the root *mashah* and means 'deliverer,' 'one who draws out'; cf. *yamsheni*, 'let him deliver me' (Ps. xviii. 17). Pharaoh's daughter, who is supposed to speak Hebrew, calls the child *Mosheh*, 'because I have drawn him out of the water' (Ex. ii. 10), though it might seem that *mashuy*, 'drawn out,' 'delivered,' would have been more appropriate. It is possible that the rendering of the Greek version, *Moyses*, followed by Philo, New Testament writers, and Josephus, represents an attempt to find an Egyptian etymology, and Josephus suggests a derivation from *mou*, 'water,' and *ses*, 'taken'; but the order and the construction in Egyptian would be different. More recently it has been conjectured that *Mosheh* corresponds to an Egyptian *'mes'* or *'möse,'* meaning 'child,' 'offspring'; but the sibilant is different, as is also the length of the first vowel. There seems to be no adequate reason for abandoning the Hebrew etymology.

The leading events in the life of Moses, as set forth in Exodus-Deuteronomy, are the following. He was born in Goshen (q.v.) at a time when an Egyptian king whose name is not mentioned was oppressing the Hebrews, forcing them to hard labor in the building of the cities Pithom (q.v.) and Ramses, ordering their two midwives, Shiphrah and Puah, to slay all male infants, and, when they disobeyed, commanding the Egyptians to kill the children. His father was Amram, a grandson of Levi, who had come with Jacob into Goshen 430 years before the Exodus, and his mother was Amram's aunt (*dodah*), Levi's daughter, Jochebed (Yah is glory). The date of his birth is not given, but, according to the chronological system adopted in the Old Testament, it occurred 990 years before the destruction of the temple by Nebuchadnezzar, which took place in 586 B.C. (80 years to the Exodus, 480 from the Exodus to the building of the temple, 430 the duration of Solomon's temple); consequently in 1576 B.C. To save her child from the massacre, Jochebed put the infant in an ark of bulrushes, i.e., a papyrus box, and set it out in the river. Rescued by the daughter of Pharaoh, Moses was brought up as her own child. When he was grown up, he murdered an Egyptian who had killed one of the Hebrews and fled to Midian, where he married Zipporah, the daughter of a priest Jethro (or Reuel), whose flocks he tended until he was 80 years of age. Then the god of his fathers appeared to him in a bush that was burning without being consumed, commanded him to go to Egypt to deliver his people, attested his mission by giving miraculous power to his rod and his arm, and hinted at His divine name without making it fully known. Later He revealed to Moses His real name, Yahwe (see JEHOVAH), by which He had not been known to his fathers and evidently not to his father-in-law either, and on account of his infirmity of speech gave him Aaron (q.v.) as his prophet, while he himself was to be a god to Pharaoh. Moses then started for Egypt with his wife and his son Gershom (q.v.). On the way Yahwe met him and sought to kill him, but was pacified when Zipporah circumcised her son and cast the foreskin at His feet.

In Egypt Moses demanded of Pharaoh that he let his people go into the wilderness to celebrate a festival to Yahwe. But in spite of the miracles he wrought, which were in part successfully imitated by the Egyptian magicians, Pharaoh's heart was hardened, and he would not accede to the request. Moses therefore performed with his rod or his outstretched arm a series of miracles, including the change of the water in the river into blood, plagues of frogs, lice, flies (probably a duplicate of the lice), murrain, boils (probably a duplicate of the murrain), hail, locusts, and darkness, and culminating in the slaying of the first-born of man and beast. None of these blows affected the Hebrews in Goshen. (See PLAGUES OF EGYPT; PASSOVER.) Pharaoh at last yielded, and Moses led the people, consisting of 600,000 armed men, besides women, children, and a mixed multitude joining them, by way of Succoth (q.v.), Etham, and Pi-hahiroth to the Sea of Sedges, probably a branch of the Red Sea (q.v.). Pursued by the Egyptian army, the Hebrews seemed to be caught in a cul de sac; but Moses stretched out his arm over the sea, and Yahwe made the sea dry land, the waters standing up as a wall on the right and the left, while the people crossed over. The Egyptians were drowned by the returning waters. Having thus delivered his people, he led them by way of Shur, Marah, and Elim to the wilderness of Sin, providing them miraculously with quail and manna (q.v.) to eat and water from the rock which he struck with his rod. At Rephidim (q.v.), Amalek (q.v.) was defeated. As Moses and the people approached Sinai, they met Jethro, who had with him Zipporah and her sons, Gershom and Eliezer. Jethro rejoiced with Moses over the deliverance that had been wrought and offered sacrifices to God.

From the top of Mount Sinai, Yahwe spoke to Israel amidst lightning, thunder, and smoke. As the people could not endure this, Moses went up into the mountain and was alone with Yahwe 40 days and 40 nights, receiving the tablets of stone on which Yahwe wrote the Ten Commandments (see DECALOGUE), as well as many other laws, and directions as to the construction of the tabernacle (q.v.). Meanwhile Aaron made a golden calf (q.v.), which the people worshiped. When Moses descended from the mountain and saw this, his indignation was such that he broke the tablets of stone; but he afterward interceded for the people, who were spared after 3000 had been slain by the Levites. Moses then went up again into the mountain, where he spent 40 days and 40 nights with Yahwe, neither eating bread nor drinking water during this time. As he descended with new tablets on which he had written the Ten Commandments his skin emitted rays, so that he must henceforth put on a veil when he spoke to Israel. While Yahwe did not allow him to see His face, He graciously permitted him to see His back. The tabernacle was constructed by Bezaliel, a sacrificial code was given, Aaron and his sons were installed in the priesthood, dietary laws and a holiness code were promulgated, a census of the holy people was taken, and Moses led the people from Mount Sinai towards the promised land. On the way Eldad and Medad prophesied, and Moses refused to censure them for it. At Hazeroth, Miriam and Aaron opposed Moses because of the Cushite woman whom he had married. Miriam was therefore stricken with leprosy, but recovered when Moses interceded on her behalf.

Israel then settled at Kadesh Barnea (q.v.). From there Moses sent forth spies, whose re-

ports discouraged the people. A rebellion started by the Levite Korah and the Reubenites Dathan, Abiram, and On was severely punished; the earth opened itself and swallowed up these men, with their families and their supporters, 250 men were consumed by a fire that went out from Yahwe, and on the following day 14,700 were stricken by a plague because they murmured. When the people requested Moses to give them water, he did indeed strike the rock and produce water, but acted so proudly and failed so completely to glorify Yahwe in the matter that he was severely rebuked for it. Miriam died and was buried at Kadesh Barnea, and Aaron died at Mount Hor, or at Moserah. Since Edom refused to let the people pass through its land, it was necessary to go around by the Sea of Sedges, clearly the Gulf of Akabah (q.v.), in order to invade the land of Moab, then largely in the hands of Sihon, King of Heshbon. On the way the people suffered from the bites of serpents, until Moses set up a brazen serpent (q.v.), which brought healing to those who looked up to it. The Arnon was crossed, Beer was captured, Sihon was conquered, and Heshbon fell into the hands of Israel, as well as somewhat later the Kingdom of Og in Bashan. Nothing could check the progress of Moses and his people. Balaam (q.v.), who was called by Balak to curse, was obliged to bless Israel, and the Midianites who seduced Israel to worship Baal Peor were utterly routed. In the land of Moab, Moses gave his farewell address, proclaimed some additional laws, saw the promised land of Canaan from the top of Pisgah, was buried in the valley at the foot of Mount Nebo by Yahwe Himself, so that no man knew his grave, and was mourned by Israel 30 days. As he reached the age of 120 years, his death, according to the biblical chronology, occurred c.1456 B.C.

Further details are added in later writings. Thus, the name of the Egyptian Princess is given as Merris by Artapanus (in Eusebius, *Præp. Ev.*, ix, 27), who says that she was the childless wife of Chenephres, King of Upper Egypt, and also declares that Moses invented the alphabet, the various arts and sciences, philosophy, and certain forms of Egyptian worship, and won great victories as a military commander in Ethiopia. Josephus (*Ant.*, ii, ix, 2 ff.) gives the name of his foster mother as Thermutis and that of the Cushite wife as Therbis, the daughter of the Ethiopian King. Two of the Egyptian magicians who withstood Moses are mentioned in 2 Tim. iii. 8 as Jannes and Jambres (q.v.), and his acquaintance with all the wisdom of the Egyptians is recorded in Acts vii. 22. According to Paul (Gal. iii. 19), the Law was given by the hand of angels. Josephus declares in reference to his end that "a cloud suddenly stood over him, and he disappeared, though he wrote in Scripture that he died, which was done from fear lest people might say that because of his extraordinary virtue he had been turned into a divinity" (*Ant.*, iv, viii, 48). According to Jude (vs. 9), the archangel Michael disputed with the devil about the body of Moses; this statement was regarded by Clement of Alexandria, Origen, and Didymus as a quotation from *The Assumption of Moses*. Our Latin text of this work calls him "the great angel" (cf. Ecclus. xlv. 2: "he made him glorious as a god") and announced that "all the world is his sepulchre" (xi. 8). The conception of his translation into heaven seems to underlie his appearance with Elijah in Matt. xvii. 3 ff., and possibly also the description of the two witnesses in Rev. xi. 6. Numerous episodes in his career are described in rabbinical literature.

Besides the Pentateuch, many other works are ascribed to Moses, such as Psalm xc, the Book of Job (so *Baba bathra*, 15 a), the Book of Jubilees (see APOCALYPTIC LITERATURE), the Assumption of Moses (see APOCRYPHA), the Testament of Moses, probably preserved in the part of the Assumption of Moses now extant in a Latin version, and the Sacred Apocryphal Book of Moses called the Eighth or Holy Book, preserved in a Leyden papyrus. It has also been maintained in the Jewish synagogue that part of the revelation of God to Moses was not written down by him, but handed to posterity by way of tradition, and that this "oral law from Sinai," having been faithfully transmitted, was committed to writing in Mishna and Talmud (qq.v.). In regard to most of these works scholars are practically agreed to-day in rejecting their claims to Mosaic authorship. Concerning the Pentateuch there is no absolute consensus of opinion. Though the Roman Catholic church has officially affirmed the essential Mosaic authorship of the Pentateuch, it may be held, and is maintained, by many eminent Catholic scholars that there is not only pre-Mosaic, but also post-Mosaic, material in this work. Not a few Protestant and Jewish scholars believe that there are certain sections that were actually written by Moses, and there is an inclination on the part of some of these scholars to assume that Moses wrote on clay tablets in the Babylonian language and the cuneiform script, known at the Egyptian court in the fifteenth century, as the Tel el Amarna letters show, and that his accounts were some centuries later translated into Hebrew and copied in the North Semitic alphabet. A very large number of investigators, however, find this improbable and reject wholly the Mosaic authorship of the Pentateuch. The vast majority of these scholars, as well as some belonging to the former class, believe that the work is made up of four literary strata, consisting of documents, designated as Yahwistic, Elohistic, Deuteronomic, and Priestly, and conceived of as gradually expanding in successive editions until they were united in the work we now possess. The difference of the divine names in the Masoretic text, to which Astruc called attention in 1753, is still largely, though by no means exclusively, used as a criterion in separating these documents. According to a very generally held view, the Yahwistic document was originally written c.850 B.C. and expanded c.750, the Elohistic in its earliest form c.750 and in a later edition c.650, Deuteronomy in 620, and the Priests' Code after the exile, possibly not before Ezra (q.v.).

Assuming the correctness of the analysis and the tentative dates, the earliest biography of Moses, not yet containing the infancy story, the distinct Egyptian coloring of the plagues, and the emphasis on the miraculous, would have been written about 600 years after the traditional date of his death. The attempt to place the Exodus in the time of Mer en Ptah (1244–1232 B.C.), abandoning the biblical chronology, which might be supposed to be artificial, promised for a while a reduction of the distance to 300 years; but the discovery of an inscription

by this King representing Israel as settled in Canaan and suffering from an invasion of Palestine, which seems to have occurred in the reign of Ramses II (1310–1244), and the light thrown upon the advance of the Hebrews already in the Amarna period, have tended to render this late date wholly improbable. (See Jews.) In spite of the absence of any written sources, the silence concerning Moses in early prophetic oracles, and the contrast between the Mosaic laws and the practice of even pious Yahwe worshipers, many students have leaned upon the assumed oral tradition and endeavored to present on the basis of it a picture of the life and work of Moses. Scholars like Gressmann and Gunkel have recently urged as arguments in favor of the historical character of Moses the Song of Miriam, the still-remembered volcanic nature of Sinai, the pillar of fire and cloud which seems to them likewise to betray the memory of the volcanic character of Sinai, the knowledge of the fact that Israel was not indigenous in Palestine, the references to Ramses and Pithom, the Egyptian names of Moses and Phinehas, the friendly relations to the Midianites, the struggles with Amalek, the conquests of the Amorites in the East Jordan country, and the difficulty of accounting for the union of Israel and the close relation between Yahwe and Israel without such a founder as Moses may be supposed to have been.

Against the validity of these arguments various objections have been raised, especially by Cheyne, Winckler, Eduard Meyer, and N. Schmidt. The Song of Miriam seems to be only a repetition of the first two lines of the Song of Moses, which is generally regarded as late. Even if the volcanic nature of Sinai were more unmistakably indicated than it is, the knowledge of its character would not be strange, seeing that pilgrimages were apparently made to it even in the time of Elijah. As the pillar of fire appears long before the arrival at Sinai, it does not seem to be connected with the nature of this mountain. Living for centuries among the gradually subdued Amorites, Canaanites, and Hittites, Israel must have been conscious of being invaders; but the historic character of Moses does not appear to follow from a recognition of this fact. Since the cities of Pithom and Ramses were built by Ramses II, these names point to a period much later than that which the biblical date and historic considerations alike suggest for the Hebrew invasion. There is no convincing evidence that either Moses or Phinehas is an Egyptian name. Memories of early relations with Midian and Amalek may have existed without involving the character of Moses. The Songs of the Conquest, which may be among the oldest poems in Israel, seem to mention the crossing of the Sea of Sedges as well as the Arnon, and the capture of Beer and Heshbon, but there is no reference to Moses. The historian Eduard Meyer complains that "among those who treat him [Moses] as an historical figure none has been able to give him any content, to present him as a concrete individuality, or to indicate anything he did, or wherein his historic work consisted; since to say that he made the statement that Yahwe was Israel's god is only to use an empty and meaningless phrase"; he regards Moses as the mythical ancestor of the priests of Kadesh, "a figure of the genealogical saga, connected with the cult, and not an historical personality." (*Die Israeliten*, p. 451, Halle, 1906.) The references to Moses as a god (Ex. iv. 16, vii. 1), his face as emitting rays (or "having horns," so the Vulgate and, according to Jerome, Aquila; hence the representation of Moses by Michelangelo as horned), and his wearing a veil to hide his face, having even been interpreted as surviving signs of an originally divine figure, to which the name Deliverer would be altogether suitable.

In recent years a reaction has set in against the prevalent system of Pentateuchal analysis on the ground of the inadmissibility of the divine names as a documentary criterion, the inadequacy of other marks of distinction, the indications of a diaskeuastic activity in ways not hitherto considered, and the independence and higher age of numerous songs and sagas. Concerning this latest phase of criticism, represented by Eerdmans, Wiener, Dahse, and Schmidt, as well as the history of critical study in general of the books ascribed to Moses, and the division of the material among the currently assumed documents, see Pentateuch. The more searching textual and historical criticism now demanded may incidentally produce great uncertainty as to stratum of tradition and relative date where for some time everything has seemed to be definitively settled, and impose suspense of judgment; but it is by no means impossible that it may ultimately lead not only to a more correct view of the growth of a wonderful literature, but also to an actual increase of knowledge and a more accurate appreciation of the figure of Moses.

There is as yet no external evidence of any kind that is of real importance. The number of Greek and Roman historians who mention Moses and the expulsion of the Jews from Egypt is indeed considerable. Among them are Hecatæus of Abdera, Manetho, Posidonius, Lysimachus, Chæremon, Trogus, Strabo, Diodorus, Tacitus, and Plutarch; but even their combined testimony has little weight. The later writers depend on the earlier, and some of these may easily have picked their crumbs of learning in the Jewish ghetto at Alexandria. Hecatæus and Manetho are the most important. It cannot be said to be impossible that the former was told by Jews that their fathers were driven out of Egypt because the gods were angry with them, and that the common mass of the expelled became their ancestors, while the flower of the people went to Hellas (fragment in Diodorus, xl, 3); but nothing of historic importance can be extracted from it. Manetho evidently identified the Hebrews with the Hyksos, and some personality called Osarsiph of the Hyksos period with Moses. Whether he found this name in his story, which is genuinely Egyptian and may have been of considerable age, we have no means of knowing. In itself it is not at all improbable that Habiri-Hebrews came into Goshen while the Hyksos occupied Egypt, and that they were driven out of their dwelling places in consequence of the expulsion of the Hyksos. (See Jews.) But Manetho's statement is too late and comes to us through channels that are too dubious to inspire confidence.

Bibliography. Consult the histories of Ewald, Renan, Stade, Kittel (2d ed., Gotha, 1909–12), Guthe, Buhl, Köhler, Winckler, Piepenbring, Kent, Klostermann, Wellhausen (7th ed., Berlin, 1914); also the commentaries on Exodus, Leviticus, Numbers, and Deuteronomy enumerated in the articles on these books; the biblical

theologies by Schultz, Dillmann, Stade, Smend, Marti, and others; the introductions to the Hexateuch by Kuenen, Wellhausen, Westphal, Holzinger, and Carpenter-Battersby; the general introductions to the Old Testament by Cornely, Kaulen, Baudissin, Cornill, Driver, Sellin, and others; Nathaniel Schmidt, "The External Evidence of the Exodus," in *Hebraica* (Chicago, 1894); Karl Budde, *Religion of Israel to the Exile* (New York, 1899); S. R. Driver, in *Authority and Archæology* (London, 1899); T. K. Cheyne, "Moses," in *Encyclopædia Biblica* (ib., 1902); Wilhelm Spiegelberg, *Aufenthalt Israels in Aegypten* (Leipzig, 1904); Eduard Meyer, *Die Israeliten und ihre Nachbarstämme* (Halle, 1906); Paul Volz, *Moses* (Berlin, 1907); Nathaniel Schmidt, "Jerahmeel and the Negeb," in *The Hibbert Journal* (London, 1908); Eerdmans, *Alttestamentliche Studien*, vol. ii (Giessen, 1910); C. F. Lehmann-Haupt, *Israel* (Berlin, 1911); Hugo Gressmann, *Moses* (ib., 1913); J. F. H. Gunkel, "Moses," in *Die Religion in Geschichte und Gegenwart* (Tübingen, 1913). For the mass of legends that gathered around Moses, see Gustav Weil, *Biblische Legenden der Muselmänner* (Frankfort, 1845); Beer, "Das Leben Moses nach Auffassung der jüdischen Sage," in *Jahrbuch für die Geschichte der Juden und des Judenthums*, vol. iii (Leipzig, 1863); Lauterbach and Kohler, "Moses," in *The Jewish Encyclopædia* (New York, 1905).

MOSES. A colossal statue in the church of San Pietro in Vincoli, Rome, one of the most famous works of Michelangelo. The gigantic figure is seated in the attitude of one about to spring to his feet. The left hand is pressed to the body to restrain his indignation at the worship of the golden calf, at which he appears to gaze with flashing eyes and frowning face, while the right hand grasps the tables of the law. The head shows two short horns, based on a mistaken interpretation of Ex. xxxiv. 29. The "Moses" was one of 30 proposed statues for the tomb of Pope Julius II in St. Peter's, which was not completed. See Plate under MICHELANGELO.

MOSES, ASSUMPTION OF, and REVELATION OF. See APOCRYPHA, *Old Testament;* also ASSUMPTION OF MOSES.

MOSES, BELLE (?–). An American author. She was born at Savannah, Ga.; graduated from Home College at Montgomery, Ala.; and became a contributor to newspapers and magazines. She is author of *Louisa M. Alcott, Dreamer and Worker* (1909); *Lewis Carroll in Wonderland and at Home* (1910); *Charles Dickens and his Girl Heroines* (1911); *Helen Ormesby* (1912).

MOSES, BERNARD (1846–). An American writer on political science, born at Burlington, Conn. He graduated at the University of Michigan in 1870, studied at Heidelberg (Ph.D., 1873), and was professor of history at Albion College in 1875. In 1876 he was appointed professor of history and political science at the University of California. He served as a member of the United States Philippine Commission in 1900–02. He is author of *Politics* (1884), with W. W. Crane; *The Federal Government in Switzerland* (1889); *The Railway Revolution in Mexico* (1896); *Democracy and Social Growth in America* (1898); *The Establishment of Spanish Rule in America* (1898); *Government of the United States* (1906); *South America on the Eve of Emancipation* (1908); *Spanish Dependencies in South America* (1915).

MOSES, MONTROSE JONAS (1878–). American author, born in New York, where he graduated from the City College in 1899. He early took up editorial and literary work, the drama and literature for children being his special interests. Between 1900 and 1910 he was connected editorially with, or was a contributor to, various periodicals: the *Literary Digest*, the *Reader*, the *Independent*, the *Book News Monthly*. Besides editing the *Green Room Book* and the *Anglo-American Dramatic Register* and making some translations from the French, he wrote: *Famous Actor Families in America* (1906); *Children's Books and Reading* (1907); *Henrik Ibsen* (1908); *The Literature of the South* (1909); *The American Dramatist* (1911); *Maurice Maeterlinck: A Study* (1911).

MOSES BEN MAIMON BEN JOSEPH. See MAIMONIDES.

MOSES OF CHORENE, kō-rē′nē. An Armenian author of the fifth century. Of the works ascribed to him the most important are *A History or Genealogical Account of Armenia Major* (to 442 A.D.), a small *Geography of Armenia*, and a *Rhetoric*. Their authorship, however, is uncertain, most critics assigning the *Geography* to the seventh century, while the *History* is by some (Gutschmid, Khalatiants, Carrière) held to be a work of the seventh or eighth century and by others (Gutschmid at one time, Baumgarten, Conybeare) to have originated in the fifth century, being largely interpolated in later ages. The style of the *Rhetoric* differs from that of the other two works, and Conybeare thinks it is a genuine work of Moses of Chorene. From the *History* it appears that the author was born at Khor'nī, in the Tarom district, and was a pupil of the Patriarch Sahak the Great and of Mesrob, the inventor of the Armenian alphabet. After 431 he was sent by them to Alexandria to study Greek literature and visited Palestine, Italy, Athens, and Constantinople. He later became Archbishop of Pakrevant and died about 492 A.D. Later tradition added to his fame, and numerous works came to be ascribed to him. The *History*, which at one time stood high in the opinion of critics, is now little trusted. It is important for the light it throws on the religious history and folklore of early Armenia. It was published, along with the *Geography*, at Venice (1843, 1865) and, with Latin translation, by the brothers Whiston (London, 1736). The *History* has been translated into French by De Florival (Venice, 1841) and Langlois (Paris, 1869), German by Lauer (1869), Italian by the Mechitarist Brothers at Venice (1841), and Russian by Emin (Moscow, 1858). The *Geography* is available in French (trans. by Vivien Saint-Martin, 1818, and Soukry, 1881); the best edition, however, is that of Patkanov (St. Petersburg, 1877, with Russian translation). Consult: Khalatiants, *Armenskie Epos Moiseia Khorenskago* (Moscow, 1869); Von Gutschmid, *Ueber die Glaubwürdigkeit der armenischen Geschichte des Moses von Khoren* (Leipzig, 1876); Carrière, *Moïse de Khoren* (Paris, 1891); id., *Nouvelles sources de Moïse de Khoren* (Vienna, 1893; supp., 1894); the articles of F. C. Conybeare, in *Byzantinische Zeitschrift*, vols. x, xi (Leipzig, 1901–02); the works enumerated by Chevalier, *Répertoire des sources historiques du moyen-âge; Bio-Bibliographie*, vol. ii, col. 3271 et seq. (Paris, 1907).

MOSETENAN, mō′sâ-tā′nan. The language

of the Indians of northwestern Bolivia, South America, living on the Río Beni and its tributaries, between the fourteenth and sixteenth parallels of south latitude. Consult: N. Armentia, *Los Indios Mosetenes y su lengua* (Buenos Aires, 1903), and A. F. Chamberlain, in *Journal de la Société des Américanistes de Paris*, vol. vii (N. S., Paris, 1910).

MOSGU, mōs'kōō, or **MUSGU.** Pagan negroes in the Chad basin, Sudan, south of the lake, between the Shari and Logone rivers. Their number is estimated at 35,000. Together with the Logonese and other tribes, related to them but politically independent, they form the Masa family. Their habitations are highly distinctive conical clay structures studded at regular intervals with curious protuberances which enable the natives to climb to the top. The Mosgu are both fishermen and cultivators of the soil; their agricultural implement is the hoe, and they are acquainted with the use of manure. The women are deformed by immense wooden disks inserted into both lips. Unlike neighboring Mohammedan peoples, the Mosgu have a rather imperfect political organization; each individual is more or less independent of his neighbors, and the chiefs have little influence. Thus they have fallen prey to the slave raiders from Bornu. Consult: Henry Barth, *Travels and Discoveries in North and Central Africa*, vol. iii (New York, 1857); H. K. W. Kumm, *From Hausaland to Egypt* (London, 1910); Mohn, "Das deutsche Tschadseegebiet, Land und Leute," in *Jahrbuch des städtischen Museums für Völkerkunde zu Leipzig* (Leipzig, 1911); Adolf Friedrich, Herzog zu Mecklenburg, *Vom Kongo zum Niger und Nil* (ib., 1912).

MOSHEIM, mōs'hīm, JOHANN LORENZ VON (1694–1755). A distinguished German Church historian and theologian. He was born at Lübeck, Oct. 9, 1694, and studied at Kiel. In 1723 he became ordinary professor of theology at Helmstedt and in 1747 at Göttingen, where he died as chancellor of the university, Sept. 9, 1755. His theological works are numerous, among them a work on Bible morality, *Sittenlehre der heiligen Schrift* (1735–53; 4th ed., 1753–61; continued by J. P. Miller, 1770–78), and discourses, *Heilige Reden* (1732; 4th ed., 1765). But his contributions to theological literature in the department of ecclesiastical history are most important, by reason of their great learning, fullness, and accuracy. The following have been translated from the original Latin: *Christian Church in China* (London, 1862); *Commentaries on the Affairs of Christians before the Time of Constantine the Great* (ib., 1813–15); *Institutes of Ecclesiastical History* (Murdock's trans., ed. by W. Stubbs, 1862; new ed., Boston, 1892); his valuable *Versuch einer unparteiischen Ketzergeschichte* (1746–48) is untranslated.

MOSHER, mō'zhēr, HARRIS PEYTON (1867–). An American laryngologist, born at Woodfords, Me. He received his education at Harvard University (A.B., 1892; M.D., 1896). Opening an office in Boston, he became connected with several hospitals. He joined the staff of his alma mater as instructor in anatomy and was later appointed professor of laryngology. At Harvard he founded a museum illustrating the normal anatomy of the nose and throat and accessory sinuses and their variations. He also conducted annually a graduate course on these subjects. Mosher became successful as an operator and devised the exenteration of the ethmoidal labyrinth; the approach to the cavernous sinus by the orbital route; an intranasal operation for drainage of the lachrymal sac and the tear duct; etc. He also originated instruments for direct intubation, an adjustable speculum for direct inspection of the larynx, a spiral wire papilloma extractor, a ballooning œsophagoscope, a tube for closing safety pins in the trachea or œsophagus. Mosher contributed numerous articles to professional journals.

MOSKVA, mōs-kvä'. A river of European Russia, a left affluent of the Oka, which is itself an affluent of the Volga. It rises in the Government of Smolensk, flows eastward through the city of Moscow, and joins the Oka near Kolomna, in the Government of Moscow, after a course of 285 miles. It is navigable for small vessels between Moscow and the Oka, a distance of 112 miles, and is an important commercial route. On its banks, Sept. 7, 1812, occurred the famous battle of the Moskva or Borodino between the Russians and Napoleon.

MOSKVA, PRINCE OF THE. See NEY, MICHEL.

MOSLEM, mŏz'lĕm, or **MUSLIM**, mŭz'lĭm. A common designation in the West for a Mohammedan. It comes from the Arabic *muslim*, a derivative of *salima*, 'to be safe,' which is often used by Mohammed in the sense of 'self-resigned,' 'submissive,' 'a follower of Islam,' generally in contrast to *kāfir*, an unbeliever, infidel. The name Mussulman, often used in the same sense, is derived from the Persian plural of *muslim* (*muslimān*). See ISLAM; MOHAMMEDANISM.

MOSLEM ART. See MOHAMMEDAN ART.

MOSLER, mōz'lēr, HENRY (1841–1920). An American genre painter, born in New York City. He studied in Cincinnati under J. H. Beard, in Paris under Hébert, at the Munich Academy under Wagner, and in Düsseldorf. He became especially well known in Paris, where he lived many years and exhibited much. Though appealing to popular taste, his work is frequently deficient in draftsmanship and color. He won various awards, including gold medals at the International Exposition at Nice (1884), at Atlanta (1895), and at Charleston (1902), and the cross of the Legion of Honor. His more notable works include: "The Return" (1879), the first painting by an American to be bought by the French government for the Luxembourg; "Wedding Feast in Brittany" (Metropolitan Museum, New York); "Saying Grace" (Corcoran Gallery, Washington); "Rainy Day" (Pennsylvania Academy); "Wedding Morning" (Sydney Museum, Australia).

MOSQUE, mŏsk (Fr. *mosquée*, from Sp. *mezquita*, from Ar. *masjid*, temple, from *sajada*, to prostrate one's self, to pray). A Mohammedan house of prayer and worship. Examples of these buildings are found wherever the Mohammedan faith has prevailed, from Spain to India and Turkestan. There is no fixed form of structure for them; in poor communities a bare room provided with a *mihrāb* (prayer niche) to mark the *kiblah* (q.v.) often serves the purpose. In general the earliest type of mosque was an open court, surrounded on three sides by an arcaded portico, of a single or rarely a double row of arches on columns or piers, and having at the side of the court towards Mecca the open prayer hall composed of similar arcades, with more

rows of supports; it contains the *miḥrāb* and to the right of it the *mimbar* (pulpit), and, in front, generally a platform and reading desk. In the open court (*ṣaḥn*) is the fountain for ablutions, an indispensable feature of every mosque inclosure, often of large size and covered with a dome. This is the typical mosque plan until the fourteenth century. All the early mosques of Cairo and the great mosques of Kairwan, Mecca, Medina, Damascus, etc., were of this type.

The mosques of India and Central Asia are also generally constructed after this plan. The Mohammedans, however, have always been influenced by the native forms of architecture in the different countries which they have entered. The Spanish mosques, e.g., closely resembled churches, having many parallel aisles supported on a forest of columns like the old Cordova mosque, or fewer aisles, like the mosque at Toledo, now San Cristo de la Luz. The dome was not used to any extent till the thirteenth century, when the new type of the mausoleum mosque, derived perhaps from Persian domical tombs, made its appearance. Already as early as 1201 the dome had appeared in the Bibars and Imam Shaffeij mosques at Cairo. But the masterpiece of the type is the Hasan mosque at Cairo (1356), followed by those of Barkuk, Khawand al Baraka, and others. In the fifteenth century appeared the second or Turkish type, based on Hagia Sophia (see Plate of ST. SOPHIA), of which there are several superb examples at Constantinople (Mehmet II, Suleiman, Ahmet, and others); at Adrianople (of Selim I); an earlier one at Isnik, and the model spread even to Egypt, as in the Sinan mosque at Bulak. Still another type of dome appeared in certain mosques of India of the Mogul period (after 1496), based on Persian models, as in the Jumma Musjid at Delhi, the Muti Musjid at Agra, and the stupendous mosque at Bijapur. Among the most famous and sacred of the early mosques were the Masjid al Ḥarām at Mecca (q.v.), the Masjid al Nabī at Medina (q.v.), the Masjid al Aḳsā, the Mosque of Omar at Jerusalem (see Plate of JERUSALEM), and the great Mosque of Walid at Damascus. All of these have been rebuilt, so that their early form is no longer recognizable. The old mosque at Kairwan (q.v.) is a well-preserved early example (eighth century), as is also the Mosque of Tulun at Cairo; the Mosque of Amru at Cairo is of even earlier foundation, and still retains portions of old work. The Mosque of Omar represents the concentric mausoleum type. It is now two or three centuries since mosques of any architectural importance have been erected. The poorer mosques have bare whitewashed walls with no decoration of any kind. The larger and more pretentious are often elaborately and artistically decorated with carvings, arabesques, and passages from the Koran in the most involved style of ornamental calligraphy. Hundreds of oil lamps and sometimes ostrich eggs, elephants' tusks, and the like hang from the ceiling. The floor is usually covered with matting. A striking feature of mosque architecture is the minaret (q.v.).

The five prayers are said in the mosque daily. (See MOHAMMEDANISM.) The worshiper before entering performs the necessary ablutions, removes his shoes, carries them in his left hand, sole to sole, puts his right foot first over the threshold, and takes his place in the congregation facing the *miḥrāb*. The attendance is more general on Friday, when some special prayers are said and a sermon (*khuṭbah*) is often added. A mosque which has this service is called *masjid al jāmi'* (mosque of the general assembling) or simply *jāmi'*. The *khuṭbah*, as well as religious proclamations, is generally pronounced on or from the *mimbar*, a narrow and lofty pulpit, with a steeple-like cap; it stands at the right of the *miḥrāb* and is reached by a steep flight of steps. Women are not forbidden to enter the mosque, but their presence is not considered seemly during the time of prayer; sometimes a special place, secluded by a screen, is provided for them. There are few mosques to which unbelievers do not now have access. The utmost decorum and solemnity are observed during services, and the mosques are deeply reverenced by the faithful, yet when services are not going on they serve as general gathering and lounging places and as resting places for travelers and wanderers. It has been the custom from the beginning for teachers and professors to give lectures and hold classes in the larger mosques, which thus serve as college buildings. The teacher takes his place at a pier or column at stated hours, his favorite pupil holds his books or notes, and the audience sit around on mats. Several such courses are carried on simultaneously in different parts of the covered arcades. Until madrasahs (see MADRASAH) were built in the eleventh century, the mosques were probably the only regular seats of advanced teaching. In recent times the advanced education in the mosques has been largely confined to the preparation of candidates for the position of imam, but there are still notable exceptions. The Azhar mosque in Cairo, the only survivor of many fine mediæval institutions, has long been the main centre of advanced instruction in Mohammedan countries, and its courses are attended by between 5000 and 10,000 students. Minor buildings, such as schoolrooms, academies, libraries, hospitals, dormitories, public kitchens, and almshouses, are often connected with the mosques. Attached to the Imperial mosques at Constantinople and at Brusa are also *turbeh*, or mausoleums of sultans; some of them (e.g., that of Soliman) are of great magnificence.

The revenues of the mosques are derived not only from the contributions of the faithful, but also from investments in landed property (*wuḳūf*), often from gifts made centuries ago; this property is in the hands of trustees. The income serves to keep the buildings in repair and to pay necessary expenses. The mosque officials and attendants include the imam, who leads the prayers; the learned men, who teach (*mawlawī, 'ulamā*); the *khatib*, or preacher (in a *jāmi'*); the muezzins (see MUEZZIN), who call to prayers; doorkeepers, lamplighters, etc. Their number depends entirely upon the revenues; sometimes a single imam combines in his person the functions of all the others. The imam has a salary from the revenues, but the teachers are dependent entirely upon the gifts of their pupils. See MOHAMMEDANISM. Consult: Marcel Dieulafoy, *L'Eglise et la mosquée* (Paris, 1909); S. H. Leeder, *Veiled Mysteries of Egypt and the Religion of Islam* (London, 1912); G. L. Bell, *Palace and Mosque at Ukhaidir* (Oxford, 1914). Cf. MOHAMMEDAN ART, *Bibliography*.

MOSQUERA, mōs-kā'rä, TOMÁS CIPRIANO DE (1798–1878). A Colombian soldier, statesman,

and scientist, born in Popayán. He served with distinction in the wars of independence; at 31 was a general; was sent as Ambassador Extraordinary to Peru; and in 1833 was made Senator. As President from 1845 to 1849 he promoted the country's development, fostered science and education, encouraged public improvements, and maintained the credit and finances of the nation on a sound basis. A tolerant conservative, he became the leader of the Liberal party and headed a successful revolt against the government in 1859. He assumed the dictatorship in 1861 and called a congress which formed a new federal constitution. Mosquera was then reëlected President and continued the policy of his earlier administration. He was deposed and banished in 1867 for arrogating to himself the power of adjourning Congress. He returned to Colombia two years later and became Governor of Cauca and a Congressman. His writings include *Memorias sobre la vida del libertador Simon Bolivar* (1853); *Memoir on the Political and Physical Geography of New Granada* (1853); *Compendio de geografía de Colombia* (1866).

MOSQUE (mŏsk) **SWALLOW.** One of a group of related Asiatic and North African swallows within the genus *Hirundo*, whose prevailing colors are blue, with chestnut on the rump and side of the head and buff or brownish streaked breasts. They are familiar town swallows wherever they occur, and take their English name from the habit of placing their nests commonly on the walls and minarets of mosques. These nests and their eggs are much like those of the American eaves swallow. The commonest Oriental species are *Hirundo daurica* and *Hirundo nepalensis*, and a conspicuous African one of large size is *Hirundo senegalensis*. Consult Sharpe and Wyatt, *Monograph of the Hirundinidæ* (London, 1885–94), and authorities upon East Indian birds cited under Bird.

MOSQUITÍA, mōs'kē-tē'ä. A strip of territory on the east coast of Central America. See Mosquito Coast.

MOSQUITO, mos-kē'tō (Sp., Portug. *mosquito*, dim. of *mosca*, fly, from Lat. *musca*, fly). A biting fly of the family Culicidæ. These flies belong to the group of nematocerous Diptera, and their nearest allies are the crane flies, the midges of the families Dixidæ, Stenoxenidæ, and Chironomidæ, the fungus gnats, gall gnats, and moth flies, from all of which true mosquitoes are distinguished by the fact that the veins of the wing and the body itself bear flattened scales, readily perceived under a low power of the microscope. The family is a large one and the number of described species has doubled within the last few years, since especial attention has begun to be paid to this group, and activity in research is now so great that it is probable that the number of species may again be doubled before the mosquito fauna of the globe is fairly well known.

A female mosquito (*Culex*).

Geographic Distribution. The mosquitoes form a cosmopolitan group and extend practically to all known portions of the globe. Certain species are excessively abundant in the Arctic regions, while the greatest number of species is to be found in the tropical and subtropical life zones. Certain of the genera are very widely distributed, the typical genus, *Culex*, being found practically everywhere. *Anopheles* is represented in all regions except the Boreal and the Arctic; *Stegomyia* occurs in southern Europe, North, South, and Central America, West Indies, Africa, India, Malay Archipelago, eastern Asia, and Australasia. A similar distribution is found with others of the less conspicuous genera. Certain species are also of almost world-wide distribution, and this is doubtless largely due to the ease and frequency with which mosquitoes are transported by seagoing vessels and by railway trains, and to the extraordinary facility with which they accommodate themselves to a novel environment. It is a well-substantiated fact, e.g., that there were no mosquitoes in the Hawaiian Islands until they were brought there by sailing vessels. Certain species have a remarkable range through different life zones, and the group as a whole has only a slight faunistic value. For example, *Culex pipiens*, the "rain-barrel" mosquito, occurs throughout Europe from Scandinavia to Malta, all over North and Central America and the West Indies, and is also found in Oriental regions.

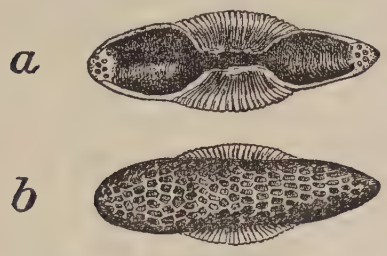
Mosquito of malaria (*Anopheles maculipennis*).

Classification. The family has been divided by Theobald into six subfamilies, Anopheles, Megarhinus, Culex, Ædomyia, Trichoprosoön, and Corethra being the typical genera of these subfamilies. The last named, however, has a short proboscis not formed for piercing, and does not belong to the biting mosquitoes proper. The characters which have been relied upon mainly in the differentiation of the genera have been the comparative length of the palpi in the different sexes, the character of the terminal joints of the palpi, the relative proportions of certain of the cells of the wings, the characters of the scales of the legs and head, the bristles upon the metanotum, and certain other points connected with the relations of the veins of the wings. The species for the most part have been separated upon colorational characters, although certain characteristics of the wing venation are specific rather than generic, and the study of the body scales reveals specific characters. There are also some interesting characters

Mosquito of yellow fever (*Aëdes calopus*).

connected with the teeth of the foot claws which are both specific and generic.

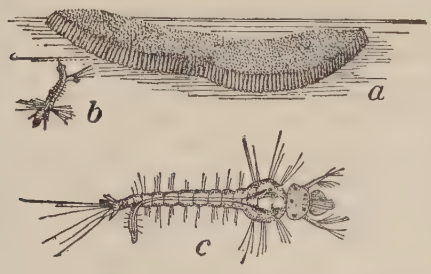
Life History. Mosquitoes in their early stages are all aquatic. The larvæ need a certain amount of standing water for their development. The eggs are laid by the adult insects, in the majority of cases upon the surface of



EGG OF ANOPHELES.

a, upper surface; *b*, under surface. These eggs float in disconnected masses. (Greatly magnified.)

standing water. They may be laid upon end, attached side by side in raft-shaped masses, as in *Culex pipiens* and as in the genus *Uranotænia*, or they may be laid singly on their sides, as in *Anopheles* and *Aëdes*. They may also be laid upon moist earth in swampy places, as with *Aëdes solicitans*, or upon the leaves of pitcher plants, as with *Wyeomyia smithii*, hatching in these cases when water eventually reaches them. The eggs of some species, as those last named and *Aëdes calopus*, will bear desiccation; but the vitality of others, as those of *Anopheles*, is destroyed when they are removed from the water for any length of time. The egg stage is short with perhaps the majority of species, but with others it is much longer, and may be the hibernating stage with certain forms. The larva is an active and voracious little creature, and is commonly known as a wiggler or wriggler. Its life as a rule is short, and with the great majority of the species it is a true air breather, coming to the surface of the water at frequent intervals and extruding its respiratory tube in order to suck air into its tracheæ. The



EGGS AND LARVÆ.

a, a raft of eggs of the common mosquito (*Culex*); *b*, a single larva (wiggler) taking breath at the surface; *c*, a larva (enlarged).

anal locomotory flaps of many species have an abundantly branched tracheal supply, and at least during part of the larval life these flaps function as air gills, rendering it possible for the larva to remain below the surface of the water for a prolonged period of time. The food of mosquito larvæ is most variable. They swallow all sorts of minute organisms which float upon the surface or are held in suspension in the water. The larvæ of *Anopheles* feed for the greater part of their life at the surface, and consequently devour mainly the spores of algæ which float there. Later in life in shallow water they descend to the bottom and feed upon heavier objects. The larvæ of *Culex* and *Aëdes* feed below the surface upon small organisms, animal and vegetable, and mineral as well, which are held in suspension. The larvæ of *Psorophora* seem largely carnivorous, and, on account of their large size, are able to overpower and to devour other mosquito larvæ and other aquatic insects. They are even cannibals, and will feed upon small individuals of their own kind. All mosquito larvæ are very active, wriggling quickly through the water by abrupt and rapid bendings of the body, aided in some cases by long lateral hairs, and especially by a well-developed group of flaps at the anal end of the body. Food is brought into the mouth by the active movement of long oral cilia. In many forms the jaws are undeveloped, but in some, as in *Psorophora*, they are well formed and adapted for piercing and tearing.

The pupa is also active, but does not feed, and possesses no mouth parts. As a rule it floats at the surface of the water, breathing through two respiratory tubes which issue from the thorax—a curious change from the respiratory tube of the larva, which is single and issues from the anal end of the abdomen. Although generally floating at the surface, the pupa when disturbed rapidly vanishes below the surface by energetic movements of the abdomen and of the anal flaps, and is thus enabled to a certain extent to avoid the attacks of fish and other enemies. The pupal stage is usually of short duration, and the adult issues through the cracking of the skin of the thorax. With many mosquitoes there are several generations annually. With *Culex pipiens*, e.g., there may be from eight to twelve such generations in a long summer, but other species, probably including *Anopheles maculipennis*, have but one. With other species it seems reasonably certain that the life duration of the individual is much greater and that in some cases there may be but a single generation each year. Some mosquitoes hibernate as adults, stowing themselves away in protected places at the beginning of cold weather; others hibernate in the egg stage, and still others as larvæ, readily standing extremes of temperature, and even emerging in good condition with the warm weather of spring from blocks of ice in which they have been solidly frozen.

Agency of Mosquitoes in Carriage of Disease. Since 1898 mosquitoes have been known to be of vital importance to the human race, following the discovery that certain of them are agents in the carriage of several diseases of human beings, notably malaria and yellow fever. Malaria is carried by *Anopheles maculipennis* (also known as *A. quadrimaculatus*) and yellow fever by *Aëdes calopus* (formerly known as *Stegomyia fasciata*). See INSECTS, PROPAGATION OF DISEASE BY.

Riddance of Mosquitoes. The most effective way of relieving a neighborhood of mosquitoes consists in abolishing the breeding places. All accumulations of stagnant water—and these are of the most varied and frequently inaccessible character—must be removed wherever it is possible. Swampy lands should be drained; hollows in old trees and stumps should be filled up; old cans and bottles should be removed; cesspools should be hermetically sealed; rain-water

barrels should be covered with fine wire gauze; the roof troughs of houses should be frequently cleaned out. No possible supply of standing water should be overlooked, and this will in many cases require a most careful and ingenious search. Where mosquitoes are breeding in troughs, fountains, or similar places, fish, such as sunfish, goldfish, or top minnows (qq.v.), should be introduced. Where ponds exist which it is not possible to drain, the water margins should be kept clean and sharp, and superabundant vegetation should be removed and the pond stocked with fish. Moreover, if the fish supply of such ponds cannot be made satisfactory, a certain amount of kerosene placed upon the surface of the water will quickly destroy mosquito larvæ. This kerosening of swamp lands, where drainage is impossible or very expensive, is often a temporary remedy of great value. In malarial regions persons may be protected from the bite of the dangerous and annoying mosquitoes by the careful screening of houses and by wearing mosquito veils and gloves at night when obliged to be out of doors. *Anopheles*, as a rule, bites only at night. By protecting healthy persons and malarial patients as well, and by the free use of quinine with the patients, the general health of the population of the Roman Campagna has greatly improved. The Germans in East Africa made efforts to wipe out malaria by simply destroying the disease with medicine. Malaria once abolished in human beings, there will be none for the mosquitoes to carry. In the United States extensive work has been done in destroying breeding places. Under such conditions malaria will die out. In Cuba, aside from protecting the early yellow-fever patients and the constant use of mosquito bars in hospitals, yellow fever has been exterminated by house-to-house work against the breeding places of *Aëdes*, this work being carried on first by the medical officers of the United States army and later by the health authorities of the Cuban government. Mosquitoes, as a rule, may be stupefied by burning pyrethrum powder (Persian insect powder). They may also be deterred from biting by anointing the skin with oil of citronella. See Gorgas, W. C.; Insects, Propagation of Disease by; Panama Canal; Yellow Fever.

Bibliography. L. O. Howard, *Mosquitoes* (New York, 1901); Ronald Ross, *Mosquito Brigades* (London, 1902); Theobald, *A Monograph of the Culicidæ of the World* (ib., 1901–10); G. M. J. Giles, *Gnats and Mosquitoes* (New York, 1905); E. G. Mitchell, *Mosquito Life* (ib., 1907); E. H. Ross, *Reduction of Domestic Mosquitoes* (Philadelphia, 1911); Howard, Dyar, and Knab, *Mosquitoes of North and Central America and the West Indies* (4 vols., Washington, 1913).

MOSQUITO, mŏs-kē'tō (corruption of the native name *Misskito*). A tribe which occupies the eastern coast of Nicaragua, known from them as the Mosquito Coast (q.v.). They are an intelligent people, short in stature and usually very dark in color. This latter trait is said to be due in part to admixture with negro blood from the slavers wrecked upon their coast. They number about 6000 souls. Tehmann connects their language with the Sumo group. Consult C. De Kalb, "A Bibliography of the Mosquito Coast of Nicaragua," in *Journal of the American Geographical Society*, vol. xxvi, pp. 241–248 (New York, 1894), and W. Tehmann, "Ergebnisse einer Forschungsreise in Mittelamerika und Mexico, 1907–1909," in *Zeitschrift für Ethnologie*, vol. xlii, pp. 687–749 (Berlin, 1910).

MOSQUITO BEE. Any one of several of the very small, stingless, tropical honeybees of the genus *Melipona*, which form communities, consisting at times of countless numbers. They are among the smallest of the bees, and although they do not sting, all the essential elements of the sting are present, the pointed or penetrating part of the apparatus being stunted. One species (*Trigona*, or *Melipona, mosquito*) sends off swarms after the manner of the common hive bee. The nests abound in honey, and have many enemies, since the bees cannot defend themselves by stinging. The nests, however, are rich in devices for protection and for the exclusion of intruders. Some species of them build their nests in completely with clay. See Bee.

MOSQUITO BLIGHT. A disease of the tea plant in India and Ceylon, caused by the punctures of several of the species of the genus *Helopeltis* of the plant-bug family Capsidæ. The young bugs as well as the adults feed upon the leaves and young twigs of the plant, causing them to wilt.

MOSQUITO COAST, or Mosquitía. The strip of territory inhabited by the Mosquito Indians on the east coast of Central America, stretching along the Caribbean Sea from about lat. 10° 30′ N. to 13° N. and extending about 40 miles inland (Map: Central America, F 4). It is notable chiefly for the fact that it was for a time the subject of diplomatic controversy between the United States and Great Britain. From about 1655 to 1850 it constituted a protectorate under the nominal control of Great Britain, during which time various attempts were made to plant colonies there, but only with partial success. Both the Central American republics and the United States denied the claim of Great Britain to a protectorate over the Mosquito Coast, the latter particularly on account of the contiguity of the territory to the proposed interoceanic canal which the United States wished to construct or cause to be constructed. The seizure in 1848 of Greytown (San Juan del Norte), an important commercial port at the mouth of the San Juan River, in Nicaragua, by the Mosquito Indians with the aid of England, caused great excitement in the United States, and for a time war seemed possible. To avert this danger, however, and to obtain a basis for a uniform policy of abstention from interference in the region by both England and the United States with a view to securing the neutrality of the proposed canal, the Clayton-Bulwer Treaty of 1850 was concluded between the two countries, by which it was agreed that neither party would occupy, fortify, colonize, or exercise dominion over the Mosquito Coast or any part of Central America. By a treaty of Nov. 28, 1859, with Honduras, Great Britain ceded to that Republic its claim to the protectorate hitherto exercised over the Mosquito Indians and agreed to recognize as belonging to and under the sovereignty of Honduras all territory occupied by the said Indians. This arrangement was very unsatisfactory to the Indians and led to a revolt among them. The difficulty was finally adjusted by the Treaty of Managua between Great Britain and Nicaragua of Jan. 28, 1860, by which it was stipulated that Great Britain would recognize the sovereignty of

Nicaragua over the Mosquito territory lying within its bounds; that a certain district should be assigned to the Indians; and that the British protectorate should cease within three months after the exchange of ratification. A dispute having arisen between Nicaragua and the Mosquito nation in regard to the interpretation of the treaty, the Emperor of Austria was requested to decide upon the true meaning of the clauses in dispute, which he did in 1880, holding that the sovereignty of Nicaragua over the Indians was limited by the right of self-government conceded to them by the treaty. From that time onward the natives enjoyed almost complete self-government. By an agreement entered into between Nicaragua and the Mosquito Indians in 1894 they were formally and voluntarily incorporated into the Republic of Nicaragua, their country becoming the Department of Zelaya. This led to difficulties with Great Britain, which were adjusted by a treaty ratified in 1906 in which the sovereignty of Nicaragua was recognized. Pop. (est.), 15,000. Consult Travis, *Clayton-Bulwer Treaty* (Ann Arbor, 1893), and C. N. Bell, *Tangweera: Life and Adventures among Gentle Savages* (London, 1899).

MOSQUITO HAWK. The name of several animals which dart about after small flying insects, as (1) a nightjar or nighthawk; (2) a dragon fly (q.v.).

MOSQUITO LAGOON, or INDIAN RIVER NORTH. A salt-water lagoon on the eastern coast of Florida (Map: Florida, F 3). It lies eastward of the northern end of Indian River, and extends along the coast for a distance of about 17 miles. It is shallow (from 1 to 10 feet deep), has an average width of about 2 miles, and is connected with Indian River by the Haulover Canal and with Hillsborough River (to the northward) by several shallow and narrow channels, through which boats of not more than 3 feet draught may pass by Indian River to Mosquito Inlet and Halifax River. A strip of land from ½ mile to 5 miles wide separates the lagoon from the Atlantic Ocean.

MOSS, môss. A town of southeast Norway, situated on the east shore of the Christiania Fiord, 33 miles south of Christiania, on the railroad between the capital and Fredrikstad. It has a good harbor visited by steamers, and trades in wood and preserves. Pop., 1900, 8941; 1910, 8648. On Aug. 14, 1814, the treaty was signed at Moss by which Norway consented to a union with Sweden.

MOSS (MDutch, Dutch, OHG. *mos*, Ger. *Moos*, moss; connected with Lat. *muscus*, moss). The common name of plants belonging to the Musci (q.v.), one of the two groups of Bryophytes (q.v.).

MOSS, FLOWERING. See PYXIE.

MOSS, SIR CHARLES (1840–1912). A Canadian jurist, brother of Thomas Moss. He was born at Cobourg, was educated at the Ontario Law School, and was called to the bar in 1869. He was lecturer and examiner to the Ontario Law Society (1872–79), a bencher of that society (1880–97), and vice chancellor of Toronto University (1900–06). In 1894 he was an unsuccessful Liberal candidate for the Ontario Legislature. In 1901 he was made a member of the royal commission for the revision of the Imperial statutes affecting Canada. He was appointed a judge of the Court of Appeal (1897) and was Chief Justice of Ontario in 1902–12.

MOSS, FRANK (1860–1920). An American lawyer, born at Cold Spring, N. Y. He studied at the College of the City of New York and became a member of the law firm of Moss, Laimbeer, Marcus, and Wels. He was president of the board of police of New York in 1897, and served as assistant counsel to the Lexow Investigating Committee and as chief counsel to the Mazet Investigating Committee in 1899. He became professor of medical jurisprudence at the New York College and Hospital for Women and president of the New York Ophthalmic Hospital. While assistant district attorney of New York (1910–14) he figured prominently in the prosecution of Lieut. Charles Becker for the murder of Herman Rosenthal. Moss is author of a history of New York, *The American Metropolis* (3 vols., 1897).

MOSS, RICHARD WADDY (1850–). An English Wesleyan Methodist clergyman, born at Shirley, near Southampton. He was educated at the New Kingswood School, entered the ministry in 1869, and was elected a member of the Legal Hundred in 1899. From 1888 to 1902 he was classical and mathematical tutor in Didsbury College, then tutor in systematic theology, and after 1913 principal. He represented his church as fraternal delegate to the General Conference of the Methodist Episcopal church in 1904 and in 1915 was president of the Wesleyan Methodist Conference. Moss is the author of *From Malachi to Matthew* (1893); *The Discipline of the Soul* (1894); *The Range of Christian Experience*, the Fernley lecture for 1898; *The Scene of our Lord's Life* (1911); *The Life of W. B. Pope, Theologian and Saint* (1912).

MOSS, THOMAS (1836–81). A Canadian jurist, born in Cobourg, Ontario, and educated at Upper Canada College and at Toronto University, where he graduated in 1858 with the highest honors ever won by a student in that institution. He was called to the bar in 1861 and rapidly rose to the highest rank in his profession, especially as an equity pleader. He was made queen's counsel in 1872, and was elected in 1873, and reëlected in 1874, for West Toronto as a Liberal member of the House of Commons. In 1875 he was appointed a judge of the Court of Appeal, in 1877 Chief Justice of that court, and in 1878 Chief Justice of Ontario. Moss became a member of the Law Reform Commission (1875) and was vice chancellor of Toronto University in 1874–81. His brief career on the bench was remarkable for the learning, mental grasp, and finished style of his decisions. Failing health compelled him to seek a change of climate, and he died at Nice, France. Consult J. C. Dent, *Canadian Portrait Gallery* (Toronto, 1880), and D. B. Read, *Lives of the Judges* (Toronto, 1888).

MOSS AGATE. See MOCHA STONE.

MOSSÂMEDES, mŏs-sä′mâ-dĕs. The chief town of the District of Mossâmedes, Portuguese West Africa, situated on the Atlantic coast 150 miles north of the mouth of the Kunene (Map: Africa, F 6). It is a well-built and regularly laid out town, with a fine government building, church, hospital, and a fort. It is the terminus of a railroad which runs for 125 miles into the interior. The harbor is excellent and equipped with an iron pier, and the trade is considerable. The chief exports are rubber, cattle, and dried fish. Pop., 4500.

MOSS ANIMALS. See POLYZOA.

MOSS′BUNK′ER (from Dutch *marsbanker*,

probably from *mars*, peddler's pack, or possibly from *mas*, crowd + *bank*, bank; so called in allusion to the appearance of the fish in shoals). A name (heard about New York and New Jersey) for the menhaden (q.v.). It is said by Goode (*Fishery Industries, Sec. I*, Washington, 1884) that the word is a relic of the early Dutch, who took it from their name for the horse mackerel of Europe, which was "marshbanker." It has survived in some localities in New Jersey in its original form, but is more usually cut down and changed to "bunker" about New York and Long Island Sound.

MOSSES, WILLIAM (1858–). An English labor leader. He was born in Newcastle-on-Tyne and worked as a pattern maker at the Elswick Engine Works until 1884. In that year he became general secretary of the United Pattern Makers Association. From 1885 on he was a delegate to the Trade Union Congress, and after 1907 was a member of the parliamentary committee. In 1905 he represented the Trade Union Congress at the Pittsburgh Convention of the American Federation of Labor. Mosses was also a member of the advisory committee of the National Insurance Act, and (after September, 1913, when it was first instituted) of the sickness claims committee of the Industrial Council.

MOSSES FROM AN OLD MANSE. A collection of tales by Nathaniel Hawthorne (1846). Many of his famous sketches are contained in it.

MOSSLEY, mŏs'lĭ. A municipal borough in Lancashire, England, on the Tame, 3 miles southeast of Oldham. Its importance dates from 1840, when there were established cotton and woolen factories and foundries. The town hall is a handsome structure. The municipality owns its markets and its gas works and maintains recreation grounds. It became a municipal borough in 1885. Pop., 1901, 13,452; 1911, 13,205.

MOSSO, mŏs'sō, ANGELO (1846–1910). An Italian physiologist. He was born at Turin, studied medicine there and at Florence, Leipzig, and Paris, and was appointed professor of pharmacology (1876) and professor of physiology (1879) at Turin. He invented various instruments to measure the pulse and experimented and wrote upon the variation in the volume of the pulse during sleep, mental activity, or emotion. In 1900–01 he visited the United States and embodied the results of his observations in *Democrazia nella religione e nella scienza: studi sull' America* (1901). In 1882 he founded with Emery the *Archives Italiennes de Biologie*, in which journal most of his essays appeared. Among his other works are: *Die Diagnostik des Pulses* (1879); *Sulla paura* (1884); *La paura* (1891; Eng. trans. by E. Lough and F. Kiesow, *Fear*, London, 1896); *La fatica* (1891; Eng. trans. by M. A. and W. B. Drummond, *Fatigue*, New York, 1904); *La temperatura del cervello* (1894); *Fisiologia dell' uomo sulle Alpi* (1897; 3d ed., 1909); *Mens Sana in Corpore Sano* (1903); *Vita moderna degli Italiani* (1905); *Escursioni nel mediterraneo e gli scavi di Creta* (1907; 2d ed., 1910; Eng. trans., *The Palaces of Crete and their Builders*, New York, 1908); *La preistoria: origini della civilta mediterranea* (1910; Eng. trans. by M. C. Harrison, *The Dawn of Mediterranean Civilization*, New York, 1911). Mosso was also a collaborator on the *Nuovo Antologia*.

MOSS PINK. A flowering plant. See PHLOX.

MOSS POINT. A city in Jackson Co., Miss., 40 miles southwest of Mobile, Ala., on the Pascagoula and Escatawpa rivers and on the Pascagoula-Moss Point Northern Railroad (Map: Mississippi, H 9). There are extensive lumber mills and a large paper mill manufacturing wrapping paper from pine slabs. Pop., 1910, 3054.

MOSS SIDE. A manufacturing town in Lancashire, England, 1½ miles southwest of Manchester. It is provided with gas, electric lighting, and water by the Manchester corporation. The town owns its tramways and slaughterhouses, maintains a free library, and provides for technical education. Pop., 1901, 26,700; 1911, 33,100.

MOST, JOHANN JOSEPH (1846–1906). A German-American anarchist, born at Augsburg in Bavaria. He learned the trade of bookbinding and in 1863–68 traveled as an apprentice through Germany, Austria, Italy, and Switzerland. On his return to Germany he was first a Socialist writer at Mainz and afterward editor of the *Freie Presse* in Berlin. He was several times arrested and imprisoned because of the violence of his writings. From 1874 to 1878 he was a representative of Chemnitz in the Imperial Reichstag, but in the latter year, having been expelled from the Socialist organization, he went to London, where in 1879 he founded the anarchist organ *Die Freiheit*. In 1881 he was there arrested for printing editorials approving the assassination of Czar Alexander II and sentenced to 18 months' imprisonment. Upon his release he emigrated to New York, where he resumed the publication of his paper. In 1886, and again in 1887, he was imprisoned for inciting to violence. During the following years he continued to publish his paper, lectured, and wrote frequently in the interests of anarchy. After President McKinley's assassination, in 1901, he was arrested for publishing a seditious editorial in *Die Freiheit* and was sentenced to one year's imprisonment. He was sent to the New York penitentiary in June, 1902. Among Most's publications are: *Der Kleinbürger und die Socialdemokratie* (1876); *Die Lösung der socialen. Frage* (1876); *Mosts Proletarier-Liederbuch* (1875); *Why I Am a Communist* (1890); *Down with the Anarchists!* (1901), a pamphlet published in order to prove that the aims of anarchy are pacific.

MOSTAGANEM, mŏs'tà-gà-nĕm'. A fortified seaport of western Algeria, in the Department of Oran, situated on a steep cliff 280 feet above the Mediterranean coast, 45 miles east of Oran. It has flour mills and tanneries and an active trade in wool, skins, and horses. It is connected by a branch road with the railroad from Oran to Algiers. Pop., 1901, 17,485, of commune, 18,090; 1911, 21,087, of commune, 23,166. Mostaganem, which occupies the site of a flourishing Roman city, was a large and important trade centre in the sixteenth century, but later fell into decay. It has again prospered since its capture by the French in 1833.

MOSTAR, mŏs'tär. The largest town and capital of Herzegovina (q.v.), situated on the Narenta 33 miles southwest of Serajevo, with which it is connected by rail (Map: Austria-Hungary, E 5). It has a number of modern Italian buildings, but is essentially Oriental in appearance, with numerous mosques, bazars, and Turkish shops. There are a fine Greek cathedral, a higher Gymnasium, a vintner's

MOTHS - AMERICAN

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1 SALT - MARSH CATERPILLAR MOTH - ESTIGMENE ACRÆA
2 HUMMING - BIRD MOTH - HEMARIS THYSBE
3 ARGE MOTH - APATENSIS ARGE
4 PEARL WOOD - NYMPH - EUTHISANOTIA UNIO
5 PANDORUS SPHINX - PHOLUS PANDORUS
6 TIGER MOTH - APATENSIS NAIS
7 MELON CATERPILLAR MOTH - DIAPHANIA HYALINATA
8 STRIPED FOOTMAN - HYPOPREPIA MINIATA
9 TOBACCO - BUD MOTH - CHLORIDEA VIRESCENS

ALL NATURAL SIZE

and a trade school. Tobacco and arms are the chief products. Mostar is the seat of a Roman Catholic and a Greek bishop, as well as of a mufti, and has a strong garrison. Mostar was occupied by the Montenegrin army in the European War which broke out in 1914. See WAR IN EUROPE. Pop., 1910, 16,369, including over 7000 Mohammedans.

MOS'TELLA'RIA (Lat., ghost). An entertaining comedy of a haunted house, by Plautus, which appears to have been adapted from the *Phasma* of Philemon.

MOSUL, mō-sōōl'. The capital of the Vilayet of Mosul, Asiatic Turkey, on the right bank of the Tigris, opposite the ruins of ancient Nineveh (q.v.), and 220 miles by river northwest of Bagdad (Map: Turkey in Asia, E 3). It is surrounded by walls now almost in ruins. Of the ancient buildings only the Great Mosque remains. Mosul is the seat of a Roman Catholic mission, Dominican schools, a British political agency, and French and Russian consuls. It is an important military station. Its trade, formerly much greater, is now confined to cotton, hides, wax, gallnuts, gum, and wool, all carried chiefly by caravans. The principal causes of its diminished importance were the rise of Abushehr (q.v.) as an emporium of trade and the diversion of traffic by the Suez Canal. Pop., about 75,000, chiefly Arabs, but comprising also Kurds, Turks, Armenians and others aggregating about 7000 Christians, and 1500 Jews. Mosul was an old Arabic town, taken by the Moslems in 636. It was besieged by Saladin in 1182, and was successively under Mongol, Persian, and Turkish sway until finally annexed to the Turkish Empire by Murad IV in 1638. In the twelfth century it was very important, and for a time supplied Europe with its manufactures, especially muslins, which probably got their name from this town. At present Mosul has acquired importance in the eyes of archæologists, as the sites of the principal cities of Assyria can be easily reached from its precincts.

MOSYR. See MOZYR.

MOSZKOWSKI, mŏsh-kôf'skê, MORITZ (1854–). A Polish composer and pianist, born at Breslau. He studied at the Dresden Conservatory and in Berlin. At 19 years of age he made his début as a piano virtuoso, and after successful tours throughout the principal European countries settled in Berlin, in which city he subsequently made his headquarters, although after 1897 he became almost entirely identified with the musical life of Paris. The best known of his works is *Spanish Dances,* which nowhere met with greater success than in America, and which may be said to have introduced him to the world at large; he also wrote many pieces for pianoforte, chamber music, concert studies, and waltzes. Among the larger works are: *Boabdil der Maurenkönig* (1892); incidental music to Grabbe's *Don Juan und Faust* (1896); a symphonic poem, *Jeanne d'Arc;* overtures, concert suites, a concerto for violin and one for piano.

MOTAZILITES, mō-tä'zĭ-līts. See MUTAZILITES; MOHAMMEDAN SECTS.

MOTECUHZOMA. See MONTEZUMA.

MOTET' (from It. *motetto,* dim. of *motto,* word, from ML. *muttum,* word, grunt, from Lat. *muttire, mutire,* to mutter). A sacred vocal composition without instrumental accompaniment, in polyphonic style. As a rule the text of motets is Latin; but there are also motets with German, Italian, and English words. Although the *a cappella* style is the rule, it was not always followed. Especially during the first half of the seventeenth century, which witnessed the beginnings of instrumental music, it was not unusual to add a *basso continuo,* or even a number of violin parts. In some instances we find even motets for a solo voice with instrumental accompaniment. The motet must not be confounded with the *anthem* (q.v.), in which latter form *homophony* (q.v.) is always employed. The form of the motet is very old and has undergone many changes with the various styles of music. The oldest motets were constructed on a *cantus firmus* (q.v.). From the *Ars Cantus Mensurabilis* of Franko of Cologne we learn that a motet had two different texts in the alto and tenor parts. J. S. Bach, in his motets, substitutes the Protestant chorale for the *cantus firmus.* Consult Hugo Leichtentritt, *Geschichte der Motette* (Leipzig, 1908).

MOTH (AS. *mope,* Ger. *Motte,* moth; perhaps connected with Goth. *maþa,* OHG. *mado,* Ger. *Made,* AS. *maþþu, maþa,* Eng. *mad, made,* maggot, grub). An insect of an indefinable section of the Lepidoptera (q.v.), separated from butterflies by superficial features and habits. No scientific distinction exists between these two, and the terms Rhopalocera for the former and Heterocera for the moths have been abandoned in taxonomy. Moths as a rule are nocturnal, while butterflies as a rule fly by day. Moths rest in most cases with the wings horizontally disposed, while butterflies hold them erect, displaying the undersurface. The antennæ of moths are likely to be feathery in shape, while those of butterflies are threadlike, swollen towards the end into a club head. The nearest to a structural division is made by the fact that all so-called moths have a jugum, or hook and eye, by which the fore and hind wings are held together in flight, while such a structure is absent from the butterflies. (See BUTTERFLIES AND MOTHS.) All but four families of Lepidoptera, and by far the greater number of species and individuals, are moths. They are, however, less conspicuous than their relatives, on account of their generally smaller size and inconspicuous hues, but mainly because of their nocturnal habits. They are of more importance, too, in their relations with mankind than the ornamental butterflies, which do comparatively little either of harm or good beyond the delight their beauty affords. The moths, on the contrary, supply the useful product silk, on the one hand, and on the other furnish a great variety of species which, especially in the larval stage, do enormous damage to growing crops and fruit, as well as to stored grain and foodstuffs, and to a long list of materials, in both their raw and manufactured states. The accompanying colored plate represents moths of various families, and exhibits the form and style of coloration assumed. The species figured are described elsewhere. Consult: I. M. Eliot, *Caterpillars and their Moths* (New York, 1902); W. J. Holland, *Moth Book* (ib., 1903); M. C. Dickerson, *Moths and Butterflies* (Boston, 1905); W. F. Kirby, *Butterflies and Moths in Romance and Reality* (New York, 1914). See BUTTERFLIES AND MOTHS.

MOTH, BROWN-TAILED. A name given in England and New England to the European moth, *Euproctis chrysorrhœa.* The moth is white in color, with a brown tip to the abdomen. Its larva feeds on a great variety of trees, and is

gradually spreading in New England. The best remedy is to burn the larvæ cases during the winter. See INSECT, *Economic Importance of Insects*.

MOTHER ANN. A name given to Ann Lee (q.v.), the founder of the Shakers.

MOTHER BUNCH. A nickname given by Tucca to Mistress Miniver, the alewife, in Dekker's *Satiromastix* (1602). The name was applied later to makers of jokes, as in *Pasquil's Jests, Mixed with Mother Bunch's Merriments* (1604) and in *Mother Bunch's Closet Newly Broke Open* (1760).

MOTHER CAREY'S CHICKEN (possibly corrupted from Lat. *mater cara*, dear mother, in allusion to the Virgin Mary). A name familiarly given by sailors to the stormy petrel (*Thalassidroma pelagica*) and other small black-and-white species of petrel. The name Mother Carey's goose, or hen, is in like manner given to the great black petrel, or bone breaker (*Ossifraga gigantea*) of the Pacific Ocean, which is a ravenous feeder on dead whales and other animal garbage and also preys upon other sea birds. See PETREL.

MOTHER CLOVES. See CLOVES.

MOTHER GOOSE. The supposed author of the familiar nursery rhymes known as *Mother Goose's Melodies*. A baseless claim that the name originated in Boston was made on behalf of Elizabeth Goose, whose rhymes were printed by her son-in-law, Thomas Fleet, as *Songs for the Nursery; or, Mother Goose's Melodies* (Boston, 1719). The title appears to have come from France, where Queen Goosefoot, or Bertha au Grand Pied, the mother of Charlemagne, was regarded as the special patron of children, and her festival, January 2, is celebrated. The most definite source is Charles Perrault's *Contes de ma mère l'oye* (1697), containing 10 stories, seven of which are from the *Pentamerone*. It was translated by Robert Samber in 1729. *Mother Goose's Melodies* were printed in London by John Newbery in 1760. Though the title is probably of French origin, the songs are English, some belonging to the time of Shakespeare and earlier. Consult "Berta de li gran pie," in *Romania*, vols. iii, iv (Paris, 1874–75).

MOTHER GOOSE TALES. See NURSERY LORE.

MOTHER HUBBARD'S TALE, or PROSOPOPOIA. A metrical composition in couplets by Edmund Spenser (1591), abounding in satire.

MOTHER MARY OF SAINT ANGELA. See GILLESPIE, E. M.

MOTHER-OF-PEARL. The shells of the large marine bivalve mollusks *Avicula* (*Meleagrina*) *margaritifera*, *Avicula macroptera*, and *Avicula fuenta*, which also produce the precious pearls. (See PEARL.) These shells are collected in the tropical seas, chiefly on the coast of Ceylon, Manila, Cuba, Panama, the Gulf of California, and the South Sea islands. In 1865 extensive fishing grounds were found on the northwest coast of Australia. The shells from Panama are small and thick and are known in commerce as bullock shells. Those from Manila and Australia are finest in quality; they are disk-shaped and often as much as a foot in diameter. There are two varieties, the white, or silver-lipped, and the black-lipped. The mother-of-pearl or nacre of commerce is really the inner portion or lining of the shell, which the oyster secretes in successive layers of filmy thinness and marvelous smoothness of surface. Some fine mother-of-pearl is also produced in inland waters, chiefly in the rivers of China, Germany, and Russia. The shells of Mississippi River mollusks have been used extensively in the manufacture of pearl buttons. See BUTTON; PEARL OYSTER. Consult: G. F. Kunz, *Fresh-Water Pearls and Pearl Fisheries of the United States* (Washington, 1898); "Mother-of-Pearl Shell Industry," in *United States Consular Reports*, vol. lxxi (ib., 1903); W. A. Herdman, *Pearl Fisheries of Ceylon* (ib., 1905); Kunz and Stevenson, *Book of the Pearl* (New York, 1908); Maurice de Keghel, *Les perles fines, les nacres et leurs imitations* (Paris, 1913).

MOTHER OF PRESIDENTS. A name frequently given to the State of Virginia, which has furnished more presidents to the Union than any other State. The following eight were born there: George Washington, Thomas Jefferson, James Madison, James Monroe, William H. Harrison, Zachary Taylor, John Tyler, and Woodrow Wilson. See STATES, POPULAR NAMES OF.

MOTHER OF STATES. A name given to Virginia as the oldest of the 13 American Colonies and because its original territory was formed into a number of States—West Virginia, Kentucky, Ohio, Illinois, and Indiana.

MOTHER SHIPTON'S PROPHECIES. See SHIPTON, MOTHER.

MOTHER'S MARK. See NÆVUS.

MOTHERWELL, mŭTH'ēr-wĕl. A municipal and police burgh and manufacturing town in Lanarkshire, Scotland, 12 miles southeast of Glasgow (Map: Scotland, E 4). Its growth and importance are due to its iron and steel works and its neighboring collieries. Its specialties are cranes, boilers, and bridge material. It has fine municipal buildings, owns its water works, and maintains a public park, etc. Pop., 1901, 30,418; 1911, 40,380.

MOTHERWELL, WILLIAM (1797–1835). A Scottish poet, born in Glasgow and educated at Edinburgh and at Paisley. His first appearance in print was as editor of a volume of local poems (1819). His *Minstrelsy Ancient and Modern* (1827) won him the acquaintance of Scott. With Hogg, too, Motherwell was on friendly terms, and in 1835 the two prepared an edition of Burns's poems. Motherwell died of apoplexy in the same year, overcome by the strain of testifying before a parliamentary committee on Orangeism. In his *Poems, Narrative and Lyrical* (1832) he utilizes Scottish and Norse mythology and occasionally shows lyric power, as in the familiar "Jeanie Morrison," which it is said was planned at the age of 14.

MOTH FLY. Any one of the true flies of the family Psychodidæ—very small, weak flies which look like little moths and are frequently found upon windows and upon the undersurfaces of leaves. They have broad wings, rather thick antennæ, and are densely clothed with hairs, even the surface of the wings being hairy. These are the only true flies, except true mosquitoes, which have hairs or scales on the wings. In the arrangement of the wing veins these flies differ from all other Diptera and probably represent the most generalized type in this order of insects. They differ greatly in larval habits: some live in rapidly running water, others on fallen leaves in small pools, others are found in rotten potatoes, while some live in dry cow dung. The larvæ have both tracheal gills and open spiracles, so that theoretically they can

breathe both air and the oxygen of the water. The family has a wide distribution, but only about 20 species are known in the United States.

MOTH HUNTER. A bird, the nightjar (q.v.).

MOTILÓN, mō'tē-lōn' (Sp., Cut-haired). A fierce tribe of Cariban stock (q.v.), inhabiting the mountains known as the Painted Andes, about Ocaña, in northeastern Colombia. They were conquered in the early Spanish period and colonized in the lowlands under supervision of missionaries, but on the outbreak of a smallpox epidemic they were compelled to cut their hair to cool the fever and were otherwise subjected to such sanitary regimen that they rebelled and fled to the mountains. They were fugitives for half a year, but returned on the subsidence of the epidemic. On a recurrence of the epidemic some years later the Indians again fled to the mountains, where they have since remained. For nearly two centuries they have been distinguished for their aggressive and untamable hostility to the whites, so that very little is definitely known of them. See YAMEO.

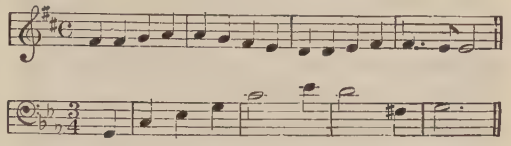
MOTION. See MECHANICS.

MOTION (Lat. *motio*, from *movere*, to move, Skt. *mīv*, to push). In law, an application to a court to obtain a direction, or order, in relation to some question or matter incidental or collateral to the main issues of the action. Generally, motions raise questions of both law and fact, and it often becomes a serious question whether a matter can be decided by the court on motion or whether it is of such a nature as to entitle the party against whom the relief is sought to a trial. A motion differs from a trial in that the latter is the judicial method of determining the substantive rights of the parties to an action on the main issues raised by the pleadings, whereas a motion is usually made to expedite the progress of the cause, or for summary relief preliminary to the trial of an action, and cannot be employed to bring up the entire merits of the action. It may, however, be made at any stage in legal proceedings, from a motion to strike out pleadings or to quash or dismiss an indictment, to the motion to set aside a judgment or for a new trial. A motion is regularly based on affidavits or other written statements of the facts upon which the mover relies.

Where there is a question to be decided by the court on which the parties may reasonably differ, the motion can be made only after due notice to the opposite party. Generally any person interested in the subject matter of an action is entitled to make a motion to protect his interests therein, whether or not he is party to it. See AFFIDAVIT; DECREE; JUDGMENT; TRIAL.

MOTION. In music, the progression of the various voices or parts in a composition. Two voices proceed in *contrary motion* when one ascends, the other descends; in *parallel motion* when both ascend or descend; in *oblique motion* when one remains on the same tone while the other proceeds either ascending or descending. In compositions for three or more voices all three kinds of motion may appear simultaneously. Progression of voices in *parallel* motion requires the greatest care because it is here that faulty progressions (fifths, octaves) appear. For this reason the beginner would do well to lead the soprano and bass in *contrary* motion whenever possible. For examples of the different kinds of motion, see Ex. 13, under HARMONY.

In respect to the tones of a single part a distinction is made between *conjunct* and *disjunct* motion. In the former case the notes proceed either by steps or semisteps; in the latter by intervals greater than a whole step. The following two examples from Beethoven illustrate this:



MOTION OF PROJECTILES. See PROJECTILES, MOTION OF.

MOTION PICTURES. See MOVING PICTURES.

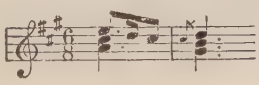
MOTIONS. A name given to a kind of puppet show, especially illustrating scriptural stories. Motions throve in England in the fifteenth century.

MOTION STUDY. The analytical observation of workers, usually craft workers at repetitive tasks, to determine the sequence of muscular movements they make. The further purpose is to establish the best and simplest sequence and by instruction make that standard for all workers at that task, thus raising their efficiency. Motion study requires both special aptitude and training on the part of the observer and the highest skill in using the stop watch. Of late the moving-picture camera, including in its field both the worker and a clock with a second hand revolving over a large dial, has been employed by Frank B. Gilbreth, to whom indeed motion study owes most of its literature and its scientific practice. It is a long step towards further refinement of the analysis undertaken in time study (q.v.) and is one of the most actively discussed of the methods advocated by the teachers of scientific management (q.v.).

MOTIVE (ML. *motivus*, moving, from *movere*, to move). In psychology, a general term for the conscious conditions of action (q.v.). As these conditions include always processes of two kinds, sensory and affective, the motive falls into two parts: the inducement, the sensory or intellectual process, the reason for action; and the incentive, the affective process which prompts to it. Thus, a thief is induced to steal by the sight of the unguarded loaf; the incentive to his theft is the unpleasant feeling of hunger. The typical motive to action is the impulse (q.v.). See ACTION.

MOTIVE. In music, the original germ from which all musical form is evolved. A motive generally fills one measure, and two motives constitute the *section*. (See FORM.) The simplest form of motive is the *rhythmic* motive considered apart from the melodic and harmonic progressions, in conjunction with which it generally occurs. Thus, the *rhythmic* motive underlying the principal subject of Beethoven's Symphony in A major is:

and the *complete* (rhythmic, melodic, harmonic combined) motive is:



However, there are also purely rhythmical motives which are set against other complete motives. A famous example is furnished in Beethoven's C minor Symphony, where the rhythmic motive of the principal subject is sounded on the basses against the secondary subject of the violins. In a wider sense the term "motive" is used almost synonymously with "theme." In the use of this term musical terminology is very careless, for "motive" more frequently is applied when "theme" or "subject" should be used. Hence, in theoretical works the term "measure motive" is adopted to denote the simplest form as explained above. The leading motives in Wagner's works should properly be called leading themes. See LEITMOTIV.

MOT'LEY, JOHN LOTHROP (1814–77). An eminent American historian, born in Dorchester, Mass., April 15, 1814. He entered Harvard College at the age of 13 and was graduated in the class of 1831. The two years following he spent in Germany at the universities of Göttingen and Berlin, and here he formed an intimate personal friendship with Bismarck which continued till his death. On his return he studied law. He was married, in 1837, to Miss Mary Benjamin, of Boston. Motley's first venture in literature was a story entitled *Morton's Hope* (1839), a very unsuccessful historical-romantic novel. In 1841 he was made Secretary of the American Legation at St. Petersburg, but, owing to the severity of the climate and his regret at being separated from his family, he soon resigned. His first work revealing his real power was a review of a memoir of Peter the Great, which he wrote for the *North American Review* in 1845. Two years later he published in the same periodical a scholarly article on Balzac and in 1849, for the same organ, a review of Talvi's *Geschichte der Colonisation von Neu England*, a paper showing accurate knowledge of the history of New England and of the Puritan movement and displaying philosophical insight. The same year saw the appearance of his *Merry-Mount*, an historical novel dealing with an episode in the early life of the Massachusetts Colony.

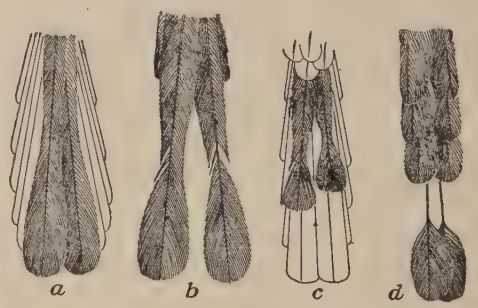
With this novel, and with an unsuccessful term in the Massachusetts Legislature, ended what may be called Motley's experimental period. He saw the true path for his genius to follow, and he was seized with the desire to write, to cite his own words, "one particular history," that of the Dutch. Having obtained the approbation of the historian W. H. Prescott, on whose territory he feared he might be trespassing, he began to gather material in America, and in 1851 he set sail for Holland to continue his researches. In 1856 appeared the *History of the Rise of the Dutch Republic*, a work in three volumes, published at his own expense. The same year Motley returned to Boston, where he remained about a year; then he went to England in 1858. Here he received the degree of D.C.L. from Oxford, and in 1860 he published the first two volumes of his *History of the United Netherlands*. In England he did his country good service by sending (1861) to the London *Times* two letters on the causes of the American Civil War, which helped to dissipate the British misunderstanding of American affairs. In 1861 he was appointed Minister to Austria, and in Vienna he served the United States faithfully and with tact, until misunderstanding and calumny caused him to resign in 1867. In 1868 appeared the last two volumes of the *History of the United Netherlands*, a book which sustained the high reputation of his earlier work and its own earlier volumes.

President Grant, on his election, appointed Motley Minister to England, but he recalled him in November of the following year (1870), for what appear to have been unsatisfactory reasons. Motley then retired to private life and began work on the last of his histories. This was *The Life and Death of John of Barnevèld, Advocate of Holland; with a View of the Primary Causes and Movements of the Thirty Years' War* (1874), which, in two volumes, virtually completed his plan of the history of Holland and the Dutch. It was his last work. He had suffered an incapacitating paralytic stroke in 1873, and the death of his wife in 1874 was a heavy blow. He himself lingered three years longer and died in Dorchester, England, May 29, 1877.

Motley takes rank with the most distinguished of American historians. His work presents a finished and often brilliantly colored picture of the times and the country with which it deals. It was written only after a thorough examination and analysis of all available documents and is philosophical as well as pictorial in its treatment. It is full of an inspiring love of freedom, has the advantage of dealing with an heroic movement, displays marked skill at characterization, and often flashes with wit. His *Correspondence* is scarcely less brilliant and affords many glimpses of interesting personages, both American and European.

The histories are in print in good English and American editions. Consult: *Correspondence of John Lothrop Motley*, edited by G. W. Curtis (New York, 1889); O. W. Holmes, *John Lothrop Motley: A Memoir* (Boston, 1898); *John Lothrop Motley and his Family: Further Letters and Records*, edited by his daughter, Mrs. S. St. J. Mildmay (New York, 1910).

MOTMOT, mŏt'mŏt (onomatopoetic, in imitation of the bird's note). A bird of the family Momotidæ, related to the coraciiform bee eaters, todies, and kingfishers. The motmots are peculiar to tropical America, and only one (*Momotus cœruliceps*) of the 20-odd species reaches as far north as the Mexican boundary of the United States. They are birds of very brilliant plumage



TAILS OF MOTMOTS.

a, Lesson's motmot, central rectrices perfect; *b*, the same, rectrices denuded; *c*, Mexican motmot, central rectrices affected while yet growing; *d*, blue-headed motmot showing rackets resulting from complete denudation of a part of the feather.

and about the size of a blue jay, but more slender in form, are solitary in habits, and live on insects, reptiles, and fruits. Their most peculiar feature is the long tail, in which the

middle pair of feathers are longer than the rest and have a peculiar shape which has caused them to be called racket feathers. The cause of the peculiarity has been greatly discussed, and for years it has been supposed that the birds intentionally mutilated their plumage, biting away the vanes from the denuded part. Beebe has recently proved from observation of living birds in captivity, and from macroscopical and microscopical examination of the feather, that a median area of the vane of the central tail feathers is congenitally weak. When these feathers reach full length, shed their sheaths, and become dry, the normal preening, or passing of the feather between the mandibles of the bird, is sufficient to break off the weakened barbs, and in a short time all disappear and the racket is formed. Consult: Belt, *Naturalist in Nicaragua* (London, 1888); *Murie*, in *Ibis* (ib., 1892); G. K. Cherrie, *The Auk* (New York, 1892); C. W. Beebe, "Racket Formation in Tail-Feathers of the Motmots," in *Zoologica*, vol. i, no. 5 (ib., 1910). See Plate of KINGFISHERS, MOTMOTS, ETC.

MOTONO, mō'tō-nō, ICHIRO, BARON (1862–1918). A Japanese diplomat, born in the Ken of Saga. He graduated from the University of Lyons, France, and was made translator in the Japanese Foreign Office in 1890. He became a councilor in 1893, private secretary to the Foreign Minister in 1895, and First Secretary of the Legation at St. Petersburg in 1896. In 1898 he was appointed Minister to Belgium and in 1901 Minister to France. He became Japanese Ambassador to Russia in 1906 and in the following year was created Baron. He became also a member of the Permanent Court of Arbitration at The Hague.

MOTOORI NORINAYA, mō'tō-ō'rĭ nō'rĭ-nä'yà (1730–1801). A Japanese scholar and poet, the greatest authority, until the era of modern research, upon the customs, history, poetry, and religion of ancient Japan. He wrote many books, his most important being a commentary on the *Kojiki* (Records of Ancient Matters, the oldest extant Japanese book). The commentary is in 44 volumes. It was begun in 1764 and finished in 1796. Upon the publication of the first part students came to Motoori from all parts of Japan. In 1801 he lectured in Kyoto to crowds, princes and nobles being among his auditors. His influence increased after his death, and his writings are thought to have aided in bringing about recent changes in the Empire. He is regarded as a master of literary style and *tanka* or short poetry.

MOTOR BOAT. A generic term applied to small vessels propelled by internal-combustion motors or engines and, sometimes, by electric motors, but never to steam-driven craft. As the word "boat" has come to be used only when referring to a relatively small craft, as distinct from a vessel or ship, so the term "motor boat" is applied only to small vessels. Those over a length of approximately 65 feet are usually designated by their type, rig, or the kind of service for which they are employed—such as motor yacht, motor schooner, motor tug, or motor barge. The name is never applied to craft where the power is used as auxiliary to sails, in which case the name of the rig is used as a distinguishing appellation—as, e.g., auxiliary sloop, auxiliary schooner, and the like.

Though the internal-combustion gas motor was first put into practical operation by Dr. N. A. Otto in 1876 (credit for its conception belonging to M. Beau de Rochas), it was some years later before the principle was used for marine purposes, and it remained for others to develop it for propulsive power for boats. (See INTERNAL-COMBUSTION ENGINE.) The history of the marine gasoline engine proper may be said to date from 1885, when the first successful gasoline engine for any purpose was placed on the market, though experiments had been made along these lines both in the United States and in Europe. Until the early nineties the marine gasoline-engine industry remained almost at a standstill, but by 1893 a number of small gasoline marine engines were in successful use and several boats driven by this power were exhibited at the World's Fair in Chicago. Boats driven by electric motors run by current furnished by storage batteries were successfully operated about 1890, but made their first practical appearance at the World's Fair. These boats have usually been called electric launches, to distinguish them from boats driven by internal-combustion motors; and as the latter type developed in such a satisfactory manner, electric launches have fallen into disuse and are a negligible quantity in the field to-day.

At first one of the chief drawbacks to the use in small boats of engines built on the Otto-cycle principle was their weight, and in the efforts to produce a two-cycle motor, built on similar lines but receiving an impulse at every revolution instead of every other, thereby allowing reduction in weight, the names of Day and Nash in England and Sintz in the United States stand out prominently.

Before the internal-combustion engines were sufficiently developed for satisfactory marine use, various types of hot-vapor engines were developed to take the place of steam for power in small boats, and of these the naphtha, the alco-vapor, and the Daimler were the most successful and were placed on the market between the years 1885 and 1890. Naphtha and vapor engines differ from internal-combustion motors in that they are pressure engines, similar in general principle to steam engines, but in which the vapor of the more volatile liquids is used instead of steam. In the naphtha engines the heat for the boiler was generated by a portion of the vapor from the boiler flowing to the burner, the remainder passing to the engine and furnishing the power. The power in the alco-vapor types was furnished by the evaporation of alcohol, using gasoline as fuel. These vapor engines were vastly superior to steam for small-boat use, weighed less than a steam outfit, and were reliable. They were in great demand for pleasure-boat use up to about 1896 or 1897, and while the boats they were in were usually called naphtha or alco-vapor launches, they were in reality motor boats. As the gas engine became perfected, however, it offered so many advantages over the vapor engines that the development of the motor boat since those years has been along lines recognizing only some form of gas engine for power.

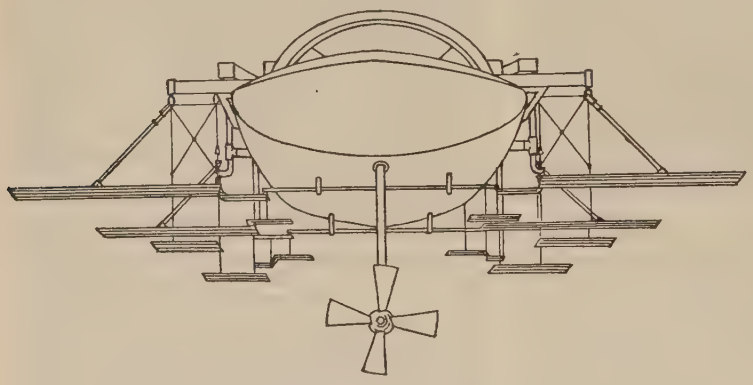
The coming of this new type of power for small-boat use brought with it a new problem in boat design. The small steam launches that up to that time had been in use had, as a rule, been evolved without much thought as to design or fitness for the work expected of them. Not much attention was given to stability, seaworthy qualities, or ease of propulsion. It was

natural when the smaller, internal-combustion engines began to make a claim for recognition for boat use that they should be tried first in the same type of craft used for steam. They were put into open boats of the steam-launch model, and at first all the efforts of builders were towards developing the *power* rather than the boats.

Under the influence of naval architecture the old hybrids of steamboat, rowboat, and steamship models were abandoned; overhanging clipper bows, cutaway underbodies, and ocean-steamship sterns in boats under 35 feet long began to disappear, and in their places came properly designed hulls, with fair curves, making them easy to drive, good sections with plenty of flare forward, proper sheer, etc. The old counterstern, which gave no bearing aft, was discarded, and in its place came the torpedo stern, the pointed or canoe stern, and lastly, the straight transom stern.

At first most of the boats that had cabins were given a high glass-windowed house that was not only unsightly, but tended to make the boat top-heavy and was not water-tight. The first departure in this direction was the adoption of the trunk cabin, borrowed from the sailboat, and the ceiled cockpit, which made a much abler boat, as it was entirely inclosed. Then came the raised deck forward, which gave more room below and produced a better proportioned hull and, if properly designed, a drier one. In the development of the cruising type of motor boat the power-boat races from New York to Bermuda, which were started in 1907, played a great part in producing an abler and more seaworthy type of craft. This race was for boats between 40 and 60 feet in length, and the best average time over the 670-mile course was 10.3 knots per hour, made by *Ailsa Craig* in 1907. Such developments as were made here found useful expression in the large numbers of submarine chasers built for the American and British navies during the World War. These were slightly larger but proved seaworthy and serviceable. There was held a race for these submarine chasers August 16–19, 1919, from Bermuda to New York that was won by Subchaser No. 131 in 56 hours and 46 minutes.

Motor boats used for pleasure can be classified under four general heads—viz., open boats, cruisers, speed boats, and hydroplanes — and each classification has been developed along separate lines. Up to about 1905 in Europe, and to 1910 in the United States, the speed-boat development followed normal lines with displacement models; but between those years the influence of the hydroplane, a boat with a series of two or more planes with steps between them for lifting the body of the boat out of the water, began to be felt. The principle of the hydroplane had been experimented with for some time, but with no very practical results, the theory being to decrease the displacement and wetted surface of the hull by lifting it above the water, as the boat ran, by means of planes, adjustable or stationary, working on the water and projecting in various ways from the hull itself. In 1876 M. de Sanderal worked out a craft in France that embodied these principles but proved a failure, and in 1897 Count de Lambert (France) built his first gliding boat that achieved any measure of success. Like his predecessors he was working with steam for power, and, as in the case of the aëroplane, no marked measure of success was obtained until the perfection of the internal-combustion motors allowed of their use, light and powerful engines being essential in boats that must lift out of the water as they run.



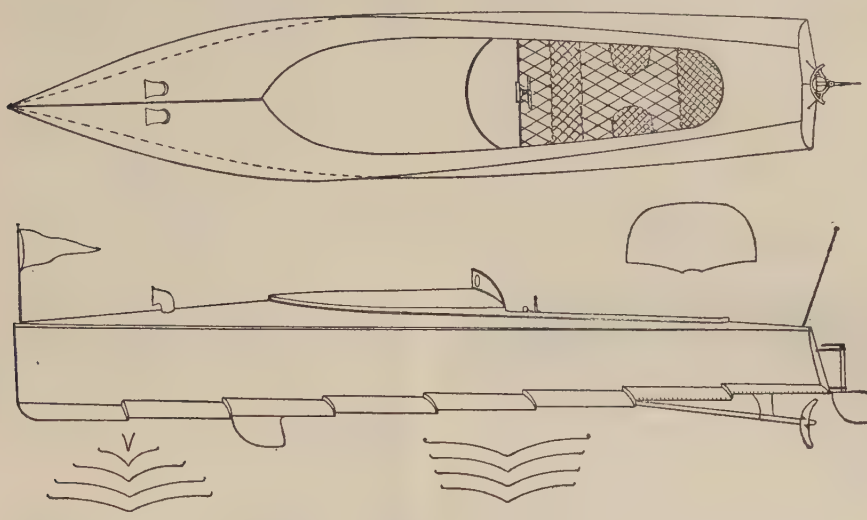
COOPER HEWITT HYDROPLANE.
Showing the series of submerged planes which lift the hull of the boat entirely clear of the water when running.

Dr. Peter Cooper Hewitt experimented with a boat in which the lifting planes were not on the bottom, but were carried by a rectangular framework around the hull, the planes themselves projecting outward several feet from this framework and below the bottom of the boat so that the hull could be lifted entirely out of the water while the planes would still be immersed. The propeller, of course, worked in the water. He obtained a speed of about 30 miles an hour with this craft, but it had the drawback of not being able to run in any but the smoothest water. Another pioneer who developed boats of this type, whose supporting planes pass through the water, was Signor Enrico Forlanini. Later W. H. Fauber, an American, conducted many tests in France of a hydroplane with a series of six or seven steps and short planes of a V section on its bottom that really marked the beginning of the present type. In this craft the accepted form of boat hull above the water was retained, and a much more seaworthy craft was produced which could still maintain very high speed. It was the remarkable speed of *Pioneer*, a Fauber hydroplane that raced in the United States in 1910 for the British International Trophy, that was largely responsible for the discarding of the displacement type of boat in America and the development of the hydroplane for high-speed purposes.

In hydroplane construction it is known that, theoretically, the lifting power increases with the size of planes, and it has been the aim of naval architects to find just the proper size and angle of planes to produce the best results.

This has led to several distinct types, each with its adherents: boats with many shallow steps, called multiplanes; boats with a single step in the middle and two planes, called biplanes; and boats with a single flat plane and no step, called monoplanes. The present tendency is towards the two latter types. Some work has been done with hydroplanes with propellers working in the air (as in an aëroplane) instead of in the water, but these have not shown as much speed or any advantage over those operating in the conventional way.

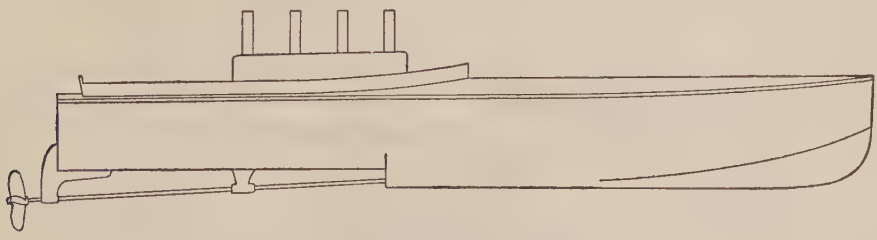
With the development of the light-weight automobile engine this type of power plane was tried in lightly built speed boats, and motorboat racing became popular. Annual regattas for boats of this type are held both in Europe and in America, those at Monaco, France, and the annual races for the Gold Challenge Cup in America and the British International Trophy being the most important though other long and short distance races are held on various rivers and lakes. The latter is an international trophy presented in 1903 by Alfred Harmsworth, later Lord Northcliffe, to encourage the development of high-speed craft under 12 meters (about 40 feet) in length. The first race for that trophy was held in 1903, when a speed of about 20 statute miles per hour was obtained. In 1907 it was captured by *Dixie I* with a speed of 31.8 statute miles per hour, owned by E. J. Schroeder and representing the Motor Boat Club of America, and remained in America until 1912, when it was taken back to England by the hydroplane *Maple Leaf IV* with a record of 43.125 statute miles per hour for a 30-mile race. In 1920 competition was resumed and *Miss America* won at Cowes, England from *Maple Leaf VI*. In 1921 the trophy was successfully defended by the United States, *Miss America II* winning from *Maple Leaf VII* which sprang a leak and sank.



FAUBER HYDROPLANE.

Showing application of the principle to hulls of accepted design. Note the concave surfaces of planes.

By 1922 the highest racing speed obtained in the Gold Challenge Cup Race was in 1918 by *Miss Detroit III* where she averaged 57.23 statute miles an hour over a 30-mile course. The best official record for 1-mile trials, averaged with and against the current, was 80.567 miles per hour, made by *Miss America II* at Detroit Sept 6, 1921 in competition for the Lake George 1-mile Speed Boat Championship Trophy.



MODERN SINGLE-STEP HYDROPLANE OR BIPLANE.

Such as *Baby Speed Demon II* (American.)

In the commercial field the coming of the motor boat has revolutionized many industries. In fishing, lobstering, oyster dredging, and in small freight, passenger, and tug boats, the internal-combustion engine now is almost the only recognized power. It gives a power that is reliable, economical, and that greatly increases the radius of operation of the fisherman, while it allows him to make his market with a certainty unknown under sails. In the oystering industry the hoisting machinery for the dredges is also operated by this power instead of by hand. Even in the deep-sea fisheries the gas motor is used as auxiliary power up to 150 or 200 horse

power, both to enable the boats to follow the fish and to market their catch without having to wait on the wind.

Apart from the fitness of this type of power for small craft, and the fact that the motors occupy little room and can be placed in almost any desired part of the boat, another cause for its popularity is that no licensed engineer is required for its operation. With the steam plants, no matter in how small a boat they were installed, a licensed engineer was required by the United States laws, but in motor boats no licensed engineer is necessary. The United States laws governing the inspection and operation of vessels on United States waters define a motor boat as "every vessel propelled by machinery and not more than 65 feet in length, except tugboats and towboats propelled by steam."

The government regulates the equipment of motor boats (both navigating and life-saving), but does not require licensed operators or navigators, except where a boat is used to carry passengers for hire, in which case a licensed operator is required, though no examination is necessary for obtaining such license.

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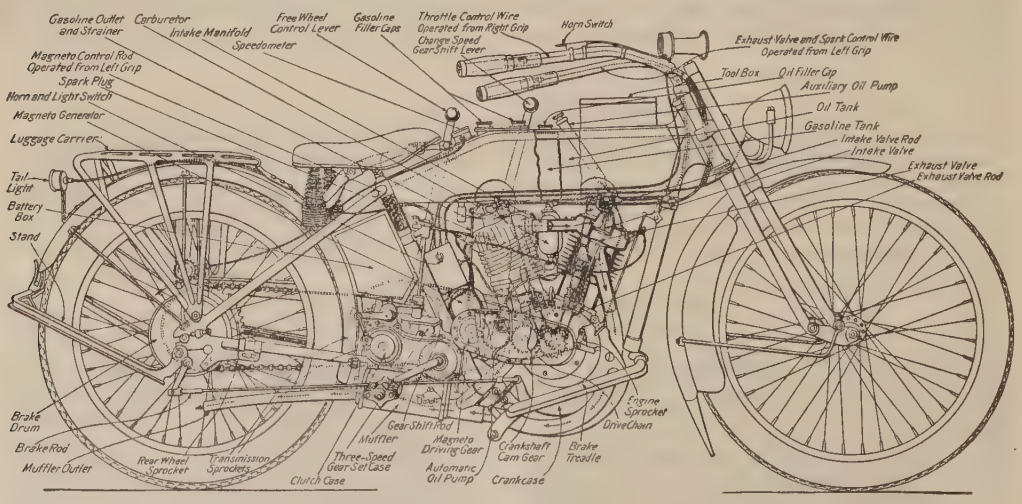
MOTOR CAR. See MOTOR VEHICLE.

MOTOR COAL CUTTER. See COAL, and Plate of COAL.

MOTOR CYCLE. A form of the bicycle or two-wheeled apparatus for transportation, with the wheels in the same plane, in which the power is derived from an internal-combustion motor which replaces the weight and muscular effort of the bicycle rider. (See INTERNAL-COMBUSTION ENGINE; MOTOR VEHICLE.) The operator rides astride of the frame of the machine, his feet resting upon special foot rests. The earlier designs had one cylinder; later and more powerful machines were fitted with twin cylinders, and four cylinders have been installed on larger, heavier designs. The motor axle is the treadle shaft of the foot-driven machine, and power is conveyed to the rear or driven wheel by chain, belt, or shaft drive. Some of the newer and more flexible machines are fitted with a variable-speed gear, or transmission gear box, so that there may be two or more speeds for the driving wheel with their increased leverage for hill climbing and for convenient manipulation in traffic of crowded streets. The motor cycle has all the elements of operation and control which belong to the motor-driven four-wheeled vehicle —tank for fuel, tank for oil, carburetor, throttle, spark-advance control, clutch, magneto, spark plugs, muffler—but is of necessity always air-cooled. The front wheel is the steering wheel.

This vehicle is much used in the control of street traffic in cities and on highways, and in military dispatch work, by reason of its possible speed and manœuvring power. Its light weight, ease of storage and upkeep, and its lower purchase price have made it popular for trips and touring without much bulk of luggage. The rider cannot be protected effectively from mud or dust or weather and must usually be dressed in conformity with these limitations. The motor will usually be started by a few strokes of the foot pedals or by a run of a few feet on the ground with the clutch engaged. As the motor cycle is developed to carry more than one person, it may become a tandem motor cycle; or a side car may be added (see SIDE CAR), which makes it a tricycle in effect; or it may pass into a four-wheeled vehicle and become a cycle car (q.v.). The thirteenth United States census for manufactures (1913) reported the output of motor cycles in 1909 as 18,628, value $3,015,988, compared with 160, value $33,674, in 1899. The exports of motor cycles in 1914 were 6410, value $1,234,194.



11-H. P. TWIN-CYLINDER MOTOR CYCLE WITH COMPLETE ELECTRICAL EQUIPMENT.

MOTOR GENERATOR. See DYNAMO-ELECTRIC MACHINERY.

MOTOR ORGAN (Lat. *motor*, one who moves, from *movere*, to move). A structure which when stimulated moves the parts attached. Motor organs are found at the base of leaves and leaflets in various plants, particularly members of the bean family (Leguminosæ). They are formed by the modification of the structure of the main leafstalk and of the stalks of the leaflets (Fig. 1). When the latter

FIG. 1. MOTOR ORGANS OF LEAF OF BEAN.

The primary organ at the base of main petiole; secondary ones at the base of each leaflet; the lower figures show the curvature of these organs after stimulation (blades cut away to show more clearly).

are short the motor organ may constitute the whole stalk. The motor organ is a cushion (pulvinus) of very thin-walled tissue (parenchyma) whose centre is occupied by a strand of vascular and mechanical tissue (Fig. 2). This is in sharp contrast with the structure of the stalk elsewhere. There the outer parenchyma forms the usual cortex, the vascular and mechanical strands are distinct and often numerous, and the centre is occupied by a pith (parenchyma) of considerable volume. The central position of the strands in the motor organ obviously permits freer bending. The cells of the parenchyma are normally turgid, and by mutual pressure the organ is kept rigid, supporting the leaf or the leaflet. The action of an appropriate stimulus on the plant results in the exudation of water from the cells on one side of the pulvinus. This water passes into the intercellular spaces of the organ and the cells of course lose their turgor. Owing to the now unopposed pressure of the still turgid cells on one side of the organ, it bends more or less, the flaccid side becoming concave, and the leaf blade is carried through a considerable arc. In the sensitive plants (*Mimosa*) of the tropics contact is the usual stimulus. The whole reaction takes place very rapidly, the time from shock to response being only a fraction of a second. In other plants variations in the intensity of light cause similar but slow curvatures in the motor organs. Later work on the physiology of the action of these organs indicates that the movement is brought about by a change in the permeability of the cells of the pulvinus to solutes contained within the cells. With an increase in permeability there is an exudation

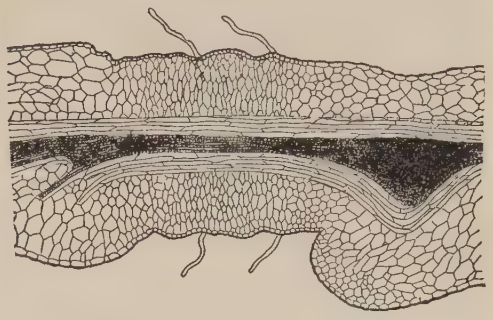


FIG. 2. LONGITUDINAL SECTION THROUGH MOTOR ORGAN OF SENSITIVE PLANT (*Mimosa pudica*).

of solution into the intracellular spaces and a shrinkage of that region of the organ. A decrease in permeability acts in the opposite way. Some stimuli (photonastic, thermonastic, anæsthetics) increase or decrease the permeability of the cells on both the upper and lower halves in the same direction, but in a different degree; others (phototropic and thermotropic) modify the permeability in one-half of the pulvinus only; and still others (geotropism) modify the permeability oppositely in the two halves of the organ. It is possible also that condensations and hydrolysis of cell substances and even changes in water-absorbing capacity by wall and protoplasmic colloids are involved in these reactions. See MOVEMENT.

MOTOR TRUCK. See MOTOR VEHICLE.

MOTOR VAN. See MOTOR VEHICLE.

MOTOR VEHICLE (Ger. *Motor-wagen*). A carriage for the transportation of passengers or a truck for transportation of freight, fitted to run on streets and highways without a track, and having the force to propel it generated within its body, or on its frame, or stored within it, so as to be operated without horses or other sources of tractive force outside of itself and transmitted thereto. The emphasis should be laid primarily on the principle of the generation of power or the release of stored energy within itself, and secondarily upon its freedom to operate for this reason on any road without a permanent track or a connection by wire or otherwise to a central power-generating station.

An historic study of the motor vehicle has been made under the article Automobile (q.v.). It may be studied from its practical or industrial aspects from several points of view:

I. Its uses and the exterior forms which such uses impose.

II. The motive power used to secure propulsion.

III. The running gear, frame, springs, and wheels.

I. The uses to which a car is to be put and the purposes which it is to serve condition its design as a structure and as a machine. These determine first of all the weight to be borne and the speed at which it is to be moved. These fix the frame, the springs, the motor and its gearing, and the design of the body, and are therefore of primary consequence. Motor vehicles may be divided as respects their uses and function into two groups:

1. Passenger vehicles; often called cars.
2. Freight vehicles; often called trucks.

A subordinate grouping of passenger vehicles may be into pleasure vehicles and business or commercial vehicles, the latter operated for hire or as productive investments.

The passenger vehicle for pleasure was the first to appear, the freight-carrying vehicle coming as a later development. The body or passenger-carrying part was based on the single-seated buggy or runabout. This provided for the driver and one passenger and carried the motor and its mechanism under the single seat. The surrey or stanhope carrying four was the next step, and from this four-passenger type were developed the designs of touring car which shortly became standard. The French recognized at once the inconvenience of access for repair and adjustment which resulted from having the motor under the body, and they placed it in front of what was formerly the dashboard of the horse-drawn vehicle. The dash was no longer needed to keep mud and splashings from the occupants of the front seat; but a partition has remained to occupy its place and keep the motor and its heat and oil confined in front of it.

The military engineer of France has called the stationary part of the mounting of a fortress gun by the term "chassis." It means the foundation for all the structure and the mechanism which are needed to train the carriage and elevate the piece—in general, the basis of all movable parts for control and manipulation. So the designer of motor vehicles calls the frame and springs, the wheels and motor and transmission of power to the wheels, taken together, by the name *chassis*. The rest of the structure of the car he calls *body*. Evidently one design of chassis can be used for many varying forms of body.

Confining attention for the moment to the types of body, the preëxisting surrey or carryall of the horse vehicle carried four persons, or three besides the driver, and had no sides. It often had no doors of entry to the rear seats and never had any for the front seats. The speed of the motor vehicle made protection from weather and dust and the safety of the rear passengers imperative, while any added weight of body could be met by increasing the sizes of the springs and the motor. Hence the rear of the body received a shape derivable from a cup or bowl or tankard, and the French, catching the resemblance of such rear body to an ornamental barrel in which the passengers sat, called this rear portion the *tonneau*, or hogshead. The name remained long after the bulging curves and exaggerated molding disappeared. The most curvilinear and ornate kind of tonneau was called the King of the Belgians model, from a specially luxurious car designed for the late King Leopold. With the displacement of molded wood for bodies by the sheet-metal body of aluminium or steel, a severer and more artistic modeling came into use, following what in the design of ships has been called stream lines.

The *touring-car* body can carry two on the front seat and three on the rear. By lengthening the rear body two additional seats can be introduced, either permanent constructions or arranged to fold and be put out of the way. Early tonneaus opened in the back; later side doors became practically universal. The touring car is therefore called a five or seven passenger car.

As originally constructed the touring car had no shelter to protect its users from the weather. The increased use in all weathers, in extreme heat and in cold, has brought about the use of what is called a top. Its presence introduces some new types of body with their names. When the body becomes completely inclosed in a permanent construction behind the front seat, with glass in windows on rear and sides and roof over the driver's seat, and for three or five passengers within it, the car becomes a *limousine*. Later designs included also the driver and the front seat in the permanent side inclosure as well as under the roof. The name is French and is that of the district from which it first came. If the top be so constructed that its rear portion can be lowered, leaving the more permanent front portion in place, the model becomes a *berliet*. The *brougham* or *taxicab* model is often made in the berliet type, but without having the roof cover the driver. Canopy tops supported upon rod posts had a temporary vogue, but have been superseded by the *cape top*, a derivative of the buggy or barouche top, supported upon bows or frames, so that it can be completely lowered at the back of the body. The cape top requires side curtains to inclose the seats completely. A glass or other wind shield is the usual equipment over the dash, to protect those on the front seat, while yet giving the driver uninterrupted view ahead.

The touring car is above all the type of pleasure vehicle for the lover of road travel in the open country. It will carry a moderate amount of luggage, its light weight makes easy-riding springs possible, and it accommodates a large family or party of guests. The limousine is the car of luxury and for use in well-paved cities. It protects the passengers from the weather, wind, and dust, and can therefore be used by wearers of expensive gowns or persons in evening dress. The size and weight make the limousine ill-adapted for rough roads, and it should not be operated at speed. In use as a town car with driver and second man, the limousine puts both employees outside of the inclosed body. In the touring car or the single seated roadster the mechanic may have a seat on the running board if the owner drives.

The first touring-car and limousine bodies were made without doors to the forebody, in which was the front seat. The standard is to have fore doors so that the driver and the other at his side may be protected from weather and dust. An effort to reduce weight and cost for the rear body resulted in the so-called *toy tonneau*, seating two, in which the height of back and sides was reduced, and usually the side door omitted. This did not win general acceptance, as the doors contribute greatly to safety and the high back and sides to comfort and cleanliness.

The fine coach work on the tonneau surface

was costly; the weight was hard on tires and increased the fuel cost; entertainment of guests on tour was expensive to the host; and the big car was more costly to make and to buy than one which would carry only two persons. Hence occurred a reversion to the earlier type derived from the buggy, a type which is called the *roadster*. It is a touring car built for two and has a single seat and usually a folding or small cape top. Behind the seat are the tanks for gasoline and lubricating oil, or a box for luggage and spare parts. Trade names of *cruiser*, *tourabout* or *raceabout* were created by some manufacturers, but they did not meet with favor. The roadster or a single-seat enclosed car or coupe has commended itself where the owner is his own driver. A difficulty of the type in some forms has been that the removal of the rear seat has unduly reduced the weight on the hind wheels for traction, so that in snow or on hills the driving wheels have not held to the road surface in a satisfactory degree. The car body vibrates with the roughnesses of the roads, owing to the lessened mass and weight. Many owners who desire to use the motor vehicle in their business have chosen the roadster and utilized the space at the rear of the seat and over the wheels to carry merchandise. It is possible to mount any desired form of body up to the capacity of the chassis and such types as the station wagon are largely used.

The roadster develops into the *racing car* or *racer* by emphasizing its adaptedness for speed. The carrying capacity is limited to that of the driver and his mechanic. The centre of gravity is made as low as possible, to secure safety at turns, the motor capacity increased, and the transmission gear receives a high ratio to compel the car to move a greater distance for each revolution of the motor. Very low seats are noticeable features of this design, compelling the legs to assume a nearly horizontal position. Fuel and oil tanks are always at the rear, behind the seats.

The first motor vehicles were driven always by their owners for pleasure and sport, and there were no paid employees to act as drivers. This fact gives an interesting side light on the origin and meaning of the term "chauffeur," now so generally applied to a salaried employee who drives the car for an owner. The first introduction of the motor-propelled vehicle among the bicyclists of France was received with abuse and contumely. "Such a man is no sport," said the users of muscles; "he is nothing but a boiler tender. Out upon him!" Now, the French term for a boiler tender is "chauffeur," and such owner of a lazy temperament who preferred a mechanical motor to his legs was a chauffeur, a term of derision. On the footplate or in the cab of a locomotive the driver of the engine is the chief and is called the mechanician. The boiler tender, or chauffeur, is his assistant. Hence when the owner drove his car his employed subordinate was in the relation of chauffeur to the mechanician as respects his employer; and the practice of having the employee drive for the owner resulted in the use of the term for the salaried driver, who is properly also the mechanic in most cases. In racing, the second man is never called a chauffeur, but always a mechanic or mechanician.

If the roadster be still further reduced in capacity, weight, and cost, so as to provide for the operator only, it becomes a *motor bicycle* or *motor cycle* (q.v.). But the developments of the motor cycle where the roads are good has resulted in the attachment of a *side car* for a passenger, and the further design of a *voiturette*, or *voiture-legère*, in France, in which the tricycle or three-wheeled motor cycle has grown into a light four-wheeled vehicle built on motor-cycle lines, but with motor-vehicle features. (See CYCLE CAR.) These approach roadsters as they increase in size, power, and weight. They have a narrow gauge and a motor of small size. The development of the limousine or touring car to secure passenger-carrying capacity for more than six besides the driver has resulted both in the *wagonette*, which is a short omnibus with seats on the sides of the inclosed body so that the occupants face each other, and the *motor omnibus* with passenger seats on the roof. This is not comfortable for road riding at speed nor for sight-seeing. Hence the *motor diligence* or *sight-seeing* vehicle has been produced, where a number of seats are arranged across the vehicle, the occupants all facing to the front. For sight-seeing each seat is slightly elevated above that in front of it; and a canopy top can be spread in case of bad weather. These latter of course are business or commercial vehicles.

A design of *motor buggy* has had some vogue where mud is deep or snow lies heavily. It preserves the large wheel diameter of the horse-drawn prototype and puts the motor under the body. Its object is to meet the requirements of deeply rutted highways where great clearance between the ruts is required. The large wheels require heavy reduction in the transmission mechanism and make a structure which it is hard to make strong enough to withstand the shock of a high speed. The light, long-spoke wheel is of necessity also a steel-tired wheel, and this fact keeps speed down. The motor buggy has disappeared therefore in many districts, and will disappear more completely with the era of good roads.

MOTOR TRUCKS

The freight-carrying class is known as *commercial vehicles*, *motor trucks*, *motor vans*, and by special names resulting from their functions. The special features are capacity for heavy loads and the provisions for loading and unloading. The earliest forms were the delivery wagon, adapted to carry light freight or bundles from store to buyers. These were special or horse-wagon bodies placed on a touring-car chassis. Later the larger and heavier types were designed, with special chassis, wheels and springs, and specially designed motor. For delivery work from department stores a duplicate body has been found a measure of economy, so that one body can be loaded at the store while the other carried on the chassis is on the road. Dumping bodies for coal and building materials can be operated from the motor. The wheels and springs require to be of special strength by reason of the heavy load, and for this same reason the speed will not be high, and extra heavy gearing is made necessary. The body designs range from the ordinary stake equipment of the dray up through the heavy express-wagon body to the special steel bodies for coal and similar material. A type of commercial wagon for stone and building material has six wheels. The rear pair are those of the

ordinary contractor's wagon, but in front of these is a special forebody, carrying the motor, steering gear, and driver's seat, and coupled to the front axle of the cart at the fifth wheel. Or, again, this motor part may have one wheel only, which may be both the traction and the steering wheel. Both designs have been accepted also as transitional designs for city fire apparatus, to transform the existing and still useful pumping machinery into motor-drawn units to increase speed and reliability. In time, however, all the motor-drawn units will depend on the internal-combustion motor for pumping as well as propulsion, and much machinery designed to this end as a single unit is now in use. See FIRE ENGINE; FIRE PROTECTION.

The motor truck or delivery wagon shows its greatest economy when it is running on the road continuously and without stops of any considerable length either in receiving its load or in its detailed delivery. In the case of delivery wagons hastening the unloading process is the great factor.

SYSTEMS OF PROPULSION

II. The second point of view from which to consider the motor vehicle is that of its mechanical propelling power. By definition above, this is to be generated either outside of the vehicle and stored within it for use, or it must be generated as required in or on the vehicle itself. There will therefore be two classes:

1. Power-storage systems.
2. Generated-power systems.

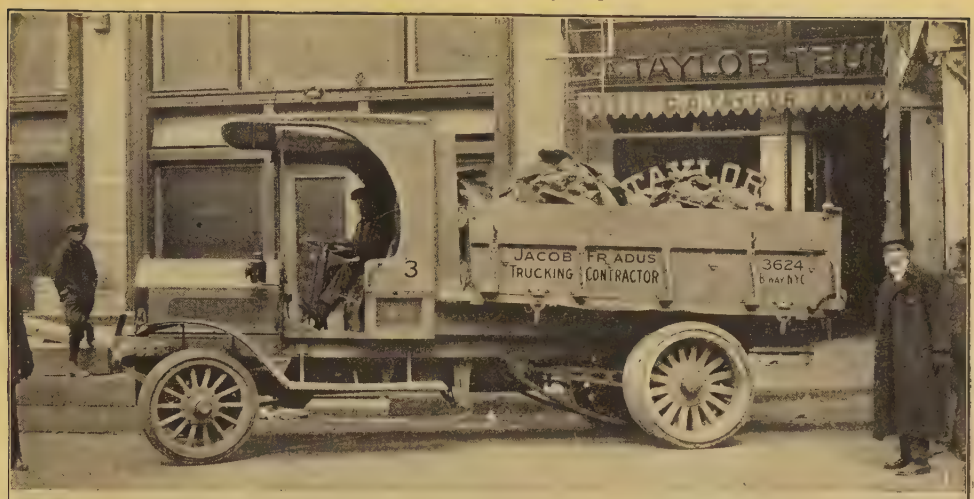
The electric vehicle is the representative of the first class; the steam-propelled and the internal-combustion or gasoline motors represent the second class.

The air of the atmosphere or any other cheap permanent gas can be compressed by a power-driven air compressor into strong steel reservoirs at a high tension and gradually be allowed to expand in an air engine down to atmospheric pressure. In this drop of its pressure it can propel the vehicle, just as steam drives a locomotive. The system has much to commend it both theoretically and practically. It is clean, simple, easily comprehended, and has no fire risk and no trouble from acids or vapors. It is not commercially practicable on the ground of expense: the radius of action of such a car is relatively small, and it is difficult to get the compressed-air tanks recharged in general touring in the country or even in many cities.

The Electric Motor Vehicle. In the electric storage system a chemical compound very ready to oxidize is reduced by passing an electrical current through it. This in effect charges the battery cell containing the compound, and when desired the process of oxidation in the battery solution gives out the electrical energy previously stored. The current need only be led by wires through the necessary switch for reversing and through a controller to an electric motor in mechanical connection by gearing to the driving wheels. In the early electric vehicles two motors were used, one for each wheel. This made differential gearing unnecessary for going around curves. The later designs had shaft drives, and gearing transmissions, so as not to draw down the battery energy too fast on hills.

The electric vehicle with a charged storage battery has a radius of action limited by the capacity of such battery. To increase the number of hours during which it will supply constant energy is to increase the number of cells and the consequent weight. The battery should be capable of being easily removed from the vehicle when nearly exhausted and replaced by one freshly charged. The batteries can be recharged wherever electrical energy is available, but there are of course many rural neighborhoods where charging is troublesome. The electric vehicle is by excellence the town car, and for paved and level streets. The ordinary battery capacity for a four-passenger electric brougham or roadster at average speed and on level or slightly rolling roads will carry it 75 miles. Heavy loading, poor road surface, heavy hill climbs, sand, mud, or snow will reduce this limit proportionately. This capacity is given by 40 cells in a lead battery of 13 plates each, or by 54 cells of the Edison design. The lead battery will weigh 1300 pounds and the nickel-iron battery about 1000 pounds. The controlling mechanism in standard designs is designed to give speeds of 5, 8, 13, 17, and 20 miles per hour. At the ordinary suburban rate of six cents per kilowatt hour for battery charging, the usual cost for charging current for a day's usage will be about $1.50.

Steam-Propelled Motor Vehicles. In the second group of types of motors for propulsion the steam-driven vehicle is historically the first. (See AUTOMOBILE.) In this system a fuel is burned under a boiler to generate steam, usually at relatively high pressure, which latter drives a reversing steam engine similar to that of the railway locomotive. The shaft of this engine is connected by reducing gears to the driving axle and its wheels. The fire box is open to the air to admit oxygen for the combustion of the fuel, and there are hot products of the combustion to be disposed of. The higher the pressure of the steam, the smaller the engine can be for a given power; hence the engine is usually compound, so as to utilize all the available energy of the steam. Steam-driven vehicles in America have been exclusively of the passenger and pleasure types, although in England steam-driven trucks have had some vogue and success. In France the best-known work with steam vehicles was done by M. Leon Serpollet. In 1889 he designed a type of flash boiler in which the water was pumped in small quantities into a coil of pipe close to the burner, where, owing to the intense heat, the water became steam with great rapidity and was then passed into a series of twisted flat tubes in the current of hot products of combustion, where it became highly superheated. The fuel used was gasoline or kerosene oil, the combustion being effected first by vaporizing the liquid and then mixing it with the necessary air in a burner on the Argand principle. The Serpollet engines were four-cylindered, either with the axis of one pair at 90 degrees with that of the other and each axis at 45 degrees with the vertical, or with the cylinders in pairs opposite to each other in a horizontal plane (double opposed). The power plant of the American steam pleasure vehicle has had two forms: in one the boiler is a fire-tube upright boiler; in the other it is a semi-flash water-tube boiler of coils of steel pipe. In the early Stanley designs the boiler had steel heads and copper fire tubes, the shell being of copper, bound closely with steel piano wire to give great strength against rupture while preserving ductility to resist sudden changes of



REPRESENTATIVE MOTOR TRUCKS

1. MACK 7½-TON CONTRACTOR'S TRUCK
2. SAURER 5-TON HYDRAULIC HOIST TRUCK
3. MACK 2-TON WORM-DRIVE DEPARTMENT STORE TRUCK

MOTOR TRACTORS

1. TRACTOR WITH SELF-STEERING APPARATUS PLOWING
2. TRACTOR HAULING WAGONS FOR ROAD CONSTRUCTION
3 TRACTOR HAULING WHEAT TO MARKET. USED ALSO FOR MILITARY TRAINS

temperature. The liquid gasoline was fed to the burner under considerable pressure. The boiler held little water at one time, and was therefore safer than if more energy had been stored in a larger mass of highly heated liquid, but great care had to be exercised to prevent the water being exhausted, as the boiler would promptly burn out by overheating at the joints. The semi-flash boiler of the White Company introduced the cool feed water at the top of the series of coils, farthest from the heat of the burner, and drew out superheated steam from the hottest coils at the bottom close to the flame. From time to time American inventors have developed steam cars that have been demonstrated with some success as to power and flexibility but they have failed to secure approval and use. Most ingenious devices were used to make the fuel supply at the burner and the water supply to the coils automatic in relation to speed of the motor and the demand for power, and when they were in good order they left nothing to be desired. The English motor trucks or vans burned either coke, coal, or liquid fuel, such as kerosene or gasoline.

The steam-propelling system had these advantages:

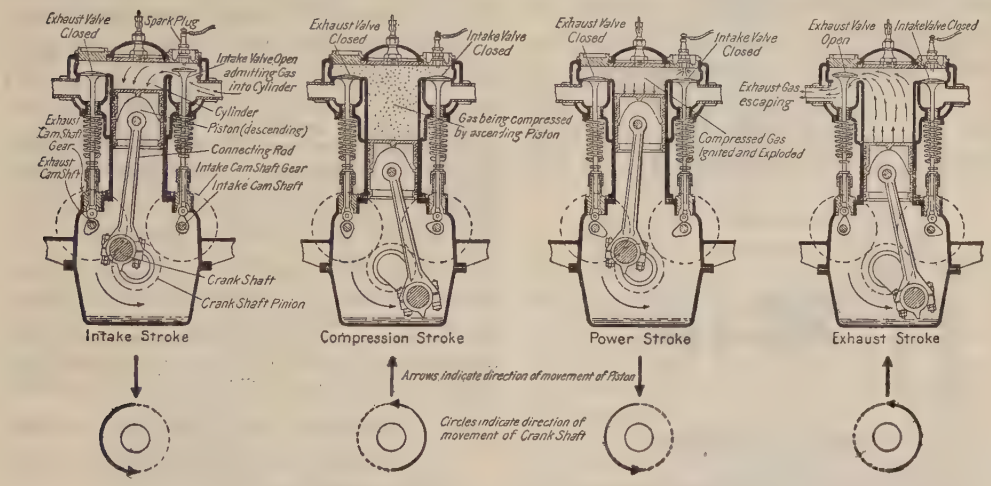
1. Quiet running—no gears or chains in transmission.
2. Flexible as to speed by opening or closing a throttle.
3. The engine reversed easily.
4. There was a reserve of power, stored in the high-pressure steam and water in its boiler, that made it easy to start without auxiliary apparatus.

The objections to the system were:

1. The open or external flame, troublesome in high winds, dangerous as source of possible fire if the car were left alone with flame alight.
2. The pressure on the tank of fuel and the danger from a leakage under that pressure.
3. The time and delay in starting the vaporization of the liquid fuel when the car was cold.
4. The necessity for filling the water tank at comparatively short intervals of time or distance.
5. The lubricating oil which came from the engine to the condensing radiator and so into the water feed of the boiler.
6. The complication of the automatic devices and their continual need of care and upkeep.
7. The relatively high fuel consumption per mile.

Internal-Combustion System. The practical advantages of the internal-combustion principle have put it far in advance of any other steam system in the modern development of both the passenger and the freight vehicle.

The propulsive energy in this system is derived from a mixture of fuel gas or vapor with air in proper proportions to burn actively and instantaneously when ignited. This mixture is drawn into the cylinder by a suction stroke of the piston and is compressed upon the return traverse; at the instant of maximum compression (or just before) it is ignited by a spark and the ensuing combustion causes a great increase in pressure, due to the increase in the volume of the gas when hot as compared to its volume when relatively cool before firing. This pressure acts on the piston and the power stroke is communicated to the crank shaft. The final



THE SUCCESSIVE STAGES IN A FOUR-CYCLE MOTOR-CAR ENGINE.

or fourth cycle is the exhaustion of the cylinder as indicated on the accompanying diagram, which shows the successive stages in such an engine. The combustion is entirely inclosed or internal to the cylinder, hence the name internal combustion. (See INTERNAL-COMBUSTION ENGINE.) If fuel gas is delivered to such an engine it is a *gas engine*. (See GAS ENGINE.) If the fuel is a liquid hydrocarbon, such as gasoline, alcohol, or kerosene, a piece of apparatus is required to atomize the liquid and make it into a mist or fog and then completely to gasify it so that it may burn instantaneously and without smoke. Such a device is called a *carburetor* and is not only both an atomizer and vaporizer, but also a mixer, supplying the quantity of fuel needed and the air for its complete combustion and increasing the proportion of air as the motor speed increases. The carburetor is therefore expected to meet the following requirements:

1. It must proportion air and fuel.
2. It must mix them intimately.
3. It must proportion and mix under wide variations of car and engine speed and corresponding variations of pressure on the delivery side of the instrument.

4. It must mix and proportion under wide variations of power demand and under inverse variations of speed with power.

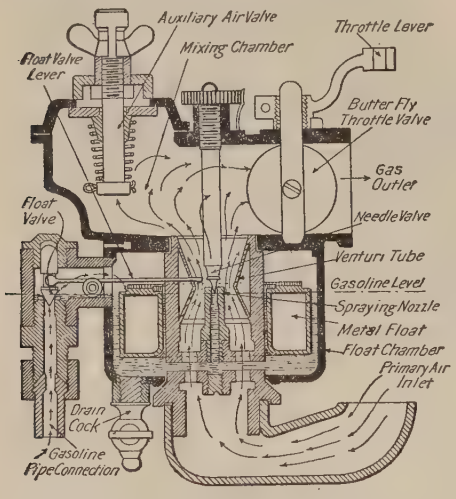
It must vaporize the liquid fuel under wide variations of temperature, and particularly for the first few strokes of the piston when the engine and carburetor are cold.

6. It must preclude flooding by excess liquid fuel, particularly after a run at speed, and above what the motor can assimilate in a few revolutions.

7. It must meet increased demand for speed promptly, and permit rapid acceleration from rest or after a slow-down.

8. It must operate successfully for the above requirements under variation in the quality and particularly of the volatility of the gasoline furnished to it.

The modern carburetor which seeks to meet these contradictory requirements has usually three inlets and one outlet, as illustrated by the type shown. The first will be the gasoline or fuel intake. This takes gasoline from a storage tank, delivered either by gravity from a level above that of the carburetor or by a pressure of air or products of combustion greater than that of the atmosphere on the surface of the fuel in such storage tank. Excess flow to the carburetor is prevented by a float in the float chamber of the carburetor, which rises when a desired level is reached and in such rise closes a needle valve in the fuel-supply pipe.



CARBURETOR.

The float-control idea was due to Maybach. The float may actuate the fuel valve directly or, more usually, through weighted levers, so that jolts and swaying of the car may not unseat the valve and flood the chamber. Inertia of float and weighted levers may be made to neutralize such fluttering of the fuel valve. From the float chamber a passage leads to the jet nozzle, whose height is $\frac{1}{16}$ inch above the level of the fuel in the float chamber. Any lowering of pressure at the nozzle will unbalance the pressure on the liquid, and the latter will flow through it into the moving current of air which surrounds it. The normal quantity of air for proportioning the mixture will enter through the second inlet orifice, usually fitted with a screen to keep dirt out. The flow of both fuel and air will be determined to a degree by the lowering of pressure around the jet, and by proportioning the areas of cross section of the jet nozzle and the fresh-air inlet the mixture is kept somewhat as desired. But under great reductions of pressure caused by high speeds of the engine the quantity of fluid flowing will increase more rapidly than the needed air, owing to its greater mass and inertia. The easiest way to meet this difficulty is by an auxiliary or supplementary air valve held shut by a spring against light suction pressures, but opening progressively to admit more air as the engine speeds up and the pressure in the mixing passage grows less. The fourth orifice is the outlet to the engine. This is usually the passage to which the throttle valve is attached and which it controls. With the throttle closed or nearly so, the reduction of pressures in the cylinders is not so completely admitted to the carburetor passages, and hence the flow of mixture to the cylinders is under less difference of pressure. The friction past the throttle also prevents the compression in the cylinders from being as effective as when mixture flows freely to fill the cylinder on the aspiration stroke. Anything foreign which gets into the carburetor jet and closes it will stop gas making and the engine will stop. The air passing to the mixing passage is often led by a pipe from a jacket around the hot exhaust pipe to preheat the air for combustion. The carburetor is usually made with hollow walls in which the jacket water is circulated. This is to keep it warm in cold weather and to keep it from getting too hot in long runs. The carburetor often requires to be helped to a rich flow of mixture in starting by "tickling" or depressing the float so as to open the fuel valve and raise the level of fuel in the float chamber so as to produce an instantaneous excess of liquid at the fuel jet. Too much liquid or too "wet" a mixture ignites with difficulty if this process is overdone.

The internal-combustion engine for the motor vehicle offers the following advantages:

1. Light weight for the power it can develop.
2. Safety from fire.
3. Simple mechanism, not likely to get out of order.
4. Speed in starting.
5. Economy in fuel, because the motor is efficient.

The objections to the system are:

1. It is only efficient at one speed; hence gearing has to be introduced to meet the condition of heavy resistances at low speeds of car.
2. It turns only one way; hence a reversing gear must be added.
3. It does not start from rest by opening a throttle valve. One working stroke or more must be made by some external force, such as the human arm, an electric motor, or the energy in compressed air; or the cylinders must be primed by letting in a mixture of fuel and air compressed outside and sent into the motor by its pressure and fired before the motor has turned over.
4. The heat of combustion makes it necessary to cool the cylinders by circulating water or currents of air. This is necessary to enable the pistons to be lubricated and to prevent irregular firing or preignitions.

Objections Nos. 1 and 2 have been met and overcome by introducing a train of toothed gears between the motor and the driving wheels.

By introducing a clutch and a train of gears of different numbers of teeth it is possible:

1. To turn the motor and not propel the car.

2. To turn the motor fast and yet move the vehicle slowly.

3. To overcome the resistances due to inertia of the body and passengers in starting from rest and yet have the motor revolve at its best speed and with no danger of stalling.

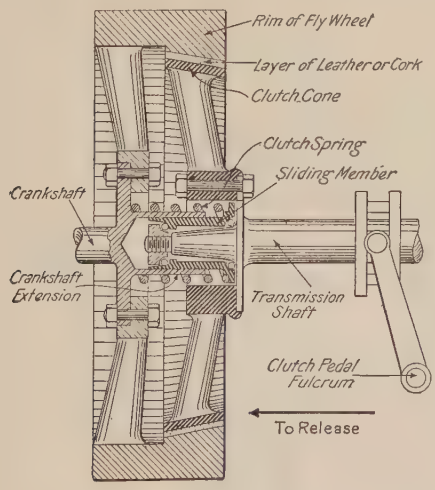
4. To make possible the use of a much smaller cylinder volume (piston area multiplied by stroke) than would be required for starting from rest if there were no gearing. When the car is in motion, the motor has to overcome much less resistance than is met in starting.

5. To start the motor independently of the wheels by inserting an engaging and disengaging clutch in the transmission. This enables changes in the gear ratio to be made without inconvenient shock, and with much less effort than if the train of gears were always under stress.

6. To enable the car to coast with motor disconnected from drivers.

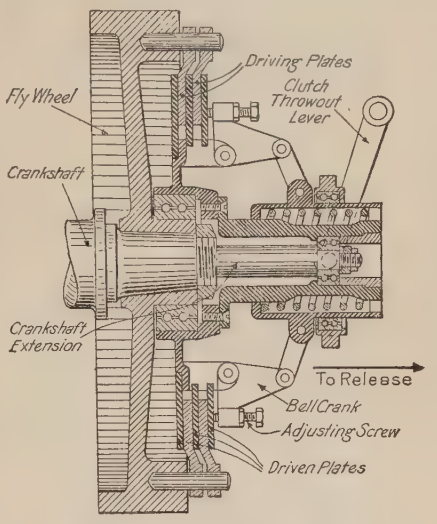
The clutch, the train of gears, and the differential gear at the rear axle may be generally called *the transmission*, because their function is to transmit the power and the motion of the motor crank shaft to the driving wheels which are in contact with the ground.

The clutch (q.v.) is a well-known mechanical device for engaging or disengaging a source of power from the machinery it is to drive. In the motor vehicle it is normally held engaged or in the driving position by a powerful spiral spring. It is disengaged so that the motor does not drive the car by compressing this spring by the action of a foot pedal (usually located so as to be operated by the left foot). Its function is to enable the motor to be started independently of the car; to have the motor disconnected from the wheels without shifting



SECTION OF TYPICAL CONE CLUTCH.

gears while coasting or in traffic stops; to enable transmission-gear ratios to be changed without having to overcome the pressures on these gears due to the magnitude of the resistances being overcome. The slipping or flexibility of the clutch permits it to save the motor and the teeth of the gears from shock when the car meets a sudden resistance, as in a collision or a hole in the road. Motor-vehicle clutches are of the friction type and usually of one or two varieties. The cone clutch has two conical contact surfaces, of which one will be pressed into the other by the spring above referred to. The hollow member (sometimes called the female part) will usually be found on the inner face of the rim of the flywheel of the engine.



SECTION OF TYPICAL DISK CLUTCH.

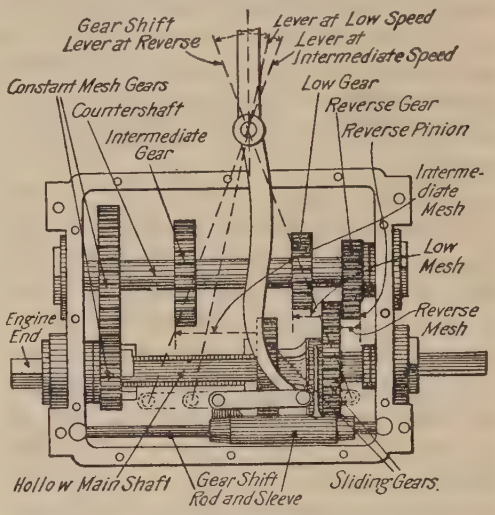
The male part can slide longitudinally on its shaft so as to go in or out of contact with the hollow or female part. The contact surfaces may be metal to metal or the face of the male element may be faced with leather. The other varieties are disk clutches, in which a series of alternating disks are borne, the odd members by the driving element of the clutch and the even members between the driving disks being attached to the shaft to be driven, so as to compel it to turn with them but capable of slight longitudinal motion thereon. The spring forces these alternate disks into contact by their faces; and by having enough of them, a sufficient contact area is secured so that one set will drive the other. The pedal movement antagonizes the spring, and the disks separate enough to disengage the driver and driven. This type of clutch was proposed by Weston. It engages more smoothly than the cone type, but is usually more sluggish in disengagement. The clutch was often interconnected to the hand brake of the car, so that if the brake was set the car could not be started. This practice was discontinued, particularly for heavy-grade work, so as to allow the motor to be used as a brake with the hand brake in series with it as an additional resistance.

The Gear Box. It is universal to inclose the train of gears for the changing of driving speed and for reversing in an oil or grease tight casing or box within which they may work free from grit and with minimum noise and complete lubrication. This gear box is a most important element in the transmission of speed and power, and is often called the transmission, of which it is properly only a part. The principle of the operation of a train of gears is that when a small diameter of gear drives a large one there is a gain of leverage

(often called power) with a loss of velocity. This is reversed when a large gear drives one of smaller diameter. For starting a car from rest the motor should turn at its usual speed or faster, while the driving wheels should turn slowly so as not to slip on the ground. Here then a small gear driven by the motor through the clutch should mesh into one of considerably larger diameter. So far as the mass of the body of the car is concerned the motor is working in *low gear*. There will usually be a second speed, faster than the low, and a third speed and a *high-speed* combination in four-cylinder cars. In six-cylinder cars there may be only three speeds, by reason of a greater flexibility of the motor on each gear. The gear box also embodies a second principle in transmission by gears; in a train of such external gears the odd members are revolving in one direction and the even members in the other. Hence by inserting a wheel between wheel number 1 and wheel number 2 so that the latter becomes number 3, the direction of rotation of the latter is reversed, and the motor driving gear number 1 will drive gear number 3 connected to the driving wheels in the reverse direction from that in which they turned when the driven gear wheel was numbered 2 in the train. The gear box is then said to provide for three (or four) speeds forward, and reverse. The gear for backing is always a slow and powerful combination. The high-speed gear is usually a *direct drive;* i.e., the change gears or back gears for gaining leverage in driving are out of mesh, and the shaft from the motor or clutch which enters the gear box is directly connected to the shaft which carries power out of the gear box to the driving wheels. Engagement or changing of gears in the gear box is effected by sliding the gears lengthwise on their axle, either squared or splined so as to allow lengthwise sliding but compel rotation of shaft and wheel. The teeth of the gear are so shaped at their ends that entry into gear is made easy and sure. The gears must not be turning at rates too different if this meshing is to be secured, and it is part of an operator's skill to make changes silently and without shock.

Planetary gearing is a type less usual than the sliding type, though employed on the well-known Ford car, in which the transmission for each speed is effected by using one externally and one internally toothed wheel in the same plane of revolution, the two being connected together by a small pinion or by several small pinions borne or revolving upon studs. The studs for these connecting gears are borne upon a plate or disk concentric with the common axis of driver or driven gear, which is free to revolve when permitted to do so. When thus free the pinions revolve around the external driving gear as the planets revolve around the sun, and transmit no power or motion, and the concentric disk revolves also. When the disk is prevented from revolving by a brake band or otherwise, the pinions must transmit motion and power, because their axes are no longer free to rotate. Hence a transmission is effected, and the teeth of the gear are always in mesh. The type is heavy and cumbrous as compared with the sliding gear, and with the use of gears of alloy steel of high abrasive and other resistance in the latter, the need for continuous meshing has disappeared.

Friction Gear.—The variable speed for varying resistances of the road has also been secured by applying what is mechanically known as the brush-wheel gear. This consists of a flat face or driving disk on the rear end of the engine shaft, against which is pressed by an adequate spring force a smooth-edged disk. The latter is covered on its contact circumference with leather or rubber or some similar slightly compressible material. The driven disk has its axis at right angles to that of the motor; and this driven disk can be pressed against the driving disk at varying radial distances from the axis of the latter. When the driven disk is



PROGRESSIVE SLIDING-GEAR SET.
Showing operation of change-speed gear-shift lever.

rotated by contact and pressure near the axis of the driving disk there is slow speed and power. When the driven disk is held and driven farther from the axis there is speed and less power. When the driven disk is moved past the centre of the driving shaft the driven disk turns in the reverse direction. By this system there is no meshing or sliding of gears; the increase or decrease of speed can be gradually made with or without limitation of steps in gear ratio; the gear-shift lever is also the clutch lever, or the clutch pedal of the other system, and is retained as a means of releasing the pressure of the disks against each other. The difficulty with the gear is that the driven disk must have a surface of some extent in contact with the driving face; and hence at only one plane of the former will the contact areas have the same linear velocity. Hence the contact material wears unevenly and the face of the driving disk wears into hollows where the driven disk runs most frequently and with the greatest contact pressure and with rings projecting between such hollows.

Shaft Drive. Chain Drive. Worm Drive.—The power and the motion coming from the motor through the gear box are to be further transmitted to the rear or driving axle of the car. This may be done in one of two ways: the driven shaft in the gear box may be extended by what is called the *propeller shaft* and by means of flexible joints of proper construction made to operate a driving pinion in gear with a toothed wheel on the driving axle, or the driving may be

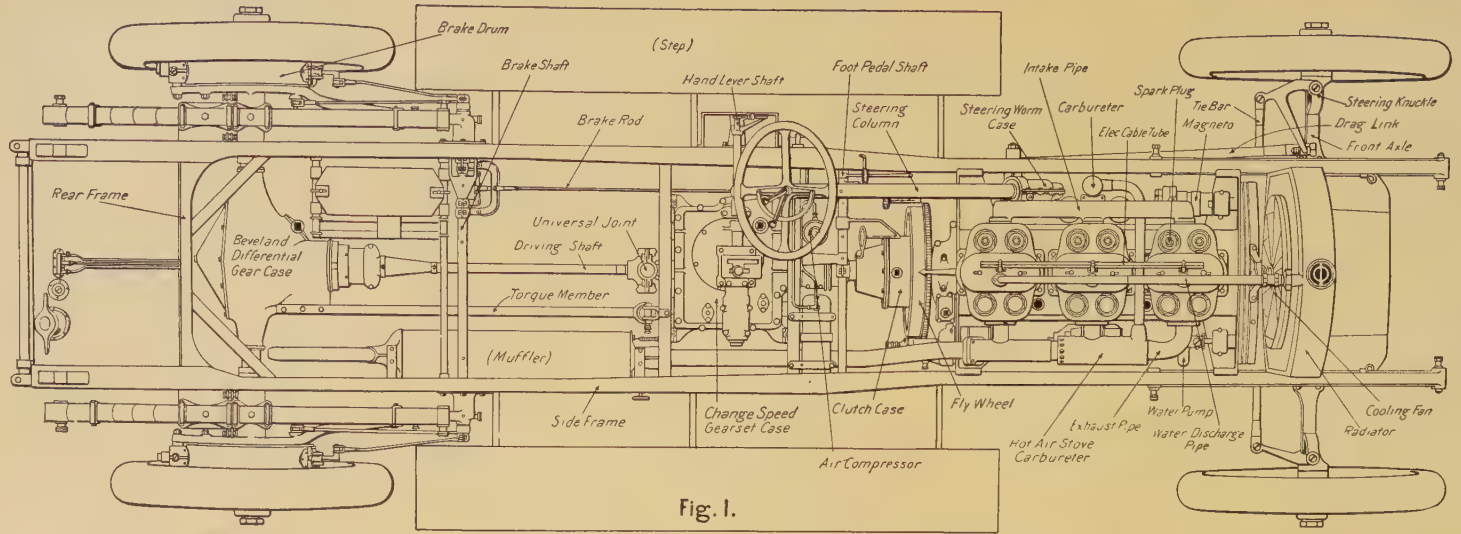


Fig. 1.

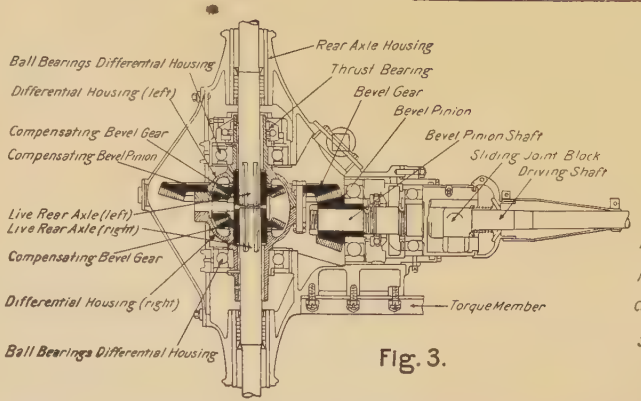


Fig. 3.

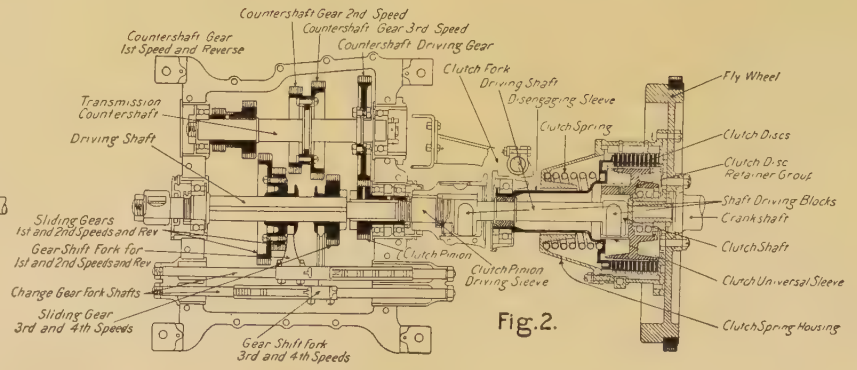
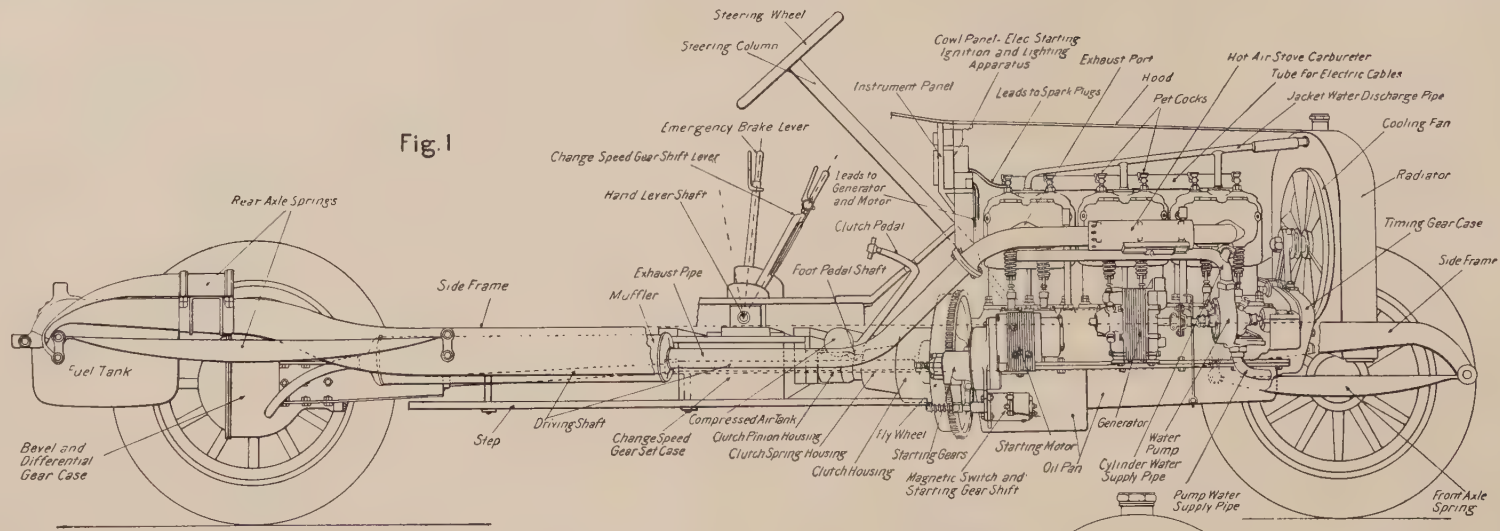
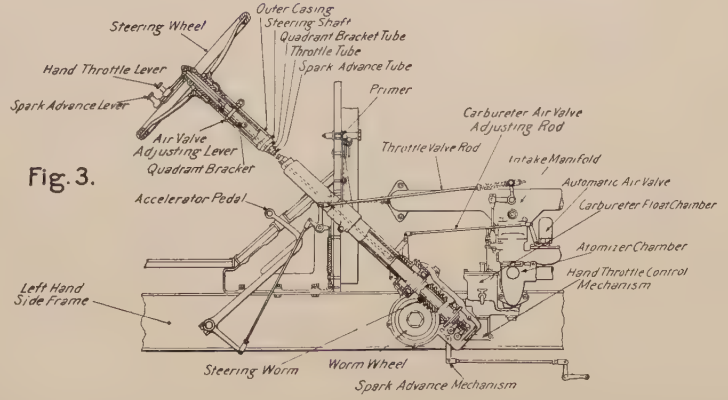


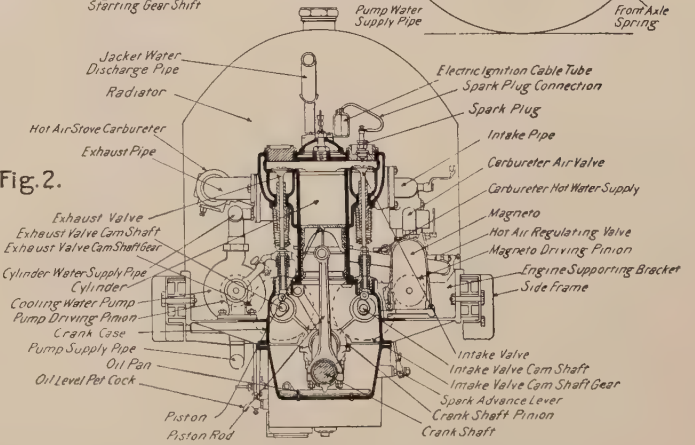
Fig. 2.

A HIGH GRADE SIX CYLINDER ENGINE AND CHASSIS

1. SIX CYLINDER ENGINE AND CHASSIS—SECTIONAL PLAN
2. MULTIPLE DISC CLUTCH AND SELECTIVE CHANGE SPEED GEAR SET
3. LIVE REAR AXLE AND BEVEL AND DIFFERENTIAL GEARS



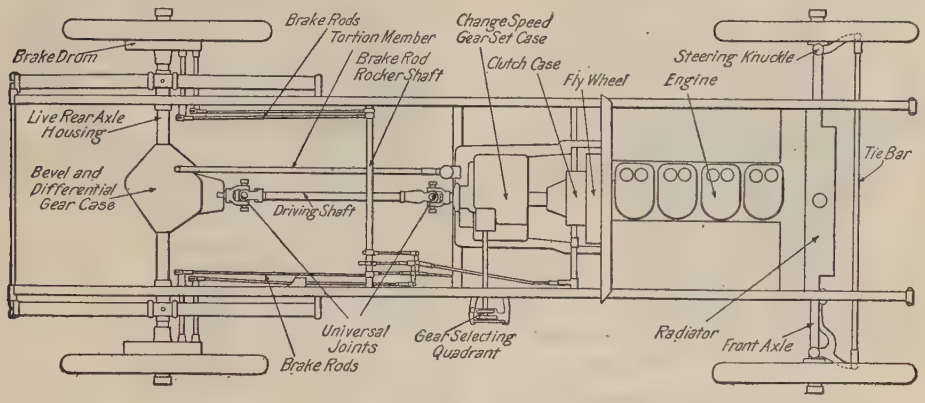




1. VIEW OF RIGHT-HAND SIDE OF CHASSIS OF TYPICAL HIGH-GRADE SIX-CYLINDER AMERICAN CAR
2. VERTICAL TRANSVERSE SECTION THROUGH ENGINE END OF CHASSIS
3. DETAIL OF STEERING COLUMN AND ACCELERATOR MECHANISM

done by chains to sprocket wheels on the wheels themselves and independent of the rear axle. The first is called the *shaft-drive* system and is much in favor for light and medium-powered cars. The second is the *chain-drive* system and is generally preferred for heavy commercial vehicles which do not use the *worm drive*. The worm gear gives compact and rapid reduction of speed and change of direction of motion, and is adapted for high rotative speed of the motor.

Propeller Shaft. Universal Joint. Cardan Joint.—The motor and the gear box are fastened to the frame of the car, so as to be borne upon the springs and to receive the benefit of

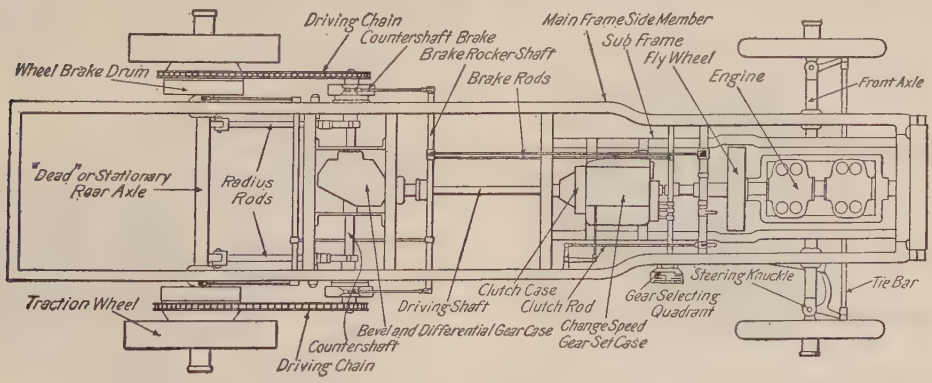


PLAN OF TOURING-CAR CHASSIS.
Showing shaft drive.

chain drive was the first system and offers the advantage of flexibility in yielding to distortions of the frame from inequalities in the road and obstacles met by one wheel only. The objections are the difficulties of protecting the exposed chains from mud and grit and of constructing protecting covers which shall be both effective and convenient. The shaft drive is clean, positive, mechanically simpler, and needs no troublesome lubrication. The chain drive requires a shaft parallel to the rear axle and carrying the driving sprocket wheels. This is called the jackshaft and is driven by a bevel-pinion gear in the gear box. The shaft drive has no jackshaft, and eliminates weight.

Worm Drive.—English practice in pleasure vehicles and American standards in motor-truck

elastic support of their weight. The jars and shocks which affect both axles and the spring-supported frame will cause different motions of both, and yet they must be connected mechanically, so that the motor may drive the axles under all loadings and vertical motions. This requires a *universal joint* at each end of the propeller shaft. This is a combination consisting of a diagonal cross-shaped piece of steel, to whose ends the driving and driven shafts are connected, each at right angles to the axis of the other. That is, if the driving shaft is connected to arms 1 and 3, the driven shaft will be connected to arms 2 and 4. Hence the angle between the centres of the driving and driven shafts can be varied within a considerable range and neither shaft be flexed by such



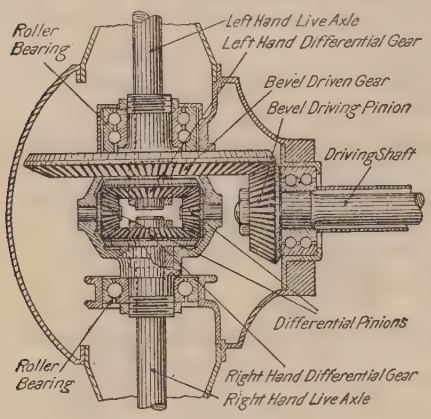
PLAN OF MOTOR-TRUCK CHASSIS.
Showing chain drive.

design make use of the screw drive or worm gear as a means of transmitting power from gear box to rear axle. (See ENDLESS SCREW.) The worm or screw is on the propeller shaft, and the end thrusts are borne by ball bearings. The worm wheel is at right angles to the propeller shaft on the axis of the rear axle. The

variation when the two shafts revolve. Such universal joint is used in compass mountings, and was first proposed by an Englishman named Hooke. It is also called a "Cardan" joint.

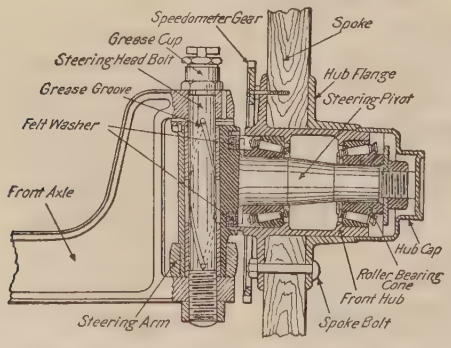
Differential Gear.—The space passed over in one or many revolutions by the circumferences of a pair of rear wheels of a car will be the

same when the car is moving in a lineal direction at right angles to their axis. In mathematical terms the axes of all four wheels intersect at an infinite distance. As soon as the car turns to move in a curve or arc of a circle of



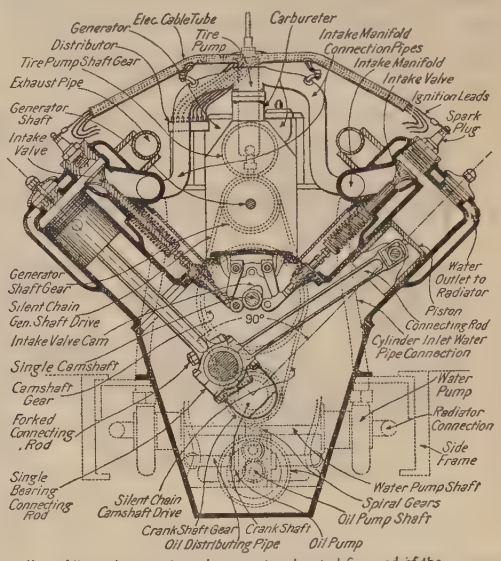
BEVEL AND DIFFERENTIAL GEARS.

finite radius, the wheels on the rear axle revolve on arcs of differing radius and hence of differing length for any angular motion of such axle. This will make one or the other of these wheels slip—usually the outer one, or one of longer path, since the inertia of the wheel as a whole helps motion in the direction it has to go. Such slipping, due to unequal track length, would wear the tires, waste propelling energy, and make hard riding. To correct it a provision is made, usually in the axle housing of shaft-driven cars or in the gear box of chain-driven cars, whereby this differential motion or difference in wheel path may be compensated for. The simplest arrangement is to provide that two, three, or four gears, bevel or spur, shall be planetarily mounted, so that their axes shall be borne in the body of the gear which received motion from the motor. These planetary gears mesh with two others, one being on the axle



VERTICAL TRANSVERSE SECTION OF FRONT HUB.

of the right wheel and the other on the axle of the left. When the resistance is equal at the tires of both car wheels, there is no motion around the axis of the intermediate gears. As soon as one driving wheel demands a shorter path than the other, these intermediate gears begin to revolve around their axes while still driving both axles, and compensate or give a differential motion to the two driving wheels as required. This is a very old mechanical device or movement and has been called the jack-in-the-box. The differential is usually carried

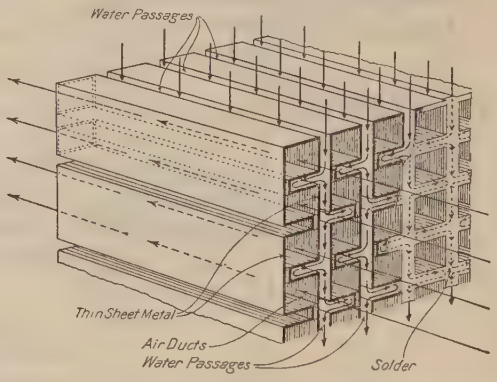


Note: All machine parts and apparatus located forward of the plane of section are shown by broken lines.

A TYPICAL V-TYPE EIGHT-CYLINDER ENGINE.
Vertical cross section through pair of forward cylinders.

in an enlargement of the axle casing, and should be kept well supplied with oil or grease.

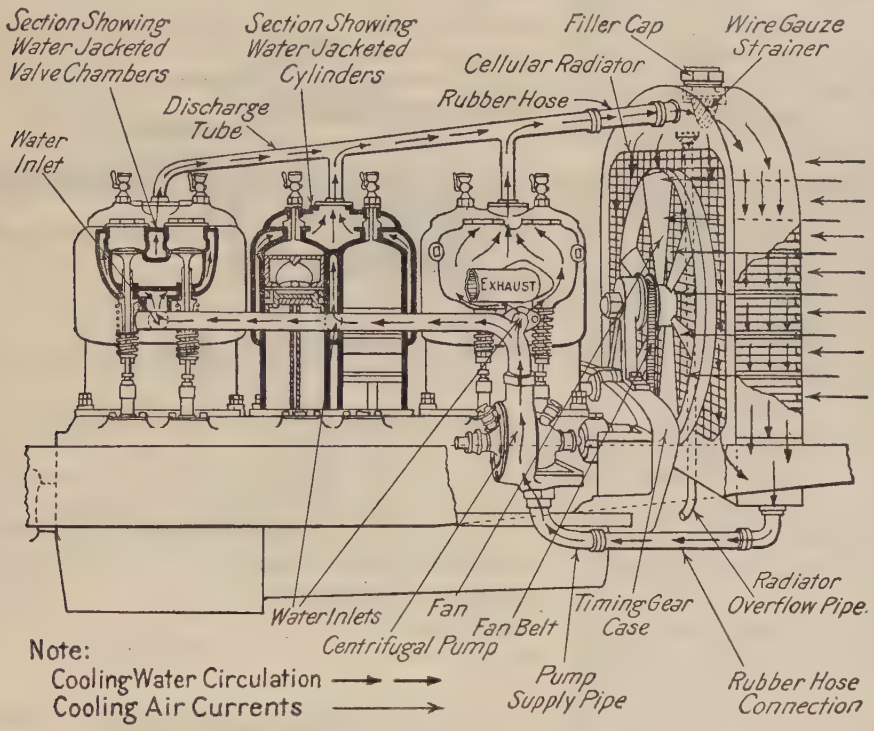
Steering Gear.—The horse-drawn vehicle has the motor force connected to the front axle and at right angles thereto at all times. The motor car driven from the rear axle requires that the front pair of wheels be controlled by the driver. The principle of easy steering and control was first pointed out by Ackerman. Unlike the horse-drawn vehicle, where the axis of revolution of each of the front wheels is in the same line, in a motor vehicle each front wheel is mounted independently, so that in steering, its plane of revolution may be rotated about a vertical axis at either end of the front axle. This is secured by mounting the front wheel on a



CELLULAR RADIATOR.
Sectional view, showing structure.

knuckle which is adjustable for position around a vertical pin borne in the forging of the front axle. These two knuckles are coupled together by a rod of sufficient strength which connects

to an arm on each, and these arms are so located as to converge slightly when the wheels are parallel. When these arms are moved laterally in the operation of steering, the wheels are made to depart from parallelism, the outer all the shocks of the road which tend to swerve the front wheels. The steering-control wheel is borne in a hollow steering post, strongly attached to the frame. The steering knuckles, rods, and arms, and the teeth of the gears must

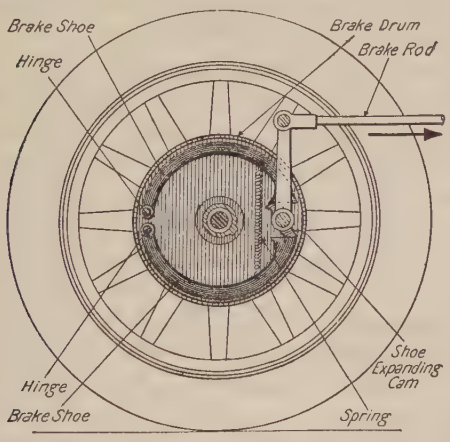


TYPICAL COOLING SYSTEM OF ENGINE.

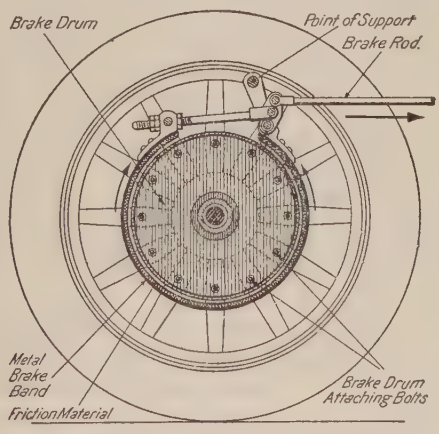
wheel moving through a greater angle than the inner. Hence the Ackerman principle can be closely realized by very simple means. The early knuckles were connected to a lever or tiller when cars were light and speeds low. Modern control is by a wheel which turns a screw or worm, the latter meshing into a section of a worm wheel. The screw gear makes a transmission which is nearly irreversible, so that the driver does not have to resist with his muscles

be massive enough not to break under shock and stress.

Floating Axle. Live Axle.—In the chain-driven cars the sprocket-gear toothed wheel will be a part of the running wheel; hence the rear axle need not turn in bearings. The bearings will be in the wheel hub. Such an axle as must turn in order to drive the wheel will be called a live axle. In shaft-driven cars the weight of the car may be borne upon a hollow casing to



INTERNAL EXPANDING SHOE BRAKE.



EXTERNAL CONTRACTING BAND BRAKE.

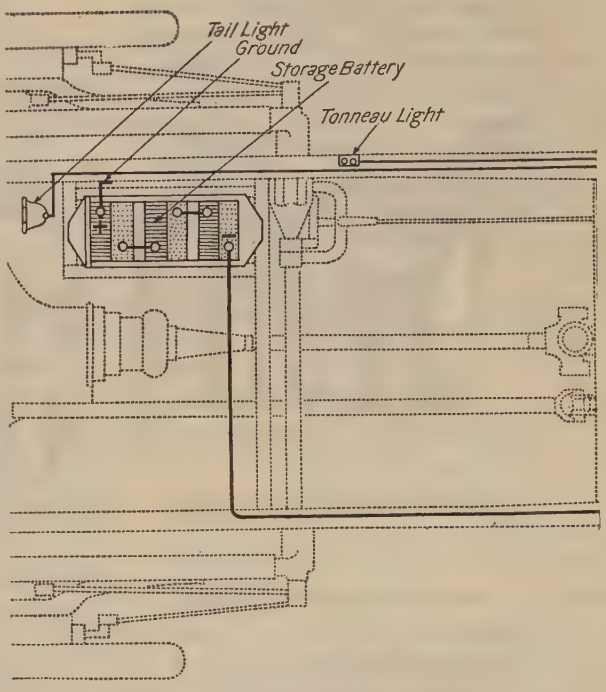
which the spring seats will be attached, and the driving axle may pass through the tubular casing out to the wheel hub without contact with the latter. The outer end of the axle is splined so as to compel the wheel to turn, but the axle is exposed to torsion stresses only. Such an axle as carries no bending stresses is called a *floating axle*, or a full-floating axle. A semi-floating axle is one in which the axle itself at its outer end is fitted to the weight-carrying bearings and is therefore exposed to transverse bending stress at its outer end.

The varying speeds and resistances of the motor vehicle make the four-stroke or Otto-cycle preferable to the Clark or two-cycle principle for motor-vehicle engines. (See INTERNAL-COMBUSTION ENGINE.) To secure uniformity of turning effort for the crank shaft and to balance the weights in motion about it, the four-cylinder single-acting design has been preferred, one cylinder being always in action to drive the shaft. The vertical cylinder axis makes the most convenient and accessible arrangement. Six cylinders arranged tandem give an overlapping of effort, so that as one becomes weaker in propelling effect another is just coming into action. Six cylinders have therefore a greater range of power before the gear-driving ratio needs to be altered, and make a more powerful motor on the high gears, but they use more fuel, and the car is proportionately heavier and with more parts. In some designs the cylinders are arranged with the axes at 45 degrees from the vertical, or as it were on the arms of a V, and this is often the arrangement where eight cylinders are employed.

The cylinders are cast in two blocks of four cylinders each, with water jackets, combination chambers, and intake manifold integral, and the two blocks are mounted on the crank case at an angle of 90 degrees to each other. The crank shaft has four throws, all in one plane, similar to that of a four-cylinder motor, excepting that each throw operates the two connecting rods from the pistons of the corresponding pair of opposite cylinders. One connecting rod of the pair is forked at the lower end, and the lower end of the rod fits inside the fork. The motors have a single cam shaft located directly above the crank shaft and operated by the latter through silent chain device. The cam shaft carries eight cams, each cam operating two valves on opposite cylinders. The valves are operated in pairs—four cams operating the eight intake valves and four cams operating the eight exhaust valves. The cylinders being of the L-head type, the intake and exhaust valves are all on the same side of the respective cylinder blocks. In firing the power stroke from a cylinder on one side is followed by a power stroke from a cylinder on the opposite side. The eight power impulses thus obtained during each complete cycle of two revolutions give a power impulse for every quarter turn of the flywheel, thus insuring a constant torque. The motor employs only one carburetor. It is provided with two cooling water pumps, an oil pump, and a tire pump. In other respects, such as electric ignition, starting, and lighting, it is similar to other standard motors.

The older and standard designs of engines have lifting or poppet valves. These when worn are easy to grind to their seat so as to be made tight and require no lubrication. Sliding sleeve, rotating cylindrical and conical valves are competing with the lifting type to diminish clearance losses and noise. They must be copiously lubricated, and the difficulties from a deposit of carbon on or near the sliding surfaces must be overcome, as well as a tendency to grow out of round by the continual action of heat. They cannot be reground when worn or scored.

To cool the water which circulates around the cylinders and valve chambers, a radiator is constructed to subdivide the circulating fluid into small currents and bring every channel into close contact with the air tubes. A driven fan keeps up an air movement more rapid than that of the car itself and increases the radiation. The control of the motor by spark and throttle is effected by levers on the steering post. Foot levers throw the clutch in or out, apply the brake, and control fuel supply in supplement to or substitute for the hand throttle or gas lever. The foot brake is often called the *service brake* and is powerful enough to lock the wheels. The hand brake is sometimes called the *emergency brake* and is to be available in case the foot brake fails in an emergency. It usually is fitted with a spring dog engaging into teeth on a sector, so that the brake can be locked on, holding the car even against the motor when the foot brake is released by the driver leaving his seat.

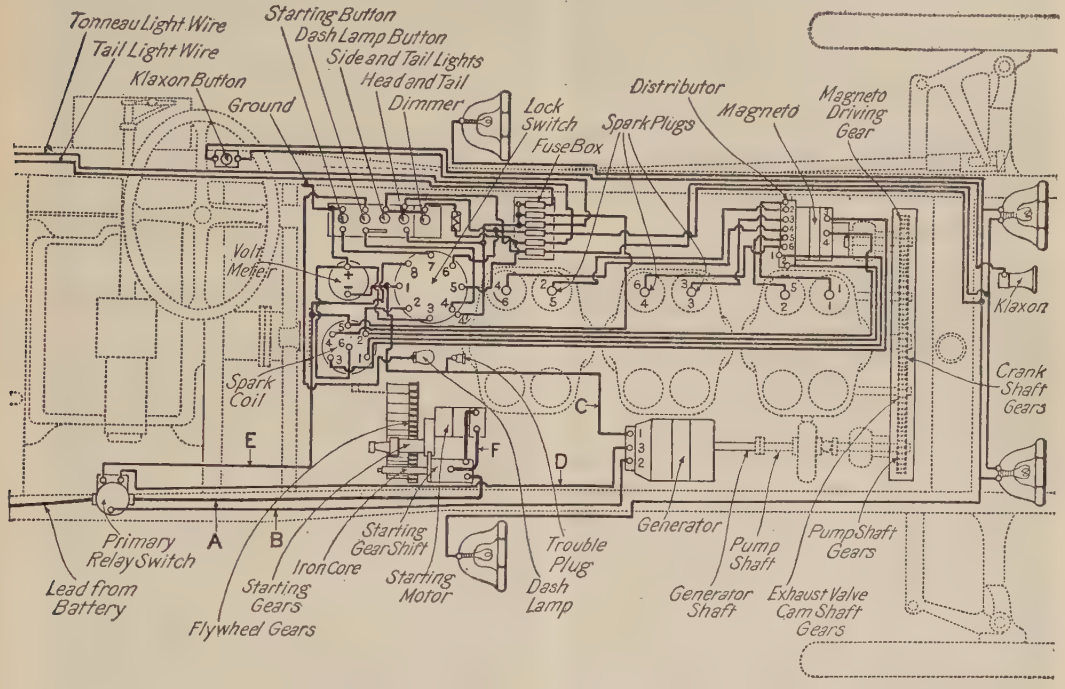


TYPICAL ELECTRIC POWER AND LIGHTING SYSTEM OF A MODERN HIGH-GRADE CAR.

STORAGE BATTERY AND LIGHTING CIRCUITS FOR REAR OF CAR.

MECHANICAL STARTER

Self-Starter. The internal-combustion motor used on most motor vehicles requires that one or more strokes of the engine piston be made by some force external to such engine before the cycle of operations can be restarted after a stop. The first method of doing this was by a hand-operated crank. This was so designed and installed that as soon as the motor took up its own functioning the hand crank was unlocked and thrown out of gear by a spring releasing a jaw clutch which worked in one direction only. A spring can also be used to start the motor, by having the motor wind it up to sufficient tension before the crank shaft stopped revolving before the stop. Latterly either the energy in compressed air stored by pumping it into a tank at 150 to 200 pounds' pressure per square inch has been applied, or an electric motor operated from a storage battery in the car can be similarly used. In compressed-air systems the pump is driven by the engine until the desired tank pressure is reached, when it



TYPICAL ELECTRIC POWER AND LIGHTING SYSTEM OF A MODERN HIGH-GRADE CAR.

GENERAL CIRCUIT CONNECTIONS FOR SELF-STARTER, LIGHTING SYSTEM, ETC.

The battery is grounded on the positive side. A heavy cable lead connects the battery with the primary relay switch. Ordinarily this switch is open and no current can flow through the cable *A* beyond the switch. Current flows through the wire *B* and through the series field of the generator, out through the wire *C* to terminal 1 on the lock switch. The generator terminal 3 is so connected with an automatic switch on the generator that it has voltage only when the generator is not running or is running below 300 r.p.m. A wire *D* connects generator terminal 3 with a magnet coil in the primary relay switch. A wire *E* runs from the magnet coil to terminal 8 on the lock switch, through the switch and out from the terminal 7 to the starting button on the four-gang switch.

Starting the Engine. — When the starting button is pressed current flows along the wires *D* and *E*, through the lock switch and the starting button to the ground. The magnet in the primary relay switch closes the circuit, and current flows through the wire *A* to the starting gear shift, energizing a powerful electromagnet and passing through the wire *F* to the starting motor. The energized magnet pulls the iron coil inward against the pressure of a spring, thereby pulling the starting gear into mesh with the flywheel gear. A copper mushroom inside the switch base connects two copper fingers through a resistance in service with the starting motor, closes the main circuit to the motor, which cranks over the engine. When the engine starts firing the generator voltage builds up and opposes the battery voltage at the generator terminal 3. This allows the primary relay switch to open by the pressure of a spring contained therein, thereby cutting off the current flowing through the wire *A* and demagnetizing the electromagnet in the starting gear shift. This allows the spring to push out the iron coil, thereby pulling the starting and flywheel gears out of mesh.

Lighting Circuit Connections. — The lock switch terminals are connected as follows: 1 is connected to the battery and generator feed wire *C*, supplying the lighting system; 2 is connected to the terminal 2 on the spark coil; 3 is connected to the grounded side of the voltmeter; 4 is connected to the side and tail light bus on the four-gang switch; 4 is connected to the headlight terminal on the four-gang switch, and to the Klaxon, tonneau light, and ignition fuse bus; 5 is connected to the tail-light wire on the lamp side of the four-gang switch, also to the driver button operating through a 0.5-ohm resistance coil; 6 is connected to the side-light wires on the lamp side of the four-gang switch; 7 connects with the starting button on the four-gang switch; 8 is connected with the magnet coil in the primary relay switch. The lock switch has three positions. In the "on" position the starting gear shift and motor, all the lights, the Klaxon, and ignition can be operated by the button on the four-gang switch. In the "day" position all the starting, lighting, Klaxon, and ignition circuits are disconnected and cannot be operated; while terminals 2 and 3 are connected, grounding the magneto. In the "night" position terminals 2 and 3 are connected, grounding the magneto; 5 and 6 are connected to the battery, allowing current to flow direct to the side and tail lights, so that they cannot be turned off by the buttons on the four-gang switch. All the other circuits are disconnected.

Ignition Connections. — Terminal 2 of the lock switch is connected to terminal 2 of the spark coil. The terminals 1, 2, 3, 4, are connected to the correspondingly numbered terminals on the magneto. The terminal 5 is connected to the primary relay switch, battery, and ground; 6, the centre post of the coil, is connected to the posterior side of the voltmeter, connected to lock switch terminal 3, which is the grounding terminal for the magneto. The high-tension cables are connected to the distribution terminals in the order of rotation 1, 2, 3, 4, 5, 6; the other ends of the cables go to the spark plugs in the order of firing, 1, 5, 3, 6, 2, 4.

is disengaged. When the engine is to be started this compressed air is released through proper valves into one or more cylinders. The compressed air can also be used for inflating the tubes of pneumatic tires. The pump is lighter in weight than the electric motor of the other system, and the air tank lighter than the battery. In electric systems a pressure on a foot treadle first starts the motor slowly and then throws an engaging clutch into gear, turning the engine slowly until it begins to speed up under its own power. The clutch is then automatically disengaged so as not to turn the motor armature backward. A typical electric self-starting mechanism is shown in the accompanying figure.

RUNNING GEAR AND SPRINGS

III. The third section of the subject is the running gear, wheels and springs. As the motor vehicle is the derivative of the motor tricycle, there has been a drift towards the use of three wheels at different times, but usually as a transition type. The three-wheeled vehicle is not so stable against overturning as the four, particularly on roads of high crown and deep ditches and on curves. The rubber-tired wheel with a pneumatic tube filled with compressed air consumes the least power and is easiest for the passengers. Commercial vehicles for slow speed and heavy loads have solid or cushioned tires. Six-wheeled vehicles for very heavy weights distribute the pavement load, and are made with the wheels either independent or fitted with compensating levers when four wheels of the six are drivers, as in the Dow system. Springs are flat and elliptic or semi-elliptic on pleasure vehicles and flat-leaved or locomotive platform type for heavy-load trucks. Brakes are in duplicate, so that failure of one pair will find the other pair in service. Usually one pair is foot-operated and one pair hand-operated, the latter arranged to lock the brakes when the vehicle is left standing. The brakes should be capable of locking the wheels on ordinary road surfaces and of retarding the motion of the car in less time than the adhesion of the clutch will allow it to be accelerated.

The frames are of steel, usually of standard channel section, either plain or reënforced with wood. Mud guards are attached over the wheels to protect both the body and its occupants.

RACING

Specially designed cars with abnormally high gearing for speed and much higher power than can be utilized in the ordinary vehicle have given very high speed records on special courses and tracks or on sea beaches where a hard surface can be secured. Regular race meets long have been a commercial feature both for the gate receipts and for the advertising value of success against competitors. They also give a hard try-out to the machinery and construction of the motor and running gear. Originally these motor races were held on the public highways which were policed and marked, but becoming so dangerous to both contestants and spectators they were restricted to specially constructed speed courses or beaches. Two of the most important meets were known as the race for the Grand Prix of the Automobile Clubs and the race for the Vanderbilt Cup. The Vanderbilt Cup Race in 1901 was held for the first time over a special course on Long Island instead of on the highway. The winning machine, a 60-horse-power car with six-cylinder engine, made the 278 miles of the course in 4 hours, 25 minutes, and 42 seconds, or at an average speed of 62.8 miles an hour. The concluding races for both these trophies were held at Santa Monica, Calif. in 1916. In the Vanderbilt Cup Competition a Peugot special car was driven 294.035 miles in 3 hours 22 minutes 48 seconds which also won the grand prize driving 403.238 miles in 4 hours 42 minutes 47 seconds. At Daytona a Dusenberg car on April 27, 1920 made a mile in 23.07 seconds (157 miles an hour) and two miles in 46.24 seconds while on Feb. 17, 1919 a Packard special was driven 10 miles in 4 minutes 9.31 seconds (145 miles an hour) and 20 miles in 8 minutes 54.20 seconds. In 1908 the longest competition ever held, from New York to Paris, took place, and was won by an American car, which covered the distance of 12,116 miles in 112 days.

The manufacture of automobiles has become an important industry, the greatest work having been done in the construction of vehicles for touring and recreation; and for this purpose numerous factories have been established, both in the United States and in Europe. The value of automobiles produced in the United States in 1919 according to the census of manufactures was $2,387,903,287 against $249,202,000 in 1909. The year 1920 marked the high water mark. The exports grew from approximately $10,000,000 in 1910 to $212,031,702 in 1920 falling off considerably in 1921. In 1915 and 1916 the exportation was greatly increased, especially in trucks, which were greatly in demand for use in transportation during the European War.

Bibliography. There is a growing literature, as well as a number of journals, devoted to Motor Vehicles. The early history of steam vehicles, in common with that of other forms of steam engines, will be found in R. H. Thurston, *A History of the Growth of the Steam Engine* (New York, 1901). For a comprehensive descriptive treatise, consult: W. W. Beaumont, *Motor Vehicles and Motors* (London, 1901); also R. B. Whitman, *Motor-car Principles* (rev. ed., New York, 1909); Cyclopaedia of Automobile Engineering (Chicago, 1915); Fraser and Jones, *Motor Vehicles and their Engines* (New York, 1919); F. A. Talbot, *Motor Cars and their Story* (ib., 1912); V. W. Pagé, *Modern Gasoline Automobile* (ib., 1918); id., *The Modern Motor Truck* (ib., 1921); W. H. Berry, *Modern Motor Car Practice* (London, 1921); F. V. Z. Lane, *Motor Truck Transportation* (New York, 1921); H. P. Manly, *The Modern Motor Car* (Chicago, 1918); Brokaw and Starr, *Putnam's Automobile Handbook* (New York, 1916). See AUTOMOBILE; CYCLE CAR; MOTOR CYCLE.

MOTRIL, mō-trēl'. A city and port of entry in south Spain, in the Province of Granada, situated about 1 mile from the Mediterranean coast, 32 miles south by east of Granada (Map: Spain, D 4). There are ruins of old Moorish fortifications, but the greater part is well built with modern houses. Motril is chiefly an industrial town, has iron foundries, and manufactures sugar, spirits, chocolate, flour, soap, paper, cotton textiles, and pottery. The harbor is an exposed roadstead. Pop., 1900, 18,508; 1910, 18,444.

MOTT, ALEXANDER BROWN (1826–89). An American surgeon, son of Valentine Mott. He

was born in New York City and studied at University Medical College, New York, and the Vermont Academy of Medicine, Castleton, graduating in 1850 (M.D., University of Pennsylvania, 1857). Settling in his native city, he served as medical director there during the Civil War and from 1862 to 1864 was surgeon at the United States Army General Hospital. In the latter year he was ordered to the front as medical inspector of the Department of Virginia and was attached to General Ord's staff. In 1865 he was mustered out of service with the brevet rank of colonel. At Bellevue Medical College, which he had helped to found, he held the chair of surgical anatomy from 1861 to 1872 and from 1872 to 1889 that of clinical and operative surgery. He was the author of *Surgical Operations* (3 vols., 1856–57), *Advantages of Clinical Teaching* (1868), etc.

MOTT, James (1788–1868). An American Abolitionist, born at Cowneck, Long Island, N. Y. Soon after completing his education he became a teacher in a Friends' boarding school in Dutchess Co., N. Y., where he met Lucretia Coffin (see Mott, Lucretia), whom he afterward married. In 1810 he removed to Philadelphia and became a merchant. He early manifested his sympathy with the antislavery movement and was one of the first supporters of William Lloyd Garrison. He was one of the organizers of the Philadelphia National Antislavery Society in 1833, and in 1840 he was a delegate to the World's Antislavery Convention in London. There he took a prominent part in the agitation to admit women delegates and eight years later presided over the first national convention held in support of the woman's rights movement. In 1865–69 he was actively interested in the establishment of Swarthmore College by the Philadelphia Yearly Meeting, of which he was a member.

MOTT, John R(aleigh) (1865–). An American Y. M. C. A. leader and authority on foreign missions. He was born at Livingston Manor, N. Y., graduated from Cornell University in 1888, and in the same year became student secretary of the international committee of the Y. M. C. A. and chairman of the executive committee of the Student Volunteer movement. He became general secretary of the World's Student Christian Federation in 1895, foreign secretary in 1898 and associate general secretary in 1901 of the international committee of the Y. M. C. A., and chairman of the continuation committee of the World Missionary Conference in 1910. His lectures and conferences on Y. M. C. A. and mission work brought him large influence throughout the United States. Dr. Mott declined the presidency of Princeton University, to succeed Woodrow Wilson, and in 1913, when Mr. Wilson offered him the post of Minister to China, declined that also. Yale, Edinburgh, and Princeton gave him honorary degrees. Besides pamphlets and articles he is the author of *Strategic Points in the World's Conquest* (1897); *The Evangelization of the World in this Generation* (1900); *Christians of Reality* (1902); *The Pastor and Modern Missions* (1904); *The Future Leadership of the Church* (1908); *The Decisive Hour of Christian Missions* (1910; Ger. trans., 1911; 2d Ger. ed., 1912); *The Present World Situation* (1914).

MOTT, Lewis Freeman (1863–). An American English scholar, born in New York and educated at the City College (S.B., 1883) and at Columbia University (Ph.D., 1896). In 1884 he became a tutor at the City College and held that position until 1897, when he was made professor of English. He served as president of the Modern Language Association in 1911 and, in addition to various scholarly pamphlets, is the author of *The System of Courtly Love* (1894) and *The Provençal Lyric* (1901).

MOTT, Lucretia (Coffin) (1793–1880). An American Abolitionist and woman's rights advocate, born on Nantucket Island. She was educated in the Friends' School at Nine Partners, near Poughkeepsie, N. Y., where she met James Mott (q.v.), whom in 1818 she married. She became prominent as a preacher in the Society of Friends and was chosen a minister. As a result of a visit to Virginia in 1818 she became an ardent advocate of emancipation. At the Separation of 1827 which divided the Society of Friends into two hostile factions, she and her husband adhered to the liberal or Hicksite party. (See Hicks, Elias.) In 1833 she attended as an invited guest the first convention of the American Antislavery Society, of which her husband was a member. Soon afterward she helped to organize the Female Antislavery Society, of which she continued one of the leaders until 1839, when it was merged in the men's organization. As the feeling against Abolitionists grew in intensity, many of the more timid Quakers began to deprecate any discussion of slavery by one of their ministers, and even in her own meeting she was regarded with suspicion and dislike. In 1840, at the World's Antislavery Convention in London, to which both James and Lucretia Mott had been chosen delegates, the question of the equal participation of women in the proceedings of the convention came up, and after some discussion all women were excluded. This action may be said to have started a movement for the emancipation of women from legal and political disabilities in the United States and England and, in a lesser degree, in France. It was then that Lucretia Mott and Elizabeth Cady Stanton first discussed the woman's rights movement, which they launched eight years later at a convention in Seneca Falls, N. Y. But these two movements, abolition and woman's rights, while they received the greater share of her attention, were not the only ones in which Mrs. Mott was interested, for all that promised to uplift humanity or to break the fetters of ignorance and tradition received her warmest support. Almost to the end of her life she made frequent journeys to visit distant meetings or to attend conventions called to consider the elevation of woman, the promotion of temperance, and the establishment of universal peace. Consult A. D. Hallowell, *The Life and Letters of James and Lucretia Mott* (Boston, 1884).

MOTT, Valentine (1785–1865). An American surgeon, born at Glen Cove, N. Y. He studied medicine at Columbia College and graduated in 1806, taking postgraduate courses in London and Edinburgh. In 1810 he was appointed to fill the chair of surgery at Columbia College, in which position he was continued after the medical department of that institution was united with the College of Physicians and Surgeons in 1813. In 1826 he was one of the founders of the Rutgers Medical College, which was disbanded four years later. He then returned to the College of Physicians and Sur-

geons, but resigned on account of failing health in 1835. After a prolonged stay in Europe he returned in 1841. In the same year he assisted in founding the New York University Medical College, whose president and professor of surgery he was until 1850. From 1850 to 1852 he again traveled in Europe. Mott was celebrated as a skillful operator in all branches of surgery and was the inventor of several valuable surgical instruments. He introduced an operation for immobility of the lower jaw and in 1821 performed the first operation for osteosarcoma of that member. He performed the operation of lithotomy 165 times and amputated more than 1000 limbs. Many foreign distinctions were conferred on him, and he was a member of many learned societies. He died in New York. His library of over 4000 medical works is now in the New York Academy of Medicine. He published an account of his first European journey in 1842, *Travels in Europe and the East*, and published also a translation of Velpeau's *Surgical Anatomy* and a volume of clinical lectures (1860). Among Dr. Mott's essays may be mentioned: *An Experimental Inquiry into the Chemical and Medical Properties of the Statice Limonium of Linnæus* (1806); *Reminiscences of Medical Teaching and Teachers in New York* (1850); *Pain and Anæsthetics* (1862; 2d ed., 1863). Consult T. D. Gross, *Memoir of Valentine Mott* (Philadelphia, 1868).

MOTTA, môt'tȧ, José Vianna da (1868–). A Portuguese pianist and composer, born on the island of St. Thomas, Gulf of Guinea. He studied at Lisbon, attended the Klindworth-Scharwenka Conservatory in Berlin, and was a pupil of Liszt at Weimar in 1885, of Schäffer at Breslau, and of Von Bülow at Frankfort-on-the-Main in 1887. He made concert tours in Germany, Russia, Portugal, France, England, Brazil, Argentina, and the United States. Motta composed several songs and piano pieces, a symphony, and the cantata *Lusiaden*, and is the author of *Studien bei Hans von Bülow* (1896).

MOTTARONE, môt'tȧ-rō'nȧ, Mount. A mountain in Italy on the west shore of Lake Maggiore (q.v.). It is 4892 feet high and is often called the "Rigi of North Italy." The view is magnificently extended. At one's feet lie Maggiore and six other lakes; across Maggiore, 60 miles to the southeast, may often be seen the cathedral of Milan, and to the north rise the Alps.

MOTTE FOUQUÉ, Baron de La. See La Motte Fouqué, F. H. K.

MOTTE-GUYON. See Guyon, J. M. B. de la Motte-.

MOTTEUX, mô'tē', Peter Anthony (1660–1718). A French-English playwright and translator, born at Rouen in Normandy. He went to London on the revocation of the Edict of Nantes in 1685 and afterward opened a warehouse in Leadenhall Street, where he sold "tea, china, and Indian wares" (described in the *Spectator*, No. 552). In 1693 appeared Boileau's *Ode sur la prise de Namur, avec une parodie de la même ode par le Sieur P. Motteux.* Motteux mastered English in eight years, and in 1694 appeared one of the two works which made him famous. With Sir Thomas Urquhart and others he published in three volumes a translation of Rabelais (books i-iii), the remainder of which followed in 1768 (books iv-v). For the stage he wrote comedies, masques, and operas. But his fame rests wholly on his Rabelais and on his admirable version of *Don Quixote.* Motteux died on Feb. 18, 1718, his birthday anniversary, in a brothel near St. Clement's Church. Though several persons were held for his murder, it is more likely that he died of disease.

MOTTEVILLE, môt'vēl', Françoise Bertaut de (1621–89). A French writer, born at Paris. She was a member of the household of Anne of Austria, wife of Louis XIII, was exiled by Richelieu, but returned to court in 1642. She was devoted to the Queen and faithful to her to the very end. Her *Mémoires* are important because of the details of court life and the historical setting of the war of the Fronde (q.v.). They may be compared, for their keen insight into the manners and customs of the time, to the letters of Madame de Sévigné and the memoirs of the Cardinal de Retz (qq.v.). The *Mémoires* were translated by K. P. Wormeley (3 vols., London, 1902).

MOTTIER, mŏt-tēr', David Myers (1865–). An American botanist. He was born at Patriot, Switzerland Co., Ind., and was educated at Indiana University (A.B., 1891; A.M., 1892) and at Bonn (Ph.D., 1897) and Leipzig (1898). At Indiana University he was instructor in botany (1891–93), associate professor (1893–98), and professor after 1898. He served as president of the Indiana Academy of Science in 1907. His writings include *A Practical Laboratory Guide for First Year in Botany* (1902) and *Fecundation in Plants* (1904).

MOTTL, mŏt'l, Felix (1856–1911). An Austrian composer and musical conductor, born in Vienna. He studied at the conservatory there under Hellmesberger, Dessoff, and Bruckner and won a number of prizes. In 1881 he became court chapel master at Karlsruhe and conducted the philharmonic concerts till 1892. In 1886 he conducted at Bayreuth, and in 1893 he was appointed general musical director at Karlsruhe. Here his most noteworthy undertaking was the initial production at Karlsruhe of Berlioz's great two-part opera, *Les Troyens.* From 1903 until his death he held the position of general music director at Munich. During the season of 1903–04 he directed some performances at the Metropolitan Opera House. Although he had been engaged specially to conduct the first American Parsifal performances, he finally declined to direct that work, owing to the opposition of the Wagner family. He wrote the operas *Agnes Bernauer* (1880) and *Fürst und Sänger* (1892); a festival play, *Eberstein;* a singspiel, *Pan im Busch;* and a string quartet. Together with H. Levi (q.v.) he completely reorchestrated Cornelius' *Barbier von Bagdad* (1884), and also edited Wagner's early overtures—*König Enzio, Polonia, Christoph Columbus, Rule Britannia.* Consult Erich Kloss, "Felix Mottl," in *Monographien Moderner Musiker,* vol. iii (Leipzig, 1909).

MOTTO (It., a saying). In heraldry, a word or short sentence which forms an accompaniment to a coat of arms, crest, or household badge. Mottoes were originally the battle cries of the knights who used them. They were attached to the badge, when the family had one, or to the crest, when there was no badge. See Heraldry.

MOTUCA (mô-to͞o'kȧ) **FLY.** A gadfly (q.v.) which abounds in parts of Brazil and makes, in biting, a large and deep cut which may bleed considerably. As this fly (*Hadrus lepido-*

tus) sometimes settles in numbers on human beings, it is deservedly feared.

MOUBATA (mōō-bä′tä) **BUG.** See MITE.

MOUCHES VOLANTES, mōōsh vō′länt′. See MUSCÆ VOLITANTES.

MOUCHEZ, mōō′shĕz′, AMÉDÉE ERNEST BARTHÉLEMY (1821–92). A French naval officer and astronomer, born at Madrid. He studied in the French Naval Academy at Brest and served with distinction in the navy until 1878, when he succeeded Leverrier as head of the National Observatory. In 1880 he was made rear admiral. He had already shown himself an able and industrious scientist in the coast surveys of Brazil and Algeria and as organizer of the expedition to the island of St. Paul to observe the transit of Venus in 1874. In his new post he greatly improved the equipment of the observatory, brought out a score of volumes of the *Annales* and a part of the catalogues listing all stars observed since 1838, and, above all, planned the international photographic chart of the heavens. He wrote: *Côtes du Brésil* (1864–74); *Rio de la Plata* (1873; 3d ed., 1891); *La photographie astronomique à l'observatoire de Paris et la carte du ciel* (1887).

MOUFLON, mōōf′lŏn (Fr.). A wild sheep (*Ovis musimon*) now, and perhaps always, restricted to the islands of Corsica and Sardinia, where it is confined to the highest parts of the mountains. The rams stand about 27 inches high at the shoulders, carry immense horns, and have an abundant mane about the neck, shoulders, and breast. This mane is ashy gray, but the body is rusty red, lighter on the sides and stern, and with a dark line along the spine. The belly, sides of the tail, feet, and nose are white. The females are more dun-colored, so that they are almost invisible among the rocks. During the winter flocks of several hundred formerly gathered and ranged the mountains until spring, when they separated into family parties of three or four ewes and lambs, led by an old ram; but now large flocks are uncommon. The rutting season is in midwinter; the lambs—one or two at a birth—are produced in April or May. The animals have now become very wary and on that account offer most excellent sport to hunters. Consult books of European natural history and sport, especially Aflalo, *Sport in Europe* (London, 1901).

The term is sometimes extended to the aoudad (q.v.), and more especially to a slightly smaller sheep (*Ovis ophion*), with lighter horns, which is confined to the mountains of Cyprus and called the Cyprian mouflon.

MOUKDEN, mōōk-dĕn′. The capital of Manchuria. See MUKDEN.

MOULD. See MOLD.

MOULDING. See MOLDING.

MOULE, moul, ARTHUR EVANS (1836–). An English missionary to China. He was the son of the vicar at Fordington, Dorset, and was educated at Malta College and the Islington Church Missionary Society College. In 1861 he went out to China, where he arrived in time to witness some of the stirring scenes of the Taiping Rebellion. He worked in the vicinity of Ningpo in 1861–69 and in 1871–76; at Hankow (where his brother had founded, in 1869, the first inland mission residence) from 1876 to 1879; in Shanghai in 1882–94; and, after eight years at home, in Chekiang and Kiangsu from 1902 to his retirement in 1910, having been Archdeacon in the diocese of Mid-China for 30 years. In Chinese he published tracts, sermons, a commentary on the Thirty-nine Articles, "A Letter to the Scholars of China," etc.; and in English: *Chinese Stories* (1880); *New China and Old* (1891; 3d ed., 1902); *Half a Century in China* (1911); *The Chinese People: A Handbook on China* (1914).

MOULIN ROUGE, mōō′lăN′ rōōzh (Fr., Red Mill). A well-known dance hall on the right bank of the Seine in Paris, which, since the disappearance of the Jardin Mabille, has been one of the chief places of popular amusement.

MOULINS, mōō′lăN′. The capital of the Department of Allier, France, on the Allier, 36 miles northeast of Montluçon (Map: France, S., H 2). It is a well-built town, with pleasant, beautifully shaded promenades and many places of interest, chief among them the Hôtel de Ville, with a magnificent library and valuable manuscripts, the cathedral of Notre Dame and its art treasures, the Archæological Museum, the church of the Sacred Heart, and the Lycée. There are a seminary, two religious colleges, and a school of music. Industries include the manufacture of glassware, farm tools, paper, hats, oil, vinegar, cotton and woolen fabrics, and silk; there is an important trade in coal, wood, grain, and wine. Moulins was for a time the capital of Bourbonnais and the residence of the dukes of Bourbon; of the ducal castle, a fourteenth-century tower, now used as a prison, remains. Pop., 1901, 22,340; 1911, 21,990.

MOULMEIN, moul-mīn′. A city in Lower Burma. See MAULMAIN.

MOULTING. See MOLTING.

MOULTON, mōl′ton, FOREST RAY (1872–). An American astronomer, born at Le Roy, Mich. He graduated from Albion College (A.B., 1894) and from the University of Chicago (Ph.D., 1899), where he was associate in astronomy (1898–1900), instructor (1900–03), assistant professor (1903–08), associate professor (1908–12), and professor after 1912. He became an associate editor of the *Transactions of the American Mathematical Society* in 1907 and a research associate of the Carnegie Institution in 1908. Besides various contributions to mathematical and astronomical journals he is the author of *An Introduction to Celestial Mechanics* (1902; 2d rev. ed., 1914); *An Introduction to Astronomy* (1905); *Descriptive Astronomy* (1912); *Periodic Orbits* (1913).

MOULTON, JAMES HOPE (1863–1917). An English Wesleyan Methodist clergyman and philologist. He was born at Richmond College, where his father, Rev. W. F. Moulton (q.v.), was a professor. He was educated at King's College, Cambridge, entered the ministry in 1886, and was elected a member of the Legal Hundred in 1904. He was master at the Leys School, Cambridge, from 1886 to 1902, also lecturing on the classics at Girton and Newnham colleges; was a tutor at Didsbury (Wesleyan) College; and in 1908 became Greenwood professor of Hellenistic Greek and Indo-European philology in Manchester University. In 1911–12 he was dean of the theological faculty of the university. Moulton received honorary degrees from London, Edinburgh, Durham, Berlin, and Groningen. Besides contributions to periodicals and to Hastings' *Dictionary of the Bible* he is the author of: *The Vision of Sin* (1898); *Two Lectures on the Science of Language* (1903); *Grammar of New Testament Greek*, vol. i (1906; Ger. trans., 1911); *Early Religious Poetry of*

Persia (1911); *Early Zoroastrianism*, the Hibbert lecture for 1912.

MOULTON, John Fletcher, Baron (1844–1921). An English jurist, brother of Richard Green and William Fiddian Moulton. Born at Madeley and educated at St. John's College, Cambridge, he became a barrister of the Middle Temple in 1874, queen's counsel in 1885, and served in Parliament in 1885–86, in 1894–95, and from 1898 to 1906. Moulton served as judge of the Court of Appeal from 1906 to 1912, when he became Lord of Appeal in Ordinary and member of the judicial committee of the Privy Council. In 1906 he was knighted and in 1912 was created a life peer.

MOULTON, (Ellen) Louise (Chandler) (1835–1908). An American poet and story-writer, born at Pomfret, Conn., April 10, 1835. She was educated at Troy, N. Y., and before her twentieth year had edited *The Waverley Garland, a Present for All Seasons* (1853) and had written *This, That, and the Other* (1854). In 1855 she married William Moulton (died 1898), a Boston publisher and journalist. Repeated periods of residence in England, from 1876 on, made her lasting friends among leading English men and women of letters, and her Boston home was a favorite resort of literary talent. She died Aug. 10, 1908. Her published work includes the following titles: *Juno Clifford: A Tale* (1856); *My Third Book: A Collection of Tales* (1859); *Bedtime Stories* (1873); *More Bedtime Stories* (1874); *Poems* (1876), a notable volume, published (1877) in England as *Swallow-Flights; New Bedtime Stories* (1880); *Random Rambles* (1881); *Firelight Stories* (1883); *Ourselves and our Neighbors* (1887); *Miss Eyre from Boston, and Others* (1889); *In the Garden of Dreams: Lyrics and Sonnets* (1889); *Stories Told by Twilight* (1890); *At the Wind's Will* (1899). Mrs. Moulton edited the poems of Philip Bourke Marston (1892) and of Arthur O'Shaughnessy (1894). A collection of her verse—*Poems and Sonnets* (1900)—includes an introduction by H. P. Spofford.

MOULTON, Richard Green (1849–). An American educator and literary critic, brother of John Fletcher and William Fiddian Moulton. Born at Preston, England, he was educated at London University (B.A., 1869), at Christ's College, Cambridge (M.A., 1877), and at the University of Pennsylvania (Ph.D., 1891). He was university-extension lecturer to Cambridge (1874–90), to the American Society for the Extension of University Teaching (1890–91), and to the London Society (1891–92). Moulton became professor of literature in English at the University of Chicago in 1892 and in 1901 professor of literary theory and interpretation and head of the department of general literature. His works include: *Shakespeare as a Dramatic Artist* (1885); *The Ancient Classical Drama* (1890); *Four Years of Novel Reading* (1895); *The Literary Study of the Bible* (1896; 2d ed., 1899); *A Short Introduction to the Literature of the Bible* (1901)—the last two being supplementary to the *Modern Reader's Bible*, edited in 21 volumes in 1895–98 and republished in 1 volume in 1907; *The Moral System of Shakespeare* (1903), republished as *Shakespeare as a Dramatic Thinker* (1907); *World Literature and its Place in General Culture* (1911); *The Modern Study of Literature* (1915). In the *Modern Reader's Bible*, Moulton, with rare insight into and appreciation of the significance of the text from a literary standpoint, arranged the various books in accordance with modern English usage, as prose narrative, dramatic dialogue, lyric verse, or whatever form seemed appropriate.

MOULTON, William Fiddian (1835–98). An English Wesleyan Methodist clergyman and educator, brother of John Fletcher and Richard Green Moulton and father of James Hope Moulton. He was born at Leek and was educated at Woodhouse Grove School, at Wesley College, Sheffield, and at London University, where he graduated in 1856 and was prize medalist in mathematics and natural philosophy. In 1858 he entered the ministry and in 1872 was elected to the Legal Hundred. He was assistant tutor and classical tutor in Richmond College between 1868 and 1874, when he founded and became the first head master of the Leys School at Cambridge. This position he retained until his death. He was a member of the New Testament Company on the revision of the Scriptures (1870–81), was elected president of the Wesleyan Methodist Conference (1890), from 1873 until his death was secretary of the committee for the examination of the preachers on trial, and in 1891 was a member of the Ecumenical Methodist Conference held at Washington, D. C. He translated and enlarged Winer's *Grammar of New Testament Greek* (1881), with A. S. Geden compiled *A Concordance to the New Testament Greek* (1897), and contributed the comments on the Gospel of John to *The International Revision Commentary* (1879). Consult *William Fiddian Moulton: A Memoir*, by W. Fiddian Moulton, with a chapter by James Hope Moulton (New York, 1899).

MOULTRIE, mōl'trĭ. A city and the county seat of Colquitt Co., Ga., 140 miles south of Macon, on the Atlanta, Birmingham, and Atlantic, the Flint River and Northeastern, the Georgia and Florida, the Valdosta, Moultrie, and Western, and the Georgia Northern railroads (Map: Georgia, C 4). It is a commercial and manufacturing centre, has a meat-packing plant, and produces naval supplies, mattresses, fertilizers, lumber, wool and cotton mill products. The city contains a Carnegie library and a fine government building and owns its water works and electric-light plant. Pop., 1900, 2221; 1910, 3349.

MOULTRIE, Fort. See Fort Moultrie.

MOULTRIE, John (1799–1874). An English poet and clergyman, and rector at Rugby in Thomas Arnold's time. Born in London, educated at Eton and at Cambridge, he was ordained in 1825 and was presented by Lord Craven with the living of Rugby. His friendship with Dr. Arnold is recorded in his poetry, which, in the midst of much that is dull, contains some popular poems—e.g., "Godiva" and "My Brother's Grave"—and several hymns which, in point of poetic quality, are well above most productions in that kind. His poems—originally appearing in several separate volumes—were completely collected in two volumes in 1876.

MOULTRIE, mōō'trĭ *or* mōōl'trĭ, William (1731–1805). An American soldier, prominent in the Revolutionary War. He was born in Charleston, South Carolina, received an ordinary education, and in the Cherokee troubles of 1761 was a military captain. In 1775 he was the representative of St. Helena Parish in the South Carolina Provincial Congress and later

MOUND, ADAMS COUNTY, OHIO

CIRCULAR EARTHWORK, OHIO

in the same year was chosen colonel of a South Carolina regiment. For the defense of Charleston he placed a battery at Haddrell's Point and (March, 1776) began the erection of a rude fort of palmetto logs on Sullivan's Island. This fort commanded the entrance to the harbor and on June 28 was fiercely but unsuccessfully attacked by Admiral Sir Peter Parker. Moultrie had undertaken the defense against the advice and wish of his superior officer, Gen. Charles Lee. For his success he received the thanks of Congress, and in his honor the fort was named Fort Moultrie. In September of the same year he was made a brigadier general and was put in command of the Department of Georgia and South Carolina. He defeated the British under General Gardner at Beaufort in February, 1779, and, by obstructing the advance of Prevost in May, enabled Charleston to prepare for its defense, finally entering the city and holding chief command until the arrival of General Lincoln. On the surrender of Charleston in May, 1780, he became a prisoner, but in February, 1782, he, with several others, was exchanged for Burgoyne. He was made a major general in October of that year and subsequently was twice (in 1785 and in 1794) elected Governor of South Carolina. He retired to private life after his second term and died at Charleston, Sept. 27, 1805. His *Memoirs of the Revolution as Far as it Related to the States of North and South Carolina* (2 vols., 1802) was written in part while he was a prisoner and was finished in later years.

MOUND BIRD. The mound birds are a group of gallinaceous birds, with feet like those of pigeons in not having the hallux raised above the other toes, and related to the American curassows. (See CURASSOW.) They form a family, the Megapodidæ, which, as is indicated by the name, are characterized by the possession of unusually large feet. Although the family contains two subfamilies, the mound birds proper or, as they are called in Australia, jungle fowl, and the brush turkeys (see BRUSH TURKEY), all these birds agree in the remarkable habit which has given them their widely known name. This habit is the building of a huge mound for a nest, within which the eggs are left to be hatched by heat caused by the decay of vegetable matter within the heap. These mounds vary greatly in size and shape as well as in manner of construction, and in the number and arrangement of the eggs which they contain. The simplest are where the birds excavate a hole in the sand in which the eggs are laid, and are then covered with a mixture of sand and vegetable matter. Such is the habit of the lowan, or mallee bird (*Megacephalon maleo*), of Celebes. In most cases, however, the birds scratch up grass, leaves, turf, etc., and with their large feet throw this material together in a heap. The female digs down into such a heap from the top and lays an egg, which is so placed that it is nearer the outside than the top of the mound. Just how the young escape from the mound when the egg hatches is still uncertain, but it is probably by digging through to the side. The young are well developed, feathered, and able to fly as soon as they leave the mound. The number of eggs laid by each female is still a matter of doubt; from 4 to 20 are found in each mound, and there is no doubt that several females often lay in the same heap. The eggs are white when first laid, but soon become stained by the vegetable matter in which they lie. They are remarkably large for the size of the bird and are ellipsoidal rather than oval; they measure from 3 to 4.3 inches in length, according to the species. The birds resort to the same mound season after season, but add fresh material at every egg-laying time; consequently the mounds increase with age and may be in use for many years. They are usually more or less truncatedly conical or crater-like in form, but may have one of the horizontal diameters much longer than the others. The largest one on record was reported to be about 50 feet in diameter and some 14 feet high.

The mound birds themselves are plainly colored and vary in size from a small fowl to a small turkey. They are shy and retiring and are not often seen. They frequent scrub and undergrowth along the seacoast or on the banks of streams emptying into the sea. The mounds are built in open spaces in the thick scrub or on unfrequented parts of the shore. The birds fly little and heavily and are not easily flushed, but sometimes seek shelter in trees. They are said to be noisy at night and to have hoarse call notes which they use during the day. All the Megapodidæ are inhabitants of the Australasian region and are not found north of Celebes; the majority of the species are Australian. The one best known on that continent is the scrub hen, or mound turkey, of Queensland (*Megapodius tumulus*). Another smaller one is the leipoa (*Leipoa ocellata*). The brush turkeys of New Guinea and neighboring islands belong to the genus *Tallegalus*.

Consult Gould and other authorities on the ornithology of Australia. (See BIRD.) See also Campbell, *Nests and Eggs of Australian Birds* (Sheffield, 1900), and id., "Mound-Building Birds" (with photographic illustrations of mounds), in *Bird Lore*, vol. v (New York, 1903).

MOUND BUILDERS. Specifically, a hypothetical race or people at one time supposed to have antedated the Indian tribes as inhabitants of the Ohio and Mississippi valleys; but the mound builders of the Mississippi valley are now regarded merely as the ancestors and representatives of the tribes found in the same region by Spanish, French, and English pioneers. The custom of erecting mounds has been widespread; most primitive peoples are known to have erected mounds either habitually or in some stage of their development. Most of the mounds of the typical regions in central North America are mortuary or sacrificial. The chief contents are skeletons, with ceremonial and other objects buried with the bodies, while the structures are wholly of earth; in a few cases houselike structures form the nucleus of the mound. See ARCHÆOLOGY, AMERICAN; SEPULCHRAL MOUND.

MOUND CITY. A city and the county seat of Pulaski Co., Ill., 8 miles north of Cairo, on the Ohio River and on the Cleveland, Cincinnati, Chicago, and St. Louis Railroad and a branch of the Illinois Central (Map: Illinois, F 11). It has a trade in lumber, shipbuilding interests, and manufactures of lumber, veneer, heading and hoops, etc. In the national cemetery here are 5310 graves, 2732 of unknown dead. Pop., 1900, 2705; 1910, 2837.

MOUNDS'VILLE. A city and the county seat of Marshall Co., W. Va., 11 miles south of Wheeling, on the Ohio River and on the Baltimore and Ohio Railroad (Map: West Virginia, D 2). It is the seat of the State penitentiary

and has a fine courthouse, Federal building, Reynolds Memorial Hospital, and a famous relic of the mound builders, a massive structure of conical form, after which the city was named and in which two burial vaults containing skeletons and copper ornaments were discovered by excavations of 1838. The city is in an agricultural and coal-mining region, has important commercial interests as a result of its shipping facilities, and extensively manufactures glass, lumber products, enameled ware, bricks, lamps, metal ceilings, brooms, whips, clothing, cigars, grain cradles, flour and feed, foundry products, leather, etc. The government is vested in a mayor, elected every two years, and a unicameral council. Pop., 1900, 5362; 1910, 8918; 1914 (U. S. est.), 10,433; 1920, 10,669.

MOUNET, mōō'nâ', (JEAN) PAUL (1847–1922). A French actor, brother of Jean Mounet-Sully. He was born at Bergerac, Dordogne, became a doctor of medicine, and first appeared on the stage in *Horace* at the Paris Odéon (1880). It was in 1889 that he first played at the Comédie Française, of which he became sociétaire two years later. Mounet gained his reputation in *Les Erynnyes*, *L'Arlésienne*, *Othello*, *Patrie*, *Hamlet*, *La Furie*, *Anthony*, *Le Roi*, *L'Enigme*, *Le Dédale*, and *Œdipe Roi*. He served also as a professor at the Paris Conservatoire and became Chevalier of the Legion of Honor.

MOUNET-SULLY, sụ'lē', JEAN (real name, JEAN SULLY MOUNET) (1841–1916). A French tragedian. He was born at Bergerac and at 21 entered the Conservatoire. After beginning his career at the Odéon (1868) he served in the Franco-Prussian War and in 1872 made his début at the Théâtre Français. Admirably gifted by nature, he became famous for the power and passion of some of his impersonations. His successes were both in classic repertoire and in more modern plays: *Andromaque*, *Le Cid*, *Iphigénie*, *Phèdre*, *Zaïre*, *Hernani*, *Ruy Blas*, *Antigone*, *Othello*, *Marion Delorme*. Perhaps his most notable achievement, however, was his production of *Œdipe Roi* in the fêtes at the old Roman Theatre of Orange, a performance repeated in Paris at the Théâtre Français (1888) and some years later in New York. His Hamlet also counts among his most serious efforts. He wrote, with Barbier, the drama *La vieillesse de Don Juan* (1906), in which he assumed the title rôle. Consult Brander Matthews, *The Theatres of Paris* (New York, 1880).

MOUNIER, mōō'nyā', JEAN JOSEPH (1758–1806). A French politician and author, born in Grenoble (Isère). He became judge at Grenoble in 1783, secretary of the estates of Dauphiné in 1788, and in 1789 was elected deputy to the States-General. There he unsuccessfully advocated the system of two legislative chambers, a subject which he also expounded in his *Considérations sur les gouvernements, et principalement sur celui qui convient à la France* (1789). He was elected President of the National Assembly in 1789, but soon afterward resigned because of the decision to remove the Assembly to Paris. He withdrew to Switzerland and thence to Weimar, published his *De l'influence attribuée aux philosophes, aux francs-maçons et aux illuminés, sur la révolution de France* (2d ed., 1828), and in 1801 returned to France, where Bonaparte appointed him Prefect of Ille-et-Vilaine (1802) and Councilor of State (1805). His further publications include *Recherches sur les causes qui ont empêché les Français de devenir libres* (1792). Consult De Lanzac de Laborie, *Un royaliste libéral en 1789: Jean Jos. Mounier* (Paris, 1887).

MOUNT, FOR GUNS. See COAST ARTILLERY; GUNS, NAVAL; ORDNANCE.

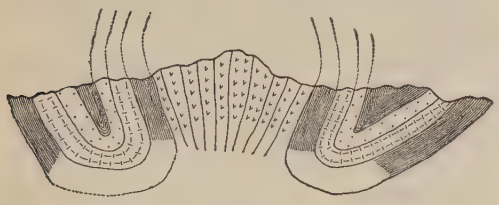
MOUNT, WILLIAM SIDNEY (1807–68). An American genre and portrait painter. He was born at Setauket, Long Island, and studied at the National Academy, New York, of which he was made a member in 1832. His first works to gain repute were the "Daughter of Jairus," exhibited in 1828, a full-length portrait of Bishop Onderdonk, and a number of clever children portraits. It was not until the exhibition of "Husking Corn" that his special talent for genre painting was recognized. Mount was the forerunner of a whole school of genre painters. His scenes are sympathetically composed and his figures well drawn and natural; he had a keen eye for humor and was one of the first Americans to portray the negro character successfully. Among his best paintings are: "Bargaining for a Horse," "The Fortune-Teller," and "The Truant Gamblers," all in the New York Historical Society; "Raffling for a Goose" (1837), Metropolitan Museum, New York; "A Long Story" (1837), Corcoran Gallery, Washington; "Coming to the Point," Public Library, New York.

MOUNTAIN (OF. *montaigne*, *muntaigne*, Fr. *montagne*, from ML. *montanea*, *montana*, mountain, from Lat. *montanus*, mountainous, from *mons*, mount). A term somewhat loosely used for a high prominence on the earth's surface with steep slopes. The distinction between mountain and hill is merely one of size. A plateau is distinguished from a mountain by its broader top and sometimes by its gentler slopes. Where a mountain forms a linear elevation it is called a range, ridge, chain, or sierra. Where the ridges are grouped in parallel lines, or *en échelon*, the groups are called mountain chains, systems, or cordilleras. These terms are sometimes given more precise meanings. *Mountain ridge* is sometimes confined to a series of parallel ranges, all of which were formed within a single geosyncline or on its borders. *Mountain system* is applied to a number of parallel or consecutive ranges formed in separate geosynclines of approximately similar dates of upheaval. *Mountain chain* is applied to two or more systems of the same general region of elevation, but of different dates of origin. *Cordillera* is applied to several mountain chains in the same part of the continent. Most of the names applied to parts of mountains explain themselves. Crest, peak, knob, pinnacle, needle, valley are familiar to all. A gorge or cañon or clove is distinguished from a valley by its steep slopes and narrow bottom; a park is a broad valley; a col or saddle is an exceptionally low point in a crest; a cirque is a steeply walled, outward facing amphitheatre near the crest of the range.

Types and Origin of Mountains. Mountains are formed (1) by uplift, (2) by circumdenudation or land sculpture, and (3) by eruptive agencies; and mountains formed in these three ways have characteristic and distinguishing forms.

1. By far the larger number of mountains due to uplift are in the form of folds or wrinkles in the earth's crust. These folds take

on a great variety of form and arrangement. Usually a number are parallel, but not coextensive in their longer directions, lapping by one another *en échelon*. They may be upright or overturned at various angles. They may be



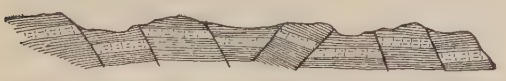
FAN STRUCTURE, ALPS.

compressed along the limbs and spread out at the crest in such a way that the strata on both sides of the axial plane of the fold dip towards this plane, a type of folding called the fan fold, sometimes the Alpine structure, because of its excellent development in the Alps. On the major folds with this variety of attitude may be imposed smaller folds, just as smaller waves are superimposed on the greater waves of a body

SYMMETRICAL FOLD, JURA MOUNTAINS.

of water. Again, the folds are themselves folded in directions transverse to their longer directions. Examples of mountain systems representing folds of the earth's crust are the Alps, the Jura, the Appalachian system, the Coast Ranges, and most of the Rocky Mountains.

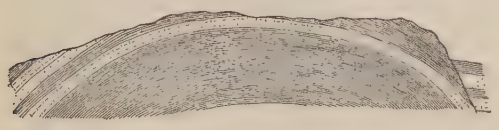
Another type of uplift is shown in the Basin Ranges of Nevada, Idaho, Arizona, and New Mexico and is known as the Basin Range structure. Here the uplift is not accompanied by



FAULTED STRUCTURE, BASIN RANGE.

any horizontal compression. The rocks apparently have been uplifted vertically in great blocks owing their outlines to joints or faults, while others remain stationary or go down. Not infrequently a series of such blocks is tilted in a monoclinal manner, corresponding edges of different blocks going up and the opposite edges going down, the elevated edges thus making mountains and the depressed edges valleys.

Still another type of uplift is shown in the Uinta Mountains of Utah, where a great mass of



BROAD ARCHED FOLD, UINTA MOUNTAINS.

rock has been lifted vertically above the adjacent rocks with only a gentle arching.

Two theories have been proposed to explain mountains of the fold type—the so-called gravitation theory and the contraction theory. It has been observed that mountains formed by folding or faulting are for the most part composed of great thicknesses of sediments which were deposited in the same general geosyncline, i.e., in the same great depression of the earth, or perhaps which were deposited in areas which became geosynclines owing to subsidence of the area under the weight of the sediments. It is supposed that the load of sediments may cause the isogeotherms to rise, i.e., causing the rocks at a certain level to have a higher temperature than they otherwise would have. This, perhaps combined with the injection of igneous rocks, which are sometimes observed to occur in such areas, causes the rocks to expand, resulting in folds or mountains. To this there are a number of objections. The expansion possible by this cause is not sufficient to explain the amount of folding observed, and furthermore it does not explain the occurrence of the folds in parallel ridges. The contraction theory is briefly this: The cooling of the earth is proceeding more rapidly in the interior than at the cool exterior. This causes more rapid contraction of the interior than of the exterior, and the crust, in its tendency to make itself smaller in order to fit the smaller nucleus, becomes wrinkled and corrugated. The wrinkles become located along points of weakness. These are likely to be under the geosynclines near the continental lands where great sedimentation has occurred, where, as above seen, the temperature is supposed to be higher.

2. When an area is elevated above the sea, the natural forces of erosion, wind, water, changes of temperature, etc., begin their attack upon the land and slowly cut it down, the waters collecting in rills, brooks, and rivers, cutting small and large valleys with a variety of forms and distribution due to the varying hardness and the structure of the materials cut through. If carried far enough, this process will ultimately bring the elevated area to sea level. At certain stages in the process certain areas, because of their hardness or structure, may stand high above the surrounding areas which have been worn away and may be called mountains. In so far as mountains have already been formed by folding and elevation, subsequent erosion only modifies their shapes; but where uplift has not left the land in mountain form, subsequent denudation may bring it into this point. Mountains formed or modified in this way have a variety of shapes. When the strata are horizontal, a hard layer at the top may resist erosion sufficiently long to make the mountain a flat or table-top mountain. Hard volcanic material about a volcano may resist erosion more than the surrounding material, and the area thus stand as a lava-topped mountain. The mesas and buttes of the Great Basin region of the United States illustrate the effects of erosion upon rocks of different hardness. If the strata are much folded, erosion cuts down along lines of least resistance, usually following the softer strata, leaving the edges of the harder ones as ridges. This state of affairs appears in the Appalachian system, a system owing its present features to folding and elevation combined with differential denudation along softer layers.

3. Mountains formed by eruption of igneous rocks are of common occurrence. Volcanic mountains formed by lavas occurring either singly or grouped in lines are well known. Vesuvius, Rainier, Hood, St. Helen's, Lassen,

and Shasta are examples of these. The volcanic materials may be so grouped as to form an upland of considerable extent, as the Cascade Range. Eruptions of igneous rocks which never reach the surface also form mountains by bulging up the strata above them. Going upward towards the surface they find it easier at a certain point to spread out in a globular form (called laccolite), arching the strata above them, than to break through the overlying strata and come to the surface. The mountain thus formed is a dome with a nucleus of igneous material, which latter may be afterward exposed to view by erosion along the crest of the arch. The Henry and Huerfano mountains of the western United States are of this type.

Mountains and Climate. Mountains fulfill important uses in the economy of nature, especially in connection with the water circulation of the world. They are at once the great collectors and distributors of water. In the passage of moisture-charged winds across them the moisture is precipitated as rain or snow. When mountain ranges intersect the course of constant winds and abstract the moisture, they produce a moist country on the windward side and a comparatively dry and arid one on the leeward. This is exemplified in the Andes, the precipitous western surface of which has a different aspect from the sloping eastern plain; and so also the greater supply of moisture on the southern sides of the Himalayas brings the snow line 5000 feet lower than on the northern side. Above a certain height the moisture falls as snow, and a range of snow-clad summits would form a more effectual separation between the plains on either side than would the widest ocean, were it not that transverse valleys are usually of frequent occurrence, which open up a pass, or way of transit, at a level below the snow line. Some ranges, like the Pyrenees and the Caucasus, are practically impassable except near their ends. Mountains also show considerable vertical variation in their life and climate zones. It is well known that, other things being equal, the air is one degree cooler for every 300 feet of ascent, and also that the rate of precipitation increases upward. At a certain elevation rain gives way to snow. Corresponding to these varying conditions of temperature and moisture is the distribution of the vegetation, which is commonly in well-defined zones, each zone distinguished by its species from the zones above and below. Near the top of many mountains the vegetation ends altogether, and the peaks are absolutely barren, the limit being reached more rapidly in cold than in warm climates.

Age of Mountains. The age of most folded mountain systems has been determined by the structure of the sediments of known age which compose them, and their relation to other sediments of known age. For instance, the Appalachian system of the eastern United States, composed mainly of Paleozoic rocks, is much contorted, while rocks of Mesozoic age rest against this mountain system in relatively undisturbed layers. It is clear that the main uplift of the mountain system followed the deposition of the Paleozoic rocks and preceded that of the Mesozoic rocks. The age of volcanic mountains is determined by the relations of the volcanic materials of surrounding sedimentary rocks of known age. The mountain systems of the world were formed at various times. Some of them have represented areas of weakness where several mountain-making movements have occurred, as in the Rockies, Pyrenees, Alps, Jura, and Himalayas. Others have been cut down by denudation to their very roots and do not now appear as mountains. The greatest and loftiest mountains of elevation have for the most part received their main uplift in comparatively recent geological times.

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MOUNTAIN, George Jehoshaphat (1789–1863). A Canadian Anglican bishop, son of Jacob Mountain. He was born in Norwich, England, was educated at Cambridge, and, having gone to Canada, was in 1813 ordained priest. After filling pastorates at Fredericton, N. B., and Quebec, he became Archdeacon of Quebec in 1821 and in 1836 Bishop, with the title of Bishop of Montreal. Shortly afterward the Bishop of Quebec retired, and Mountain took entire episcopal charge of the two provinces until 1839, when Upper Canada was made a separate see. In 1849–50 through his efforts the dioceses of Rupert's Land and Montreal were established, and he became Bishop of Quebec, retaining the position until his death. He founded the Church Society in Canada, and Bishop's College, Lennoxville. He published: *The Journal of the North-West American Mission* (1845; 2d ed., 1849); *Songs of the Wilderness* (1846), a book of poems; and several sermons. Consult A. W. Mountain, *A Memoir of George Jehoshaphat Mountain* (Montreal, 1866).

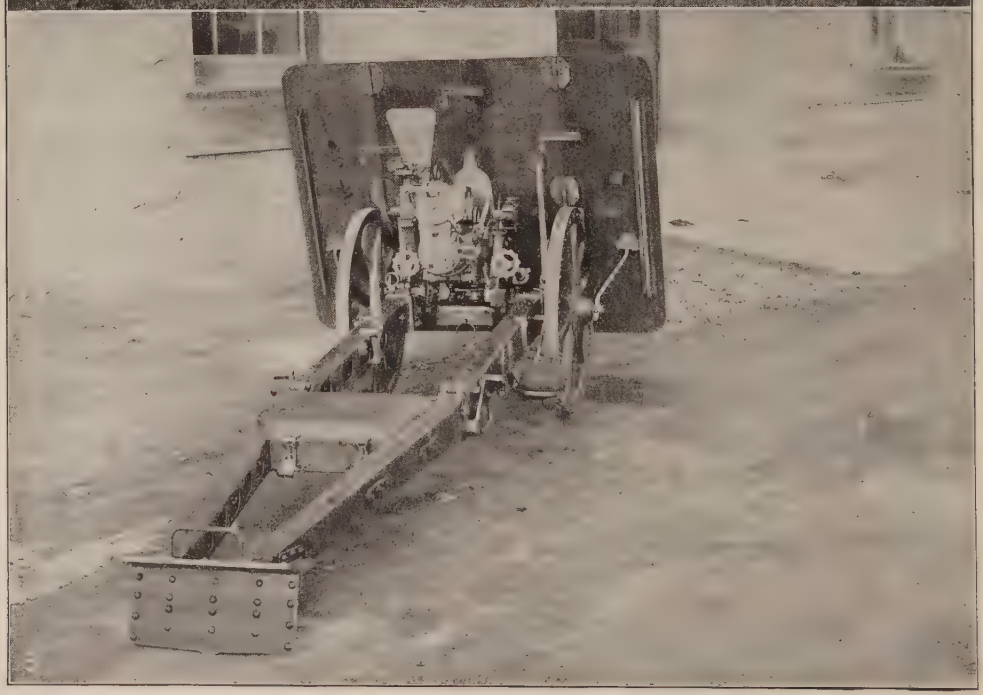
MOUNTAIN, Jacob (1750–1825). The first Protestant Bishop of Quebec. He was born in the County of Norfolk, England, was educated at Cambridge University, and was afterward ordained a priest of the Church of England. He held livings in Norfolk, Huntingdonshire, and Lincolnshire (1781–93) and in the latter year was made Bishop of Quebec. In 1792 Canada was divided into two provinces, Upper and Lower Canada. There were only six Anglican clergymen in the former province and three in the latter; but Mountain took episcopal charge of both provinces and by great energy and devotion during 32 years became the founder of the Anglican church in Canada. He built churches, extended missions, and also gave his services in a judicial and executive capacity at a time when the British régime was being organized in Lower Canada.

MOUNTAIN, The. The name of a political faction in the French Revolution. See Montagnards.

MOUNTAIN, or PACK, ARTILLERY. Field artillery in which the gun and all its equipment and ammunition are habitually transported on the backs of animals, instead of being drawn on wheeled carriages. The desirability of having a gun of large calibre (usually 3-inch)

UNITED STATES ARMY THREE-INCH MOUNTAIN HOWITZER PACKED ON MULES AND READY FOR THE FIELD

The five packs represent the distribution of the load of one gun



1. UNITED STATES ARMY MOUNTAIN BATTERY EQUIPPED FOR FIELD SERVICE

2. 2.95-INCH VICKERS MAXIM MOUNTAIN GUN (ENGLISH). Used in United States Army until replaced in 1915 by 3-inch Mountain Gun of Ordnance Department. Gun in action. Note wheels in the air

3. UNITED STATES ARMY 3-INCH HOWITZER. Rear view of carriage

available in difficult country inaccessible to wheeled transportation led to the invention and development of the modern mountain gun. The more accurately descriptive term is *pack* artillery, for the reason that such guns are frequently used in country which is not mountainous, but difficult from some other cause, e.g., on account of lack of trails, thick undergrowth, marshes, etc. Like all other field artillery, the mountain gun exists only for the support of infantry and cavalry. On account of its mobility, quietness, and relative invisibility as compared with wheeled carriages requiring six harnessed animals, mountain artillery is peculiarly fitted to advance with and coöperate in the close support of infantry lines. A single mountain gun, including its carriage and other equipment, is usually carried as five mule loads. (See illustration.) A mule with his load is not as high as a mounted man, and when led in single file, with extended distances, along ditches, beds of streams, behind hedges, etc., he is far more easily concealed than the light artillery carriage with its three hitched teams and mounted drivers. A packed mule can go anywhere a man can climb without using his hands. After the mule has reached his limit of mobility, his load may be removed, carried forward by four men, and the gun assembled on its small wheels and axle and dragged by hand to positions impossible to reach with other types of field guns. Although usually about the same calibre and using about the same weight projectile, the mountain gun, owing to weight limitations, is less powerful than the 3-inch light artillery gun.

A mule load should not much exceed 250 pounds, its length should not be over 4 feet, 6 inches. A gun weighing only 250 pounds is insufficient in power for modern requirements. For this reason the modern gun itself is usually divided into two loads, transported on two mules, and assembled upon unpacking. In several modern guns this division is made just behind the base of the cartridge, the breech ring and breech block being carried on the second mule. The number of mules required to transport a single complete gun, including its carriage and equipment, varies in different armies. The usual number, as in the United States, is five mules; in some other armies, three or four. In addition there are mules to carry the ammunition, baggage, grain, rations, etc. The men, with the exception of the officers and certain noncommissioned officers who are mounted, walk and lead the packed mules. The organization is like that for light artillery (q.v.), usually four guns to the battery, three batteries to the battalion, two battalions to the regiment. In the American service there are only six regiments of field artillery. Two of these, or one-third the total, are equipped with mountain guns. This proportion is much larger than that obtaining in other armies, but is no doubt maintained on account of the necessity for mountain guns in the American colonial possessions and for possible use in Mexico. The 3-inch United States mountain gun which was issued to the service in 1915 weighs about one-third as much as the corresponding 3-inch light field gun. Its initial velocity is 900 foot seconds as compared with 1700; weight of projectile 16 pounds as compared with 15; maximum range 5500 yards as compared with 6500. The angles of elevation and fall are much greater, the mountain gun being in fact a howitzer (q.v.). The gun and carriage are carried as five mule loads as follows: gun, cradle, top carriage and axle, trail, shields and wheels.

On the mountainous frontiers of northern Italy the Alpini, or frontier troops, organized to defend the passes, are supported by 36 mountain batteries. For similar reasons the Swiss army has a large number of mountain guns. Austria, surrounded by mountains, has given special attention to such guns. Her army has also a 30-pounder mountain howitzer, drawn on a narrow-gauge wheeled carriage and limber by three mules hitched tandem. When wheels cannot be used, the howitzer is dismounted and dragged on the trail, which is designed so as to be used as a sleigh.

In the European War of 1914 mountain artillery played an important part in the Carpathian Mountains and along the German and French Swiss frontiers. The Japanese frequently found them necessary in Manchuria during the Russo-Japanese War of 1904–05. Consult: United States War Office, *Drill Regulations, Mountain Artillery* (Washington, 1908); H. A. Bethell, *Modern Guns and Gunnery* (Woolwich, 1910); id., *Modern Artillery in the Field* (New York, 1911); Bond and McDonough, *Technique of Modern Tactics* (Menasha, Wis., 1913); H. G. Bishop, *Elements of Modern Field Artillery* (ib., 1914). See HOWITZER.

MOUNTAIN ASH. A coal-mining town and urban district in Glamorganshire, Wales, 5 miles south of Merthyr-Tydfil. It contains many fine buildings, including the town hall, the hospital, and the library institute and public hall. It has large collieries and foundries, owns its water and gas works, and maintains slaughterhouses. Pop., 1901, 31,093; 1911, 42,246.

MOUNTAIN ASH, ROWAN TREE, or QUICKEN TREE (*Pyrus aucuparia; Sorbus aucuparia* of many botanists). An ornamental European

MOUNTAIN ASH.

tree of the family Rosaceæ. It does not attain a great size; has in general a straight erect stem; and is distinguished from species of the other sections of *Pyrus* by pinnate glabrous leaves of serrated leaflets, terminated by a

single leaflet; corymbs of small flowers; and small globose fruit. The wood is valued for its compactness. The inner bark and sapwood have a peculiar odor. In the superstitions of European peasants a twig of rowan tree was supposed to have great efficacy in scaring away evil spirits. The generally red, sometimes yellow, fruit (rowan berries), which is acid and somewhat bitter, is sometimes used for preserves. The very nearly allied American species (*Pyrus americana*), which has bright-red fruit, is a shrub or small tree distributed from Newfoundland to Manitoba and southward in the mountains, and often planted as an ornamental. The wood is soft, light, and little used. Somewhat similar to it is the elder-leaved mountain ash (*Pyrus sitchensis*), a hardy species ranging north to Labrador and Alaska, but seldom found south of the Great Lakes region. It differs from *Pyrus americana* in its leaves, larger flowers, and fruits.

MOUNTAIN BEAVER. The sewellel (q.v.).

MOUNTAIN CAT. 1. In California, the cacomistle. 2. Any of several wild cats regarded as peculiar to local mountain regions; a catamount.

MOUNTAIN CHAIN. See MOUNTAIN.

MOUNTAIN CLIMBING. The awakening of man's interest in mountains is chiefly due to Rousseau, though earlier writers, while approaching them as scientists, were also susceptible to their charm. This twofold interest led Saussure to incite J. Balmat to find a way to the summit of Mont Blanc in 1786 and to accompany him thither in 1787. From that ascent alpinism is generally dated. In London in 1857 was formed the first alpine club to foster "the community of feeling amongst those who in the life of the High Alps have shared the same enjoyments, the same labors, and the same dangers." This idea, in a modified form, was taken up throughout continental Europe and advocated with such enthusiasm that doubtless 150,000 persons of both sexes are now enrolled in the various alpine societies. The largest of these are the German and Austrian (founded in 1862), about 98,000 members; Swiss (1863), 12,000; Italian (1863), 9036; and French (1874), 7000. In 1907, during the jubilee of the original alpine club, the Ladies Alpine Club was formed in London. In America several strong societies have come into being: the Appalachian Mountain Club (q.v.) in Boston (1876), 1800 members; the Sierra Club (1892) in San Francisco, 1900; the Mazamas (1894) in Portland, Oreg.; the Mountaineers in Seattle (1907), 500; and the Alpine Club of Canada (1906), 800. In these derivative societies eligibility is based upon a love of nature and of the mountain in particular rather than on alpinism proper, though most of them contain a contingent of expert climbers. The American Alpine Club (1902), 82 members, with its home in Philadelphia, reverts to the original type, but adds to its field polar exploration and the study of glaciers.

PRINCIPAL FIRST ASCENTS

NAME	Locality	Height	Year	Party
Mont Aiguille	Dauphiny	7,000	1492	Dompjulian de Beaupré
Pic du Midi	Pyrenees	9,547	15—	De Candale
Titlis *	Swiss Alps	10,627	1739	Anonymous
Mont Blanc †	" "	15,781	1786	Balmat and Paccard
Jungfrau	" "	13,672	1811	J. R. and H. Meyer
Finsteraarhorn	" "	14,026	1812	H. Meyer et al.
Monte Rosa ‡	" "	15,217	1855	Smyth et al.
Schreckhorn	" "	13,385	1861	Leslie Stephen
Weisshorn	" "	14,803	1861	J. Tyndall
Dent Blanche	" "	14,318	1862	E. S. Kennedy, C. Wigram
Matterhorn	" "	14,780	1865	E. Whymper et al.
Gross Glockner	Tyrolese Alps	12,457	1799	
Ortler†	" "	12,800	1804	Josele (a hunter)
Kasbek	Caucasus	16,546	1868	D. W. Freshfield et al.
Elbruz †	"	18,470	1868	" " "
Ushba	"	15,700	1888	J. G. Cockin
Dykhtau	"	17,000	1888	A. F. Mummery
Bride Peak	Himalayas	25,100	1909	Duke of the Abruzzi to 24,583§
Trisul	"	23,406	1907	T. Longstaff
Kabru	"	24,015	1883	W. W. Graham
Pioneer Peak	"	22,600	1892	W. M. Conway
Lungma	"	22,868	1903	Dr. W. H. and Mrs. Workman
Mount Cook†	New Zealand	13,349	1895	M. Zurbriggen (guide)
Chimborazo	Andes	20,498	1879	E. Whymper
Aconcagua	"	22,860	1897	S. Vines, Zurbriggen
Huascaran	"	21,812	1908	Annie S. Peck
Illimani	"	21,030	1898	W. M. Conway
Mount Washington †	White Mountains	6,293	1642	Darby Field
Pikes Peak	Rocky Mountains	14,147	1820	E. James et al.
Hood	Cascades	11,934	1854	Barlow et al.
Rainier	"	14,408	1870	Stevens and Van Trump
St. Elias	"	18,024	1897	Duke of the Abruzzi et al.
Sir Sandford †	Selkirks	11,590	1912	Palmer, Holway, et al.
Dawson	"	11,100	1899	C. E. Fay, H. C. Parker
Robson	Canadian Rockies	13,068	1909	Kinney and Phillips
Temple	" "	11,637	1894	S. E. Allen, W. D. Wilcox et al.
Assiniboine	" "	11,860	1901	J. Outram
McKinley	Alaska	20,464	1913	H. Stuck
Blackburn	"	16,140	1912	Dora Keen
Ruwenzori	Africa	16,744	1906	Duke of the Abruzzi

* The first snow peak. † The highest in range.
‡ The highest summit. § The world's "record" climb.
In most instances the guides are not mentioned in this list.

Thus cultivated, Alpine climbing has attained almost to a science. Its principles are set forth in extended manuals, such as Dent's *Mountaineering*, Badminton Library (London, 1892). It

has called into existence the class of professional guides—Swiss, Tyrolese, and Italian—whose skill far exceeds that of the best amateurs. Their aid, always expedient in tours above snow lines, has until recently been regarded as indispensable in attacks upon giant peaks in distant lands, but the most recent conquests by American climbers in Alaska (Mounts McKinley and Blackburn) have been made without guides.

In England, especially, mountain climbing has from the beginning held a high rank among recognized sports and the Alpine Club has always numbered among its members many of the leading scientific, literary, and professional men of the nation, such as Tyndall, Lister, Stephen, and Bryce. Properly conducted it is not a dangerous sport, much as the unhappily large toll of lives annually sacrificed through rashness or inexperience would seem to argue to the contrary. These casualties usually occur in the Alps, to which the annual resort is very great, and have never attended the carefully planned ascents of the great peaks in more distant fields. Even in Switzerland it is true that disaster seldom if ever attends the ascent of the most difficult peaks such as the Gripon, the Charmoz, and the most difficult routes of the Matterhorn. Attempted only by experts, with the most experienced guides and only under the most favorable conditions, and conducted with unremitting care, the elements of risk are reduced to a minimum. The principal causes of accidents are avalanches, falling stones, breaking through cornices that overhang precipices below the summit arêtes or through snow bridges into concealed crevasses, or falls in attempting difficult crags or chimneys, often from the giving way of hand or foot holds—nearly all of which are avoidable.

Alpine ascents involve two quite different elements—snow and ice work and rock climbing. In both, the alpine rope and ice axe are indispensable aids, the former for binding together the members of the party (three is the ideal number), of whom in critical places but one moves at a time, the others being as firmly anchored as possible; the ice axe is used not merely for step cutting but also for varied service in rock climbing, as well as to replace the alpenstock. The firmness of foothold is increased by the use of various types of nails that stud the soles of the heavy waterproof boots and protect their edges from abrasion.

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MOUNTAIN CORK, or **MOUNTAIN LEATHER.** A fibrous and asbestos-like variety of amphibole (q.v.). See ASBESTOS.

MOUNTAIN CRANBERRY. See CRANBERRY.

MOUNTAIN DEVIL. See MOLOCH.

MOUNTAIN FINCH. See BRAMBLING.

MOUNTAIN GAZELLE. See GAZELLE.

MOUNTAIN GOAT. See ROCKY MOUNTAIN WHITE GOAT.

MOUNTAIN GREEN. See GLAUCONITE; GREEN EARTH.

MOUNTAIN GUN. See HOWITZER; MOUNTAIN ARTILLERY.

MOUNTAIN HERRING. The Rocky Mountain whitefish (*Coregonus williamsoni*), found in clear streams from the northern Rocky Mountain ranges to the Pacific coast. It is good food and is esteemed by anglers, as it readily takes a fly. See WHITEFISH, and Plate of WHITEFISH, SMELTS, ETC.

MOUNTAIN LAUREL. See KALMIA.

MOUNTAIN LEATHER. See ASBESTOS.

MOUNTAIN LIMESTONE. The basal strata of the Carboniferous series in the south of England and Wales. It is highly fossiliferous and carries a few ores. Its chief use is for building stone. The term was applied to the calcareous rocks of the American Subcarboniferous, but soon fell into disuse. See CARBONIFEROUS LIMESTONE.

MOUNTAIN LION. The name in the western part of the United States for the panther, cougar, or puma (*Felis concolor*, or *couguar*). Early writers upon America reported that the lion was a resident of North America from the skins they saw among the Indians, which they supposed to be those of lionesses. See PUMA; HUNTING BIG GAME.

MOUNTAIN MEADOWS MASSACRE. In American history, the massacre, by Indians, near Mountain Meadows in Utah on Sept. 11, 1857, of a party of emigrants from Arkansas and Missouri passing through Utah on their way to southern California. They numbered, all told, about 140 men, women, and children. On their way they were everywhere refused food until they reached the neighborhood of Mountain Meadows, a valley in Iron County, about 350 miles south of Salt Lake City. Here they stopped to rest their horses and on Sept. 7, 1857, were fired upon by Indians and, it is alleged, by Mormons disguised. They withstood siege until September 11, when, on promise of protection by John D. Lee (q.v.), Mormon Bishop and Indian agent, they left the shelter

of their wagons. All adults and children over seven years of age were killed, and 17 younger children were distributed among Mormon families, but were afterward restored to relatives by the United States government. The Mormons were accused of having instigated the massacre. Lee was executed for this crime in 1877, but a number of other indicted persons escaped conviction. In a confession made shortly before his execution Lee asserted that the massacre was committed by order of Brigham Young (q.v.) and others high in the Mormon church. H. H. Bancroft, in his *History of Utah*, discredits the confession, however, and lays the blame upon Lee and other minor fanatics. In his opinion Young was too astute to risk incurring the wrath of the American people by such an act. Consult *Confessions of John D. Lee* (St. Louis, 1891), and Linn, *Story of the Mormons* (New York, 1902).

MOUNTAIN MOCKING BIRD. See Mocking Bird.

MOUNTAIN PLANTS. The chief features of mountain plants have been discussed under the head of Alpine Plant. At the bases of most mountains the vegetation closely resembles that of the surrounding lowlands, but with elevation changes appear which correspond to the changes observed as the globe is traversed towards high latitudes. For example, in the mountains of Mexico the typical vegetation of the lowlands gives place with ascent to various zones of trees, including forms which are deciduous like those of the United States, then conifers like those of the northern United States and Canada, and finally into mosses and lichens characteristic of the alpine regions. Mountains contain a large proportion of endemic plants. This is doubtless due to their relative isolation. Mountain endemism is particularly characteristic of the alpine forms, probably because the conditions for their migration are less favorable than for those farther down. Some plants characteristic of mountain habitats are shown in the accompanying plate. See Endemism.

MOUNTAIN PLOVER. A ring plover (*Ægialitis montana*, or *Podasocys montanus*), very common throughout the Rocky Mountain region and neighboring plains, where its sandy gray plumage renders it almost invisible when it alights. It remains in the open lands and rarely ascends above the level (8000 to 9000 feet) of the interior parks. It breeds throughout its summer habitat.

MOUNTAIN QUAIL. A local name of two Californian partridges: (1) the plumed partridge (*Oreortyx picta*) and (2) Gambel's partridge (*Lophortyx gambeli*). See Ptarmigan; Quail; and Plate of Partridges.

MOUNTAIN SHEEP. The Rocky Mountain sheep. See Bighorn; Hunting Big Game.

MOUNTAIN SICKNESS, or Aviators' Disease. See Occupational Diseases.

MOUNTAIN SPINACH. See Orache.

MOUNTAIN SYSTEM. See Mountain.

MOUNTAIN TEA. See Gaultheria.

MOUNTAIN VILLAGE. An Eskimo settlement on the Yukon River, about 100 miles from its mouth. It has a Roman Catholic mission and a government school. The natives in 1913 owned 438 reindeer. Pop., 1915, about 300.

MOUNT AIRY. A city in Surry Co., N. C., 40 miles northwest of Winston-Salem, on the Southern and the Mount Airy and Eastern railroads (Map: North Carolina, B 1). Lumbering and the quarrying of granite constitute the chief industries. The electric light and power plant is owned by the city. Pop., 1900, 2680; 1910, 3844.

MOUNT ATHOS. See Athos.

MOUNT AUBURN. A well-known cemetery in Cambridge, Mass., containing the graves of many celebrated men, including Longfellow, Lowell, Charles Sumner, and Phillips Brooks.

MOUNT CAR'MEL. A mountain range of Palestine. See Carmel.

MOUNT CARMEL. A city and the county seat of Wabash Co., Ill., on the Wabash River, 35 miles northwest of Evansville, Ind., on the Cleveland, Cincinnati, Chicago, and St. Louis and the Southern railroads (Map: Illinois, J 9). The city contains a public library and attractive courthouse and high-school buildings. It is in a rich agricultural region. Besides railroad shops of the Big Four, there are manufactories of tomato catsup, ice, paper, strawboard, lumber, staves, and flour. Settled in 1818, Mount Carmel was chartered as a city in 1865. Pop., 1900, 4311; 1910, 6934.

MOUNT CARMEL. A borough in Northumberland Co., Pa., 71 miles northeast of Harrisburg, on the Northern Central, the Philadelphia and Reading, and the Lehigh Valley railroads (Map: Pennsylvania, J 5). There are extensive anthracite mining interests here and in the vicinity, and an important coal trade is carried on. The borough has also manufactures of miners' caps, cement blocks, cigars, shirts, stockings, etc., and large silk and planing mills, foundry and machine shops, a knitting mill, lumber yards, a packing plant, and wagon works. Pop., 1900, 13,179; 1910, 17,532; 1914 (U. S. est.), 19,386; 1920, 17,469.

MOUNT CAR'ROLL. A city and the county seat of Carroll Co., Ill., 128 miles west of Chicago, on the Chicago, Milwaukee, and St. Paul Railroad (Map: Illinois, E 1). It has a public high-school library, the Frances Shimer school for girls, a Carnegie library, and the Caroline Mark Home for Old Ladies. Though agriculture, dairying, and stock raising are the main interests, there are valuable lead and iron-ore deposits in the vicinity. The water works are owned by the city. Pop., 1900, 1965; 1910, 1759.

MOUNT CLEM'ENS. A city and the county seat of Macomb Co., Mich., 20 miles by rail northeast of Detroit, on the Clinton River, at the head of navigation, and on the Grand Trunk Railroad (Map: Michigan, G 6). It is a popular summer and health resort, beautifully situated, and noted for its mineral springs, which possess curative properties for many diseases. The city has a Carnegie library and well-equipped hotels and bathhouses. Its industrial interests are represented by a large beet-sugar factory, cooperage works, and establishments producing carriages, wagons, sleighs, automobile springs, bathtubs, typewriter cabinets, pottery, and agricultural implements. Settled in 1802, Mount Clemens was laid out in 1818 by Judge Christian Clemens and was incorporated first in 1878. The government is administered, under the conventional charter of Michigan cities of the fourth class, by a mayor, annually elected, and a unicameral council. The city owns and operates the water works. Pop., 1900, 6576; 1910, 7707.

MOUNT DESERT, dĕ-zĕrt' *or* dĕz'ĕrt. The largest of the many islands along the coast of

MOUNTAIN PLANTS

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1 ERODIUM PETRÆUM.
2 CAMPANULA PULLA.
3 DIANTHUS HIRTUS
4 GENTIANA ACAULIS.
5 PEDICULARIS ELONGATA.
6 LEUCOJUM VERNUM.
7 DAPHNE CNEORUM.
8 BULBOCODIUM RUTHENICUM)
9 SAXIFRAGA OPPOSITIFOLIA.

Maine. It is separated from the mainland on its northern end by Mount Desert Narrows (Map: Maine, D 4). A ridge of hills extends across the southern portion of the island, several of the peaks rising somewhat above 1000 feet. Numerous small bays and coves indent the coast, and there are many picturesque lakes and ponds. These lakes, with the rugged mountains and the bold cliffs along the coast, where there is much fine surf, furnish the inspiring and characteristic scenery which has made Mount Desert one of the most famous and attractive summer resorts on the Atlantic coast.

The principal harbors are Bar Harbor (so called on account of the bar which shows at low water between it and Bar Island, about ½ mile offshore), on the northwestern coast; Northeast Harbor and Southwest Harbor, at the entrance of Somes Sound; and Seal Cove, at the outlet of Seal Cove Pond—each with a village of the same name. Near the coast lie numerous islands, of which the largest are Bartlett, Swan, the Cranberry Isles, and Ironbound and several smaller islands off Bar Harbor. All of these islands are used as summer resorts. Mount Desert is connected with the mainland by a bridge across the Narrows (above referred to).

The principal village is Bar Harbor, an unincorporated settlement in Eden Township, with a population of about 2000, which is greatly augmented during the summer. It is on a branch of the Maine Central Railroad and is also served by steamship lines from New York, Boston, Portland, and other Atlantic coast ports. The ocean here is often too cold for bathing, even in summer; and a large open-air sea-water swimming pool serves as a substitute. The situation of the village is most picturesque, and there are a number of elaborately appointed hotels and many fine residences in the vicinity. There is a naval coaling station on the north shore of Eastern Bay, and Bar Harbor is frequently the rendezvous in summer of the North Atlantic squadron of the United States navy.

First discovered by Champlain, who gave the island its name, Mount Desert was settled in 1608 by French Jesuits, their colony of St. Sauveur on Somes Sound, however, being destroyed eight years later by an expedition from Virginia. A permanent settlement here was effected by the English in 1761. The town of Mount Desert was incorporated in 1789. Since that date the towns of Eden, Cranberry Isles, Tremont, and Southwest Harbor have been formed from the original district and incorporated, respectively, in 1796, 1830, 1848, and 1905. Pop.: Cranberry Isles, in 1910, 399; Eden, in 1910, 4441; Mount Desert, in 1900, 1569; Tremont, in 1910, 1116. Consult Street, *Mount Desert: A History* (Boston, 1905).

MOUNTED GRENADIERS. See INFANTRY, MOUNTED.

MOUNTED INFANTRY. See INFANTRY, MOUNTED.

MOUNTED POLICE. See MILITARY POLICE for description of various military and semi-military organizations of this nature; also POLICE.

MOUNTED RANGERS. See RANGERS, MOUNTED.

MOUNTED SERVICE SCHOOL. One of the 15 or more service schools maintained in the military educational system of the United States. It is located at Fort Riley, Kans., and includes the following subschools: the School of Equitation, the School of Farriers and Horseshoers, and the School of Bakers and Cooks.

The School of Equitation embraces four courses, viz., (*a*) the course for field officers; (*b*) the first-year course for company officers; (*c*) the second-year course for company officers; (*d*) the course in swordsmanship for noncommissioned officers. The object of the school is to give practical instruction in the following subjects:

In the course for field officers—In the methods of training the military horse as taught to company officers; in the use of the cavesson and longe; in advanced equitation of the officer; in correction of vices of the horse; in jumping; in cross-country work; in conditioning; modern breeds, crossbreeding, blood lines, conformation, and points of the horse. Duration of course, two months.

In the course for company officers—As indicated above for field officers and, in addition, hippology, horseshoeing, harness and transportation, forage, pioneer duties. The duration of the course is one year, except for 10 selected graduates of the first-year course, who are given an additional year's instruction in the most advanced work under the Saumur or French methods. Fifteen field officers and 36 company officers of cavalry and field artillery constitute the student classes. Officers of other branches of the service may be admitted upon the approval of the Secretary of War.

In the course in swordsmanship, cavalry noncommissioned officers alone are eligible—one from each regiment. The course is six months.

The School of Farriers and Horseshoers embraces two courses:

The course of instruction for enlisted men, farriers, is four months and includes the army horse in accident and disease, hospital work, first aid, bandages, treatment of wounds, sprains, bruises, abrasions, abscesses, operations, dissections, determination of age, conformation, defects, blemishes, lameness, and dispensary work. The course for enlisted men, horseshoers, includes actual work in the shoeing shop in all the departments of shoeing and of care of feet.

The School of Bakers and Cooks for enlisted men. Duration of course from three to five months. Includes practical instruction in all departments of cooking the government ration, baking bread, keeping accounts, and handling field bakeries in campaign. About 1600 pounds of bread are baked daily for the use of the garrison stationed at this post.

The personnel of the Mounted Service School consists of a commandant, who is a field officer, usually a colonel or lieutenant colonel of cavalry; the school staff; the Mounted Service School detachment; and the officers and enlisted men detailed as students. In addition to the personnel of the Mounted Service School there are stationed at Fort Riley, as a permanent garrison, a regiment of cavalry and a regiment of field artillery. The Field Artillery Board, formerly stationed at this post, has been transferred to Fort Sill, Okla., where the School of Fire for Field Artillery and the School of Musketry are now located. See FIELD ARTILLERY; SCHOOL OF FIRE FOR FIELD ARTILLERY; SCHOOL OF MUSKETRY; MILITARY EDUCATION.

MOUNT EVEREST. See EVEREST, MOUNT.

MOUNTFORT, WILLIAM (?1664–92). An

English actor and playwright. As early as 1678 he was playing in London. After 1682 he was a member of the company at the Theatre Royal and was the creator of many parts in the drama of the time, besides writing and adapting several plays, such as *The Injur'd Lovers, or the Ambitious Father* (published 1688); *Successful Strangers* (1690); *King Edward the Third* (1691); *Greenwich Park* (1691). According to the common account of his death, he was assassinated Dec. 9, 1692, by Capt. Richard Hill, a jealous admirer of Mrs. Bracegirdle. Consult Cook, *Hours with the Players* (London, 1881), and Cibber, *Apology*, edited by Lowe (ib., 1889).

MOUNT HELICON. See HELICON.

MOUNT HOL'LY. A town and the county seat of Burlington Co., N. J., 20 miles east of Philadelphia, on Rancocas Creek and on the Pennsylvania Railroad (Map: New Jersey, C 3). It has the Burlington County Hospital, Children's Home, the Burlington County Lyceum of History and Natural Science, founded in 1876, which possesses a library of 6500 volumes, and several old Colonial buildings, including a Friends' meetinghouse, and a courthouse and jail. The industries are represented by several extensive shoe factories and by machine shops, foundries, canneries, a hosiery mill, leather-goods works, a curtain factory, etc. Pop., 1900, 5168; 1910, 5652.

MOUNT HOLYOKE (hōl'yŏk) **COLLEGE.** An institution for the education of women at South Hadley, Mass. In 1837 Mount Holyoke Seminary was established by Mary Lyon (q.v.); from this grew Mount Holyoke College, which received its charter in 1888. In addition to the regular undergraduate courses, provision is made for graduate work, and special courses are open to teachers. The four years' course includes two years of prescribed and two years of elective work, leading to the degree of A.B. The college offers a large number of scholarships and four graduate fellowships. There were enrolled in all departments, in the collegiate year 1914–15, 796 students, with a faculty and staff of 114. Upon the college campus of more than 150 acres, attractively laid out, are built: 10 dormitories; Mary Lyon Hall, which occupies the site of the original building (destroyed by fire in 1896) and includes the chapel and offices of administration; a well-equipped gymnasium; an observatory; Lydia Shattuck Hall for chemistry and physics; Lyman Williston Hall for natural sciences; Dwight Memorial Art Building; a library of 56,000 volumes, with permanent fund of $25,000; a music building; the Skinner Recitation Hall; and the student alumnæ building—the latter two in process of construction in 1915. The student alumnæ building will contain a large auditorium and offices for the various student and alumnæ organizations. The productive funds of the college amounted in 1914 to $1,480,000, and its gross income was $344,000. Buildings and grounds are valued at $1,128,000 and the entire college property at $2,256,000. The president in 1915 was Miss Mary E. Woolley, A.M., LL.D., Litt.D., L.H.D.

MOUNT HOOD. See HOOD, MOUNT.

MOUNT HOOKER. See HOOKER, MOUNT.

MOUNT KENIA. See KENIA, MOUNT.

MOUNT KISCO. A village in Westchester Co., N. Y., 37 miles north of New York City, on the New York Central Railroad. It is in a fertile agricultural region and contains a fine public library, several fraternal organizations, and several beautiful estates and residences. The water works are owned and operated by the village. Pop., 1900, 1346; 1910, 2802.

MOUNT LEBANON. See LEBANON, MOUNT.

MOUNT LOGAN. See LOGAN, MOUNT.

MOUNT MANSFIELD. See MANSFIELD, MOUNT.

MOUNT MARCY. See MARCY, MOUNT.

MOUNT MOR'GAN. A municipality of Raglan Co., Queensland, Australia, 24 miles south-southwest of Rockhampton and 404 miles from Brisbane by rail (Map: Queensland, G 7). It is noted for the abundance and richness of the gold deposits found on the mountain summit and inclosed in a rock mass largely composed of iron ore and siliceous sinter. The yield of the Mount Morgan Mine (gold and copper) was, in 1911, $2,733,850. Pop., 1904, 6280; 1911, 7650.

MOUNT MORRIS. A village in Livingston Co., N. Y., 34 miles south by west of Rochester, on the Delaware, Lackawanna, and Western, the Erie, the Dansville, and Mount Morris, and the Pennsylvania railroads (Map: New York, C 5). Noteworthy features are the public library and post-office buildings and the picturesque Genesee River High Banks. There are also canning factories and municipally owned water works. Pop., 1900, 2410; 1910, 2782.

MOUNT MOTTARONE. See MOTTARONE, MOUNT.

MOUNT OF OLIVES. See OLIVES, MOUNT OF.

MOUNT OF OLIVES (*Christus am Oelberg*). An oratorio by Beethoven (q.v.), first produced in Vienna, April 5, 1803; in the United States, March 24, 1833 (Boston).

MOUNT OLIVE. A village in Macoupin Co., Ill., 43 miles northeast of St. Louis, Mo., on the Wabash, the Illinois Central, the Illinois Traction, and the Litchfield and Madison railroads (Map: Illinois, E 7). There are extensive coal mines, and flour milling and coal mining constitute the chief industries. The water works and electric-light plant are owned by the village. Pop., 1900, 2935; 1910, 3501.

MOUNT OLIVER. A borough in Allegheny Co., Pa., 2 miles from Pittsburgh, of which it is a residential suburb. Pop., 1910, 4241.

MOUNT OLYMPUS. See OLYMPUS.

MOUNT PARNASSUS. See PARNASSUS.

MOUNT PILATUS. See PILATUS.

MOUNT PLEASANT. A town and the county seat of Henry Co., Iowa, 28 miles west by north of Burlington, on the Chicago, Burlington, and Quincy Railroad (Map: Iowa, F 4). It is the seat of a State Hospital for the Insane, the Iowa Wesleyan College (Methodist Episcopal), opened in 1844, and was until 1911 the seat of the German College, opened in 1873. It has also several secondary institutions, a conservatory of music, and a public library. Mount Pleasant is the centre of a productive farming country and is an important shipping point for live stock, especially horses. There are grain elevators, repair shops, a planing mill, a brick and tile factory, a canning factory, etc. Limestone is extensively quarried in the vicinity. The water works and electric-light plant are owned by the municipality. Pop., 1900, 4109; 1910, 3874; 1915, 4078.

MOUNT PLEASANT. A city and the county seat of Isabella Co., Mich., 54 miles west by north of Saginaw, on the Chippewa River

and on the Ann Arbor and the Pere Marquette railroads (Map: Michigan, E 5). It is the seat of the Central State Normal School and of a United States Government Indian School and has a handsome courthouse. A fertile agricultural region surrounds the city, and there are manufactures of lumber and various lumber products, flour, woolen goods, plows, foundry products, brick and tile, wagons, condensed milk, etc. The water works are owned and operated by the municipality. Pop., 1900, 3662; 1910, 3972.

MOUNT PLEASANT. A town in Westchester Co., N. Y., 25 miles north of New York City, on the Hudson River and on the New York, New Haven, and Hartford Railroad (Map: New York, B 1). It is composed of the villages of North Tarrytown, Pleasantville, Sherman Park, and part of Briar Cliff Manor. Among the noteworthy features are the Westchester County Hospital, St. Joseph's Normal School, the Hebrew Sheltering Arms, the Dominican Fathers Home for Cripples, and the Cancer Hospital. Of interest in the vicinity are the Sleepy Hollow Cemetery, the old Dutch church, and the André Monument. The manufacture of automobiles constitutes the town's chief industry. Pop., 1900, 8698; 1910, 11,863.

MOUNT PLEASANT. A borough in Westmoreland Co., Pa., 69 miles by rail southeast of Pittsburgh, on the Baltimore and Ohio and the Pennsylvania railroads (Map: Pennsylvania, C 7). It is the seat of the Western Pennsylvania Classical and Scientific Institute (Baptist) and has a fine municipal building. The borough is the centre of an extensive coke-making industry and manufactures also flour, lumber, iron, foundry products, glass, etc. Pop., 1900, 4745; 1910, 5812.

MOUNT PLEASANT. A city and the county seat of Titus Co., Tex., 60 miles west by south of Texarkana, on the St. Louis Southwestern and the Paris and Mount Pleasant railroads (Map: Texas, E 3). It is in a productive cotton, corn, and trucking region and has a hardwood heading mill. Delwood Park and the Red Mineral Springs are worthy of note. There are municipal water works. Pop., 1910, 3137.

MOUNT RORAIMA. See RORAIMA, MOUNT.

MOUNT RUWENZORI. See RUWENZORI.

MOUNT SAINT MARY'S COLLEGE. A Roman Catholic college founded at Emmitsburg, Md., in 1808. It is controlled by a board of directors, of whom the Archbishop of Baltimore is president. The college has, in addition to the regular courses, a preparatory, a scientific, and a business course. The total enrollment in all departments in 1913–14 was 355 students and 27 instructors. A degree of A.B. only is conferred. The library contains about 20,000 volumes. The president in 1915 was Rt. Rev. Mgr. Bernard J. Bradley, A.M., LL.D.

MOUNT SHASTA. See SHASTA, MOUNT.

MOUNT SINAI. See SINAI.

MOUNT SINAI MANNA. See MANNA.

MOUNT STE'PHEN, GEORGE STEPHEN, first BARON (1829–1921). Canadian capitalist and railway promoter, born at Dufftown, Banffshire, Scotland. Going to Canada in 1850, he entered the dry-goods business in Montreal. He succeeded there as a cloth manufacturer and became wealthy. In 1876–81 he was president of the Bank of Montreal. Having been successful in railway operations in Minnesota and Manitoba, he later was conspicuous chiefly for his share in carrying through to completion the long-delayed Canadian Pacific Railway, of which he was president in 1881–87. For his services in this connection he was made Baronet by Queen Victoria (1886), and the following year he and Sir Donald Smith (afterward Lord Strathcona) gave $500,000 each for the building of the Royal Victoria Hospital, Montreal, in commemoration of her Majesty's jubilee. In 1888 he went to reside in England and in 1891 was created first Baron Mount Stephen, a title taken from a peak in the Rocky Mountains named for him during the construction of the Canadian Pacific Railroad.

MOUNT STERLING. A city and the county seat of Montgomery Co., Ky., 33 miles east of Lexington, on the Chesapeake and Ohio Railroad (Map: Kentucky, G 3). It has a public library and several private educational institutions. The city controls important tobacco and cattle interests, and among its industries are planing mills, flouring mills, machine shops, lunch-box and glove factories, and a distillery. Pop., 1900, 3561; 1910, 3932.

MOUNT TACOMA. See TACOMA, MOUNT.

MOUNT-TEMPLE, WILLIAM FRANCIS COWPER-TEMPLE, BARON (1811–88). An English politician, born in Hertfordshire. He studied at Eton and became an officer of the Royal Horse Guards. In 1835 he became secretary to his uncle, Lord Melbourne, who was then Prime Minister. He served in Parliament for Hertford from 1835 to 1863 and for South Hampshire from 1868 to 1880 and was Commissioner of Works in 1860–66. He inherited estates in Ireland from his stepfather, Lord Palmerston, in 1869 and then changed his surname to Cowper-Temple. In 1870 he introduced into the Education Bill the Cowper-Temple clause, which forbade religious instruction in rate-aided schools. He became Baron Mount-Temple in 1880.

MOUNT TOM. See TOM, MOUNT.

MOUNT UNION. A borough in Huntingdon Co., Pa., 45 miles southeast of Altoona, on the Juanita River and on the Pennsylvania and the East Broad Top railroads (Map: Pennsylvania, F 7). Its noteworthy features include Crum, Perduzzi, and Stratford blocks and the Mount Union Library. There are silica brickworks, a tanning and extract plant, coal yards, foundry and machine shops, and extensive manufactories of refractories. In the vicinity are found bituminous coal, a high grade of ganister rock, fire clay, and some timber. The water works are owned by the municipality. Pop., 1900, 1086; 1910, 3338.

MOUNT UNION COLLEGE. A coeducational institution for higher education founded at Alliance, Ohio, in 1846 as Mount Union Seminary and chartered as Mount Union College in 1858. It was the first institution in the United States to admit women to graduation on exact equality with men. In 1911 Scio College of Scio, Ohio, was consolidated with Mount Union College. The college included until 1915 an academy which in that year was discontinued. In addition to the college of liberal arts there is a conservatory of music, and a summer school is maintained. The total attendance in 1914–15 was 742, with 252 in the college, 352 in the conservatory, and the rest in the summer school. The college faculty numbered 19 and the instructors in the conservatory 15. The college campus includes 50 acres, with six buildings, a lake, two parks, and an athletic field. It has a pro-

ductive endowment of $286,000 and an annual income of about $35,000. The value of the buildings and grounds is about $223,000. The library contains about 16,000 volumes. The president in 1915 was Rev. M. C. McMaster, A.M.

MOUNT VERNON. The home and burial place of George Washington, in Fairfax Co., Va., on the right bank of the Potomac, 15 miles south of Washington, D. C. (Map: Virginia, G 3). The Washington mansion, beautifully situated on an eminence, commanding a view of the river, is of wood, two stories high, 96 feet long, and 30 feet deep. It was built in 1743 by Washington's elder brother, Lawrence, who called it Mount Vernon, after Admiral Vernon, under whom he had served in the British navy. A high piazza runs along the front of the house, which has six rooms of moderate size on the ground floor, containing many objects of historical interest. The plain brick tomb to which Washington's remains were removed from the old family vault in 1831 stands a few hundred yards from the house, near a wooded ravine. Mount Vernon, which had been much enlarged by Washington, was by him bequeathed to Bushrod Washington, upon whose death it came into the hands of John A. Washington, his nephew, who sold it in 1858 to the Ladies' Mount Vernon Association, which holds it in trust as a place of national interest. Consult: B. J. Lossing, *The Home of Washington and its Associations, Historical, Biographical, and Pictorial* (new ed., New York, 1865); Wineberger, *Home of Washington at Mount Vernon and its Associations* (Washington, 1866); T. N. Page, *Mount Vernon and its Preservation* (New York, 1910).

MOUNT VERNON. A city and the county seat of Jefferson Co., Ill., 76 miles by rail east by south of St. Louis, Mo., on the Louisville and Nashville, the Chicago and Eastern Illinois, the Southern, and the Wabash, Chester, and Western railroads (Map: Illinois, G 9). It has an attractive Supreme Court building, Carnegie library, and Highland Park and is engaged principally in agriculture, coal mining, and the manufacture of cars, machine-shop products, axe handles, lumber, flour, hosiery, catsup, cut glass, mattresses, etc. There are also a large grain elevator, knitting and canning factories, and a tie-preserving establishment. Pop., 1900, 5216; 1910, 8007.

MOUNT VERNON. A city and the county seat of Posey Co., Ind., 20 miles west by south of Evansville, on the Ohio River and on the Louisville and Nashville and the Chicago and Eastern Illinois railroads (Map: Indiana, B 9). It has a fine courthouse, a Carnegie library, and a handsome Soldiers and Sailors Monument. There are manufactories of flour, hominy, lumber, foundry and machine-shop products, engines, carriages, etc. Mount Vernon is a commercial centre of considerable importance for a fertile region in which corn and wheat are abundant. Pop., 1900, 5132; 1910, 5563.

MOUNT VERNON. A city in Westchester Co., N. Y., on Eastchester Creek, an arm of Long Island Sound, and the Bronx River and on the New York Central and Hudson River, the New York, Westchester, and Boston, and the New York, New Haven, and Hartford railroads (Map: New York, B 2). It is chiefly a residential suburb of New York City, which it adjoins on the north. It has more than 50 miles of well-paved and shaded streets and in the more elevated parts of the city, which command fine views of the Sound, there are costly mansions. Mount Vernon maintains a Carnegie library. Among the prominent edifices are the Lucas building, which contains the city offices, the Mount Vernon Hospital, Proctor Theatre building, the post office, and many churches and school buildings. There are manufactories of silver deposit, machinery, and clothing. Mount Vernon was founded in 1852, was incorporated as a village in the following year, and in 1892 was chartered as a city. The government, under the original charter, is vested in a mayor, elected every two years, and a municipal council. Pop., 1900, 21,228; 1910, 30,919; 1914 (U. S. est.), 35,047; 1920, 42,726.

MOUNT VERNON. A city and the county seat of Knox Co., Ohio, 25 miles north by west of Newark, on the Kokosing River, and on the Baltimore and Ohio and the Pennsylvania railroads (Map: Ohio, F 5). It has a fine courthouse, a public library, a large State tuberculosis sanitarium, and Hiawatha Park with a picturesque lake. There are locomotive, bridge, and Corliss-engine works, a large foundry, flour and saw mills, bent-wood works, and manufactories of furniture, glass, hoops, staves, sashes, and doors. The city is the centre of a fertile agricultural region, and near by are found natural gas and timber in abundance. The water works are owned by the municipality. Pop., 1900, 6633; 1910, 9087.

MOUNT WASHINGTON. See WASHINGTON, MOUNT.

MOUNT WHITNEY. See WHITNEY, MOUNT.

MOUNT WILSON SOLAR OBSERVATORY OF THE CARNEGIE INSTITUTION OF WASHINGTON. An astronomical observatory devoted to solar research and the study of stellar evolution. The computing offices, laboratories, and instrument shops are at Pasadena, Cal., while the telescopes and other apparatus for astronomical observations are at the summit of Mount Wilson (5886 feet), about 16 miles distant. The knowledge derived from the study of the sun, which is the only star sufficiently near the earth to be examined in detail, is applied to the interpretation of stellar phenomena, the chief object in view being to throw as much light as possible on the evolution of stars and the structure of the universe. An important phase of the work is the imitation of celestial phenomena in the Pasadena laboratories, which are equipped with a great variety of instruments for this purpose. The chief instruments on Mount Wilson include: (1) the Snow horizontal telescope, used daily for photographing the sun, both directly and with the spectroheliograph, which records the invisible clouds of calcium vapor and hydrogen gas in its atmosphere; (2) the 60-foot tower telescope, with 30-foot spectograph and spectroheliograph, used chiefly for the study of the pressure and motions of gases at various levels in the solar atmosphere; (3) the 150-foot tower telescope, with 75-foot spectrograph and spectroheliograph, mainly employed for the investigation of the magnetic phenomena of sun spots and of the sun as a whole; (4) the 60-inch reflecting telescope, devoted to the photography, both direct and spectroscopic, of stars and nebulæ; (5) the 100-inch reflecting telescope (not yet completed), which will also be used for stellar research. For a popular account of the purposes and work of the observatory, consult *Ten Years' Work of a Mountain Observatory*,

MOUNT VERNON

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MOURNING BRIDE, THE. A play by William Congreve (1697). The play is the source of the famous lines beginning, "Music hath charms to soothe the savage breast."

MOURNING CLOAK. A handsome butterfly (*Euvanessa*, or *Vanessa, antiopa*), known in England as the Camberwell beauty. It appears

THE MOURNING CLOAK.

in the United States very early in the spring and may not infrequently be seen flying about on warm days in winter. It hibernates in the adult stage even in cold climates. According to Scudder it ranges from the Arctic circle to the thirtieth parallel of latitude. It is purplish brown, with wings bordered by yellow, brown, and blue. The larvæ are covered with black spines and feed gregariously on willow, elm, poplar, and hackberry, often stripping the larger branches of leaves. The species is two-brooded, and the second generation of moths appears in midsummer.

MOURNING DOVE. The Carolina dove. See DOVE.

MOUROMTSEV, SERGEI. See MUROMTSEV, S. A.

MOURZOUK, mo͝or-zo͝ok′. A town of Africa. See MURZUK.

MOUSCRON, mo͞os′krôn′. A town of Belgium in the Province of West Flanders, situated near the French frontier, 32 miles southwest of Ghent (Map: Belgium, B 4). It is a customs station, has an episcopal college, and manufactures furniture and cotton and woolen goods. Pop., 1900, 19,366; 1910, 22,188.

MOUSE (AS., OHG. *mūs*, Ger. *Maus*, Lat. *mus*, Gk. *μῦς*, *mys*, OChurch Slav. *myshĭ*, Skt. *mūṣa*, mouse, from *mus*, to steal). The word "mouse" was originally applied to a small rodent mammal, *Mus musculus*, now called the house mouse, which was formerly confined to the Old World, but is now cosmopolitan in its distribution. Gradually the use of the word has extended to other small rodents, and especially in compounds to mammals not rodents, and even to birds. This troublesome little rodent is a small gray creature, with a body about 3 inches long and a tail half that length, the ears rather large and very delicate, and small feet. The color shows considerable variation, in some cases having a strong brown cast, while in others it becomes very pale and even fades to white. In its habits the mouse is largely nocturnal, though often seen during the day. It makes its home in sheltered nooks and crannies, where a nest of rags, paper, feathers, etc., is nicely made. Mice are very prolific, 6 to 10 young being born at a time, and there are many broods during the year. Much has been written about the singing powers of the mouse, and the fact that it does sing is supported by the evidence of perfectly trustworthy witnesses. Mice are unquestionably fond of music, but it is not fully determined whether their ability to make it is normal or is an individual peculiarity. Some writers have gone so far as to assert that it is due only to a diseased throat.

The name "mouse" is applied to any representative of the genus *Mus* not big enough to call a rat. This genus is one of the largest of mammalian genera, although recently there is a tendency to split the group into several. It has been usually defined as including upward of 130 species, which vary considerably in size, somewhat in color, and not a little in the softness of the pelage. The upper molar teeth are always wide, with three series of tubercles, and therefore called trituberculate; in this respect *Mus* differs from all of the native American rats and mice. Another characteristic of the genus is the long, slender, rounded tail, with whorls of scales, and few hairs; in some mice this is almost prehensile. Besides the common mouse the following may be mentioned as well-known European species: the wood mouse (*Mus*, or *Apodemus, sylvaticus*), which is a trifle larger than its cosmopolitan cousin, and on account of its longer tail is sometimes called the long-tailed field mouse; it is abundant in Great Britain and is noted for the large stores of grain which it hoards. The harvest mouse (*Mus*, or *Micromys, minutus*) is the smallest of British quadrupeds, the length exclusive of tail being only about 2½ inches; it occurs chiefly in the southern parts of England and is notable for its curious globular nest, composed of grass leaves and panicles woven together and suspended between stalks of grain or tall grass; a somewhat smaller species (*Mus*, or *Micromys, pumilus*) occurs in the south of Europe. Asia and Africa have many species, as the curious black-striped Barbary mouse, which looks like a miniature American ground squirrel.

In America the name "mouse" is applied to a large number of small mammals, especially in such compounds as wood mouse, field mouse, etc. Some of these are very different from the true mice, but nearly all belong to the family Muridæ, though not to the Murinæ with the Old World mice. Many of them are voles, of the subfamily Microtinæ, while others are vesper mice or white-footed mice of the subfamily Cricetinæ, to which the hamsters also belong. A typical American example of this latter group is the well-known and widely distributed white-footed mouse or deer mouse (*Peromyscus leucopus*), which is found, in some one of many local races, nearly throughout North America. It is about 7 inches long, of which nearly one-half is the tail. The upper surface is fawn color of some shade, while the under parts and the feet are snowy white. The ears are rather large, and the general form and appearance delicate and graceful. It is found in all sorts of situations and even lives in houses sometimes, like the common mouse. In the Central and Southern States another species even handsomer than this occurs, known as the golden mouse (*Peromyscus aureolus*). It is golden cinnamon above and yellowish white beneath. The largest and in some respects the most remarkable of this group is the rice-field mouse (*Oryzomys palustris*), which is 10 or 11 inches long, dark grizzly rat color, and has very harsh pelage. It is said to be more

like the true mice than any other American species. The curious little harvest mouse (*Ochetodon*, or *Reithrodontomys, humilis*) of the Southern States is one of the smallest of American quadrupeds, being only 4 inches long, and half of that is tail. More detailed information will be found under the names of these and other mice, as JUMPING MOUSE, MEADOW MOUSE, ETC. See also accompanying Plate of MICE AND JERBOAS.

Consult authorities cited under MAMMALIA.

MOUSE, FLYING. See FLYING PHALANGER.

MOUSE BIRD. Any bird of the African genus *Colius* and family Coliidæ; a coly. These birds have soft gray and white plumage, conical brightly colored bills, and long and narrow central tail feathers, and take their name not only from their ashy plumage, but from their mouse-like activity in scrambling about the branches of trees, where they hang head downward (even sleeping that way), and swing and twist like acrobats. They are enabled to do this by the striking peculiarity of structure in the feet, which have all four toes turned forward. They are fruit eaters, go about in small bands, but fly poorly, and build their nests in dense shrubs. See Plate of KINGFISHERS, MOTMOTS, ETC.

MOUSE DEER. See CHEVROTAIN.

MOUSE-EAR CHICKWEED (*Cerastium*). A genus of numerous species of plants of the family Caryophyllaceæ, natives of temperate and cold countries throughout the world. Some of them are among common weeds; others, having larger flowers, are occasionally planted in flower borders and on rockwork. The form and hairiness of the leaves of some species have given rise to the popular name.

MOUSE FISH. One of the tropical frogfishes (*Pterophryne histrio*), common in the Gulf of Mexico, the colors of which are highly variable. It is related to the anglers (see ANGLER), and its bait is its first dorsal spine, which is bifurcate. The fact that it is frequently found in the fields of sargasso weed of the Atlantic gives it a second name, sargassum fish.

MOUSE LEMUR. A very small woolly lemur of Madagascar, nocturnal and mouselike in its appearance and habits. It is a member of the genus *Chirogaleus*. Five species are recognized. See CHIROGALE; LEMUR; Plate of LEMURS.

MOUSE TOWER. A tower built on a rock in the middle of the Rhine near Bingen. According to popular tradition, it was hastily erected by Archbishop Hatto I of Mainz (q.v.) as a refuge from the swarms of mice sent to devour him in punishment for his cruelty to the poor, whom he burned in a granary during a famine. The German name Mäuseturm is probably a popular corruption of Mautturm, toll tower, for which the structure appears to have been originally intended, and the legend was built about the name. According to some authorities, the building was a watch tower, and the name is referred to Old German *musen*, to spy. It is now used as a signaling station for steamers.

MOUSTERIAN (mōō-stē'rĭ-an) **EPOCH.** See PALEOLITHIC PERIOD.

MOUTH (AS. *mūþ*, Goth. *munþs*, OHG. *mund*, Ger. *Mund*, mouth; connected with Lat. *mentum*, chin, and ultimately with Skt. *mukha*, face). In an animal, the opening through which food enters the body. Not all animals have mouths, for certain parasitic forms, notably the tapeworm, lack a system for digesting food, and consequently no opening for its entrance is necessary; in such cases the food is absorbed through the surface of the animal. The simplest form of mouth is that which occurs in the Protozoa, where the food is taken into the body through a special opening, which is fairly constant in position and may be surrounded with cilia, sometimes long. Many Protozoa, as well as sponges, have no mouth in any true sense, as the food may be taken in at any part of the body surface, and therefore the opening has no fixed position and no regular size or form. The mouth of corals, jellyfish, sea anemones, and other cœlenterates is simply an opening, almost always central in position, on the lower surface in free-swimming forms, on the upper surface in fixed forms. It is usually circular, but may be flattened, and in one group of jellyfish it is divided up into four or more, sometimes innumerable, small openings, by the growing together of the lobes on its margin. In the flatworms the mouth is usually circular and is often in the centre of a sucker, but its position is variable, though it is always on the ventral side. It may be near the anterior end of the animal, but it is more often at the centre and is sometimes posterior. Among the various classes of worms the mouth is always anterior, and often terminal, though more often on the lower side of one of the first segments or, in unsegmented forms, in a similar position. In bloodsuckers it lies in the centre of a powerful sucker, and is provided with three chitinous jaws; in vegetable-eating and some carnivorous forms (nemertines) it is a simple opening without jaws, while in such active carnivorous worms as *Nereis* it is provided with powerful jaws. These jaws, however, are clearly modified segmental appendages, and are practically feet which have become modified to assist in seizing food or forcing it into the mouth. In the crustaceans, insects, spiders, and the like (arthropods) the mouth is more or less terminal and is provided with lateral jaws; sometimes as many as eight pairs of appendages are modified to serve for this purpose. The structure and arrangement of the mouth parts in insects are very complicated and are of great importance in classification. Roughly they may be grouped as *biting*, when there are freely movable lateral jaws which seize and cut or tear the food; *piercing*, when the various parts are more or less united to form a sharp, piercing instrument, which penetrates animal or plant membranes in search of the fluid food, which is then sucked; *sucking*, when the parts are united to form a suctorial tube, with no adaptation for piercing.

Among echinoderms the mouth shows considerable variety of form. In mollusks the mouth is generally anterior and often ventral, but it is frequently terminal. In the devilfish, squids, and the like, it is in the centre of the foot. In the clams and other lamellibranchs there are special organs of sense, known as labial palps, on each side of the mouth, but there is no tongue, while in all other mollusks a tongue covered with teeth and known as the radula is present. The cephalopods (squids and the like) have powerful jaws, arranged like the beak of a parrot, but in all other mollusks the jaws are small and rather weak, sometimes three in number, or they may be wholly wanting, as in the lamellibranchs.

In the vertebrates we find the formation of the mouth is used by some writers to divide them into two contrasted groups, the *cyclostomes*

MICE AND JERBOAS

1. AMERICAN JUMPING MOUSE (Zapus Hudsonius).
2. EGYPTIAN JERBOA (Dipus Ægypticus).
3. YARKAND JERBOA (Euchoreutes naso).
4. KIRGHIZ JERBOA (Alactaga decumana).
5. BARBARY STRIPED MOUSE (Mus Barbarus).
6. HOUSE-MOUSE (Mus musculus).
7. HARVEST-MOUSE (Mus minutus).
8. MEADOW-MOUSE (Microtus Pennsylvanicus).

or round mouths and the *gnathostomes* or jaw mouths. The round mouths include only three or four genera, and are characterized by the absence of jaws, the mouth serving as a sucking organ. The surface of this mouth sucker bears characteristic horny teeth. All the other vertebrates are gnathostomes, provided with vertically moving upper and lower jaws, one or both of which, except in birds, turtles, and some whales, bear teeth. There are also a tongue and various glands, notably the salivary glands. True lips, provided with muscles, are characteristic of mammals, but are also found in dipnoid fishes. In many mammals the sides of the buccal cavity—i.e., the space outside the jaws—are enlarged to form cheek pouches, of use as food reservoirs. The origin of the vertebrate mouth has been a matter of much discussion and is closely associated with the still more fundamental question of the origin of the skull. Apparently, however, the jaws arise as modifications of the first branchial arch, which becomes divided into two parts, the proximal giving rise to the quadrate bone, which gives rise to an anterior process, forming a sort of primary upper jaw; the distal part is the cartilage of Meckel, the basis of the lower jaw.

See ALIMENTARY SYSTEM; GLAND; SKULL; TEETH; TONGUE.

MOUTH, DISEASES OF THE. From its situation at the portal of the digestive tract, the mucous membrane lining this cavity is peculiarly exposed to many forms of irritation and infection. The following are the principal forms of inflammation of the mouth, or *stomatitis* (Gk. *στόμα, stoma,* the mouth), as it is termed by nosologists:

1. *Acute catarrhal stomatitis,* which may extend over the mouth, including the tongue, or may occur in limited areas, is seen in children, associated with dentition or gastrointestinal disturbances, and in adults following excessive smoking or the taking of hot or too highly seasoned food. It is a frequent concomitant of indigestion and febrile diseases, but is more commonly a complication of other diseases than an original affection. In ordinary cases a simple mouth wash composed of a solution of borax and honey, and gentle catharsis, will effect a rapid cure.

2. *Parasitic stomatitis,* a diffuse inflammation with the formation of patches of false membrane, is caused by a fungus—the *Saccharomyces albicans,* also known as *Oidium albicans.* It occurs most commonly in young children, and is described under its popular name, THRUSH.

3. *Aphthous stomatitis,* also known as herpetic, follicular, or vesicular stomatitis, is an inflammation of the follicles of the mucous membrane and is described in the article APHTHÆ.

4. *Ulcerative stomatitis,* sometimes called *fetid* stomatitis, or putrid sore mouth, generally occurs in children after the first dentition and is associated with defective hygienic and sanitary conditions. The ulcerative process begins usually at the margin of the gums and extends along the gum lines of the jaws. The bases of the ulcers are covered with a grayish-white adherent membrane. The swelling of the adjacent parts is often so considerable as to be apparent externally. There is a copious flow of saliva, and the breath is very offensive. The ulceration may continue for weeks, or even months, but always yields to treatment. The febrile symptoms and the constipation which are usually present must be combated in the ordinary way. Perhaps the best general method of treating the disease is by the administration of small doses of chlorate of potash and by frequently washing the mouth with a weak solution of the same drug, or of borax, sodium salicylate, or hydrogen peroxide.

5. *Gangrenous stomatitis, cancrum oris,* or *noma,* is the most severe form of stomatitis and occurs as a rule in feeble children between two and five years old during convalescence from the acute fevers. It occurs frequently in institutions, is believed to be mildly contagious, and is associated with the presence of Vincent's microörganisms. The disease is characterized by a rapidly progressing gangrene, beginning on the cheeks or gums, resulting in extensive destruction of the soft tissues, at times even invading the jawbones and ears. The constitutional disturbance is great and the prostration extreme, and the case usually terminates in death. Treatment is unsatisfactory. Early destruction of the ulcer by the cautery, careful nourishment, and free stimulation may arrest the disease. Salvarsan (q.v.) has been suggested as a remedy.

6. *Mercurial stomatitis* and other diseases of the mouth are noticed in the articles GUMS, DISEASE OF; RANULA; SALIVATION; SCURVY; THRUSH; TONGUE; TUMOR (for cancer). Consult J. S. Marshall, *Mouth Hygiene and Mouth Sepsis* (Philadelphia, 1912), and Broomell and Fischelis, *Anatomy and Histology of the Mouth and Teeth* (4th ed., ib., 1913).

MOUTON, mōō-tŏn′, ALEXANDER (1804–85). An American politician, born in what is now Lafayette Parish, La. He graduated at Georgetown College (District of Columbia), studied law, and was admitted to the bar in 1825. In 1826 he was elected to the Lower House of the Legislature and was Speaker in 1831–32. He was a presidential elector in 1828, 1832, and 1836, and in 1837 was elected to the United States Senate. He resigned in 1842 to accept the nomination for Governor of Louisiana, was elected, and served from 1843 till the adoption of the new constitution in 1846. He was president of the Southwestern Railway Convention in 1853 and a delegate to the National Democratic Conventions in 1856 and 1860. In 1861 he presided over the Louisiana convention called to consider the question of seceding from the Union. In the latter part of the same year he was a candidate for the Confederate Senate, but failed to be elected and then retired to his plantation, where he spent the remainder of his life.

MOUTON, mōō′tôn′, GEORGES. See LOBAU, COUNT DE.

MOVABLES (OF. *movable, mouvable,* Fr. *mouvable,* from Lat. *movere,* to move). Such subjects of property as can be moved or transported from one place to another. The term is used as contradistinguished from things immovable, as lands and chattels which have become definitely and permanently attached to land as fixtures. The terms "movable" and "immovables" are sometimes inaccurately employed as identical in meaning with personal and real property, respectively. While most movable chattels are personal property, some, as heirlooms, are classed as real property, and many important estates or interests in land, as mortgages and leaseholds, are classed as personal property. Moreover, there are many

kinds of property, of an intangible or incorporeal character, to which the terms "movable" and "immovable" are wholly inapplicable, such as debts and other choses in action, patent rights, copyrights, shares of stock in corporations, annuities, titles of honor, etc. These are variously classified as real or personal property.

In Scots law the word "movables" is used as contradistinguished from heritable property, and is practically synonymous with personal property in American and English law. See CHATTEL; PERSONAL PROPERTY; REAL PROPERTY.

MOVEMENT. Several modes of movement are manifested in plants and plant organs. Some of the lower forms (bacteria, algæ, and fungi) exhibit movements of locomotion in certain stages, swimming freely in the water in which they are found. The same is true of the zoöspores and conjugating sexual cells (gametes) of many plants which themselves are not motile. Also, the plasmodia of slime molds show a peculiar flowing of the protoplasm which results in motion from one place on the substratum to another. This is called amœboid movement. (For directive locomotor movements see CHEMOTAXIS; PHOTOTAXIS; TAXIS; ETC.) Another kind of movement often met with in plants is the so-called hygroscopic movement. This is shown by the awns of certain grasses and other fruits (seeds) (Fig. 1), by the valves of many seed pods (Fig. 2), by the teeth of the peristome of moss capsules, and by the elaters of liverworts, horsetails, (*Equisetum*), etc. It is a phenomenon having no connection whatever with the vitality of the parts, being due merely to unequal swelling or shrinkage (i.e., warping) of the different tissues by reason of their unequal absorption or loss of water; and this depends on the unlike composition of the material of the cell walls.

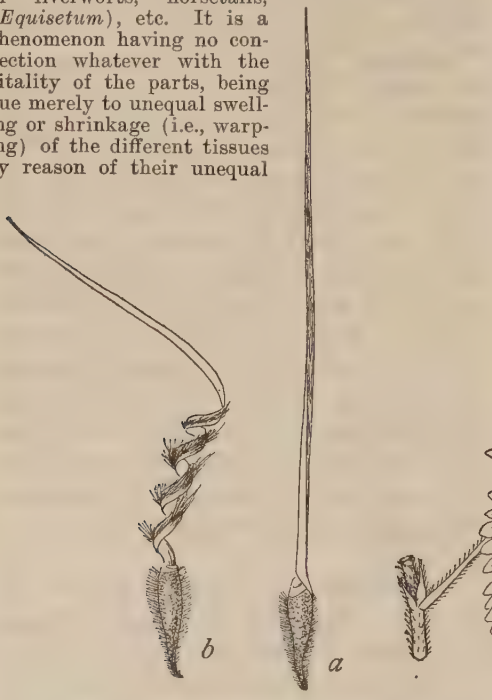

FIG. 1. FRUIT OF ERODIUM GRUINUM.

a, when wet; *b*, when dry; the straightening of *b* when tip is caught in grass and the awn absorbs moisture bores the seed-containing lower part into the soil and so plants it.

From a physiological point of view perhaps the most important form of plant movement is that exhibited by the leaves of the so-called sensitive plants. The best example of this is found in the mimosa of greenhouses. When this plant

FIG. 2. HYGROSCOPIC MOVEMENTS OF THE VALVES OF SEED PODS.

1, *Campanula ranunculoides*: *a*, when dry; *b*, when wet. 2, *Linaria macedonica*: *a*, when dry; *b*, when wet.

is jarred, struck, locally burned, or injured otherwise, its leaves suddenly collapse, even those at a distance from the shock. Its leaves are doubly compound, and in closing the pinnules rise so that the upper faces of opposite ones are brought together, the pinnæ drop downward and forward, while the whole leaf sinks (Fig. 3). If a shock be given to one pinnule, the disturbance there set up, if severe enough, is propagated to other parts of the same leaf and

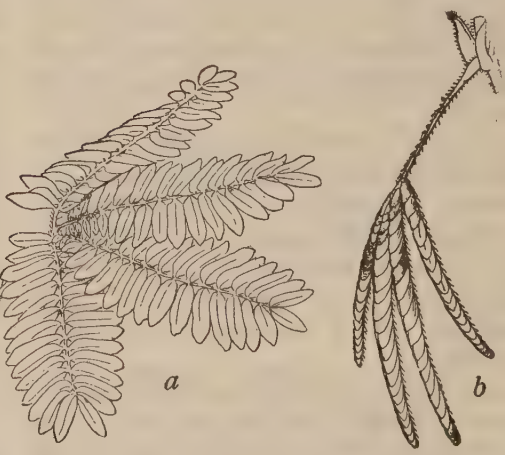

FIG. 3. LEAF OF THE SENSITIVE PLANT (*Mimosa*).

a, in light when undisturbed; *b*, after shaking.

even to other leaves. Almost any portion of the plant can receive a stimulus in this way and pass it on to other regions. The organs which execute the visible response are motor organs (see MOTOR ORGAN), cushions of tissue (pulvini) situated one at the base of the leaf, of each

pinna, and of each pinnule. Indigenous plants which show this reaction, though not so strikingly, are the common oxalis and different species of *Cassia*.

The so-called "sleep movements" of leaves of the pea family, *Oxalis*, etc., are executed by the same motor organs, which, however, are often less perfectly developed. These movements consist of changes in the position of the leaf following variations in the intensity of illumination, so that these leaves have a nocturnal and a diurnal position. Hence the misleading expression "sleep movements."

For a discussion of the variety of movements of plants in response to stimulation, which are brought about by unequal growth on opposite sides of an organ, see CHEMOTROPISM; ELECTROTROPISM; GEOTROPISM IN PLANTS; HELIOTROPISM; RHEOTROPISM; THERMOTROPISM. See also LOCOMOTION; MYXOMYCETES; ROTATION; SLEEP OF PLANTS.

MOVEMENT. A musical term denoting a division of a cyclical composition. As early as the sixteenth century a number of dances were loosely joined together, the only rule followed being that all should be in the same key and that the tempo (fast, slow) should alternate. This gave rise to the suite (q.v.), but the modern symphony or sonata was developed from the old overture, which consisted of three parts, a fast one followed by a slow one with the first part repeated. Gradually the three parts were separated and became distinct movements. In the sonata the first movement is always written in a particular form called sonata form. The different movements are in different (but related) keys. The first and last are always in the same key, which is therefore spoken of as the key of the cyclical composition. When the first movement is in the minor, the last is generally in the relative major. Each movement has its own themes. Occasionally, however, a composer introduces in a later movement (generally the finale) a theme from a former movement. The number of movements depends upon the character of the composition. In works written in sonata form the usual number is three for sonatas and four for symphonies. In suites the number varies from four to eight. See FORM; OVERTURE; SONATA; SUITE; SYMPHONY.

MOVEMENT, PERCEPTION OF. We may perceive movements of a part of the body, movements on the surface of the body, and movements of objects in space; i.e., we may have kinæsthetic, cutaneous, and visual perceptions of movement. Psychologically, movement is a composite perception made up of spatial and temporal perceptions. (See DURATION; EXTENSION; LOCALITY.) When we perceive an object as moving, it occupies different positions in space during a certain time. But the characteristic thing about the perception of movement is that there is no successive localization of an object, with temporal pauses between; the object is perceived as changing its position continuously; and it is the continuity of movement, therefore, that first offers itself for explanation. It has been held that the sensory basis of continuity is to be found in the positive afterimage. (See AFTERIMAGES.) Since sensation continues for a time after the cessation of stimulus, the gap between the sensations set up at the beginning and end of the movement is thus filled in; and changes in the intensity of the afterimage, aided by cortical disposition, furnish the necessary clews for the perception. In the cutaneous and kinæsthetic fields this theory seems adequate to the facts; but in the case of visual movement there are difficulties. It is well known that, if discrete phases of some objective movement be thrown upon the retina in rapid succession, by an instrument like the stroboscope or the moving-picture machine, the perception of movement will result. This illusion was formerly explained by reference to the positive afterimage; but recent experiments discredit that theory completely by showing that perceptions of movement may be obtained from nonmoving objects. If, e.g., a short vertical line is drawn at the end, and a short horizontal line at the middle, of a stroboscopic strip, and if the strip is revolved slowly in the cylinder, the two lines appear, successively, as discrete objects; if revolved rapidly, the two lines appear as a right angle; but if it is turned at a rate between these two extremes, the lines are seen to move, the vertical turning down, the horizontal up, through the angle of 90°. Afterimages are out of the question, and explanation by way of cortical disposition fails because the experience seems to be entirely new. An hypothetical movement centre in the brain has been suggested; but a more likely theory supposes a cortical short circuit.

Numerous experiments have been made to determine the quantitative aspects of the perception of movement, its extent and duration. Estimations of the extent of the movement of some part of the body appear to be founded on a fusion of articular, muscular, and tendinous sensations, and perhaps also cutaneous pressure. (See MUSCLE SENSE.) The actual liminal excursion has been found to be least in the case of the larger joints (0.22° to 0.60° for shoulder, hip, elbow), greatest for the smaller joints (0.50° to 1.30° for knee, finger, ankle).

But our ideas of the extent of movement are not limited to those which refer to members of our body; we can also estimate the extent of the movement of an object felt (skin) or of an object seen (eye). A stimulus moving over the skin excites end organs of pressure which possess different "local signs." If the first local sign has not lapsed from consciousness when the last is reached, we are able to estimate the extent of the movement in purely cutaneous terms; otherwise we may make judgments in visual terms. The least noticeable extent of cutaneous movement depends upon the place stimulated, the intensity of the pressure, and the rate and direction of the motion. On the forehead it may amount to 10 millimeters. A very slow movement may pass unnoticed. Movements lengthwise of a limb are less readily noted than movements crosswise, on account of the distribution of the nerve endings in the skin. Movement is often noted before direction of movement, either because the starting point is forgotten or because the judgment "movement" is more easily aroused than the judgment "movement in this direction." The visual idea of extent of movement may be variously formed. 1. If the eyes remain fixed while the object moves across the visual field, the estimation results from the stimulation of different local signs in a manner analogous to that of the purely cutaneous estimation. At the fovea the least noticeable amount of movement is probably about equal to the minimum visibile;

but in indirect vision it is only about a quarter of the limen of spatial duality. (See EXTENSION.) 2. If the fixation point of the eyes follows the moving object, the estimation of the extent of movement of the object is made in terms of the strain, pressure, and articular sensations evoked by the movements of the eyes in their sockets, of the head upon the shoulders, or of the body as a whole. Without the aid of some fixed point of reference, such as is actually used in eye measurement (see EXTENSION) and convergence, estimations of this second type are extremely uncertain, on account of the occurrence of unnoticed movements of the eyes themselves.

Turning to the temporal aspect of the perception of movement, we can say in general that quick movements are more readily noted than slow, whether they appeal to subcutaneous tissues, skin, or eye. On the skin a uniform rate in the stimulus is not perceived as a uniform rate in sensation, for a given movement appears more rapid where localization is more accurate. The slowest perceptible visual movement is at the rate of 0.0028 millimeter per second. In discriminating between two different rates the optimal speed is rather slow, because rates of movement which are at all quick are confused by the persistence of the excitation in the form of afterimages.

Finally, rate of movement, or, more strictly, a change in the rate of movement of the body as a whole, is perceptible, although no estimation of the extent of such a movement is possible. Upon vehicles like elevators, boats, etc., where there is little jar, it is easy to observe that, once the speed is uniform, it is impossible to perceive any motion; acceleration or diminution of this rate, however, sets up certain sensations due to the inertia of the body, and perhaps, too, other sensations mediated by the semicircular canals and otolith apparatus. See STATIC SENSE.

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MOVEMENT CURE. See MECHANOTHERAPY.

MOVENDO. See MANCANDO.

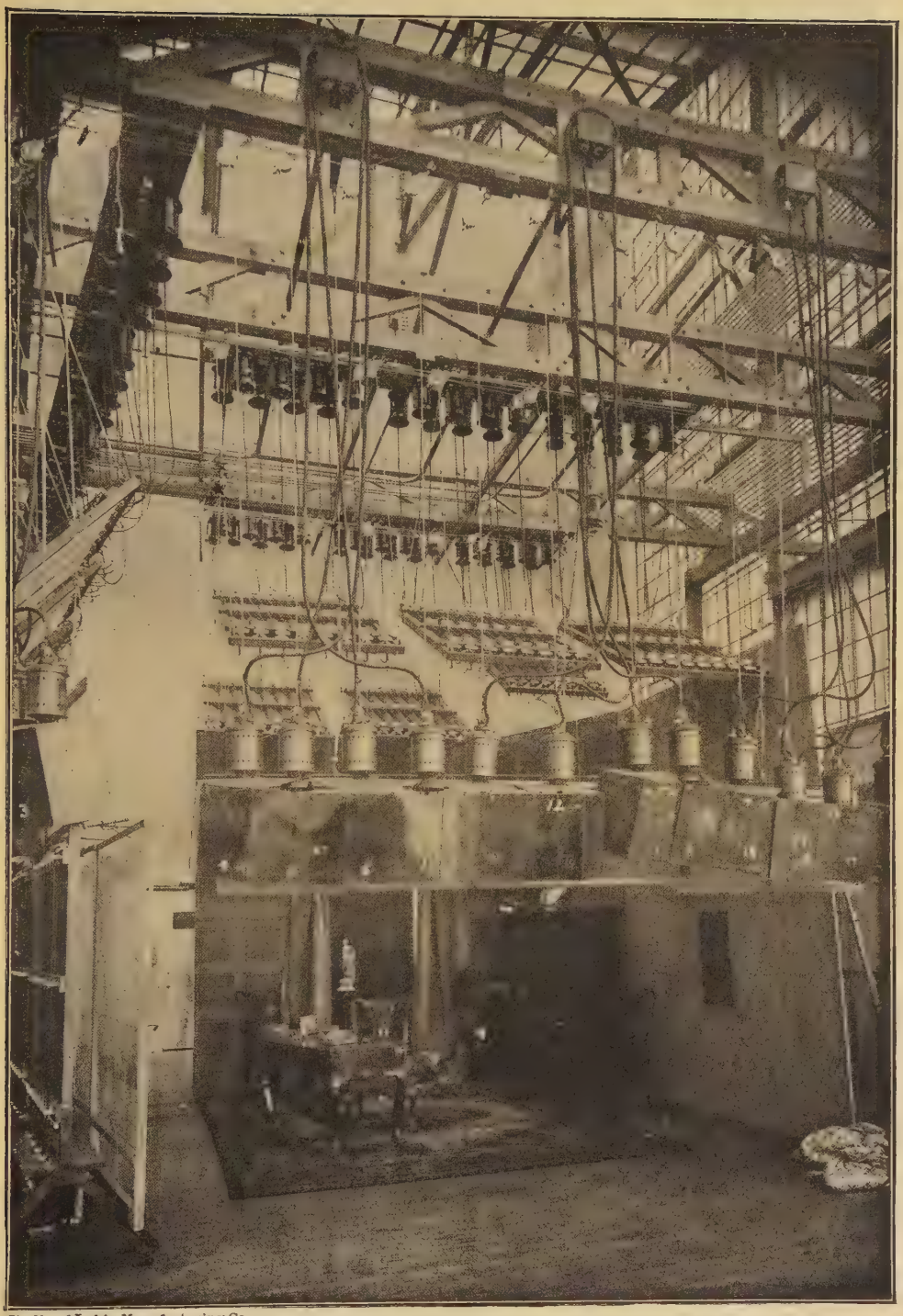
MOVERS, mō'vērs, FRANZ KARL (1806–56). A German divine and Orientalist. He was born at Koesfeld, Prussia, and was educated at Münster and Bonn. After being settled for six years over a church in Berkum, he was in 1839 appointed professor of Old Testament theology in the University of Breslau, where he remained until his death. His elaborate and scholarly treatise on the Phœnicians, *Die Phönizier* (vol. i, 1841; vol. ii, 1849–56), and as addition *Phönizische Texte* (1845–47), is his best-known work. He also wrote *Kritische Untersuchungen über die biblische Chronik* (1834) and the important dissertation *De Utriusque Recensionis Vaticinorum Jeremiæ Indole et Origine* (1837).

MO'VILLE. A seaport, market town, and summer bathing resort in County Donegal, Ireland, on Lough Foyle, 17 miles north-northeast of Londonderry (Map: Ireland, D 1). It is noted as a port of call of the Anchor and the Allan line steamers from New York to Glasgow. Pop., 1911, 1016.

MOVIMAN, mō-vē'man. The language of the Movinas (Mobinas) of Bolivia, South America, on the shores of Río Mamoré and Río Yacuma, about lat. 14° S. They are now civilized and very cleanly. Vocabularies of their language show but faint resemblances with any other. Consult D. G. Brinton, *The American Race* (New York, 1891), and A. F. Chamberlain in *Journal de la Société des Américanistes de Paris*, N. S., vol. vii (Paris, 1910).

MOVING PICTURES. The representation, suitably enlarged on a screen, of a series of photographs of objects in motion made on a ribbon-like film of sensitized celluloid, by means of a specially constructed camera, containing mechanism for alternately exposing and moving the film at a high rate of speed, in connection with a revolving shutter which prevents access of light through the camera lens to the film while the latter is being shifted from one position of exposure to another. In making the original photograph the film is placed on a reel in the camera and unwound by a hand-driven mechanism that advances it into a position where it is momentarily stationary during the exposure, a rotating shutter, an integral part of the machine, in the meantime operating to prevent access of light to the film during the time required to move it into position for the next exposure. After the film negative is developed, a positive is made by contact printing on a similar kind of film, and the latter, wound on a reel, is placed in a machine in which it is unwound, and while kept at a proper degree of tension it passes through a projection lantern provided with a powerful light. The magnified image of every picture on the film is projected in succession upon a screen or white surface in a darkened room, where the resultant effect, viz., the illusion of the representation of objects in actual and natural motion, may be observed by a large number of persons at one time. The sensitized films are made about 1000 feet in length; each picture is ¾ by 1 inch in size, the standard aperture on the projection machine being $\frac{11}{16}$ by $\frac{15}{16}$ inch.

The moving-picture illusion depends upon the fact that an impression received by the retina of the eye lasts for a short interval after the stimulus giving rise to the impression has ceased. This is commonly known as the persistence of vision, and its duration may vary from one-tenth to about one-fiftieth of a second. In the early part of the nineteenth century several interesting pieces of scientific apparatus were developed for combining a series of pictures representing bodies in motion, which produced the illusion of motion. One of the earliest of these was the stroboscope (q.v.), which consisted of a disk having a series of radial slits cut near its circumference. Representations of successive phases of a movement when rapidly moved as on the periphery of a second disk and viewed through these slits in the first disk also in revolution had an apparent motion that depended upon the relative motion of disk and moving body.



Studio of Lubin Manufacturing Co.

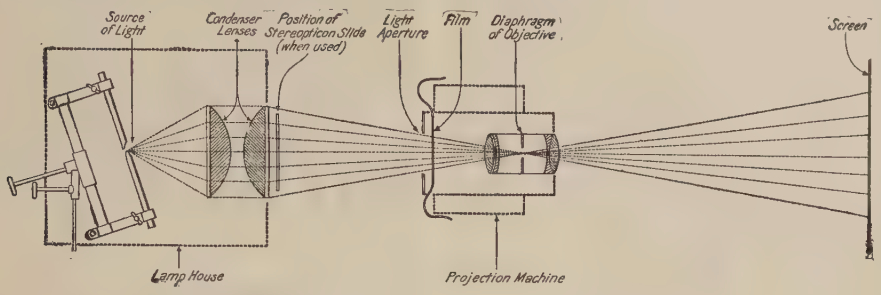
ELECTRIC LIGHTS AND ARRANGEMENT OF SCENERY IN A LARGE MOVING PICTURE STUDIO

TAKING A SCENE FOR A PHOTOPLAY

Studio of Lubin Manufacturing Co.

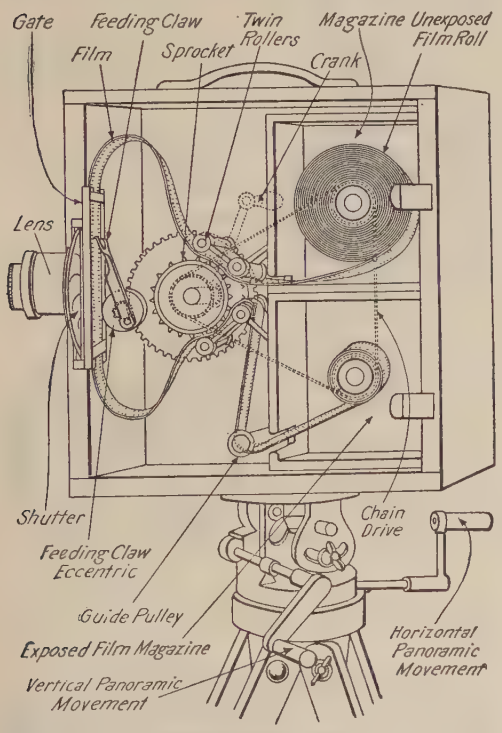
INTERIOR OF A MOVING PICTURE STUDIO, SHOWING THE MAKING OF A PHOTOPLAY

About 1845 the zoetrope was developed, consisting of a cylinder revolving on a vertical axis and having a number of vertical slits cut



MOVING-PICTURE MACHINE — PRINCIPLE OF OPTICAL PROJECTION.

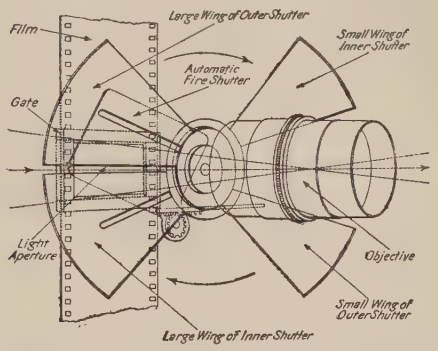
near the top. On the inside surface of the cylinder was placed a strip of paper having on it a series of pictures representing an object in successive stages of motion, as, e.g., a horse running. An observer looking through the slits at the moving picture inside the cylinder saw the object apparently in motion repeating the



MOVING-PICTURE CAMERA.

cycle of movement with every revolution of the apparatus. See ILLUSION.

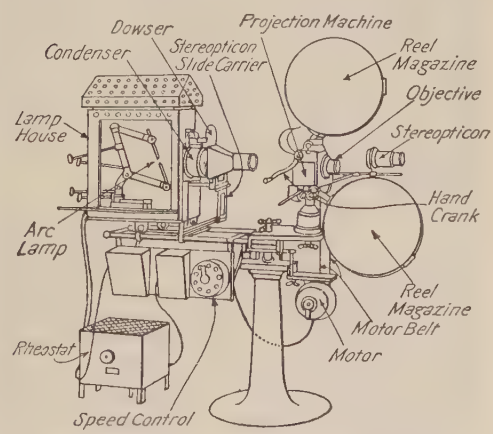
In 1877 Eadweard Muybridge, in America, made a series of photographs of horses in motion, employing glass dry plates, as at this time sensitized films had not been invented. The horses were photographed at various points of their progress around a race track by placing along the track at certain intervals a battery of cameras in proximity, whose shutters were operated by a string broken by a horse as it passed along. In this way was secured a series of pictures which, while they showed the true position of the animal from the particular spot where the camera was placed at given instants, did not contain the essential elements of true moving pictures, as there was no exact



DOUBLE-CONE SHUTTER OF PROJECTION APPARATUS.

Position of the shutter when intermittent sprocket stops. The small wings pass in front of the light aperture when the film is moving.

regularity in the interval between exposures. Incidentally, however, they aroused a great deal of discussion among anatomists and artists, and settled conclusively some questions that had



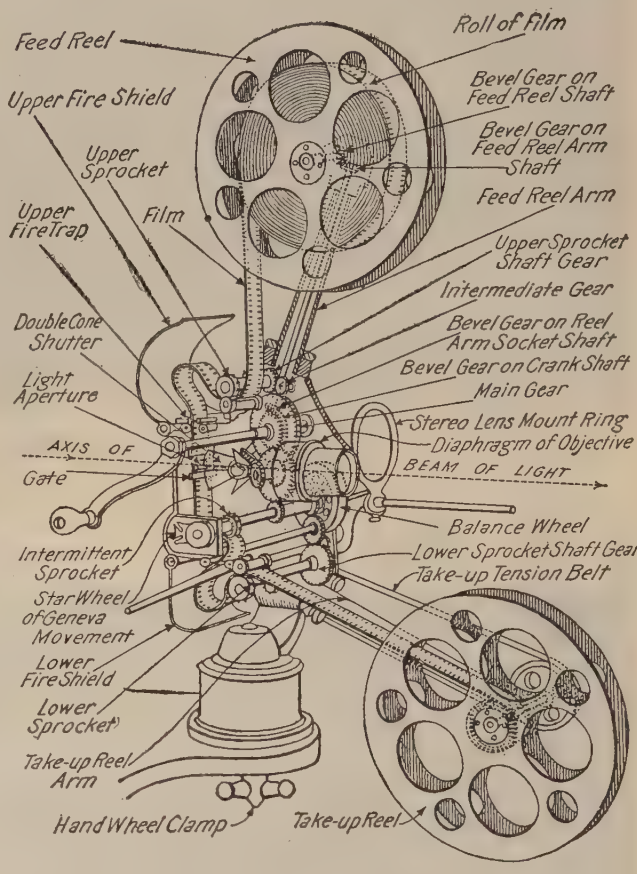
COMPLETE INSTALLATION OF PROJECTION APPARATUS.

been in dispute between them. These pictures if combined did not possess that continuity of succession necessary to furnish the illusion to an observer of the horse moving in a natural

manner, for in making the originals there was a space between any two cameras in which the position of the horse was not photographed, consequently on combining these successive camera records they were not consecutive. At the time the pictures were made, however, they marked a decided advance in the art of photographing objects in motion.

The kinetoscope (q.v.), brought out by Edison in 1893, and independently developed in a modified form by Lumière, Paul, and others shortly after, comprised a machine operated by hand or by electric motor for moving a transparent film in front of an aperture, through which an observer might view a consecutive series of pictures by the aid of a lens, suitable illumination of the film being provided. A modification of this apparatus allows the image of the film enlarged to be thrown by a suitable lantern so as to form magnified images of the photographs upon a screen. This in essence is the modern moving-picture machine. When projected at the rate of 16 to 20 pictures per second, one visual impression does not entirely die out before another succeeds it, and the illusion of actual motion results.

The shutter of the projection lantern interrupts the light for the short interval of time necessary to move the film into a new position and avoids blurring of successive impressions in the mind of the observer. Thus the motion of the film in a projection machine is an intermittent one, each picture being projected on the screen for an instant; then, the shutter coming into operation, the film is shifted so as to place the next picture in position for projection and the shutter opened, repeating the operation to the end of the film. A slower speed than 16 per second causes an impression of flicker and fatigue to the eye and produces an unsatisfactory picture. For the same reason it is possible for special purposes, as well as for grotesque and comedy films, so to speed up the projection machine that the objects appear to move at an exaggerated velocity not attained in the original motion.



MOVING-PICTURE-PROJECTION APPARATUS.
Detail of film operating mechanism.

For the actual taking of the pictures there have been developed many ingenious forms of cameras following the fundamentals already outlined, but carefully perfected as regards mechanical details and facility of operation. This is true not only with regard to the demands of the great moving-picture industry but also with reference to portable designs for military and aëronautical purposes, as well as for the study of wild life, exploration, etc.

Likewise projection machines have been developed to a high degree of mechanical perfection. Since the magnification of the pictures is very great, approximately 35,000 times, any minute defect in the machine that would produce an irregular feeding of the film, or cause a sudden jar or vibration to it, is intensified in the same proportion on the screen. While these machines are built to operate either by hand or by an electric motor, the former mode is often prescribed by city ordinances on account of the necessity of stopping instantly in case the film catches fire. The films are made with a row of perforations on each edge, which are engaged by the teeth of sprocket wheels on the machine, both above and below the lantern aperture, to insure a uniform rate of feeding and withdrawing the film and to avoid the buckling or undue accumulation of it at places where it would be likely to become ignited and cause a panic in the audience.

Until a short time ago fires in moving-picture theatres were of common occurrence, originating at or near the projection machine and caused by the ignition of the film. The usual cause was an accidental stoppage of the motion of the film by some defect in the machine itself or by carelessness or inattention on the part of the operator, for as soon as the film stops, the heat radiated by the arc lamp and concentrated by the lens on the film develops such a high temperature that the latter may be instantly ignited, unless an automatic shutter, to operate the moment the film stops, is provided. Another cause of such fires is insufficient protection afforded the film after it has passed in

front of the lens. If it is exposed underneath the projection machine, it may become ignited by an incandescent particle of carbon thrown off from the arc lamp. The danger of fire and the more serious panic incident to the ignition of the film has been largely diminished by inclosing the machine and operator in a noncombustible booth or compartment of tile or asbestos, to which no one but the operator has access, and providing it with a small window through which the light from the lantern may pass to the screen and with a noncombustible door that must be kept shut. By better design and construction of the machine, providing more perfect protection of the film, by causing it to pass through narrow slots or fire gates above and below the beam of light, and by a metal shutter which automatically drops between lens and film the moment the latter stops, fires have been reduced in number, and insurance and State or municipal regulations are now generally quite strict and enforced in this field.

The human as well as the mechanical features also have received attention, and the complication of apparatus involved in projecting moving pictures has led to the development of a class of employees as operators that possess considerable experience, judgment, and skill in securing uniformly satisfactory results on the screens. These men are often recruited from spot-light operators and electrical workers of the stage, and while the work does not involve delicate manipulation or expert scientific knowledge, there is, nevertheless, a noticeable difference in the results of the work of different operators with the same film. The proper adjustment of the latter in the projection machine, the correct and uniform speed of running it, in addition to coolheadedness in case of film fire or other mishap which might result in panic, are the requirements that should be possessed by the most successful operators.

In spite of precautions, fires sometimes occur in the operator's booth, and prompt and intelligent action by the man in charge of the projection machine often has prevented a panic that might have resulted disastrously, yet actually in many cases has caused but slight interruption to the exhibition of film pictures. In the larger American cities the operators receive a salary of from $20 to $35 a week, their work including both afternoon and evening representations.

Growth of the Industry. The growth of the moving-picture business has been phenomenal the world over. It is difficult to obtain exact figures either of the amount of capital invested in the business or of the daily or annual attendance at the theatres. With the development of the industry and the excellence of the pictures and plays, the number of persons attending moving-picture theatres is increasing rapidly. In 1902 the moving pictures were limited to a few "nickolodeons," and were accepted more as a mechanical freak than as a legitimate form of entertainment. In 1922 many of the largest and most costly theatres in the world are given over exclusively to the films. Aside from the huge cinema palaces which have been built in every city in the world, and some of which seat over five thousand people, such playhouses as Covent Garden in London, the Boston Opera House, the Hippodrome in Paris, and even the Shakespeare Memorial Theatre in Stratford-on-Avon have devoted themselves, temporarily at least, to the exhibition of moving pictures. There are approximately seventeen thousand film theatres in the United States, and about twenty thousand throughout the rest of the world. In the United States, the average daily attendance is some ten million people, which means that the paid admissions amount to more than thirty times the total population of the country. As the average price of admission is eighteen cents, the box office receipts per annum are about six million dollars. The same figures, of course, do not apply in other countries, as the United States is actually the birthplace of the motion picture, and also the pioneer in its development. But in Europe, and particularly in Great Britain, France, Germany, and Italy, the popularity of the cinema is incredibly great. The same is true of South America and Japan. In Australia it is estimated that half of the total population attends the film theatres each week, a higher average, unquestionably, than in any country outside the United States. Approximately 13 per cent of the regular moving-picture patrons in the United States are under fifteen years of age, and 33 per cent are from sixteen to twenty-five. The percentage of men exceeds that of women by a few points. The centre of moving-picture production is in Los Angeles, Cal., although New York has occasionally threatened to provide a rival. The number of producing units outside these two localities is negligible. After a picture has been completed, from twenty-five to three hundred copies of it are made and sent to various exchanges throughout the country. These exchanges attend to the work of distribution. In most cases, they are subsidiary units of the main producing organization, but a few of them are independent companies, operating on a commission basis. The films themselves are manufactured of a standard size and material so as to be available for use in projection machines in all countries of the world. The United States is divided into exchange districts, and films are used daily in successive motion picture theatres in each exchange district for six months, nine months, or a year. This service is given at a fixed rate to the exhibitor, the rate depreciating as time goes on and as the film loses its temporal value or becomes worn and frayed through constant use. The expenses of a motion-picture house with a seating capacity of 500 average between three hundred to five hundred dollars a week, but some of the larger theatres spend as much as three thousand dollars a week on programme and advertising. Practically, any theatre requires two thousand weekly admissions to be assured of a reasonable profit.

While many inventors have made machines and devices for connecting moving-picture projectors with talking machines, many of which have been extensively exhibited, it is difficult to make the combination a satisfactory one. Perfect synchronism and the reproduction of the tones of the voice in their original quality and sufficiently loud to be heard in every part of a theatre are very difficult to attain. Perfect voice reproduction is not considered impossible, however, and inventors' efforts are being continued, as is evidenced by several recent patents. Edison's kinetophone (q.v.), first put before the public in 1912, proved

moderately successful, but still defective in the quality of voice reproduction and sometimes lacking in synchronism. About the same time that Edison attacked the problem Gaumont and Clermont-Huet in Europe were endeavoring to construct talking picture machines. It can be readily understood that when the moving-picture machine and the phonograph are mechanically connected, any slip or imperfection of the parts will cause one to get out of time with the other, and for this reason simple mechanical connections for this purpose have been practically abandoned. A type of apparatus for the electrical control of one machine by the other, devised by Gaumont, in its latest form accomplished the result of uniform operation of the two machines by controlling the motor driving the projection apparatus by means of a current obtained from the armature of a motor generator attached to the operating shaft of the phonograph. Another talking moving-picture machine which promised excellent results operates on the principle of controlling the projection apparatus by means of a current derived from a commutator on the shaft of the phonograph motor. This commutator has six sections, each one of which is connected with an electro-magnet or solenoid having an iron plunger connected to a crank on the shaft of the projection machine. Thus each one of the magnets of this solenoid motor is actuated by current derived from any convenient circuit controlled through its respective section of the commutator on the shaft of the phonograph so as to produce perfect synchronism of projector and talking machine.

Often it is advantageous to show moving pictures in daylight. The use of a translucent screen, said to resemble parchment, and which is also fire and water proof, has been tried, the pictures being projected on the screen from behind, and the audience or a class under instruction sitting in front are enabled to make notes or refer to books, etc.

Photoplays. The moving-picture play as a distinct artistic form grew out of the moving picture in much the same way as the regular drama developed from the crude mimicry of early times. The process of evolution in the one case, however, occupied only a few years, while in the other it extended over centuries. Just as the most primitive forms of drama were probably no more than rude attempts to portray or caricature actual events in the lives of persons and animals, so the first moving pictures were mere photographic transcripts from life, with little or no attempt at artistic arrangement.

But when the public had once become accustomed to the novelty of the moving picture there was a natural falling off in attendance at the places of exhibition, and it became necessary to invent some further means of entertainment. The exhibitors hit upon the obvious device of telling a story by means of the pictures. At first the attempts were confined largely to broad comedy or farce of the slap-stick variety; but the popular success of these crude efforts opened the eyes of both public and producers to the artistic possibilities of the new form of entertainment, and photographic dramatizations of popular stories and plays began to appear.

These attempts at story-telling were decided improvements over the original pictures. They were far from satisfactory, however, because the producers had not yet realized that a new technique was necessary and were trying merely to duplicate the effects of the legitimate stage. It was only after long experiment that the advantages and limitations of the art as a distinct form revealed themselves and the moving-picture play as we know it to-day was evolved.

Technically the new form is perhaps more closely related to pantomime than to drama. There is this essential difference, however: in pantomime we accept the convention that there is a race of beings whose natural language is gesture and who are therefore capable of expressing all their thoughts and emotions without the assistance of words, while in the motion picture we imagine the characters to be speaking as in ordinary life though, by convention, we are unable to hear them.

It is this convention of silence which has imposed the chief limitations on the moving-picture play as an artistic form. So long as the characters in the moving-picture play can express nothing that cannot be conveyed by means of gesture or facial expression the moving-picture playwright is necessarily limited in the choice and treatment of his theme to the more elemental emotions. The moving-picture play does not, therefore, attempt to deal in psychological subtleties or nice shades of character, but relies for its effect mainly on plot, as does the pantomime. It has an advantage over pantomime, though, in its use of captions or leaders. These are printed matter—inscriptions, letters, dialogue, headings, etc.—thrown on the screen to explain a scene or sequence of scenes that would not be intelligible from the acting alone. The tendency, however, is to dispense with these devices wherever possible and allow the story to unfold itself in action.

In structure the moving-picture play follows the Elizabethan rather than the modern tradition. Change of scene is frequent, and there is no obligation on the part of the playwright to arrange the events of his story so as to fall into the ordinary divisions of time and space which is obligatory to the contemporary legitimate dramatist. If in the course of the play some of the characters move from Europe to America, the spectators may take passage with them and witness the events on the journey; if the hero and heroine steal into the garden for five minutes, they may follow and see precisely what happens instead of trusting their report when they return to the drawing room. This flexibility of form lends an impression of greater continuity in action and makes possible a wealth of detail and added air of veracity that renders the moving-picture play a dangerous rival to the type of regular drama in which character and psychology are subordinate to plot. Already there is a tendency on the part of writers of melodrama to imitate the dramaturgy of the moving-picture play.

It is in connection with the representation of dramatic scenes in the form of so-called photoplays that the moving-picture industry finds its widest application. Depicting current events in this way of course aroused interest, but this does not bulk large in connection with the portrayal of successive scenes from some new or standard play in which the action follows along rapidly and emphasizes the dramatic succession of incidents. This involves the reduction of a play to a simple scenario or story, or it may

be the construction of a scenario or outline from new and original ideas. Once this is done the work of staging and photographing the scenes must be started. This involves large expense and considerable time, as many of the situations may be modified as the work proceeds, to give them proper dramatic value and effect. For production on the large scale that is now necessary, when moving-picture plays as regards not only elaboration but even in prices charged for admission and seats are in some cases put on a level with actual stage productions, extensive workshops and large studios are increasingly common. Several photoplays may be in process of production simultaneously, and a large force of costume makers, scene painters, and other assistants are employed, together with the necessary workshops for developing and finishing the films as rapidly as possible. The expense of the duplication of a film, once it is made, is not large proportionately, and as soon as films are released for rental the profits, according to the popularity of the subjects, are very large. When a film has been made and found satisfactory for exhibition it is imprinted with the name of the manufacturer and copyrighted. A film may be run about 500 times in the hands of a careful operator before its condition renders its projection unsatisfactory by reason of streaks and spots that appear greatly magnified upon the screen; in addition to which there is a certain increased fire danger from the frayed and split condition of the edges when exposed to the intense heat in front of the lantern.

The original photographs are made not only in large moving-picture studios that have become so common, but it is often desirable to transport a company of actors long distances to make even one reel under the exact natural surroundings called for by the story to give it a proper historical setting. Thus, some films have been made in the desert of Sahara, in the South Seas, or in the most inaccessible portions of the Alps. In the United States moving-picture companies have often been sent from New York to the cañons and prairies of the Far West, to the battlefield of Bull Run, or to Fort Ticonderoga, in order to secure a natural setting and the required realism of surroundings. All of this of course is one of the incidental expenditures in the production of photoplays and one that involves a large sum.

The first photoplays were one or two reels in length, but with the production, in 1912, of *Queen Elizabeth* and *The Prisoner of Zenda*, the vogue of the "feature film," or five-reel picture, commenced. From then on, it became necessary to protract all photoplay stories to five reels, or about five thousand linear feet of film, whether the conditions warranted it or not. Victor Hugo's *Les Miserables* and Rudyard Kipling's *A Man There Was* had to be shortened and lengthened, respectively, until they approached a common size. In 1915, however, David Wark Griffith revolutionized all the theories of motion-picture production with *The Birth of a Nation*, which was the first multiple reel photoplay. He proved that one picture could provide an entire evening's entertainment, and that the public would pay as much to see it as they would pay to see a play on the speaking stage. Consequently, *The Birth of a Nation* paved the way for a great flood of eight, ten and twelve-reel pictures. Another type of photoplay, the serial, came into popular favor at this time. The serial is presented in episodic form, two reels at a time, and is usually melodramatic in nature, so that the suspense will be carried over from week to week. Most serials average thirty reels in total length, although several have materially exceeded that number.

The development of the photoplay has rested with a few genuine artists, and a host of imitators. Griffith, in *The Birth of a Nation*, introduced the first battle scenes, and his pictures of the Civil War served as models for all the various war pictures that were made between 1914 and 1919. Mary Pickford's popularity inspired countless golden-haired ingenues, just as Charlie Chaplin caused all film comedians to adapt black mustache and grotesque shoes. William S. Hart was responsible for the Wild West-cowboy melodramas, and Douglas Fairbanks for the acrobatic-hero farce-comedies.

When George Loane Tucker produced *The Miracle Man*, he promoted a wave of religious enthusiasm in the films. The success of Theda Bara in *A Fool There Was* started the "vampire" craze which lasted for several years. In the same way, the demand for "mother-love" themes originated with *Humoresque* and for symbolism with Griffith's *Intolerance*.

After the great war the screen reflected the general trend toward realism, and so-called "costume dramas" in historical settings fell into popular disfavor. But then, for the first time in seven years, films were imported from Germany, and they tended to reverse the situation. The first of these, *Passion*, was based on the story of Mme. DuBarry and the French Revolution, and it was followed by a number of others, including *Deception*, *Gypsy Blood* and *The Loves of Pharaoh*—all costume dramas. Not all of these German pictures were successful financially, but they inspired many American producers to attempt photoplays of an historical nature. Examples of films that demonstrate this influence are Douglas Fairbanks in *The Three Musketeers* and *Robin Hood*, and Griffith's *Orphans of the Storm*.

The Germans also introduced a distinct innovation, the futuristic photoplay, as exemplified by *The Cabinet of Dr. Caligari* and *The Golem*. These two pictures proved that the effect of a supernatural story may be vastly increased by the use of weird, impressionistic settings. They disclosed a fourth dimension on the screen.

Non-Dramatic Films. Aside from dramatic representations moving pictures are widely employed. The safety-first movement makes use of moving pictures to represent safe and unsafe methods of working in the vicinity of moving machinery, belts, gears, etc., as well as demonstrating how to avoid dangers that are constantly present to railroad men and industrial workers in their regular work around cars and engines and machines. Important commercial use has also been made of moving pictures, since a salesman, by means of a portable projection outfit, cannot only show the variety of goods manufactured or sold by the firm employing him, but can also make clear if necessary every step in the manufacture and marketing.

Although at first used as a means of popular amusement, moving pictures soon were found adapted to purposes of instruction. Educationally the value of properly prepared films

on a large number of subjects has been increasingly appreciated, particularly in technical schools and universities. The processes of mining, smelting, and refining of ore and the manufacture of the metal into various forms, the action of complicated pieces of machinery or machine tools, or a surgical operation illustrating the operative methods in use in various cases, can all be shown by a series of moving-picture films to large classes with great facility and advantage. Among topics that have achieved wide popularity are those showing the work of boy scouts; of fresh-air fund committees; crusades against tuberculosis, typhoid, and other diseases; how comunities combat the dangers of impure milk and of infection from flies and other insects; unhygienic housing conditions; harvesting and handling of grain; collection and manufacture of silk, etc. In addition there are illustrated Bible stories, also historic biographies, such as those of Lincoln, Washington, and other famous characters; and, where the attendance is composed largely of industrial workers and their families, first-aid methods in cases of accident and injury are often shown.

There is practically no portion of the earth's surface that has not been photographed by the motion-picture camera. Travel films are a regular feature of the bill at almost every cinema theatre, and their educational value cannot be underestimated. Schools and colleges, realizing this, have used them extensively in connection with geographical instruction. A notable example of the travel pictures was *Nanook of the North* which depicted the life of that Eskimo so graphically and so dramatically that it achieved as much popularity as the most successful of the regular "feature" photoplays.

With a judicious selection of subjects moving pictures have been employed for the diversion and amusement of the inmates of penal institutions and insane asylums with good results. In the Montana Penitentiary and at Sing Sing, New York, films have been shown regularly every Sunday, and all convicts with a record of good behavior during the week were allowed to witness them.

For instruction in rifle practice moving-picture films representing moving persons and objects, bodies of cavalry, artillery, etc., are projected upon a background of scenery representing some locality unfamiliar to the troops who are being instructed. The background or screen is in semidarkness in order that the objects to be fired at may appear more distinctly, but the men at the firing line are in daylight, so that there is no difficulty in sighting the rifles. The projection apparatus is arranged so as to permit stopping the film long enough to show the location of the hits on the various parts of the target. After recording these the film is moved on and firing proceeds.

Photography from aëroplanes was developed extensively during the Great War because of the obvious military value of such films. The camera was used to record the effects of shell fire, enemy operations and strategic positions. Aërial photographs are now taken of cities, mountain ranges and unexplored regions, and are also used widely in connection with the news reels.

Some highly successful results have been secured in making pictures under water. The camera is placed in a closed, water-tight compartment, lowered into the water from a boat. This chamber is provided with a plate-glass window, in front of which a number of powerful electric lights are suspended, so as to illuminate any objects in the immediate vicinity with sufficient brightness to enable photographs to be made, even at depths as great as 60 feet, showing fish, plants, and other objects that otherwise could not be studied in their natural surroundings.

The slow-motion camera, as it is called, is in reality an ultra-rapid machine which records swift action with such speed that it is reduced to slow motion on the screen. Ordinarily, the camera will expose ten frames of film (ten separate pictures) in a second; the ultra-rapid process will expose four times that number, so that a race-horse, traveling at maximum speed, may be shown so distinctly that every detail of his muscular exertion is clearly visible.

Censorship. In 1909 the National Board of Censorship was organized at the request of the proprietors of many moving-picture theatres in New York City. This was a voluntary, unofficial group formed by the People's Institute of that city, and composed of professional and business men and women, social workers, and many others interested in the problems that have been brought up by the development of the moving picture. The members of the Board served without compensation, and their decisions had no legal force, although the film producers agreed to abide by them. Their object was to prevent photoplays of a questionable nature from being exhibited to the general public, since it was realized that so large a portion of every audience must necessarily be composed of children.

For some time this board operated successfully, but its principle reason for existence was removed with the advent of official State censorship. This censorship has been applied in many States, but most rigorously in Pennsylvania and Ohio, where the standards of judgment are peculiarly strict. Owing to the difference in the attitude of these regulatory boards in different States, the results are sometimes absurd. There have been cases of the total rejection of a photoplay by the censors of one State and its approval, unchanged, by those of another. In general, however, they have concentrated their attention on crime topics, immorality, and the exposure of the person. Censors are often offended more by the suggestion of evil than by anything in the action of a play. In one State the suggestion of expected motherhood is under the ban and may not be portrayed in the films; while in others, certain scenes that are in themselves sordid and even disgusting are allowed to run, provided the evil doer is suitably punished.

This uncertain situation, of course, has worked great harm to the motion-picture industry, since many photoplays must undergo complete revision every time they pass a State line. As a result, the producers have expended great sums of money to combat the extension of censorship and to work for the repeal of existing laws. The appointment of Will H. Hays as director-general of the industry was a direct result of this agitation, and represented a determined attempt on the part of the producers to purify the moving pictures from the inside so that the need for censorship would be removed.

Popularity. Every possible subject seems to have been covered by the films, from the daily

news service to religious, historical, and other educational subjects; in addition to sports, travel, military and naval events, fiction, comedy, tragedy, and the romantic drama. The audiences are cosmopolitan, composed of persons of all ages, nationalities, and conditions of life. The low price of admission prevailing as compared with that charged at regular theatres attracts many in search of diversion, entire families who would otherwise seldom go to an ordinary theatre are enabled to attend.

Bibliography. There is a constantly growing popular, as well as more or less technical, literature in this field available for consultation. There may be recommended the following: E. Muybridge, *The Horse in Motion* (Philadelphia, 1878); D. S. Hulfish, *Cyclopedia of Motion-Picture Work*, American Technical Society (2 vols., Chicago, 1911); F. H. Richardson, *Motion Picture Handbook* (2d ed., New York, 1912); *Moving Picture Annual and Yearbook* (ib., 1912 et seq.); Carl Froch, *Der Kinematograph und das sich bewegende Bild: Geschichte und technische Entwicklung der Kinematographie bis zur Gegenwart* (Vienna, 1913); F. A. Talbot, *Practical Cinematography and its Applications* (London, 1913); *Modern Bioscope Operator* (ib., 1913); J. A. Nelson, *The Photoplay: How to Write and How to Sell* (Los Angeles, 1913); E. W. Sargent, *Technique of the Photoplay* (2d ed., New York, 1913); Esenwein and Leeds, *Writing the Photoplay* (Springfield, Mass., 1913); J. B. Rathbun, *Motion Picture Making and Exhibiting* (Chicago, 1914); Horstmann and Tousley, *Motion Picture Operation* (ib., 1914); J. H. Hallberg, *Motion Picture Electricity* (New York, 1914); *Kinematograph Year Book, Diary*, and *Directory* (London, 1914); *Kinematograph and Lantern Weekly* (ib., 1914 et seq.); also the following publications of the National Board of Censorship of Motion Pictures: Annual Reports of the Board; *Policy and Standards of the National Board of Censorship; The Question of Motion Picture Censorship; Suggested Ordinance and Requirements for Motion Picture Theatres.* See KINETOSCOPE.

MOVING PLANT (*Desmodium gyrans*). An East Indian plant of the family Leguminosæ, remarkable, as are also some other species of the same genus, for the autonomic movements of the leaves, which are ternate, the lateral leaflets much smaller than the terminal one. These lateral leaflets are in constant motion, being elevated by a succession of little jerks, and then moving downward by similar rapid jerks. The terminal leaflet does not remain absolutely at rest, although its movements are not like those of the lateral ones. This is the most striking example of autonomic movements in plants. The movements are not very rapid, a complete up-and-down movement requiring two to four minutes, the fall being more rapid than the rise. The reason for these movements is unknown, nor are they known to be of any value to the plant. See MOVEMENT.

MOVING STAIRS. See ELEVATOR, *Escalator.*

MOWAT, mō'at, SIR OLIVER (1820–1903). A Canadian statesman, born in Kingston, Ontario, of Scottish parentage. In that city and in Toronto he was educated. He became a barrister (1841), practiced his profession in Kingston and Toronto, and was made queen's counsel in 1855. He was a Liberal member of the Canada Legislative Assembly for South Ontario in 1857–64, Provincial Secretary in the Brown-Dorion cabinet in 1858, Postmaster-General in the Macdonald-Dorion cabinet in 1863–64, and a judge of the Court of Chancery for Ontario from 1864 until 1872. Before accepting a seat on the bench Mowat was a strong advocate of Confederation, and was one of the delegates to the Quebec Conference (1864) at which its fundamental terms were settled. Resigning from the bench in 1872, he was elected leader of the Ontario Liberals and became Premier of that province, which position he retained for the unprecedented term of 24 years. As Premier his administration was chiefly noteworthy for its defense of provincial rights, Ontario's contention against the Dominion being sustained in several cases by the final court of colonial appeal, the Judicial Committee of the Privy Council. The best known of these cases arose from the boundary dispute between Ontario and Manitoba. (See MANITOBA, *History.*) Mowat also procured the passage of a large number of useful provincial laws. Legal reform early engaged his attention, and in 1856 he was a member of a commission for consolidation of the general statutes respectively of Canada and Upper Canada. During his premiership an act for the creation of a High Court of Judicature was passed, the object being the fusion of the courts of law and equity. In 1896 he was called to the Dominion Senate, where he became Liberal leader, also being appointed Minister of Justice in the administration of Sir Wilfrid Laurier. He was afterward Lieutenant Governor of Ontario (1897–1903). Consult J. C. Dent, *Canadian Portrait Gallery* (Toronto, 1880), and C. R. W. Biggar, *Sir Oliver Mowat* (ib., 1905).

MOWBRAY, mō'brâ, HENRY SIDDONS (1858–). An American decorative and figure painter, born of English parentage in Alexandria, Egypt. He was brought to the United States in 1859. In 1878 he went to Paris, where he studied under Bonnat. He started as an illustrator and painter of subtly refined ideal subjects and portraits, such as "A Lady in Black" (Buffalo Academy), "Idle Hours" (National Gallery, Washington), and "Le Destin," and was the first director of the American Academy at Rome (1903). In later years he confined himself to decorative painting, in which he displays great artistic intuition, restraint, elegance of composition and draftsmanship, and warmth of tone. In his beautiful adaptations of Pinturicchio's frescoes in the Borgia Apartments of the Vatican for the Library of the University Club, New York, he has thoroughly grasped the Italian master's style, and his original lunettes are no less admirable than the copied panels. Other fine decorations include the frieze "Development of Law" in the Appellate Court, New York; mural paintings in the Congressional Library, Washington, the Federal Court, Cleveland, the library of J. Pierpont Morgan, New York (also ceiling), and the private residences of C. P. Huntington and F. W. Vanderbilt, New York, and of Larz Anderson, Washington. He was elected a National Academician in 1891 and received a gold medal at Buffalo in 1901.

MOWBRAY, ROBERT DE, EARL OF NORTHUMBERLAND. See NORTHUMBERLAND.

MOWER. See REAPERS, REAPING.

MOWER, mō'ẽr, JOSEPH ANTHONY (1827–

70). An American soldier, born at Woodstock, Vt. He fought in the ranks during the Mexican War, but rose, in 1861, to be a captain in the regular army. During the first year of the Civil War he took part in the military operations in Kentucky and Tennessee, rendering conspicuous service. In November, 1862, he was promoted to brigadier general of volunteers, and was placed in command of a brigade before Vicksburg (1863). In 1864 he was promoted to the rank of major general of volunteers and commanded a division in Louisiana. Later he accompanied Sherman in the Atlanta campaign. Upon the reorganization of the army at the close of the war he was commissioned colonel of the Thirty-ninth Infantry and received command of the Military Department of Louisiana.

MOWRY, mou'rĭ, WILLIAM AUGUSTUS (1829–). An American educator and historical writer, born at Uxbridge, Mass. From 1854 to 1857 he studied at Brown University, from which he received an honorary A.M. in 1866. For many years he was engaged in educational work in Rhode Island and Massachusetts. In 1884-85 he was editor of the *Journal of Education* and from 1886 until 1891 of *Education*. He wrote: *Elements of Civil Government* (1890; new ed., 1913); *Talks with my Boys* (1892; 5th ed., 1909); *A History of the United States* (1896); *First Steps in the History of our Country* (1898; rev. ed., 1914), with A. May; *American Inventions and Inventors* (1900); *Marcus Whitman and Early Oregon* (1901); *The Territorial Growth of the United States* (1902); *American Heroes* (1903), with Blanche S. Mowry; *American Pioneers* (1905); *Essentials of United States History* (1906; rev. ed., 1914); *Recollections of a New England Educator* (1908).

MOXA. The downy hairs of *Artemisia moxa*, a plant of the family Compositæ; also the plant itself. The Chinese and Japanese use this substance as a cautery and a counterirritant.

MOX'OM, PHILIP STAFFORD (1848–). An American Congregational clergyman, born at Markham, Canada. He came to the United States at an early age and a year after the outbreak of the Civil War joined the Federal army. In 1875 he entered the Rochester Theological Seminary, where he remained three years, then entered the University of Rochester, where he graduated in 1879. He was pastor of the First Baptist Church in Cleveland, Ohio, from 1879 until 1885, and of the First Baptist Church in Boston from 1885 until 1894, when he took charge of the South Congregational Church in Springfield, Mass. He was university preacher at Harvard in 1894–97. His publications include: *The Aim of Life* (1894); *From Jerusalem to Nicea: The Church in the First Three Centuries* (1895); *The Religion of Hope* (1896); *Two Masters: Browning and Turgenief* (1912).

MOXON, mŏk'son, EDWARD (1801–58). An English publisher and minor poet, who went to London from his native Wakefield and, after some experience with Messrs. Longman, set up for himself as a London publisher in 1830, Samuel Rogers supplying the capital. A book of verse of his own, *The Prospect and Other Poems*, appeared in 1826. He published for a number of illustrious English authors, among them Wordsworth, Shelley, Browning, Monckton Milnes (Lord Houghton), Tom Hood, Lord Lytton, and Tennyson. An interesting incident in his career was the suit which was brought against him on a charge of blasphemy for publishing Shelley's *Queen Mab*—a case which was successful and compelled the deletion of certain passages in a number of subsequent editions. A second volume of Moxon's verse (1837) was combined with his first volume, the two appearing together in 1843. Moxon's business, as continued by Arthur Moxon and J. B. Payne, had among its publications Swinburne's *Atalanta* (1865). In 1871 the business of the Moxons was merged with that of Ward, Lock, and Tyler.

MOXOS, mō'hŏs, MOJOS, MOHOS, or MUSU, mōō'sōō. A noted group of tribes occupying the Province of Moxos, on the upper region of the Mamoré and Beni rivers, in northeastern Bolivia, and speaking a language of the widespread Arawakan stock (q.v.). By submitting themselves to the Inca Yupanqui they became incorporated with the Peruvian Empire (see QUICHUA), and an Inca colony was established in the province. In 1564 they repelled a Spanish invasion of their country, but in 1674 readily accepted the teaching of the Jesuit missionary Baraza, who worked among them for nearly 30 years and succeeded in collecting them into 15 mission villages, at the same time teaching them agriculture, weaving, and carpentry. Moxos missions grew and flourished, other neighboring tribes being also gathered into them, until in 1726 their 15 villages numbered 30,000 Christian Indians, representing nearly 30 tribes and at least 9 distinct languages, the Moxos proper predominating. With the expulsion of the Jesuits in 1767 the mission period came to an end, but the former converts maintained themselves as a civilized population and exist to-day in practically undiminished numbers. Physically they are of rather light complexion, with intelligent and handsome features. They are grave and thoughtful, honest and devoutly religious, peaceable and civil, but carrying always an air of independence. They are successful farmers, expert boatmen, and skillful with the lariat.

MOYABAMBA, mō'yä-bäm'bä. A town of Peru. See MOYOBAMBA.

MOYA Y CONTRERAS, mō'yä ē kŏn-trā'-räs, PEDRO DE (c.1520–91). A Spanish prelate and administrator, born in the diocese of Cordova. He received the doctorate in canon law at the University of Salamanca and afterward held numerous ecclesiastical positions, including those of inquisitor at Saragossa and Murcia. In 1571 he was sent to Mexico, as chief inquisitor, to establish the Inquisition there. He became Archbishop of Mexico in 1573 and was Viceroy of New Spain during 1584 and 1585. He summoned and presided over the third provincial council of the church in Mexico (1585). After his return to Spain in 1591 he was appointed president of the Council of the Indies.

MOYNE. See LE MOYNE.

MOYNE, PIERRE LE. See IBERVILLE, SIEUR D'.

MOYOBAMBA, mō'yō-bäm'bä, or **MOYABAMBA.** The capital of the Department of San Martín, Peru. It is situated in the northern part of the department, on the river Mayo and on a plateau of loose, sandy material, which the floods wash out, forming large ravines penetrating the town (Map: Peru, B 5). It has a fine healthful climate, with an average temperature of 77° F. The town consists

mainly of isolated houses thatched with palm leaves and scattered over a large area. The principal industry is the manufacture of Panama hats. Moyobamba has some trade with Brazil by way of the Amazon, with which the Mayo communicates through the Huallaga, but otherwise it is practically cut off from communication with the rest of Peru. Pop. (est.), 9000.

MOYSE, mwäz, HYACINTHE (1769–1801). A Haitian revolutionist, nephew of Toussaint L'Ouverture. In 1791 he headed a revolt against the whites and won the battle of La Croix-des-Bouquets, driving the whites into Port-au-Prince. This success was followed by a general revolt in the south and west, accompanied by massacres, executions, and devastation of the country. In 1794 he joined the party of Toussaint L'Ouverture (q.v.) and was made general of a brigade. He aided in the expulsion of the English (1798) and was commander of the Army of the North in the attack on Spanish Santo Domingo in 1801. Displeased at the despotism and usurpation of Toussaint, Moyse was accused of instigating a revolt in the north. He was arrested and court-martialed and with 23 of his men was blown from the cannon's mouth.

MOZAMBIQUE, mō'zam-bēk'. The former name of Portuguese East Africa (q.v.), now restricted to the northeast coast of that colony (Map: Africa, H 6).

MOZAMBIQUE. The capital of the Portuguese Province of Mozambique, situated on a small coral island separated from the east coast of Africa by a strait a mile wide, at the narrowest part of the Mozambique Channel (Map: Africa, J 6). Its principal buildings are the Governor-General's palace, the custom-house, the hospital, and the cathedral. It has three interesting old forts dating from the early sixteenth century, one of which is built entirely of stone imported from Portugal. Mozambique was formerly a centre for the slave trade and has declined in importance since that era. There is some traffic in rice, gum, gold dust, and timber; the shipping amounts to 150,000 tons annually. Pop., 1910 (est.), 362,000.

MOZAMBIQUE CHANNEL. The body of water between the east coast of Africa and the island of Madagascar (Map: Africa, J 6). It is about 1000 miles long, and its width ranges from 260 miles at the middle to nearly 600 miles at either end. The principal river flowing into it is the Zambezi. The Comoro Islands lie in the north entrance to the channel, and on the west shore are the ports of Beira and Mozambique. A warm current flowing through this channel strikes the Agulhas Bank to the south and produces in the shallows one of the roughest seas in the world.

MOZARABIC (mōz-ăr'å-bĭk) **LITURGY** (Sp. *Mozárabe,* from Ar. *Mustarb,* from *ta 'arrab,* to become an Arab, from *'arab,* Arab), or GOTHIC LITURGY. The ancient liturgy of the Church of Spain. The former title is derived from the name applied to the Christian inhabitants after they were subjected to the Arab domination; the latter is applied to it because it was most widely used during the Gothic period. It is also called the Toledan or Isidorian rite. A common opinion has been that it was of Eastern origin and was brought by the Goths from Constantinople or Asia Minor in the fifth century and then revised by St. Isidore of Seville; but some recent writers regard it as of Italian origin, with additions from Gaul and Africa. In the second half of the eleventh century the Roman liturgy began to supersede it; but this change was stubbornly resisted. In the end six old churches in Toledo were allowed to retain the local rite. Cardinal Ximenes made special efforts at the beginning of the sixteenth century to prevent the liturgy from falling into oblivion and founded a chapel expressly for its use. He also caused a number of learned priests to collate the existing manuscripts and published a revised edition, unfortunately incomplete, in 1500–02. At present it is still used in this chapel daily, and at a chapel in Salamanca once or twice a year. The affinities of this liturgy with the Gallican and the Greek make its study important to liturgical scholars. It was reprinted by Lesley (Rome, 1755) and by Lorenzana (ib., 1804); it is in Migne, *Patrologia Latina,* lxxxv, and the Breviary in lxxxvi, and a new edition appeared at Toledo in 1875. Consult J. M. Neale, *Essays in Liturgiology and Church History* (London, 1863), and C. E. Hammond, *Ancient Liturgies* (Oxford, 1879). See LITURGY.

MO'ZART, *Ger. pron.* mō'tsårt, LEOPOLD (1719–87). A German musician, father of Wolfgang Amadeus Mozart, born at Augsburg. He was sent to study law at Salzburg, but became a chorister and afterward a music teacher, as he played the violin well, and in 1743 was made a member of the Prince-Bishop's orchestra. In 1762 he was appointed court composer. He produced about 12 oratorios, 18 symphonies, 6 trio sonatas, as well as serenades and concertos. Twelve of his pianoforte pieces were published under the title *Der Morgen und der Abend.* His famous violin method, almost the first of its kind, *Versuch einer gründlichen Violinschule* (1756), was often reprinted and translated; but his chief service to the world was the careful and sympathetic training of his son, the great Mozart, whose genius he judiciously fostered.

MOZART, WOLFGANG AMADEUS (1756–91). A famous German composer. He was born at Salzburg, Austria, Jan. 27, 1756. Mozart's love for music first manifested itself when his eldest sister, Nannerl, began to receive musical instructions from her father. When he was only five years old he composed little minuets and was discovered at work on a concerto. At six he had become so proficient as a performer on the piano, and his sister's progress also had been so great, that their father took them on a tour of the leading capitals of Europe, everywhere meeting with notable receptions.

In 1768 the elder Mozart again took his son to Vienna. There this boy of 12 conducted a solemn mass of his own composition, and his operetta *Bastien und Bastienne* was given at a private performance. After a brief sojourn in Salzburg, where Wolfgang was appointed concert master to the Archbishop, his father took him to Italy. In Rome he heard the famous *Miserere* of Allegri, which was so jealously guarded by the authorities that musicians were forbidden to copy it under pain of excommunication. After twice hearing it young Mozart wrote it out by ear. His compositions and his performances made such a profound impression

that the Pope created him Knight of the Golden Spur, and at Bologna he was elected a member of the Philharmonic Society. At Milan he received a commission to compose an opera, the result being *Mitridate re di Ponto*, which was brought out in December, 1770, and had 20 consecutive performances. His knowledge of the Italian style of singing was greatly broadened through this Italian trip, and especially through his acquaintance with the male soprano Farinelli, the greatest singer of his time.

After another brief sojourn in Salzburg he returned in August, 1771, to Milan, where he brought out his serenata *Ascanio in Alba*, in honor of the nuptials of Archduke Ferdinand, a son of Maria Theresa. The death of Archbishop Sigismund at Salzburg was a severe blow to the Mozarts; for his successor, Hieronymus, for whose installation Mozart composed *Il sogno di Scipione* (The Dream of Scipio), showed little appreciation of his genius. Two other Italian stage works, *Lucio Silla* and *La finta giardiniera*, were produced in Milan, and the latter also in Munich; and on the occasion of Archduke Maximilian Francis's visit to Salzburg, in 1775, he brought out *Il re pastore*.

Disgusted with the obstacles which Hieronymus constantly threw in his way, Mozart, accompanied by his mother, again started out on his travels in September, 1777. In Mannheim he met the Weber family, which was destined to play an important part in his life. The head of this family, Fridolin von Weber, was prompter and copyist at the theatre. The eldest daughter, Josepha, afterward Frau Hofer, was the prima donna for whom in later years Mozart wrote the "Queen of the Night" music in *The Magic Flute*. A younger daughter, Aloysia, afterward Frau Lange, was for a time Mozart's pupil, and he promptly fell in love with her. Another daughter, Constanza, later became his wife. A trip to Paris ended tragically in his mother's death. He returned to Salzburg, stopping on his way in Munich, where Aloysia had secured a position and where he learned that she no longer cared for him. In after years, however, this youthful sweetheart did more than any other singer to make his music famous. While in Paris he made a friend of the encyclopædist Grimm.

At Salzburg he composed the music to the tragedy *King Thamos* and began the composition of an operetta, *Zaïde*, which was interrupted by an invitation to compose an opera for Munich. *Zaïde* was never finished, but the result of the Munich invitation was the opera *Idomeneo*, which opened a new epoch in his life, being his first masterpiece in the grand style. During a visit to Vienna in 1781 Mozart terminated once for all his relations with the boorish Hieronymus, who had grossly insulted him. He took up his residence with the Webers, who were now in Vienna. His father strongly objected to this, and he moved his lodgings. But he had fallen in love with Constanza, and in August, 1782, they were married. Notwithstanding the grinding poverty of their lot, their marriage was a happy one, for their mutual love atoned for the hardships which constantly confronted them. His marriage took place shortly after the production in Vienna of his opera *Belmonte und Constanza, oder Die Entführung aus dem Serail*. The Italian musicians of Vienna, headed by Salieri, used all means in their power to have the production fail, but it was triumphantly successful. Gluck attended one of the performances and was enthusiastic in his approval of it. Nevertheless, from this time on Mozart was constantly met by the hostile machinations of the Salieri party, which greatly embittered his career.

The success of the opera led the Emperor to order a new opera buffa of Mozart, who, in connection with its composition, was brought together with Lorenzo da Ponte. The result was *Le nozze di Figaro*. Beaumarchais's work on which the libretto is based had been forbidden in Vienna on the ground of its immorality. Mozart, however, went to work on the score, and when part of it had been composed, Da Ponte found opportunity to have the Emperor hear it, with the result that he ordered its completion and performance. Besides this he gave the composer an order for a musical comedy, *Der Schauspieldirector*, for a garden fête at Schönbrunn. Throughout the preparations for the production of *Figaro* Salieri and his adherents were active in opposition, and the first performance, in May, 1786, came near being a failure. In January, 1787, however, it was received with immense enthusiasm at Prague, where Mozart became a popular idol. The concerts which he gave there were immensely successful, and he was engaged to write another opera. Da Ponte suggested *Don Giovanni* to him and in April placed the libretto of the work in his hands. By September Mozart and his wife and Da Ponte were in Prague, rehearsals were taken in hand, and late in October *Don Giovanni* was produced and was even more successful than *Figaro* had been.

During a tour undertaken in 1789 with Prince Carl Lichnowski, the destination being Berlin, Mozart stopped en route at Leipzig, where he played in the Thomaskirche and was deeply impressed with Bach's motets. In Berlin his success was such that Frederick William II offered him a position as kapellmeister with a salary of 3000 thalers. But a few words of reassurance from the Austrian Emperor, accompanied with an order for a new opera, coupled with his own strong feeling of loyalty, unfortunately induced him to decline the King's offer, the best he had had. The opera was *Così fan tutte*, which was produced in Vienna in January, 1790. After a visit to Frankfort to attend the coronation of the new Emperor, Leopold II, he returned to Vienna. Meanwhile his old acquaintance Schikaneder was managing a theatre in Vienna. The affairs of the house being precarious, he thought to better them by producing an opera by Mozart, and so applied to him in the spring of 1791 to write a "fairy" opera—"a piece that would attract." Schikaneder himself furnished for Mozart the libretto to the *Zauberflöte* (The Magic Flute). The work was interrupted by an order to compose an opera for the coronation of Leopold as King of Bohemia at Prague in 1791. It was *La clemenza di Tito*, written in a few weeks by a man already much overworked. It did not make much impression. *The Magic Flute* was brought out in September, 1791, under the composer's own direction and with distinguished success.

But Mozart's constant struggle with intrigue and pecuniary necessities, and the strain to which he had subjected himself in order to meet these by constant work, had begun to tell upon him, and when, even before he had finished *The Magic Flute*, he received a mysterious commis-

WOLFGANG AMADEUS MOZART

sion to compose a requiem, he felt that he was writing his own swan song. It is now known that the commission came from a Count Walsegg, whose intention was to have the work performed as his own and who therefore kept his identity from Mozart. So fixed became Mozart's idea that he must complete his *Requiem* before death overtook him that even when his wife drove out with him, so that he might be in the open air, he insisted on taking his portfolio of music paper along. It was on one of these drives that his melancholy led him to express the belief that he had been poisoned at the instigation of his Italian rivals, a suspicion which does not, however, seem to have been borne out. Feeling that he would not live long enough to finish the *Requiem* himself, he sketched out the principal features of the uncompleted part, leaving them for his pupil Süssmayer to fill out. The night before his death he gathered some of his favorite singers about him, had the score of the *Requiem* brought to his bed, and the work was sung until the "Lacrimosa" was reached, when Mozart burst into tears and closed the score. His death came at one o'clock in the morning of December 5, and an eyewitness says that his last motion was an endeavor to imitate the kettledrums in the *Requiem*.

Mozart created no new forms, but filled those of his predecessors with his own individual genius; so that, when he died, his works marked, up to that time, the culmination of every form of music, with the exception only of the oratorio and the fugue. Above all, Mozart was a universalist who moved with equal freedom in all the fields of instrumental and vocal music. Both his inventive and plastic powers were extraordinary, and his mastery of all technical means supreme. But it must not be supposed that he acquired all this without effort. In 1908 Schünemann published Mozart's notebook of the year 1764, which shows that the eight-year-old composer was by no means a finished artist. Mozart arrived at consummate mastery at an earlier age, it is true, than most great masters, yet only through constant and conscientious practice. In quite recent years the researches of musical scholars have thrown new light on the influences that developed the master's individual style. Mozart's mind was one of unusual receptivity. He learned from all his predecessors, but especially from Stamitz, Johann Christian Bach, Franz Xavier Richter, and Johann Schobert (qq.v.). It has been proved that several works listed in Köchel's thematic catalogue are not original compositions by Mozart, but studies on works by the composers just mentioned. Thus, Wyzewa and Saint-Foix established the fact that the first four piano concertos are only studies on sonatas by Schobert (*Zeitschrift der internationalen Musikgesellschaft*, November, 1908). Likewise the symphony listed by Köchel as No. 18 is only a copy in Mozart's handwriting of a work by K. F. Abel (q.v.). Far from detracting from the master's real greatness, the result of these researches proves but the seriousness and scrupulous care with which the young man strove for perfection.

Rubinstein's words, "Eternal sunshine in music, thy name is Mozart," are a happy characterization of the master's style, which is an ideal combination of Italian melodiousness (in the best sense, of course) and German seriousness. This eternal sunshine, however, is one of the chief reasons why Mozart's music has paled before the more varied and compelling utterance of a Beethoven, Brahms, and Wagner.

Mozart's dramatic works have been completely enumerated in the preceding biographical sketch. The greatest of these, *Le nozze di Figaro*, *Don Giovanni*, *Die Zauberflöte*, have maintained themselves to this day in the operatic repertory. Of the 40 symphonies only 3—those in G minor, E flat, and C (Jupiter)—are still heard. The other orchestral works include 31 divertissements and serenades (see DIVERTIMENTO; SERENADE), besides a considerable number of pieces in various forms (marches, dances, etc.). He also wrote 25 piano concertos, 6 violin concertos, and over 40 arias with orchestra. In the field of chamber music he left 26 string quartets, 7 string quintets, 2 piano quartets, 42 sonatas for piano and violin, and several other works for various combinations of instruments. The piano works comprise 5 sonatas (four-hand), 17 solo sonatas, and numerous smaller pieces. Among the master's Church music the first place belongs to the immortal *Requiem*. Of the masses published under his name 15 are genuine. It may be of special interest to note that of the so-called *Twelfth Mass*, which for a long time was the most popular, only the magnificent fugue, "Cum Sancto Spiritu," was composed by Mozart. His other sacred music consists of litanies, vespers, magnificats, and smaller works, among which the famous *Ave Verum* deserves special mention.

Mozart's complete works were published by Breitkopf and Härtel from 1876 to 1886.

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MOZDOK, mŏz-dŏk′. A town in the Caucasian Province of Terek, Russia, situated on the left bank of the Terek, 58 miles north of Vladikavkaz (Map: Russia, G 6). It has a number of Armenian and Greek churches, of which that of the Assumption attracts many pilgrims. The educational institutions include four Mohammedan schools. Gardening and the manufacturing of wine are the chief occupations. The town

was founded in 1762. Pop., 1897, 14,583; 1911, 17,068, consisting chiefly of Kabardins, Georgians, and other Caucasian tribes, Armenians, and about 4000 Russians.

MOZETTA, mō-tsĕt'tȧ. See COSTUME, ECCLESIASTICAL.

MOZIER, mō'zhĕr, JOSEPH (1812–70). An American sculptor. He was born at Burlington, Vt., and in 1831 settled in New York, where he established himself as a merchant. In 1845 he retired from business to devote himself to art and shortly afterward went to Italy. He studied sculpture for several years at Florence and then went to Rome, where he spent the greater part of his professional career. Among his best works are: "Esther"; "Wept of Wishton-Wish"; "Tacite" and "Truth," in the Mercantile Library, New York; "Pocahontas"; "Prodigal Son," in the Philadelphia Academy; "Rebecca," in the New York Public Library; "Il Penseroso," in Horticultural Hall, Fairmount Park, Philadelphia. Though often amateurish and deficient in modeling, these statues are interesting and show more originality and emotional power than the average sculpture of the day in America. "Rizpah," in the Metropolitan Museum, New York, is one of his latest and most mediocre works. He died at Faids, Switzerland.

MOZLEY, mōz'lĭ, JAMES BOWLING (1813–78). An English clergyman. He was born at Gainsborough, Lincolnshire, and was sent in early youth to school at Grantham. In 1830 he was admitted to Oriel College, where he came into intimate association with the leaders of the Oxford movement—Newman, Pusey, Keble, and Hurrell Froude. With this movement he became formally allied, though he was never among the more dogmatic of its promulgators. In 1834 he took his degree, and shortly thereafter won the Chancellor's prize for an English essay on "The Influence of Ancient Oracles on Public and Private Life." He remained at Oxford, studying theology under the direction of Pusey and Newman, as fellow of Magdalen, until 1865, during which period he contributed, first to the *British Critic* and later to the *Christian Remembrancer*, articles suggested by the Church movement of the time. He was in full accord with Anglican teachings until the Gorham controversy of 1850 on the subject of baptism led him to attempt a reconciliation of the Christian tradition about baptism with the teachings of Calvinistic theology. His contributions to this subject were: *A Treatise on the Augustinian Doctrine of Predestination* (1855); *The Primitive Doctrine of Baptismal Regeneration* (1856); *A Review of the Baptismal Controversy* (1862). (See GORHAM CONTROVERSY; GORHAM, GEORGE CORNELIUS.) He removed from Oxford on his marriage in 1856, and became rector of Old Shoreham, Sussex. In 1869 Gladstone appointed him canon of Worcester, and two years later nominated him regius professor of divinity at Oxford, which post he held until his death. In addition to the works already mentioned he published his Bampton lectures on *Miracles* (1865) and *Ruling Ideas in Early Ages* (1877). Consult Anne Mozley, *The Letters of J. B. Mozley* (London, 1885), and Paul Thureau-Dangin, in *The English Catholic Revival in the Nineteenth Century* (2 vols., ib., 1914). He was a brother of Thomas Mozley.

MOZLEY, THOMAS (1806–93). An English clergyman and journalist. He was born at Gainsborough and attended Charterhouse School. In 1825 he entered Oriel College, Oxford. He became fellow of Oriel and enjoyed the intimate friendship of the leaders of the Oxford movement, the personal side of which he has given in his *Reminiscences, Chiefly of Oriel College and the Oxford Movement* (1882). In 1831 he entered the active ministry, but returned to Oriel in 1835 to assume the office of junior treasurer. In 1836 he resigned his fellowship and became rector of Cholderton, Wiltshire, where he remained 11 years, varying his pastoral duties by writing for the *British Critic*. In 1841 he succeeded Newman as editor of that journal. In 1844 he began writing for the *Times* (London), and in 1847 he resigned his living and removed to London, formally entering upon a long literary career. From 1868 to 1880 the rectorship of Plymtree was his. The years 1869–1870 found him in Rome as correspondent for the *Times*. From 1880 to 1893 he resided at Cheltenham, engaged in literary pursuits. James Bowling Mozley was his brother.

MOZOOM'DAR, PRATAP CHANDRA (c.1840–1905). A Hindu reformer and theist. He was born at Calcutta, India, studied in the native college there, was led by conviction to join the Brahmo-Somaj (q.v.), and became the editor of the *Theistic Quarterly Review* and the *Interpreter*, published in Calcutta in the interests of the association. In 1874 he visited England, and in 1883 the United States, where he was welcomed by the leading men of several Christian denominations. During his stay he published a book entitled *The Oriental Christ*, and on his second visit he read a paper before the World's Parliament of Religions on the *Brahmo-Somaj*, published in Chicago, 1893. He is the author of *The Faith and Progress of the Brahmo-Somaj* (1882); *Life and Teachings of Keshub Chunder Sen* (1887); and has contributed also to British and American periodicals. His fame and influence were, however, far greater in England and America than they ever were in India.

MOZYR, mō-zēr'. A town in the Government of Minsk, Russia, situated on the right bank of the Pripet, 204 miles southeast of Minsk (Map: Russia, C 4). It manufactures leather, beer, and hardware, and trades in grain, animals, and lumber. Pop., 1897, 10,762; 1910, 10,729, including about 5000 Jews.

MPONGWE, m'pōn'gwē. A Bantu-speaking people living about the Gabun estuary, in French Equatorial Africa. They are often confused with the Pangve, a distinct group of tribes ranging between lat. 1° and 5° N. Formerly powerful, the Mpongwe have been broken up by the movements of other tribes, especially by the Fans. Missionary work has been carried on among the Mpongwe for a long time, and their language, which has been reduced to writing through these efforts, is peculiarly rich, so that it has been adopted by neighboring tribes, and thus forms a trade language. The Mpongwe are above the average height and well developed; their hair is woolly, and the skin of light chocolate color. In character they are boastful and indolent. Agriculture and trading are their chief pursuits. As merchants they are untrustworthy, being known as clever swindlers. The political unit is the clan, ruled over by the headmen. The so-called king is chosen from the headmen by lot in a solemn conclave, and is reviled and mistreated before being proclaimed.

In arts the Mpongwe are at a low level. They

are said to cook their food by boiling it in earthen vessels, apparently not being familiar with the method of roasting. As canoe makers they are skillful, and are admirable boatmen. The canoes, usually 60 feet long, are hollowed out by fire and transported often several miles to water. Around the stations the Mpongwe are nominally Christians, but the isolated natives retain their pagan religion, with its fetish idols, charms, and belief in witchcraft.

MRICCHAKATIKA, mrĭch'ă-kā'tē-kā' (Skt. *mrcchakaṭīkā*, clay cart). The title of a Sanskrit play of the sixth century attributed to a king named Sūdraka, but probably written for him by the poet Dandin (q.v.). The play, which is in 10 acts, is one of the most exquisite of all the Sanskrit dramas and is noteworthy for its vigor, life, and action. The scene is laid at Ujjain (q.v.), and its central theme is the noble love of the rich courtesan Vasantasenā for a merchant named Charudatta, who has been reduced to poverty. The *Mricchakatīkā* has been edited by Stenzler (Bonn, 1847), Codabole (Bombay, 1896), Vidyasagara (2d ed., Calcutta, 1891), and Parab (Bombay, 1900). It has been translated into German by Böhtlingk (St. Petersburg, 1877), Fritze (Chemnitz, 1879), and Kellner (Leipzig, 1894); into Dutch by Vogel (Amsterdam, 1897); into Swedish by H. Anderssen (Lund, 1826); into French by Fauche (1861) and Regnaud (1876–77); into Italian by Kerbaker (1908); and into English by Wilson in *Select Specimens of the Theatre of the Hindus* (3d ed., London, 1871) and Ryder (Cambridge, Mass., 1905). Consult Lévi, *Théâtre Indien* (Paris, 1890); Chaṭṭopādhyāya, *Mricchakatīkā, or The Toy-Cart of King Śūdraka: A Study* (Mysore, 1902); Gawrónski, *Sprachliche Untersuchungen über das Mricchakatīkā und das Daśakumāracarita* (Leipzig, 1907); Bartoli, *Il caretto d' argilla* (Bari, 1909). For bibliography, consult Montgomery Schuyler, *Bibliography of the Sanskrit Drama* (New York, 1906).

MUALLAKAT. See Moallakat.

MUCHA, mụ'shȧ', Alphonse Marie (1860–). An Austrian decorative painter and illustrator. He was born at Ivancia (Moravia) and studied at the Munich Academy, at Vienna, and in Paris, chiefly under J. P. Laurens, who strongly influenced him. He started in Paris as an illustrator, but first attracted wide attention by his poster of Sarah Bernhardt as "Gismonda." Later he designed posters for her in all her great rôles, achieving special success with his "Medea." All his work in this line is distinguished by originality of design, richness of color, skillful use of mosaic backgrounds, and a wealth of decorative detail. His decorative panels, including a series of the "Four Seasons," and his cartoons for stained-glass windows possess great charm and individuality. He also takes a high rank as an illustrator of such works as Seignobos' *Scènes et épisodes d'Allemagne* and Robert de Fler's *Ilsée*. He contributed frequently to *L'Illustration, Le Monde Illustré*, and other periodicals, and became a Chevalier of the Legion of Honor. Consult *Alphonse Mucha et son œuvre* (Paris, 1897).

MUCH ADO ABOUT NOTHING. A comedy by Shakespeare, produced in 1597–98 and printed in 1600. It was probably a recast of *Love's Labour's Won* (1590), and was known as *Benedick and Beatrice* (1613). The story of Hero and Claudio is taken probably from the tale of "Ariodante and Ginevra" in Ariosto's *Orlando furioso*, which was translated by Beverly and dramatized as *Ariodante and Geneuora* (1582). It is found also in Bandello's novels and in a German play by Jacob Ayrer, *The Beautiful Phœnician* (1596). This contains some features not in the novel but used by Shakespeare, pointing to some unknown intermediate source. Otherwise the comedy is quite original, especially the inimitable Dogberry.

MU'CILAGE (Lat. *mucilago*, moldy, musty juice, from *mucere*, to be moldy, from *mucus*, slime). A name applied to aqueous solutions or jelly-like preparations of vegetable gums or of dextrin (q.v.). Distinction was made formerly between solids exuding from plants, such as gum arabic or gum tragacanth, and solutions made by extracting plants, as quince, marshmallow, etc. The United States Pharmacopœia contains four mucilages, including *Mucilago acaciæ* and *Mucilago tragacanthæ*. See Cement.

MU'CIN. See Mucous Membrane.

MUCIUS SCÆVOLA, mū'shī-ŭs sĕv'ô-lȧ. See Porsena.

MUCK, mụk, Karl (1859–). A German opera and concert conductor, born at Darmstadt. He was intended for a professional career and studied at Heidelberg and Leipzig. While at Leipzig he also attended the Conservatory. After a successful début as pianist at the Gewandhaus (1880), he turned his attention entirely to music, becoming conductor at Salzburg. After some minor engagements he attracted attention through his work at the opera at Prague (1886–92). In 1892 he became one of the conductors of the Berlin Royal Opera, alternating with Richard Strauss. At the same time he frequently directed at Bayreuth, and was in great demand as guest conductor in all the principal cities of Europe, both in opera and concert. From 1906 to 1908 he was conductor of the Boston Symphony Orchestra. Although the management would gladly have retained him longer, he was obliged to return to Berlin, as the Emperor refused to extend his leave of absence. In 1912 he obtained a definite release from his duties at the Royal Opera and assumed the regular conductorship of the Boston orchestra.

MUCK'ERS (Ger. *Mucker*, sulky person, hypocrite). The popular but opprobrious name, meaning that they were hypocrites, of an extraordinary sect which sprang up at Königsberg in Germany in 1835. The movement seems to have originated in the dualistic and Gnostic views of John Henry Schönherr (1770–1826) concerning the origin of the universe by the combination of a spiritual and a sensual principle. His followers carried out his system much more completely than himself. The most notable of them were two clergymen, Johann Wilhelm Ebel and Georg Heinrich Diestel, the former an archdeacon, who founded a society to which women—some of noble birth—attached themselves. Scandal was thereby caused, and Ebel's easily misunderstood expressions as to the proper relations of the sexes were made the basis of charges against his chastity and moral influence. His followers were accused of the grossest immorality, and a garden in Königsberg where they met acquired the name of the Seraph's Grove. The subject was brought before the courts (1839–42), and the result was that Ebel and Diestel were degraded from their offices, and the latter was further punished by

imprisonment. But the sentence was dictated by strong prejudice against the accused, on account of their religious views and peculiar eccentricities, and the evidence gives no support whatever to the charge of licentiousness. The matter was revamped without proper examination by W. Hepworth Dixon in his *Spiritual Wives* (London, 1868), and thus rendered familiar to English readers. For the facts consult J. I. Mombert, *Faith Victorious*, a life of Ebel (New York, 1882). See AGAPEMONE.

MUCKLESHOOT. See SALISHAN STOCK.

MU'CORA'CEÆ (Neo-Lat. nom. pl., from Lat. *mucor*, mold, from *mucere*, to be moldy, from *mucus*, slime; connected with Gk. *μύξα*, *myxa*, mucus, Skt. *muc*, to release). A family of the Mucorales (q.v.), which is an order belonging to the Zygomycetes (q.v.), one of the two groups of Phycomycetes (q.v.). The Mucoraceæ include the best-known black molds, and are among the most common of the saprophytic fungi. The characteristic cobwebby, fleecy-white mycelium, composed of large, often glistening, profusely branched filaments (hyphæ), is very common on decaying material, stale bread (kept moist and warm), fruits and fruit juices, etc. The ordinary form on stable manure is *Mucor mucedo*, while the common bread mold is *Rhizopus nigricans*. The cobweb-like mycelium produces erect branches (sporophores) which terminate in globular sporangia (spore cases), the spores and stalk being dark or even black, suggesting the name black mold. Sexual reproduction occurs under special conditions, when suitable individuals are brought together, for it has been found that the mycelia are sexually differentiated, although the two sexes cannot be distinguished. Fertile branches are developed by the pairing individuals, come into contact tip to tip, and a terminal cell is cut off by each. These two abutting cells fuse, and a zygote (fertilized egg) is the result. *Pilobolus*, the squirting fungus, is also a member of this family, occurring on stable manure and resembling *Mucor*, but remarkable for its method of discharging spores. The sporophore becomes much swollen just beneath the sporangium, and finally bursts, hurling the sporangium with considerable force.

MUCORALES, mū'kô-rā'lēz. One of the two orders of Zygomycetes (q.v.), which in turn is one of the two groups of Phycomycetes (q.v.). The plants of this order are commonly known as black molds, among which are many of the most common saprophytic fungi. Among the families of Mucorales are the Mucoraceæ (q.v.), the best-known black molds. The other order of Zygomycetes is the Entomophthorales (q.v.), a group of parasites fatal to insects.

MU'COUS MEMBRANE and **MU'CUS.** The mucous membrane is continuous with the skin at all the orifices of the body and lines the passages by which the internal organs communicate with the outer world. For convenience of description the mucous membrane may be divided into three great tracts—the alimentary, the respiratory, and the genitourinary.

The *alimentary mucous membrane* commences at the lips and not only forms the inner lining of the intestinal canal from the mouth to the anus, but gives off prolongations which after lining the ducts of the various glands (the salivary glands, the liver, and the pancreas) whose products are discharged into this canal, penetrate into the innermost recesses of these glands and constitute their true secreting element. Besides these larger offsets we find in the stomach and small intestine an infinite series of minute tubular prolongations, the anatomical arrangement and function of which are described under DIGESTION, ORGANS OF.

The *respiratory mucous membrane* begins at the nostrils and under the name of *Schneiderian* or *pituitary membrane* (see NOSE) lines the nasal cavities, from whence it sends on either side an upward prolongation through the lachrymal duct to form the *conjunctiva* of the eye; backward, through the posterior nares (the communication between the nose and the throat), it sends a prolongation through the Eustachian tube to the middle ear (the cavity of the tympanum), and is continuous with the pharyngeal mucous membrane (which is a portion of the alimentary tract); it then, instead of passing down the œsophagus, enters and forms a lining to the larynx, trachea, and bronchial tubes to their terminations.

The *genitourinary mucous membrane* commences at the genitourinary orifices, lines the excretory passages from the generative and urinary organs, and is the essential constituent of the glands of both. In the female it becomes continuous with the serous membrane of the abdomen at the fimbriæ of the Fallopian tubes. See KIDNEY.

Mucous membranes line all those passages by which internal parts communicate with the surface and by which matters are either admitted into or eliminated from the body. As a general rule they are soft and velvety, and of a more or less red color, from their great vascularity; but they present certain structural peculiarities according to the functions which they are required to discharge. In all the principal parts of the mucous tracts we find the mucous membrane presents an external layer of epithelium (q.v.) resting on a thin, transparent, homogeneous membrane, which from its position is termed the basement membrane, and beneath this a stratum of vascular tissue of variable thickness, which usually presents either outgrowths in the form of papillæ and villi, or depressions or inversions in the form of follicles or glands, or both. The follicles are almost invariably present, but the papillæ and villi are limited to the alimentary or gastrointestinal mucous membrane. The mucous membranes constitute the medium through which are effected nearly all the material changes that take place between the living organism and the external world. Thus, in the gastrointestinal mucous membrane we find a provision for reducing the food by means of a solvent fluid poured out from its follicles; while the villi, which are closely set upon the surface of the small intestine, are specially adapted to absorb the nutrient materials thus reduced to the liquid state. The same membrane, at its lower part, constitutes an outlet through which are cast out not merely the indigestible residuum of the food, but also the excretions from numerous minute glands in the intestinal wall. Again, the respiratory mucous membrane serves for the introduction of oxygen from the air and for the exhalation of water and carbonic acid. And, lastly, the mucous membranes are continuous with the cell-lined vesicles or tubes of the various glands, which are the instruments whereby their respective products are separated from the blood.

Mucus. Although the various kinds of epi-

thelial cells discharge a special office in relation to the peculiar function of the mucous membrane upon which each kind occurs, yet they all serve one general purpose—viz., that of protecting the surfaces on which they are placed. This protecting power is increased by the presence of the secretion known as *mucus*, which ordinarily forms an extremely thin layer on these membranes, but when they are irritated or inflamed is secreted in very considerable quantity. (See CATARRH.) The exact mode of its formation is still a disputed question, but it is generally believed to be the product of the gradual solution of the uppermost epithelial cells. Besides acting both mechanically and chemically as a shield to highly sensitive membranes, mucus has other uses, among which two may be especially mentioned: (1) it communicates to the salivary, and probably to other, glands properties which are not possessed either by itself or by the pure glandular secretions; and (2) it serves to eliminate a considerable quantity of nitrogen from the system.

Mucin. This nitrogen is contained in the *mucin*, which forms from 2.4 to 9 per cent of nasal and bronchial mucus. This mucin contains 12.64 per cent of nitrogen, and is the substance which gives to mucus its viscid and tenacious character. Normal mucus is devoid of smell and taste and is faintly alkaline in reaction.

MUCU'NA. A genus of leguminous plants. See COWAGE; LUMBRICOID.

MUCUS. See MUCOUS MEMBRANE.

MU'DAR (Hind. *madār*, from Skt. *mandāra*, coral tree), *Calotropis*. A genus of East Indian shrubs of the family Asclepiadaceæ. The bark of the root and the thick milky juice of some species are used in the East, where they have long been credited with alterative, purgative, emetic, and sudorific properties which have attracted some attention from European physicians. Mudar is a very common and often troublesome weed in India. The commonest species, *Calotropis gigantea*, a large shrub, with stems often thicker than a man's leg, and broad, fleshy leaves, rapidly attains a large size on very dry sands, where almost nothing else will grow. The short, not easily spun, silky down of the pods is used for making floss and a soft, cotton-like thread. A strong fibre, useful for cordage and fishing lines, is obtained from the inner bark. When properly prepared it is especially well adapted to mix with various other fibres, especially silk. The thick, milky juice, collected by making incisions in the bark, is used as a substitute for caoutchouc and gutta-percha. It becomes flexible when heated. *Calotropis procera* occurs as a low tree in the Sahara. Its fruit is said by some to be the apple of Sodom of the Bible. See SODOM, APPLE OF.

MUD CAT. See CATFISH.

MUD DAUBER. See MUD WASP.

MUD EEL. A siren. See MUD PUPPY.

MUDFISH. A name given to several widely different fishes which frequent muddy waters. 1. In the United States, the bowfin (q.v.). 2. In California, a small marine goby (*Gillichthys mirabilis*) which lives in shallow places that are left bare at low tide and harbors in excavations made by itself in the mud. 3. One of the killifishes (see KILLIFISH), the mummichog, or mud dabbler. 4. Any of the lungfishes or dipnoans, especially the rare *Lepidosiren paradoxa* of Brazilian swamps. (See DIPNOI, and Plate of DIPNOI AND CHIMÆRA.) This is a salamander-like creature which grows to a length of 4 feet or more, has the dorsal, caudal, and anal fins united into one continuous fin and the pectoral and ventral fins produced into long jointed filaments. The head is conical, eye small, gill openings without covers, mouth small, and teeth pointed and cusped, adapted to crushing the fresh-water snails (chiefly *Ampullaria*) upon which it feeds. A closely related west African fish (*Protopterus annectans*), sometimes 6 feet long, is very abundant in the Gambia River, where it sustains a torpid existence during the dry season by burying itself in the mud, forming a sort of nest or case of hardened mud about it. Many specimens have been dug out and sent, each within its clod, to Europe, and kept alive in zoölogical gardens. They grow rapidly, are active and voracious the year round, when kept in tanks in hothouses feed upon flesh and all sorts of small animals, and frequently eat each other. In the wet season they swim and crawl about the muddy rivers they inhabit, and are sought as food by the natives. They are nocturnal and frequently rise to the surface to breathe. Their breeding habits are little known, but they are believed to be ovoviviparous. The young have external gills. Consult Richard Lydekker, *Royal Natural History*, vol. v (London, 1895).

MUD'FORD, WILLIAM (1782–1848). An English writer, who as editor of the London *Courier*, for a time the rival of the *Times*, exerted great influence on public opinion. Leaving the *Courier*—which declined in influence after his withdrawal and presently was discontinued—he became editor and proprietor of the *Kentish Observer*, the organ of the Conservative party in Kent. In 1841 he succeeded Theodore Hook as editor of *John Bull*. To *Blackwood's Magazine* he contributed many essays and tales, afterward collected in part. Among his published volumes are: *A Critical Enquiry into the Writings of Dr. Samuel Johnson* (1803); *Nubilia in Search of a Husband* (1809); *The Contemplatist* (1811), essays; *An Historical Account of the Campaign in the Netherlands in 1815* (1817); *Tales and Trifles from Blackwood's* (1849).

MUDGE, ENOCH (1776–1850). The first Methodist minister reared in New England. He was born at Lynn, Mass., was converted under Jesse Lee, the pioneer of Methodism in New England, and entered the ministry in 1793. He labored as an itinerant preacher in Maine until 1799, when his health gave way and he was forced to retire. He was twice chosen State Representative and had much to do with the passage of the Religious Freedom Bill. In 1816 he resumed preaching. From 1832 to 1844 he was pastor of the Seaman's Chapel at New Bedford, Mass.

MUDGE, JAMES (1844–). An American Methodist Episcopal clergyman and writer, nephew of Zachariah Mudge. He was born at West Springfield, Mass., and graduated from Wesleyan University in 1865 and from Boston University School of Theology in 1868. The same year he entered the ministry, joining the New England conference. While a missionary in India from 1873 to 1883 he edited the Lucknow *Witness*. After his return he was pastor of churches in Massachusetts until 1908, serving also as lecturer on missions at the Boston

University School of Theology. In 1889 he became secretary of the New England conference. He wrote: *Memorial of Rev. Z. A. Mudge; Historical Sketch of the Missions of the Methodist Episcopal Church* (1877); *A Defense of Christian Perfection* (1896); *The Best of Browning* (1898); *The Life Ecstatic* (1906); *Fénelon the Mystic* (1906); *The Riches of His Grace* (1909); *History of the New England Conference* (1910); *The Perfect Life in Experience and Doctrine* (1911); *Hymns of Trust* (1912); *Religious Experience Exemplified in the Lives of Illustrious Christians* (1913). For many years he was book editor of *Zion's Herald*.

MUDGE, THOMAS HICKS (1815–62). An American Methodist Episcopal clergyman, born at Orrington, Me., the son of Enoch Mudge. He graduated from Wesleyan University in 1840 and from Union Theological Seminary in 1843, and then entered the ministry, joining the New England conference. After several pastorates in New England he became professor of sacred literature in McKendree College, Lebanon, Ill., serving from 1857 to 1859. Later he held pastorates in St. Louis, Mo., and Baldwin, Kans.

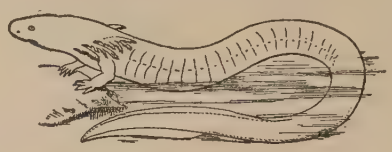
MUDGE, ZACHARIAH ATWELL (1813–88). An American Methodist Episcopal clergyman and author, nephew of Enoch Mudge. He was born at Orrington, Me., and was educated at Wesleyan University. He entered the ministry in 1840 and held various pastorates in Massachusetts. For three years he was editor of the *Guide to Holiness*. He was the author of *Memoir of Cyrus Shepherd* (1848); *Views from Plymouth Rock* (1861); *The Christian Statesman: A Portraiture of Sir Thomas Fowell Buxton* (1865); *The Forest Boy: The Sketch of the Life of A. Lincoln* (1867); *Footprints of Roger Williams* (1871); *Arctic Heroes* (1875); *North Pole Voyages* (1875); *An Easy Lesson Book for Infant Scholars*, the sale of which reached into the hundred thousands. It was translated into the Urdu language by James Mudge, who also wrote a *Memorial* of his uncle.

MUD HEN. A variant of marsh hen, some species of coot, gallinule, or rail (qq.v.).

MUDIE, mū'dĭ, CHARLES EDWARD (1818–90). The founder of the famous Mudie's Lending Library, London, and a publisher. He was born at Chelsea and established himself in 1840 in London as a stationer and bookseller. In 1842 he commenced his lending library and, by a shrewd understanding of the needs and tastes of his public and by extensive advertising, fostered its growth and established several branches. In 1864 Mudie's became a limited company. Among the books he published may be noted the first English edition of James Russell Lowell's poems. A volume of Mudie's own verse appeared in 1872.

MUD MINNOW. A small, minnow-like fish of the family Umbridæ, closely allied structurally to the pikes. They inhabit weedy streams, bogs, and ditches in the United States, and also in Austria, where they bury themselves in the mud. They are carnivorous, and extremely tenacious of life. Often when none can be seen in a pool a swarm of these little dark-green fishes may be aroused by raking through the mud. Two American species are known, the Eastern mud minnow (*Umbra pygmæa*) and the Western dogfish (*Umbra limi*).

MUD PUPPY, or WATER DOG. An American salamander of the family Proteidæ, characterized by having four toes on each foot and persistent larval gills. This genus was formerly called *Menobranchus*. Two species inhabit the central parts of the United States, of which the more common and widespread is *Necturus maculatus*. It reaches the length of 1 foot, is smooth, slimy, and brown-blotched, with the



A MUD PUPPY.

tufted gills dark red. These creatures remain mostly among weeds or rocks at the bottom of the water during the daytime, but at night they move about, often with quick eellike motions (a local name is mud eel), in search of crayfish, worms, insects, frogs, etc. They spawn in April or May. Other salamanders are sometimes given the same name, especially the axolotl (q.v.).

MUD SHAD. A useless shadlike fish (*Dorosoma cepedianum*), called also "gizzard" and "hickory" shad, which is abundant all along the coast from Cape Cod to Mexico and also throughout the Mississippi valley. It grows to a length of about 15 inches and is bluish silvery, the young having a round dark spot at the shoulder. See Plate of HERRING AND SHAD.

MUDSKIPPER. One of the curious little fishes (3–4 inches long) of the goby family and genus *Periophthalmus*. They are sometimes called jumping fishes or leaping fishes and abound on the coasts of west Africa, the Red Sea, Indian Ocean, and eastward to Japan. Their remarkable peculiarity is that they will leave the water to visit every place washed by the surf. By the aid of the pectoral and ventral fins and the gill covers these fishes skip across the damp sand, ascend the roots of mangroves, and run up wet rocks in quest of flies. They are, says Day, essentially mud-dwelling fishes, dark brown in color, and if placed in a vessel of

A MUDSKIPPER.

deep clear water will drown. This amphibious power of these fishes has been acquired without any essential change in the character of the gills; but the fish is in the habit when out of water of puffing out its cheeks with air, which is held for a short time and then renewed. Consult Day, *Fishes of India* (London, 1878), and Karl Semper, *Animal Life as Affected by Natural Conditions of Existence* (New York, 1881).

MUD SUNFISH. A small bass (*Acanthar-chus pomotis*) of little value as food, numerous in sluggish coastal streams from New York to South Carolina. It is dark green in color, with five indistinct blackish stripes lengthwise and a black opercular spot.

MUD TORTOISE, or MUD TURTLE. A dark-brown turtle (*Cinosternum pennsylvanicum*) with light dots on the head, found from Canada to Texas. See TERRAPIN.

MUD WASP, or MUD DAUBER. Any one of a group of wasps belonging to the old genus *Pelopœus*, now *Sceliphron*. They build nests of mud in sheltered places, choosing the cracks of a barn or fence or some sheltered place under the eaves of any wooden building, entering also disused rooms in houses, and sometimes even rooms that are in daily use. The nests consist of a varying number of mud cells placed side by side, usually in a single row, but sometimes in several rows. The cells before completion are packed with a food supply for the future young, and this consists almost invariably of spiders, as many spiders being placed in one cell as the cell will hold. A single egg is laid upon the last spider which has been placed in the cell, and the larva hatching from the egg eats rapidly, consuming the abdomens of the spiders first and subsequently the remainder of their bodies. All of the spiders which have been placed in the cell have been stung and paralyzed by the parent wasp, but many of them are not really dead when the larva reaches them. After the egg is laid and the nest is closed up, new cells are constructed by the same female. The mud or clay with which the nests are constructed is brought in little balls by the aid of the wasp's mandibles, and 20 or more visits are required to complete one cell; so that for the construction of a large nest of 50 cells about 1000 visits must be made by the insect. The larva reaches full growth in a short time, usually 10 days or two weeks, and forms a cocoon within the mud cell, the winter being passed in the cocoon, although there may be two or more summer generations, in which case the summer pupal period is short. The group is a large one, and mud wasps are common not only in America and in Europe, but in India and Australia. Consult: J. H. Fabre, *Insect Life* (London, 1901); David Sharp, in *Cambridge Natural History*, vol. vi (ib., 1901); L. O. Howard, *The Insect Book* (New York, 1914). See also the article WASP and its bibliography.

MUET, mụ'ā', PIERRE LE (1591–1669). A French architect, born at Dijon. He is chiefly noted for his work on the beautiful church of the Val-de-Grâce in Paris, whose construction he superintended from 1655 to 1666 as successor to Jacques Lemercier (q.v.). He published in 1623 *Manière de bien bâtir pour toutes sortes de personnes.*

MUETTE DE PORTICI, mụ'ĕt' de pôr'tē-chē, LA (Fr., The Dumb Girl of Portici). An opera by Auber (q.v.), first produced at Paris, Feb. 29, 1828; in the United States, Nov. 28, 1831 (New York).

MUEZZIN, mû-ĕz'ĭn, or **MUED'DIN** (Ar. *mu'adhdhin*, one who calls to prayer, from *'adhdhana*, to call to prayer, from *'adhina*, to hear). The Arabic name of the Mohammedan official attached to a mosque, whose duty it is to announce the different times of prayer. His chant (*'adhān*) consists of these words, repeated at intervals: "Allah is great [four times]. I testify that there is no God but Allah [two times]. I testify that Mohammed is the apostle of Allah [two times]. Come to prayers [two times]. Come to salvation [two times]. There is no god but Allah." The Shiites also say "Come to good works," and "Prayers are better than sleep" is added before the early morning prayer (*fajr*). Besides these regular calls, two more are chanted during the night for those pious persons who wish to perform special nightly devotions. In small mosques the *'adhān* is chanted by the imam, and, when the mosque is provided with a minaret, the muezzin ascends it for his chant; in smaller mosques, the chant is made at the side. The office of muezzin is considered a meritorious one, and insures the holder's admission into Paradise.

MUFTI, mŭf'tē (Ar. *muftī*, expounder of the law). The name of a Mohammedan official who expounds the law according to the Koran and traditions; according to his decision, delivered in a memorandum called a fetwa, the cadi, or judge, decides the case. In Turkey the grand mufti, or *Sheikh al Islam*, is appointed by the Sultan. He is the supreme chief of the ulemas, or body of Mohammedan theologians. His fetwa is extremely powerful—even under certain circumstances may depose the Sultan. It is through him that the jihad, or holy war, is proclaimed, as was done by the fetwa published in the *Tanin*, Nov. 15, 1914. The title mufti is also applied to jurisconsults attached to local government councils in the Turkish Empire, but the power of the muftis, with the exception of the grand mufti, is largely nominal.

MÜGELN, HEINRICH VON. See HEINRICH VON MÜGELN.

MÜGGE, mụg'ge, THEODOR (1806–61). A German novelist, born and educated in Berlin. His liberal sentiments, expressed in various newspapers and in such pamphlets as *Die Censurverhältnisse in Preussen* (1845), led in several instances to his arrest and prosecution. During the 20 years preceding his death he wrote numerous sketches, tales, novels, and romances. Several, including *Toussaint* (1840) and *Afraja* (1854), have been translated into English by E. J. Morris. Among the most interesting of his writings are his Norwegian romances and sketches of travel: *Leben und Lieben in Norwegen* (1858); *Skizzen aus dem Norden* (1844); *Nordisches Bilderbuch* (1858; 3d ed., 1862). A complete edition of his novels was published in 33 volumes (Breslau, 1862–67). Consult the *Allgemeine deutsche Biographie*, vol. xxii (Leipzig, 1885).

MUGGER. The common marsh crocodile of India and the Malay islands (*Crocodilus palustris*). It is not often more than 12 feet in length. Its head is rough, with a thick and rather broad snout, and each jaw contains 19 teeth on each side. It inhabits rivers, ponds, tanks, and marshes, and goes ashore only when it is obliged to move into some new water by the drying up of its pond, or wishes to bury its eggs in the sand. In extreme drought, however, it buries itself in the mud and remains dormant until the coming of the rains. This is the crocodile which is venerated by the Hindus and is kept in a half-domesticated condition in certain ponds, attended by fakirs, who worship in a neighboring temple of their cult. Consult the writings of Indian naturalists, especially Sir J. E. Tennent, *Sketches of the Natural History of Ceylon* (London, 1861); A. L. Adams, *Wanderings of a Naturalist in India* (Edinburgh, 1867); W. T. Hornaday, *Two Years in the Jungle* (7th ed., New York, 1901).

MUG'GLETO'NIANS. A sect that arose in London about the year 1651. The founders were

two cousins, John Reeve (1608–58) and Lodowicke Muggleton (1609–98), obscure journeymen tailors, claiming to have the spirit of prophecy. Muggleton professed to be the "mouth" of Reeve, as Aaron was of Moses. They affirmed themselves to be the two witnesses of Revelation xi. They asserted a right to curse all who opposed them, and did not hesitate to declare eternal damnation against their adversaries. They denied the doctrine of the Trinity; held anthropomorphist opinions about the Deity; and to all this added many strange doctrines of their own, as that the devil became incarnate in Eve, etc. *The Complete Works of Reeve and Muggleton* were published in London (1756; reprinted, 1832). The sect lasted until the middle of the eighteenth century. Consult Gordon, "The Origin of the Muggletonians" and "Ancient and Modern Muggletonians," in the *Transactions of the Liverpool Literary and Philosophical Society* for 1869–70.

MUGNONE, mo͞o-nyō'nâ, Leopoldo (1858–). An Italian orchestral conductor, born at Naples. He received his musical education at the Conservatory of his native city, and began the usual career of an Italian operatic conductor. When he became acquainted with Wagner's works, he saw that he had found a task worthy of his unusual gifts. From that time on he was, together with Mariani (q.v.), the most active apostle of the new style, which everywhere met with opposition. His excellent work at the Costanzi Theatre in Rome made him famous, and attracted the attention of Verdi, who, in 1892, chose him to direct the first performance of *Falstaff*. Together with Mariani, Mugnone is to be regarded as the founder of interpretative conducting in Italy. As a composer he is unimportant. His work in this field comprises three operas: *Don Bizarro e le sue figlie* (1875), *Il Birichino* (1892), *Vita Brettona* (1905).

MUGWORT. A popular name for various species of *Artemisia* (q.v.).

MUGWUMP (Algonquin *mugquomp*, chief, great man). In American politics, a term originally applied to a voter nominally identified with a particular party, but claiming the right to vote with another party. It early passed into the local phraseology of some of the New England villages, being applied in its original (Indian) signification to any local magnate. Its first appearance in print seems to have been in the Indianapolis *Sentinel* in 1872. Its popular use began with an article in the New York *Sun* for March 23, 1884. In September of the same year it was first given to a political party, the Independent Republicans, who refused to ratify the nomination of James G. Blaine for the presidency. The name was applied to them in a spirit of derision, but was accepted by them, and now regularly denotes any body of voters who profess to be independent of strict party obligations. The name Dudes and Pharisees was also applied in 1884 to those Republicans who opposed the election of James G. Blaine. As since adopted in England, it usually means one who stays neutral and votes for no party.

MUHAR'RAM (Ar. *muḥarram*, sacred, from *ḥarama*, to forbid). The first month of the Mohammedan year. Originally the Arabs had a solar year by means of intercalary months. The first month was called *Safar I* and came in the autumn. It was the month of fairs, pilgrimages, and festivals, and hence acquired the epithet *al Muḥarram*, the sacred, which in time supplanted the real designation. When in the year 10 of the Hejira Mohammed restored the lunar year, on the ground that intercalary months were an impious interference with the order of things as established by God, Muharram and all the months began to come earlier in each succeeding year. Mohammed is said to have observed the tenth day of Muharram (the *'āshūrā*) as a fast day, perhaps in imitation of the Jewish Day of Atonement on the tenth of Tishri. Later he appointed the month of Ramadan (q.v.) for fasting. The Sunnites still consider the tenth of Muharram as sacred, and keep it as a fast. The Shiites lament the death of Husain on the first 10 days of the month. See Hasan and Husain. Consult Julius Wellhausen, *Reste arabischen Heidenthums* (2d ed., Berlin, 1897).

MÜHLAU, mu̇'lou, Ferdinand (1839–1914). A German biblical scholar. He was born in Dresden, was educated at Leipzig and Erlangen, and in 1869 became docent at the latter university. From 1870 to 1895 he was professor of exegesis at Dorpat and then, until his retirement in 1909, of New Testament exegesis at Kiel. Among his published works are: *Geschichte der hebräischen Synonymik* (1861); *De Proverbiorum quæ Dicuntur Aguri et Lemuelis Origine et Indole* (1869); *Besitzen wir den ursprüngliche Texte der heiligen Schrift?* (1884); a text of Genesis without points, with Kautzsch (4th ed., 1904); a revision of Gesenius' lexicon, with Volck (1886, 1890); *Zur paulinischen Ethik* (1898).

MÜHLBACH, mu̇l'bȧg, Luise. The assumed name of Klara Mundt (1814–73), wife of Theodore Mundt, an author of the Jungdeutschland school. A German author, born in Neubrandenburg. Her very numerous works, consisting mostly of historical novels, are sensational, inartistic, distorted, but show a talent for lively description and narration that gave her a wide but short-lived popularity. *Friedrich der Grosse und sein Hof* and many others of her novels have been translated into English.

MÜHLBERG, mu̇l'bĕrk. A town in the Province of Saxony, Prussia, on the Elbe, 35 miles northwest of Dresden (Map: Prussia, E 3). It manufactures sugar, bricks, and lumber. It is famous as the scene of a battle in 1547, which resulted in the defeat of the Protestants under John Frederick I, Elector of Saxony, by the Emperor Charles V, and the triumph of the Catholics in Germany. Pop., 1900, 3463; 1910, 3345.

MÜHLEISEN-ARNOLD, mu̇l'ī-zen-är'nold, John (1817–81). An English clergyman, missionary, and author, born at Zell (Württemberg). He was educated in Germany and after his removal to England was successively missionary of the Church Missionary Society in India and Abyssinia, chaplain to the Bishop of Gibraltar, and chaplain to St. Mary's Hospital, Paddington, London (1852–61). In 1859 he founded the Moslem Mission Society in England. He was chaplain of East Ham, Essex, from 1861 to 1865, consular chaplain at Batavia, Java, from 1865 to 1871, and rector of St. Mary's Church, Papendorf, Cape Town, South Africa, from 1876 until his death. His publications include: *Ishmael; or, A Natural History of Islamism* (1859); *English Biblical Criticism, and the Authorship of the Pentateuch, from a German*

Point of View (2d ed., 1864); *Genesis and Science; or, The First Leaves of the Bible* (2d ed., 1875).

MUHLENBERG, mū'len-bĕrg, FREDERICK AUGUSTUS CONRAD (1750–1801). An American clergyman and politician, son of Heinrich Melchior Muhlenberg. He was born at New Providence (now Trappe), Montgomery Co., Pa., studied in Germany at the University of Halle, and upon his return to America entered the Lutheran ministry in Pennsylvania. In 1773–76 he was pastor of a Lutheran church in New York City. He was an ardent patriot, and in 1776 he quitted New York and returned to his native State, at the same time abandoning the work of the church for political activity. He was elected to the Continental Congress in 1779. He was also a prominent member of the Pennsylvania Legislature and was twice Speaker of that body. The first session of the House of Representatives in Washington's administration chose him as Speaker, an office which he twice filled. He was also made chairman of the Committee of the Whole in 1795, and cast the deciding vote that saved the Jay Treaty (q.v.).

MUHLENBERG, GOTTHILF HEINRICH ERNST (1753–1815). An American clergyman and botanist, son of Heinrich Melchior Muhlenberg, born at Trappe, Pa. He was educated at Halle and traveled in Germany and in England. He was ordained a Lutheran minister and became assistant pastor of a Lutheran church in Philadelphia. In 1779 he retired to the country, where he devoted himself to the study of botany; and it is as a botanist that he is best known. A well-known genus of grasses (*Muhlenbergia*) was named in his honor. His chief works are *Catalogus Plantarum Americæ Septentrionalis* (1813) and *Descriptio Uberior Graminum et Plantarum Calamariarum Americæ Septentrionalis Indigenarum et Cicurum* (1817).

MUHLENBERG, HEINRICH MELCHIOR (1711–87). The founder of American Lutheranism. He was born at Eimbeck, Prussia, Sept. 6, 1711. His parents were Saxon, but, having suffered greatly in the Thirty Years' War, removed to Eimbeck. The death of his father in his twelfth year threw the family into poverty and occasioned an interruption of his studies, and till his twenty-first year he toiled incessantly to assist in the support of the family. In 1735 he entered the University of Göttingen, where he remained three years. Graduating at Göttingen, he went to Halle in 1738, where, besides studying, he taught in the orphan house. He associated intimately with Francke, Cellarius, and Fabricius. Soon after his ordination application came to Germany from Pennsylvania for some one to be sent to labor among the destitute Lutherans of that colony. The faculty selected Muhlenberg, who was then in his thirty-first year. He accepted the appointment, and the better to qualify himself went to London, where he acquired facility in the use of English. He reached America in 1742, to the great joy of the German Christians. His arrival marked a new era in the history of the Lutheran church in the United States. He took the pastoral care of the associated churches of Philadelphia, New Hanover, and New Providence (now Trappe, some 25 miles northwest of Philadelphia), which had united in calling a minister, and these three congregations were the principal scenes of his ministerial labors. At his request more ministers came from Halle, and his oversight of the Lutheran churches extended from Georgia to New York. The first three years of his ministry he resided in Philadelphia, the next 16 in New Providence. In 1761 he removed to Philadelphia, but in 1776 went back to New Providence. During the War of the Revolution his sympathy with the colonists excited great opposition, and his life was often in peril. Consult: his autobiography to 1743 (in German), edited by W. Germann (Altoona, 1881), and his *Life* by M. L. Stoever (Philadephia, 1856), W. J. Mann (ib., 1887), and W. K. Frick (ib., 1902); also Ochsenford, *Muhlenberg College, a Quarter-Centennial Memorial Volume* (Allentown, 1892).

MUHLENBERG, JOHN PETER GABRIEL (1746–1807). A Lutheran preacher and leader in the Revolutionary War, son of Heinrich Melchior Muhlenberg (q.v.). He was born at Trappe, Pa., Oct. 1, 1746, was sent to the University of Halle to be educated, but entered the army, and passed a year as a private in the dragoons. Returning to America, 1766, he studied for the Lutheran ministry; was called to Virginia, 1771; to have a legal standing as a clergyman there, went to England, 1772, and was ordained by the Bishop of London; in the same year he was settled at Woodstock, Va. Soon after the beginning of the Revolutionary War he told his congregation that there was a time to preach and a time to fight, and at the close of the services he threw off his gown, showing himself in full uniform, and read from the pulpit his commission as colonel. He had the drummers strike up for volunteers, and nearly 300 of his congregation volunteered and joined his regiment, the Eighth Virginia, popularly known as the German regiment, afterward noted for its courage and good discipline. In 1774 he was a member of the House of Burgesses and served on the committee of safety, and two years later he sat in the State convention. He participated in the fighting at Charleston in 1776, and was made brigadier general the following year and placed in command of the Virginia line. He took part in the battles of the Brandywine, Germantown, and Monmouth, and in the capture of Stony Point. He defended Virginia against the expeditions of Leslie and Arnold, and was commander in chief there till the arrival of Steuben. Upon the invasion of Virginia by Cornwallis he was next in command to Lafayette, and at the siege of Yorktown he was in command of the first brigade of light infantry. He retired at the close of the war with the rank of major general. Soon after he settled in Pennsylvania. He served in Congress in 1789–91, 1793–95, and 1799–1801. In the latter year he was chosen United States Senator, but resigned when Congress met to become supervisor of revenue for the district of Pennsylvania, and in 1803 he was appointed collector of the port of Philadelphia, in which position he died near Philadelphia, Oct. 1, 1807. Consult his *Life* by his great-nephew, Henry A. Muhlenberg (Philadelphia, 1849).

MUHLENBERG, WILLIAM AUGUSTUS (1796–1877). An American Episcopal clergyman and philanthropist, grandson of Heinrich Melchior Muhlenberg. He was born in Philadelphia and graduated at the University of Pennsylvania in 1814. Three years later he was ordained deacon and served as assistant to Bishop White at Christ Church, Philadelphia. Ordained

priest in 1820, he was rector from 1821 to 1828 of St. James's Church, Lancaster, Pa., where he helped to establish the first public school in the State outside of Philadelphia. He founded in 1828 at Flushing, Long Island, a school afterward known as St. Paul's, of which he was principal until 1846. Then he was rector of the church of the Holy Communion in New York until 1858, in the latter year becoming superintendent and pastor of St. Luke's Hospital, which he had founded. In the later years of his life he was instrumental in establishing an industrial Christian settlement at St. Johnland, Long Island. He died in St. Luke's Hospital, April 8, 1877. To trace his effect upon his time would be to record the origin of several of the most important movements within the Episcopal church. Thus, he made his New York parish the first free-seat church of his communion in America; he organized the first sisterhood within the same limits in 1845, known as the Sisterhood of the Holy Communion; and the important later developments in the direction of Christian unity (see EPISCOPAL CHURCH) and of liturgical enrichment and flexibility both really grew out of his memorial to the House of Bishops in 1853. Church music and hymnody also owe much to him; he published three books in this department; but his most important literary work is contained in *Evangelical Catholic Papers* (1875–77). For his life, consult biographies by Anne Ayres (4th ed., New York, 1889) and William Newton (Boston, 1890); also Leighton Coleman, *The Church in America* (New York, 1896).

MUHLENBERG COLLEGE. An institution for higher education founded at Allentown, Pa., in 1867. It is under the control of the Evangelical Lutheran church. The college includes preparatory and collegiate departments, with classical, scientific, and philosophy courses leading to the degrees of A.B., S.B., and Ph.D. The total enrollment in all departments in 1914–15 was 213 and the faculty numbered 14. In the library are 21,000 volumes. The campus of 72 acres and the college building are valued at $755,500. The income from all sources in 1913–14 was $26,205. The college had an endowment of about $300,000. The president in 1915 was John A. W. Haas, D.D.

MÜHLFELD, mül'fĕlt, RICHARD (1856–1907). A German clarinetist and symphony director, born at Salzungen. He received musical instruction under Emil Bückner at Meiningen. At 17 an expert clarinetist, from 1875 to 1896 he was a member of the orchestra at the Bayreuth Festival. In 1905 he became chief symphony director at the ducal court chapel of Brunswick.

MÜHLHAUSEN, mül-hou'zen. A town in the Province of Saxony, Prussia, on the Unstrut, 30 miles northwest of Erfurt (Map: Prussia, D 3). It is an old town with a number of churches, of which that of St. Blasius dates from the twelfth century and the church of St. Mary from the fourteenth century, and a mediæval Rathaus. It is surrounded with modern suburbs and has a Gymnasium, a trade and textile school, a seminary for teachers, and a theatre. There are manufactures of woolen and linen goods, carpets, leather, cigars, chewing tobacco, sewing machines, bicycles, furniture, dyes, malt and beer. The city has considerable trade in cattle, grain, and fruit. Pop., 1900, 33,433; 1910, 35,091. Mühlhausen appears in history as early as 925, when it was a fortified post. It rose to considerable importance as a free city in the fourteenth century, and at the time of the Peasants' War was the headquarters of the Anabaptist leader, Thomas Münzer, who was executed in the neighborhood in 1525. The town was finally incorporated as a part of the Kingdom of Prussia in 1815.

MÜHLHEIM, mül'hīm. See MÜLHEIM.

MUIR, mūr, JOHN (1810–82). An English Sanskrit scholar. He was born in Glasgow and was educated at the University of Glasgow and the East India School at Haileybury. He engaged in the civil service in British India in 1829–53 and devoted himself to the study of the languages, history, and antiquities of India. In 1853 he retired from the service and settled at Edinburgh, devoting himself to the advancement of Oriental literature, especially in its bearing upon Christianity. In 1846 he offered to the University of Cambridge a prize of £500 for the best treatise on the errors of the Hindu systems of philosophy and on expounding the principles of Christianity to learned natives of India; and he gave, in 1862, £5000 to the University of Edinburgh for the endowment of a professorship of Sanskrit and comparative philology. Muir did much to help the spread of Christianity among the Hindus. His most important work was *Original Sanskrit Texts on the Origin and History of the People of India, their Religion and Institutions* (London, 1858–72; 3d ed., 5 vols., 1872–74), treating of the origin of caste, racial and linguistic affinities of the Hindus, and the Vedas, including Vedic mythology. In 1875 he issued an anthology of Sanskrit proverbs entitled *Religious and Moral Sentiments Metrically Rendered from Sanskrit Writers*, followed by a similar volume called *Metrical Translations from Sanskrit Writers* (London, 1879).

MUIR, JOHN (1838–1914). An American explorer and naturalist, born at Dunbar, Scotland, April 21, 1838. He studied at the Dunbar Grammar School and then, having come to the United States, at the University of Wisconsin. After four years he began to explore the less-known portions of the North American continent, devoting his attention particularly to the western coast and to Alaska, where the Muir Glacier (q.v.) is named for its discoverer. In 1878 he visited the Arctic Regions on the U.S.S. *Corwin* in search of the De Long expedition; in 1899 became a member of the Harriman expedition to Alaska; and subsequently traveled in Russia, Siberia, Manchuria, India, Australia, and New Zealand (1903–04), in South America (1911), and in Africa (1912). John Muir preceded the "conservation movement" many years in his earnest advocacy of the preservation of American forests and the establishment of national parks and reservations, especially in the Sierras, with which his name will always be identified. He became a member of the American Academy of Arts and Letters and received honorary degrees from the universities of Wisconsin and California and from Yale. Muir died at Los Angeles, Dec. 24, 1914. He published: *The Mountains of California* (1894; enlarged ed., 1911); *Our National Parks* (1901; enlarged ed., 1909); *Stickeen* (1909); *My First Summer in the Sierra* (1911); *The Yosemite* (1912); *Story of my Boyhood and Youth* (1913); and nearly 150 magazine and newspaper articles on natural history. He also

edited *Picturesque California*. After his death appeared (1915) *Letters to a Friend* and *Unpublished Prose and Letters*, containing a practically complete work on Alaska.

MUIR, Matthew Moncrieff Pattison (1848–). An English chemist. He was born and educated in Glasgow, studied at the University of Tübingen, and became fellow and prelector in chemistry at Gonville and Caius College, Cambridge. Muir did much to popularize modern chemistry. He published: *Qualitative Analysis and Laboratory Practice* (1874), with T. E. Thorpe; *Chemistry for Medical Students* (1878); *Chemistry* (1883); *A Treatise on the Principles of Chemistry* (1884; 2d ed., 1889); *Elements of Thermal Chemistry* (1885); *Practical Chemistry* (1887), with D. J. Carnegie; *Chemistry of Fire* (1893); *The Alchemical Essence and the Chemical Element* (1894); *The Story of the Wanderings of Atoms* (1898); *The Story of Alchemy* (1902); *The Elements of Chemistry* (1904); *A History of Chemical Theories and Laws* (1906); *The Chemical Elements* (1908).

MUIR, Thomas (1845–). A British mathematician and educator. He was born near Lanark and was educated at Wishaw Public School, at Glasgow University, and in Germany. For a time he taught in Glasgow, first as assistant professor of mathematics in the University, and then as head of the mathematical and science departments of the high school. He then removed to Cape Town, South Africa, where he was vice chancellor of the University of the Cape of Good Hope (until 1901) and Superintendent General of Education in Cape Colony. His principal publications are a *Treatise on the Theory of Determinants* (1882), *History of Determinants* (1890), and *Theory of Determinants in the Historical Order of Development* (2 vols., 1906–11).

MUIR, Sir William (1819–1905). A British administrator and Orientalist. He was born at Glasgow, studied at the universities of Glasgow and Edinburgh, and in 1837 entered the Bengal civil service of the East India Company. Ten years later he was appointed secretary to the Lieutenant Governor of the Northwest Provinces, and during the Indian Mutiny (1857) he was chief of the intelligence department at Agra and successfully took charge of communications upon which largely depended the suppression of the mutiny. When the capital was removed to Allahabad, in 1858, he went there as the Lieutenant Governor's secretary and had the chief share in organizing the government. Unfortunately his plans for raising the largest amount of revenue compatible with the ability and contentment of the natives were not adopted in London, although approved by expert opinion in India. He was provisional member of the Viceroy's legislative council (1864–67), foreign secretary in the Viceroy's executive council (1867), Lieutenant Governor of the Northwest Provinces (1868–74), and financial member of the Viceroy's executive council (1874–76). The heavy land assessments were reduced by him, and the custom of female infanticide among Hindus was tactfully suppressed. His interest in education was shown in the founding of Muir College and Allahabad University. So far as official duties permitted Muir was a diligent student of Oriental literature and thought. He was a profound Arabic scholar and investigated the life of Mohammed and the history of Islam. His publications include: *Life of Mahomet* (4 vols., 1858–61), an authoritative work; *The Corân* (1878); *Ancient Arabic Poetry* (1879); *The Caliphate* (2d ed., 1893); *Agra in the Mutiny* (1896); *The Mohammedan Controversy* (1897).

MUIR GLACIER. One of the largest and best known of the Alaskan glaciers, named after John Muir (q.v.), who discovered it in 1878. The ice stream flows down the slopes of Mount Fairweather, which is over 15,000 feet high, and enters Glacier Bay as a palisade of ice nearly 2 miles long and from 136 to 210 feet high. It forms a barrier across the head of the bay, and its submarine base reaches as much as 760 feet below the sea level. In the lower course the ice moves about 7 feet a day, breaking off at the end in great bergs that float away to the sea.

MUIRHEAD, mūr′hĕd, John Henry (1855–). A British philosopher, born in Glasgow. His mother was a kinswoman of James Frederick Ferrier (q.v.). He studied at Glasgow Academy and University and at Balliol College, Oxford. For a time he was assistant to the professor of Latin at Glasgow; then lectured on philosophy at Bedford College, London; and in 1900 became professor of philosophy in the University of Birmingham. Muirhead was a Hegelian. He was an editor of the *Hibbert Journal* and of a series called "The Library of Philosophy." He translated into English Zeller's *Aristotle and the Earlier Peripatetics* (1897), contributed to *Mind*, and wrote *The Elements of Ethics* (1892; 3d ed., 1910); *Philosophy and Life* (1902); *The Service of the State* (1908), four essays on T. H. Green's political teaching; *The Starting Point of Poor Law Reform* (1910); *German Philosophy in Relation to the War* (1915).

MUIR-MACKENZIE, mə-kĕn′zĭ, Montague (1847–1919). An English barrister and law writer. He was educated at Charterhouse School and at Brasenose College, Oxford, and was a fellow of Hertford College, Oxford (1874–88). In 1873 he was called to the bar, and he was secretary to Lord Chief Justice Coleridge for the four following years. He became recorder of Deal in 1892 and was a bencher of the Middle Temple from 1894 to 1905 when he became an official referee. His publications are upon technical subjects, such as *Bills of Lading*, *Judicature Acts*, *Laws of Registration*, and *Bankruptcy Acts*.

MUIR WOODS. See National Monuments.

MUKADDASI, mōō′kȧd-dä′sē (Ar. *Abū 'Abd Allāh Muḥammad ibn Aḥmad al Muḳaddasī*, or *al Maḳdisī*). A famous Mohammedan geographer. He was born at Jerusalem (whence his name: *Muḳaddasi*=from Jerusalem) in 946. His father was an architect and gave his son a good education. In his twentieth year he made the pilgrimage to Mecca and afterward decided to devote his life to the study of geography. For a score of years he journeyed up and down through the Moslem world, seeking information with infinite labor and excellent judgment. The only Mohammedan countries not visited by him seem to have been India, Sejestan, and Spain. In 985 he published his book, dividing it into three parts: (1) what he had himself seen; (2) what he had learned from trustworthy witnesses; (3) what he had read. He then resumed his travels and three years later issued a new and enlarged edition. Mukaddasi's

travels did not reach quite so far as those of some other Arabic geographers, but, judged by the zeal with which he collected his material, the good sense he showed in sifting it, and the clear and logical arrangement of his work, he is easily the foremost of them all. It has been edited by De Goeje in his *Bibliotheca Geographorum Arabicorum*, vol. iii (*Descriptio Imperii Moslemici Auctore Al-Mokaddasi*, Leyden, 1877); the part relating to Syria, including Palestine, has been translated into English with notes by Le Strange in the *Library of the Palestine Pilgrims' Text Society*, vol. iii (London, 1886). Mukaddasi was a trained philologist, but his imitation in the description of each region of the dialect of its inhabitants, though not without its value to us, is more to the credit of his versatility than of his good taste. He was liberal in his religious views and a member of the famous philosophical society of Basra called the *Ikhwan al Safa* (the pure brothers). Consult: August Sprenger, *Die Post- und Reise-Routen des Orients* (Leipzig, 1864); Alfred von Kremer, *Kulturgeschichte des Orients*, vol. ii (Vienna, 1877); G. Le Strange, *Palestine under the Moslems* (London, 1890); Carl Brockelmann, *Geschichte der arabischen Literatur*, i (Weimar, 1898); R. A. Nicholson, *A Literary History of the Arabs* (London, 1907); C. I. Huart, *Histoire des Arabes* (Paris, 1912).

MUKDEN, mōōk-dĕn′, or **MOUKDEN.** The capital of Manchuria and of the Province of Shengking, situated in a fertile region near the Hun-ho, 110 miles northeast of Newchwang, its port (Map: China, M 3). It is surrounded by a brick wall and is divided into nine parts, of which the central contains the old Imperial palace, the former examination hall, and beautiful administration buildings in the foreign style of architecture. The city is regularly and solidly built, but is of little architectural interest. It is the seat of a considerable industry, and is the converging point for the principal trade routes between northern and southern Manchuria and China. Mukden trades chiefly in agricultural products and fur, and is the seat of the administration of Manchuria. In the vicinity of the city are the tombs of the ancestors of the late Manchu dynasty of China. The population is estimated at about 158,000. The city suffered greatly during the Boxer uprising of 1900, and about it was fought, February-March, 1905, the culminating battle of the Russo-Japanese War (q.v.). Mukden is a clean, well-ordered city. Theoretically it is open to foreign trade. It has rail connection with Sinminting and Antung. Consult Dugald Christie, *Thirty Years in the Manchu Capital* (New York, 1914).

MUKHTAR PASHA, mōōk′tär pä-shä′, (Ahmed Mukhtar Pasha el Ghazi) (1832–). A Turkish general and administrator, born at Brusa in Asia Minor. He was educated at the Constantinople military school, was rapidly promoted, and became successively professor and governor of the school. He served as adjutant in the Crimean War, as a staff officer in the Montenegrin campaign of 1862, and in 1870–71 in campaigns against the Arabs of Yemen, in which he gained the titles of pasha and marshal. He was made commander of the Second Army Corps (1873), and in 1875, at the breaking out of the troubles in Bosnia and Herzegovina, assumed command of the Turkish forces there. After his defeat at the Duja Pass in the Montenegrin campaign of 1876 Mukhtar was sent to Erzerum to take charge of the operations against Russia on the outbreak of war with that country in 1877. On April 29 he was defeated and driven into Kars; but, in a number of severely contested battles during the following months, his troops displayed great courage and regained the position, defeating the Russians severely near Erzerum on June 25 and compelling them in July to raise the siege of Kars. For his exploits in this campaign the title of Ghazi (victorious) was bestowed upon him. On October 14–15, at Aladja Dagh, the Russians gained an important victory over Mukhtar, driving him back to Kars and soon afterward to Erzerum. In November Kars was stormed by the Russians, and before the end of the year Mukhtar was recalled. He put down the Cretan insurrection in 1878 and was put in command on the Greek frontier in 1879. In 1885 he was appointed Turkish High Commissioner in Egypt. In 1912 he was one of the negotiators appointed to conclude a peace with Italy and to pacify Albania. The latter mission was interrupted by the outbreak of the Balkan War. He was appointed Grand Vizier in July, 1912, but resigned in the following October. For his son, see below.

MUKHTAR PASHA, Mahmud (1867–). A Turkish soldier and diplomat, son of the Grand Vizier Ghazi Mukhtar. He was born in Constantinople and returned thither in 1893 after seven years' military education in Germany. He took part in the Græco-Turkish War of 1897, in spite of the prohibition of the Sultan. In 1900 he was appointed to a minor office in the War Department and in 1908 was put in command of the First Army Corps. In 1909 he was forced to flee to Greece, but soon returned to Constantinople and received the command of the First Corps. In 1910 he was Minister of Marine in Hakki Pasha's cabinet and brought about the building of the first Turkish dreadnought. At the outbreak of the Balkan War in 1912 he was again Minister of Marine, but he went to the front, commanded the Third Army Corps at Kirk-Kilisseh, and was severely wounded. In April, 1913, he became Ambassador at Berlin. He wrote an account of his experiences in the Balkan War, of which a German and a French version appeared in 1913.

MULA, mōō′lä. A town of southeast Spain, in the Province of Murcia, situated on a branch of the Segura, 18 miles west by north of the city of Murcia (Map: Spain, E 3). The place is unimportant, but has some reputation on account of the warm sulphurous baths known as Baños de Mula, some 3 miles east. Pop., 1900, 12,733; 1910, 11,922.

MULAT'TO. See Mixed Races.

MUL'BERRY (OHG. *mōrberi, mūrberi*, Ger. *Maulbeere*, mulberry, from Lat. *morum*, Gk. *μῶρον, mōron, μόρον, moron*, mulberry + *berry*, AS. *beri, berige*, OHG. *beri*, Ger. *Beere*, Goth. *basi*, berry), *Morus*. A genus of trees of the family Moraceæ, natives of temperate and warm climates, with deciduous leaves, unisexual flowers in short, thick spikes, the perianth of the female flowers becoming succulent and closing over the small pericarp to form with other flowers of the spike an aggregate fruit. There have been about 100 species described, but most authors have reduced them to 10 or even less. The

common mulberry, or black mulberry (*Morus nigra*), a long-lived native of the middle parts of Asia introduced into cultivation in Europe more than a thousand years ago, and now naturalized there, is a low, much-branched tree, with thick, rough bark and broad, unequally serrated, and very rough heart-shaped leaves. It is not hardy in the United States as far north as New York, and is seldom seen except in the South and in California, where some of the improved varieties are grown. The fruit, which is purplish black, with dark-red juice, fine aromatic flavor, and subacid sweet taste, is often produced in prodigious quantities and is esteemed for dessert, for preserving, and for wine making. The wood is employed in cabinet-work, but is not of much value. The leaves are sometimes used for feeding silkworms. It is propagated by seed, suckers, layers, or cuttings, and succeeds best in a rich light soil. The white mulberry (*Morus alba*) has been planted in southern Europe since 1540, in India and China, where it is native, from time immemorial for its leaves, which are the best food for silkworms. In North America it has been extensively planted and in places exists in a half-wild state as trees a foot or more in diameter. (See KENRICK, WILLIAM.) The fruit is almost white, and much less palatable than that of the black mulberry, although there is great difference among the varieties. The best variety for feeding silkworms, on account of its rapid growth and abundant leaves, is that called the Philippine mulberry. A variety called the Russian mulberry is a hardy, rapid grower, well adapted to hedges, windbreaks, small timber, and ornamental plantings, for which purpose it has been extensively planted in the western United States. *Morus multicaulis*, by some considered a variety of *Morus alba*, once grown extensively in the United States to feed silkworms, is seldom seen now. In India the white mulberry is treated as a bush, and cut down twice a year, the stripped shoots being thrown away. Its bark has long been used in China and Japan for making paper. It grows readily from cuttings. The root has a considerable reputation as a vermifuge. The red mulberry (*Morus rubra*), a native of eastern North America, ranging from New England to the Dakotas and south to southern Florida, is the largest tree of the genus, sometimes attaining in the South a height of 70 feet and 3 feet in diameter. It endures severe frosts much better than the preceding, and is therefore preferred for cultivation in some parts of Europe. Its fruit is deep red and almost as pleasant as the black mulberry. The wood is much more valuable, being fine-grained, strong, durable, and adapted even for shipbuilding. Of each of these three species there are numerous named varieties which are cultivated for their fruits, but they have not received the attention in the United States that they deserve. The Indian mulberry (*Morus indica*) has black fruit of a delicate flavor, and the leaves are extensively used for feeding silkworms in China, Cochin China, and Bengal. *Morus alba; Morus celtidifolia* and *Morus corylifolia*, Peruvian species; *Morus lævigata*, the species most common in the north of India; and *Morus cashmeriana*, probably a form of *Morus indica*, a native of Cashmere, produce pleasant fruit. *Morus dulcis*, a native of the north of India, is said to be superior in flavor to all others.

RED MULBERRY (*Morus rubra*).

The paper mulberry (*Broussonetia papyrifera* and *Broussonetia kæmpferi*), a native of India, Japan, and islands in the Pacific, frequently planted for ornament and shade in America and Europe, differs from the true mulberry in having the female flowers collected in a globular mass. The fruit is oblong, dark scarlet in color, sweetish, but insipid. The tree is of moderate size, or, in cultivation, a bush 6 to 12 feet high with leaves either simple or lobed. The islanders of the Pacific cultivate this species with great care and make a kind of clothing from the bark. For this purpose branches an inch or more in diameter are macerated in water. The epidermis is then removed by scraping, and the inner bark beaten thin into kapa cloth. The young shoots are also used for paper making in Japan and the East. When the shoots are cut new ones spring up very rapidly. Silkworms eat the leaves. See Plate of MULBERRY AND LIQUIDAMBER, accompanying latter title.

MULBERRY FAMILY. See MORACEÆ.

MUL'CASTER, RICHARD (?1530–1611). An English schoolmaster, whose birthplace may have been the old border tower of Brackenhill Castle on the river Line, or perhaps Carlisle. From Eton he passed to King's College, Cambridge, and thence to Christ Church, Oxford, where he graduated M.A. in 1556. When the Merchant Taylors' School was founded in London (1561), Mulcaster was appointed its first head master, a post which he held till 1586. Here he probably had the poet Spenser as a pupil. Ten years later he was elected high master of St. Paul's School. This office he retained to the great age of 78. He was also vicar of Cranbrook (1590), prebend of Salisbury (1594), and rector of Stanford Rivers (1598). He died April 15, 1611. In his own time Mulcaster gained wide repute as an efficient teacher, and in recent times much attention has been given to two books: *Positions, wherein those primitive circumstances be examined, which are necessarie for the training up of children, either for skill in their book or*

health in their bodie (1581), and the *Elementarie, which entreateth chefelie of the right writing of our English tung* (1582). Mulcaster strenuously advocated physical training as a part of the education of boys, and implied that there should be grammar schools for girls. He taught his boys music and singing, and permitted them to perform in masques and interludes before the Queen. Consult the reprint of the *Positions*, edited by Quick (London, 1888).

MULCH (more correctly *mulsh*, probably from AS. *molde*, earth mold; ultimately connected with Goth. *malan*, Ir. *melim*, Lith. *malti*, Lat. *molere*, to grind, Eng. *meal*). A covering of loose material, such as brush, leaves, manure, or straw, maintained on the surface of the soil mainly for the purpose of preventing evaporation, which it accomplishes by breaking the continuity of the capillarity in the soil and thus retarding the rise of water to the surface. Stirring the surface soil, and thus maintaining what is termed a soil mulch, brings about the same result. The use of the mulch of vegetable matter is probably not so common as formerly, but the soil mulch is increasing in favor and in arid regions where agriculture is dependent upon irrigation and conservation of moisture is a matter of great importance. In addition to checking evaporation, mulches of vegetable matter are useful in protecting the surface soil from puddling and washing, keeping the soil cool, preventing freezing, and retarding growth in the spring. Mulching is a valuable means of reclaiming washed or galled lands and for securing a growth on dry, bare spots in lawns and meadows. A mulch of barnyard manure not only conserves moisture, but furnishes plant food.

Mulching berry bushes, orchard trees, etc., on a large scale with coarse manure and refuse material is not generally to be recommended, because it interferes with cultivation, harbors insects, and causes the plant roots to remain near the surface, thus increasing the danger of injury by drought. Mulches are, however, found useful in orchards on hilly land very subject to washing, and on a small scale for special purposes, such as protecting small fruits from injury by late frosts by retarding growth in spring. The soil mulch is more generally useful. The depth and character of this soil mulch must be determined by a variety of conditions, among which are the kind and root habits of the plant and the character of the soil and climate. It is evident that any crop, such as corn, with an extensive surface root system, would be injured by the destruction of its roots if stirring were frequent and deep. Again, in arid regions the mulch must be deeper and more perfect than in regions of frequent rainfall, in order to be effective and useful.

MULDER, mōōl'dēr, GERARDUS JOHANNES (1802–80). A Dutch chemist, born at Utrecht. After obtaining the degree of doctor of medicine at the university of his native town in 1825, he commenced the practice of his profession at Amsterdam, but was soon invited to teach botany and subsequently chemistry at the medical school at Rotterdam. In 1840 he was elected professor of chemistry at the University of Utrecht, and kept this post until 1868, when he retired from active service. Mulder is best known for his researches on the proteids and for his excellent works on physiological and agricultural chemistry. His *Chemistry of Vegetable and Animal Physiology* has been translated into English by Fromberg, and his *Chemistry of Wine* by Bence Jones. He also wrote an autobiography under the title *Levensschets* (published posthumously in 1881; 2d ed., 1883).

MULDER, LODEWIJK (1822–1907). A Dutch writer, born in The Hague. He was an instructor in the Royal Military Academy at Breda in 1851–59; was then for a time employed in the Ministry of War as an editor of original documents in early Dutch history; and from 1868 to 1872 was an inspector of schools in Utrecht Province. He prepared manuals of the history of the Netherlands (1859; 12th ed., 1881) and of general history (1862; 8th ed., 1880), and wrote several plays and works of fiction, the last including his best-known work, the historical novel *Jan Faessen* (2 vols., 1856), a tale of the conspiracy against Prince Maurice of Orange, and the comedy *Een gevaarlijke vriendendienst* (1890).

MULDOR, CARL DE. See MILLER, CHARLES HENRY.

MULE (OF., Fr. *mule*, from Lat. *mulus*, mule). A hybrid animal, the offspring of the male ass and the mare, highly valued as a beast of burden. The ears are long; the head, crop, and tail resemble those of the ass rather than those of the horse; but in bulk and stature the mule approaches more nearly to the horse. The mule seems to excel both the ass and the horse in intelligence; its powers of muscular endurance are remarkable; and its sure-footedness particularly adapts it to mountainous countries. It is easily kept, endures hunger and thirst better than the horse, lives to a greater age, and is comparatively free from disease. Great care is bestowed on the breeding of mules in Kentucky, Missouri, and some other central States, in Mexico, and in Spain and Italy; and mules of particular districts are highly esteemed. An extensive experiment in mule breeding at the Mississippi Experiment Station has given instructive results. In America mules are of greatest importance, especially in the Southern States, the census of 1910 giving the number in the country at nearly four and a half million. Texas had over 706,000, while Alabama, Arkansas, Georgia, Kansas, Kentucky, Mississippi, Missouri, Oklahoma, and Tennessee each had over 200,000. The cotton and sugar-cane plantations utilize large numbers because they are easily and cheaply kept. As in other hybrid animals generally, males are more numerous among mules than females in the proportion, it is said, of two or three to one. There is no instance on record of offspring produced by two mules; but rare instances are reported of the female mule producing offspring with the horse and with the ass. The mule is very superior in size, strength, and beauty to the hinny, the offspring of the male horse and the female ass. Several breeds of jacks have been used for producing mules. The chief breeds are Andalusian, Maltese, Catalonian, Italian, and Majorcan. The Catalonian is the best of imported breeds, but in the United States the native jack, a mixture of all breeds, is most used. Black is the preferred color, and the jack should be of good size. The mare should also be well bred and of good form and color. In the Southern States mules are divided into two classes, the smaller ones cotton mules and the larger sugar mules.

MULE, IN SPINNING. See SPINNING.

MULE DEER (so called on account of the large ears), or BLACKTAIL. One of the principal species of North American deer (*Odocoileus hemionus*), originally ranging throughout the open regions of the western half of the United States, but by the end of the nineteenth century restricted to the upper valleys of the Missouri and Saskatchewan rivers and to the Rocky Mountain region and the country west and south of it from northern Mexico to southern British Columbia. Four western and southwestern forms are considered to be distinct subspecies. This deer appears never to have ranged east of the plains, and was always most numerous in the broken country of the West and Northwest. Its favorite haunts are the brushy high-lying valleys. Its favorite place in summer is the summits of the mesas and the pastures on the chaparral-covered hills or near the timber line, where it goes to rest along the edge of precipices that give a wide outlook. In winter it comes lower down, and gathers into large herds in the foothills, after the manner of the wapiti (q.v.).

It is somewhat larger than the Eastern or Virginian deer (see DEER), and stands about 3 feet, 4 inches high at the shoulder. Its body is rather heavy, and its coat is dull yellowish in summer, rather than reddish, and in winter bluish gray. The ears are very large (suggesting the name) and heavily furred; and its antlers have a short basal snag, above which the beam projects outward and then upward, forking equally and the prongs again dividing, so that there are normally 10 points. The stern bears a yellowish-white disk, and the tail is of moderate length, round, and black at the end. The hide of this species made the best buckskin known to the Indians, and was most used by them for clothing. Its value was soon learned by the pioneers in the West; and from about 1860 to 1870 this deer was pursued so ruthlessly by hide hunters that for several years about 250,000 skins were sent annually to England alone. The venison also is of superior quality, and the haunts and habits of the animal, his craft and speed, make him the most interesting to the sportsmen of all the American deer. The fawns are often domesticated, and the adults thrive well in parks, and are to be seen in every zoölogical garden in the world. Consult: J. D. Caton, *Antelope and Deer of America* (New York, 1877); A. M. Mayer (ed.), *Sport with Gun and Rod* (ib., 1892); Richard Lydekker, *Deer of All Lands* (London, 1898); T. S. Van Dyke, in Theodore Roosevelt, *The Deer Family* (New York, 1902); especially E. T. Seton, *Life-Histories of Northern Animals* (ib., 1909); and the writings of travelers and sportsmen in the western United States. See Plate of DEER OF NORTH AMERICA.

MULE KILLER. A local name in the Southern States for several species of insects and land arthropods, such as the mantis, pirate bug, and whip-tailed scorpion (qq.v.).

MULEY-HASSAN, mōō'lā-häs'sän, SIDI (1831–94). A sultan of Morocco. He succeeded his father, Sidi Muley-Mohammed, in 1873. He was energetic and warlike and spent the greater part of his reign in the field, enforcing his authority over the unruly Berber tribes or extending the boundaries of the Empire in the direction of the Sahara. In 1880 reports of shocking cruelties committed on the Jews in his dominion led to the calling of an international conference at Madrid, which drew up a protocol decreeing liberty of conscience in Morocco, a decision to which the Sultan acceded, but which he altogether ignored.

MULFORD, ELISHA (1833–85). An American Protestant Episcopal clergyman and philosophical writer, born in Montrose, Pa. He graduated at Yale in 1855 and studied for the ministry in the Union Theological Seminary, at Andover, and later at Halle and Heidelberg in Germany. He was ordained a priest in 1862. A part of his career was spent in ministerial work in various charges, but from 1864 to 1877 he lived in his native town without parochial charge and engaged in study. Among his publications are *The Nation, the Foundation of Civil Order and Political Life in the United States* (1870) and *The Republic of God: An Institute of Theology* (1881). In 1881 he settled in Cambridge, Mass., and lectured in the Episcopal Theological School there until his death.

MUL'GRAVE, CONSTANTINE JOHN PHIPPS, second BARON (1744–92). A British naval officer and politician. Entering the navy at 16, he served in the reduction of Martinique and of Havana and in 1765 was made post captain. In 1768 he entered the House of Commons for Lincoln, and became known as one of the King's Friends, a political party which supported George III in the attempt to enforce the principles of arbitrary government, especially in relation to the American Colonies. Five years later he was commanding the *Racehorse*, which with the *Carcass* (on which the naval hero Nelson was a midshipman) attempted to find a northern route to India, but was stopped by ice at Spitzbergen. After his return he again sat in the House of Commons (1777–84), and saw active service in naval operations against the French off Ushant (1778) and off Brest (1781). In 1784 Mulgrave was appointed a commissioner for India. Second Baron by succession in 1775, he was made a peer of Great Britain as Baron Mulgrave in 1790. He had the chief part in founding the Society for the Improvement of Naval Architecture. *A Voyage towards the North Pole* (1774) is the account of his Arctic experiences

MULGRAVE, LORD. See BUCKINGHAM AND NORMANBY.

MULHACÉN, MARQUIS OF. See IBÁÑEZ DE IBÁÑEZ DE IBERO, CARLOS.

MUL'HALL, MICHAEL GEORGE (1836–1900). A distinguished statistician, born in Dublin, Ireland, Sept. 29, 1836. He was educated at the Irish College in Rome. In 1858 he emigrated to Buenos Aires, where, three years later, he established the *Standard*, said to be the first daily newspaper printed in English in South America. This daring and successful enterprise Mulhall kept going till 1894. Returning to England in 1878, he gave his attention to statistics. In 1884 he was elected to the British Association for the Advancement of Science. Besides numerous contributions to the *Contemporary Review*, his works include: a *Handbook of the River Plata* (1869), the first English book published in Argentina; *Rio Grande do Sul and its German Colonies* (1873); *The English in South America* (1878). In 1880 Mulhall, who had for some time been gathering materials on his favorite subjects of statistics, brought out his *Progress of the World in Arts, Agriculture, Commerce, Manufacture, Instruction, Railways, and Public Wealth*, covering the period from 1800 to the time of its publication. This

was followed by other highly valued works on statistics: *History of Prices* (1885); *Industries and Wealth of Nations* (1896); and a *Dictionary of Statistics* (1883; 4th ed., 1899). Mulhall died Dec. 13, 1900, in Dublin.—His wife, MRS. MARION MULHALL, is the author of *Between the Amazon and the Andes* (1883) and several essays, including the *Celtic Sources of Dante's Divine Comedy*. For this last monograph she was honored by a chair in the Arcadia of Rome.

MÜLHAUSEN, mul-hou'zen (Fr. *Mulhouse*). The second largest city of Alsace-Lorraine, Germany, situated on the Ill and the Rhine-Rhone Canal, 58 miles south-southwest of Strassburg (Map: Germany, B 5). It is divided into the irregularly built old town, on an island of the Ill, the new town, started in 1826, between the old town and the canal, and the workingmen's colony (*cité ouvrière*) on the north. The old town, with the exception of the Rathaus and a few modern churches, dates from the sixteenth century. The border of the canal is the best part of the new town, which has a fine post office and a museum established by the Industrial Society. The society's building also contains natural-history collections, a library, schools of drawing, industrial art, and textile working. The workingmen's colony, established in 1853 by Mayor Dollfus, is provided with model dwellings and with reading rooms, schools, restaurants, baths, and other modern institutions. In the suburbs is a good zoölogical garden. The educational institutions of Mülhausen include a Gymnasium and schools of chemistry and mechanics. It is the most important industrial city of Alsace-Lorraine and one of the largest textile centres of the Empire. This industry of Mülhausen dates from 1746, and the cotton mills are situated partly in the city and partly in the vicinity and specially in the adjacent settlement of Dornach. Over 80,000 persons are said to be engaged in the textile mills and in other establishments connected with the textile industry in the manufacturing district around Mülhausen. Besides cotton and woolen goods and kindred products, there are also manufactured machinery, chemicals, iron, copper, and lead castings, dyes, oil, sewing machines, stoves, starch, cordage, cement, and lumber. It has railway shops and an extensive trade in local manufactures, wine, and the agricultural products of the vicinity. Pop., 1900, 89,012; 1910, 95,041, largely Roman Catholics. Mülhausen first appears in 717, when Adalbert, Duke of Alsace, presented it to the monastery of St. Stephen in Strassburg. It was taken by Rudolf of Hapsburg in 1261 and raised to a free city of the Empire in 1273. In order to maintain its independence it entered into an alliance with the Swiss cantons of Bern and Solothurn in 1466, and in 1515 became a member of the Swiss Confederation and was recognized as such at the Peace of Westphalia. It joined the French Republic in 1798, and passed to Germany with Alsace-Lorraine in 1871. Mülhausen was captured by the French in the early part of the European War which began in 1914. They were later compelled to evacuate it. See WAR IN EUROPE. Consult: Metzger, *La république de Mulhouse* (Lyons, 1883); Schneider, *Geschichte der Stadt Mühlhausen* (Mülhausen, 1888); Heydenreich, *Aus der Geschichte der Reichsstadt Mühlhausen* (Halle, 1900); Jordan, *Der Uebergang der freien Reichsstadt Mühlhausen an Preussen* (Mülhausen, 1902).

MÜLHEIM-ON-THE-RHINE, mul'hīm, or **MÜHLHEIM.** A town of the Rhine Province, Prussia, on the right bank of the Rhine, 2 miles north of Cologne (Map: Prussia, B 3). Mülheim is extraordinarily well laid out for an old town, has a good harbor, a handsome modern Gothic church, a Realgymnasium, a textile schōol, and a commercial school. It manufactures wire ropes and cables, velvet, silk, canvas, fire brick, machinery, vehicles, chemicals, electrical appliances, and tobacco, and trades in wine. Pop., 1900, 45,085; 1910, 53,425. Mülheim is of ancient origin, and became a town as early as 1322.

MÜLHEIM-ON-THE-RUHR, -rōōr. The capital of a circle in the Rhine Province, Prussia, on the Ruhr, 16 miles north of Düsseldorf (Map: Prussia, B 3). It has a church dating from the twelfth century, a Gymnasium, an industrial and commercial school, and a Realschule. Coal and iron are mined in the district, and there are extensive smelters, manufactures of machinery, tubes, zinc ware, leather, paper, tobacco, cordage, beer, and brandy. Mülheim does a large river business in coal. Pop., 1900, 38,292; 1910, 112,580.

MULHOLLAND, mŭl'hŏl'and, WILLIAM (1855–). An American hydraulic engineer. He was born at Belfast, Ireland, and was educated at the Christian Brothers' School, Dublin. Having come to the United States, in 1886 he became superintendent and chief engineer of the water works of Los Angeles, Cal., and in that capacity made plans and estimates and had charge of the construction of the Los Angeles Aqueduct for conveying water from the Sierra Nevada Mountains (250 miles distant) at a cost of $24,500,000. He served also as a consulting engineer on irrigation and water-power projects.

MULIER, mŭ-lēr', PIETER, THE YOUNGER, called TEMPESTA (1637–1701). A Dutch landscape and marine painter, born at Haarlem, son and probably pupil of the marine painter Pieter Mulier, the Elder (died at Haarlem, 1670)—not, as was for a long time erroneously supposed, son of Pieter de Molyn (q.v.). After having traveled through Flanders and Holland, he went to Rome and soon acquired a reputation by his pictures of storms at sea (whence his surname, given him by the Italians). He also painted Italian landscapes, with historical or idyllic accessories, in a facile, decorative style with strong light effects. In Genoa, whither he went from Rome, he was imprisoned for 16 years under suspicion of having caused his wife to be murdered. Characteristic works are in the galleries at Dresden, Hamburg, Brunswick, Cassel, Vienna, St. Petersburg, Milan, and elsewhere.

MULITA, mōō-lē'tà (Sp., little she-mule). A small armadillo (*Tatusia hybrida*), allied to the peba, but confined to southern South America; so called from the resemblance of its face and ears to those of a mule.

MULL. The second largest island of the Inner Hebrides, belonging to Argyllshire, Scotland. It is situated north of the Firth of Lorne and is separated from the west coast of Scotland by the Sound of Mull, from 1 to 3 miles wide (Map: Scotland, B 3). It has an area of 347 square miles, is very irregular in shape, deeply indented with bays and sea lochs, and consists mainly of volcanic rock with some outcroppings of granite. The island as a whole is mountainous, rising in Ben More to a height

of 3185 feet. The scenery along the coast is very picturesque, and there are beautiful lakes and woods in the interior where deer and fish attract sportsmen. The scenery in the interior is not striking, the mountains being rounded in outline, and large tracts consisting of moorlands. The soil is fertile, but the stormy and humid climate is unfavorable for agriculture, and the land is chiefly used for grazing—cattle, sheep, and horses being exported. Pop., in 1901, 4334; 1911, 3809. The chief town is Tobermory, on the north coast, with a population (1901) of 1019; 1911, 1079.

MULLAH. See MOLLAH.

MULLANY, JAMES ROBERT MADISON (1818–87). An American naval officer, born in New York City. He entered the navy as a midshipman in 1832 and in 1844 was promoted to the rank of lieutenant. During the war with Mexico he participated in the capture of Tabasco. After the outbreak of the Civil War he was commissioned commander in 1861 and captain in 1866, and during the conflict was assigned to duty with the blockading squadron. At his own request he was transferred from the *Bienville* to the *Oneida*, that he might take part in the battle of Mobile Bay, Aug. 5, 1864. His ship, one of the last in the line, received a terrific pounding from Fort Morgan, and was attacked by the Confederate ram *Tennessee*, which would probably have sunk it had not the monitor *Winnebago* come to the rescue. As it was, the *Oneida* was disabled by the fire from the fort, many of her crew were killed, and Commander Mullany lost his left arm. After the war and while commanding the North Atlantic squadron (1874–76) he gave material aid to Generals William H. Emory and Philip H. Sheridan at New Orleans, and during a revolution in Colombia protected American interests on the Isthmus of Panama. He became a commodore in 1870, a rear admiral in 1874, and retired in 1879.

MULLEIN, mŭl'ĭn (AS. *molegn*, mullein). A name given to members of the genus *Verbascum*, of the family Scrophulariaceæ, of which there are more than 100 species, mostly large biennial or perennial herbs with rather thick taproots, and natives of the Eastern Hemisphere. The more or less woolly plants produce flowers upon spikes or panicles. The leaves and flowers were formerly reputed to have medicinal qualities, but are not so recognized in the United States. They contain a sort of mucilage which is obtained by boiling the leaves in water. Three European species are well-known weeds in the United States, the common mullein (*Verbascum thapsus*), the moth mullein (*Verbascum blattaria*), and the white mullein (*Verbascum lychnitis*). *Verbascum phlomoides* is reported as established and spreading as a weed in Kentucky.

MÜLLENHOFF, mụl'len-hôf, KARL VIKTOR (1818–84). A noted Germanist. He was born at Marne, Holstein, and after studying at Kiel, Leipzig, and Berlin was professor at Kiel (1846–58) and at Berlin (1858–84). Müllenhoff's greatest works were: *Deutsche Altertumskunde*, begun in 1870 and not finished till 16 years after his death; the treatise *De Antiquissima Germanorum Poesi Chorica* (1847); *Denkmäler deutscher Poesie und Prosa aus dem 8.–12. Jahrhundert* (3d ed., by Steinmeyer, 1892), with Scherer. He also edited important texts. Consult Scherer and Schröder, *Karl Müllenhoff* (Berlin, 1896), and article in the *Allgemeine deutsche Biographie*, vol. xxii (Leipzig, 1885).

MÜLLER, mụ'lĕr. A family of celebrated quartet players. They were the sons as well as pupils of Aegidius Christoph Müller, the principal musician to the Duke of Brunswick, and were all born in the city of Brunswick.—CARL FRIEDRICH (1797–1873) was first violin in the quartet and was also concert master to the Duke.—THEODOR HEINRICH (1799–1855) was the viola player.—AUGUST THEODOR (1802–75) played the cello, and FRANZ FERDINAND GEORG (1808–55) was the second violin. They were especially educated by their father for quartet work and were conceded to have reduced the art of string-quartet playing to a degree of perfection previously unknown. They were ambitious for greater fame than could be obtained within their own limited environment and were particularly handicapped by the Duke of Brunswick, in whose employ they were, who had formulated the order that none of his musicians should participate in any musical performance outside that connected with his own corps. In 1830 they resigned their employment and made their first appearance in Hamburg, where they met with such success that they were invited to Berlin, in which city they were received with great enthusiasm. An extended tour throughout Germany followed, and in 1837 they performed in Paris. Other successful tours made them known throughout the world. They confined their programmes almost entirely to the works of Haydn, Mozart, and Beethoven and were also a very important influence in raising

COMMON MULLEIN (*Verbascum thapsus*).

and establishing a higher standard of musical appreciation. Consult Louis Köhler, *Die Gebrüder Müller und das Streichquartett* (Leipzig, 1858).

MÜLLER, August (1848–92). A German Orientalist, born at Stettin and educated at the universities of Halle and Leipzig. In 1874 he became professor of Oriental languages at the former university. In 1882 he became professor of Oriental philology at the University of Königsberg and in 1890 professor at Halle. His numerous and valuable contributions to Oriental literature include: *Die griechischen Philosophen in der arabischen Uebersetzung* (1873); *Der Islam im Morgen- und Abendland* (1885–87); *Hebräische Schulgrammatik* (1878), the syntax of which was translated into English by James Robertson. He also reëdited (1876) Caspari's *Arabische Grammatik*, which he considerably enlarged, and with Nöldeke published a *Delectus Veterum Carminum Arabicorum* (1890), furnished with copious annotations, and thus rendered useful to those who desire to become acquainted with Arabic poetry. Especially creditable is his edition (1884) of the *History of Physicians* by Ibn Useibia, with Arabic text and a critical commentary. Several of his essays are contained in the *Zeitschrift der deutschen morgenländischen Gesellschaft* and *Beiträge zur Kunde der indogermanischen Sprachen.* In 1887 he was appointed editor of the *Orientalische Bibliographie.*

MÜLLER, mụ'lâr', Charles Louis (1815–92). A French historical painter. He was born in Paris, Dec. 22, 1815, and was a pupil of Baron Gros and Léon Cogniet. He received a first-class medal at the Paris Exposition of 1846. Müller is best known by his masterpiece, the "Roll-Call of the Last Victims of the Reign of Terror," formerly in the Luxembourg Museum. Other works are: "Lady Macbeth" (1849), Amiens Museum; "Charlotte Corday in Prison" (1875), Corcoran Gallery, Washington; "Primavera" (1846) and "Haydée" (1848), Lille Museum; he also decorated the Salle d'Etat in the Louvre. His pictures are skillfully composed, but the coloring and drawing are mediocre. He was made a member of the Institute in 1864.

MÜLLER, mụ'lẽr, Christian Friedrich (1782–1816). A German engraver, born at Stuttgart. He first studied under his father, Johann Gotthard Müller, an engraver of note, and subsequently in Paris. In 1808 his engraving of "St. John about to Write his Revelation," after Domenichino, won him a high reputation, which was maintained by his "Adam and Eve under the Tree of Life," after Raphael. In 1814 he was appointed professor of engraving in the Dresden Academy, and the rest of his life was devoted to the execution of the plate of his greatest work, the "Madonna di San Sisto," after Raphael, considered the most exact existing reproduction of the subject. His health broke down under the labor imposed by this undertaking, and he did not live to see a finished print of his work. His engravings are only 18 in number, mostly portraits, including Schiller, Jerome Bonaparte, Jacobi, and a medallion of Napoleon I.

MÜLLER, David Heinrich (1846–1913). An Austrian Orientalist, born at Buczacz in Galicia. He was educated in Vienna, Leipzig, Strassburg, Berlin, and London; from 1881 to his death he was professor at Vienna and served as an editor of the *Wiener Zeitschrift für die Kunde des Morgenlandes.* His very valuable works include: *Himjaritische Inschriften* (1875); *Südarabische Studien* (1877); *Die Burgen und Schlösser Südarabiens* (1879–81); *Sabäische Denkmäler* (1883), with Mordtmann; *Epigraphische Denkmäler aus Arabien* (1889); *Die altsemitischen Inschriften von Sendschirli* (1893); *Epigraphische Denkmäler aus Abessinien* (1894); *Ezechielstudien* (1895); *Die Propheten in ihrer ursprünglichen Form* (1896); *Südarabische Alterthümer* (1899); *Die Mehri- und Soqotri-sprache* (1902); *Die Gesetze Hammurabis und ihr Verhältnis zur mosaischen Gesetzgebung sowie zu den XII Tafeln* (1903); *Das syrisch-römische Rechtsbuch und Hammurabi* (1905); *Semitica Sprach- und rechtsvergleichende Studien* (1906); *Die Bergpredigt im Lichte der Strophentheorie* in *Biblische Studien,* No. 5 (1908); *Der Johannes, Evangelist* (1909); editions of *Kitab al Farq* (1876); of Hâmdâni, *Geography of the Arabian Peninsula* (1884–91); of part of Tabarî, *Annales* (1888).

MÜLLER, Eduard (1828–95). A German sculptor, born at Hildburghausen. His first occupation was that of a cook in the ducal kitchen at Coburg, and he practiced his trade subsequently in Munich and Paris and thence went to Antwerp, where, on the advice of the sculptor Geefs, he proceeded to study at the Academy in 1850. Two years afterward he continued his studies in Brussels and in 1857 settled permanently in Rome. Good composition, truthfulness to life, and a high degree of technical ability are the chief characteristics of his ideal figures and mythological groups, the best known of which include: "Nymph Kissing Cupid" (1862); "Faith, Love, and Hope" (1869), Schröder Mausoleum, Hamburg; "Satyr with the Mask" (1870); "The Faun's Secret" (1874); "Eve with her Children" (1880). His masterpiece is the group in heroic size, "Prometheus Bound and the Oceanids" (1874–79), National Gallery, Berlin, chiseled out of a single block of marble.

MÜLLER, Ferdinand von (1825–96). A German naturalist. He was born in Rostock, studied at Kiel, and in 1848 went to Australia, where he was engaged in botanic explorations (1848–52) and was director of the Melbourne Botanical Garden (1857–73). His researches on the subject of the acclimatization of plants yielded highly valuable results. Müller wrote: *Plants of Victoria* (1860–65); *Fragmenta Phytographiæ Australiæ* (1862–81); *Flora Australiana* (7 vols., 1863–70), with Bentham; *Select Extratropical Plants* (1891). A monument was erected in his memory in Melbourne in 1901.

MÜLLER, Frederik Paludan-. See Paludan-Müller, Frederik.

MÜLLER, Friedrich, called Maler Müller (1749–1825). A German poet, painter, and engraver, born at Kreuznach. He showed in his youth a talent for art and began to study painting at Zweibrücken, where his fascinating personality and varied endowments won him the favor of the court circles. In 1774 he went to Mannheim and soon acquired a reputation as a poet. His idyls were inspired, first by Gessner, afterward by Voss (q.v.), some of them being realistic descriptions of the life of the common

people in the Palatinate. He is best known as a dramatist, and as such a true representative of the Storm and Stress period, whose unbalanced enthusiasm is most apparent in *Golo und Genoveva*, one of the best imitations of Goethe's *Götz*. To the theme attempted in *Fausts Leben dramatisirt* his powers were hardly adequate. In 1777 he had become electoral court painter, and in 1778 means were provided to satisfy the artist's longing for Rome. Although he continued there his literary efforts for a time, he more especially cultivated painting, setting up Michelangelo as his idol, but falling into exaggerations and never attaining any real success. Gradually estranged from his art through failures and distress, he devoted himself to art-historical studies, became a sort of ambulant antiquary, and was much sought as a cicerone. Through the patronage of the Crown Prince of Bavaria (afterward King Louis I) he was enabled to pass his declining years in comparative ease. Consult: Seuffert, *Der Maler Müller* (Berlin, 1877); A. Saver, in *Deutsche Nationalliteratur*, vol. lxxxi (Stuttgart, 1883); A. Luntowski, *Maler Müller* (Leipzig, 1908).

MÜLLER, Friedrich (1834–98). An Austrian philologist and ethnologist. He was born at Jemnik, Bohemia, studied in Vienna and Göttingen, and from 1866 until his death was professor of comparative philology and Sanskrit at the University of Vienna. He was a member of the Academy of Sciences and was one of the highest authorities on comparative philology and ethnology and the relations of the two sciences. Besides contributing largely on these subjects to the *Mitteilungen der anthropologischen Gesellschaft* and the *Wiener Zeitschrift für die Kunde des Morgenlandes* and editing these periodicals for a time, he wrote the linguistic and the ethnological parts of the *Reise der österreichischen Fregatte Novara* (1867–68); *Allgemeine Ethnographie* (1873; 2d ed., 1879); *Grundriss der Sprachwissenschaft* (1876–87).

MÜLLER, Friedrich Max, known as Max Müller (1823–1900). A distinguished Orientalist and philologist. He was born at Dessau in the Duchy of Anhalt-Dessau, Dec. 6, 1823, where his father, the poet Wilhelm Müller (q.v.), was librarian of the ducal library. Max Müller received the elements of his education at Dessau and then went to Leipzig (1836), where, under Hermann Brockhaus, he began the study of Sanskrit. This he soon chose as his special pursuit, and at the age of 20 he was ready for the degree of doctor of philosophy. The first fruits of his labors appeared in a translation of the *Hitōpadēša* (1844; 2d ed., 2 vols., 1864–65). In 1844 he went to Berlin to study under Bopp and Schelling and to consult the Sanskrit manuscripts there. In Paris, whither he went in 1845, he began, at the suggestion of his teacher Burnouf, to prepare an edition of the Rig-Veda, with the commentary of Sāyana (q.v.). With this view he went to England in June, 1846, to examine the manuscripts in the East India House, London, and the Bodleian Library at Oxford, and on the recommendation of the distinguished Sanskritist H. H. Wilson, the East India Company commissioned him (1847) to edit the Rig-Veda at their expense. The first volume of this great undertaking appeared in 1849, and the sixth and concluding volume was published in 1874. A second edition was issued in 1889–92 (4 vols.). In 1848 Müller went to Oxford, where two years later he was appointed deputy Taylorian professor of modern languages; in 1854 he succeeded to the professorship, and in 1858 he was elected a fellow of All Souls' College. While pursuing his labors connected with the Rig-Veda, he published treatises on a variety of philological topics which did more to awaken in England a taste for the science of language in its modern sense than the labors of any other single scholar. Inheriting the poetic imagination and fire of his father, he had at command such a felicity of illustration that subjects dry under ordinary treatment became in his hands attractive, though it must be admitted that he advanced few new ideas of any value. In 1872 he lectured before the newly established university at Strassburg, returning to Oxford in 1876, where he gave up his professorial duties in order to assume the editorship of *The Sacred Books of the East*. The first series of this vast undertaking was issued in 24 volumes (1879–85), the second in 25 volumes (1886–95), and the third, begun in 1894, was completed by an index by Winternitz in 1910. The lectures which he delivered on the Hibbert Foundation on the *Origin and Growth of Religion* (1878) and the Gifford series on *Natural Religion*, *Physical Religion*, *Anthropological Religion*, and *Theosophy or Psychological Religion* (1890–92), as well as the *Contributions to the Science of Mythology* (2 vols., 1897), attracted much attention. He continued to publish on literary, linguistic, and philosophical subjects up to the time of his death, which occurred at Oxford, Oct. 28, 1900. Among his long list of works mention may be made of a translation into German of Kalidasa's *Mēghadūta* (1847); *The Language of the Seat of War in the East* (2d ed., 1855); *Comparative Mythology* (in the "Oxford Essays" for 1856); *History of Ancient Sanskrit Literature* (2d ed., 1860); lectures on *The Science of Language* (1861; last ed., 1891; Ger. trans., Leipzig, 2 vols., 1892–93); *The Science of Religion* (1870). *Chips from a German Workshop*, in four volumes, was published in 1867–75 (new ed., 1895; Ger. trans., 1869–76); the Hibbert lectures on the *Origin and Growth of Religion* (1878; 3d ed., 1880); *Selected Essays* (1881); *India: What can it Teach us?*, lectures at Cambridge (1883; Ger. trans., Leipzig, 1884); *Six Systems of Indian Philosophy* (1899); *Auld Lang Syne* (1st and 2d series, 1899); *Rāmakrishna, his Life and Sayings* (1899). His translation of Kant's *Critique of Pure Reason*, with a scholarly introduction, appeared in two volumes (1881; 2d ed., New York, 1896). He wrote a romance, *Deutsche Liebe* (Leipzig, 1857; 14th ed., 1905), and edited Scherer's *History of German Literature* (New York, 1886). He was one of the foreign members of the Institute of France, a Knight of the Order "Pour le Mérite," a member of the Privy Council of the Queen of England, besides being the recipient of many honorary degrees. After his death appeared his *Last Essays* (1901) and *My Autobiography* (1901), edited by his son. From 1898 to 1904 his *Collected Works* were issued in 20 volumes. Consult *Life and Letters of the Right Honorable Friedrich Max Müller*, edited by his wife (2 vols., London, 1902), and Winternitz, "Max Müller," in *Anthropologische Gesellschaft Mitteilungen*, vol. xxxi (Vienna, 1901). For a criticism

of his work, consult W. D. Whitney, *Max Müller and the Science of Language* (New York, 1892).

MÜLLER, Friedrich von (1779–1849). A German statesman. He was born at Kenreuth, Bavaria, studied law at Erlangen and Göttingen, and in 1801 entered the administrative employ of Weimar. His greatest political achievement was his inducing Napoleon to keep Weimar independent (1806–07). For this he was rewarded by being ennobled and raised to the post of Privy Councilor. He wrote *Erinnerungen aus den Kriegszeiten von 1806–13* (1851). Müller became Chancellor and Minister of Justice in 1815 and from 1835 to 1848 was a deputy in the Landtag. On his friendship with Goethe, consult Burkhardt, *Goethes Unterhaltungen mit dem Kanzler Friedrich von Müller* (Stuttgart, 1870).

MÜLLER, Fritz. See Müller, Johann Friedrich Theodor.

MÜLLER, Georg Elias (1850–). A German psychologist, born at Grimma in Saxony. He was educated at the universities of Leipzig, Berlin, and Göttingen, receiving the degrees of M.D. and Ph.D. In 1870 he entered the German army as a volunteer and took part in the campaign against France. On returning to academic life he became privatdocent at Göttingen (1876) and professor of philosophy at Czernowitz (1880). After April, 1881, he was professor of philosophy at Göttingen. Müller was the chief organizer in 1903 of the Gesellschaft für experimentelle Psychologie, of which he was thereafter president. His works in psychophysics are classical, and an uninterrupted series of experiments upon memory, begun in 1887 and continued to the present day, entitle him to rank as the foremost authority in that field. He published: *Zur Theorie der sinnlichen Aufmerksamkeit* (1873); *Zur Grundlegung der Psychophysik* (1878); *Zur Theorie der Muskelkontraktion* (1891); *Experimentelle Beiträge zur Untersuchung des Gedächtnisses* (1893), with F. Schumann; *Zur Psychophysik der Gesichtsempfindungen* (1896–97); *Zur Analyse der Unterschiedsempfindlichkeit* (1899), with L. J. Martin; *Experimentelle Beiträge zur Lehre vom Gedächtnis* (1900), with A. Pilzecker; *Gesichtspunkte und Tatsachen der psychophysischen Methodik* (1904); *Zur Analyse der Gedächtnisthätigkeit und des Vorstellungsverlaufes* (vol. i, 1911; vol. iii, 1913).

MÜLLER, Georg Friedrich (1805–98). An evangelist and philanthropist whose work was done in England. He was born at Kroppenstädt, Prussia, near Magdeburg, Sept. 27, 1805. He entered the University of Halle (1825) as a divinity student, although his life was anything but exemplary. Late in that year he was converted and in 1826 began preaching. In June, 1828, he was invited to London by the Society for Promoting Christianity among the Jews, to engage in its service for six months, and in March, 1829, reached London. He settled as pastor of Ebenezer Chapel, Teignmouth, in connection with the Plymouth Brethren (1830); in 1832 he removed to Bristol and was coworker with Henry Craik. While at Teignmouth he gave up pew rents and depended on voluntary gifts, for which a box was placed in the chapel. The result was a largely increased income, and from that time on he would take no salary, depending wholly upon voluntary gifts. In December, 1835, after a visit to the Continent, he published a proposal for the establishment of an orphan house for destitute children bereft of both parents. Spontaneous offers of money and service were received, and the opening of the home was announced May 18, 1836. At the end of 1856 there were 297 orphans under his care. The number of orphans increased, and the buildings were multiplied, until in 1875 "2000 children were lodged, fed, and educated, without a shilling of endowment, without a committee, without organization, by funds drawn from all parts of the world." In 1849 he moved the orphanage to Ashley Down, a suburb of Bristol, to specially constructed buildings. Late in life, attended by his wife, he made evangelistic tours all over the world. His *Narrative* and other books and pamphlets had a large sale and gave information of his work. He died at Ashley Down, March 10, 1898. Consult his biography by A. T. Pierson (New York, 1899) and by Warne (ib., 1911).

MÜLLER, Gerhard Friedrich (1705–83). A German historian, born at Herford in Westphalia and educated at Leipzig. Entering the newly established St. Petersburg Academy, he gave instruction in history, geography, and Latin and was soon appointed professor of history. In 1740 he went to Siberia and traveled for 10 years, engaged in the study of its antiquities and geography. Of his great work on Siberia only one volume was published (1750). On his return he became historiographer to the Empire and in 1766, after many attacks by his colleagues, was appointed keeper of the national archives. He drew up for the government a collection of its treatises and wrote a number of works on Russian history, in which subject he was a high authority. His most important book, *Collection for the History of Russia*, appeared at St. Petersburg in nine volumes (1732–65). His work in geography and cartography was also important.

MÜLLER, Iwan Ritter von (1830–). A German classical scholar. He was born at Wunsiedel in Bavaria, studied at Erlangen, and was professor at this university (1862–93) and at Munich (1893–1906). His published works are numerous; he is best known as general editor of the comprehensive *Handbuch der klassischen Altertumswissenschaft* (1885–1906), and also as the editor of many of the works of Galen (q.v.) and as reviser of Nägelsbach's *Lateinische Stilistik* (6th ed., 1888). He published also many articles in learned periodicals and from 1884 to 1897 was editor of Bursian's *Jahresbericht über die Fortschritte der klassischen Altertumswissenschaft.*

MÜLLER, Johann Friedrich Theodor, known as Fritz Müller or Müller-Desterro (1822–97). A German naturalist, known for his contributions to bionomics and to the evolution theory. He was born at Windisch-Holzhausen, near Erfurt. He studied at Greifswald and Berlin. The troubles of 1848 finally drove him from home and Berlin, and he emigrated to southern Brazil, settling at Blumenau. Here he lived the life of a colonist and pioneer until 1856, when he became a teacher of mathematics and natural history in the Gymnasium at Desterro on the island of Santa Catharina. After various changes he was in 1874 appointed *naturalista viajante* of the museum at Rio de Janeiro and lived at Itajahy. Afterward he was suddenly dismissed from his position, with-

out any explanation from the authorities, and returned to Blumenau.

Müller published numerous papers on jellyfishes and worms, but more particularly on crustaceans and insects, his articles appearing mostly in Wiegmann's *Archiv für Naturgeschichte*, *Kosmos*, *Natur* and in the *Annals* of the Rio de Janeiro Museum. His single book, *Facts for Darwin*, was called out by Darwin's *Origin of Species*, and it gave him wide fame. It was written at Desterro in 1863, was published at Leipzig in 1865, and was translated, with some additions, into English in London in 1869. It was the application of Darwinian principles to certain forms of a single class, the Crustacea. In this book we have, in the chapter on the "Progress of Evolution," the first clear statement of the biogenetic law or recapitulation theory afterward restated by Haeckel. He conducted an extensive correspondence with Darwin, who considered Müller's observations of the greatest value in connection with the evolution theory. Müller also proposed the theory of mimicry which bears his name. See MIMICRY.

MÜLLER, JOHANN GOTTHARD VON (1747–1830). A German line engraver, born at Bernhausen, near Stuttgart. He went to Paris in 1770 and studied for six years under Wille. While in the capital he won a number of prizes and was elected to the French Academy. In 1776 Duke Charles recalled him to Stuttgart, where he taught for nine years, and whence he was summoned to Paris to engrave a portrait of Louis XVI, after Duplessis. Next in importance to this is his engraving of Trumbull's "Battle of Bunker Hill." On his return to Stuttgart he became director of the school of engraving. He was elected a member of the principal European academies and was knighted in 1818. He engraved 33 plates in all, of which, besides those mentioned, the best are: "Madonna della Sedia," after Raphael; "Schiller," after the portrait by Graf; "St. Cecilia," after Domenichino; "Wille," after Greuze; "Madame Vigée-LeBrun," after the portrait by herself. Müller was one of the finest engravers of the late eighteenth and early nineteenth centuries, excelling particularly in portraiture.

MÜLLER, JOHANNES (1436–76). The real name of the German scientist Regiomontanus (q.v.).

MÜLLER, JOHANNES (1801–58). The most masterful, accurate, and influential physiologist and morphologist of his time. He was born at Coblenz, Rhenish Prussia, July 14, 1801. He began to study theology, but abandoned it for medicine, beginning his medical studies at Bonn. While there he prepared a prize essay, *De Respiratione Fœtus* (1821). He graduated in 1822 and in 1823 went to Berlin and studied with Rudolphi, returning to Bonn as privatdocent of physiology and comparative anatomy. In 1826 he was promoted to be professor extraordinarius and in 1830 to a full professorship. In 1833 he was called to Berlin, where he succeeded Rudolphi as professor of anatomy and physiology. After Meckel's death he edited the *Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin* and remained at Berlin until his death, which occurred April 28, 1858.

With his unusual powers of application, thoroughness, and breadth, his acuteness and penetration, young Müller opened up in different directions new fields of research. In 1826 he published an important work on specific nerve energies—*Ueber die phantastischen Gesichtserscheinungen;* in the same year an explanation of the color sensations produced by pressure on the retina—*Zur vergleichenden Physiologie der Gesichtssinnes der Menschen und der Thiere;* in 1827 a work based on his lectures on physiology; in 1829 his work on general pathology; and in 1833 the first part of his epoch-making *Handbuch der Physiologie des Menschen* (Eng. trans., *Elements of Physiology*, 1837–43). This was completed in 1840. In 1834 Müller was elected a member of the Berlin Academy of Sciences. As a physiologist, he was the founder of a new school, working by novel methods. To him physiology owes the foundation of Bell's law, the principle of reflex movements and other nervous activities; comprehensive and detailed views on vision and hearing; a thoroughly well-grounded knowledge of the nature of the blood, lymph, and chyle; the proof of the independence of the quality of glandular secretions from the grosser structure of the glands; and the knowledge of chondrin. An opponent of the school of nature philosophers, Müller placed physiology on a sound basis and led in the development of the new morphology. The science of comparative embryology was greatly enriched by his researches. He discovered the pronephric ducts which bear his name, explained the nature of hermaphroditism, and made extended contributions to and laid the foundations of our knowledge of the embryology and metamorphoses of the echinoderms. His examination into the mode of development of certain sharks led to his subsequent studies on the ganoids and *Amphioxus*. Müller also experimented on the vocal cords and the voice, advanced the theory of color contrast, and demonstrated the bristle cells of the inner ear. The debt morphology owes him is shown in his discovery of the lymph hearts of the Amphibia; the micropyle of the eggs of fishes, holothurians, and the like; the intimate structure of glands, of cartilaginous and bony tissue, of erectile tissue, of the musculature of the intestines, and the finer structure of the peritoneum. It was he who introduced the idea of fever as a nervous reflex.

Müller's principal work in comparative anatomy and morphology was his *Vergleichende Anatomie der Myxinoiden, etc.* (1835–41). His unfinished work, *Ueber den feinern Bau der krankhaften Geschwülste* (1838), was of great importance in pathological anatomy. In collaboration with Henle he published *Systematische Beschreibung der Plagiostomen* (1841), and in systematic zoölogy most important were *System der Asteriden* (1842), with Troschel, and *Horæ Ichthyologicæ*. Besides these he published upward of 250 articles, addresses, and reports, most of which appeared in the *Abhandlungen der berliner Akademie der Wissenschaften* and in the *Archiv für Anatomie, etc.*, and nearly all of which were of great significance. In 1899 the city of Coblenz, his native town, erected a monument to Müller.

Consult the biographical notices by Du Bois-Reymond (*Abhandlungen der berliner Akademie der Wissenschaften*, 1859), containing a list of his works; Virchow, *Johannes Müller: Eine Gedächtnisrede* (Berlin, 1858); Bischoff, *Ueber Johannes Müller und sein Verhältnis zum jetzigen Standpunkt der Physiologie* (Munich,

1858); *Proceedings of the Royal Society of London*, vol. ix, p. 556.

MÜLLER, JOHANNES VON (1752–1809). A German historian. He was born Jan. 3, 1752, at Schaffhausen, where his father was a clergyman and rector of the Gymnasium. He studied theology at Göttingen under Heyne, Schlözer, Walch, and others. In 1772, after being admitted to the ministry, he was appointed professor of Greek at Schaffhausen and in the same year published his first work, *Bellum Cimbricum*. In 1778 he went to Geneva, where he studied history at the university and devoted his leisure hours to the investigation of Swiss chronicles and documents. In 1780 he published his *Geschichte der Schweizer* and in 1781 was called to the Collegium Carolinum at Cassel as professor of history and statistics; at Cassel he wrote *Reisen der Päpste* (1782; new ed., 1831). In 1786 he was appointed librarian and councilor of state to the Elector of Mainz; here he started his *Geschichte der schweizerischen Eidgenossenschaft* (5 vols., 1786–1808), his *Zur Darstellung des Fürstenbundes* (1787), and *Briefe zweier Domherren* (1787). In 1787 he was in Rome, became Privy Councilor in 1789, and was knighted by the Emperor in 1791. In 1792 he went to Vienna, where the Emperor made him a member of the Aulic Council (1793), and where he in 1800 became first Imperial librarian. In 1804 he left Vienna for Berlin, where he wrote, among other things, an additional volume of his Swiss history. Introduced to Napoleon after the battle of Jena, he was appointed by him (1807) Secretary of State in the new Kingdom of Westphalia. He died at Cassel, May 29, 1809. His works have all been replaced by more modern researches, but in their own day they were of great value. Besides those mentioned, the *Vierundzwanzig Bücher allgemeiner Geschichte*, based on lectures delivered in Geneva (1811 and often republished), are important. Müller's *Sämmtliche Werke* were published (27 vols., Stuttgart, 1810–19; new ed., 40 vols., 1831–35).

MÜLLER, JOSEF (1855–). A German writer on philosophy and religion. He was born and educated in Bamberg, studied theology and philosophy, was ordained a priest in 1877, but in 1887 retired from clerical work and became a leader of the Reform Catholic movement in Germany, editing its organ, *Renaissance*, from 1900 to 1907. Among his books the most important are those on Richter—including *Jean Paul und seine Bedeutung für die Gegenwart* (1894), *Die Seelenlehre Jean Pauls* (1894), *Jean Paul-Studien* (1900), and a biography (1913)—and *Das Wesen des Humors* (1896); *Philosophie der Schönheit* (1897; 2d ed., 1912); *Keuschheitsidee* (1897; 2d ed., 1912); *Reformkatholizismus, die Religion der Zukunft* (1899; 2d ed., 1900); *Das sexuelle Leben* (3 vols., 1902–04); *Das Bild in der Dichtung* (2 vols., 1903–06); *Moralphilosophische Vorträge* (1904). Consult the autobiographic volume, *Das Leben eines Priesters in unsern Tagen* (Munich, 1903).

MÜLLER, JULIUS (1801–78). A German theologian. He was born at Brieg in Silesia and was a brother of Karl Otfried Müller (q.v.). He studied at Breslau and Göttingen, at first devoting himself to law, but afterward to theology. In 1825 he was appointed pastor at Schönbrunn and Rosen, near Strehlen, where he remained seven years. He was appointed in 1831 second university preacher in Göttingen, and there lectured on practical theology and pedagogics. In 1834 he became extraordinary professor of theology in Göttingen and soon after full professor in Marburg, whence he went in 1839 to occupy a similar chair in Halle. The work on which his reputation as a theologian chiefly rests is *Die christliche Lehre von der Sünde* (1839; 6th ed., 1889; Eng. trans., from the 5th ed., Edinburgh, 1868), the most exhaustive treatise in all theology on the subject. He also issued *Dogmatische Abhandlungen* (1870). He afterward published pamphlets on subjects of temporary interest, particularly in vindication of the cause of evangelical union against the attacks of the rigid Lutherans. In conjunction with Neander and Nitzsch he edited a periodical entitled *Deutsche Zeitschrift für christliche Wissenschaft und christliches Leben*. Consult his biography by M. Kahler (Halle, 1878) and by L. Schultze (Bremen, 1879); also J. L. Schultze, *Julius Müller als ethiker* (Bremen, 1895).

MÜLLER, KARL OTFRIED (1797–1840). A German archæologist and philologist, born at Brieg in Silesia. He studied at Breslau and Berlin, where he was the pupil of August Boeckh. His dissertation, *Ægineticorum Liber* (1817), showed the direction of his future studies, which were devoted to the reconstruction of the history of Greek localities and races. In 1817 he was appointed a teacher at the Magdaleneum in Breslau, in 1819 professor extraordinarius of philology at Göttingen, and in 1823 professor ordinarius there. In connection with his studies he traveled widely and in 1839 secured leave of absence for a visit to Greece and Italy. A sunstroke received while he was copying inscriptions at Delphi led to an attack of fever, from which he died at Athens, where he was buried on the Hill of Colonus. His desire to reconstruct the entire ancient life naturally led Müller to a wide range of scholarly activity. His great work was to be his *Geschichte hellenischer Stämme und Städte*, of which he completed volume i, *Orchomenos und die Minyer* (1820), and volume ii, *Die Dorier* (1824); a second edition of these works was prepared by Schneidewin (1844; trans. by G. C. Lewis and H. Tufnell, London, 1839). In the same field belonged his treatise, *Ueber die Wohnsitze, Abstammung und ältere Geschichte des macedonischen Volks* (1825), and his *Etrusker* (1828; 2d ed. by Deecke, 1877). His *Handbuch der Archäologie der Kunst* (1830; 3d ed. by Welcker, 1846; trans. by Leitch, London, 1850), though now antiquated in its collections, is of value from the many acute observations it contains. It was accompanied by Müller and Oesterley's *Denkmäler der alten Kunst* (Göttingen, 1834–39), which was continued and completed by Wieseler (1846–56). A third edition appeared in 1877–81; a fourth edition of part ii, *Kunstmythologie*, was begun at Leipzig in 1899. His *Prolegomena zu einer wissenschaftlichen Mythologie* (1825) was based on his belief that the elements of the Greek religion were to be found in analysis of the myths, which would refer the specific names to specific places and tribes. In the last years of his life he undertook to prepare, for the English Society for the Diffusion of Useful Knowledge, a history of Greek literature. A translation by Lewis and Donaldson from the author's manuscript, entitled *A History of the*

Literature of Ancient Greece, an excellent book, was published in London in 1840 and again, with a continuation by Donaldson, in 1858; in volume i there is an essay by Donaldson "On the Life and Writings of Karl Otfried Müller." The German original, *Geschichte der griechischen Litteratur bis auf das Zeitalter Alexanders* (1841; 4th ed., revised and continued by E. Heitz, 1882–84), was published by his brother after his death, as well as *Kleine deutsche Schriften* (1841). A collected edition of *Kunstarchäologische Werke*, in five volumes, was published in Berlin (1872–73). Müller was also prominent as an editor. His fine edition, with German translation, of *Æschylus' Eumenides* (Göttingen, 1833) gave rise to a fierce controversy with Gottfried Hermann and his school, while his critical editions of Varro, *De Lingua Latina* (Leipzig, 1833), and Festus, *De Significatione Verborum* (ib., 1839), were long standards and are still valuable. For his biography, consult: F. Ranke (Berlin, 1870); C. Dilthey, *Otfried Müller* (Göttingen, 1898); O. and E. Kern (eds.), *K. O. Müller: Lebensbild in Briefen an seine Eltern* (Berlin, 1908); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

MÜLLER, Lauro Severiano (1863–). A Brazilian statesman, born in Santa Catharina. He entered the military school in 1882 and later took an active part in the organization of the movement which established the Republic (1889). He was a member of the Constituent Assembly, serving on the committee which elaborated the republican constitution of Feb. 24, 1891. Afterward he served as deputy and Senator from Santa Catharina to the National Congress. In 1902 he was appointed Minister of Industry, Communications, and Public Works and in this position fostered numerous public improvements, including especially railways and port projects. In 1912 he became Minister of Foreign Affairs. In the endeavor to promote better relations with all the other American republics he made official visits to the United States in 1913, and to Uruguay, Argentina, and Chile in 1915.

MÜLLER, Leopold (1834–92). An Austrian genre painter, born in Dresden of Austrian parents. He was a pupil of Karl Blaas and of Christian Ruben at the Academy in Vienna and worked eight years as an illustrator for the Vienna *Figaro*. Continuing his studies subsequently, he repeatedly visited Italy and Egypt, and made his name favorably known through a series of scenes from popular life in Italy and Hungary. His best works, however, are his Oriental paintings and sketches, which possess great ethnographic exactness and delicacy and charm of color. Such are "Street Scene in Cairo" (Metropolitan Museum, New York); "Pilgrims to Mecca Resting," "Bedouins in Camp," "Young Copt Woman" (New Pinakothek, Munich). Other works include "The Church of the Carmelites"; "In the Cellar" (Rudolfinum, Prague); "The Little Mother" and "Last Task of the Day" (both in the Vienna Museum).

MÜLLER, Lucian (1836–98). A German Latinist. He was born at Merseburg and studied at the universities of Berlin and Halle, as well as in Holland. In 1869 he published *Geschichte der klassischen Philologie in den Niederlanden*. In 1870 he was made professor of the Latin language and literature at the Imperial Philologico-Historical Institute at St. Petersburg. His works, which display great erudition and critical acumen, are marred by his bitter attacks on eminent scholars whose opinions differ from his own. They include his famous *De Re Metrica Poetarum Latinorum præter Plautum et Terentium* (1861; 2d ed., 1894); *Metrik der Griechen und Römer* (2d ed., 1885), a brief but excellent treatise, translated by S. B. Platner (1892); editions for the *Bibliotheca Teubneriana* of *Horace* (2d ed., 1879), of *Catullus* (1870), and other Latin poets; editions of *Lucilius* (1872), *Phædrus* (1877), *Ennius* (1884), *Nævius* (1885); Horace's *Odes and Epodes*, with German commentaries (1882); *Nonius Marcellus* (1888); Horace's *Satires and Epistles* (1891–93). His treatise entitled *Ein Horazjubiläum* (1892) contains a short autobiography. Consult also J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

MÜLLER, Max. See Müller, Friedrich Max.

MÜLLER, Morten (1828–1911). A Norwegian landscape painter, born at Holmestrand on the Christiania Fiord. After studying in Düsseldorf (1847–50), first under Tidemand and Gude, then at the Academy under Schirmer, he lived in Stockholm, where in King Karl XV he found a warm friend and patron, and in 1866 went to Christiania, where (1870–73) with K. Bergslien he conducted Eckersberg's school for painting, subventioned by the government. In 1873 he removed again to Düsseldorf, and in 1874 was made a member of the Swedish Academy and court painter. The rugged grandeur of the fiords and mountainous woodland fastnesses of his native country are the favorite subjects of his characteristic landscapes, in which he combines a romantic conception of nature with purely realistic color effects. Representative examples are a "View on Christiania Fiord" (1855) and "Entrance into Hardanger Fiord" (both in the National Gallery, Christiania); "Pine Forest in Norway" (1860, Hamburg Gallery); "Romsdal Fiord" (1876); "Forest Lake by Moonlight" (1892).

MÜLLER, Otto (1816–94). A German novelist. He was born at Schotten in Hesse, was for some time connected with the court library at Darmstadt, and edited newspapers at Frankfort and Mannheim. In 1854 he established the *Frankfurter Museum*. He was the author of novels, *Charlotte Ackermann* (1854); *Der Stadtschultheiss von Frankfurt* (3d ed., 1878), treating of Goethe's grandparents; *Aus Petrarcas alten Tagen* (1861); *Der Majoratsherr* (1873); *Schatten auf Höhen* (1881). Consult the biography by Schulte vom Brühl (Stuttgart, 1895).

MÜLLER, Otto Frederik (1730–84). A Danish zoölogist, born in Copenhagen. His contributions to the knowledge of Infusoria are especially valuable. He wrote: *Fauna Insectorum Friedrichsdaliana* (1764); *Flora Friedrichsdaliana* (1767); *Vermium Terrestrium et Fluviatilium, seu Animalium Infusoriorum Helminthicorum et Testaceorum non Marinorum Succincta Historia* (2 vols., 1774); *Zoölogia Danica s. Animalium Daniæ et Norvegiæ Descriptiones et Historia* (2 vols., 1777–80; 3d ed., 4 vols., 1789–1806).

MÜLLER, Peter Erasmus (1776–1834). A Danish theologian and antiquary. He was born in Copenhagen and studied at the university there, passing his theological examination in 1791. After spending some time in German universities, he visited France and England. Returning, he wrote numerous works; was appointed professor of theology at the University of Copenhagen in 1801, and in 1830 became Bishop of Zealand, the highest ecclesiastical dignity in Denmark. He was an eminent theologian, and his theological works, including that on the Christian moral system (1808) and other volumes, are highly valued. But his literary reputation rests upon his essays on Danish and Norse antiquities, of which the most valuable are: *Om det islandske Sprogs Vigtighed* (1813); *Kritisk Undersögelse af Danmarks og Norges Sagnhistoire* (1823–30); and, above all, his *Sagabibliothek* (*Library of the Sagas*) (1816–18).

MÜLLER, Sophus Otto (1846–). A Danish archæologist, born in Copenhagen, the son of Dr. C. L. Müller, archæologist and numismatist. He studied philology in his native city, where he obtained the doctorate (1880) with the important essay *Dyreornamentiken i Norden.* In 1878 he became assistant in the Museum of Archæology, in 1885 inspector, and in 1892 a director in the National Museum. As secretary of the Royal Archæological Society (after 1881) he edited *Aarböger for Nordisk Oldkyndighed* and *Nordiske Fortidsminder,* to which he made numerous learned contributions on Danish archæology. His principal works are *Ordning af Danmarks Oldsager* (2 vols., 1888–95), with 1300 illustrations, and *Vor Oldsid* (1897), both fundamental works on Danish archæology. With C. Neergaard he wrote *Danevirke, arkæologisk undersögt, beskrevet og tydet* (1901).

MÜLLER, Therese. See Malten, Therese.

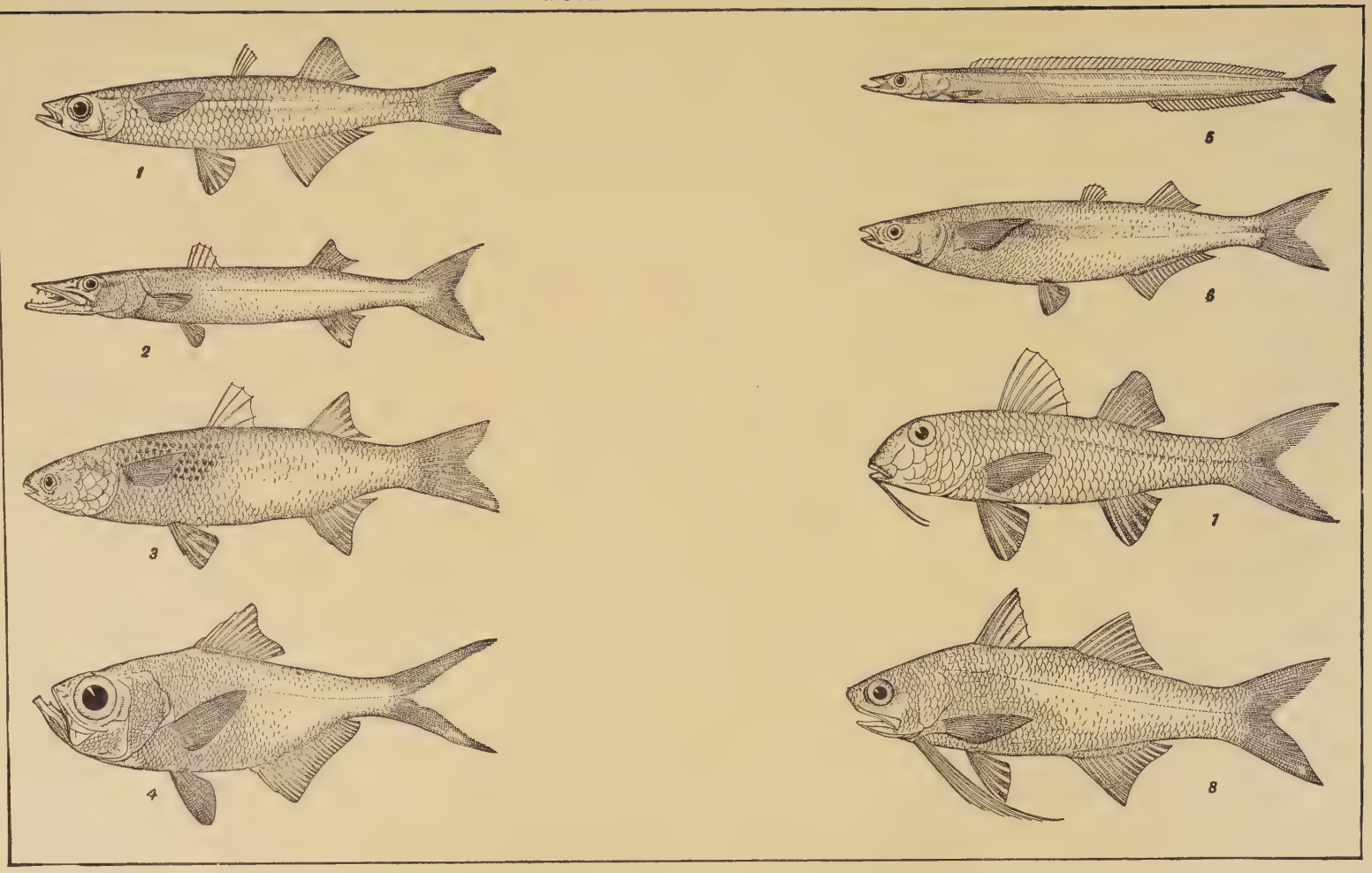
MÜLLER, Victor (1829–71). A German historical painter. He was born in Frankfort, where he received instruction at the Städel Institute under Steinle. He studied afterward at the Antwerp Academy and under Couture in Paris, but became a follower of Courbet, whose technique, the reverse of Couture's, he adopted and subsequently helped to promote in Germany. In 1858 he returned to Frankfort, where he soon attracted attention with a series of pictures, romantic in subject but thoroughly realistic in conception and treatment and of great coloristic charm, but scarcely understood by a public accustomed to the sentimental trend of the Düsseldorf school of that period. Therefore, in 1865, he removed to Munich, where such revolutionary departures from traditional treatment as the "Sleeping Wood-Nymph" (1863) and "Hero and Leander" were more likely to be appreciated. Out of a cycle from Shakespeare which he painted there "Hamlet in the Graveyard" (1869, Städel Institute, Frankfort) is surpassed only by the "Balcony Scene in Romeo and Juliet" (New Pinakothek, Munich). Another of the series, "Ophelia," and two scenes from the "Life of Hartmuth von Cronberg" are also in the Städel Institute, Frankfort. His power as a landscape painter is shown in a "Scene from *Les Misérables*" and "Faust on the Promenade," and his charming fairy pictures prepared the way for those of Hans Thoma. To his influence as a colorist was due not only the introduction of the tone element into the paintings of the Munich school, but also the truer conception of historical characters and a more wholesome observation of nature among the younger generation of artists.

MÜLLER, Wilhelm (1794–1827). A German poet, excelling in popular and political songs that attracted great composers, notably Schubert, and also influenced Heine's lyric development. Müller, who was born in Dessau, Oct. 7, 1794, studied philology and history, fought in the War of Liberation, visited Italy (1817–19), was made professor in the Gelehrtenschule at Dessau (1819), and ducal librarian there. He died in Dessau, Sept. 30, 1827. His poems, published under the titles *Müllerlieder* (1818), *Gedichte eines Waldhornisten* (1821), *Lieder der Griechen* (1821–24), *Lieder des Lebens und der Liebe* (1824), *Lyrische Reisen* (1827), were collected with other *Works* by Schwab in five volumes (1830). An excellent edition by Müller's son, the Orientalist, Friedrich Max Müller (q.v.), appeared in 1868; the *Poems* were published in one volume (1874). A complete critical edition by J. T. Hatfield appeared in 1906 (Berlin). Consult B. Hake, *W. Müller, Leben und Dichten* (Berlin, 1908).

MUL'LER, William James (1812–45). An English landscape and figure painter, born at Bristol, whither his father, a Prussian scholar, had migrated. He studied with James Pyne, landscape painter, and in 1833 exhibited for the first time at the Royal Academy the "Destruction of Old London Bridge, Morning." He spent seven months traveling in Germany, Switzerland, and Italy, and in 1838 he visited Greece and Egypt. In 1841 he published his "Picturesque Sketches of the Age of Francis I," the fruits of a visit to France, and the same year he joined the government expedition to Lycia, the results of which were paintings of Oriental life and scenery, five of which were exhibited at the Royal Academy in 1845. Among these are "The Tent Scene, Xanthus," the "Burial-Ground at Smyrna," and "Head of a Cingari." A fine collection of the sketches made at this time is in the British Museum. He is excellently represented in the Tate Gallery by about 80 paintings and sketches in oil and water color, and in the South Kensington Museum by a number of water-color drawings. Muller died at Bristol. His art was original and powerful. His English landscapes are perhaps wanting in simplicity and local color and atmosphere, but his glowing Eastern scenes, with their broad brushwork, admirable light effects, and pure strong color, place him in the foremost ranks of painters of the Orient. Consult the *Memoir* by Solly (London, 1875).

MÜLLER, mŭ'lĕr, W(ilhelm) Max (1862–). An American Oriental scholar, born at Gleisenberg, Germany, and educated at Erlangen, Berlin, Munich, and Leipzig, where he received his Ph.D. After 1888 he resided in the United States, and after 1890 he occupied a chair in the Reformed Episcopal Seminary in Philadelphia. During various periods he was engaged in archæological researches in Egypt, being sent there in 1904, 1906, and 1910 by the Carnegie Institution. Müller also lectured on Egyptology at the University of Pennsylvania. His writings include: *Asien und Europa nach altägyptischen Denkmälern* (1893); *Die Liebespoesie der alten Aegypter* (1899); *Egyptological*

MULLETS AND ALLIES



1. GULF SILVERSIDES (Menidia peninsulæ).
2. BARRACUDA (Sphyræna barracuda).
3. COMMON MULLET (Mugil cephalus).
4. SLIMEHEAD (Beryx splendens).
5. SAND-EEL (Ammodytes Americanus).
6. CALIFORNIA 'SMELT' (Atherinopsis Californiensis).
7. AMERICAN SURMULLET (Mullus auratus).
8. GULF BARBUDO (Polydactylus Virginicus).

Researches (1906, 1910 et seq.). He was also a contributor to the *Encyclopædia Biblica* and the *Jewish Encyclopædia*, and after 1905 served as joint editor of the *Gesenius Hebrew Dictionary*.

MÜLLER, Wolfgang, called Müller von Königswinter (1816–73). A German poet and novelist, born at Königswinter on the Rhine. He studied medicine at Bonn and practiced at Düsseldorf, but afterward removed to Cologne and gradually gave up medicine to devote himself to literature. Müller's poetry finds its material in the Rhine, its beauty, its legends, and the life of its people. The more important of his books are: *Gedichte* (1847; 3d ed., 1868); *Der Rattenfänger von Sankt Goar* (1856); *Liederbuch* (1857; 4th ed., 1871); *Lorelei*, an epic cycle (1851; 4th ed., 1873); *Erzählungen eines rheinischen Chronisten* (1860–61); *Im Rittersaal* (1874). His best-known poem is "Mein Herz ist am Rhein." Six volumes of his selected poems were published under the title *Dichtungen eines rheinischen Poeten* (1871–76). Consult Joesten, *Wolfgang Müller von Königswinter* (Cologne, 1895).

MÜLLER-GUTTENBRUNN, gu'ten-brun, Adam (1852–). An Austrian author, sometimes using the pseudonym Ignotus, born at Guttenbrunn and educated at Hermannstadt and Vienna. In 1879 he removed to Vienna from Linz. His first success was *Des Hauses Fourchambault Ende* (1880), supplementing Augier's drama *Les Fourchambault*. This was followed by *Im Banne der Pflicht* (1882), the comedy *Schauspielerei* (1883), with Laube, and *Irma* (1885). Among his novels and stories, which for the greater part appeared serially, the best known are: *Frau Dornröschen* (1884; 3d ed., 1891); *Gescheiterte Liebe* (1889); *Die Magyarin* (1896); *Götzendämmerung* (1908); *Der kleine Schwab* (1910; 10th ed., 1912); *Die Glocken der Heimat* (1911; 8th ed., 1912); *Es war einmal ein Bischof* (1912); *Der grosse Schwabenzug* (1913).

MÜLLER-URY, Adolfo (1864–). A Swiss-American portrait painter. He was born in Airolo, Switzerland, and studied under Deschwanden in Switzerland, at the Munich Academy, and at the Ecole des Beaux-Arts, Paris, under Cabanel. After spending two years (1883–85) in Rome, he came to America in 1886. Although he painted many religious pictures, he is best known for his portraits of prominent personages in Europe and America. These include Pope Pius X, Cardinals Hergenrother, Hohenlohe, and Merry del Val, Lord and Lady Strathcona, Lord Mount Stephen, Emperor William II (1909, New Palace, Potsdam), President William McKinley, General F. D. Grant, Senator and Mrs. Chauncey M. Depew, J. Pierpont Morgan, and James J. Hill.

MUL'LET (OF., Fr. *mulet*, dim. of *mulle*, from Lat. *mullus*, red mullet). Any one of a variety of useful fishes, principally of the family Mugilidæ. In this family the body is nearly cylindrical, with large scales and two widely separated dorsal fins, the first with four stiff spines. The mouth is small. The best-known mullets belong to the genus *Mugil*, of which there are many species found in all warm waters. The common or striped mullet (*Mugil cephalus*) is the largest (10 to 12 pounds) and best of all. It occurs on both coasts of America, and also in Europe. It often ascends rivers, and searches for soft or fat substances for food, frequently obtained by thrusting its mouth into the mud. It is easily reared in ponds, readily answers the call which usually summons it to be fed, and was in great request among the ancients. Mullets are used fresh, salted, and smoke-dried. A preparation of their roe, called botarcha, is in great esteem as a condiment in Italy and the south of France. They are often caught in the Mediterranean by angling from a rock, with a bait paste, when they have been previously attracted to the spot by macaroni thrown into the water. The white or blueback mullet (*Mugil curema*) is found on both shores of America, and is of importance as a food fish. An abundant species about the Florida Keys is the fan-tailed mullet (*Mugil trichodon*). Mullets are very numerous in surface-swimming shoals in the lagoons of the Gulf coast in late winter and spring, and are captured generally by means of casting nets. Among the fishermen of Spanish America, mullets are called liza, lizita, and macho, with descriptive adjectives for the various species.

The name is also given in the western and southern United States to various suckers of the genus *Moxostoma*. Consult G. B. Goode, *Fishery Industries*, sec. i (Washington, 1884). See Plate of Mullets and Allies.

MULLET (OF. *molette, mollette*, Fr. *mollette*, rowel, from Lat. *mola*, millstone). In heraldry, a charge (originally interchangeable with the estoile) in the form of a star, generally with five points, intended to represent a spur rowel. See Cadency.

MULLET, Abram B. (c.1820–1890). An American architect, born in Ohio. His professional training was obtained in the offices of local architects. In 1865 he was appointed supervising architect of the Treasury, having charge of the design and construction of all Federal buildings, which post he occupied until 1875. He designed the War, State, and Navy Department Building at Washington, the post offices of New York and Boston, and many other important buildings, in a hard and mechanical version of the French Renaissance style. While his work wholly lacked artistic refinement, it set an example of solid and durable construction at a time when not only artistic taste but apparently all sense of good building seemed to be dead in the United States.

MUL'LIGAN LETTERS. A series of letters written by James G. Blaine (q.v.) to Warren Fisher, a business associate, which, it was alleged, proved corrupt connection, on the part of Blaine, with legislation in Congress favoring the Little Rock and Fort Smith Railroad and the Northern Pacific Railroad. The letters were obtained from Fisher by one James Mulligan, a former clerk of Fisher, who had been called to Washington to testify before a committee of the House of Representatives appointed to investigate the charges against Blaine. Blaine obtained the letters from Mulligan, and on June 5, 1876, read them before the House, after defying the committee to compel him to surrender them. The letters were freely used in the presidential campaigns of 1876 and 1884 by the opponents of Blaine, who took full advantage of the suspicious sound of several detached sentences. By the adherents of Blaine it was asserted that the letters did not prove corruption or even participation in discreditable business and political transactions on his part. Consult Peck, *Twenty*

Years of the Republic, chap. i (New York, 1906).

MULLINGAR, mŭl'lĭn-gär'. The capital of County Westmeath, Ireland, on the Brosna, 50 miles west by north of Dublin, with which it is connected by rail and by the Royal Canal (Map: Ireland, D 4). It is a centre for agricultural products, and the most important horse and cattle fairs in Ireland are held here periodically. Pop., 1901, 4500; 1911, 5539.

MULLINGER, mŭl'lĭn-jĕr, James Bass (1834–). An English historian, born at Bishop Stortford. He was educated at University College, London, and at St. John's College, Cambridge, where he graduated with high honors. After lecturing in 1881–83 at Bedford College, London, he became lecturer to the Teachers' Training Syndicate, at Cambridge, on the history of education (1885–95), and lecturer on ecclesiastical history in Trinity College (1890–94). He wrote: *The Ancient African Church* (1869); *The University of Cambridge from the Earliest Times to the Decline of the Platonist Movement* (4 vols., 1873–1914); *The Schools of Charles the Great* (1876); *An Introduction to English History*, with S. R. Gardiner (1881; 7th ed., 1913); *The Age of Milton*, with Canon Masterman (1897); *History of St. John's College, Cambridge* (1901).

MULLION (corrupted from *munnion*, from Fr. *moignon*, stump of an amputated limb, from OF. *moign*, from Lat. *mancus*, maimed). A vertical member used to subdivide an opening, as a window or triforium arch, into two or more divisions within the main framework. It was practically unknown to all ancient styles of architecture. In the early Christian (especially Syrian), Byzantine, and Romanesque styles it occurs with increasing frequency in the very simple form of a circular shaft or colonnette (sometimes a small pier) subdividing a window or an arch of a gallery into two arched openings.

It was in the Gothic style that the mullion received a distinctive organic development through the use of tracery owing to the enormous increase in the size of windows and other openings, necessitating the multiplication of minor members. The typical cathedral window has from two to six mullions forming subordinate divisions or lights, and their profiles are varied and rich, being often a group of shafts and a composition of fillet and cavetto moldings. These Gothic mullions are exquisitely slender and far removed from the heavy pre-Gothic mullion colonnette. (See Tracery.) The Renaissance architects abandoned the mullion, returning to the antique idea of undivided openings. Only occasionally is a single colonnette used as a window mullion, especially in early work.

MÜLLNER, mŭl'nĕr, Adolf (1774–1829). A German dramatist and critic, a nephew of G. A. Bürger, born at Langendorf, near Weissenfels, Saxony. He studied law in Leipzig and practiced it at Weissenfels until 1816. Encouraged by the success in an amateur theatre of several comedies, as, e.g., *Der angolische Kater* (1815), skillfully composed after French models, he produced in 1812 a one-act tragedy, *Der neunundzwanzigste Februar*, in imitation of Werner's *Der vierundzwanzigste Februar* (1812), the first of those fate dramas with which the German stage was flooded during the following decade. Surpassing its model in the accumulation of horrors, Müllner's play lacked the innate poetry which was the redeeming feature of Zacharias Werner's (q.v.) production. The same applies to his best-known work, *Die Schuld*, a four-act drama, based on the story of a young man who, according to a prophecy, is destined to kill his brother. This typical fate tragedy was brought out in Vienna in 1813, and subsequently on all the principal stages of Germany, retaining its popularity for some years, although its effectiveness was due mainly to clever technical construction. Consult: Schütz, *Müllners Leben, Charakter, und Geist* (4 vols., Meissen, 1830); Höhne, *Zur Biographie und Charakteristik Müllners* (Wohlau, 1875); Minor, *Die Schicksalstragödie in ihren Hauptvertretern* (Frankfort, 1883); Foth, *Die Schicksals-Idee in der deutschen Tragödie* (Leipzig, 1895).

MULOCK, mū'lŏk, Dinah Maria. An English author. See Craik, Dinah Maria.

MULOCK, Sir William (1843–). A Canadian jurist and statesman, born at Bondhead, Ontario, and educated at the University of Toronto. He was called to the bar in 1868, and practiced his profession in Toronto, where he became one of the leaders of the bar. In 1888 he was made queen's counsel. In 1882 he was elected a Liberal member of the Dominion House of Commons, and in 1896 was made Postmaster-General in the administration of Sir Wilfrid Laurier. The establishment of a penny-postage rate between Canada and other portions of the Empire was mainly due to him, and he also strongly advocated an all-British cable system, and procured direct steamship communication between Canada and South America. While Postmaster-General he introduced legislation establishing the Department of Labor and was its first minister (1900–05). In the latter year he was appointed the first Chief Justice of the Exchequer Division of the High Court of Justice for Ontario. He was vice chancellor of the University of Toronto in 1881–1900. Deeply interested in the movement for international peace and arbitration, in 1907 he was chairman of the board of conciliation respecting the coal strike in British Columbia. In 1902 he was knighted (K.C.M.G.).

MULREADY, mŭl-rĕd'ĭ, William (1786–1863). An Irish genre painter. He was born at Ennis, County Clare, but his father moved to London when William was a child. He early showed artistic powers, which were encouraged by the sculptor Banks, through whose influence he gained admittance to the academy schools. He began as an illustrator of children's books, and his first painting of importance, "Returning from the Ale House," now in the Tate Gallery, London, under the title "Fair Time," appeared in 1809; his later works, "The Carpenter's Shop," "Punch," and "Idle Boys," commanded very general attention. Mulready was elected an associate of the Royal Academy in 1815, and the following year, on the merits of his picture entitled "The Fight Interrupted" (South Kensington Museum), he was made Academician. His subjects, though of the popular order, are painted with great carefulness and fidelity to detail. They are rather small in size, and closely resemble the Dutch school, but are spoiled by gaudy color.

Mulready's most important pictures are in the South Kensington Museum and in the Tate Gallery. In the former are 33, among them "Hampstead Heath" (1806); "Giving a Bite" (1836); "First Love" (1839); "The Sonnet" (1839); "Choosing the Wedding Gown" (1846);

"The Butt" ("Shooting a Cherry") (1848). In the latter are five, including a "Snow Scene." "Young Brother" and "The Toy Seller" are in the National Gallery, Dublin, and his "Wolf and the Lamb" is in royal possession. An early marriage, contracted soon after his arrival in London, was productive of much unhappiness. Throughout his life Mulready was a successful and painstaking teacher. Consult Stephens, *Memorials of Mulready* (London, 1867).

MULTAN, or **MOOLTAN,** mōōl'tän'. The capital of a district of the same name, Punjab, British India, 190 miles southwest of Lahore and 4 miles from the left bank of the Chenab, the inundations of which sometimes reach the city (Map: India, B 2). It possesses railway communication with all the principal cities of India and has, in the Indus Valley Railway, a commercial outlet from Central Asia, the Punjab, and the United Provinces, to the Arabian Sea at Karachi. Steamers ply to Hyderabad, a distance of 570 miles. The city, situated in a district remarkable for its fertility, is built on a mound consisting of the ruins of ancient cities, and is surrounded by a dilapidated wall from 10 to 20 feet high. Large and prosperous suburbs have grown up in recent times. The vicinity abounds in mosques, tombs, and shrines, attesting the city's antiquity and former magnificence. The most important of these, situated in the old fort, is the tomb of Rukn ul Alam (pillar of the world), dating from 1340, an octagonal red-brick structure covered with multicolored glazed tiles and raised mosaics and forming a conspicuous object in the surrounding landscape. The tomb of Bhawal Hakk, dating from 1264, the tomb of Shams i Tabriz, and the Hindu temple of the Narasingh Avatār of Vishnu are also noteworthy. The bazars are numerous, extensive, and well stocked, and the stores are adequately supplied with European and Asiatic commodities. There are a fine public garden, several high schools for boys, and a convent school for girls. There are manufactures of silks, cottons, shawls, scarfs, brocades, tissues, carpets, shoes, tin boxes, enamel ware, and pottery, and extensive banking interests, but Multan is most important as a trade centre. It holds an annual horse bazar. The local merchants are proverbially rich. Multan is a military station, with an important cantonment 1½ miles to the east. It was taken by the British in the second Sikh War, in January, 1849. Pop., 1901, 87,394; 1911, 99,243.

MUL'TIPLE (ML. *multiplus,* manifold, from Lat. *multus,* many + *-plus,* fold). An integral number divisible without remainder by another integral number. Thus, 35 is a multiple of 7 and also a multiple of 5. *Equimultiples* are multiples containing different numbers an equal number of times; e.g., 21 and 33 are equimultiples of 7 and 11. The *least common multiple* of several numbers is the least number containing each of them without a remainder. The least common multiple contains all prime factors not common to all of the numbers, and all common prime factors with their highest exponents. Thus, the least common multiple of $5 \cdot 7$ (i.e., 35), $3^2 \cdot 2$ (i.e., 18), and $7^2 \cdot 2^2 \cdot 5$ (i.e., 980) is $5 \cdot 7^2 \cdot 2^2 \cdot 3^2$ (i.e., 8820).

Mathematical expressions which satisfy given conditions for different numerical values are said to be multiple-valued; e.g., $\sin^{-1}x$ (i.e., the angle whose sine is x) is two-valued between 0° and 360°; thus, if the sine equals ½, the angle has two values, 60°, 120°. (See TRIGONOMETRY.) Contacts above the first order between curves or surfaces are called multiple contacts. A multiple point of a curve is a singularity composed of several coincident points; e.g., if the curve crosses itself twice at the same place, the intersection is called a triple point. A double point admits of two tangents, a triple point admits of three tangents, and so on, and these are called multiple tangents.

MULTIPLE PERSONALITY. See DOUBLE CONSCIOUSNESS.

MULTIPLICA'TION (Lat. *multiplicatio,* from *multiplicare,* to multiply, from *multiplex,* manifold, from *multus,* many + *plicare,* to fold, Gk. πλέκειν, *plekein,* to twine). One of the fundamental processes in arithmetic and algebra. In arithmetic the symbol for multiplication is × or the period, the latter being slightly raised in the United States to distinguish it from the decimal point, but not being raised in the European books, where the decimal point is either a comma or a raised period. In algebra the symbol is the period or cross (as in arithmetic) or simple juxtaposition. For example, $a \cdot b$, $a \times b$, ab, are symbols for a times b. Multiplication may be defined as the process by which a number called the *product* is formed from a number called the *multiplier* in the same way that this multiplier is formed from unity. For example, the number — 3 may be formed from unity by the process symbolized as $-(1+1+1)$, and similarly the product $-3 \cdot 4$ may be formed by the process $-(4+4+4) = -12$. Elementary multiplication is subject to the associative and distributive laws (qq.v.); but there are branches of higher mathematics in which exceptions occur. (See QUATERNIONS; SUBSTITUTION.) For a method of checking multiplication, see CHECKING.

In a series of operations multiplication takes precedence over addition and subtraction. For example, $2 + 3 \cdot 6 - 4$ equals $2 + 18 - 4$, not $5 \cdot 2$. The operation of multiplication can be abbreviated by the use of logarithms (q.v.), the slide rule (q.v.), or tables of products and factors or of quarter squares. The plan of multiplication by means of Napier's rods (*Rabdologiæ sive Numerationis per Virgulas Libri Duo,* Edinburgh, 1617) has been revived through the manufacture of sets of *réglettes multiplicatrices* planned by Genaille and Lucas (Paris, 1885). Growing out of the demand for a system by which prime numbers could be detected, there appeared, in the seventeenth century, numerous tables in the theory of numbers. In 1728 Poëtius published a table of factors for numbers up to 100,000. In 1770 Lambert arranged such a table in modern form for numbers up to 102,000. Burkhardt's table (1814–17) includes factors of numbers to 36,000, and Crelle, Pase, and Glaisher have carried these to 9,000,000. The oldest of the large tables is that of Crelle (7th ed., with an introduction by Bremiker, Berlin, 1895). This gives the products to $1000 \cdot 1000$. Zimmermann's *Rechentafel* (Berlin, 1889) and Müller's *Multiplicationstabellen* (Karlsruhe, 1897) give the products to $100 \cdot 1000$, and are well arranged. For the products to $100 \cdot 100$, Jordan's *Mathematische und geodätische Hilfstafeln* (9th ed., Hanover, 1895) is one of the best. The most elaborate table of prime numbers is that of Lehmer, which gives all such numbers from 1 to 10,006,721. Products have also been tabulated by means of quarter squares,

a relation known to the Arabs and doubtless of Hindu origin. The construction of these tables depends upon the identity

$$ab \equiv \frac{(a+b)^2}{4} - \frac{(a-b)^2}{4};$$

thus, the product of any two numbers is given by subtracting the quarter square of their difference from the quarter square of their sum. Among the various tables of this type, Laundy's (1856) contains the quarter squares of all numbers up to 100,000. Blater's (Vienna, 1887), complete to 200,000, is regarded as the best. See CALCULATING MACHINES.

MULVA'NEY. A character in Rudyard Kipling's "Soldiers Three" in *Plain Tales from the Hills* (1888).

MULVIAN BRIDGE. See MILVIAN BRIDGE.

MUM. See BEER.

MUM'BO JUM'BO. A strange bugbear described by Mungo Park as common to the Mandingo towns of Africa and used to discipline quarrelsome wives of the natives. The person assuming the character is clothed in a suit made of bark. After various rites the offender is seized by Mumbo Jumbo, stripped, tied, and whipped with his rod. The name is used in a wider sense of negro idols and fetishes, as well as in reference to the secret societies of the West African natives.

MUMFORD, mŭm'fĕrd, JAMES GREGORY (1863–1914). An American physician, born at Rochester, N. Y. He studied medicine at Harvard (M.D., 1890) and practiced in Boston from 1890 to 1912, during which time he taught at Harvard Medical School and was connected with several hospitals. Thereafter till his death he was physician in chief at the Clifton Springs (N. Y.) Sanatorium and Hospital. He is the author of *Mumford Memoirs* (1900); *Narrative of Medicine in America* (1903); *Surgical Aspects of Digestive Disorders* (1907), with A. K. Stone; *Surgical Memoirs and Other Essays* (1908); *One Hundred Surgical Problems* (1911); *Practice of Surgery* (1910; 2d ed., 1913); *A Doctor's Table Talk* (1912).

MUMMERS. See MOMIERS.

MUM'MICHOG (North American Indian name). A small minnow-like fish of sluggish tidal streams of the eastern United States. See KILLIFISH.

MUM'MIUS. 1. LUCIUS MUMMIUS (c.185–130 B.C.). A Roman commander, of plebeian birth. In 146 B.C. he was elected consul and placed in command of the war against the Achæan League. (See ACHÆA.) The first battle, fought near Corinth, resulted in the complete defeat of the Grecian allies. Corinth, Thebes, and Chalcis were plundered and then destroyed by the Roman troops. As trophies of his victory, Mummius caused many of the most valuable works of art to be sent to Rome. The surname of Achaicus was given to Mummius, and a triumph was decreed to him. Cicero speaks of him as a blunt and plain but honest man and says that of all his enormous plunder none was reserved for his own use. In 141 he was again elected consul. Nothing certain is known about his later life or his death. 2. SPURIUS MUMMIUS, brother of Lucius, legate of his brother in Achæa. He is chiefly known as pioneer writer among the Romans of the poetic epistle; he sent humorous letters in verse to friends at Rome describing his experiences in Greece. (Consult Cicero, *Epistulæ ad Atticum*, xiii, 6, 4.) Both brothers had a modest reputation as orators.

MUMMY (Ar., bitumen). Strictly speaking, the word "mummy" is applied to bodies which have been so preserved by one means or another as to defy disintegration for a long time. Thus, there are mummies of the ancient Peruvian race which seem to owe their preservation to the desiccation resulting merely from the dryness of the climate. But by general consent the term has come to be applied usually to bodies, whether of human beings, animals, fish, or reptiles, and even insects, found in Egypt, which have been preserved by the use of bitumen, spices, gums, or natron, a substance made up of carbonate, sulphate, and chloride of soda. Instances are known in which bodies have been preserved by immersion in honey. See EMBALMING.

The oldest mummy in existence for which an authentic date is afforded is that of Seker-em-sa-f, the son of Pepi I, which was found at Sakkara. It dates about 3000 B.C., and the evidence furnished by it indicates that the process of mummifying had already been highly developed by this time. In fact the existence of a stele dating about 4000 B.C. leads to the supposition that as early as this it was practiced with skill.

Owing to the Egyptian belief that a complete body was necessary for the happiness of a man in the next world, the custom of mummifying the body continued until the introduction of Christianity. At this time the Christian's faith in the resurrection tended to bring an end to the mummification of the dead.

The different materials used to preserve the body produced different results in the mummy. The employment of resin gave the skin a greenish color and rendered it like tanned leather. While such substance seems to have preserved the hair and teeth, it rendered the bodies easily breakable when freed from their wrappings. The use of bitumen to fill the abdominal cavity rendered the body black and hard, while natron caused the flesh to fall away from the bones.

In addition to the bodies of human beings the Egyptians mummified those of many animals, reptiles, and insects which were sacred to the gods.

Curiously enough, several centuries ago, the belief was common that the bitumen from mummies was a balm for cuts or bruises, and much of this material, called mummy, was sold for this purpose. Consult: E. A. T. Wallis Budge, *The Mummy* (Cambridge, 1894); G. E. Smith, *A Contribution to the Study of Mummification in Egypt* (Cairo, 1906); C. W. Mead, "Peruvian Mummies and what they Teach," in *American Museum of Natural History, Guide Leaflet No. 24* (New York, 1907).

MUMMY CASE. In ancient Egyptian embalming, the case immediately surrounding the shrouded mummy. It was in the outlines of a human body and was made to fit the corpse. There were usually two mummy cases for each mummy. The inner one was plain, while the outer one was covered with paintings and hieroglyphs recounting the life and deeds of the dead. The material was usually cedar. The double case was inclosed in an oblong coffin, and this in its turn in a sarcophagus. See EGYPT, *Manners and Customs;* EMBALMING; SARCOPHAGUS.

MUMPS (from Dutch *mompen,* to cheat, from *mommen,* to mumble); EPIDEMIC PAROTIDITIS. A popular name of a specific inflamma-

tion of the parotid and rarely of the other salivary glands. It is an infectious, contagious disease, occurring as a rule in epidemics, although isolated cases are often seen. While it chiefly attacks children and adolescents, adults are not exempt.

The disorder usually begins with a feeling of stiffness about the jaws, which is followed by pains, heat, and swelling beneath the ear. The swelling begins in the parotid, but the other salivary glands may become involved, so that the swelling extends along the neck towards the chin. One or both sides may be affected, and, in general, the disease appears first on one side and then on the other. There is seldom much fever. The inflammation is usually at its highest point in three or four days, after which it begins to decline, suppuration of the glands scarcely ever occurring. In most cases no treatment further than due attention to the bowels and protection of the parts from cold by the application of flannel or of cotton is required, and the patient completely recovers in eight or ten days.

A singular circumstance connected with the disease is that in many cases the subsidence of the swelling is immediately followed, in patients past the age of puberty, by swelling and pain in the testes in the male sex and in the ovaries or mammæ in the female. The inflammation in these glands is seldom very painful or long continued. More serious complications are metastasis into the internal ear (producing permanent deafness), meningitis, joint inflammations, and albuminuria.

MUN, mĕN, (Adrien) Albert (Marie), Count de (1841–1914). A French politician and author, leader of the Catholic Anti-Republican party. He was born at Lumigny, graduated at Saint-Cyr in 1862, and fought with distinction in the Franco-Prussian War and against the Commune. Count de Mun was the chief founder, in 1871, of the Circles of Catholic Workmen. He was a member of the Chamber of Deputies in 1876 and from 1881 till his death, except for an interval in 1893. Through his influence the power of the French clergy was thrown to the Boulangists. In 1892 he founded the league of the Sacré Cœur, and on the Pope's instructions promised to work with the Republic for reform if the government would give up its atheism. Count de Mun took a prominent part in the Dreyfus trial. In 1905 he was one of the ablest opponents in parliament of the bill for the separation of church and state. In 1913 he fought hard to have the three-year military law repealed, although he predicted that France would soon be at war with Germany. When war did break out the next year, he made a notably eloquent appeal to France to meet the crisis with courage. (See France.) He was elected to the French Academy in 1897. His published works, especially his speeches, for which he was famous, include: *Discours* (7 vols., 1888–1900); *Lettres adressées à M. Waldeck-Rousseau* (1900); *L'Organisation professionelle* (1901); *Les congrégations réligieuses devant la Chambre* (1903); *Contre la séparation* (1905); *L'Heure décisive* (1913).

MUN, Thomas (1571–1641). An English merchant and economic writer, born in London. As a young man he was engaged in the Mediterranean trade and in 1615 was appointed member of the committee, or director, of the East India Company. In 1621 he published *A Discourse of Trade, from England into the East Indies,* in which he defended the East India Company against the charge that it drained England of bullion. His most important book, *England's Treasure by Foreign Trade,* was published after his death in 1664. This work is the ablest of the writings of the mercantilists, and exercised great influence over the economic and political thought of the time, effectually refuting the Bullionist view, that only such foreign trade as yielded a direct balance of bullion was advantageous to the realm.

MUN'BY, Arthur Joseph (1828–1910). An English poet, born in Yorkshire. He graduated (1851) from Trinity College, Cambridge, and was called to the bar at Lincoln's Inn (1855). *Verses New and Old* (1865) contained "Doris," a lovely pastoral. *Dorothy* (1880), a country story in elegiac verse, was very popular in England and the United States. Later appeared: *Vulgar Verses* (1891), written in dialect; *Susan: A Poem of Degrees* (1893); *Poems* (1901); *Relicta* (1909). Munby defended his realism in an appendix to *Dorothy.*

MUNCH, mụnk, Edward (1863–). A Norwegian painter, born in Löiten. He was educated in Christiania and Paris under Bonnat. His "Early Morning" (1883), which attracted much attention among artists, "The Sick Child" (1885), "Spring" (1889), his best work, and "The Day Thereafter" (all in Christiania Gallery) reveal Munch as an able colorist. "Ashes," "Youth," "The Death in the Room," "Loving Woman," "Kiss," "Shriek," "Vampire," aroused much opposition by their pessimism. Munch's exhibition in Berlin (1892) caused a stir. His landscapes, "Summer Night," "Stars," "White Night," and his portraits, especially of himself and his sister, are notable examples of his work. An exhibitor abroad as well as at home, Munch came to be considered one of Norway's most important painters.

MUNCH, Peter Andreas (1810–63). A Norwegian historian. He was born in Christiania and educated there at the university. He became professor of history in Christiania in 1841 and in 1861 was appointed historiographer and archivist of Norway. He maintained that three distinct dialects prevailed in the kingdoms of Norway, Sweden, and Denmark, and that the so-called Icelandic literature was really the production of ancient Norway. He held that the modern Icelanders keep one dialect, and the inhabitants of the Faroe Islands another, of the ancient Norwegian. He rejected the term "Icelandic," for which he substituted "Old Norse." Among his works are: *Norges gamle Love indtil 1837* (3 vols., 1846–49), in collaboration with Keyser; *Det gothiske Sprogs Formläre* (1848); *Historisk-geografisk Beskrivelse over Kongeriget Norge i Middelalderen* (1849); a *History of the Norwegian People* (*Det norske Folks Historie*) (8 vols., 1852–63); *Om den saakaldte nyere historiske Skole i Norge* (1853). He edited a number of Icelandic works. His essays were edited by Gustav Storm (Christiania, 1872–76; 2d ed., 1894).

MUNCHAUSEN, mün-chô'sen, Baron. English for Münchhausen (q.v.).

MÜNCH-BELLINGHAUSEN, mụnk-bĕl'-lĭng-hou'zen, Eligius Franz Josef, Baron von (1806–71). An Austrian dramatist, known under the pseudonym Friedrich Halm. He was born at Cracow, studied jurisprudence, and held

a number of government offices in Austria. His first play, *Griseldis*, produced in 1834 (11th ed., 1896), was well received. It was followed by *Der Adept* (1836); *Camoens* (1837); *Imelda Lambertazzi* (1838); *Der Sohn der Wildnis* (1843; 10th ed., 1896), a conspicuous success on all the stages of Germany, and known on the American stage under the name of *Ingomar, the Barbarian*. In 1854 appeared *Der Fechter von Ravenna*, his greatest work, which was greeted with universal applause. Of all his subsequent efforts the romantic comedy *Wildfeuer* (1864; 7th ed., 1896) alone brought him a renewal of his earlier triumphs. He knew the stage and its requirements, but was not a great artist. His collected works were published in eight volumes in 1857–64. Consult: Pachler, "Die Jugend- und Lehrjahre Halms," in *Oesterreichisches Jahrbuch* (Vienna, 1877); Schachinger, *Briefwechsel zwischen Michael Enk von der Burg und Münch-Bellinghausen* (ib., 1890); *Allgemeine deutsche Biographie*, vol. xxii (Leipzig, 1885).

MÜNCHEN-GLADBACH, mün'ken-glät'-bäg. A town in Prussia. See GLADBACH.

MÜNCHHAUSEN, münk'hou-zen, HIERONYMUS KARL FRIEDRICH, BARON (1720–97). An adventurous German noble, born on his father's estate, Bodenwerder, in Hanover, where he died. He served in the Russian cavalry against the Turks (1737–39) and told marvelous tales of his adventures. These were first gathered in English by Rudolph Erich Raspe (q.v.), a German exile (Oxford, 1785), as *Baron Münchhausen's Narrative of his Marvelous Travels and Campaigns in Russia*. G. A. Bürger rendered this into German (1786), and in that language it gained universal popularity as a monument of methodical lying unparalleled in literature. Consult Karl Müller-Fraureuth, *Die deutschen Lügendichtungen bis auf Münchhausen* (Halle, 1881), which shows that some of Raspe's tales are borrowed from Bebel's *Facetiæ* (1508) and others from Lange's *Deliciæ* (1765). Consult also Griesbach's introduction to a reprint of Bürger's translation (Stuttgart, 1890) and F. Lienhard, *Münchhausens Lustspiel* (Leipzig, 1900).

MUNCIE, mün'sï. A city and the county seat of Delaware Co., Ind., 54 miles northeast of Indianapolis, on the White River and on the Cleveland, Cincinnati, Chicago, and St. Louis, and Lake Erie and Western, the Chesapeake and Ohio of Indiana, the Fort Wayne, Cincinnati, and Louisville, the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Central Indiana railroads, being the terminus of the last mentioned, which has shops here (Map: Indiana, G 4). Intercommunication among the various lines is furnished by a belt road encircling the city. It is connected with Indianapolis and other cities by five interurban roads. It is the seat of the Muncie Normal Institute, and has a large public library, courthouse, and hospital. The city is situated in the natural-gas belt of the State near deposits of coal—advantages that have contributed to its development as an important industrial centre, noted particularly for its extensive iron, steel, and automobile interests. There are also large glass and fruit-jar works, canneries, and manufactories of lawn mowers, silver and silver-plate goods, underwear and clothing, handles, caskets, wheels and carriage woodwork, gas engines and supplies, steam boilers, iron bedsteads, etc. Pop., 1900, 20,942; 1910, 24,005; 1914, 24,969; 1920, 36,524.

MUNCK, münk, ERNEST DE (1840–1915). A Belgian violoncellist, born at Brussels. He studied under his father, François de Munck, also noted as a violoncellist, and under Servais, and at 15 toured Great Britain with Jullien's orchestra. He played in Paris in 1868–69, at Weimar in 1870, at Leipzig in 1872, and at Vienna in 1877–78. In 1879 he married Carlotta Patti, a sister of Adelina Patti, and herself a soprano singer of ability. With his wife he made concert tours in the United States, India, China, Australia, and Egypt. In 1893 he was appointed professor of music at the Royal Academy of Music, London.

MUN'DA. An ancient town of Hispania in the country of the Turdetani in modern Andalusia. It is noted for the victory gained here by Cæsar over the sons of Pompey in 45 B.C. The exact location of the town is, however, a matter of dispute.

MUN'DAS, or MUNDA-KOLS. The inhabitants of Chota Nagpur and one of the principal tribes of the Kolarian stock in northeastern Hindustan. They are also known as Horo-hu. The Mundas are short of stature and very dolichocephalic. Monogamy is the rule, and the position of the wife is higher than with many Oriental peoples. Some writers use Munda as a general term for Kolarian. See KOLARIAN PEOPLES.

MUN'DAY, ANTHONY (1553–1633). An English poet, playwright, and compiler, born in London. In Rome he obtained material for *The Mirrour of Mutabilitie* (1579), a moralistic effort in verse, and after some experience on the English stage he wrote tracts against the Jesuits and other Roman Catholics, particularly Edmund Campion. Of 18 plays in which he had a hand only four are extant—*John a Kent and John a Cumber* (1595); *The Downfall of Robert Earle of Huntingdon* (1599); *The Death of Robert Earle of Huntingdon* (c.1601), with Chettle; *The True and Honourable History of the Life of Sir John Oldcastle* (1600), with others. Munday also translated French romances, wrote many "pageants," such as *The Triumphs of the Golden Fleece* (1623), and verse, such as *A Banquet of Daintie Conceyts* (1588). For bibliography of this prolific, if second-rate, man of letters, consult *Dictionary of National Biography*, vol. xxxix (London, 1894).

MUNDE, mün'dă, PAUL FORTUNATUS (1846–1902). An American gynæcologist, born in Dresden, Germany. He came to the United States with his father after the revolution of 1848–49, and in 1866 graduated at Harvard Medical School, after serving as medical cadet in the Federal army in 1864. Volunteering as assistant surgeon in the war between Prussia and Austria, he was from 1866 to 1870 assistant in the hospitals at Würzburg, and in 1870–71 served as surgeon with the grade of first lieutenant in the Franco-Prussian War. Munde settled in New York City in 1872 as an obstetric specialist. In 1880 he became professor at Dartmouth Medical College, and in 1882 professor in the New York Polyclinic. He invented several gynæcological instruments, edited the *American Journal of Obstetrics* (1874–92), and wrote: *Minor Surgical Gynæcology* (1880; 2d ed., 1885); *A Sketch of the Management of Pregnancy, Parturition, and the Puerperal State, etc.* (1887); *Diseases of Women* (1891).

MUNDEL'LA, ANTHONY JOHN (1825–97). An English statesman and philanthropist, born at Leicester of Italian-Welsh descent. At 11

he was employed by a hosiery manufacturer; at 23 he was on the way to success as partner in a hosiery firm in Nottingham. Politically he was a Radical, sympathized with Chartism (q.v.), and manifested a deep concern for the suffering poor. He was instrumental in forming at Nottingham the first British board of conciliation for the settlement of differences between employers and employed (1866). Elected to Parliament for Sheffield (1868), he directed his energies towards the improvement of laws regulating factories and education, and was particularly successful in the lightening of women's and children's labor. In 1880–85 he was vice president of the Council of Education under Gladstone, and he succeeded in passing a compulsory-education act (1881), while as President of the Board of Trade (1886 and 1892) he started a labor department of which the *Labor Gazette* was the organ. In 1894–95 he was chairman of an important committee on poor-law schools, and worked to prevent the undue isolation of pauper children while being educated. He resigned from Parliament in 1894, but was reëlected the following year and died while in service.

MÜNDEN, mụn'dĕn. A town in the Province of Hanover, Prussia, situated at the confluence of the Fulda and the Werra, 11 miles northeast of Cassel (Map: Germany, C 3). It has a thirteenth-century Lutheran church, a Gymnasium, a royal school of forestry with a library of 9000 volumes, and a palace in which are relics of the faïence industry which once flourished in Münden. The chief manufactures are confectionery, hats, rubber, lead, celluloid, art objects, sugar, boilers, chemicals, and cigars. In the vicinity are coal mines and millstone quarries. Pop., 1900, 9236; 1910, 10,991.

MUN'DEN, Joseph Shepherd (1758–1832). An English comedian, now noted especially for Charles Lamb's encomium, "On the Acting of Munden." Born in London, he began life in a commercial position, but he early found a place on the provincial stage, and in 1790 made his appearance in London. His ability to "make faces" was famous, and he was greatest in broad farce, though in serious parts he was not without success. Among his best characters were Sir Francis Gripe, Sir Peter Teazle, Old Dornton, and Sir Robert Bramble. He retired in 1824, and died on Feb. 6, 1832, in London. Consult: Charles Lamb, *The Essays of Elia* (1st series, London, 1823); *Memoirs of Joseph Shepherd Munden, Comedian,* by his son (ib., 1844); Laurence Hutton, in *Actors and Actresses of Great Britain and the United States,* edited by Matthews and Hutton (New York, 1886).

MUNDT, mụnt, Klara. A German novelist, best known under her pseudonym Luise Mühlbach (q.v.).

MUNDT, Theodor (1808–61). A German novelist and critic of the "young German" school, husband of Luise Mühlbach. In 1848 he became professor of history at Breslau and in 1850 professor and university librarian at Berlin. He became first known by his *Madonna, oder Gespräche mit einer Heiligen,* a memorial of Charlotte Stieglitz. Mundt edited, with Varnhagen von Ense, Knebel's letters and posthumous works, and also published Luther's *Politische Schriften.* He wrote books of travel and romantically historical novels: *Carmela* (1844); *Mendoza* (1847); *Die Matadore, etc.* (1850); and also *Geschichte der Weltlitteratur; Geschichte der Litteratur der Gegenwart* (1842); *Geschichte der Gesellschaft;* and a critical *Kunst der deutschen Prosa* (1837). Consult Otto Draeger, *Theodor Mundt und seine Beziehungen zum jungen Deutschland* (Marbach, 1909), and H. H. Houben, *Jungdeutscher Sturm und Drang* (Leipzig, 1911).

MUNDURUCU, mo͞on'do͞o-ro͞o-ko͞o'. A powerful tribe of the great Tupian stock (q.v.), residing chiefly about the confluence of the Tapajos and Amazon in north-central Brazil. They are variously estimated at from 30,000 to 40,000. The men are tall, athletic, broad-chested, and of light complexion, and their naked bodies are entirely covered with artistic tattooing. The women are pleasing in manner, with a natural and unconscious vivacity. Both sexes are noted for their honesty. The men practice agriculture and do beautiful feather work. The women are skillful in weaving cotton fabrics and hammocks. Besides their habit of preserving the heads of their enemies, which has gained them the name of Paiguize (beheaders) among the surrounding tribes, they have the custom of killing persons hopelessly ill or decrepit.

MUNGER, mŭng'gẽr, Theodore Thornton (1830–1910). An American Congregational clergyman, born at Bainbridge, N. Y. After graduating from Yale College in 1851 and from the Yale Divinity School in 1855, he was pastor at Dorchester, Mass., until 1860, then spent two years in travel and study, and had charges at Haverhill and Lawrence. While in California in 1875–76 he established a church at San José. Afterward he was pastor at North Adams, Mass., until 1885, and from then till his death was connected with the United Church at New Haven, Conn., as pastor (1885–1900) and pastor emeritus. Dr. Munger was influential in the reconstruction of religious thought necessitated by science and criticism. He published: *On the Threshold* (1880; revised and enlarged ed., 1908); *The Freedom of Faith* (1883); *The Appeal to Life* (1887); *Horace Bushnell, Preacher and Theologian* (1899); *Essays for the Day* (1904). Consult B. W. Bacon, *Theodore Thornton Munger, New England Minister* (New Haven, 1913).

MUNGHIR, mŭn-gẽr'. A town of India. See Monghyr.

MUN'GO. See Shoddy.

MUNGO, Saint (?518–603). The popular name of St. Kentigern, one of the three great missionaries of the Christian faith in Scotland. St. Ninian (q.v.) converted the tribes of the south; St. Columba (q.v.) was the apostle of the west and the north; St. Kentigern was the apostle of the Strathclyde Britons, who held the country between the Clyde on the north and the farthest boundaries of Cumberland on the south. (See Strathclyde.) He is said to have been the son of a British prince and princess and is believed to have been born at Culross on the Forth, near Perth, in 518. He planted a monastery on the site of Glasgow and became the Bishop of the Kingdom of Cumbria (q.v.). The nation would seem to have been only partially converted, and about 553 persecution drove St. Kentigern from the realm. He found refuge among the kindred people of Wales, and there, upon the banks of another Clyde, he founded another monastery and bishopric, which still bears the name of his disciple, St. Asaph. Recalled to Glasgow in 573 by King Roderick the Bountiful, Kentigern renewed his episcopal and

missionary labors, in which he was cheered by a visit from St. Columba. He died Jan. 13, 603, and was buried where the cathedral of Glasgow, called St. Mungo's, now stands. There is a fragment of a *Life* of St. Kentigern written in the twelfth century, and a longer *Life* by Jocelyn of Furness, written about 1180, printed with translation in Pinkerton, *Lives of the Scottish Saints* (Paisley, 1889–95). Consult A. P. Forbes, in *The Historians of Scotland*, vol. v (Edinburgh, 1875).

MUNGO BEAN. See BEAN.

MUN'GOOS. One of the various spellings of mongoose (q.v.).

MUNG TSE. See MENCIUS.

MUN'HALL. A borough in Allegheny Co., Pa., on the Pennsylvania Railroad (Map: Pittsburgh, J 8). It contains a Carnegie library. The manufacture of steel products constitutes the borough's sole industry. Pop., 1910, 5185.

MUNICH, mū'nik (Ger. *München*). The capital of Bavaria and the third largest city in Germany, situated at an elevation of 1700 feet, mostly on the left bank of the Isar, on the south border of a partly swampy and partly fertile forested plateau, 296 miles by rail south of Leipzig (Map: Germany, D 4); lat. 48° 9′ N., long. 11° 35′ E. The city is only about 25 miles north of the Bavarian Alps and is subject to a somewhat raw climate characterized by abrupt changes of temperature, which are at times trying. Mean annual temperature, 46° F.

Munich is comparatively modern. It is progressive and handsomely equipped with the latest municipal improvements, having, in fact, been mostly built since about 1830. It owes its artistic and regal appearance to the art-loving Louis I and his successors. The very wide avenues and the many buildings constructed in all the leading styles of architecture lend great dignity to the metropolis. The streets are generally regular, and the city is lavishly adorned by numerous squares and pleasure parks and gardens. The largest park is the beautiful English Garden. It contains over 500 acres, watered by branches of the Isar and adorned with small temples, towers, etc., and was laid out by Count Rumford (q.v.), a native of Massachusetts, who lived in Munich from 1784 to 1799, and whose monument stands on the Promenadenplatz.

The old section of Munich, especially around the old canal and arms of the Isar, is very picturesque, with narrow streets and old houses. Improvements were made about 1800, 1830, and 1888. To the first period belong the Sonnenstrasse, Karlsplatz, Maximiliansplatz, Promenadenplatz, etc.,—streets which follow the old wall from the Sendlinger Gate, past the Karls Gate, to the Ludwigstrasse. The Ludwigstrasse, laid out in 1830, stretches from the Hall of Generals, an open loggia with statues of General Tilly and Prince Wrede, crossing the Odeons Platz with a statue of King Louis I, to the Gate of Victory, flanked with impressive Renaissance edifices (Library, Ludwigskirche, University, etc.), continuing as Leopoldstrasse to the suburb Schwabing. Other streets of this period are the Briennerstrasse from the gate of the court gardens, crossing the Karolinenplatz with the Obelisk, the Königsplatz with the exhibition building, the Glyptothek, and Propylæa, to the Stiglmayerplatz; and the Maximilianstrasse, running from the Max Joseph-Platz to the Isar, crossing the river on the Maximilian Bridge, and leading up to Maximilianeum; this street is lined by state and public buildings and ends in the Am Gasteig Park. The Am Gasteig Park and Maximilian Park border the Isar on the east side and contain the Friedensdenkmal in memory of the Peace of 1871 after the Franco-German War. To the Maximilian Park leads the Prinz-Regentenstrasse, belonging to the third period, running on the south side of the English Garden and crossing the Isar on the Luitpold Bridge. Eight bridges span the Isar.

The Max Joseph-Platz, together with the Marienplatz, represents the centre of life in Munich. The former connects the old and new sections and is embellished by Rauch's huge bronze statue of King Max Joseph. The Alte Residenz, one of the three parts of the royal palace, extends here along the Residenzstrasse with its open arcades and frescoes, especially the Italian landscapes by Rottmann. This structure was erected from 1598 to 1616 and contains four courts, but is of little architectural worth. Its apartments, however, are a source of great interest to sightseers, being luxuriously furnished in the seventeenth-century style and rich in historical associations. The royal chapel and the treasury possess numerous objects of intrinsic and historical value.

The other two parts of the palace are the fine Festsaalbau and the Königsbau. The latter, finished in 1835, and fashioned after the Pitti Palace, is notable for its splendid Nibelungen frescoes by Schnorr (1831). The former is a handsome edifice, completed 1842 in late Italian Renaissance style. It is enriched with Ionic pillars and with allegorical figures of the Bavarian provinces. Several apartments contain Hiltensperger's frescoes from the *Odyssey*. Beautiful salons are also the throne room, with striking bronze statues by Schwanthaler; the Rudolf von Hapsburg Hall, with paintings; the Barbarossa Hall, with reliefs by Schwanthaler; the Hall of Charlemagne, containing ambitious decorations descriptive of scenes from the Emperor's life; the "rich" rooms and chapel; the Pope's room (occupied in 1728 by Pius VI). But the best known of these apartments are those containing Stieler's 36 portraits of beautiful women, painted from various types of Bavaria's fairest womanhood.

Connected with these royal edifices are the great Hof und National Theater dating from 1823, with an attractive portico borne by Corinthian columns, and containing seats for 1800 persons, and the artistic and impressive court chapel, a structure dating from 1837, in the Byzantine Romanesque, and having sumptuous decorations. Adjacent also are a valuable ethnographical museum, an Art Union, with works of living artists, an instructive museum of plaster casts, and the museums of the Bavarian army in high Italian Renaissance. Other palaces in the city are the Old Castle or Ludwigsburg, the oldest palace of the Bavarian dukes, dating from 1253, the palace of the Archbishop, palace of Prince Charles, the palace of Prince Luitpold, the palace of Duke Max, with good decorations, and the royal Wittelsbach palace, begun in 1843.

Munich has no churches of great fame. The Ludwigskirche (by Gärtner, 1829–44) is a rather attractive example of Italian Renaissance, and contains a noteworthy "Last Judgment" by Cornelius. The St. Boniface basilica by Hübsch

MUNICH

LUDWIGSTRASSE, LOOKING TOWARDS GATE OF VICTORY (UPPER)
CENTRAL SECTION OF THE CITY, WITH THE NEW CITY HALL AND THE FRAUENKIRCHE (LOWER)

(1850), with some threescore gray-marble columns, is also worthy of mention, as are the Gothic Mariahilfkirche (1831–39) and Giesinger Church (1865–84), the Romanesque St. Annakirche (1892–94), and the St. Paulskirche (1895–1902). All these are modern churches. Of old churches may be mentioned the cathedral or Frauenkirche (1468–88), with two unfinished towers, the token of Munich, and the monument of the Emperor Louis (1314–47); the St. Peterskirche (1181), the oldest church of Munich; the St. Michael Hofkirche (1583–97), a fine Renaissance edifice, with the monument of Eugène Beauharnais by Thorvaldsen; and the Theatinerhofkirche (1663–75), Italian Baroque, with the mausoleum of the royal family. Of the four Protestant churches the Mathäuskirche, on the Sonnenstrasse, is the oldest, and near the Isar the St. Lukaskirche (finished 1897), Gothic-Romanesque. The synagogue (1883–85) is one of the largest and finest in Germany. Among the impressive secular buildings are the early Renaissance Mint; the Government Building; House of Parliament; War Office; Post Office; Palace of Justice; the Old Rathaus (1313–27); the Gothic New Rathaus, one of the finest and largest modern European municipal buildings, completed in 1906; the Martinus Hospital and the Red Cross Hospital; the Savings Bank; etc.

The picture and sculpture collections of Munich are famous. The building of the Old Pinakothek, situated in the northern section of the city, not far from the royal palace, was constructed in 1826–36, in the Renaissance style. It is about 174 yards long, and is embellished on the exterior by statues by Schwanthaler. It contains about 1400 canvases. Almost all the great masters of painting since Raphael's time are represented here by works of the highest excellence. The greatest gems perhaps are Dürer's Sts. Peter, John, Paul, and Mark (the "Four Temperaments") and his self portrait; several portraits and other pictures by Rubens, including the "Battle of the Amazons," the "Massacre of the Innocents," and the "Lion Hunt"; Perugino's "Virgin and St. Bernard"; Raphael's "Madonna Tempi"; and Murillo's "Two Beggar Boys Eating Fruit." The Old Pinakothek contains in addition valuable cabinets of vases; also engravings and drawings. Its loggie are decorated by Cornelius. Adjacent on the north is the New Pinakothek, with external frescoes by Kaulbach (q.v.), and with a good collection of modern artists, mostly Bavarian. There are about 1000 paintings, and many fine bronzes and terra cottas principally from Rome and Greece. In the vicinity is also the Glyptothek, containing mainly a collection of ancient statuary; a fine Ionic edifice by Von Klenze. It has Assyrian and Egyptian departments, as well as departments devoted to excellent Greek and Roman examples and to incunabula. The highly prized collection of marbles from the island of Ægina is also in the Glyptothek. Its most valuable sculpture perhaps is the Greek Barberini Faun (300 B.C.). Among the modern statuary are many originals, as well as copies from good artists, and choice works of Canova, Thorvaldsen, Dannecker, and others.

In connection with the realm of art in Munich may be mentioned the Kunstgewerbehaus; also the Academy of Art, an ambitious edifice in Italian Renaissance style, completed in 1885, a school which has produced many well-known artists. The artists of Munich maintain in the so-called Exhibition Building (finished in 1845) a permanent exhibition of their paintings exposed for sale. In the Crystal Palace (finished in 1854) are held the annual exhibitions of art, especially statues and paintings. The Club of Artists (finished in 1900) is celebrated for its interior decorations. The Bavarian National Museum, founded in 1855 and housed in a fine edifice, is of great value. Among its numerous collections covering many departments of human endeavor, the most valuable perhaps are the art works of the mediæval, Renaissance, and modern periods. The German Museum (1906–15), on the Museum Island in the Isar, contains a collection of originals and models illustrating the development of technical subjects and of natural sciences. On the same island is also to be found the Alpine Museum. The Schwanthaler Museum contains models of the master's works. A noteworthy picture collection also is the Schack Gallery, possessing choice originals and interesting copies of the great masters by many of Germany's foremost modern painters. Other museums are the collection of pictures and drawings left by the painter Kaulbach and the Lotzbeck Museum of pictures and marbles.

Munich is celebrated also as a musical centre, especially for German operas. The National Theatre is one of the most important of modern operatic institutions, being intimately identified with the Wagner influence and tradition. The theatre is well represented by about seven houses, besides the Court Theatre, among them being the Residence Theatre, the German Theatre, the Prince Regent Theatre, and the Gärtner Place Theatre.

Among the many monuments not already mentioned are those of the Emperor Louis the Bavarian, Louis I, Schiller, Goethe, Wagner, Glück, Schelling, Fraunhofer, Gärtner, Klenze, Ohm, and Pettenkofer; the large and striking monument to Maximilian II, dating from 1875; the fine statue of Elector Maximilian I, after plans by Thorvaldsen; an obelisk on the Königsplatz made of the metal of captured cannon, and erected to the memory of the 30,000 Bavarian soldiers who died in the Napoleonic war with Russia in 1812; the fine monument to Liebig, the chemist; the Mariensäule on the Marienplatz, erected by Maximilian I in 1638 in memory of the victory on the White Mountain (1620); near to the column the bronze Fischbrunnen, associated with the Butchers' Festivals; the new and splendid Wittelsbach fountain; the Nornenbrunnen. The Siegestor (gate of victory), constructed in 1843 in honor of the Bavarian army, is a splendid arch patterned after that of Constantine at Rome. It is surmounted by a huge figure of Bavaria, riding in a chariot drawn by four lions. On the Königsplatz, near the Glyptothek, rises the Propylæa, an attractive portal completed with Doric and Ionic features in 1862—a tribute to the cause of Greek independence. Notable also is the ancient Isartor, with elaborate frescoes. Still other objects worthy of visit in Munich are the bronze foundry and the Royal Arsenal, with an interesting military museum containing relics of the Napoleonic wars.

At the head of the educational institutions is the celebrated university. (See MUNICH, University of.) The city's educational system is scarcely surpassed either for comprehensive-

ness or for excellence. The Maximilianeum, on the right bank, is an institution founded by Maximilian II for advanced civil-service instruction. It is surrounded by attractive pleasure grounds extending along the river shore. The important Polytechnic School (1865–68) is in a fine modern edifice in Italian Renaissance, and had, in 1914, 65 teachers and 2790 students, divided into five departments—engineering, construction, mechanical, chemico-technical, and agricultural. Near by is an art industrial school. There are also in the city a military academy and a military school, an academy of science with noteworthy collections, and numerous organizations for the development of all the chief branches of knowledge and its application.

Of the many valuable libraries, the Royal Library is by far the most important. Its spacious Florentine building was constructed after 1832, and possesses a magnificent staircase. The library is one of the largest in the world. It contains some 1,100,000 volumes and over 50,000 manuscripts. It is especially rich in German documents and scholastic literature, possessing some of the rarest of literary editions and other specimens, including a translation of Boccaccio, a codex aureus (in gold letters and dating before 900), and four books of Gospels. In this library, also, are the archives of Bavaria—a collection of 500,000 documents. The city has a botanic garden.

Industrially, Munich is important and prosperous. Its iron, bronze, and bell foundries, its lithograph and engraving establishments, its optical and mechanical instrument factories, are celebrated, as are its enormous breweries (some 45 in number), which have made the city famous for excellent beer. The large, palatial brewhouses and, during summer, the celebrated "cellars," or beer gardens, in the suburbs, are features of the city's social life. Well known are the Hofbräuhäuser on the Platz in old Munich, the Löwenbraukeller, and the Augustinerkeller. The other manufactures comprise cotton, wool, and damask goods, wax cloth, leather, paper hangings, carriages, pianos, gold and silver articles, machinery, steel wares, etc. In its manufacturing and commercial interests the city has made great strides. Beer is the chief export. Grain, hops, coal, wool, furniture, carpets, and art goods also are exported. Munich has a network of canals over 100 miles in length. Numerous important industrial and commercial unions and associations are established here.

Munich is the seat of all the important government institutions of Bavaria. It is administered by 2 burgomasters, about 40 magistrates, and some 70 councilmen. The annual budget balances at approximately $4,500,000. The municipal debt is about $40,000,000, offset by nearly twice that amount invested in public property, mostly in buildings and grounds. Over a third of the taxes goes to the service and reduction of the debt. The charitable institutions are excellent.

The popular festivals and *dults* (fairs) are a feature of Munich. They are all elaborate and interesting—e.g., the annual carnival, the Magdalen Festival in July, and the October Festival. The last is a kind of agricultural fair which attracts the picturesque country population. The environs are of interest. Their unique attraction is the famous "Bavaria," an immense bronze statue by Von Klenze rising on a low elevation west of the city. It is a hollow female figure 94 feet high, cast from the bronze of foreign cannon, according to designs by Schwanthaler. It was unveiled in 1850. From its head there is a good view of the city. The adjacent Hall of Fame is a Greek colonnade dating from 1858. It holds about 100 busts of famous Bavarians, including Jean Paul and Schelling. The Nymphenburg is a royal château near the city. Its grounds are very attractive. The cemeteries of Munich are said to contain the most artistic tombs in the Empire. The population of the city has more than doubled in the last few decades. In 1800 it was 40,000; in 1871, 169,963; in 1900, 499,959; in 1910, 596,467; in 1915, about 630,000, mostly Roman Catholics. The death rate fell from 30.4 to 20.5 per 1000 from 1871 to 1904.

History. The history of Munich may be said to date from the time of Henry the Lion, who made it the centre of the salt trade in 1158. It grew rapidly under the house of Wittelsbach, which made it its capital city. The city was fortified in 1254, Otho the Illustrious having established his residence here. In the first half of the fourteenth century the library was founded. About the middle of the sixteenth century the art collections were begun. Munich became a royal residence in 1806. From the reign of Louis I dates the city's present magnificence.

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MUNICH, UNIVERSITY OF. One of the leading German universities, founded by Duke Ludwig of Bavaria with the approval of Pope Pius II as a Studium Generale at Ingolstadt. The members of the faculties took an oath of loyalty to the see of Rome. Though the bull authorizing the opening of the institution was issued in 1458, it was not opened until 1472. True to its pledge, Ingolstadt University remained faithful to the Church of Rome during the trying period of the Reformation, the famous Dr. Eck being a member of it at that period. In 1556 the Jesuits gained control of the university and conducted it until their suppression in 1773, though Ickstatt labored from 1746 to remove them. At the instance of Ludwig Maximilian, whose name the institution now bears, it was moved in 1800 to Landshut, where it remained until 1826, when it was transferred to Munich and reorganized. In addition to the collections and institutes brought thither from Landshut, the government transferred to the university the botanical garden, anatomical theatre, observatory, and antiquarium, and a valuable collection of coins. In 1913 the university consisted of the faculties of theology, law, political science, medicine, and philosophy, with a total attendance of 7718 students. The university also includes a number of seminars, clinics, museums, a botanical garden, and an observatory. The university library contains over 600,000 volumes, about 3000 incunabula, and about 2500 manuscripts. The Collegium Geor-

gianum, founded in 1494 for the education of Catholic priests, and the Maximilianeum, founded in 1852 and opened in 1876, for the education of talented Bavarian youth, are affiliated with the university. The income of the university is about $250,000 a year, the greater share being contributed by the government.

MUNICIPAL (mû-nĭs'ĭ-pal) **ARCHITECTURE** (Lat. *municipalis*, from *municeps*, citizen, from *munus*, duty + *capere*, to take). That branch of civil architecture which has to do with buildings erected out of public funds for the use and amusement of the inhabitants of a city or purely for the adornment of the city itself. The term is sometimes extended to include buildings for public business or amusement erected by private capital, such as exchanges, railway stations, and theatres. It is thus related on the one hand to the important concerns of civic administration and improvement, and on the other to those of architectural art. Its greatest development has been in modern times, coincidently with the progress in ideals of public policy and of democracy. It is doubtful if municipal buildings, properly speaking, existed in the prehistoric and the ancient Oriental worlds; the temple and royal palace filled all needs in these civilizations. The great city gates of ancient Babylonia and Assyria were the only structures in the Orient that could be included under the title of municipal buildings. See GATEWAY.

Greece. With the development of Greek city life after the seventh century B.C. several classes of such buildings were erected. Among these may be named the *Theatre* (q.v.), which was always erected with public funds, and which first began early in the fifth century B.C. to be built of stone and in the form and style recognized in the ruins of those at Epidaurus, Athens, Sicyon, etc. The *Stadium* (q.v.) and the *Hippodrome* (q.v.), for the different kinds of races, gave little opportunity for much distinctive architecture. The *Gymnasium* and *Palæstra* were devoted to contests requiring less space and to training and practice, and embodied features developed later by the Romans in the Imperial thermæ. Those at Ephesus and Alexandria-Troas are especially well preserved. The commercial centre of the city was the market place, or agora, corresponding to the Roman Forum (q.v.), an open rectangular space bordered by colonnades and halls and decorated with monumental entrances, statuary, and fountains. The various halls for the transaction of municipal business, such as the *Prytaneum* and the *Bouleuterion*, were often connected with the market place, and there were frequently two agoræ in each city—the political and the commercial. Those at Priene, Assos, and other cities of Asia Minor are particularly important, as no well-preserved examples have been found in Greece itself. The so-called *leschai* were public halls for banquets and other reunions and celebrations. Of the highest importance were the *propylæa*, or city gates, of which the most famous are those of the Acropolis at Athens and of Eleusis and Priene. To the list of Greek municipal buildings should be added the *stoæ*, or open colonnades, and such decorative and memorial structures as the choragic monument of Lysicrates and the Tower of the Winds at Athens, public fountains, and the like. See PROPYLÆA; STOA.

Rome. The Romans developed municipal architecture even further in magnificence and variety after the second century B.C. Their theatres were more important structurally and richer in decoration; their amphitheatres were a new form altogether; their circus was architecturally more significant than the stadium and hippodrome. The Roman Forum, which was at first an irregular square without architectural beauty, was later bordered by basilicas, great halls for commercial and judicial purposes, while memorial and triumphal arches were placed at its entrances and along its main road. In the early days of the Empire a new type of city was developed, in which the various main groups of public buildings were united and harmonized by vast stretches of porticoes. Such porticoes in Rome itself were the Porticus Maximæ, extending to the Tiber, and the mile-long Porticus Triumphi in the Field of Mars. In the cities of Syria and the rest of western Asia a great era of rebuilding set in, the old blank-walled main streets being replaced by colonnaded avenues decorated with statues and intersecting at right angles. This type, which originated at Antioch, can now best be studied at Palmyra, Gerasa, and other cities near the coast line.

The many new Roman colonies and municipalities in north Africa and Syria gave even more occasion than the old cities for the carrying out of a regular plan of municipal architecture. The cities of Theveste and Timgad are important examples. The Pompeian Forum with its well-preserved basilica, its curiæ or municipal meeting halls with their colonnades, its Temple of Jupiter flanked by memorial arches, its Pantheon with the money changers' shops, its market hall, Temple of Venus, lounging gallery, and other well-grouped structures, shows how the government of a provincial town of moderate size grouped the public buildings around its main square.

Of the theatres, those at Aspendos in Asia Minor and Orange in France are the best preserved; of the amphitheatres, those of Rome (the Coliseum), Verona, Capua, Arles, Nîmes, and Thysdrus; of the basilicas, those of Maxentius in Rome, of Pompeii, and of Treves.

With the decline of Roman power and the transfer of the capital to Byzantium the focus of activity in municipal architecture was shifted and Constantinople, or New Rome, became the scene of an extraordinary work of reconstruction under Constantine, Theodosius, and (later) Justinian. Meanwhile, until the final overthrow of the older capital, public buildings, porticoes, and basilicas were still being erected in Rome, and the majestic ruins of the Basilica of Maxentius and Constantine attest the importance of these expiring efforts of Roman art.

Middle Ages. The growth of municipal architecture in the Middle Ages was very gradual and depended largely upon the character of city government. In the monastic and feudal cities there were no works of municipal architecture of any importance. Conditions were more favorable to the erection of municipal buildings in the free communes and episcopal cities, which possessed complete or partial autonomy.

The most important municipal buildings were the hôtel de ville in France, the Rathaus in Germany, and the palazzo pubblico or communale in Italy. The cities of northern and central Italy, of northern France and the Netherlands,

of northern Germany (especially the Hanseatic League), were most conspicuous for such buildings during the Romanesque and Gothic periods. The plan of the communal palaces varied according to whether the local constitution provided for meetings of a large body of citizens or only of a select few inside the building. The Doge's Palace in Venice had halls for the Gran Consiglio and others for the Council of Ten and the smaller council. At the more democratic Padua the immense hall with its wagon roof—the largest in Europe—provided for larger meetings. At Udine and Piacenza are the best examples of a whole lower story open in vaulted arcades for the popular meetings, with halls on the second floor for the smaller committees. These palaces in Lombardy were usually termed *broletti* (Como, Bergamo, Cremona, Monza, etc.). The main meeting room on the second floor was nearly always provided with a balcony or *ringhiera*, from which announcements were made to the people.

The cities of Tuscany and Umbria, later in achieving independence (except Pisa), erected, however, even more magnificent public palaces than their northern neighbors. The Palazzo Vecchio and Bargello in Florence, the Palazzi Pubblici at Siena and Perugia, built during the Gothic period (1250–1350), are the largest in Italy and especially remarkable for magnificent towers. Hardly a city in Italy, even one enjoying but a modicum of administrative autonomy, but had a public palace of some sort, and in some cities there were two palaces, the episcopal and the civil.

Such communal palaces were much rarer in feudal France; they are almost wholly wanting in the southern and central provinces. But the powerful cities of the Netherlands—Lille, Louvain, Mechlin, Brussels, Ghent, Bruges, Ypres, Arras, and Liége—built as magnificent public palaces as their Tuscan compeers. That of Brussels, with its great central tower, is a fine example in the developed Gothic style; that of Louvain presses it closely in magnificence. Germany is particularly rich in such buildings, not on so large a scale, certainly, but interesting from their very number. In France the hôtels de ville of St. Antonin (thirteenth century) and of Compiègne (fifteenth century) are among the few mediæval buildings of this class. Municipal belfries (see BELFRY), or *campanili*, were prominent in many cities of both northern Europe and Italy. The *palais de justice* of France were important civic monuments, as those of Paris and Rouen, the Prévôté at Poitiers, etc.

The communal organization in the cities was usually based upon the association of the labor and trade guilds. It was the officers of these guilds who, coming together for mutual benefit, originated in most cases the city administration and constitution. Many of these guilds had separate buildings for their meetings and they usually repeated on a smaller scale the architectural features of the communal palaces. The Loggia dei Mercanti at Bologna, those at Ancona and Perugia, the Or San Michele at Florence, are a few among many. The lawyers' guild sometimes built sumptuously, as in the Palazzo dei Giureconsulti at Cremona. In the case of some of the very powerful Flemish guilds, such as the cloth guild, their buildings equaled or surpassed the average town hall; this was the case at Ypres (recently destroyed). In some cases the governing body had a palace separate from that where the popular meetings were held. Thus, at Pistoia there was a Palazzo del Comune and also a Palazzo del Podestà. Other associations besides the guilds erected common halls—the religious fraternities, such as that which built the Bigallo in Florence or the various beautiful *scuole* in Venice. Hospitals like those of Ourscamp and Beaune in France, the Hospital at Milan, and the Misericordia at Arezzo, are distinctly public monuments.

The most important of the minor works of municipal architecture were the bridges, fountains, and gates. The first two classes have been treated under their separate heads, so that it will be necessary to describe only the city gates. During the Middle Ages the fortification of cities by heavy walls was a universal custom and the gates were fully as important as the triumphal arches and gateways of Roman cities. The great gates at Lübeck, Frankfort, and Freiburg, and several gates at Florence, show the German and Italian styles. They were usually dedicated to a saint and contained a shrine and frescoes or carved images in the central opening; guardrooms on the sides and above contributed to making the gate a monumental structure. The round or pointed single archway was often flanked by two towers, as in the Porta della Vacca at Genoa.

In so far as the general arrangement of the larger mediæval cities is concerned, the cathedral square was the main centre of the city, the market place, and a place of resort; but wherever there was also a strong municipal civic organization there was also a second square dominated by one or more city buildings and kept free for public assemblies. Seldom do we find a single square used for both classes of buildings.

Mohammedan. There was far more of municipal architecture in the mediæval Mohammedan cities of the Orient than Europeans realize. The bazars with their long covered galleries rivaled the gallery arcades of modern cities; the khans and caravanserais with their immense courts were often on a colossal scale. Numberless sebils or fountains were dotted through the streets. The city gates were monumental. The alcazars were an interesting combination of governmental palace and fortress. There were numerous hospitals and colleges with attached mosques and mausoleums, as at Ispahan. Few European cities showed so ample a display as Bagdad, Cairo, Damascus, Adrianople, Constantinople, or even the mediæval cities of second rank, like Fez, Kairwan, Emesa, and a hundred more. The Mohammedan engineers in western Asia were famous for their bridges, fortifications, and castles. The great wealth and advanced culture of the Arabs, Moors, and Persians, and of the Moslem Hindus—far superior to that of the West in the Middle Ages—made it easy to build up beautiful cities, now all reduced to squalor and ruin.

Renaissance. While the Renaissance was more fruitful in works of private and religious architecture than in municipal architecture, a great number of notable buildings were erected for public purposes in the cities of Italy and of western Europe. The general downfall of civic liberties checked the progress of some phases of municipal architecture, but the change of style ushered in by the Renaissance led to the erection of many new edifices in the more modern

style. Thus, in Italy the elegant town hall at Verona (Palazzo del Consiglio), by Fra Giocondo (1470), the town hall at Padua, the Loggia del Papa at Siena, the Procurazie Vecchie at Venice, belong to the fifteenth century; to the sixteenth, the Library of St. Mark and the Loggetta of the Campanile (demolished by the fall of the tower, 1902, but since rebuilt) at Venice, the magnificent arcade surrounding the ancient Basilica at Vicenza, by Palladio, and many loggias and administrative palaces in other cities. The Hôtel de Ville at Paris (1546), the town halls of Rheims, Rouen, and other French cities, and even of small towns like Beaugency, erected in the sixteenth century, the great town halls of Antwerp and of several Dutch cities, and the picturesque Rathäuser, or council halls, of Bremen, Nuremberg, Altenburg, Cologne, and other German cities, prove that there was still opportunity for effective and beautiful municipal buildings. Fountains were also multiplied, often of great elaboration and sculptural splendor. (See FOUNTAIN.) In the seventeenth and early eighteenth centuries there developed a remarkable movement for the embellishment of cities by the decorative treatment of open squares and spaces. Of this movement the piazza in front of St. Peter's, with its colonnades, obelisk, and fountain, and the Piazza del Popolo, both at Rome, and the Place de la Concorde and Place Vendôme at Paris, are the finest examples. It was in the eighteenth century that a new era of municipal architecture commenced in Germany with the transformation of Berlin under Frederick the Great, followed by that of Munich in the first half of the nineteenth century, and then by that of Vienna, and that of Paris by Baron Haussmann under Napoleon III. New classes of buildings were developed and erected —museums, picture and sculpture galleries, halls of fame, theatres, and public educational buildings. Every style of architecture was employed, but mainly the neo-classic and neo-Renaissance. The triumphal arch again came into vogue. Great boulevards became the fashion. The old-fashioned narrow streets were discredited, even in Italy. The sun was let in everywhere. The increasing volume of transportation compelled the multiplying of bridges, the rectification of the street plan, and the construction of railway tunnels, cuttings, and viaducts, the building of docks and terminals, and many other like improvements.

Recent Development.—Europe. Of the more recent development of municipal architecture Paris, Vienna, and Budapest stand out as the most conspicuous examples; but Berlin, Munich, and other German cities, Rome and Naples, and in less degree many other cities in Europe, have undergone a process of architectural remodeling. The great operations undertaken by Napoleon III in Paris under Haussmann's direction included not only the reform of the city's street plan, but also the erection of many public buildings. This work, interrupted by the fall of the Empire, was resumed under the Republic, and has been steadily prosecuted ever since, at the joint expense of the city and state. The new Opera House, the reconstructed Palais de Justice, the Tribunal de Commerce, the completed and remodeled Louvre, the St. Michel Fountain, and since the War of 1870–71 the new Hôtel de Ville, Sorbonne (university), and Ecole de Médecine, the demolition of the ruined Tuileries and creation of new gardens on its site, the two new art palaces, and the Alexander III and other bridges, are the monuments of this remarkable activity. So the Reichstagsgebäude (parliament house), the Museum, the various columns of victory and other monuments, and the Sieges-Allee, at Berlin, the squares and modern public buildings of Munich, the town hall and new railway terminal at Hamburg, the town hall at Leipzig, and many other examples indicate the tendencies of German taste in municipal buildings and embellishments. Germany at present leads the world in city planning, whatever be thought of the artistic quality of many of her municipal buildings; while in Austria-Hungary the marvelous rebuilding of the central portion of Vienna and the more recent architectural enterprises in Budapest are equaled only by the transformation of Paris under Napoleon III. While the architectural treatment of the Viennese public buildings (the Gothic town hall, the classic parliament house, the Renaissance university, museums, art institute, the Hoftheater, etc.) leaves something to be desired, the general effect is highly impressive by its stateliness and grandeur of disposition along a single splendid street, the Ringstrasse. In Great Britain nearly every important city has in recent years either rebuilt portions of its more overcrowded districts on improved plans, or erected new town halls, exchanges, public baths, schools, and museums; and the English architects have developed in these public works an architectural style of considerable interest and character, quite different from the modified French Renaissance style which has more generally prevailed elsewhere. Italy, though backward in many respects in this field of architecture, has not only remodeled some of the worst-crowded districts of Naples and Rome, but has embellished many of her cities with public buildings in modern style, established new parks and public gardens, and in some cases completed the unfinished façades of ancient buildings—notably that of the cathedral of Florence (1883–89). The embanking of the Tiber (1879–1900) in Rome, the construction of new bridges, the building of arcades or glass-roofed streets of monumental design, flanked by attractive shops (as at Milan, Naples, etc.), and the erection of railway termini sometimes of considerable architectural splendor, are further evidences of municipal activity.

United States. While the first 50 years of independent national existence witnessed the erection of many noteworthy Federal and municipal buildings, especially customhouses and State capitols, these were often indifferently placed, with no adequate approach or surroundings. The public buildings of American cities—town halls, railway stations, schools, courthouses, and administrative offices—were for the most part commonplace, or pretentious and ugly. Only rarely, as at Washington, New York, Savannah, and Charleston, was there until recent years even the semblance of any recognition of the art of municipal planning or of the importance of artistic treatment alike in the design and setting of public buildings. The rectangular street plan was universally accepted as the ideal arrangement. Of late, with the general awakening of the art instinct in the United States, stimulated by the object lessons afforded by several great expositions (Chicago, Omaha, Buffalo, St. Louis) and by congresses and con-

ventions of architects and civic reformers, there has begun a widespread reform in municipal architecture, of which the commission plan for the improvement of Washington, the adoption of the group system for the public buildings of Cleveland, Ohio, the new park system of Boston, and the proposed remodeling of the Chicago lake front, are a few out of many evidences. Recent town halls, exchanges, public libraries, courthouses, and railway stations in the United States are excellent structures architecturally. Particularly noticeable are new public libraries at New York, Detroit, St. Louis, and Springfield (Mass.); the new municipal group of this last-named city, the city hall at Los Angeles (Cal.), and the superb new municipal offices at New York; the colossal railway termini of New York and its great bridges across the East River, its new docks and ferry terminals; and an impressive number of courthouses, customhouses, terminals, squares, bridges, monuments, school buildings, municipal hospitals, and the like in nearly all the larger and some of the smaller cities, which give promise that the ugliness of American cities is to be greatly mitigated if not done away with in the near future. See TOWN HALL, and Plates of PHILADELPHIA.

MUNICIPAL ART SOCIETIES. Societies in the United States which take their name from the purpose of their organization, which is the promotion of municipal art, i.e., art as applied to cities. They seek in a general way to beautify cities. Among the means advocated to this end are the planning of cities with regard to artistic beauty as well as to the needs of traffic; the planting of streets with trees and the restriction of billboard advertising; the increase in the number and size of parks, especially in the congested districts; worthy sites and beautiful architecture for public buildings, and their decoration with statuary and mural painting; the embellishment of the city with statues, monuments, and other works of art—things which have long been esteemed essential in European cities. In the United States these ideals are promoted by local societies, like the municipal art societies of New York, Chicago, Baltimore, Cincinnati, and other cities, the Fairmount Park Association of Philadelphia, and the American Park and Outdoor Association. Among the achievements of the movement have been the official appointment of municipal art commissions, composed principally of artists, by New York, Chicago, and other cities, with general supervision over public buildings, monuments, and other artistic undertakings; enactment of legislation, both State and local, designed to regulate billboards in Chicago and elsewhere; appointment of commissions of experts to devise comprehensive plans for the growth of Washington (1901) and similar proposals for New York (1903). Two volumes of *Municipal Affairs* are given to the movement, vol. ii and iii (New York, 1898–99). Consult also C. M. Robinson, *The Improvement of Towns and Cities* (ib., 1900; 8th ed., rev., 1913); id., *Modern Civic Art* (ib., 1903); T. H. Mawson, *Civic Art* (London, 1911).

MUNICIPAL CORPORATION. See MUNICIPALITY.

MUNICIPAL DEBTS. In a strict sense of the word, debts incurred by municipalities. When, however, the total municipal indebtedness of a country is being discussed, particularly in comparison with state or national debts, the indebtedness of all minor civil divisions is generally included. Municipal debts are divided into bonded (or funded) and floating, and the latter may be divided still further into temporary loans in anticipation of revenue and obligations due for material furnished or services rendered. Bonded indebtedness, as a rule, so far exceeds floating indebtedness that the latter is frequently ignored in ordinary discussions.

History, Objects, and Methods. The development of municipal debt is for the most part coincident with the expansion of municipal functions, an expansion which began with the nineteenth century and was particularly active during the decades between 1850 and 1870. A factor which contributed largely to the growth of American municipal debts was the aid given to railway enterprises. Many municipalities so burdened themselves with debt for the sake of assisting in the construction of railways through their limits, that for many years they were obliged to forego the most essential public improvements. Such railway aid was granted by rural as well as by urban communities.

Railway assistance aside, the chief objects for which urban communities issue bonds are the opening and paving of streets, the construction of water works, sewers, bridges, schoolhouses, and other public buildings, and lighting. Counties, in some sections, issue bonds for bridges and for highway improvements. Finally, school districts, chiefly those located in rural sections, issue bonds to raise money to construct schoolhouses. Obviously, floating debts and loans in anticipation of taxes may have their origin in almost any of the various needs of the municipality. Loans in anticipation of revenues are usually raised on notes or tax certificates. Obligations for material and for labor or other personal services, or for amounts due on contracts, are frequently acknowledged by warrants on the general treasury or on some special fund, and such warrants become negotiable paper. When the cost of specifically local improvements, like paving or sewers, is met by special assessments on the property directly benefited, and the collections are delayed or distributed over a series of years, the obligations are met in a variety of ways, ranging from warrants to short-term bonds. In negotiating municipal loans bonds are commonly sold, after public advertisement, to the highest bidder. Temporary loans on notes are commonly effected at banks.

The financial principles involved in a consideration of municipal debts are in most respects similar to those already set forth under DEBT, PUBLIC; FINANCE. Municipal bonds are issued for definite periods, and the best and common practice is to provide in advance for their payment at maturity. Formerly such provision was made through sinking funds, but for a number of years past there has been a growing tendency to pay off municipal bonds in installments. This plan obviates the necessity of administering a number of special and rapidly accumulating funds, which sometimes present financial difficulties and are always subject to diversion on the part of unscrupulous or ill-advised municipal officials.

In fixing the term for which municipal bonds are to run it should be borne in mind that, since municipal bonds are issued to distribute the expense of certain improvements over a number of years, the term of the bonds issued should bear

some relation to the probable life of the improvement involved. Street pavements, e.g., require renewal in from 10 to 20 years; it would therefore be a gross mistake to make bonds issued to cover their cost run 40 or 50 years. Land purchases, on the other hand, involve a class of property that appreciates rather than depreciates as time goes on; it might accordingly be permissible to pay for them by an issue of long-term bonds.

The interest rates on municipal bonds have fallen from 6 and 7 per cent a few decades ago to 3½ and 4 per cent as a normal figure for the bonds of municipalities of good standing. The premiums generally received virtually lower the interest rate, often to a considerable extent.

Debt Limitations. The interests of borrower and lender combine to make necessary some limit to the amount of indebtedness which a municipality may incur and the purposes for which money may be borrowed. Considering the latter first, it is obvious that permanent loans should never be made to meet current expenses, although occasionally it may be necessary or wise to fund a floating debt that, through bad financiering, has grown beyond ordinary revenues. Public loans to aid private enterprises are generally held to be against public policy, and are unconstitutional in some states. As to the amount of indebtedness which a municipality may incur, prudence demands that this be kept so low as not to overburden the taxpayer with interest and other capital charges, or, in the case of productive undertakings, the patrons thereof. Even where there are no constitutional, statutory, or charter limits on indebtedness and taxation, there is a practical limit to the burden of taxation which the citizen will bear. But most municipalities are subjected to definite limitations as to debt and taxation. Such limits vary widely in different countries and states, and even among the cities of a single state. It is generally some percentage of the assessed valuation, but as the relation of this to the actual value of the property assessed varies widely, comparative debt limits are likely to be very misleading unless supplemented by explanatory statements. In general, it may be said for the United States that the legal debt limit ranges from 3 to 10 per cent of the total assessed valuation, although some cities are subject to no legal limitations in this respect. Where the limit is by statute instead of constitution, appeals for its extension or for exemptions on account of certain classes are frequently made to the Legislature. Waterworks bonds are quite often exempted from computations of the debt limit, and recently there have been efforts in several States to exclude from the debt limit all bonds issued for revenue-producing works. In Great Britain some classes of loans are subject to the sanction of Parliament, and the control of other classes has been deputed by Parliament to the Local Government Board. This body has a well-organized staff of experts; it gives formal local hearings on applications for specific loans and grants or withholds its consent to the applications. On the continent of Europe there is some central control of debts in at least Prussia and France. The nearest approach to central control of loans in the United States is found in Massachusetts, but its exercise is due primarily to sanitary rather than financial safeguards. Legislative permission to make water-supply and sewerage improvements is seldom if ever granted in Massachusetts unless the plans for the proposed work are approved by the State Board of Health.

Statistics. Reliable comparative figures of municipal indebtedness are even more difficult to obtain than a comparative summary of debt limitations. The debts of individual cities, especially when reduced to a per capita basis, can be interpreted intelligently only when accompanied by statements regarding tax rates, the extent to which the cost of municipal improvements is met by special assessments, and especially by data as to the character and extent of the services rendered to the citizens by the municipality. Low per capita bonded indebtedness is not necessarily advantageous to citizens and taxpayers, since it may mean that the city in question is either without improvements or that its water works, lighting service, bridges, and even sewers are owned by private companies.

For the United States local-debt statistics by cities, States, and for the whole country were given in the tenth and eleventh censuses (1880 and 1890). From 1899 to 1901 the United States Department of Labor devoted a large part of its September Bulletin, each year, to "Statistics of Cities," among which it included bonded, floating, total, net, and per capita net debts, and sinking funds, for cities of 30,000 population and upward. The corresponding statistics, after 1901, have been published from time to time as bulletins of the Census Bureau.

According to the report of the Bureau of the Census on *Statistics of Cities in 1912*, the aggregate net indebtedness of cities having a population of 30,000 and above was $2,015,600,020, or $68.74 per capita. The per capita indebtedness varies directly with the magnitude of the city, as the following table shows:

CLASSIFICATION	Total net debt	Per capita
Cities with population over 500,000	$1,204,136,742	$95.50
Cities with population of 300,000–500,000	246,779,829	71.88
Cities with population of 100,000–300,000	270,048,931	44.61
Cities with population of 50,000–100,000	174,261,665	42.85
Cities with population of 20,000–50,000	120,372,855	38.12

New York had a net indebtedness of $792,927,021 and a per capita debt of $156.57. The lowest per capita debt among cities above 500,000 was that of Detroit, $18.09. The city of Denver had the lowest per capita indebtedness of all the cities for which statistics are given—$3.82.

Comparative figures of municipal indebtedness throw practically no light upon the problem of relative economy and efficiency. In general, the cities that are extensively engaged in productive undertakings show a large per capita indebtedness. The increase in per capita debt with increase in the size of cities is to be explained by the fact that the larger the city the greater the number of collective enterprises the city is forced to undertake.

Bibliography. Adams, *Public Debts* (New York, 1890); J. A. Fairlie, *Municipal Administration* (ib., 1908); the works noted under DEBT, PUBLIC, and FINANCE; United States Census Reports (Washington); also Bulletins on Social Statistics of cities for years since 1901; United States Department of Labor, Bulletins (ib., 1899

et seq.); British Local Government Board Reports; and the semiannual "States and City Supplement" to the *Commercial and Financial Chronicle* (New York).

MUNICIPAL FIRE PROTECTION. See FIRE PROTECTION, MUNICIPAL.

MUNICIPAL GOVERNMENT. The administration of the affairs of a city, town, borough, village, or other minor civil division of a state, but generally restricted to the government of pure municipal corporations as opposed to quasi-municipal corporations, such as counties, townships, and school districts. Municipal government seldom reaches its fullest development outside of the larger cities, but numerous municipal activities are often undertaken in progressive urban communities of only a few thousand inhabitants. Since the municipality is the creature of the state, it follows that its form of government, its various activities, and its powers are not only derived from the state, but are also subject to alteration or repeal at its will. The municipality has a direct and far more intimate relation with those who are subject to its government than does the state, supplying many wants common to its inhabitants and performing or supervising the performance of many services which outside of the municipality are left to private enterprise.

In some of these respects, as in the exercise of the police power, the care of the public health, the administration of charity, and the administration of local justice, the municipality is actually the agent of the state and discharges duties of interest to the state at large; in others, as in the furnishing of water or light, the state permits the community as a whole to act as a local organization for the satisfaction of purely local needs of interest to the community only. The very remarkable growth of the urban population during the last half century has greatly increased the importance of municipal government and at the same time multiplied its difficulties. For the origin and nature of the legal powers of municipalities, see MUNICIPALITY; see also the general article GOVERNMENT. For the history, growth in population, and certain economic, social, and political phases, see CITY.

Municipal government may be considered under four main heads: (1) functions; (2) organization; (3) finance; (4) public policy.

Municipal Functions. The functions of a municipality include all the public activities of the city, whether direct, such as laying out and maintaining streets, or indirect, such as regulating traffic and maintaining order on the public thoroughfares. These activities are many and complex and frequently overlap, but they may be grouped as follows: (1) the so-called public utilities, which include ways and means of communication and transportation, together with the supply of light and water to the inhabitants; (2) disposal of wastes; (3) protection of life, health, and property; (4) charities and correction; (5) education; (6) recreation; (7) municipal housing. The provision of *ways and means of communication and transportation* is one of the first and most obvious functions of municipal government. Its basis is the public streets, upon the surface of which all land traffic moves, beneath which are placed pipes to bring in municipal supplies and to carry out wastes, and either above or below which are wires for transmitting messages. As an aid to the movement of street traffic, it falls within the duties of the municipal government either to provide street railways or to see that they are provided and properly operated by private enterprise. In many of the English and Scottish cities the street railways have been constructed and are owned by the municipality, or have been acquired by purchase; they are sometimes leased to a private company for operation. In the United States this is usually a function of private enterprise, subject to the supervision of the city. Where waterways are involved, bridges and perhaps ferries must be provided, and frequently docks, wharves, and harbors as well. Bridges are now almost always built and maintained at public expense. Municipal docks are far more common than municipal harbors. Where docks are required, they often are or may be an important source of revenue; but the first consideration should be to afford every facility for the speedy and cheap handling of goods and passengers. The relation of municipal government to the telephone and telegraph service is chiefly regulative, especially in the United States, and thus far extends but little beyond the police control of the electric wires involved.

One of the most important municipal services is the supply of water for household and industrial purposes, for fire protection, and for sewer and street flushing. The lighting service, like the water supply, is for both public and private use. The light furnished may be either in the form of gas or electricity. Almost everywhere at present the water and lighting supplies are municipal functions, although they may be intrusted to private companies. Municipal markets for the sale of meat and other food supplies are frequently maintained for the sake of both convenience and sanitation. The sanitary aspects of cattle markets, abattoirs, and slaughterhouses are of great importance. Consequently, where markets are not provided, the municipal health authorities exercise, or should exercise, a rigid supervision over private markets and also over the various foods prepared or exposed for sale therein. The supply of such articles as milk and ice to the inhabitants is left to private enterprise, but on sanitary grounds is usually subject to regulation. Infant milk depots are being maintained by an increasing number of cities at home and abroad.

Wastes.—By far the greater part of the large quantity of water supplied to the modern municipality must be removed again in a more or less befouled condition. All American, many British, and the largest continental cities have found water to be the best vehicle for removing excreta, and as a result we have the modern sewerage system, which carries away this dangerous waste together with the water otherwise befouled by domestic use. The surface drainage from roofs, yards, and streets may be removed with the sewage or else in separate conduits. The food wastes of the kitchen and table, consisting of decomposable organic matter, and commonly known as garbage, require collection and disposal (see GARBAGE AND REFUSE); and the same is true of ashes, waste paper, and other rubbish. Street dirt must be collected and removed, and the streets must be sprinkled to keep down the dust which is inevitable even with the best sweeping. All these are municipal functions which cannot be left to private enterprise. Finally, the human dead must be considered under the general head of wastes, and cemeteries must be provided for burying or cre-

matories for burning the bodies. Cemeteries are frequently, but crematories rarely, owned by municipalities. The other services included under the heading "wastes," in so far as they are performed with regularity and system, are almost invariably rendered by the municipality, either directly or by contractors at its expense and under its supervision.

Protection of Life, Health, and Property.— The protective functions of a municipal character include the work of the police, the courts, the fire department, and the board of health, together with the building-inspection service and the provision of public baths, washhouses, and water-closets. *The charities and correction service* includes poor relief and the maintenance of asylums and reformatories. *The educational service* embraces not only the work of the common schools preparatory to the college, but also manual training, and sometimes technical education, night schools, vacation schools, libraries, and museums. The municipality in undertaking the work of elementary education and poor relief is acting as the agent of the state, and is subject to more or less central control so far as these activities are concerned. *The recreation service* includes the establishment and maintenance of parks, playgrounds, gymnasiums, together with the provision for public concerts and lectures. The three first named institutions might also be included under both education and health service, while concerts and lectures may be included under education as well as recreation. *Municipal housing* is practically unknown in America, but is a marked feature of municipal activity in Great Britain. It has arisen partly through the demolition of whole blocks of unsanitary houses, which seemed to make necessary a provision for rehousing the ejected tenants, and partly from a desire to afford municipal aid in the efforts being made by philanthropists to improve the home condition of the working classes. The houses built at municipal expense are generally designed to provide living places thoroughly sanitary in their construction and appointments for the poorest class of self-supporting wage earners.

Organization. The successful administration of the many and varied activities just outlined demands a degree and character of organization resembling in some respects that of a large private corporation. In the government of states it is common to divide the functions of government as well as the officials who discharge them into three groups—the legislative, the executive, and the judicial. The same general plan might be followed in considering municipal government, but separation into these three branches is by no means so easy, on account of the greater overlapping of municipal functions. The judicial power is more a state than a municipal function, and will not be further considered, except to note the existence of municipal police courts for the prompt trial of persons arrested for misdemeanors or crimes and the exercise of judicial functions by city health departments and by city boards which regulate the rates and character of service of utility companies. The legislative functions of municipal governments are exercised primarily by the council, and the executive by various officers and boards, with the mayor as the chief executive officer. Under the commission plan of city government in its extreme form the commission (or council) exercises both legislative and executive functions, and under the city-manager plan the manager instead of the mayor is the chief executive officer. Some of the executive boards possess quasi-legislative powers, while others, such as boards of health, exercise both legislative and judicial functions. The mayor's duties may be legislative, judicial, and executive. He often presides over the meetings of the council, casts the deciding vote in case of a tie, usually has the power to veto ordinances, appoints officials, supervises the affairs of the city, hears and passes upon charges involving possible dismissal of officials, and sometimes acts as a judge of municipal courts. In the United States the mayor is elected by popular vote, though formerly he was quite generally elected by the council; elsewhere he is commonly appointed either by the city council or by the central government. (See MAYOR.) In point of training the mayors or chief burgomasters of Germany take the lead; in that country the mayoralty is a profession, and a successful officer is promoted from one city to another and larger as his ability and reputation increase. In all countries the mayor is the chief representative of the city, but in Great Britain alone the office is mainly one of dignity and honor. In that country the mayor is a member of the council and presides over its meetings, but he does not possess the veto power. The importance of the mayor's office in the United States is largely due to the control which (except in commission-plan cities) he quite generally exercises over legislation through his power of veto, and (except in manager-plan cities) to his usual power of appointing and removing executive officers. The latter power is generally subject to approval by the council, but it is in larger freedom from this restriction that the growing importance of the office (outside of commission-plan and manager-plan cities) chiefly consists.

The Council. The powers and duties of the city council vary greatly in the different countries of the world, and quite as much so in the several commonwealths of the United States or even in the cities of a single State. Germany leads in the comprehensive control of its councils over municipal affairs, and Great Britain ranks next in this particular. The German and British councils control schools and charities. While the German councils are in some respects subject to the board of magistrates, including the head magistrate, the burgomaster, or mayor, and while the latter has other important functions, the English council has full local control within its sphere. The French municipal councils, unlike those of Germany and Great Britain, have few or no administrative powers, their control being limited chiefly to the appropriation of money and questions of policy. In the United States the councils formerly closely resembled those of Great Britain, and frequently had control of charities and of other municipal activities, but one by one many of their powers were taken from them and bestowed on the mayor or else on independent boards. Among these boards may be mentioned water, sewerage, street, park, fire, police, and health boards, or combinations of two or more of these into a single board. Again, single-headed departments, more or less independent of the council, have been created by municipal charters or by special legislation. The financial control of some of these new bodies has been left with the city council, at least to the extent of making or withholding appropria-

tions and borrowing money by means of bond issues. Since the advent of commission government in the United States the commissions have been much like the British councils in power, except that the American commissions do not control the public schools. In Great Britain and the United States the councils are restricted to the exercise of those powers specifically or impliedly authorized by the state, and implied powers are seldom so construed as to warrant permanent loans, purchase of land, erection of buildings, or other public works. On the continent of Europe grants of municipal authority are far more general and limitations specific, but the central government exercises a general control and supervision over the municipalities unknown in the United States and rarely if ever practiced in Great Britain. In the latter country, however, the Local Government Board in sanitary matters, and the Board of Trade in the case of municipal enterprises which produce revenues, pass upon loans, and by their power of granting or refusing authority for these they exercise no little control over municipal councils. The council in the United States, particularly in small cities, is generally a single-chambered body, elected by districts, although in some States a part of the council is elected by the city at large, but there are still some instances of an upper house, the members of which may be elected by the city as a whole. In England the council sits as one body, but it is composed of councilors elected by the people and of aldermen chosen by the council, usually from its own membership. (See GREAT BRITAIN.) In continental Europe there usually is but one chamber of councilors, and frequently the members are elected on a general ticket. As a rule, the councils in European countries are far larger than those in the United States, containing from 50 to 150 members. In the United States, even where two chambers exist, there are rarely over 50 to 60 members, but Philadelphia is a notable exception, with nearly 200 members in both branches. Beginning with the twentieth century there has been a strong movement towards small councils in the United States, generally elected at large. The commission-plan cities usually have only five commissioners, or less in the smaller places. The tenure of municipal councilors is from one to four years in the United States; from one to three years in Canada; three years for councilors and six years for aldermen in Great Britain; four years in France and Spain; five years in Italy; six years in Austria, Prussia, Hungary, Holland, Belgium; and nine years in Bavaria. In most of the European countries provision is made for periodic renewal of the council. The usual rule is renewal by thirds or halves, annually, biennially, or triennially, according to the length of the term. The most universal legal qualification for councilmen, aside from age, is residence. In the United States councilmen must not only reside in the city which they represent, but, by written or unwritten law, within the district which elects them. In France any taxpayer is eligible, even though not a voter, provided the number of nonresident councilmen does not exceed one-fourth the whole. In England taxpayers residing within 15 miles of the municipality may be elected for any district thereof. Property qualifications for a portion of the members of the council are required in European countries, but in a few cities, including Dresden and Leipzig, half of the membership must be from non-property holders. In the United States property qualifications for membership in the council were formerly quite common, but are no longer required. In all countries the work of councils is largely done by committees, and this is particularly true of those countries where the council has large powers and duties, which doubtless accounts for the large bodies in Great Britain and elsewhere in Europe. In Chicago and in most small cities the presiding officer of the council is the mayor. In other American cities the council elects its own presiding officer or he is elected by the city at large. In Europe the council usually elects its own presiding officer. Generally speaking, members of municipal councils receive no salary, but in many cities of the United States members receive pay ranging from a small per diem allowance upward to what may be considered fair compensation for the time devoted to the work by the average councilman. In the American cities governed by commission, where the boards meet frequently and their members each take charge of an executive department, salaries are generally paid.

Executive Boards and Officers. These range from the mayor and council committees to the more or less independent boards and commissions so common in the United States, and on down to minor officials acting under these officers. The number and variety of services which these boards and officials perform has been partly indicated in the enumeration of the city's functions. In cities where the council is supreme the committees of that body exercise large executive powers. Great reliance, however, is placed on trained executive officers selected by such committees or by the council as a whole for the various departments of municipal activity. Outside of the United States such officials are seldom chosen by popular vote, but in that country it is not uncommon to choose many of these officers by popular election. Minor positions are, of course, filled by the board concerned or by the chief executive officer responsible for the work undertaken by the appointee, rather than by popular election or by the council. The town clerk is the most important official in an English municipal corporation. Besides his duties as recording officer of the council and general secretary of the municipality, he acts as legal adviser of the council and as custodian of records. His tenure of office is frequently for life, he receives a high salary, and he is a trained official much as is the mayor of a German city. The city clerk in the United States is never an officer of such training and importance. Generally he is simply a recording officer to the council, or perhaps a kind of mayor's assistant. Legal advice to the municipal authorities in the United States is given by an officer styled the corporation counsel, and suits are prosecuted and defended by a city attorney, although the two classes of service may be rendered by one man, and the names vary in different localities. The city engineer is usually a technically trained man, and municipal engineering has become a distinct branch of the engineering profession. In the large cities the legal and engineering work is so extensive and important as to require large staffs of experts. This is also the case in the financial department, using the latter term to embrace all the executive officers employed in assessing, collecting, and disbursing money

and in maintaining a check on collections and disbursements.

Finance. Municipal expenses and outlays are met from the proceeds of taxes, special assessments for benefits, like the frontage tax for street paving, various licenses and fees, the profits from public utilities and from loans, the proceeds of trust funds, and from bequests. Some cities of continental Europe receive no little revenue from landed property, and the cities of Great Britain and Germany, and a few in the United States, derive considerable revenue from municipal franchises. Where municipal ownership prevails in British cities effort is often made to turn into the common treasury a revenue for the reduction of the general tax rate. In the United States a portion of the revenue from water works, and less frequently from other utilities, is sometimes applied in a similar manner. The taxing power is generally limited to the council, the chief exception to this rule being the poor authorities in Great Britain, which have an independent power of taxation. In the United States the councils often have to raise large sums by taxation for independent boards, and also for the county and for the State. It is common for the independent boards to incur bonded indebtedness without consulting the council, but only as the authority, in general or specific terms, is granted by the State Legislature. The subdepartments under the general head of finance are tax assessors, who place a valuation on taxable property; a board of review or appeals from the rulings of the last-named officers; tax collectors; the treasurer, who receives money from the collectors; the disbursing officer or controller, who issues or approves warrants for the payment of bills and claims; and the auditing department. In some cities, particularly the smaller ones, the treasurer is also the disbursing officer, and the council instead of a controller may approve claims. The *municipal budget*, or the estimate of receipts and expenditures upon which the tax rate and appropriations are based, is prepared according to various methods. In general, the several departments make up their respective estimates, and these are amended by the mayor, or by a board or committee, and sent to the council for further amendment and final ratification. As a rule, cities of the United States are deficient in real budget making and also in following such budgets as they do make, but there have been marked improvements in both respects since 1900. A proper budget utilizes past experience with receipts and expenditures to formulate a programme for the ensuing year, and such a programme should be followed.

City Charters. The municipality being a mere creature of the state, its area, powers, and form of government are laid down by the legislature in the form of (1) a specific act or charter; (2) a given act for cities of a given class; or (3) a series of either general acts relating to groups of cities or to all municipal corporations; or (4) special legislation on any subject within constitutional limits. Strictly speaking, the first only is a city charter, but the other grants of power have the same general effect, except that (3) and (4) are successively more confusing and less satisfactory than (1) and (2). In the United States city charters may or may not be, as the Legislature sees fit, submitted to popular vote for approval except as this is regulated by State constitutions. Frequently both charters and charter amendments are so submitted, and where general municipal corporation acts prevail the transition from one class to another is generally by popular vote, but it may follow from an increase in population. As a rule, voters of a municipality have some voice or influence in framing new or amending old charters, except perhaps where general legislation prevails. This participation goes so far in some cases as to permit the framing of charters by an authorized charter commission or to the adoption of changes requested by the municipal officials. Missouri, California, and Washington led in placing charter making under the control of the municipality, subject to more or less specific legislative restrictions. Michigan and Ohio followed years afterward, and this kind of "municipal home rule" is being extended. The more general practice up to 1915 was for the State legislatures to control all charter making and mending, usually, but by no means always, leaving the adoption of the measures subject to local popular vote.

Other Municipal Problems. A comprehensive term used in discussions of municipal affairs is "municipal reform." This is nothing more or less than an effort to secure honest and efficient municipal government. The problem varies with each locality, and even changes in a given locality from year to year. The bane of municipal government is partisan politics. The remedy for bad municipal government, from whatever cause, invariably lies with the citizens and taxpayers, who are often too indifferent to their own interests, or at least to the public interest, to insist on good government. A decided reform in municipal affairs was effected in Scotland in 1833, and in England and Wales in 1835, as a result of agitation directed against incompetent and corrupt borough government. The reform acts of the year named were supplemented from time to time, and in 1882 a consolidated municipal corporations act was passed. In 1888 another act was passed, providing that cities and towns of more than 50,000 inhabitants should be administrative counties, and also creating a more unified government for Greater London, known as the London County Council. In 1900 this unification was carried still further, but only to the extent of reducing by consolidation into some 15 borough governments a large number of minor authorities. In the United States the progress of municipal reform, as reflected by changed methods of administration, is difficult to trace. This is largely due to the many independent State legislatures controlling municipal affairs, to the great variations of practice within each State, and to the spasmodic efforts for reform. One of the notable steps in many States has been the adoption of constitutional amendments, from 1850 to 1880, prohibiting special acts of the Legislature which apply to a single municipality. Other great agencies of municipal reform in the United States have been the various local, State, and national reform organizations, notable among which have been the good-government clubs, the American Civic Association, the National Short Ballot Organization, the National Municipal League, and the National Civil Service Reform League.

The Commission Plan. The most radical change in the government of cities in recent years has been the adoption in many cities of the commission form of government. The first city to adopt the plan was Galveston, Tex., in

1901. A few other cities followed soon afterward. In 1908 a more elaborate commission-plan charter went into effect at Des Moines, Iowa, and since then the plan has been widely adopted. At the beginning of 1915 more than 400 cities and towns throughout the United States had voted for government by this method.

Commission Government. The commission plan varies widely in different States and even within some of the States, in the latter case depending upon whether special or general legislation prevails. Its most distinctive feature is the combination of all legislative and executive powers in a single small body, typically five but sometimes seven or more in larger cities and sometimes three in the smaller cities. The members of the commission or council are elected at large and, except for the school authorities, are usually the only city officials to be elected—hence the term, "the short ballot." As a rule, the mayor, who is one of the commissioners, has no more power than his fellow commissioners, but he is the official head of the city. The administrative work of commission cities is divided into as many departments as there are commissioners. Each commissioner heads one of these departments, by virtue either of popular election to the position or through designation by the commission as a whole, as the charter or general law may provide. As a safeguard against vesting such large powers in so small a body and also in accordance with the increasingly democratic spirit of the day, the commission plan almost invariably includes the initiative, the referendum, and the recall. Under the initiative, a stated percentage of the voters may petition the commission to pass ordinances, or in some cases charter amendments. If the council does not see fit to pass the ordinances, then the question goes to popular vote. The referendum works in a like way as regards ordinances enacted by the commission. Similarly, by petition a popular vote may be had on recalling any elected officer, and sometimes appointive officers as well. Other usual features of the commission plan are nonpartisan nominations and elections and publicity.

The adoption of the commission plan sweeps away at a single stroke all the checks and balances and divided responsibility of the mayor-and-council plan and the many independent boards which often accompany it. In their place it sets up a single small responsible body subject to popular control. Administrative responsibility is still further defined by making each commissioner the head of a large municipal department. The very strength of the commission plan is also its weakness. It provides division commanders, but no commander in chief. It fills by popular vote executive offices, some of which call for men of high technical training and large technical experience and all of which call for men of great administrative ability. Instead of insuring the choice of such men, the accidents of popular election place laymen in these important positions. These speedily qualify in their own and the public eye as municipal experts and relegate the trained men far to the rear.

City-Manager Plan. To remedy this weakness of the commission plan, and also to make good some of the worst defects of the ordinary mayor-and-council plan, a considerable number of cities (perhaps 40 or more early in 1915) have adopted the city-manager plan. Carried to its logical end the manager plan makes the council the supreme and sole policy-determining and money-appropriating body and places the manager in supreme command of the executive forces of the city, which he and he alone selects, subject to whatever civil-service rules may exist. The manager plan was first tried at Staunton, Va., in 1908; was subsequently worked out more completely but not adopted at Lockport, N. Y.; and was put in full force at Sumter, N. C., in 1912. Most of the cities which had adopted the manager plan up to 1915 were quite small, the largest being Dayton, Ohio (population, 116,577 in 1910). It was also the small and relatively small cities which took up commission government at the outset, but it has since been adopted by New Orleans, St. Paul, Buffalo, Portland, Oreg., and Jersey City, to name only places which had a population of more than 200,000 in 1910. As a rule the manager plan has been adopted by cities under or about to come under the commission plan, whence the name commission manager. Although the manager plan appears to be a marked improvement on the commission plan and on at least the weaker variations of the mayor-and-council plan, it is yet to be proved by experience whether the manager plan will be as satisfactory in practice as in theory. The chief uncertainty lies in whether or how many American cities are yet ready to elect the sort of councilmen or commissioners who will, in turn, select and retain in office and refrain from meddling with really efficient city managers. It may be that after extended experience with both the commission plan and with the manager plan as an adjunct of both the commission plan and the weaker form of mayor-and-council plan there will be a reversion to the stronger type of mayor-and-council plan in which the council has only legislative powers and the mayor is the chief executive authority, with sole power of appointment and removal of practically all city officials except the members of the council.

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MUNICIPAL HOUSING. See TOWN PLANNING AND HOUSING.

MUNICIPAL/ITY, or MUNICIPAL CORPORATION. A town or city possessed of certain privileges of local self-government; also the governing body in such a town. Municipal institutions date back to the Roman Empire. The provincial towns of Italy, though subjected to the rule of a Roman official, were allowed to enjoy the right of regulating their internal affairs. A class of the inhabitants called the *curia*, or *decuriones*, elected two officers called *duumviri*, whose functions were supposed to be analogous to those of the consuls of the Imperial city, and who exercised a limited jurisdiction, civil and criminal. There was an important functionary in every municipality called the *defensor civitatis*, or advocate for the city, the protector of the citizens against arbitrary acts on the part of the Roman governor. The municipal system declined with the decline of the Empire, yet it retained a fair degree of vitality, and rose to renewed life in union with feudalism and with the Anglo-Saxon institutions of Great Britain. Indeed, some cities of Italy, France, and Germany have derived their present magistracy by direct succession from the days of Imperial Rome, as is notably the case with Cologne. The bishop, as the shield between the conquerors and the conquered, in many cases discharged the duties or obtained the functions of the *defensor civitatis*. To the north of the Alps, under the feudal system, he became officially the civil governor of the city, as the count was of the rural district. In southern Europe, where feudalism was less vigorous, the municipalities retained a large share of freedom and self-government. Of the cities of the Middle Ages some were entirely free. Venice, Genoa, Florence, Hamburg, and Lübeck all stood in this position. Next in dignity were the free Imperial cities in Germany, which, not being comprehended in the dominions of any of the princes, were in immediate dependence on the Empire. Most of these cities rose to importance in the thirteenth century, and their liberties and privileges were fostered by the Holy Roman emperors to afford some counterpoise to the growing powers of the immediate nobility. The chief organs of government in the German cities were the councils, usually one for deliberation and a smaller one for administration, both being chosen from the various trade and artisan guilds. There were also from two to four burgomasters in each city who presided over the council meetings. The Italian cities were governed by executive officers known as consuls, usually 12 in number. By the side of these were a council and a general assembly of the citizens. During the contest between the Italian cities and the Emperor an officer, called the *podestà*, was put in control of the cities which the Emperor succeeded in subjecting to his authority. Other cities, seeing the advantage of a single executive, voluntarily introduced this officer in place of the consuls. In southern France the Italian consular system existed, but occasionally the *podestà* appears as the chief municipal officer. In the northern part of France the *maire* and *échevins* were most frequently the governing authorities of the towns.

Before the Norman Conquest the English burghs were subject to the rule of an elective officer called the portreve, who exercised in the burgh functions similar to those of the shire reve in the shire. The Normans recognized the already existing privileges of the towns by granting them charters. One of the most important of these privileges was the *firma burgi*, or lease of the town to the inhabitants in consideration of the payment of a fixed sum in lieu of all feudal dues. This involved the right of the inhabitants to elect their own magistrates, the independent exercise of jurisdiction in their

payment of the local taxes, and the performance of the quota of taxes assigned by Parliament. A sheriff or viscount was placed by the King over each shire, and a bailiff instead of the former elective officer over each burgh. In the larger towns the bailiff was allowed to assume the Norman appellation of mayor. The municipal franchise seems to have been vested in all the resident and trading inhabitants, who shared in the payment of the local taxes and the performance of local duties. Titles to freedom of the town were also recognized on the grounds of birth, apprenticeship, marriage, and sometimes free gift. In all the larger towns the trading population came to be divided into guilds or trading companies, through membership in which admission was obtained to the municipal franchise. Eventually the whole community was enrolled in one or other of the guilds, each of which had its property, its by-laws, and its common hall, and the community elected the chief officers. It was on the wealthier and more influential inhabitants that municipal offices were generally conferred; and it gradually became the practice for these functionaries to perpetuate their authority by coöptation. Contentions and disputes arose regarding the right of election, and eventually the crown threw the weight of its influence into the scale of self-elective ruling bodies. This was the period of incorporation, when charters were granted incorporating, not the inhabitants of the town, but the governing body. No new governmental powers were conferred, but the corporations were given the right to hold property and to sue and be sued. The desire of the crown to control the representatives which the towns were now allowed to send to Parliament led to a reckless policy of granting municipal charters, so that presently the urban communities were overrepresented in Parliament. During the period of the early Stuarts the writ of *quo warranto* was used frequently to deprive the towns of their liberal charters, with a view to replacing them with charters of a less liberal type, in order that the crown might the more easily control the parliamentary representation of the towns. The burghs of Scotland had a history much like that of the burghs of England; their earlier charters were mere recognitions of already existing rights, and were granted to the inhabitants at large. In the course of the fourteenth and fifteenth centuries the municipal suffrage fell more and more into the hands of restricted bodies of men until an Act of 1469 gave to the councils the right of appointing their successors, the old and new councils together electing the office bearers of the corporation. This state of things continued till 1833, not without much complaint. In the Scottish burghs the several trades possessed a much more exclusive monopoly than in England. Along with the outcry for parliamentary reform arose an outcry for municipal reform, and a separate municipal reform act putting an end to the close system was passed for each part of the Kingdom.

In the United States the English system of municipal administration became the type for the government of the early towns and cities. In nearly every instance a special organization was provided for the cities and was outlined in a charter granted by the Colonial Legislature or by the crown. Generally the governing body of the municipality consisted of the mayor, recorder, aldermen, and councilmen. At first the corporation seldom acted as the agent of the State, but was an organ for the satisfaction of purely local needs, such as the management of local property and finance. It had no power of government except the right to issue local police ordinances. Gradually, however, the municipal corporation came to be an organ for the administration of matters of State concern, as well as of purely local matters. Thus, the regulation of matters relating to public education, the public health, poor relief, elections, local justice, etc., is quite generally intrusted to the municipalities. As now understood, therefore, a municipal corporation in the United States is a body politic and corporate created by the State for the purpose of State administration as well as of local administration, and vested with certain privileges, such as the right to hold property, to sue and be sued, etc. The transformation of the municipality from an organ of local government to an organ for the administration of central matters created the necessity for legislative control, which has had the result of depriving the cities to a very large extent of the management of their local affairs. The corporation is not the body of the people, nor is it the officers collectively considered, but rather that artificial body or legal entity created by the act of incorporation and limited thereby. A distinction must be made between a municipal corporation proper and what are known as quasi corporations not created upon petition of the people of the district, but rather as territorial or political divisions of the State, such as counties, townships, and school districts created for the convenience of State administration. The laws regulating the incorporation of English towns and cities have little application to municipal corporations in this country. Here none are founded on common law or royal charter, and but few are based upon prescription. It may be said that they exist only by legislative enactment, and possess no powers not created by statute. A few municipal corporations are created by charter singly, but general laws of incorporation have been passed in many States, and at the present time the constitutions of more than 20 States forbid the Legislature to incorporate cities and, as a rule, villages by special act. In 12 of these the prohibition extends also to amendments or changes of charters. When the incorporation is single or special the charter sets out that the inhabitants are constituted a body politic with such a name and style; that by that name they may have perpetual succession, and may use a common seal, sue and be sued, etc. The territorial boundaries are defined and provision made as to the form of government—usually by a council made up of aldermen and councilmen or by trustees—as to division into wards, qualifications of voters, powers of city council to collect debts and impose taxes, etc. General laws of municipal incorporation usually start by abolishing all special charters existing and establishing general regulations for the incorporation, government, and regulation of municipal corporations throughout the State. Frequently such laws classify the towns to be incorporated as regards their importance into cities of first or second grade, towns, and villages. To become operative, the charter granted by the Legislature must be accepted by the body of citizens to be incorporated.

When established the municipal corporation is,

in the absence of constitutional provisions to the contrary, completely subject to the power of the Legislature; thus, it has been held that the latter may repeal charter provisions allowing the licensing of liquor dealers, and even such as relate to police regulations. In other words, a municipal charter is not a contract, and may always be altered or revoked, with the important exception that the rights of existing creditors must not be disregarded. The Legislature has general control over public property; thus, it may authorize a railroad to occupy streets of a city without its consent and without payment therefor. But the courts are beginning to hold that the municipalities may also own private property which is not directly devoted to governmental purposes and which is no more subject to control of the Legislature than the property of private individuals. Such are wharves, cemeteries, ferries, libraries, parks, hospitals, etc. The Legislature cannot deprive the municipality of property of this kind, or direct that it shall be applied to other purposes, as, e.g., that land used for a city reservoir shall be converted into a public park. The power of the municipality to alienate its public property without legislative authorization has generally been denied by the courts, although the right to dispose of private property as it sees fit has been readily conceded. It is also a general rule that the public property of a municipal corporation is not subject to execution in satisfaction of a judgment. No exact form of words is necessary to give force to the charter, and the corporation may even be created by implication, as where powers and privileges are conferred upon the inhabitants of a locality which cannot be enjoyed or exercised without acting in a corporate capacity.

The powers which may be exercised by a municipality are such as are expressly granted in the charter, such as may be fairly implied therefrom, and such as are essential to the declared objects and purposes of the corporation—not simply convenient, but indispensable. Any fair or reasonable doubt concerning the existence of a power claimed is resolved by the courts against the corporation. That is to say, the rule of strict construction applies. In some of the recent decisions, however, there is evidence of a tendency to depart somewhat from this rule in the direction of conceding to municipal corporations wider powers, especially as regards the management of public utilities. Thus, it has been held that a municipality which has the right to establish an electric-light plant for lighting the streets may without an express grant from the Legislature distribute lights to private families. Where the city is given discretionary power upon any subject it is not for the courts to say whether such discretion has been wisely used or not, unless fraud is shown or the discretion is being manifestly abused to the oppression of the citizen. Thus, if it have power to open new streets or grade old ones when necessary for the welfare of the city, the question of necessity is one for the determination of its own authorities. But when a municipal corporation is empowered to take certain action for others, and it is beneficial for them to have it done, the law requires that it should be done, although the language is merely permissive in form. Among the principal powers usually conferred upon municipal corporations may be mentioned the right to acquire and hold such property as may be necessary to the proper exercise of other powers granted, the right of taxation and of eminent domain, the appointment or election of officers, the maintenance of local courts, the enactment of ordinances, and the maintenance of actions in the courts. Many special powers are given, such as relate to the incurring of loans, special assessments, licenses, police regulations, wharves, ferries, entertainment of guests, etc. It is a general rule of construction that the legislative power conferred upon municipal corporations cannot be delegated to other authorities, nor can they divest themselves of it in any manner whatever. The power to act for the general welfare of the city is usually granted, in addition to other powers expressly enumerated. Under this grant it is generally held that municipal corporations may pass such ordinances not inconsistent with other provisions of the charter or the laws of the State as may be expedient in maintaining the peace, good order, safety, and welfare of the community. Thus, they may enact ordinances to provide for a proper observance of the Sabbath, for the closing of saloons at night, for restraining domestic animals from running at large on the streets, for the suppression of vagrancy, for the prevention of cruelty to animals, etc. But the general-welfare grant does not authorize the municipality to levy taxes of any kind. As a result of their contractual powers, however, municipalities may incur debts, provided they are to be paid out of the ordinary income of the city for the current year. The better opinion seems to be that in the absence of a specific grant municipalities may borrow money where it is necessary to the successful existence of the corporation, or for the exercise of privileges granted. Where the Legislature imposes a duty on municipal corporations which necessarily involves large expenditures the power to borrow may be deduced. It has been held that where the city had express power to establish meat markets, a fire department, or a liquor dispensary, the power to borrow could be implied as a necessary means for carrying out these undertakings. It may be laid down as a rule, however, that municipal corporations have no general borrowing power or power to issue negotiable paper in evidence of debts without legislative authorization. The constitutions of many States contain provisions limiting the amount of indebtedness which municipal corporations may incur. The prohibition is usually construed to apply to indebtedness of all forms. It is, however, held by some courts that contracts for meeting the ordinary expenses of the municipality and in anticipation of receipts do not create an indebtedness within the meaning of the limitation. A municipality cannot escape liability for its obligation arising *ex delicto* by pleading that its indebtedness has reached the constitutional limit. Those who make contracts with a municipality whereby its indebtedness is increased do so at their own risk. If, therefore, an individual lends money to a city which has no legal power to borrow he cannot recover it by pleading ignorance of the powers of the city. But where municipal bonds contain recitals that the city is acting within its constitutional power, and has complied with all the requirements of the law, it will be estopped from disputing the truth of such representations as against a bona fide purchaser of the bonds.

The Legislature has no power to enact legislation which will have the effect of impairing the

obligation of a contract between the city and a private party. Thus, it cannot so limit the taxing power of a municipality as to render it impossible for the city to meet its ordinary expenses and pay interest on its outstanding bonds. On the other hand, the Legislature has no power to authorize a municipality to levy taxes for other than public purposes. Thus, it cannot authorize the granting of aid by a municipality (if it involves taxation) to a private enterprise to enable it to begin business. Among the public purposes for which a municipality may levy taxes may be mentioned the construction of sewers, the laying out of parks, the establishment of water works, etc. Moreover, the Legislature cannot levy a special tax upon the inhabitants of a municipality for other than strictly municipal purposes. Thus, it cannot require them to defray the expenses of improving a navigable stream or to take stock in a railway company, although they may be required to build a local canal or levee. The city may be compelled by mandamus to fulfill its obligations to private parties, as where it refuses to levy a tax for the purpose of paying interest on its outstanding bonds or for the satisfaction of judgments against it. The city may be enjoined from doing an injurious act to an individual or from committing trespass upon his premises. Furthermore, it may be enjoined at the instance of a taxpayer from violating the law or doing other acts prejudicial to the general welfare, as where the city proposes to enter into a contract which will create an indebtedness in excess of the constitutional limits. Municipal officers may also be proceeded against under a writ of *quo warranto* for usurping powers not legally conferred upon them. In the United States the practice of frequent interference in the affairs of the cities by the Legislature has led to so many abuses that in most of the recent constitutions provisions have been inserted prohibiting the legislatures from passing special acts which apply to a particular city when a general law can be made applicable. These provisions, however, have frequently been evaded by arranging the cities into classes in such manner that a particular city will constitute a class by itself and by making the act applicable to a single class. The practical difficulties of dispensing entirely with special legislation have led the courts in some instances to sustain the constitutionality of methods of classification which seem unreasonable if not ludicrous. Where a part of a municipality is detached from the main body of the city the old corporation retains all the liabilities and private property of the city if no provision to the contrary is made by legislation. Property of a public character falling within the limits of the new corporation passes into its control, the theory being that there has been no transfer of title, but simply a change of trustee. A new municipal corporation, embracing substantially the same boundaries as the old, is regarded in law as the successor of the old, entitled to all its property rights and subject to its liabilities. Upon the repeal of the charter of a municipal corporation a court of equity will lay hold of its private property and administer it for the benefit of the creditors of the corporation. It is a general rule of construction that if the existence of a municipal corporation is not questioned by the State it cannot be put in issue by a private individual in a collateral proceeding.

In discussing the liability of municipal corporations for torts it is necessary to distinguish between the two classes of powers which they exercise, viz., public governmental functions on the one hand and private corporate functions on the other. When acting in the former capacity municipal corporations are acting as the agent of the State and are governed by the rules of public law, one of which is the irresponsibility of the government for the tortious acts of its agents. When acting in a private local capacity, primarily for the advantage and benefit of the locality, the municipal corporation is subject to the rules of the private law, according to which it is held liable for the torts of its officers. The rule of liability for torts does not apply to quasi corporations, such as counties, townships, school districts, etc., because they are agencies of the State created for the purpose of State administration, and usually without solicitation or concurrence of action of the inhabitants. The principal torts which are imputable to municipal corporations when acting in the latter capacity are negligence, noncompliance with the statutes, nuisance, and trespass. The courts have generally held that municipal corporations are not liable for failure to exercise discretionary legislative power which may be conferred by the Legislature or for the manner in which they may exercise it if done in good faith. Thus, it is not liable for its neglect to abate a nuisance, as where an individual was injured by an explosion of fireworks which the municipality was authorized to prohibit. But where the duty is ministerial and absolute the corporation becomes liable for the injury arising because of failure to perform it, and where it positively licenses something which constitutes a nuisance it will be held liable for any injuries that may result therefrom. In the exercise of a discretionary power, as in the construction of a sewer, the city will not be held liable for injuries resulting from defective service unless it results in the positive invasion of an individual's property and unless it can be shown affirmatively that the municipality has been guilty of negligence. It is a general rule that a municipal corporation is not liable for injuries arising from neglect or failure to enforce strictly its ordinances for the good government of the city, but an act of the Legislature making the city liable for property destroyed by mobs has been held to be constitutional. In the exercise of its police powers the city is not generally liable for the acts of omission of its agents, as where a policeman shoots a bystander while attempting to kill a dog running at large. The same is true of negligence on the part of the fire department and of the health department. In all these cases the municipality is acting in its public governmental capacity as an agency of the State. In the management, however, of institutions not directly connected with the function of government, such as wharves, gas and water works, markets, and washhouses, municipal corporations are held liable for injuries that may result therefrom, the theory being that in this capacity the corporation is engaged in private business, from which often a revenue is derived. It is also a general rule that municipal corporations are responsible for the management of streets. The rule, however, does not apply to quasi corporations in the management of public highways. This is due to the fact that, unlike pure municipal corporations, they are

engaged chiefly in the performance of public governmental duties from which they do not generally derive any revenue or particular private advantage. The peculiar rule exists in New England that the property of any citizen of a municipality against which a judgment has been recovered may be seized in execution thereof. Elsewhere the remedy is execution upon the private property of the municipality. Consult: H. S. Abbott, *Treatise on the Law of Municipal Corporations* (3 vols., St. Paul, 1905); Eugene McQuillin, *Treatise on the Law of Municipal Corporations* (6 vols., Chicago, 1911–13); R. W. Cooley, *Illustrative Cases on Municipal Corporations* (ib., 1913); id., *Handbook of the Law of Municipal Corporations* (ib., 1914).

MUNICIPAL LABORATORIES. See LABORATORY.

MUNICIPAL LAW. In English and American law the ordinary "law of the land," i.e., of the country, comprehending both the public and the private law, as distinguished from the external law or law of nations. To the Romans, municipal law meant the special law of the cities, other than Rome, which were included in the Roman Empire. A *lex municipalis* was a city charter granting limited self-government in matters of local interest. On the Continent, towards the close of the Middle Ages, the phrase was sometimes used to describe any local law, whether of a city or a province, as contrasted with the general law of Christendom, i.e., the Roman law, civil and canon. Later, with the development of international law, municipal law came to describe local law in contrast with international law. The term is no longer used in this way on the Continent: municipal law now means city law as contrasted with national law; but among English-speaking peoples national law is called municipal in contrast with international law. English municipal law has thus become the very inappropriate description of all the law, written or unwritten, by which England is governed in matters purely English.

The expression "municipal law" is sometimes, however, employed in the United States in the continental sense above indicated, to describe the organization of municipal corporations and the local laws enacted and enforced by municipal authorities. It is under this head (municipal corporations), therefore, that information concerning the organization of city, county, township, and village governments, and police laws for the restraint of vice, may be found. See MUNICIPALITY. Consult Eugene McQuillin, *A Treatise on the Law of Municipal Ordinances* (Chicago, 1904), and Brand Whitlock, *On the Enforcement of Law in Cities* (Indianapolis, 1913). See INTERNATIONAL LAW; JURISPRUDENCE; LAW.

MUNICIPAL LEAGUE, NATIONAL. An organization composed of individuals and associations seeking to accomplish municipal reform in the various cities of the United States. It was established in New York in 1894 as the outcome of a national conference held in Philadelphia in January of that year to promote the interests of good government. The league has no partisan political interests whatever, but confines its operations to the securing of good municipal laws, the appointment of men of integrity and ability to office, and the correction of abuses in municipal methods of government in American cities. Through its annual conferences it enables the workers in behalf of municipal betterment to come into personal touch and exchange views. By means of active committees the league has brought together groups of acknowledged experts and public men who have formulated reports of great value to publicists, students, and administrators. Through its executive officers the league is in constant touch with local and national movements concerned with municipal questions. Its annual conferences are among the most important meetings of experts in municipal reforms in the United States, and the reports, including the secretary's annual review, the most valuable statements upon these subjects. In 1900 the league published a municipal programme for a constitutional amendment and municipal corporations act. In 1915 it issued a model charter prepared by a representative committee. Consult *Proceedings of National Municipal League*, 1894 to 1910 (Philadelphia, annually), and *National Municipal Review*, a quarterly periodical (Baltimore, 1912 et seq.).

MUNICIPAL OWNERSHIP. Possession by a municipality or any minor civil division of the state. The term is, however, more commonly limited to public as opposed to private ownership of water works, lighting plants, street railways, telephone systems, and other revenue-producing industries designed to meet the wants of urban populations. The term generally implies municipal operation as well as ownership, but exceptions are frequent and sometimes notable. The term "municipal socialism" has sometimes been used in much the same sense as municipal ownership; but it is more inclusive, embracing various efforts to meet the collective wants of a municipality, whether founded on municipal ownership or not. In its broadest sense, municipal socialism would provide for all wants common to the citizens of a municipality in so far as they were not met by the state. A narrower usage would apply the term more particularly to unusual municipal enterprises, such as the management of coal yards or bakeries. The term "municipal trading" has been applied in England to municipal ownership, but it has not gained currency outside of Great Britain.

The services which a municipality may be expected to render its citizens are more comprehensive than those included under municipal ownership, municipal socialism, or municipal trading, as may be seen by referring to the article MUNICIPALITY. The object of the present article is to consider those undertakings which require the use of the streets or other public places, and which might be carried on by either municipal or private enterprise, but are actually carried on by the former. Since by their nature such undertakings exclude competition, they are called natural or municipal monopolies. Under either kind of ownership they can be carried on only by authority from the state, in the form of general or special legislation, besides which a private corporation must generally secure the grant of a municipal franchise permitting it to use the public streets. Within the limitations stated the most common objects of municipal ownership are sewerage systems and water works and gas and electric-lighting plants. More rarely street railways, ferries, and telephones are owned by the municipality.

Aqueducts for the supply of the cities of antiquity were the nearest approach to municipal

ownership as the term is understood to-day, although from remote times cities have owned lands, improved harbors, built docks, and derived revenues therefrom. But these services were confined to a relatively small number of important cities until the nineteenth century, when water works, gas works, electric-light and power plants sprang up with increasing rapidity. At the opening of the twentieth century these services were to be found in practically all the larger and in the majority of the smaller municipalities of the civilized world, particularly in the United States, Great Britain, and to a less extent on the continent of Europe and in Australia.

The proper scope of municipal ownership is still a subject of debate. Perhaps the nearest approach to a general agreement is (1) that it may rightly embrace all those services which are primarily or largely of a sanitary character, like water supply and sewerage, and (2) that it should be restricted to quasi-public industries, in which private competition is impossible or at best uncertain. Under (2) some draw the line so as to include only imperative and universal needs, the supplying of which is at the same time a natural monopoly. The difficulty with such a limitation is that it varies with local conditions, time, and individual opinions. Thus, the demand for public lighting in the larger cities of the present day is far more imperative than was that for a public water supply a hundred years ago, or in some localities to-day. There is a growing conviction that the relative cheapness and efficiency of service are the chief facts to be considered in deciding between public and private ownership, and that local conditions determine whether public or private ownership is the better in these respects. A third point upon which there is more or less agreement is that municipal ownership should not be carried so far as to increase municipal debts beyond prudent limits. So far as revenue-producing municipal works of a monopolistic character are concerned, it is generally possible so to adjust income and expense that the revenue from such undertakings will meet capital charges as well as other expenses. But there is also the possibility that the popular demand for low charges will result in a deficit that must be met from the general tax rate, and with a large number of municipal undertakings to be provided for it is conceivable that this might prove financially embarrassing if not disastrous.

The municipal-ownership question has been given a different aspect in the United States with the rapid increase in the number and power of State public service or utility commissions. The control which these commissions now exercise over the rates and service of the various municipal-franchise companies makes it less necessary than formerly for cities to adopt municipal ownership for the protection of both public and private consumers. Nevertheless the movement for municipal ownership continues.

Water Works. With the exception of sewerage systems, which rarely yield a revenue, water works are the most common form of municipal utility.

In the larger cities of the United States municipal ownership is the rule, all but 8 of the 69 cities of over 100,000 population (census of 1920) owning their own works at the middle of 1922. New York, which was first supplied by a private company in 1776, put municipal works in operation in 1842. Chicago was supplied by a company in 1840, and by its own works in 1854. Philadelphia built its works in 1801. At Boston a private company established water works in 1652—the first public water supply in the United States. A second small company built works in 1796, and continued to operate on a small scale until 1893, when its pipes were bought by the city, which had built works in 1848. The Baltimore works were built by a company in 1807, and bought by the city in 1854. Cleveland built its works in 1854–56. At Buffalo a company established works in 1852 and was bought out by the city in 1868. In San Francisco the water works were still under private ownership in 1922, but the city was building a large dam and reservoir on the Tuolumne River in the Hetch Hetchy valley and a long aqueduct therefrom. By the time this project is completed the city expects to have bought the works of the company. At Cincinnati a company built works in 1820 and sold them to the city in 1839. Up to the close of 1896 changes from private to public ownership had occurred in 205 cities and towns, against only 20 changes from public to private ownership. There have been many changes to municipal ownership since 1896, but complete figures are not available.

In the *United States* in 1801 there were but 16 works, of which only the plant at Winchester, Va., was owned by the city it served. The development of municipal ownership during the century is shown by the accompanying table.

PUBLIC AND PRIVATE WORKS IN THE UNITED STATES

AT THE END OF EACH DECADE, BEGINNING WITH 1800 *

YEAR	Public	Private	Total	Per cent of total, public
1800	1	15	16	6.3
1810	5	21	26	19.2
1820	5	25	30	16.6
1830	9	35	44	20.5
1840	23	41	64	35.9
1850	33	50	83	39.7
1860	57	79	136	41.9
1870	116	127	243	47.7
1880	293	305	598	49.0
1890	806	1,072	1,878	42.9
1896	1,690	1,489	3,179	53.2

* Compiled from the *Manual of American Water Works* for 1897. Returns, summarized in the *McGraw Water Works Directory* (New York, 1915), show that of 4875 listed towns in the United States, 3045 had municipally owned works, 1355 privately owned, 37 mixed ownership (probably both public and private), and 435 were supplied from other towns. These figures cannot be directly compared with those given in the table because the classification in the *Manuel* is by works and in the *Directory* by towns supplied, and the *Directory* lists 435 towns supplied by works in other towns, without giving the ownership. No later figures for the whole country had been compiled up to July, 1922, but the U. S. Census Bureaus "Financial Statistics of Cities, 1920" indicated that in 1921 of the 253 cities of 30,000 population and upwards, 20.1 or 30 per cent owned their works.

The relative decrease in public ownership from 1870 to 1890 was due to the remarkable activity of private water company promoters at a time when the municipalities were just awakening to the need for such improvements, but lacked the funds for public ownership, or had not become infused with the spirit which would lead towards such ownership.

In *Canada*, in 1896, municipal ownership pre-

vailed in 75 per cent of the municipalities having works, or 109 of 145 cities and towns. In 1916 there were in Canada 396 municipal (75 per cent), and 132 private works or a total of 528 plants. At Montreal water works were built by a private company in 1801 and bought by the city in 1845. At Toronto private water works were built as early as 1841 and were bought by the city in 1873.

In *Great Britain* municipal ownership of water works is the general rule. Water works appear to have been introduced by the municipality of London in 1283, by Plymouth in 1585, and by Oxford in 1610. Manchester and Liverpool each bought out a private company in 1847, Glasgow in 1855, Birmingham in 1876, and Sheffield in 1888. Edinburgh transferred municipal works to a company in 1819, but they were restored to municipal ownership in 1869. Greater London was served for many years by eight companies, beginning with the New River Company, whose works were completed in 1613 with the aid of James I. The other seven companies dated from 1721 to 1822. After years of agitation for municipal ownership, a parliamentary Act was passed in 1902 providing for the purchase of the London companies and the control of the water supply by a joint board representing the several boroughs and the other public bodies comprised within what is known as Greater London. The transfer was made in June, 1904.

Most of the large cities of the *European continent* have extensive water works. Berlin secured control of her water works in 1873, buying them from a company which began to build them in 1853. Hamburg and Frankfort-on-the-Main, Vienna, Moscow, Paris, Rome, and other large cities own their water works. The municipal water works of Rome may be said to date from 312 B.C. (See AQUEDUCT.) At Paris an old Roman aqueduct was restored in the seventeenth century, and a small municipal supply seems to have been continued from that date until more adequate works were installed by the city about the middle of the nineteenth century. As a rule, private ownership prevails in Latin-speaking countries. In Australia there are a number of important municipal works.

Gas Works. In North and South America these are rarely under municipal ownership, but in Europe they are frequently owned by the municipality.

Of 981 towns in the *United States*, each having a population of 3000 and more by the census of 1900, returns for the close of 1901 showed 21 municipal works; but of these the Philadelphia plant was leased to a private company in 1897, after over 50 years of municipal ownership and operation. Two of the 21 municipal plants supply natural gas. The municipal works at Richmond, Va., were established in 1852. The thirteenth United States census (1910), in its volume on "Manufactures" (vol. x, Washington, 1913), reported for the United States, in 1909, 119 gas works owned and operated by the municipality. Of 11 others which were not owned or operated by firms, individuals, or corporations, 8 were coöperative associations.

Of 1615 gas works in *Great Britain and Ireland* reported in 1905, 285 were owned by the municipalities served, and they supplied about half the population involved. With the exception of London, Liverpool, and Dublin, nearly all the large towns have works owned and operated by the municipality.

In *Germany* most of the cities having a population of 50,000 and upward have municipal works, and as far back as 1885 figures for the whole country showed 338 municipal to 329 private gas works. Among the larger cities with private works are Munich, Frankfort-on-the-Main, and Altona.

Municipal works are found in most of the cities of Holland, Norway, Sweden, and Switzerland, and in a few cities of France, Italy, and Australia.

Sewerage. Municipal ownership is almost universal, but many countries are practically without sewerage systems for household wastes. It is doubtful if any country is better provided with sewerage facilities than the United States, where 1096 of the 1524 places with a population of 3000 in 1900 reported sewerage systems late in 1901. Of the 1096 places then having sewers, private ownership was reported in 47 instances, mostly in small places. Later complete figures are not available, but it is known that Atlantic City, N. J. (pop., 1920, 50,707), still had a privately owned sewerage system in 1922.

Street Railways. This class of service has been developed since 1850, and up to 1870 was confined chiefly to the United States. Municipal ownership outside of Great Britain is rare, and until 1893 Huddersfield, England, and the railway on the Brooklyn Bridge were the only examples of municipal ownership and operation, the first dating from 1882 and the second from 1883. A few British cities constructed railway tracks and leased them to companies between 1870 and 1893, since when most British cities have entered upon both ownership and operation of their lines, including London, Manchester, Sheffield, and Glasgow, but there are also private lines in some of the large places. The operation of the railway on the Brooklyn Bridge, New York City, was assumed by a private company in 1898, in connection with the Brooklyn railway service. In 1901 the small city of Grand Junction, Colo., assumed the ownership and operation of a short horse-railway line. San Francisco completed a municipal railway line on Geary Street in June, 1913, and which has since been extended. Seattle and Tacoma, Washington, began united street-railway ownership about the same time as San Francisco. On April, 1919, Seattle bought out the private lines. Detroit began building street railways vigorously in 1921, and early in 1922 bought the local lines of the Detroit United Railways System. In 1902 an electric railway at St. Thomas, Ontario, was taken over in like manner. The street-railway system of Toronto, Ontario, was bought by the city at the expiration of the franchise of a company in 1891. After being operated for a few months by the city it was sold to a company. In 1921, Toronto, which meanwhile, had built some lines, again bought out the company. Eight smaller cities in Ontario, one in Manitoba, three in Alberta and one in Saskatchewan had publicly owned street railways at the close of 1922, but some of the property was controlled by the Ontario Hydro-Electric Commission. In other countries than those already named there are a few street railways owned by the city and leased to operating companies. A subway to accommodate street-railway traffic in congested districts of Boston was completed by the city in 1897 and 1898 and leased to a company, and since then other subways have been provided in like man-

ner, including one to Cambridge, put in use in 1912. A rapid-transit subway built by New York City and leased to a company for operation was put in service in 1904, and has since been supplemented to form an extensive rapid-transit system in tunnel and in the open air. The leases of both the Boston and New York subways are on such terms that the rentals will eventually reimburse the cities for their outlay. In each case the operating companies provide all equipment. Since 1914 Philadelphia has made important extensions to its short subway system which had been in operation for some years, and Cincinnati has begun to build subways.

Electric Lights. This service was started on a practical scale in or about 1880.

Probably the first municipal plant in the *United States* was put in operation in 1882 at Fairfield, Iowa. At the close of 1898 there were in places of 1000 or over by the United States census of 1890, 460 municipal and 2572 private electric-lighting plants. In 1902 there were 815 municipal and 2085 private electric-lighting plants in the United States, regardless of the size and number of places supplied thereby, and in 1912 of a total of 5221 central stations 1562 were under municipal and 3659 under private ownership. The largest municipal plants are at Chicago and Detroit; but these, like many other American municipal electric-lighting plants, are for lighting streets and public buildings only.

The first electric-lighting plant in the *United Kingdom* was established by a private company in 1882. The oldest municipal plant was started by Bradford in 1889. At the close of 1901 there were only 248 works in operation in the United Kingdom, of which 168 were municipal. In addition, 84 municipalities and 31 companies were then installing works. Among the larger municipalities Glasgow bought out a company in 1892, Liverpool in 1897, Leeds in 1898, Sheffield in 1899, and Birmingham in 1900; Dublin built works in 1892, and in 1893 Edinburgh and Manchester did likewise. London is divided between municipal and private ownership.

On the *continent of Europe* private ownership of electric-lighting plants seems to be the rule. The works of Berlin were opened by a company in 1886, but the city controls their operation in important particulars. At Hamburg municipal works were put in operation in 1889.

Telephones. This service, like the telegraph, is generally controlled by large companies or by the general governments. Tunbridge Wells, England, and Glasgow, Scotland, inaugurated the first municipal telephones in Great Britain in 1901, and Swansea, Brighton, and Hull had followed by the close of 1905. The Tunbridge Wells plant was sold to the National Telephone Company. The English trunk lines and a large London exchange were long owned by the national postal authorities, and in 1912 all the lines and exchanges of the National Telephone Company were taken over by the National Post Office.

Ferries. In the United States there are perhaps 10 cities with municipal ferries to 70 with private ones. Boston was long the most notable example of municipal ownership in the United States, but in 1903 and in 1905 New York City took over the Staten Island and the East Thirty-ninth Street ferries from private companies. In Great Britain a large municipal ferry between Liverpool and Birkenhead is owned and operated by the latter municipality. Public bodies at Glasgow and at Belfast also control ferries. There are a few other municipal ferries in Great Britain.

Other Industries. The chief additional services that might properly be discussed under municipal ownership, as here considered, are docks and wharves and public markets. The former, particularly on a large scale, are more frequently found in Europe than in America; but for many years New York City has expended many millions on dock construction, and received a considerable yearly revenue from dock leases. Since 1900 many cities of the United States and Canada have gone extensively into dock construction and some into harbor improvements. Municipal markets are common in Europe, Australia, and Canada, where they are frequently exclusive in character. In the United States they exist, but they are in competition with private markets. Of cities and towns of over 30,000 inhabitants 129 were reported in 1901 to have municipal markets, but doubtless the list was incomplete, and at the same time it included some outdoor markets or market places. New York, Boston, Baltimore, and New Orleans have large markets, which yield considerable revenue. Since 1915 many American cities have given close study to the market problem and some have spent or are spending large sums of money for markets, spurred on by the "high cost of living" and other sociological considerations. Subways for electrical wires have been constructed in a number of American cities for lease to the various owners of wires. A few cities have built such subways for general use and for rental.

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MUNICIPAL REFORM ACTS, ENGLISH,

The various acts passed by Parliament in the nineteenth century aiming to reform the government of the English municipalities. The parliamentary reform of 1832 having left untouched the notorious abuses in the English system of municipal government, a parliamentary commission was appointed the following year to investigate exhaustively the general condition of municipal corporations throughout the Kingdom. A monumental report was made by the commission showing that the municipal governments were in the hands of self-elected cliques; that the corporate funds were wasted; that public improvements were almost wholly neglected; that the municipal courts were corrupted and prostituted for party purposes; and that the whole system of municipal institutions as then constituted was a source of weakness rather than of strength to the country at large. The report of the commission was followed by the Municipal Corporations Act of 1835, which has been well called "the great charter of English municipal freedom." By this act 178 boroughs were reformed, 125 others given corporate privileges, and provision was made for the remedying of many defects and the correction of the most notorious abuses of the municipal system. It admitted to the franchise all property owners and occupiers of property rated at £10 per annum, and established a uniform system of municipal organization. This scheme provided first for an elected council varying in size according to the population of the borough; the council was to be a bicameral body, the upper house consisting of a certain number of aldermen elected by the council. The act further provided for a mayor to be chosen by the body of councilors and aldermen from among their own members. The mayor, aldermen, and councilors were to constitute the full municipal governing body. The chief features of this act have remained as the framework of the English municipal constitution, although the various acts of Parliament passed from time to time modifying in unessential particulars the municipal structure made a consolidation and revision of the statutes necessary. This was accomplished by the consolidated municipal code of 1882. By the Local Government Act of 1888 the municipal constitution was modified to the extent that cities and towns with a population of 50,000 inhabitants were made distinct counties for administrative purposes, the municipal councils assuming all duties which would otherwise devolve upon county councils. Consult: M. D. Chalmers, *Local Governments* (London, 1883); F. J. Goodnow, *Comparative Administrative Law*, vol. i (New York, 1897); G. B. Shaw, *Municipal Government in Great Britain* (ib., 1901). See works referred to under MUNICIPAL GOVERNMENT; MUNICIPALITY.

MUNICIPAL UNIVERSITY, AKRON. See BUCHTEL COLLEGE.

MUNICIPIUM, mū'nĭ-sĭp'ĭ-ŭm (Lat., from *munus*, duty, service, especially to the state, and *capere*, to take; apparently, the taking up of public services. Some, however, take *munus* as "privilege," and interpret "of the receiving of political privileges"). A term used by the Romans to denote the relation of certain towns to the Roman state. It was first used when Tusculum (see FRASCATI) received Roman citizenship, in 381 B.C. It came into greater prominence at the close of the Latin War, 338 B.C. Henceforth, in their relation to Rome, the towns of Italy were (1) *Coloniæ Civium Romanorum*, whose members were full citizens of Rome, or (2) *municipia*, whose members had partial Roman citizenship, or (3) *Civitates Fœderatæ*, whose members were not Roman citizens at all. The members of the *municipia* had, at first, in general, the *jus connubii* and the *jus commercii*, i.e., the right of intermarriage with citizens of Rome and the right to do business with them, but they did not possess the *jus suffragii*, the right to vote at Rome, or to hold office there. This *jus suffragii* was, however, given to many municipia in the second century B.C. A great change came after the Social War (q.v.). Henceforth, by the Lex Plautia Papiria every town in Italy proper might, on certain clearly defined conditions, gain Roman citizenship, and the term *municipium* was now applied to every urban group of Roman citizens in Italy. The municipium in this developed form had local self-government, and its citizens could also vote and hold office at Rome itself. Julius Cæsar extended this system to Cisalpine Gaul; Augustus and later Emperors extended it throughout the Empire, by giving full or partial citizenship to various towns. Consult the articles "Colonia" and "Civitates Fœderatæ" in W. Smith, *A Dictionary of Greek and Roman Antiquities*, vol. i (3d ed., London, 1890); A. J. H. Greenidge, *Roman Public Life* (ib., 1901); J. E. Granrud, *Roman Constitutional History* (Boston, 1902); L. Friedländer, *Town Life in Ancient Italy* (Eng. trans. by W. E. Waters, ib., 1902); F. F. Abbott, *A History and Description of Roman Political Institutions* (3d ed., ib., 1911); J. S. Reid, *The Municipalities of the Roman Empire* (Cambridge, 1913); the article "Municipium," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

MUNISING, mū'nĭ-sĭng. A city and the county seat of Alger Co., Mich., 45 miles east-southeast of Marquette, on the Munising, Marquette, and Southeastern Railroad (Map: Michigan, C 2). The chief industry is lumbering. It has a fine hospital, and there are tanneries, paper mills, and manufactories of veneer and woodenware. Pop., 1900, 2014; 1910, 2952.

MUNJAH. See MOONJA.

MUNK, mŭnk, HERMANN (1839–1912). A German physiologist. He was born at Posen, studied at Berlin and Göttingen, and in 1862 became docent in the former university. Seven years afterward he was promoted to assistant professor, and in 1876 to professor, of physiology at the veterinary college at Berlin. Besides studies on the productive methods of threadworms Munk wrote on the physiology of the nerves and especially on the brain: *Untersuchungen über das Wesen der Nervenerregung* (1868); *Ueber die Funktionen der Grosshirnrinde* (1881; 2d ed., 1890); *Ueber die Ausdehnung der Sinnessphären in der Grosshirnrinde* (1901–02); *Ueber die Functionen des Kleinhirns* (1906–08); *Zur Anatomie und Physiologie der Sehsphäre der Grosshirnrinde* (1910).

MUNK, JENS (1579–1628). A Danish navigator, born near Arendal, Norway. In 1619, under the auspices of King Christian IV, he set out with two ships to discover the Northwest Passage to the Indies and China. He penetrated Davis Strait as far north as 69° and then turned southward and spent the winter on Chesterfield Inlet. Cold, famine, and scurvy destroyed so

many of his men that only two persons besides himself survived. With these he sailed for home, reaching Bergen, Norway, in September, 1620. Just when ready to start on a new Northwest Passage journey to take possession of "New Denmark" for the Danish crown he died. An account of his first voyage was published at Copenhagen in 1623 as *Efterretning af Navigationen og Reisen til det Nye Danmark af Styrmand Jens Munk*, new edition by Peter Lauridsen (Copenhagen, 1883); C. C. A. Gosch, *Danish Arctic Expeditions 1605 to 1620*, vol. ii, Hakluyt Society, No. xcvii (London, 1897).

MUNK, Salomon (1803–67). A French Orientalist. He was born in Glogau, Silesia, of Jewish parents, studied Oriental languages at Berlin, Bonn, and Paris, and in 1842 was made custodian of Oriental manuscripts in the Paris National Library. He accompanied Montefiore and Crémieux to Egypt, bringing back many valuable manuscripts. Although he had become blind, he was in 1865 appointed professor of Hebrew, Chaldee, and Syriac in the Collège de France. He was a member of the Académie des Inscriptions et Belles-Lettres, and published an edition (with French translation) of the *Guide of the Perplexed* (1856–61) by Moses ben Maimon. (See Maimonides.) His further works include *Palestine* (1845) and *Philosophie chez les Juifs* (1848).

MUNKÁCS, mụn'käch. A town in the County of Bereg, Hungary, situated on the river Latorcza, 69 miles east-southeast of Kaschau (Map: Hungary, H 2). It has manufactures of coarse cloth, flour, spirits, a refinery of petroleum, and trade in lumber, cattle, and grain. In the vicinity are mined alum, iron, and crystals. The fortress of Munkács, situated on a rock near the town and used as a prison, is noted for its many sieges, especially for its defense against the Austrians, to whom it surrendered in 1688 after a siege of three years, the garrison having been commanded by Helen Zrinyi, the wife of the patriot leader Tökölyi. Pop., 1900, 14,416; 1910, 17,240.

MUNKÁCSY, mụn'kä-chē, Michael (1844–1900). An Hungarian historical and genre painter, whose real name was Michael Lieb. He was born at Munkács, Feb. 20, 1844, the son of a petty official, became an orphan at an early age, and in 1855 was apprenticed to a joiner. After several years of hard work and privation chance threw him in the way of the portrait painter Szamossy at Gyula, who aided and befriended him, as did also the landscape painter Ligeti, at Budapest, whither Munkácsy had gone in 1863. A small grant from the art society there enabled him to study for a year (1865) at the Academy in Vienna, under Rahl, after which he proceeded to Munich, where he studied under Alexander Wagner and found a special protector in Franz Adam, the battle painter. In 1868 he went to Düsseldorf to work under Knaus. Two years later his first important picture, "The Last Day of a Condemned Man" (in the collection of Mrs. W. P. Wilstach, Philadelphia), took Paris by storm, bringing him the gold medal. His future was forthwith assured, and in 1872 he took up his residence in Paris, where for several years he continued to depict episodes from the popular life of his native country with impressive truthfulness and a sombre, blackish coloring. In 1876 he entered upon a new field, painting a series of charming Paris interiors, in which he adopted a richer coloring, but his most important production of this period was "Milton Dictating Paradise Lost" (1878, Public Library, New York). It was not, however, until 1881 that he reached his own ideal with the completion of the now world-famous "Christ before Pilate" (John Wanamaker, Philadelphia), which has become one of the most widely discussed pictures of recent times. It was exhibited all over Europe and in the United States in 1886, on which occasion Munkácsy visited New York. In 1884 he painted his second biblical subject, "Christ on Calvary" (Dresden Gallery), which, like its predecessor, is replete with dramatic life, treated in the light of history with ethnographic reality. It also was brought to America in 1887, and the artist's next important work, "The Last Moments of Mozart" (1886), a touching representation of the dying composer rehearsing his famous *Requiem*, found its way into the collection of Gen. Russell A. Alger, Detroit, Mich. His subsequent creations were of a decorative character and comprise the "Apotheosis of the Fine Arts," for the Art-Historical Museum in Vienna, and "Arpád Taking Possession of Hungary" (1896), for the new House of Parliament in Budapest. In the same year he painted his last important canvas, "Ecce Homo." The strain and disappointments connected with this work brought on a mental disease, and the artist passed the last three years of his life in a sanitarium at Endenich, near Bonn, where he died, May 1, 1900. Many of the prominent public and private collections of the United States contain examples of his paintings. "The Pawnbroker's Shop," "The Music Room," and "The Two Families" are in the Metropolitan Museum, New York; "The Prowlers of the Night" is in the Pennsylvania Academy, Philadelphia, and "The Story of the Battle" in the Walters Gallery, Baltimore. Munkácsy's reputation has not been maintained at the height it reached during his lifetime, and he is frequently criticized for his overdramatic interpretation of sacred themes and for the sooty effect of his color. Consult: T. R. Tait, "Michael Munkácsy," in *American Art Review*, vol. ii (Boston, 1881); F. W. Ilges, "M. von Munkácsy," in *Künstler-Monographien*, vol. xl (Bielefeld, 1899); Tahi, in *Die Kunst für Alle*, vol. xv (Munich, 1900).

MUNN, Orson Desaix (1824–1907). An American publisher and patent attorney, born at Monson, Mass. He was educated at Monson Academy. In 1846, in conjunction with Alfred E. Beach, he established the firm of Munn & Co. and bought the *Scientific American*, which had been founded six months before and which, under this management, became one of the leading popular scientific journals in the United States. In 1876 the *Scientific American Supplement* was established, and in 1885 a monthly magazine called the *Architects and Builders Edition*, now known as *American Homes and Gardens*. Under O. D. Munn's supervision Munn & Co. became the largest firm of patent attorneys, and is now the oldest, in the United States.

MÜNNICH, mụ'nĭk, Burkhard Christoph, Count (1683–1767). A Russian general and statesman, born at Neuenhuntorf in Oldenburg, Germany. In the War of the Spanish Succession he served as captain of Hessian troops. He became a colonel in the Polish army in 1716,

entered the Russian service in 1721, and six years afterward became general. He was created commander in chief of the Russian army by Peter II in 1727 and in 1732 was made field marshal and president of the War Council. He superintended the work on the Ladoga Canal and played a distinguished part in the war with Turkey, overran the Crimea in 1736, and, advancing beyond the Dniester, made himself master of Moldavia. After the death of the Empress Anna Ivanovna in 1740, he opposed the party of Biron, the Regent, whom he overthrew. The regency was conferred on Anna Karlovna, mother of Ivan, the young heir to the throne, and Münnich became chief Minister and the most powerful man in Russia. After the coup d'état which placed Elizabeth Petrovna on the throne (1741), Münnich was arrested, and the sentence of death passed upon him was changed only at the foot of the scaffold to exile in Siberia, where he remained for 20 years. Peter III restored to him his estates in 1762, and he was made director general of the Baltic ports by the Empress Catharine. Münnich's *Diaries* have been variously published, notably by Herrmann (Leipzig, 1843). Consult: G. A. Halem, *Geschichte des Feldmarschalls Grafen Münnich* (new ed., Oldenburg, 1838); the Russian biography by N. Kostomarov (St. Petersburg, 1884); the *Memoirs* of Münnich's son, Ernest, edited by Arved Jurgensohn (Stuttgart, 1896); Jansen, *Nordwestdeutsche Studien* (Berlin, 1904).

MUÑOZ, mōō'nyôth, JUAN BAUTISTA (1745–99). A Spanish historian, born at Museros, Valencia, and educated at the University of Valencia. His leading work was *Historia del nuevo mundo* (1793), which Charles III had commissioned him to write. It follows the course of American discovery down to 1500. The council of the Indies, to which he had been appointed cosmographer (1770), forbade its publication; but Charles IV sanctioned it, despite the author's revelations concerning the atrocious treatment of the aborigines by Spaniards in the New World. Some writings of Muñoz are to be found in the collections of the Academy of History, Madrid, but many of his manuscripts were burned in the library of Valencia when that city was stormed by the French (1812).

MUNRO, mŭn-rō', DANA CARLETON (1866–). An American historian, brother of Wilfred Harold Munro, born at Bristol, R. I. He was educated at Brown University (A.M., 1890) and at the universities of Strassburg and Freiburg (1889–90). He was instructor and assistant professor of Roman and mediæval history at the University of Pennsylvania from 1893 to 1902 and then professor of European history at the University of Wisconsin until 1915, when he accepted a chair at Princeton. In 1904–06 also he directed the summer sessions of the University of Wisconsin. From Brown he received the degree of L.H.D. in 1912. He served as editor of *Translations and Reprints from the Original Sources of History* (1894–1902); was author of *A Syllabus of Mediæval History* (7th ed., 1913), *A History of the Middle Ages* (1902), and *A Source Book of Roman History* (1904); coauthor of *Mediæval Civilization* (1904, 1906) and *Essays on the Crusades* (1902); and editor of the department of mediæval history for the NEW INTERNATIONAL ENCYCLOPÆDIA.

MUNRO, DAVID ALEXANDER (1845–1910). An American editor and Greek scholar. He was born at Maryburgh, Scotland, and graduated M.A. from the University of Edinburgh in 1872. Subsequently he came to New York City, where he was employed in the literary department of Harper and Brothers. He edited *Garden and Forest* in 1887–89, and then became connected with the *North American Review*, of which he was general manager in 1889–96, editor in 1896–99, and thereafter assistant editor until his death. He supervised the American contributions to an edition of *Liddell and Scott's Greek Lexicon;* arranged the comparative *Greek-English New Testament* for Harper and Brothers; and collaborated on Dr. Schaff's *Companion to the Study of the Greek New Testament.*

MUNRO, HUGH ANDREW JOHNSTONE (1819–85). An eminent English classical scholar. He was born in Elgin, Scotland, was educated at Shrewsbury School, under B. H. Kennedy (q.v.), and at Trinity College, Cambridge. From 1869 to 1872 he served as the first university professor of Latin at Cambridge. His edition of Lucretius (1864; 4th ed., 1885), with commentary and prose translation, remains one of the standard English contributions to Latin scholarship. His edition of Horace (1868), containing a valuable introduction and illustrations from ancient gems (selected by C. W. King), and his *Criticisms and Elucidations of Catullus* (1878; 2d ed., 1905) are also highly esteemed. Munro contributed to the *Journal of Philology* and other learned periodicals, on Greek subjects (Aristotle, Euripides), as well as Latin, and wrote much Greek and Latin verse, to be found in the volume known as *Sabrinæ Corolla,* published by B. H. Kennedy, and *Translations into Greek and Latin Verse* (1884). Consult J. E. Sandys, *A History of Classical Scholarship,* vol. iii (Cambridge, 1908), and J. D. Duff, in preface to a new edition of Munro's translation of Lucretius (Bohn Classical Library, London, 1908).

MUNRO, NEIL (1864–). A Scottish novelist, born at Inveraray, Argyllshire, and educated at the parish school. Subsequently he entered the office of the Glasgow *Evening News.* The author of tales and romances dealing with life in the Scottish Highlands, Munro received the degree of LL.D. from Glasgow University. His writings include: *The Lost Pibroch* (1896); *John Splendid* (1898); *Gilian, the Dreamer* (1899); *Doom Castle* (1901); *Children of the Tempest* (1903); *The Clyde* (1907); *Fancy Farm* (1910); *Ayrshire Idylls* (1913); *The New Road* (1914).

MUNRO, or **MONRO,** ROBERT (?–c.1680). A Scottish soldier. Between 1626 and 1638 he served in continental wars under the King of Denmark and under Gustavus Adolphus. He then joined his countrymen in their rebellion against Charles I. In 1642 he had charge of an expedition against the Catholic rebels in Ireland. When the Civil War broke out the English Parliament in 1644 placed Munro in command of the Parliamentarians in Ulster. He captured Belfast in that year, but in 1646 was routed in the battle of Benburb by the Irish leader, Col. Owen Roe O'Neill. When Ormonde, Charles's lieutenant general in Ireland, made peace with Parliament, Munro and his Scottish followers refused to surrender Carrickfergus and Belfast and to return to Scot-

land. Thereupon Munro was taken prisoner by Monk in 1648, was confined in the Tower of London for five years, and thereafter lived on his wife's estates in Ireland.

MUNRO, Robert (1835–1920). A Scottish anthropologist and archæologist. He was born in Ross-shire and was educated at the University of Edinburgh, studying medicine. He was a practicing physician at Kilmarnock until 1886, after which he devoted himself entirely to prehistoric archæology. He was lecturer on archæology in 1888 and 1910 at Glasgow and on anthropology at Edinburgh in 1911, and from 1888 to 1899 was secretary of the Society of Antiquaries of Scotland. At Edinburgh he founded the Munro lectureship on anthropology and prehistoric archæology. Munro wrote: *Ancient Scottish Lake-Dwellings or Crannogs* (1882); *The Lake-Dwellings of Europe* (1890; in French, 1908); *Rambles and Studies in Bosnia-Herzegovina and Dalmatia* (1895; 2d ed., 1900); *Prehistoric Problems* (1897); *Prehistoric Scotland* (1899); *Man as Artist and Sportsman in the Paleolithic Period* (1904); *Munro Lectures: Paleolithic Man* (1912; delivered 1911 at Edinburgh); *Prehistoric Britain* (1914).

MUNRO, Sir Thomas (1761–1827). A British soldier and administrator. He was born in Glasgow and was educated at the university there. Having decided to enter the service of the East India Company, he went to Madras in 1780, but was soon compelled to serve in the campaign against Hyder Ali (q.v.). After further military service, chiefly under Lord Cornwallis, Munro had his first experience as an administrator, though in a subordinate position, in Baramahal, a district ceded in 1792 by Tippu Sahib (q.v.), son of Hyder Ali. His sound judgment, together with his attentive sympathy with the natives, was shown in a number of reforms which ultimately were adopted throughout a large part of British India. Chief among these was the ryotwar land tenure, providing for small holdings from the government by paying a land tax. Another test of his ability was found as administrator successively of the Canara, Ballari, Cuddapah, and Karnul districts, and the Palnad. He put down rebellion, suppressed crime and extortion, and applied his enlightened ideas with vigor and success. His sound views as to the larger policy by which the East India Company could maintain its power while governing with justice brought him into close consultation with the authorities in London, to which he returned in 1807, remaining there seven years. Again, in 1814, he went to Madras for the purpose of organizing a judicial and police system. He took part in the second Mahratta war, after which he went once more to England, returning in 1819 as governor of Madras. This position he held until 1826. Consult John Bradshaw, *Life of Sir Thomas Munro*, in the "Rulers of India Series" (London, 1894).

MUNRO, Wilfred Harold (1849–). An American historian, brother of Dana C. Munro. He was born at Bristol, R. I., and was educated at Brown University (A.B., 1870; A.M., 1873) and at Freiburg and Heidelberg. He was a master (1870–71) and president (1881–89) of De Veaux College at Niagara Falls, N. Y.; associate principal of St. Mark's School at Salt Lake City (1871); spent 1873 in South and Central America; and in 1875–79 served as principal of the Le Roy (N. Y.) Academic Institute. At Brown he was associate professor of history and director of university extension in 1891–99, and professor of European history from 1899 until his retirement in 1911. He is author of *The History of Bristol, R. I.* (1880); *Picturesque Rhode Island* (1881); *The Most Successful American Privateer* (1913); *Some Legends of Mount Hope* (1915); and is editor of *Works of W. H. Prescott* (22 vols., 1905–06) and *Record Book of the Rhode Island Society of Mayflower Descendants* (1911).

MUNRO, William Bennett (1875–). An American authority on municipal government. He was born at Almonte, Ontario, Canada, and was educated at Queen's University, Kingston (B.A., 1895; M.A., 1896), Edinburgh (LL.B., 1898), Harvard (Ph.D., 1900), and Berlin (1900–01). He was instructor in history and political science at Williams College in 1901–04, and at Harvard he served as instructor in government in 1904–06, as assistant professor in 1906–12, and thereafter as professor of municipal government. He became president of the Harvard Coöperative Society, university editor of the *Harvard Graduates' Magazine*, and associate editor of the *American Political Science Review*. He is author of *Canada and British North America* (1904); *The Seigniorial System in Canada* (1907); *Documents Relating to the Seigniorial Tenure* (1908); *The Government of European Cities* (1909); *Initiative, Referendum, and Recall* (1911); *Government of American Cities* (1912; new ed., 1913).

MUNROE, mŭn-rō′, Charles Edward (1849–). An American chemist and educator. He was born at Cambridge, Mass., graduated from the Lawrence Scientific School (Harvard) in 1871, and in the same year became assistant in chemistry. From 1874 to 1886 he was professor of chemistry at the United States Naval Academy, and then devoted himself to the study of explosives. In 1886 he was appointed chemist to the torpedo corps at Newport, R. I., and in 1892 received a chair in chemistry and the post of senior dean in Columbian (now George Washington) University. He served as president of the American Chemical Society in 1898, and was special agent of the United States Census Bureau in 1900, 1905, and 1910. Munroe invented a smokeless powder, and attained a reputation as an authority on explosives. His publications include: *An Index to the Literature of Explosives* (1886); *Lectures on Chemistry and Explosives* (1888); *A Primer on Explosives for Coal Miners* (1909; 1911).

MUNROE, Henry Smith (1850–). An American mining engineer. He was born in Brooklyn and was educated at Columbia University (M.E., 1869; Ph.D., 1877). He served as an assistant geologist of the Ohio State Geological Survey in 1870–71 and as assistant chemist of the United States Department of Agriculture in 1870–72; participated in a geological survey of Yezo, Japan, in 1872–75; and was professor of geology and mining at the University of Tokyo in 1875–76. At Columbia he was adjunct professor of surveying and practical mining in 1877–91 and professor of mining until his retirement in 1915, a member of the university council after 1895, and dean of the faculty of applied sciences in 1897–99. He was president of the Mining and Metallurgical Society of America in 1908–09 and of the

Society for the Promotion of Engineering Education in 1909.

MUNROE, KIRK (1850–). An American writer of books for boys, born near Prairie du Chien, Wis. He studied civil engineering at Harvard and while professionally engaged on the routes of the Northern and the Southern Pacific railways gained material for many of his tales. Afterward he worked for various newspapers in New York City, and was the first editor of *Harper's Round Table* (1879–82). After his marriage to a daughter of Amelia Barr, the novelist, he went to reside in southern Florida, a district that often colored his writings, which include: *The Flamingo Feather* (1887); *Dorymates* (1889; new ed., 1903); *Cab and Caboose* (1892; new ed., 1913); *Canoemates* (1892; new ed., 1903); *Raftmates* (1893, 1903); *The Fur Seal's Tooth* (1893); *At War with Pontiac* (1895); *With Crockett and Bowie* (1897); *Under the Great Bear* (1900); *The Belt of Seven Totems* (1901); *The Outcast Warrior* (1905); *For the Mikado* (1906).

MUN'SEE. A subtribe of the Delaware (q.v.), originally constituting one of the three great divisions of that tribe and dwelling along the upper streams of the Delaware River and the adjacent country in New York, New Jersey, and Pennsylvania. They were considered the most warlike portion of the tribe and assumed the leadership in war councils. From their principal totem they were frequently called the Wolf tribe of the Delaware. They were prominent in the early history of New York and New Jersey, being among the first tribes of that region to meet the whites. By a noted fraudulent treaty known as the Walking Purchase, the main body was forced to remove from the Delaware River about the year 1740. They settled on the Susquehanna, on lands assigned them by the Iroquois, but soon afterward moved westward and joined the main Delaware tribe on the Ohio River, with whom the greater portion eventually became incorporated. A considerable body, who were converted by the Moravian missionaries, drew off from the rest and formed a separate organization, most of them removing to Canada during the Revolution. Others joined the Ojibwa and Stockbridge Indians. The majority were incorporated in the Delaware, with whom they participated in their subsequent wars and removals. Those who still keep the name of Munsee are in three bands, two of which are consolidated with other tribal fragments, so that no separate census is available. These tribes are the Munsees of the Thames, Ontario, Canada; Munsee (or Christian) and Chippewa, northeastern Kansas; and Stockbridge and Munsee, Green Bay Agency, Wis. According to the census of 1910 there are 71 in the United States.

MUNSELL, mŭn'sĕl, JOEL (1808–80). An American editor, publisher, and antiquary, born at Northfield, Mass. He settled in Albany, N. Y., in 1827, as a printer, and passed from that occupation to journalism. He subsequently became the editor of various publications, among which were the *New York State Mechanic,* the *Lady's Magazine,* and the *New England Historical and Genealogical Register.* He rendered valuable services to the cause of American history by publishing the *Annals of Albany* (10 vols., 1849–59); *Collections on the History of Albany* (4 vols., 1855–57); and a series of books, some of considerable value, known as the "Munsell Historical Series." The owner of a very large collection of books on the history of printing in the United States, Munsell wrote *Outlines of the History of Printing* (1839) and *A Chronology of Paper and Paper-Making* (1856; 3d ed., 1876).

MUNSEY, mŭn'sĭ, FRANK ANDREW (1854–). An American publisher, born at Mercer, Me. In 1882 he established at New York City the *Golden Argosy,* afterward changed to the *Argosy.* In 1889 he founded *Munsey's Weekly,* which he changed to the monthly *Munsey's Magazine* in 1891. The last-named periodical was the pioneer among ten-cent magazines. He also founded the *Puritan* and the *Junior Munsey,* and some time after purchased the Washington *Times* (1901); the New York *Daily News,* which he conducted from 1901 to 1904; the Boston *Journal* (1902); the Baltimore *News;* the Philadelphia *Evening Times,* which was discontinued in 1914; and the New York *Press.* He became publisher also of the *All-Story Magazine,* the *Scrap Book,* the *Cavalier,* the *Railroad,* and *Current Mechanics.* When the new Progressive party was organized in 1912 Munsey became one of its most ardent supporters and one of the largest contributors to its campaign expenses. He is author of *Afloat in a Great City* (1887); *The Boy Broker* (1888); *Under Fire* (1890); *Derringforth* (1894).

MUNSON, mŭn'son, JAMES EUGENE (1835–1906). An American inventor, born at Paris, Oneida Co., N. Y. He studied for a time at Amherst, then removed to New York City, where he became a court stenographer, a position which he held for more than 30 years. He formulated the Munson system of stenography and invented an automatic typesetting machine and a mechanism for operating typewriting machines by telegraph. His publications include: *Complete Phonographer* (1866; rev. ed., 1894); *Dictionary of Practical Phonography* (1874; 2d ed., 1906); *The Phrase-Book of Practical Phonography* (1889); *Phonographic Dictation Book* (1904); *A Shorter Course in Munson Phonography* (1901; 2d ed., rev., 1912).

MÜNSTER, mun'stĕr. The capital of the Prussian Province of Westphalia, situated in a level district on the Aa and on the Dortmund-Ems Canal, 65 miles northeast of Düsseldorf (Map: Germany, B 3). The town is mediæval in appearance, with its ancient gabled buildings, old Renaissance houses, rococo dwellings of the eighteenth century, arcaded markets, and shaded allées. The site of the former fortifications, which divided the old and new towns, has been converted long since into promenades. Münster has many churches, of which two are prominent —St. Lambert's and the cathedral. The former is a graceful, pleasing structure. It is Gothic, dates from the fourteenth century, has been restored in recent times (since 1868), and possesses a majestic new tower 312 feet high. The church is associated with the history of the Anabaptists in the sixteenth century. The cathedral (thirteenth century) is a striking edifice, but disfigured with modern decorations. The imposing Gothic church of Our Lady (c.1340) also merits mention as well as the beautiful Romanesque tower of St. Ludger's (1170).

The Rathaus is a handsome, gabled, fourteenth-century Gothic structure. The Peace of Westphalia was signed in it in 1648, in a curious room called the Friedenssaal, which con-

tains portraits said to have been painted by Terburg. Among the interesting old buildings are also the Renaissance Weigh House; the Renaissance Stadtkeller, the headquarters of the Kunstverein, with pictures of minor value; and the Schuhhaus, or the ancient guildhall of shoemakers. The castle (1767) was formerly the episcopal residence and is now occupied by civil officials. In its grounds is a botanical garden. The government offices, the law courts, and the attractive Gothic post office are modern. The modern Ludgerus Fountain is adorned with interesting religious statues. The Roman Catholic university, which ceased to exist as such in 1818, when the institution was reduced to a theological and a philosophical faculty (which figured as the Academy of Münster from 1843), was revived in 1902 by the establishment of a faculty of law. (See MÜNSTER, UNIVERSITY OF.) Other educational institutions include three Gymnasia, a Realgymnasium, a Realschule, etc. Noteworthy also are the royal pedagogical seminary, a seminary for priests, a museum of Christian art. There is a notable zoölogical garden, which is much frequented by the citizens and contains an antiquarian collection. The industrial products of Münster include leather, linen and cotton fabrics, starch, thread, and sugar. There are also carriage works, breweries, and distilleries. A large trade is carried on in the produce of the country. The population in 1871 was 24,815; in 1901, 63,776; in 1903 certain suburbs were annexed to the commune, so that the 1905 census showed 81,439 inhabitants, of whom 58,632 were returned as Roman Catholic and 10,711 as Evangelical; the 1910 census disclosed a population of 90,254.

History. Münster had its origin in a celebrated monastery which appears as early as the time of Charles the Great. A considerable settlement sprang up around the monastery in the first part of the twelfth century. The town received municipal rights about 1180, and in the course of many years the inhabitants succeeded in vindicating their liberties as against their feudal lords, the bishops of Münster. In the thirteenth century Münster entered the Hanseatic League. In the fifteenth century it became a centre of learning and religious life, and during the Reformation suffered greatly from the strife of parties. In 1533 Münster fell into the power of the Anabaptists, whose leader, the celebrated John of Leyden (q.v.), erected the city into a kingdom of Zion with himself as sovereign (1534). The city was taken by the Bishop in the following year, and John of Leyden was put to death. Against the ambitious and warlike Bernhard of Galen, Bishop of Münster, the city carried on a desperate struggle in defense of its rights, but it was finally compelled to submit with the loss of almost all its liberties (1661). The bishopric of Münster, which held a prominent place among the ecclesiastical states of the old German Empire and embraced a territory of nearly 4000 square miles, was secularized in 1803.

MUNSTER, mŭn'stẽr. The largest of the four provinces of Ireland, occupying the southwest part of that country and bounded north by Connaught, east by Leinster, and west and south by the Atlantic (Map: Ireland, C 7). It contains the six counties of Clare, Cork, Kerry, Limerick, Tipperary, and Waterford. Area, 9532 square miles. Pop., 1841, 2,404,460; 1901, 1,076,188; 1911, 1,035,495, almost entirely Roman Catholics.

MÜNSTER, SEBASTIAN (1489–1552). A German theologian and geographer. He was born at Ingelheim, studied at Heidelberg and Tübingen, and in 1529 left the Catholic church for the Reformed. He was professor of theology and Hebrew at Heidelberg until 1536, when he became professor of mathematics at Basel. He edited in 1534–35 the first Hebrew Bible to appear under the care of a German. But his chief work was his *Cosmographia* (1544), a geography which was translated into Italian, French, and Latin, and passed through 24 editions in 100 years.

MÜNSTER, mụn'stẽr, UNIVERSITY OF. One of the more recently established Prussian universities, although historically it is connected with numerous efforts to establish such an institution in Münster. The Jesuits conducted there in 1588 the Gymnasium Paulinum, and university privileges were obtained from the Pope in 1629 and from the Emperor in 1631, without, however, much result. Another papal bull was obtained in 1773, but war and lack of endowments prevented any advance, which was further delayed by the establishment of the University of Bonn in 1808. An Akademische Lehranstalt was maintained at Münster, with chairs in law and theology (Catholic). New chairs were added from time to time after 1875, together with museums, laboratories, and other equipment. In 1900 funds were raised by the city and the Province of Westphalia; in 1902 the faculties of theology, philosophy, and law and political science were given the rank of university, which in 1907 received the title of the Westfälische Wilhelms-Universität. A complete medical faculty has not yet been established, but five semesters of medical work are provided. The enrollment in 1913 was 2356. The university library contains 224,709 volumes, about 175,000 pamphlets, as well as a large number of incunabula and manuscripts.

MÜNSTERBERG, mụn'stẽr-bẽrk, HUGO (1863–1916). A German-American psychologist, born in Danzig. He received the degree of Ph.D. at Leipzig in 1885 and that of M.D. at Heidelberg two years afterward and taught psychology at Freiburg for five years (1887–92). In 1892 he became professor of psychology and director of the psychological laboratories at Harvard University. In 1910–11 he was Harvard exchange professor at the University of Berlin. Münsterberg served as president of the American Psychological Association (1898) and as vice president of the International Congress of Arts and Sciences (St. Louis, 1904) and of the International Philosophical Congress (Heidelberg, 1908). Münsterberg was the organizer and first director of the Amerika-Institut of the German Government (1910–11) and became a fellow of the American Academy of Arts and Sciences. His early interests were mainly in the field of physiological psychology; but in later years he devoted himself in part to problems of idealistic philosophy and in part to the application of psychological laws to the problems of everyday life. As a result of the latter interest he published a number of books in popular style dealing with the psychology of testimony, of medicine, of education, etc., and he finally undertook a systematic treatment of applied psychology under the name

of psycho-technics. His more important publications are: *Die Willenshandlung* (1888); *Gedankenübertragung* (1889); *Der Ursprung der Sittlichkeit* (1889); *Beiträge zur experimentellen Psychologie* (1891); *Psychology and Life* (1899); *Grundzüge der Psychologie* (1900); *American Traits* (1901); *The Americans* (1904); *Eternal Life* (1905); *Science and Idealism* (1906); *On the Witness Stand* (1907); *Psychotherapy* (1908); *Philosophie der Werte* (1908); *The Eternal Values* (1909); *Psychology and the Teacher* (1909); *American Problems* (1910); *Psychology and Industrial Efficiency* (1912); *American Patriotism* (1913); *Grundzüge der Psychotechnik* (1914); *Psychology, General and Applied* (1914); *The War and America* (1914); *The Peace and America* (1915). After 1903 Münsterberg edited the *Harvard Psychological Studies.*

MÜNSTER-LEDENBURG, mụn'stẽr-lā'den-bụrk, Ernst Friedrich Herbert, Count zu (1766–1839). A Hanoverian statesman. He was born at Osnabrück, studied at Göttingen, and in 1788 entered the governmental service of Hanover. For three years (1801–04) he was Ambassador to St. Petersburg, and as Cabinet Minister at London immediately afterward did much to bring about the entente between Russia and England against Napoleon. In 1813–14 he was at the headquarters of the allied forces, and he was a member of the Vienna Congress (1814–15). In Germany his programme was progressive, but anti-Prussian; the constitution of the Kingdom of Hanover and its formation in the midst of Prussia may be considered typical of his policy. In 1831 Münster retired from office. Consult Hormayr, *E. F. H. Graf Münster* (Jena, 1875).

MÜNSTER-LEDENBURG, Georg Herbert, Count zu; also Baron of Grotthaus and Prince of Derneberg (1820–1902). A German diplomat, son of the foregoing, born in London, England. He was educated at Bonn, Heidelberg, and Göttingen, served for a time in the first chamber of the Hanoverian Parliament, and from 1857 to 1865 was Envoy Extraordinary of the Government of Hanover at the court of St. Petersburg. After the annexation of Hanover to Prussia in 1866 he declared himself pro-Prussian, and from 1867 was a member of the Upper House. He represented Goslar in the Diet of the North German Confederation from 1867 to 1870 and in the German Reichstag from 1871 to 1873. He became Ambassador at London in 1873, at Paris in 1885, and in 1900 retired from the diplomatic service. In 1899 he was a member of the Peace Conference at The Hague. He wrote several works on contemporary German and continental public affairs, including *Politische Skizzen über die Lage Europas vom Wiener Kongress bis zur Gegenwart* (1867) and *Der norddeutsche Bund und dessen Uebergang zu einem deutschen Reiche* (2d ed., 1868).

MUNTANER, mo͞on'tȧ-nâr', En Ramón (1265–1336). A Spanish chronicler, born at Peralada in Catalonia. He became a wandering soldier and minstrel and for 30 years led an adventurous life, serving with Roger de Flor in Sicily (1300), with the celebrated Almogávares against Asia Minor, and becoming Governor of Gallipoli and later of Jerba. Returning to Catalonia, he began in 1325 to write in Catalan the history of the princes of Aragon from the time of James the Conqueror to the coronation of Alfonso IV. This chronicle of great events, of which he was an eyewitness, is valuable for the history of his time and is remarkable for its accuracy. It remained in manuscript until the middle of the sixteenth century. The most ancient editions of the original are those of Valencia (1558) and Barcelona (1562). The former is entitled *Chronica o descripcio dels fets e hazanyes del inclyt Rey Don Jaume Primer . . . e de molts de sos descendens, etc.* It has been translated into German, Italian, and French. Karl Lanz published an edition of the original in 1844, *Chronik des edlen En Ramon Muntaner* (vol. viii, Bibliothek des literarischen Vereins in Stuttgart, 1844). Consult also the edition by A. de Bofarull (Barcelona, 1860).

MUNTHE, mụn'te, Gerhard Peter Frants Wilhelm (1849–). A Norwegian decorative painter and illustrator, born in Elverum. He was educated in Christiania, Düsseldorf, Munich, and Paris. Returning home (1883) as a pronounced realist, he painted the brilliant "Haymaking" (1884), "The Peasant's Garden" (1886), and "From Eggedal" (1888), all in Christiania Gallery. As a result of his studies of Old Norse art he exhibited in 1893 "Eleven Fantasies Illustrating Norwegian Fairy Tales," decorative water colors, among which are "Afraid in the Dark," "The Lovers," and "The Horse of the Goddess Hel." These were reproduced in tapestry and became very popular. In the Royal Castle, Christiania, hang his "State-Tapestries" ("The Golden Portal," "King Sigurd and Balduin"). Munthe decorated residences, art institutions, and King Haakon's Hall, Bergen, and illustrated, among other books, Snorri's *Saga.* "From Nitedal" (1905, Christiania Gallery) and "Bergen from Flöifjeldet" are representative of his later landscapes.

MUNTHE, Ludvig (1841–96). A Norwegian landscape painter, born at Aaröen, near Bergen. He was first given instruction by Schiertz, a German painter and architect at Bergen, and then became a pupil of Flamm at Düsseldorf, which he subsequently selected for his permanent residence. A thoroughly realistic treatment characterizes his paintings, of which autumn and winter scenes in stormy or gloomy weather, forest and coast views form the prevailing subjects, and which may be judged by such specimens as a "Pine Forest in Winter" (1870), Hamburg Gallery; "Wood Interior in Winter, with Stags" (1878), National Gallery, Christiania, which was awarded the gold medal in Paris; "Birch Wood in Autumn" (1886) and "Autumn in Holland" (1895), both in National Gallery, Berlin. He was appointed Swedish court painter and Prussian professor.

MUNT'JAC (Javanese name). Any of a genus (*Cervulus*) of small Oriental deer which dwell solitarily in the jungle and whose young are spotted. The species best known is that of India, called barking deer by Anglo-Indian sportsmen, or kakar (*Cervulus muntjac*) by the Hindustani. It is a little larger than a roebuck. Its lyrate antlers are peculiar in that they rise from pedicels about 5 inches high, or as long as the antler itself, and have only one short basal spur. The female has no antlers, nor has she the great exposed upper canine tusks, which, like those of the musk, are the effective weapons of the bucks in their fights. Allied species, some with smaller horns, are found in China and the Malayan islands, and an interesting fossil genus (*Amphitragulus*), in-

habiting Tertiary Europe, was totally hornless in both sexes. See Plate of FALLOW DEER, MUSK, ETC., with the article DEER.

THE INDIAN MUNTJAC.

MÜNTZ, mụnts, CHARLES ACHILLE (1846–). A French agricultural chemist, brother of Eugène Müntz. He was born at Sulz, Alsace, studied under Boussingault at Paris, and after acting as his assistant for 10 years, succeeded him as director of the chemical laboratories of the Institut National Agronomique. Müntz became a member of the Institute of France. The reports of his investigations, published largely in *Annales de l'Institut National Agronomique*, *Annales Agronomique*, *Annales de la Science Agronomique*, and *Comptes Rendus de l'Académie des Sciences*, include important contributions to such diverse subjects as nitrification; soils, fertilizers, and plant nutrition; foods, feeds, and animal nutrition; viniculture; irrigation; and sewage purification and utilization in agriculture. Müntz was associated with Schlösing in some of the earliest work on nitrification, and together they were the first (1877) to establish by experiment the true nature of nitrification, viz., that it is a biological rather than a purely chemical process. He made feeding experiments with large numbers of cattle and horses, and vinicultural experiments in a large number of vineyards, publishing important reports on these subjects (*Recherches sur l'alimentation des chevaux*, with Girard, 1884, and *Les vignes*, 1895). With Girard he is the joint author of a large treatise on fertilizers, *Les engrais* (1888–91). Other subjects upon which Müntz and his associates published notable reports are the effect of late irrigation on grapes (1899), agricultural value of the soils of Madagascar (1901), nitre and the national defense (1905), intensive nitrification and high-yielding nitre beds (1907), diffusion of fertilizer salts in the soil (1908), purification of sewage by means of peat beds (1909).

MÜNTZ, EUGÈNE (1845–1902). A French art critic, brother of Charles Achille Müntz, born at Sulz, Alsace. He took Taine's place as professor of the history of art at the Ecole Nationale des Beaux-Arts, where he lectured from 1885 to 1893 and filled other important positions. One of the first in France to treat the history of art as a science, he made a specialty of Italian art, and the following works are of unique value: *Notes sur les mosaïques de l'Italie* (1874–92); *Les arts à la cour des papes pendant le XVème et le XVIème siècle* (1878–98); *Raphaël* (1881; revised, 1885; new ed., 1900; Eng. ed., London, 1882); *Les précurseurs de la Renaissance* (1881); *Histoire de la tapisserie* (1882; 5th ed., 1903); *Etudes sur l'histoire de la peinture et de l'iconographie chrétiennes* (1882); *Histoire de l'art pendant la Renaissance* (3 vols., 1888–95); *Léonard de Vinci* (1899); *Pétrarque* (1901). He also contributed important articles to the *Gazette des Beaux-Arts* and other periodicals, and was a member of both the Academy and the Superior Council of the Fine Arts.

MÜNZER, mụn'tsēr, THOMAS (c.1489–1525). A religious enthusiast, communist, and popular leader of the German Reformation, born at Stolberg in the Harz Mountains. He acquired a good knowledge of theology, taught at Aschersleben and Halle, became in 1519 chaplain of a nunnery at Beutwitz, and in the following year received a call as preacher to Zwickau. There he gained great popularity by his attacks on the monastic and mendicant orders. In 1521 he was compelled to leave the town, and went to Bohemia, where his preaching, however, met with little sympathy. In 1523 he became pastor at Allstedt in Thuringia, married a nun who had abjured her vows, and carried on his pastoral work in full sympathy with the advanced representatives of the Reformation. He was an ardent champion of German nationality, and was the first to substitute German for Latin in the liturgy. He stood in close touch with Carlstadt and shared the latter's radical ideas. In time he developed a fanatic mysticism whose chief tenet was the validity of inner revelation, and he attacked as "new papists" those reformers who set up the gospel above personal justification. His ideas partook also of a political and social nature; he preached the speedy coming of God's kingdom on earth, and sought to organize the peasants and the artisans of the towns into secret associations looking, it is asserted, to the destruction of all authority and the establishment of communal property. In August, 1524, he was expelled from Allstedt and betook himself to Mühlhausen, where he joined forces with Heinrich Pfeifer, a renegade monk, who had succeeded in gaining great influence over the lower classes. Together they were driven from the city in September, and Münzer wandered through southern Germany and Switzerland, forming close relations with the Anabaptist leaders and hastening in no small degree the peasant uprising in those regions. He returned to Mühlhausen in December and, with Pfeifer, who had likewise reëntered the city, assumed leadership of the discontented masses. The old council was overthrown and a new council was installed under the control of Münzer. Mühlhausen speedily became the centre of a violent agitation. The opposition of the nobles was ineffectual; but at Frankenhausen, on May 15, 1525, Münzer's peasant mob was almost annihilated by the force of Philip of Hesse, the Elector of Saxony, and the Duke of Brunswick. (See PEASANT WAR.) Münzer escaped from the battlefield, but was captured at Frankenhausen and taken to the castle of Heldrungen, where he was put to the torture. On May 25 he was decapitated at Mühlhausen, together with Pfeifer and 24 other leaders of the peasants. Fanatic though he undoubtedly was, there is nothing to disprove Münzer's warm love for the common people, whose cause

he upheld against Luther, accusing the latter of fawning on the German princes while seeking to appease the peasants with empty words about the responsibility of rulers to God. Consult: Strobel, *Leben, Schriften und Lehren Thomas Münzers* (Nuremberg, 1795); Seidemann, *Thomas Münzer* (Dresden, 1842); also critical bibliography and article by Alfred Stern in *Allgemeine deutsche Biographie*, vol. xxiii (Leipzig, 1886); O. Merz, *Thomas Münzer und Heinrich Pfeiffer* (Göttingen, 1889); J. S. Schapiro, *Social Reform and the Reformation* (New York, 1909).

MUNZINGER, mun'tsĭng-ẽr, Werner (1832–75). A Swiss traveler and linguist. He was born at Olten, was educated at Bern, Munich, and Paris, and in 1852–53 was connected with a mercantile establishment at Alexandria, Egypt. He was attached to the expedition of Von Heuglin in 1861, but quitted it when it reached north Abyssinia, and in company with Kinzèlbach explored an unknown territory. In 1862 he was placed at the head of the German exploring expedition, succeeding Heuglin, but was unable to penetrate farther than Kordofan. In 1865 he was appointed British Consul at Massowah and in the Anglo-Abyssinian War acted as a guide to the English forces, after whose withdrawal he remained at Massowah as Consul in the French service. In 1870 he made a journey to southeast Arabia, and was appointed by the Khedive Governor of Massowah (1871). In 1872 he was made Pasha and Governor-General of the eastern Sudan, and in 1875 was mortally wounded while leading an expedition against Abyssinia. He published: *Sitten und Recht der Bogos* (1859); *Ostafrikanische Studien* (1864; 2d ed., 1883); *Vocabulaire de la langue Tigré* (1865); *Die deutsche Expedition in Ostafrika* (1865).

MUONGS, mōō'ŏngz. A people who, together with the Thos, also dwelling in northeastern Tonkin and Annam and the adjoining parts of China, constitute, in the opinion of some leading anthropologists, one of the four chief groups of the Tai stock, of which the Siamese are the best-known members. The Farther Indian Muongs inhabit the basin of the Black River, and the Thos that of the Claire, while the great mass of the primitive population of the Chinese provinces of Kwangsi, southern Kweichow, northwestern Kwangtung, eastern Yunnan, and perhaps also the Le of the island of Hainan, belong in this group of primitive Tai peoples. The Pueun and Pu-tai of Annamese Laos closely resemble in physical characteristics and language the Muongs of Tonkin. A number of the Thos-Muongs tribes have methods of writing of their own resembling those of the Laotians, and apparently not derived from Chinese, even in the case of the tribes of this group resident in China. Like some others of the primitive population of this part of the world, they impress one as being rather non-Mongolian in physical characters. Their eyes, especially, are often almost straight.

Bibliography. Baber, *Travels in Inland and Western China* (London, 1882–86); A. R. Colquhoun, *Across Chryse* (ib., 1883); B. C. Henry, *Ling-Nam* (ib., 1886); Bourne, *Journey in Southwestern China* (ib., 1888); Alexander Hosie, *Three Years in Western China* (ib., 1890); Frédéric Garcin, *Au Tonkin: Un an chez les Muongs* (Paris, 1891).

MURA, mōō'rà. A populous but inferior tribe of Tupian stock (q.v.), residing along the Amazon River, Brazil, from the confluence of the Madeira as far as the Purús. They were formerly very formidable and hostile to the Portuguese, but were completely crushed by the Mundurucú (q.v.) in 1788. Since that time some of them have come into the Portuguese settlements for protection and have acquired a rudimentary civilization; but those of the interior and upon the Purús are still in their original savage condition. Their houses, grouped in small villages, are mere roofs supported upon poles, without walls. They do not cultivate the ground, but live upon fish, game, and wild fruits, using bows six feet long, spears, and well-made canoes. They are much addicted to a sort of narcotic snuff prepared from the seeds of a species of mimosa. They were formerly naked, but those near the settlements now wear clothing. They carry on a trade with the Brazilians in sarsaparilla, turtle oil, and Brazil nuts, in exchange for cotton cloth, knives, spear and arrow heads. They are described as lazy, drunken, dishonest, and quarrelsome, and are among the lowest of all the Amazonian tribes.

MURAD, mōō'rȧd. The name of five Turkish sultans. See Amurath.

MURADABAD, mōō'rŭd-ȧ-bȧd', or **MORADABAD.** The capital of a district of the same name, United Provinces, British India, on an elevation on the right bank of the Ramganga, 50 miles northwest of Bareilly (Map: India, D 3). Its chief features are the great mosque, built in 1631, an American Methodist mission church, built in 1874, and the Anglican church of St. Paul. The cantonment and civil administrative offices are on the northwest. Muradabad is noted for its engraved brass ware, has cotton factories and many printing establishments. There is an extensive trade in sugar, wheat, rice, and other products of the district. The town is administered by a municipal council of 23 members, 18 of whom are elected. Muradabad was founded by Rustam Khan in 1625. The ruins of his fort, with brick walls from 4 to 6 feet in thickness, overlook the river. Pop., 1901, 75,128; 1911, 81,168.

MURÆNA, mû-rē'nȧ. A fish. See Moray.

MURAI CHŪZEN, mōō'rī' chōō'zĕn'. A Japanese physician and mathematician of the eighteenth century. He wrote the *Kaishō Tempei Sampō* (1765), which treated of the solution of numerical higher equations. His *Sampō Dōshi-mon* (1781) is noteworthy because of its treatment of circulating decimals.

MU'RAL CIRCLE. An astronomical instrument formerly used for measuring the declinations of stars. The principle of its construction was somewhat similar to that now used for the meridian circle, by which it has been replaced. See Meridian Circle.

MURAL CROWN. In heraldry, a crown in the form of the top of a circular tower, masoned and embattled, conferred on one who was the first to mount the walls of a besieged city and to set up a standard there.

MURAL DECORATION (from Lat. *muralis*, relating to a wall, from *murus*, OLat. *mœrus*, wall). Art applied to the adornment of wall surfaces. Wall painting in fresco, in oils, in encaustic; figured sculpture in low relief, colored or plain, in stone, marble, terra cotta, or stucco; mosaic compositions, marble incrustations, and pectile work, and wainscoting in

carved and paneled woodwork, are the principal modes used for the purpose. The term is commonly made to include also, by extension, the decorative treatment of vaults and ceilings, as well as walls. For details, consult the articles on the different varieties of mural decorations: Relief Sculpture; Inlay; Fresco; Mosaic; also the general articles Decorative Art; Interior Decoration.

Egypt. In ancient Egypt flat undecorated walls were avoided; the internal surfaces of the temples and the external surfaces of pylons and walls were converted into large grouped pictures, deeply incised, and with flat tints, graded according to the light, being delicate in the well-illuminated parts, heavier in the darker apartments. See Egyptian Art.

Asia. Babylonia and Assyria had greater variety of method. The walls were often divided horizontally into zones—a lower dado of sculpture, an upper one of painting. The sculpture was either of fine stone partly colored (not entirely, as in Egypt), or of glazed tiles in relief, strongly colored. Though the tones were still flat, more relief was given than in Egypt by the accentuation of outlines and details by heavy dark lines. Gold and other metals and rich hangings increased the strength of the color scheme. The exterior walls were often faced with flat glazed tiles in massed colors, with the same result. See Babylonian Art; Assyrian Art.

Greece. The pre-Hellenic Greeks seem to have used gypsum and plaster reliefs and wall paintings in similar fashion to the Assyrians, and the Greeks of the historic period at first show signs of Oriental influence in the bright colors applied to gable, frieze, and metope sculptures, without the Oriental appreciation of color harmony. The polychromy of Greek architecture and sculpture gradually, however, gave way to the use of plain sculpture and to a reliance on the play of light and shade by means of projecting moldings and members in place of pure surface decoration. Simplicity of method, reticence of style, plasticity of composition, and delicacy of coloring were their characteristics. Color was subordinated to form, and the decorated surfaces were broken up usually into small units. The predominance of external over internal effects helped to minimize the importance of Greek mural decoration. See Greek Art.

Rome. The Romans returned, with different methods and a different style, to the Oriental and Egyptian idea of colored instead of plastic mural adornment, which received great importance from their development of vast interiors. They adopted three principal media, with increasing heaviness as the Empire advanced—wall painting in fresco, mosaic painting, and marble incrustations. The molding of decorations in low relief in the stucco covering of walls and ceilings may be considered chiefly as an adjunct to the painted decoration. The most characteristic of these three treatments was the use of rich Oriental and African marbles. The interior walls of temples, Imperial thermæ and palaces, basilicas, and other buildings were covered to a considerable height in this way, while private houses were generally confined to fresco work. (See Plate of Pompeian Mural Decoration, under Decorative Art.) Mural decoration on stucco was often microscopic in scale, small compartments, and small scenes being juxtaposed without much central interest, and by attempts at perspective effects and different planes the effort was made to counteract the confining effect of the walls of a room; to substitute pictures one could look *into* for flat decorated surfaces. See Roman Art.

Early Christian. In early Christian and Byzantine mural decoration one school adopted as its main medium the new method of mosaic wall pictures (see Mosaic), which gave a richer mural color scheme than had ever been known in any style. Casting aside the Roman picturesqueness, this school returned to the Oriental flat effects; but with the addition of glowing gold grounds and the depth given by the colored glass cubes an entire wall often became a single picture instead of an agglomeration of units. The advantage of Byzantine decoration was that the eye was received by and sank into its rich mosaic surfaces instead of being thrown back by shallow fresco coloring. The other school preferred plain or frescoed surfaces; this treatment was common in most of Syria, Asia Minor, north Africa, and Europe. Mural decoration in these regions for long after the decline of Rome was practically extinct where Byzantine influence did not exist. Even in Byzantine art fresco painting tended in many places to displace mosaic. See Christian Art; Byzantine Art.

Mohammedan. The earliest special development of mediæval decoration was in the Mohammedan world, and it was one of great interest. It used color very generously, but also sculpture in low relief; its effects were mainly those of tapestry and other stuffs, even when design was in the form of colorless carvings on the outside surface of a dome. Geometric patterns were most prominent; floral forms, and very rarely human figures, characterize Persian art. Glazed tiles were specialties in Persia, geometric mosaics in Egypt, colored stuccoes in Spain. There was but little composition, grouping, or subdivision; the main plan was to cover the surfaces completely with more or less uniformity. There were practically no plain surfaces and no heavy projections. Such necessary projections as pendentives were broken up into minute stalactites. The effects were rich and restful, often even hypnotic. The Oriental races always retained the faculty of harmonious coloring, and used it to the full in mural decoration. Though related to the Byzantine type, this style was far more intricate and less well composed. See Mohammedan Art.

Mediæval. The mediæval decorative mural work in Europe did not begin to take shape until the close of the eleventh century; its usual media were extremely simple, merely fresco painting and sculpture in stone. The multiplicity of styles makes any unity of characterization, such as was possible in previous styles, quite impossible. During the Romanesque epoch polychromy of the walls was common and even large cycles of frescoes were often painted, especially in Germany. In central and southern France the entire exterior façades were often compositions in sculpture; in Tuscany and northern Italy effects of color on the exterior were given by the use of marbles, terra cotta, and brickwork in patterns or courses. In certain regions, such as Sicily, Rome, and Venice, the Byzantine and Oriental rich color scheme, especially in the form of mosaic work, prevailed. When, however, European art became thoroughly nationalized and indigenous

in the Gothic period, Italy took a decided lead in the development of painted mural decoration in fresco which superseded all other methods. The reason for this was that the more logical Gothic art of the North, under French leadership, practically suppressed wall surfaces, and consequently mural decoration, in favor of detached ornamentation in stone, stained glass, and the like, owing to the framework system of Gothic architecture. Italy, almost alone, did not abolish wall surfaces; consequently her painters, like Cimabue and Giotto and their contemporaries and successors, could develop the primitive fresco work of the Romanesque type into a really artistic scheme of mural decoration such as we see at Assisi, Florence, and Siena. Grand figured compositions, harmoniously grouped, were the characteristic of this Italian school. Rich borders sometimes followed, sometimes contrasted with, the architectural lines. Above all, the coloring was light and clear and the effects flat and symbolic, the figures being rather like silhouettes on a flat ground. Sometimes there were also grand exterior effects both of color and form, as at Orvieto. See ROMANESQUE ART; GOTHIC ART.

Renaissance. The Renaissance saw Italy still easily leading in mural decoration from Masaccio to Raphael; the media were even simpler than before, for mosaics were entirely discarded and effects of sculpture and architectural membermentś less frequent. The climax in the Sistine Chapel and Raphael's Stanze was reached by a perfectly consistent series of steps, some advantageous, such as the abandonment of the heavy architectural frameworks of the Giottesque period for simpler borders; some were disadvantageous, such as the attempts to do away with flat effects by the introduction of perspective and a variety of planes in both environment and figures. The juggling with perspective and anatomical difficulties indulged in during the fifteenth century by Paolo Uccello, Melozzo, and Mantegna led, in later days, to the extravagances of Correggio, Paolo Veronese, and Tiepolo. It became the main object of painters of the sixteenth century to change the subdivisions of flat mural decoration into a series of realistic framed vistas, and this mistaken realism was emphasized by the use of oil instead of fresco colors, giving effects of atmospheric perspective besides the previously acquired linear perspective. See RENAISSANCE ART.

Modern. During the first half of the nineteenth century mural decoration declined to very low estate. In France, however, the influence of the national school of fine arts and the government patronage of the arts preserved it from extinction, and the domination of classicism and tradition began towards 1840 to yield to a new and fresher spirit, exemplified in the works of Hippolyte Flandrin. The decorative sense is more highly developed in France than elsewhere, and there has risen in France a remarkable school of mural painting, whose influence has been felt throughout the modern world. Modern French decorative painting rejects the flatness and conventional composition of the Italian fourteenth-century artists, inclining rather to the pictorial realism of the developed Renaissance schools; but it recognizes the difference between an easel picture applied to a wall or ceiling, and a decorative painting composed specially for an architectural setting. The most prominent representatives during the nineteenth century were Hippolyte Flandrin, whose austere religious paintings excel in line; Paul Baudry, decorator of the Grand Opera, a follower of the High Renaissance; and greatest and most original of all mural painters of the nineteenth century, Puvis de Chavannes, who reverted to the flat decorative effects of Giotto.

While Germany did much early in the century to study and revive mural painting, classical tradition tended to stifle originality, and no really great masters of the art have appeared. Cornelius (1783–1867) and Kaulbach (1805–74) made efforts to revive monumental mural painting, especially at Munich and Berlin, but their works lack the real decorative spirit. In England there is little to show in the way of mural painting, the preference there being usually for decoration by architectonic means and conventional ornament. The fine opportunity offered by the extensive frescoes of the Houses of Parliament failed to produce an art of true decorative worth. In Spain the eccentric but powerful genius of Goya (1746–1828) asserted itself in the first third of the last century in ceiling paintings of great merit in Madrid, but he had no successors, and Spain and Italy are equally in arrears in this branch of art. The pioneers of mural painting in the United States were John La Farge, whose important decorative work in Trinity Church, Boston, began in 1876, and William Morris Hunt, whose ceiling panels in the Assembly Hall of the New York State capitol were undertaken shortly afterward. The Columbian Exposition at Chicago in 1893 not only gave extensive opportunity for mural painting, but promoted an active public interest. The well-known achievements of Sargent and Abbey in the Boston Public Library followed shortly afterward. The widest opportunity was offered in the extensive decorations of the Congressional Library, Washington, in which many American painters and sculptors participated. These were followed by similar decorations in the Appellate Court Building, New York, and especially in the State capitols of Minnesota, Iowa, Wisconsin, and Pennsylvania, the Federal Building at Cleveland, and the Court House of Baltimore. Decorations of importance were also completed for many private residences in New York and elsewhere and in some of the churches, notably that of the Paulist Fathers in New York, the interior of which contains a cycle of important subjects painted chiefly by Edward Laurel Harris. Among the painters who have distinguished themselves in mural work are Kenyon Cox, Edwin H. Blashfield, H. O. Rogers, Robert Blum, John W. Alexander, and Violet Oakley; while others like Maitland Armstrong and Frederic Crowninshield have adapted themselves rather to the important decorative accessories than to the figure subjects of mural painting. Generally speaking, the productions of the American school are not lacking in technical ability, but are luxurious rather than austere in character and more suited to the ballrooms and salons of hotels and private houses than to the halls of justice, government, and learning.

Modern mural decoration has generally abandoned fresco painting in favor of oil painting on canvas, attached to the wall with white lead. Fresco, tempera, encaustic, and water-glass painting are rarely attempted. Other forms of decoration have been revived and are largely

used, wainscoting, marble incrustation, mosaic, and inlay and stucco relief, and wall hanging in paper, tapestry, stamped leather, and other materials, besides other more purely architectonic methods of adornment, being widely used and with conspicuous success.

Bibliography. No special works have been written upon the general subject, except practical manuals for the use of painters, such as Thomas, *Mural Decorations* (London, 1869); Crowninshield, *Mural Painting* (Boston, 1887); F. H. Jackson, *Mural Painting* (New York, 1904); J. D. Grace, *The Art of Color Decoration* (ib., 1913). For mural painting in America consult the monographs by Pauline King (Boston, 1902) and E. H. Blashfield (New York, 1913).

MURAL PAINTING. See MURAL DECORATION.

MURANO, mōō-rä'nō. A town in the Province of Venice, Italy, on an island in the Venetian lagoon, 1½ miles north of Venice (Map: Italy, G 2). It has the twelfth-century cathedral of San Donato, the basilica of St. Peter, the Martyr, with a painting by Bellini. The town has been, since the thirteenth century, the seat of the Venetian glass industry and contains a museum of glass products. It is a centre for the production of false jewels. Pop. (commune), 1901, 5150; 1911, 5805.

MURAT, mụ'rȧ', JOACHIM (1767–1815). A celebrated French cavalry leader, King of Naples from 1808 to 1815. He was born March 25, 1767, being the son of a well-to-do innkeeper at La-Bastide-Fortunière, near Cahors, in France. He was intended for the priesthood and commenced the study of theology and canon law at Toulouse, but soon enlisted in a cavalry regiment. Being dismissed for insubordination after two years of service, he returned to his home, and later proceeded to Paris, where he obtained admission into the constitutional guard of Louis XVI. On the outbreak of the Revolution he was made a sublieutenant in a cavalry regiment, and a little later aid-de-camp to General Hué. His gallantry and his extreme republicanism soon won him the rank of colonel. He served with distinction under Bonaparte in Italy and Egypt. He finally rose to be general of division (1799), and having returned with Bonaparte from Egypt to France, he rendered most important assistance on the 18th Brumaire, by dispersing the Council of Five Hundred at Saint-Cloud. Bonaparte now intrusted him with the command of the Consular Guard, and gave him his youngest sister, Caroline, in marriage (Jan. 20, 1800). The same year Murat commanded the cavalry at Marengo, and expelled the Neapolitans from the Papal States. In 1803 he was a member of the Corps Législatif, and in 1804 Governor of Paris. On the establishment of the Empire he was loaded with honors, being made a marshal of the Empire (1804), and Prince and Grand Admiral (1805). He continued to command the cavalry in the armies led by the Emperor, contributed to the triumph of the French at Austerlitz, and to other victories by his enthusiasm and commanding appearance as well as by his military talent. In 1806 the newly erected Grand Duchy of Berg (q.v.) was bestowed upon him. After the battle of Jena, in 1806, he led in the pursuit of the Prussians, and in 1807 he participated in the battles of Eylau and Friedland. In 1808 Napoleon placed him in command of the army in Spain, where in May he suppressed the insurrection in Madrid. Joseph Bonaparte having exchanged the throne of Naples for that of Spain, Murat was made his successor, and on Aug. 1, 1808, was proclaimed King of Naples under the title of Joachim I. He immediately took possession of the Kingdom of Naples, but the Bourbons, through the support of Great Britain, retained Sicily. Murat instituted a number of wise and beneficent reforms, but had to endure the yoke of Napoleon, who left him little but the outward show of royalty. In the Russian campaign of 1812 he commanded the cavalry, but after sharing in the disaster which befell the French army returned to Naples anxious and discontented. He joined the French army again in 1813, and distinguished himself at Dresden, but after the battle of Leipzig withdrew to his own dominions and concluded a treaty with Great Britain and Austria in January, 1814, by which he was guaranteed the possession of his throne on condition of joining the coalition against Napoleon and contributing 30,000 troops to the allied armies. After a pretense of attacking Eugène Beauharnais in Italy, Murat withdrew to Naples and entered into private communication with Napoleon at Elba. On the Emperor's return to France, Murat placed himself at the head of an army of 40,000 men and commenced a war against Austria. He was defeated by the Austrians at Tolentino, May 2–3. Naples was evacuated May 19, and Murat fled to the island of Ischia, and finally found his way to France, while his wife and children took refuge with the British fleet. Napoleon declined to treat with his brother-in-law on any terms and forbade his presence in Paris. Murat then found a refuge near London, and after Waterloo he fled to Corsica. Declining Metternich's offer of an asylum in Austria, he proceeded in a foolhardy manner with a few followers to the coast of Naples and proclaimed himself king and liberator, but was presently taken prisoner, and after trial by a court-martial was shot in a hall of the castle of Pizzo, Oct. 13, 1815.

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MURAT, NAPOLÉON ACHILLE (1801–47). Eldest son of Joachim Murat, King of Naples. He was born in Paris and for a time bore the title of the Prince Royal of the Two Sicilies; but after the overthrow of his father, in 1815, he sought refuge with his mother in Lower Austria, where he received an excellent education. In 1821 he emigrated to the United States, and after a tour of the country settled near Tallahassee, Fla., where he bought a large estate and built an elegant mansion. When Lafayette revisited the United States in 1825, Murat traveled much with him, and was by him introduced to a grandniece of Washington,

Miss Catharina Dudley, whom he married in 1826. Murat declined numerous offers of a political career, and devoted himself to farming, literary pursuits, and philanthropic undertakings. His literary works include: *Lettres d'un citoyen des Etats-Unis à un de ses amis d'Europe* (1830); *Esquisse morale et politique des Etats-Unis* (1832); *Exposition des principes du gouvernement républicain tel qu'il a été perfectionné en Amérique* (1833). These works attracted great attention in Europe. Consult MacConnell, "The Prince and Princess Achille Murat in Florida," in the *Century Magazine* (New York, 1893).

MURAT, Napoléon Lucien Charles, Prince (1803–78). The second son of Joachim Murat, King of Naples. He was born in Milan and after the overthrow of his father, in 1815, lived for several years with his mother in Lower Austria. In 1813 he had been made Prince of Ponte Corvo, but escaped to Boston in 1825, and soon after his arrival in the United States he joined his uncle Joseph, who was then living in Philadelphia under the title of the Count of Survilliers. In 1827 he married Miss Georgina Frazer, an heiress, of Bordentown, N. J. His wife later established there a fashionable school for young women. Unlike his brother, Napoléon Achille, he did not give up the idea of recovering his father's throne, and in 1839 and 1844 made trips to France with that purpose in view, but was permitted to remain in France only a short time. After the February revolution of 1848 he returned to France and was elected a deputy to the Constituent Assembly. He was Minister Plenipotentiary to Turin in 1849–50. After the coup d'état of Dec. 2, 1851, he received a seat in the Senate, and was recognized by Napoleon III as a prince of the Imperial family, which brought to him an annual pension of 150,000 francs and secured the payment of two millions of debts. In 1861 he advanced claims to the throne of Naples, but his pretensions were officially disavowed by the French government and came to naught.

MURATORE, mụ'rà'tôr', Lucien (1878–). A French dramatic tenor. He was born at Marseilles, graduated from the conservatory of his native city in 1897, and later studied in Paris. He appeared with Calvé and Dufresne in *La Carmélite* at the Opéra Comique in Paris, where he also sang in *Muguette* and *Le cor fleuri*, and at the Opéra he appeared in *Ariane* and *La Catalane*. Besides singing the rôles of Faust, Romeo, and Walther, he created the leading parts in *Bacchus*, *Le miracle*, *Salome*, *Siberia*, and *Francesca da Rimini*. During the seasons of 1912–13, 1913–14, and 1915–16 he was a member of the Chicago Grand Opera Company.

MURATORI, mōō'rà-tō'rê, Lodovico Antonio (1672–1750). A celebrated Italian antiquary and historian. He was born at Vignola, near Modena, Oct. 21, 1672. He studied theology and history in the University of Modena and early attracted the attention and won the friendship of Father Bacchini, the librarian at the ducal palace, who fostered in him a taste for historical and antiquarian research. In 1688 Muratori took minor orders, and in 1694 obtained the degree of doctor in canon and civil law. The same year he was appointed to the staff of the Ambrosian Library at Milan. While there he published his two collections of previously unedited Greek and Latin fragments entitled *Anecdota Græca* and *Anecdota Latina* and some poems and essays of a purely literary character: *Della perfetta poesia italiana* (Modena, 1706) and *Riflessioni sopra il buon gusto nella scienze e nelle arti* (Venice, 1708). In 1700 he returned to Modena at the invitation of the Duke, in order to become keeper of the ducal archives and librarian of the Este Library. From 1708 to 1712 he wrote several polemical works in which he defended the right of the Empire to certain Italian territory claimed by the papacy, and was attacked on general lines by the Jesuits for preaching heretical doctrines. From 1714 to 1716 he was commissioned by the Duke of Modena to collect material relating to the history of the duchy which he published as *Antichità estensi* (2 vols., 1717–40). This work led him to undertake the project of collecting similar materials for Italy as a whole from the fifth to the sixteenth century, which extended over 15 years and appeared as *Rerum Italicarum Scriptores* (25 vols., 1723–51), to which he added a series of historical dissertations, *Antiquitates Italicæ Medii Ævi* (6 vols., 1738–42). Consult: the biography by his nephew, G. F. Muratori, *Vita del celebre Lodovico Antonio Muratori* (Venice, 1756); Troya, *Studi intorno agli annali d'Italia del Muratori* (Naples, 1877; new ed., 1901 et seq.). His letters were published by Lazzari (Venice, 1783). Consult also bibliography in Hauck-Herzog, *Realencyclopædie für protestantische Theologie*, vol. xiii (3d ed., Leipzig, 1903).

MU'RATO'RIAN FRAGMENT, or Canon of Muratori. A fragment of a treatise upon the Bible canon containing 85 lines and commenting upon the several books and so giving a very important list of the books accepted as canonical in Italy at the time of its composition, which probably was the latter half of the second century. In the list are the Gospel of Luke, which it calls the third (the fragment begins at this point, so doubtless Matthew and Mark had been mentioned in the part now lost); John, Acts, the Epistles of Paul to the Corinthians, Ephesians, Philippians, Colossians, Galatians, Thessalonians, Romans, Philemon, Titus, and Timothy; Revelation of John; Jude; two Epistles of John; Wisdom of Solomon; and, as doubtful, the Revelation of Peter, but omits the Epistles of James and of Peter and the Epistle to the Hebrews. The fragment was discovered in the Ambrosian Library at Milan (1740) by Lodovico Antonio Muratori (q.v.), from whom it receives its name. It is translated in the *Ante-Nicene Fathers*, vol. v. For the text and its translation, consult Tregelles, *Canon Muritorianus* (Oxford, 1867); B. F. Westcott, *History of the Canon* (6th ed., London, 1889); H. M. Gwatkin, *Selections from Early Christian Writers* (New York, 1893); J. C. Ayer, *A Source Book for Ancient Church History* (ib., 1913).

MURAVIEV, mōō'rà-vyĕf'. An ancient and distinguished Russian family, originally of Moscow, which in 1488 was presented by Czar Ivan Vasilievitch with large estates in the Province of Novgorod. The best-known members of the family are: Mikhail Nikititch (1757–1807). Catharine II made him the tutor of her grandchildren, Alexander and Konstantin, for whom he composed works in prose and poetry. He also occupied various important administrative posts. His works were published in three volumes (Moscow, 1810). — Nikolai Nikolaie-

VITCH (1768–1840). He studied at Strassburg, and thereafter served for some time in the army and navy. In 1797 he founded a private institution for officers of the general staff. During the War of 1812–14 against Napoleon he served as colonel. His school became a state institution in 1816, and he continued to superintend it until 1823, after which he devoted himself to agriculture.—ALEXANDER NIKOLAIEVITCH (1792–1864). He was the eldest son of the preceding, and was prominent in the Decembrist uprising, which broke out in 1825 at the accession of Nicholas I. In consideration of his father's services his life was spared and he was exiled to Siberia. Later he was permitted to return, and during the Crimean War he entered the army and became a major general.—NIKOLAI NIKOLAIEVITCH (c.1794–1866). The brother of the preceding. He entered the army in 1810 and took part in the campaigns of 1812–14 against the French. After the end of the war he remained in the army, and traveled extensively in Asia. He served during the Persian War and was made a major general. In 1830 the Polish Rebellion broke out, and Muraviev was called in to aid in suppressing the revolt. In 1832 he was sent to Egypt to treat with Mehemet Ali for the conclusion of peace with Turkey. He then took charge of the Russian forces dispatched to the Bosporus to aid the Sultan against Mehemet Ali. In 1838 he fell into disgrace and retired from the army, remaining inactive until 1848. During the Crimean War he rendered valuable service to Russia in the Caucasus. The capture of Kars, in November, 1855, earned for Muraviev the title of prince and other great honors.—MIKHAIL NIKOLAIEVITCH (c.1796–1866). A brother of the preceding. He entered the army and participated in the campaigns against France of 1812–13. He took an active part in the uprising of the Decembrists and was imprisoned for five months. Afterward he reentered the military service and soon occupied a prominent place among the Russian statesmen of the time. He occupied many important administrative positions, and opposed vehemently the emancipation of the serfs. During the Polish Rebellion of 1863 he was sent to Vilna, and acted with such relentless rigor that in a few months the entire insurrection was suppressed. His acts of cruelty made his name infamous throughout Europe.—MIKHAIL NIKOLAIEVITCH, COUNT (1845–1900). A grandson of the preceding. He was born April 19, 1845, studied in Heidelberg, and in 1864 entered the service of the Ministry of Foreign Affairs. He was attached to various Russian embassies in Europe, and on the death of Prince Lobanov in 1897 he became Minister of Foreign Affairs. He advanced Russian interests in the Far East and put forth the Czar's note for The Hague Peace Conference in 1898. He died June 21, 1900.

About 1730 a member of the Muraviev family married a daughter of Apostol, the Ataman of the Cossacks, whose name was added to his own. Of this branch of the family the best known is SERGEI MURAVIEV-APOSTOL (1796–1826). He participated in the Decembrist uprising of 1825, proclaimed Grand Duke Konstantin as Emperor, and seized the town of Vasilkov. Troops were sent against him and he was captured, taken to St. Petersburg, and hanged July 25, 1826.

NIKOLAI NIKOLAIEVITCH, COUNT MURAVIEV-AMURSKI (c.1809–81), belonged to another branch of this family. He entered the army while young, and served in the Caucasus, where he attained the rank of major general. In 1848 he was appointed Governor-General of eastern Siberia, and gained for Russia the entire territory of the Amur, and concluded the Treaty of Aigun, May 28, 1858, by which this country was definitely ceded by China. His services were rewarded by the title of Count, and he received the name Amurski. In the summer of 1859 he went with twelve ships to Yeddo, and concluded a favorable treaty with Japan. He resigned his governorship in 1861, and was made a member of the Imperial Council.—NIKOLAI VALERIANOVITCH (1850–1908), a nephew of Muraviev-Amurski, received his education in a military academy, the Third Classical College of Moscow, and the law school of Moscow University. After taking his degree in 1870, he was appointed assistant district attorney for the city of Moscow. By rapid advancement he became Minister of Justice in 1894. While serving as Imperial Secretary, he had taken an active part in revising and codifying the Russian law, and in his new office he carried out a reform of the courts and brought the prisons, formerly in the police jurisdiction, under the control of his department. In 1903 he was chairman of The Hague Tribunal which passed on the Venezuela claims matter, and from 1905 to his death he was the Russian Ambassador to Italy. Nikolai Valerianovitch also became known as a philanthropist and as the author of many important articles on legal subjects.

MURCAY, MARIE MARGUERITE LE VALOIS DE VILLETTE DE. See CAYLUS, M. M.

MURCHISON, mûr'chĭ-son, CHARLES (1830–79). A British physician, born in the island of Jamaica. He was educated at the universities of Aberdeen, Edinburgh, Dublin, and Paris. In 1853 he entered the East India Company's military service, but soon after reaching India was appointed professor of chemistry at the Calcutta Medical College. In 1855 he published two valuable papers on *The Climate and Diseases of Burmah.* The same year he returned to Europe, and settled in London, where he was connected with a number of the leading hospitals. He was not only an authority on tropical fevers, but also an able geologist. He published over 300 articles. Among his works are *Clinical Lectures on Diseases of the Liver, Jaundice, and Abdominal Dropsy* (1868; 3d ed., 1885; Fr. and Ger. trans.); *Treatise on the Continued Fevers of Great Britain* (1862; 3d ed., 1884; Fr. and Ger. trans.), a very important work, although he opposed the bacterial theory of infection; *Functional Derangements of the Liver* (1874; 3d ed., 1885).

MURCHISON, SIR RODERICK IMPEY (1792–1871). A British geologist, born in Tarradale, Ross. After studying at the military college of Marlow, he entered the army and served as an officer in the Peninsular War under Wellington. Through the advice of Sir Humphry Davy he was induced to take up the study of science, and in 1825 became a fellow of the Geological Society of London, before which he read a paper entitled "Geological Sketch of the Northwestern Extremity of Sussex and the Adjoining Parts of Hants and Surrey." Returning from a geological tour through France, which he made in the company of Sir Charles Lyell, he undertook a systematic exploration and study of the lower

fossiliferous strata of England and Wales. This work engaged his attention for many years and resulted in a reclassification of the Paleozoic rocks, with the introduction of a new system to which, in 1835, he gave the name Silurian. In coöperation with Sedgwick, with whom later he was to become involved in a bitter controversy over the so-called Cambrian question, he established the existence of a group of strata between the Silurian and the Carboniferous which was named the Devonian system. He was soon after employed by Emperor Nicholas in a geological survey of Russia, being associated with De Verneuil and Keyserling; during the years 1840–44 he explored a large part of southern Russia and introduced another new system—the Permian—into the geological time scale. From his knowledge of the geological structure of the Ural Mountains and the Australian systems, he was led to believe that gold occurred in the latter, and as early as 1844 predicted its discovery. Murchison was elected president of the British Association for the Advancement of Science in 1846, president of the Royal Geographical Society in 1844, 1845, and 1857, and in 1855, upon the death of Sir H. T. De la Beche, became director of the British Geological Survey. He was knighted in 1846, made Knight Commander of the Bath in 1853, and a Baronet in 1863. From the Emperor of Russia he received the grand cross of St. Anna and that of St. Stanislas. The greater portion of his contributions to science were published in the society journals. Among his principal works are: *Geology of Cheltenham* (1834); *The Silurian System* (1839); *On the Geological Structure of the Northern and Central Regions of Russia in Europe* (1841); and *Geology of Russia in Europe and the Ural Mountains* (1845). Consult Geikie, *Life of Sir Roderick I. Murchison* (London, 1875).

MUR'CHISO'NIA (Neo-Lat., named in honor of Sir R. I. Murchison). An extinct gastropod of the family Pleurotomariidæ, found in rocks of Ordovician to Triassic age, and especially common in the Devonian and Carboniferous formations. The shell has a more or less pointed spire consisting of numerous coils or whorls. The aperture has in its outer lip a slit like that of *Pleurotomaria*, and a corresponding slit band that forms a more or less pronounced ridge on the outside of the whorls all the way from the aperture to the apex of the shell. The earlier species as a rule have smooth-surfaced shells; the later species are more frequently ornamented by nodes and transverse ridges. A subgenus, *Hormotoma*, with rounded whorls, is represented by *Murchisonia gracilis*, a very common species in the Trenton limestone of the United States and Canada. *Loxoplocus*, another very peculiar genus, with the coils of the spire unrolled and somewhat carinate in section, lived in the cavities of the corals that made up the Guelph beds of Canada and western New York. See PLEUROTOMARIA.

MURCIA, mo͝or'thē-ȧ. A former division and an old Moorish Kingdom of Spain, situated in the southeastern part of the country and bounded on the north by New Castile, on the east by the former Kingdom of Valencia, on the south by the Mediterranean Sea, and on the west by the former kingdoms of Granada and Jaén and by New Castile (Map: Spain, E 4). The division comprised the modern Province of Murcia, the greater part of Albacete, and small portions of Jaén and Alicante, with a total area of about 10,000 square miles.

The surface of Murcia partakes of the general character of the whole peninsula—the interior plateau, the rapid and mountainous slope towards the sea, and the low coastal region. The last is a sandy semiarid belt from 10 to 20 miles wide, and broken by several coast lagoons, of which the Mar Menor is the largest. The mountainous belt occupies the greater part of the division, and consists of an irregular system of ranges whose nucleus and highest point is the Sierra de Espuña, with an altitude of 5193 feet. North of the mountains the interior plateau forms a part of La Mancha, a deforested and almost arid plain. The principal water system is the Segura River with its tributaries, which are used only for irrigation and are subject to great variations in volume, being at some seasons almost dry and at other times subject to disastrous inundations. The climate is subtropical near the coast and temperate on the slopes and plateaus. The winters are mild, the sky nearly always clear, and the climate is pleasant and healthful; but the rainfall is insufficient for the needs of agriculture. The whole region has been almost entirely deforested, and agriculture can be carried on only in the valleys by means of irrigation. Many of the valleys, however, are well cultivated, especially the Huerta, or Garden, of Murcia, which is one of the most beautiful places in Spain. The chief agricultural products are wheat, barley, and flax. Oranges, lemons, olives, grapes, and hemp are grown in the south. Mining is an important industry, producing iron, lead, zinc, copper, and sulphur. Other industries are silk manufactures and the plaiting of articles of esparto grass. The population in 1900 was 577,987 and, in 1910, 615,105. The chief city is Murcia (q.v.).

Murcia was the centre of the Carthaginian colonies in Spain. It was conquered by the Saracens early in the eighth century and by them called Todmir. It formed a province of the Caliphate of Córdoba, after whose dissolution, in the early part of the eleventh century, it became an independent Moorish kingdom. About the middle of the thirteenth century it was conquered by Castile.

MURCIA. The capital of the Province of Murcia in southeast Spain. It lies on both banks of the Segura River, in the beautiful valley known as the Huerta, or Garden, of Murcia (Map: Spain, E 4). This valley rivals in the luxuriance of its vegetation the famous Vega of Granada. It was carefully irrigated by the Moors, and is covered with vineyards and groves of mulberry, olive, and fig trees. The city itself has broad streets and a clean and generally neat appearance. Several promenades and pleasure grounds have been laid out along the embankments of the river, and the Paseo de Floridablanca is a wide avenue with fine rows of plane trees. Though the city still retains some of its old Moorish atmosphere and a few typically narrow streets, with balconied houses, it has preserved but few objects of interest. The only building which attracts considerable notice is the cathedral, a Gothic-Romanesque structure begun in the fourteenth century. Its façade in the baroque style dates from the eighteenth century, and its tower, the most interesting feature, was begun in 1522 and com-

pleted in 1766. Other prominent buildings are the imposing bishop's palace, the city hall, with a monumental façade, the Colegio de San Fulgencio, two theatres, a bull ring, the Moorish Alhondiga or granary, and the large and well-built silk factories. There are a provincial museum, two normal schools, and a secondary school. The industries are largely derived from the surrounding huerta, the chief being the silk industry, which, with grain and fruit raising, furnishes the principal articles of trade. There are also manufactures of woolen goods, gunpowder, soap, leather, hats, and musical instruments. The city has had a long and interesting history under Romans, Moors, and Spaniards. Pop., 1900, 111,693; 1910, 125,057.

MUR'DER (AS. *morþor, morþur*, from *morþ*, OHG. *mord*, Ger. Mord, death; connected with Welsh *marw*, Lith. *smertis*, Lat. *mors*, death, Gk. *βροτός, brotos*, mortal, Skt. *mar*, to die). The unlawful killing of a human being with malice aforethought. The term appears to have been limited in early English law to a homicide committed in secret or accompanied by concealment of the body. During the Norman period, this *morth* (or secret) slaying of Saxon times became the *murdrum*—the homicide of the very worst kind, and was distinguished by Glanville from a mere *homicidium*, or open killing. For a considerable time *murdrum* signified the fine imposed by the crown on any hundred in which a man was slain, as well as the killing itself. This fine—originally 46 marks, of which 40 went to the King and 6 to the kinsfolk of the deceased—could be avoided by the production of the slayer, or by proof that the slain man was an Englishman and not of Franco-Norman race. Furnishing such proof was known as Englishry. From the time that Englishry was abolished in 1348 murder bears the single meaning of unlawful homicide of the worst species, which subjects the slayer to capital punishment.

The next step in the history of murder as a term of English law "consists in the adoption of 'malice aforethought' as the characteristic specific distinction of murder as distinguished from other kinds of homicide." This came about from the forms of the special findings of the jury in prosecutions for homicide. In order to entitle the slayer to a pardon under the Statute of Gloucester (6 Edw. I, c. 9, 1278 A.D.) it was necessary for the jury to find that he acted "in self-defense and not by felony or of malice aforethought." During the next two and a half centuries the modern distinction between willful murder and manslaughter (q.v.) was developed, as appears by a statute of 1531 (23 Hen. VIII, c. 1, § 3), which takes away the benefit of clergy (q.v.) in cases of "willful murder of malice prepense."

The first element in the crime of murder is unlawfulness, as distinguished from the killing which is justifiable or excusable homicide. (See HOMICIDE.) Not only must the killing be unlawful, but the person killed must be a "reasonable creature in being." Accordingly, the killing of an unborn child is not murder at common law, but the crime of abortion (q.v.). The other essential element in murder is the malice aforethought with which the killing is done. This requires, first of all, sanity and discretion on the part of the slayer. An idiot, a lunatic, or an infant below the age of discretion cannot commit murder. While malice aforethought is essential to the crime of murder, the law does not require the lapse of any prescribed time between the formation of the intention to kill and the killing. It is sufficient that the murderous intention precedes and accompanies the act of homicide. If the will accompanies the act a moment antecedent to the act itself which causes death, this makes the offense murder as certainly as if a day intervened between the willing and the doing. The malice in case of murder must be actual, or, as it is sometimes said, express, in contradistinction to implied malice. This does not mean, however, that the slayer must actually have intended to kill his victim, nor that he bore towards him a settled and malignant ill will. Hence if one shoots at A and misses him, but kills B, this is murder, because of the previous felonious intent, which the law transfers from one to the other. So if one lays poison for A, and B, against whom the poisoner had no felonious intent, takes it and is killed, this is murder. In short, the idea of malice aforethought is not spite or malevolence to the deceased in particular, but evil design in general; not so much premeditated personal hatred or revenge towards the person killed as a deliberately unlawful purpose which, if persevered in, must produce mischief. At the common law the procuring of a person to commit suicide (q.v.) is murder if the suicide is accomplished. So it is said in the books that if two persons agree to commit suicide and attempt to carry their design into execution, but only one dies, the survivor is guilty of murder if he were present at the commission of the suicide; otherwise he is an accessory before the fact.

The common law knew nothing of degrees of murder. If the homicide was committed unlawfully and with malice aforethought, the slayer was a murderer and, upon conviction, liable to capital punishment. This penalty has been thought too severe for some kinds of murder, and a number of the United States have divided the offense into two degrees, continuing capital punishment for the first degree and punishing the second degree with imprisonment. While these statutes differ in detail, they agree in limiting the definition of murder in the first degree to those cases where the killing was done in a willful, deliberate, premeditated, or particularly cruel manner or while engaged in the commission of some heinous felony, such as arson, and in some States rape and burglary. Consult: J. F. Stephen, *History of the Criminal Law of England* (3 vols., London, 1883); J. P. Bishop, *New Commentaries on the Criminal Law* (Chicago, 1892); F. Wharton, *Criminal Law* (Philadelphia, 1896); Clark and Marshall, *Law of Crimes* (St. Paul, 1900); and authorities referred to under CRIMINAL LAW.

MURDERER'S BIBLE. See BIBLE, CURIOUS EDITIONS OF.

MURDERS IN THE RUE MORGUE, THE. A tale by Edgar A. Poe which appeared in *Graham's Magazine* in 1841 and became a model for later detective stories.

MUR'DOCH, JAMES EDWARD (1811–93). An American actor, born in Philadelphia. His first appearance on the stage was in his native city in 1829. In 1833 he acted with Fanny Kemble during her tour in America and in 1856 played with some success at the Haymarket Theatre in London. During the Civil War in America he devoted himself to caring for sick and wounded soldiers and gave popular readings for the benefit of the United States Sanitary Commis-

sion. Subsequently he was professor of elocution in the Cincinnati College of Music. Joseph Jefferson characterized his acting as "not only extremely versatile, but entirely original." His greatest successes were in comedy and lighter tragedy. With William Russell he published *Orthophony, or Culture of the Voice* (1845) and *The Stage* (1880).

MUR'DOCK, James (1776–1856). An American scholar, born at Westbrook, Conn., and educated at Yale, class of 1797. He taught school in New Haven and at Oneida Academy, now Hamilton College, studied for the ministry, was licensed in 1801, preached for 13 years in the Congregational church of Princeton, Mass., and was professor of ancient languages in the University of Vermont from 1815 until 1819, when he went to Andover Theological Seminary. There he taught sacred rhetoric and Church history until 1829, and then he removed to New Haven, where he devoted his last years to private study. He published versions of Münscher's *Elements of Dogmatic History* (1830), of Mosheim's *Institutes of Ecclesiastical History* (1832), and of Mosheim's *Affairs of the Christians before the Time of Constantine the Great* (1852); a *Literal Translation of the Whole New Testament from the Ancient Syriac Version* (1851); *Sketches of Modern Philosophy* (1842).

MURDOCK, Joseph Ballard (1851–). An American naval officer, born at Hartford, Conn. In 1870 he graduated from the United States Naval Academy, then served on the North and South Atlantic stations and on the Coast Survey, was instructor in physics at the Naval Academy in 1880–83, and was executive officer of the *Panther* during the Spanish-American War. Murdock became commander in 1901, captain in 1906, and rear admiral in 1909. He commanded the *Rhode Island* in the cruise around the world in 1907–09, was commandant of the New York Navy Yard in 1909–10, and served as commander of the second division of the Atlantic fleet in 1910–11 and as commander in chief of the Asiatic fleet in 1911–12. In 1913 he was retired. He published *Notes on Electricity and Magnetism* (1884).

MURDOCK, Victor (1871–). An American legislator. He was born at Burlingame, Kans., and was educated in the public schools and at Lewis Academy, Wichita. After having gained experience in newspaper work in Chicago from 1891 to 1893, he was from 1894 to 1903 managing editor of the Wichita *Daily Eagle*. In 1895–97 he was also clerk of the Kansas Appellate Court. Elected as a Republican to the Fifty-eighth Congress in 1903 to fill the unexpired term of C. I. Long, he retained his seat through successive reëlections until March, 1915. Murdock was one of the leading insurgents in his party during the Taft administration, taking an active part in the overthrow of Speaker Cannon in 1910 and in 1912 breaking away to identify himself prominently with the new Progressive party. He was nominated for Speaker of the House in 1913. The next year he was the choice of Kansas Progressives for United States Senator, but was defeated by Charles Curtis, Republican. In a referendum to the national committee of the Progressive party (1915) Murdock was elected to succeed Senator Joseph M. Dixon as chairman of the committee.

MURDOCK, William (1754–1839). An English engineer, who was the first to employ coal gas as an illuminant. He was born at Bellow Mill, Ayrshire. Working as the assistant and coadjutor of James Watt, he became superintendent of construction and erecting engineer for that famous inventor. In 1784 he made a working model of a locomotive engine which had a flue boiler and single cylinder and was capable of a speed of from 6 to 8 miles an hour. He did not develop the idea, however, on a large scale, and about 1792 he turned his attention from engines to lighting by coal gas. (See Gas, Illuminating.) The actual perfection of this invention was attained probably two or three years afterward, and in 1802 gas was used in the illumination of Soho, London, after the news of the Peace of Amiens. Murdock made several improvements on Watt's steam engine, especially in the valve gear, and invented an independent or rotary engine and various apparatuses by which compressed air might be used, including its use for operating machinery, and was the first to use it for sending packages through tubes.

MURE, mūr, Sir William (1594–1657). A Scottish poet, born probably in Ayrshire, where the Rowallan estate, which he inherited, was situated. In 1643 he was a member of Parliament in Edinburgh, and he was wounded the next year at Marston Moor. His principal effort is his clever but somewhat heavy *True Crucifixe for True Catholikes*, which appeared in 1629. His other writings are a poetical translation (1628) of *Hecatombe Christiana*, a Latin poem by Boyd of Trochrig, many miscellaneous poems, and a paraphrase of the Psalms (1639). His *Historie and Descent of the House of Rowallane*, edited by W. Mure, 1825, is quaint and valuable.

MURE, William (1799–1860). A Scottish classical scholar, born at Caldwell, Ayrshire. After studying at Westminster School and at Edinburgh, he spent several years at the University of Bonn. His chief work, *A Critical History of the Language and Literature of Ancient Greece* (5 vols., 1850–57), was left unfinished, but the several portions of it on the epic and lyric poets and the historians may be regarded as separate works. His attempt in the first two volumes to prove the essential unity of the *Iliad* and the *Odyssey* and the identity of their authorship won him a wide reputation among European scholars. His treatment of Xenophon (q.v.), also, has been much admired. In addition to numerous contributions to the *Edinburgh Review*, his publications include: *Brief Remarks on the Chronology of the Egyptian Dynasties* (1829); *A Dissertation on the Calendar and Zodiac of Ancient Egypt* (1832); and his *Journal of a Tour in Greece and the Ionian Islands* (1842). He sat in Parliament for Renfrewshire in 1846–55 and was lord rector of the University of Glasgow in 1847–48.

MUREAU, Baron Milet de. See Milet de Mureau, L. M. A. D.

MURET, mü'rā', or **MURE'TUS,** Marc Antoine (1526–85). A French humanist. He was born at Muret, near Limoges, became a proficient scholar in Greek and Latin, and when but 18 lectured in the College of Auch. Between 1544 and 1559 he taught Latin at Villeneuve, Bordeaux, and Paris. At the invitation of Cardinal Ippolito d'Este, he took up his residence in Rome, where he won fame by his lectures (1559). He took orders in 1576 and in 1584 retired from his professoriate. He wrote *Orationes* and *Epistolæ*, and his *Variarum Lec-*

tionum Libri XIX is still valuable. He edited also several Latin authors. His reputation rests chiefly, however, upon the classic Latinity of his style. The best edition of his collected works is that of Frotscher and Koch (Leipzig, 1834–41). Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

MU'REX (Lat., purple fish). A genus of tropical shells, large, heavy, and variously armed with stout spines, processes, or knobs. These are to protect and strengthen the shells, for the animals live on exposed coasts. One species (*Murex pomum*) is found along the American coast from Cape Hatteras to Texas. It is from 2 to 3 inches in length, but not so conspicuously spiny as some more tropical forms. Allied to *Murex* is the oyster drill (*Urosalpinx cinerea*), which bores into oyster shells by means of its lingual ribbon. (See DRILL.) *Murex fortispina* of New Caledonia is furnished with a powerful tooth at the lower part of its outer lip. Its favorite food is *Arca pilosa*, a species of bivalve allied to the Noah's ark (see ARK SHELL), which lives half buried in coral refuse. Many of the tropical species are gayly colored, and some yield, when the animal is crushed, a rich violet-purple liquid which will act as a permanent stain and which furnished to the ancients their royal-purple dyes. Other shells yield this or a similar color. See PURPLE SHELL; also Colored Plate of GASTROPODS.

MUREX'IDE (from Lat. *murex*, purple fish), AMMONIUM HYDROGEN PURPURATE, or ROMAN PURPLE, $C_8H_4N_5O_6.NH_4$, H_2O. A beautiful coloring matter similar to the Tyrian purple of the ancients, which was made from a species of *Murex*—hence its name. Schele in 1776 obtained a red precipitate on evaporating to dryness a solution of uric acid in nitric acid. This reaction still forms the basis of the well-known murexide test for uric acid and related compounds. As uric acid exists in abundance in guano, that material has been found one of the best sources from which to obtain murexide. According to Prout, 1818, and Liebig and Wöhler, 1838, murexide is best obtained by oxidizing uric acid with nitric acid and after evaporating for some time at a temperature a little short of boiling, while still hot, adding a slight excess of ammonia. Two compounds are formed by this process, alloxan and alloxantin, and their reaction on each other results in the formation of the beautiful minute green metallic-lustred crystals of murexide, which, in combination with some of the compounds of lead and mercury, yield most brilliant red and purple dyes. The use of murexide was becoming extensive until the discovery of the aniline colors, the greater brilliancy of which has checked its employment. The acid combined in murexide, viz., purpuric acid, $C_8H_5N_5O_6$, is not known in the free state. See URIC ACID.

MURFREE, mûr'frē, MARY NOAILLES (1850–1922). An American novelist, born in Murfreesboro, Tenn., best known by the pseudonym of Charles Egbert Craddock. She early devoted herself to reading and literary work, partly because of a lameness which barred her, even as a child, from physical activity. Choosing as her field the mountain regions of Tennessee and the people who dwelt there, Miss Murfree treated both with a freshness and fidelity born of a keen perception of, and a complete familiarity with, what was typical and appealing in them. Her work assures her an honored place among the Southern writers of her generation. Her writings include: *In the Tennessee Mountains* (1884); *The Prophet of the Great Smoky Mountains* (1885); *In the "Stranger People's" Country* (1891); *The Phantoms of the Foot-Bridge* (1895); *The Mystery of White-Face Mountain, and Other Stories* (1895); *The Young Mountaineers* (1897); *The Bushwhackers, and Other Stories* (1899); *A Spectre of Power* (1903); *The Frontiersman* (1905); *Storm Centre* (1905); *The Amulet* (1906); *The Windfall* (1907); *The Fair Mississippian* (1908); *The Raid of the Guerilla* (1912); *The Story of Duciehurst* (1914).

MUR'FREESBORO. A city and the county seat of Pike Co., Ark., 45 miles southwest of Hot Springs, on the Little Missouri River and on the Memphis, Dallas, and Gulf Railroad (Map: Arkansas, B 3). It is in a rich farming and fruit-growing region, noted particularly for its fine peaches, and there are also saw mills. Many mineral deposits are found. The largest diamond mine in active operation in the United States is located 2 miles south of Murfreesboro. Pop., 1910, 516.

MURFREESBORO. A city and the county seat of Rutherford Co., Tenn., 33 miles southeast of Nashville, on the Nashville, Chattanooga, and St. Louis Railroad (Map: Tennessee, D 3). It is the seat of Soule Female College (Methodist Episcopal, South), opened in 1852, of the Mooney School, established in 1901, the Middle Tennessee State Normal School, and the Tennessee College for Young Ladies (Baptist), established in 1906. The city has manufactures of flour, lumber, cedar ware, leather, carriages, cotton gins, machine-shop products, etc., and carries on a trade in cotton, mules, and cattle. Near the city is the Stone River battlefield (see STONE RIVER, BATTLE OF), the site of a national cemetery with 6150 graves, 2333 of unknown dead. Murfreesboro was incorporated in 1817. From 1819 to 1825 it was the State capital. The commission form of government went into effect in January, 1915. Pop., 1900, 3999; 1910, 4679.

MURFREESBORO, BATTLE OF. See STONE RIVER, BATTLE OF.

MURGER, mụr'zhā', HENRI (1822–61). A French novelist and poet, born in Paris, March 24, 1822, who made attractive to his readers the irresponsible life of artists and students in Paris. Among his works are: *Scènes de la vie de Bohême* (1848); *Scènes de la vie de jeunesse* (1851); *Les buveurs d'eau* (1854); *Madame Olympe* (1859); other prose tales; and the poems *Les nuits d'hiver* (1861). In 1849, in collaboration with Théodore Barrière, the novel *Scènes de la vie de Bohême* was dramatized and played at the *Théâtre des Variétés* under the name of *La vie de Bohême*. The opera *La Bohême*, music by *Puccini*, 1898, is based upon that drama. To Murger, if to any one writer, literature perhaps owes the word Bohemia, signifying, not a geographical spot, but a moral condition. Murger left some classic tales and songs of dissolute thriftlessness and literary impecuniosity that have deluded a generation into looking back with dreamy regret on the sordid follies of their student days. The first Romantic generation, that of Gautier, had real enthusiasm, the ardor and fervor of renascence, for which Murger's whimsical hysteria of merri-

ment and his vicious sentimentality are but a poor substitute. Murger was trained for the law, became for a time secretary of Count Leo Tolstoy, but like that earlier Bohemian, Villon, he chose dissipation rather than decency. He died in a charity hospital in Paris, Jan. 28, 1861. A monument was recently erected to his memory, not without protest. Several of Murger's songs are translated by Andrew Lang in *Ballads and Lyrics of Old France* (London, 1872). Estimates of Murger by fellow Bohemians may be found in *Les nuits d'hiver* (Paris, 1862).

MURGHAB, mo͝or-gäb′. A river of Central Asia, rising in the Paropamisus Mountains, on the north boundary of Afghanistan (Map: Afghanistan, K 4). It flows northwestward into Russian Turkestan, in the Merv Oasis it is flanked by a network of canals for irrigation, and after a course of 366 miles is lost in the sands and marshes of the desert about 150 miles below Merv.

MURIAT'IC ACID. See HYDROCHLORIC ACID.

MU'RIDÆ (Neo-Lat. nom. pl., from Lat. *mus*, Gk. *μῦς*, *mys*, mouse). The family of rats and mice, typified by the house mouse (*Mus musculus*). It embraces in its 76 genera (Thomas) more than a third of all the rodents, is world-wide in its distribution, and includes many species of great importance to man, as pests or otherwise. The family has been monographed by Oldfield Thomas in the *Proceedings of the Zoölogical Society of London* (London, 1881). Consult also authorities cited under RODENTIA; and see GERBIL; HAMSTER; MOUSE; MUSKRAT; RAT; VOLE; WATER RAT; and similar titles.

MURILLO, mo͝o-rēl′yō, BARTOLOMÉ ESTEBAN (1617–82). A Spanish religious and genre painter, one of the chief masters of the school of Seville. He was born in Seville, the last week of December, 1617. Very little is known of his early life except that he was left an orphan at 10, was adopted by his uncle Juan Lagares, and when quite young was apprenticed to Juan del Castillo, from whom he learned the rudiments of painting; but upon the departure of the latter to Cadiz in 1640 Murillo was left without means, and for the succeeding two years he supported himself by painting cheap religious compositions for unimportant convents and churches and rough, brilliantly colored pictures for the *Feria*, a weekly. His close contact with the beggars and print sellers gave him unusual opportunity for studying their characteristics, and his reproductions of them upon canvas exhibit a sympathy and somewhat idealized presentation alike notable. These earlier works may be cited as representing the artist's first period, during which he attained results intensely individualized and at the same time expressive of the type.

The example of Moya, a fellow pupil in the studio of Castillo, made Murillo discontented with his position at Seville, and he resolved to visit Rome, but, not having the means for the longer journey, he set out on foot for Madrid. Velazquez gave him shelter in his own house and access to the royal galleries, where, with untiring zeal, he copied Ribera, Titian, Rubens, Van Dyck, Velazquez, and other masters. This course of practice, extending from 1642 to 1645, gave him a much freer style and greater control of color.

He then returned to Seville, and in 1648 married a wealthy and noble lady of that city, and his house became the resort for distinguished people. In 1650, upon the death of Pacheco, he became the acknowledged head of the Seville school and the president of the academy founded in 1660. During these years he was continually improving in style, becoming more idealistic in conception and individual in technique. His ensuing works are usually classed in accordance with his three styles: an "estilo frio," or cold style (1648–52), fine examples of which are the series of 11 pictures for the small Franciscan convent near Casa del Ayuntamiento; an "estilo cálido," or warm style (1652–56), characterized by a mastery of color contrasts; an "estilo vaporoso," so called from a certain vaporous or misty effect produced. This style, according to Calvert, begins in 1656 with four pictures illustrating the "Founding of Santa Maria Maggiore," painted for Santa Maria Blanca, Seville. A favorite subject of this era was the Immaculate Conception, which he painted no fewer than 15 times, one of the most famous examples being in the Louvre, Paris. It was taken from Spain by Marshal Soult, and bought by the French government at the Soult sale, in 1852, for 586,000 francs.

Murillo is very popular with the general public, but certain artists, while acknowledging his facility and charm, find his work lacking in technique, force, and originality. His work is highly subjective—so much so that the attention of the beholder is often attracted to the personality of the artist rather than to the subject represented. Murillo's chief importance consists in the wonderful manner in which he employed the medium of Spanish realistic forms to express ideal religious conceptions.

Much of the work of the artist was taken from Spain during the Peninsular campaign, a fact that accounts for the number of fine examples to be found in the galleries of Europe, the collections of London and Paris being especially rich.

The cathedral of Seville is rich in his works, among which are "Sts. Leander and Isidore," the "Vision of St. Anthony" (1656), and "La Puríssima" (1668). In the museum are 17 of the 26 pictures painted for the Capuchin monastery at Seville, among which are several "Immaculate Conceptions" and the beautiful "Charity of Thomas of Villanova," the favorite picture of Murillo. Mention should also be made of eight large pictures painted for the church of St. George (1661–74), of which three —"Moses Striking the Rock," the "Miracle of the Loaves and Fishes," and "San Juan de Dios Attending the Sick"—remain in their original places. In the Prado (Madrid) are the beautiful "Children of the Shell" (the infants Jesus and John), the "Adoration of the Shepherds," the "Education of the Virgin," "St. Elizabeth of Hungary" and the "Immaculate Conception with the Crescent Moon." Other famous works are: "The Birth of Mary" (1655), "The Holy Family, with St. Elizabeth" (1670), and the "Angels' Kitchen," in the Louvre; "The Vision of St. Anthony of Padua," in the Berlin Museum. The Hispanic Society of America possesses two small canvases, the Metropolitan Museum a "St. John on Patmos." Excellent examples of Murillo's Madonnas are in the galleries of Dresden, Madrid, Seville, Florence

(Pitti Palace), and Rome (Corsini Palace). Of his admirable series of genre subjects the best-known examples are in the national collections of Munich, Paris (Louvre), London, and St. Petersburg, and at Dulwich, London. "Gallegas at the Window" is in the Widener collection, Philadelphia. Murillo's last work was the altar-piece of St. Catharine, painted at Cadiz for the church of the Capuchins. The picture was never completed, for Murillo fell and had to return to Seville, where he died shortly afterward, April 3, 1682. He was buried, by his own request, in the church of Santa Cruz, Seville, before Pedro de Campagna's picture of the "Deposition from the Cross."

Bibliography. The best biography of Murillo is by A. F. Calvert (New York, 1907); the most recent is by Mayer (Stuttgart, 1913), with many illustrations; others are by F. M. Tubins (Seville, 1864); Stromer (Berlin, 1879); L. Alfonso (Barcelona, 1886); Carl Justi (Leipzig, 1892), a scholarly treatise; Hermann Knackfuss, in *Künstler-Monographien*, vol. x (Bielefeld, 1897); G. C. Williamson (New York, 1903); Lafond (Paris, 1908); S. L. Bensusan (Boston, 1910); also, Sir William Stirling-Maxwell, *Annals of the Artists of Spain* (London, 1848); Curtis, *Velasquez and Murillo* (ib., 1883); Paul Lefort, *Murillo et ses élèves* (Paris, 1892); *Masters in Art*, vol. i (Boston, 1900), with an exhaustive bibliography.

MURIS, mụ'rĕs', John de. An English musical theorist of the fourteenth century. Of his life nothing is known beyond the fact that he was master of mathematics at Oxford. His *Speculum Musicæ*, written between 1340 and 1350, gives a very detailed and scholarly account of the music of that time, and is by far the most important treatise on music written during the Middle Ages. It is divided into seven books, bearing the following titles: 1. "General Introduction"; 2. "Intervals"; 3. "Musical Proportions"; 4. "Consonance and Dissonance"; 5. "The Musical System of the Ancients according to Boëtius"; 6. "Ecclesiastical Modes and Solmisation"; 7. "Mensurable Music—Discantus." Before 1884 musical scholars were greatly puzzled by the open contradictions found in several treatises bearing the name of Muris, until Robert Hirschfeld discovered evidence of the existence of two contemporary theorists of the same name. Consult: Robert Hirschfeld, *Johannes de Muris* (Vienna, 1884); H. Riemann, *Geschichte der Musiktheorie* (Leipzig, 1898); J. Wolf, *Geschichte der Mensuralnotation* (ib., 1904).

MURIS, Julianus de. A French musical theorist of the fourteenth century. In 1321 he was teaching at the Sorbonne in Paris, and in 1350 he was elected rector. Unlike his English namesake, he held very advanced views, strongly advocating the *ars nova* (counterpoint). His principal works are: *Musica Practica, Musica Speculativa, De Discantu et Consonantiis, Ars Contrapuncti, Libellus Practicæ Cantus Mensurabilis.* See Muris, John de.

MUR'ISON, Alexander Falconer (1847–). An English jurist and historian, born in Aberdeenshire and educated at the University of Aberdeen. He became a barrister at the Middle Temple in 1881. He was appointed professor of Roman law in 1883 and of jurisprudence in 1901, and dean of the faculty of law in 1912, at University College, London. He was editor of the *Educational Times* (1902–12), and wrote: *The External History of Roman Law* (1885) and, in the "Famous Scots Series," *Sir William Wallace* (1898) and *King Robert the Bruce* (1899).

MUR'LIN, Lemuel Herbert (1861–). An American Methodist Episcopal clergyman and educator, born in Mercer Co., Ohio. He graduated from De Pauw University (1891), from the De Pauw School of Theology (1892), and from Garrett Biblical Institute (1899), and studied also at the University of Pennsylvania, at Clark University, and in Europe. As early as 1886 he had entered the ministry, occupying several pastorates between this time and 1894 and teaching at Fort Wayne (Ind.) College and Cornell College (Iowa). From 1894 to 1911 he was president of Baker University (Kansas), and thereafter president of Boston University. While on leave of absence (1909–10) he was acting pastor of the American Church in Berlin. Murlin served as president of the Kansas Association of College Presidents, and was a leader in all State educational movements. He was a member of the General Conferences of 1900 and 1904 and of the Ecumenical Methodist Conferences of 1901 and 1911.

MURMEL'LIUS, Johannes (c.1480–1517). A Dutch humanist, born in Roermond, Gelderland, and educated at Deventer, at Cologne, and at Münster. He introduced the study of Greek into Holland almost single-handed and published many excellent schoolbooks. His *Scoparius in Barbariei Propugnatores et Osores Humanitatis* (1514) and his defense of Reuchlin are important documents. Consult the biography by Reichling (Freiburg, 1880) and the selections from his poems, edited by Reichling (ib., 1881).

MURNER, mụr'nĕr, Thomas (1475–1537). A German priest and satirist, famous mostly for attacking Luther and the Reformation. Murner taught and preached in Freiburg, Paris, Cracow, and Strassburg. After voyages to Italy and England he settled in Strassburg, whence in 1525 he was frightened away by the Reformation. Murner was highly enough prized for his religious poems to be made laureate by Maximilian I in 1505. In 1506 he took his doctorate in theology; in 1514 he became guardian of the Franciscan cloister at Strassburg. In 1519 he became a doctor of jurisprudence at Basel. In his *Gäuchmatt, Schelmenzunft*, and *Narrenbeschwörung* Murner shows some realistic humor. He translated the *Æneid* in 1515. His *Die deutschen Dichtungen von Ulrich von Hutten* was published in Kürschner's *Deutsche National-litteratur*, vol. xvii (Stuttgart, 1890). Consult: Kawerau, *Murner und die Kirche des Mittelalters* (Halle, 1890); id., *Murner und die deutsche Reformation* (ib., 1891); W. Ries, *Quellenstudien zu Murners satirisch-didaktischen Dichtungen* (Berlin, 1890); H. Schatz's dissertation, *Stimmungen und Effekte in Murners Dichtungen* (Kiel, 1909).

MUROM, mōō'rôm. One of the oldest towns of Russia, situated in the Government of Vladimir, on the left bank of the Oka, 84 miles southeast of Vladimir (Map: Russia, F 3). It has an old cathedral, two monasteries, and a convent. It manufactures tallow and soap and has trade in grain. Murom is believed to have existed before the time of Rurik. Pop., 1897, 12,589; 1911, 18,616.

MURILLO

"THE IMMACULATE CONCEPTION," FROM THE PAINTING IN THE LOUVRE, PARIS

MUROMTSEV, mōō-rôm-tsĕf′, Sergei Andreyevitch (1850–1910). A Russian jurist and political leader, born in St. Petersburg. He studied at Moscow and Göttingen, and became professor of Roman law and jurisprudence at the University of Moscow, of which he was made prorector in 1880. In 1879 he became editor of the *Juridical Herald.* Because of his liberal opinions he was forced out of the university in 1884. In 1892 the *Juridical Herald* was suppressed and in 1899 the Moscow Juridical Society, of which he was president, was forbidden to hold any further meeting. He was elected by the Constitutional Democratic party as senior deputy from Moscow to the first Russian Duma, of which body he was unanimously chosen president. Muromtsev was successful in keeping its discussions confined to fundamental questions. On the dissolution of the first Duma he was one of the 200 deputies who framed the famous Viborg appeal to the people to refuse to pay taxes, to absent themselves from military conscription, and in other ways to boycott the Russian government for its high-handed treatment of the Duma. For this he was tried and imprisoned. But he remained to the end an influential leader of progressive political thought in Russia. Muromtsev was the author of various works on jurisprudence. See Russia.

MUR′PHEY, Archibald De Bow (1777–1832). An American jurist, born in Caswell Co., N. C. He was educated at the University of North Carolina. He served there as a tutor and then as professor of ancient languages until 1802, when he was admitted to the bar. From 1812 to 1818 he was a member of the State Senate. While in this body he was a member of the committee appointed in 1816 to consider the establishment of a system of public schools, and at the session of 1817 submitted an elaborate plan which, while not adopted, formed the groundwork for the later attempts. In 1818 he was elected a judge of the Superior Court and was designated to sit on the Supreme bench during three terms in 1819–20. He persuaded the State to attempt an elaborate system of canals and harbor improvements. In 1822 he secured a share of the Tennessee land warrants for the University of North Carolina and thus saved that institution from ruin. He published *Reports of Cases in the Supreme Court of North Carolina* (3 vols., 1821–26).

MUR′PHY, Arthur (1727–1805). An Irish actor and playwright, born at Clomquin, Roscommon. He studied at the English college at St. Omer in France (1738–47), started the *Gray's Inn Journal* (1752–54) in imitation of Addison's *Spectator,* and in 1754 appeared at Covent Garden as Othello. Beginning with *The Apprentice* (1756), he wrote many farces and clever satires. Among his many miscellaneous works are an edition of Fielding with a memoir (1762), an essay on Dr. Johnson (1792), a translation of Tacitus (1793), and a *Life* of Garrick (1801). His plays and early essays were collected (8 vols., London, 1786), and his life was written by J. Foot (ib., 1811).

MURPHY, Charles Francis (1858–). An American political leader, born in New York City. He was educated in the public and parochial schools, became interested in politics as a young man, and gained a large personal acquaintance through his success as an athlete and as organizer and member of the Sylvian Club. He became the owner of a series of saloons which he claimed were practically poor men's clubs. In these as elsewhere he demonstrated remarkable ability in political organization. In 1891 he was made the Tammany Hall leader of his assembly district. From 1897 to 1901 he was one of the New York commissioners of docks and ferries, in 1900 being chosen treasurer of the board. After two years as chairman of Tammany Hall and on the retirement of Croker in 1902, Murphy was chosen to succeed him as chief. In 1903 and 1905 he successfully directed the campaigns which elected and reëlected George B. McClellan to the mayoralty. He opposed the nomination of Parker for President in 1904. It had been Murphy's policy to apply for the support of the independent Democrats, but in 1906, when he supported William R. Hearst for Governor, many independent Democrats voted with the Republicans for Hughes. The result was interpreted as a severe defeat for Murphy. In 1909 Tammany Hall nominated Judge Gaynor for mayor. After a campaign of great bitterness, in which Murphy was accused of corruption and of being an evil influence in politics, Gaynor was elected, but the remainder of the ticket was defeated by the fusionists. Many thought that Murphy would be forced to retire because of this defeat, but he continued as chief. In the following year the party elected Dix Governor, and Murphy's power was supposed by some to have been extended from the city throughout the State. During the succeeding years there were scandals regarding highway and canal contracts, and Tammany Hall was sharply criticized. Boss rule became a State and national issue, and Murphy was frequently held up as an example of the vicious boss. In 1912 he favored Harmon and Clark successively for the presidential nomination, but supported Wilson after the convention acted. He was elected presidential elector in the same year. In State affairs he apparently stood passive in the nomination of William Sulzer. After the latter's election, however, they became involved in disputes, and Murphy was alleged to have been the real power in the impeachment of the Governor in 1913—a trial which scandalized the whole country. In 1913 Tammany nominated Edward E. McCall for mayor, and a fierce campaign followed, in which Murphy was assailed furiously. This, as well as the gubernatorial election of the following year, went heavily against the organization, but Murphy remained in power. See the articles on the politicians herein mentioned; also Tammany Hall.

MURPHY, Edgar Gardner (1869–1913). An American clergyman and author, born at Fort Smith, Ark. He graduated from the University of the South in 1889 and for 12 years was a minister of the Protestant Episcopal church. After 1903 he was engaged exclusively in educational and social work, serving as executive secretary of the Southern Education Board, vice president of the Conference for Education in the South, organizer and secretary of the Southern Society for Consideration of Race Problems and Conditions in the South, and organizer and first secretary of the National Child Labor Committee. He retired on account of ill health in 1908. Besides contributions to periodicals he is author of *Words for the Church* (1896); *The Larger Life* (1896); *Problems of the Present South* (1904; 2d ed., 1909); *The Basis of Ascendancy* (1909).

MURPHY, Francis (1836–1907). An American temperance evangelist, born in Wexford, Ireland. He served in the Federal army during the Civil War. Beginning in 1870 at Portland, Me., he started temperance reform clubs throughout that State, and was their first president. His headquarters were in Pittsburgh, Pa., and after his first addresses there in 1876, 45,000 people signed the pledge. He labored also in Britain, and was chaplain in the Spanish-American War. During the course of his temperance labors in America and abroad Murphy is said to have induced 10,000,000 people to sign the pledge.

MURPHY, Henry Cruse (1810–82). An American politician and historian, born in Brooklyn, N. Y. He graduated at Columbia College in 1830, studied law, and was admitted to the bar in Brooklyn, where he became city attorney and, in 1842, mayor. The next year he became a member of Congress. At the expiration of his term he was elected a delegate to the New York State Constitutional Convention of 1846. In 1847 he was again sent to Congress, and in 1852 was a candidate for the Democratic nomination for President. From 1857 to 1861 he was Minister to Holland, and after his return he served for six successive terms in the New York State Senate. He is perhaps best known for his researches in the early Colonial history of New York. He translated De Vries's *Voyages from Holland to America, 1632 to 1644* (1853). During his residence at The Hague as American Minister he printed for private distribution two monographs, *Henry Hudson in Holland: Origin and Objects of the Voyage which Led to the Discovery of the Hudson River* (1859) and *Jacob Steendam, Noch Vasater: A Memoir of the First Poet in New Netherlands, with his Poems, Descriptive of the Colony* (1861). The latter of these was reprinted in his *Anthology of New Netherland; or, Translations from the Early Dutch Poets of New York, with Memoirs of their Lives,* issued by the Bradford Club in 1875.

MURPHY, John Benjamin (1857–1916). An American surgeon, born at Appleton, Wis. He graduated from Rush Medical College in 1879 and established his practice in Chicago. In 1882–84 he studied in Germany. He was professor of surgery at the Northwestern University Medical School after 1895 and at the Chicago Postgraduate Medical School. In 1911 he was president of the American Medical Association. Murphy became known through success in autogenous bone grafts, intestinal anastomosis and approximation without sutures by means of a special button (Murphy's button, 1892), union of the femoral artery severed by a gunshot wound, and through many other operations. He edited *General Surgery* for the "Practical Medicine Series" (1901 et seq.). *The Clinics of John B. Murphy, M.D., at Mercy Hospital, Chicago,* is a publication appearing periodically.

MURPHY, John Francis (1853–1921). An American landscape painter. He was born in Oswego, N. Y., had early to struggle with poverty, and studied art by himself. He first exhibited in 1876 at the National Academy, of which he was elected a member in 1887. At first influenced by Wyant and Inness, after 1900 he attacked the modern problems of light and air, thus combining the old and new theories of landscape painting. His chief characteristics are extreme refinement and charm, poetic sentiment, and beauty of surface. His composition is simple and his rendering of soil unique. A past master of values, he prefers the quiet and subdued aspects of nature. Good examples of his work are "October" (Corcoran Gallery, Washington); "The Path to the Village" and "Indian Summer" (both in the National Gallery, Washington); "The Old Barn" (Metropolitan Museum, New York); "The Hill Top" (Art Institute, Chicago); "Afternoon Lights on the Hills" (Carnegie Institute, Pittsburgh); "Neglected Lands" (Buffalo Academy). He received numerous awards, including a gold medal at Charleston (1902) and the Inness medal in 1910.

MURPHY, Lambert (1885–). An American tenor, born at Springfield, Mass. While pursuing an academic course at Harvard University, he studied singing under T. L. Cushman in Boston from 1904 to 1908. Having filled positions in several important churches in Boston, Brookline, and Fairhaven, he went to New York in 1910 as soloist of St. Bartholomew's. After further study under Isidore Luckstone, he was engaged (1911) as a member of the Metropolitan Opera. Murphy made his reputation chiefly as a concert singer, appearing at many of the great festivals.

MURPHY, Martin (1832–). A Canadian civil engineer. He was born in County Wexford, Ireland, was educated at the public schools and privately, and began engineering work in 1852 on the Midland Great Western Railway. He was resident engineer of the Dublin, Wicklow, and Wexford Railway from 1862 to 1868, when he went to Canada and served for a year as engineer for the city of Halifax. He was chief engineer for the survey of projected Nova Scotia railways in 1870–71 and contracted for the building of Intercolonial Railway bridges in 1871–74. For 30 years (1875–1905) he was provincial engineer for Nova Scotia, and in 1906 was appointed government inspecting engineer of the National Transcontinental Railway, western division. He was president of the Nova Scotia Institute of Science (1882–83) and of the Canadian Society of Civil Engineers (1902). His views on and illustrations of bridge work won high recognition from the Engineering Congress at the World's Fair, Chicago (1893).

MURPHY, Robert (1806–43). A British mathematician, born at Mallow, County Cork, Ireland. He was early self-taught, but was sent by friends to Caius College, Cambridge, where he graduated B.A. and was elected a fellow in 1829. His fellowship was sequestered for his creditors in 1832. In 1838 he became examiner in mathematics and natural philosophy at London University. Murphy contributed important papers to the *Cambridge Philosophical Transactions* (1831–36), to the *Philosophical Magazine* (1833–42), and to the *Philosophical Transactions* (1837); and published also *Elementary Principles of Electricity, Heat, and Molecular Actions* (1833) and *A Treatise on the Theory of Algebraical Equations* (1839; reprinted, 1847).

MURPHYSBORO. A city and the county seat of Jackson Co., Ill., 87 miles by rail southeast of St. Louis, Mo., on the Big Muddy River and on the Illinois Central, the Mobile and Ohio, and the St. Louis, Iron Mountain, and

Southern railroads (Map: Illinois, F 10). It is the centre of a rich farming district producing wheat and corn and containing considerable mineral wealth, particularly deposits of shale and bituminous coal. There are railroad shops, coal mines, and manufactories of flour, lumber, ice, beer, foundry and machine-shop products, shoes, building and paving brick, etc. Murphysboro contains the St. Andrew's Hospital and has a fine high school. Gen. John A. Logan (q.v.) was born here. The city has adopted the commission form of government. Pop., 1900, 6463; 1910, 7485; 1920, 10,703.

MURRAIN, mŭr'ĭn (OF. *morine*, from Lat. *mori*, Skt. *mar*, to die). A general term loosely used to designate a variety of diseases of domestic animals, but more correctly restricted to the vesicular epizoötic, popularly known as foot-and-mouth disease. See TEXAS FEVER.

MURRAY. A city in Salt Lake Co., Utah, 6 miles south of Salt Lake City, on the Oregon Short Line, the Salt Lake, and the Denver and Rio Grande railroads. The city hall and high school are both attractive buildings. There are smelters and refineries, canning factories, flour mills, lumber-finishing plant, candy factory, fish hatcheries, and brick and tile works. The water works and one of the electric-light plants are owned by the city. Pop., 1910, 4057.

MURRAY, ALEXANDER (1755–1821). An American naval officer, born at Chestertown, Md. At the outbreak of the Revolution he received a commission in the navy, but while waiting for a ship served, during 1776–77, as lieutenant and captain in the First Maryland Regiment and participated in the operations around New York. In the latter part of 1777 he commanded the *Revenge* with letters of marque to prey on British commerce. He was captured, but after exchange served on board the *Trumbull* and was again captured. When exchanged again he commanded a privateer and afterward served on the *Alliance*. When the navy was reorganized in 1798 he was one of the first six captains appointed, and commanded the *Montezuma* during the troubles with France. He served in the Mediterranean during the war with Tripoli. In 1821 he was placed in command of the Philadelphia Navy Yard, and died shortly afterward, being at that time the senior officer of the navy.

MURRAY, ALEXANDER (1775–1813). A linguist, born at Dunkitterick, Kirkcudbrightshire. He graduated at Edinburgh University, became parish minister of Urr in his native shire (1806) and professor of Oriental languages in Edinburgh University (1812). He died April 15, 1813. Murray edited in a thorough manner Bruce's *Travels* (1805; new ed., 1813); wrote for his students *Outlines of Oriental Philology* (1812); and contributed to the *Edinburgh Review*. After his death appeared his chief work, *History of the European Languages*, with a memoir and the fragment of an autobiography (2 vols., Edinburgh, 1823).

MURRAY, ALEXANDER STUART (1841–1904). A distinguished English archæologist, born near Arbroath. He was educated at the University of Edinburgh and in Berlin. In 1867 he was appointed assistant in the department of Greek and Roman antiquities of the British Museum and in 1886 keeper of the same. In 1894–96 he directed excavations in Cyprus. His publications include: *Manual of Mythology* (1873; reëdited, 1895); a *History of Greek Sculpture* (1880–83; new ed., 1890); *Handbook of Greek Archæology* (1892); *Designs from Greek Vases* (1894); *Terra-Cotta Sarcophagi* (1898); "Greek Bronzes," in the *Portfolio* (1898); *Excavations in Cyprus*, published by the British Museum (1900); *Sculptures of the Parthenon* (1903).

MURRAY, ALMA (1854–). An English actress, born in London, the daughter of an actor, Leigh Murray. Her first appearance was at the Olympic in 1870 as Sacharissa in *The Princess*. She played at the Lyceum with Irving in 1879 and at different West End theatres from 1882 to 1897, and took a prominent part in the few attempts to produce the dramas of Shelley and Browning, playing Beatrice in *The Cenci* (1886) and Mildred in *A Blot on the 'Scutcheon* (1888). After 1899 she gave recitations and became a teacher of elocution and acting. Alma Murray married Alfred Forman, who translated several of Wagner's librettos. She played Mrs. Maylie in *Oliver Twist* (1905, 1912), the Queen in *Pelleas and Melisande* (1911), Lady Dedmond in Galsworthy's *Fugitive* (1913), and Mrs. Eynsford-Hill in Shaw's *Pygmalion* (1914).

MURRAY, DANIEL ALEXANDER (1862–). A Canadian mathematician. He was born in Colchester County, Nova Scotia, and was educated at Dalhousie and Johns Hopkins universities and in Berlin and Paris. He was successively associate professor of mathematics at New York University, instructor at Cornell, professor at Dalhousie University, and, after 1907, professor of applied mathematics at McGill. He published: *Introductory Course in Differential Equations* (1897); *An Elementary Course in the Integral Calculus* (1898); *Plane and Spherical Trigonometry* (1902); *Essentials of Trigonometry and Mensuration* (1909); *Elements of Plane Trigonometry* (1911).

MURRAY, DAVID (1830–1905). An American educator. He was born at Bovina, Delaware Co., N. Y., to which his parents had come from Scotland in 1816. He graduated from Union College in 1852. The following year he became assistant in the Albany Academy, and in 1857 was advanced to the principalship. In 1863 he accepted the chair of mathematics and physics in Rutgers College. Having assisted the Japanese Embassy in 1872 in investigating the educational systems of the United States and other countries and preparing statistics thereon, he was invited by Japan to assume the supervision of its educational affairs. He removed to that country and was occupied for six years in these duties. At the time of his return to America in 1879 he was decorated by the Emperor with the Order of the Rising Sun. In 1880 he became secretary of the regents of the University of the State of New York, and held this post nine years. He published several addresses, and was the author of *Manual of Land Surveying* (1872); an introductory chapter to *Outlines of the History of Japanese Education* (1876); *Japan* (1894; rev. ed., by Baron Kaneko, 1906), in the "Story of the Nations Series"; *History of Education in New Jersey* (1899).

MURRAY, DAVID (1849–). A Scottish landscape painter. He was born in Glasgow and studied at the Glasgow Art School. After devoting 11 years to business he turned to landscape painting and in 1882 removed to London. Elected an Academician in 1905, he exercised a

marked and salutary influence on contemporaneous British landscape painting. His color, especially in his earlier works, is fresh and brilliant, his handling dexterous, and he delights in delicate detail and movement. His subjects are chiefly landscapes of Scotland, Picardy, southern England, and the Italian lakes, and marines from the Dorset coast. Among the best known are "My Love has Gone a-Sailing" and "In the Country of Constable" (both in the Tate Gallery), "Loch Linne near Port Appin," "River Road," and a "View of Windsor."

MURRAY, DAVID CHRISTIE (1847–1907). An English novelist, born at West Bromwich, Staffordshire. He was educated at a private school. He began his career as a reporter on the Birmingham *Morning News*, and in 1873 went to London, where he joined the staffs of the *Daily News* and the *World*. During the Russo-Turkish War he was a special correspondent for the *Times*, and subsequently he traveled widely and lectured. In 1879 he published in *Chambers's Journal* his first long novel, *A Life of Atonement*. Other books are: *Joseph's Coat* (1881); *Val Strange* (1882); *Time's Revenge* (1893); *In Direst Peril* (1894); *A Rogue's Conscience* (1896); *Tales in Prose and Verse* (1898); *A Race for Millions* (1898); many other novels; *A Novelist's Note Book* (1887); *Guesses at Truths, Ethical, Social, Political, and Literary* (1908), essays originally contributed to the *Referee*, under the pseudonym Merlin; *Recollections* (1908).

MURRAY, LORD GEORGE (c.1700–60). A Scottish Jacobite general, son of the first Duke of Athol. His father was loyal to the house of Hanover, but Lord George followed his elder brother, the Marquis of Tullibardine, into the Jacobite uprising of 1715, commanded a battalion at Sheriffmuir, and made his escape to France the following year. He was living in Scotland at the time of the rebellion of 1745, and was the most capable of Prince Charles's generals. To Lord George Murray's personal bravery, sound judgment, and skill in handling undisciplined troops must be attributed the chief credit for the Jacobite victories at Prestonpans and Falkirk, as well as for the Highlanders' safe retreat from England after the raid to Derby. Murray escaped to the Continent when the cause was lost and died in Holland.

MURRAY, GEORGE HENRY (1861–). A Canadian statesman of Scottish parentage, born at Grand Narrows, Nova Scotia. He began his education in his native place, finished it at Boston University, was called to the bar in 1883, and practiced his profession at North Sydney, Nova Scotia. He was appointed a member of the Nova Scotia Legislative Council in 1889, but resigned in 1891, was an unsuccessful Liberal candidate for the House of Commons, was reappointed to the Legislative Council the same year and also became a member, without portfolio, of the provincial cabinet of William Stevens Fielding (q.v.). In 1896 he became Premier and Secretary for his native province, a position he still retained in 1915. He was a delegate to the Interprovincial Conference at Ottawa in 1906.

MURRAY, (GEORGE) GILBERT (AIMÉ) (1866–). A British classical scholar, born at Sydney, New South Wales. He went to England in 1877 and was educated at Merchant Taylors' School, London, and at St. John's College, Oxford. In 1889–99 he was professor of Greek at the University of Glasgow and after 1908 regius professor of Greek at Oxford. He received honorary degrees from Glasgow, Birmingham, and Oxford. Gilbert Murray's publications include a *History of Ancient Greek Literature* (1897); *Liberalism and the Empire* (1900), part author; a text edition of Euripides, *Fabulæ*, in three volumes (1901, 1904, 1910); *The Rise of the Greek Epic* (1907; 2d ed., 1911); *Four Stages of Greek Religion* (1913); *Euripides and his Age*, in "Home University Library" (1913); *Hamlet and Orestes* (1914); and two plays, *Carlyon Sahib* (1899) and *Andromache* (1900). Murray is perhaps best known for his admirable verse translations of various plays of Euripides: the *Hippolytus* and the *Bacchæ* (together with the *Frogs* of Aristophanes; 3d ed., 1906); the *Medea*, *Trojan Women*, and *Electra* (1905–07); *Iphigenia in Tauris* (1910); *The Rhesus* (1913). These were presented at the Court Theatre, London. In the United States Granville Barker and his wife, Lillah McCarthy (qq.v.), gave outdoor performances of *The Trojan Women* and *Iphigenia in Tauris* at various colleges (1915). Murray also translated Sophocles' *Œdipus Rex* (1910).

MURRAY, (EUSTACE CLARE) GRENVILLE (1824–81). An English journalist, the illegitimate son of Richard Grenville, second Duke of Buckingham. After studying at Magdalen College, Oxford, and at the Inner Temple, he entered the diplomatic service and held various posts at Vienna, Hanover, Constantinople, and Odessa. Returning to England in 1868, he founded the *Queen's Messenger* (1869), the first of the English satirical society papers, and in the same year he was publicly horsewhipped by Lord Carrington, whose equanimity he had seriously disturbed. Driven from England, he settled in Paris, where he figured as the Comte de Rethel d'Aragon, borrowing the title of his Spanish wife. He was one of the pioneers in the gossip and scandal of modern journalism. Among his separate publications are: *The Roving Englishman* (1854); *Round about France* (1878); *Side Lights on English Society* (1881), containing a mock dedication to the Queen.

MURRAY, HUGH (1779–1846). A Scottish geographer, born at North Berwick. Between 1804 and 1814 he wrote several works of fiction and two philosophical works, but after 1816, when he became a fellow of the Royal Society of Edinburgh, he applied himself to the study of geography. He was chiefly noted for his share in the *Encyclopædia of Geography* (1834). He also compiled historical or geographical works upon *The Southern Seas* (1826); *Polar Seas* (1830); *Africa* (1830); *British India* (1832); *China* (1836); *British America* (1839); *The United States* (1844).

MURRAY, JAMES (1719–94). The first British Governor of Canada. He was the fifth son of Alexander, fourth Lord Elibank, and entered the army about 1740. In 1757 he was sent with his regiment to America, where he commanded a brigade in the siege of Louisburg in 1758, and led the left wing of Wolfe's army in the battle on the Heights of Abraham, Sept. 13, 1759. The next year he successfully defended Quebec against an attack by a superior French force under De Lévis, and later in the same year assisted General Amherst in reducing Montreal. He was appointed Governor of

Quebec in October, 1760, and of all Canada in 1763, and continued in that position until 1766. He became Governor of Minorca in 1774, was besieged in Fort St. Philip in 1781 by the French and Spanish under the Duc de Crillon, and after a desperate defense was forced in 1782 to capitulate. Upon his return to England he was tried by a court-martial, but was acquitted. He became a full general in 1783, and died near Battle, in Sussex. For an account of his career in America, consult Francis Parkman, "Montcalm and Wolfe," in *France and England in America*, part vii (Boston, 1884; new ed., 1898).

MURRAY, Sir James Augustus Henry (1837–1915). A British lexicographer born at Denholm, Roxburghshire, Scotland. After his elementary studies at home and in Edinburgh he continued his work at London University. Having taught at Hawick, he became master of Mill Hill School, near London, a position which he retained for 15 years (1870–85). Already distinguished as a scholar, he had been twice elected president of the Philological Society (1878–80, 1882–84). For that society and for the Oxford University Press he assumed, in 1879, the editorship of the *New English Dictionary on Historical Principles* (10 vols., 1888 et seq.), the most exhaustive work in lexicography ever attempted in any language. In 1885 Dr. Murray moved from Mill Hill to Oxford, where his Scriptorium is a notable feature of the city. Before beginning this work he published, notably, *The Dialect of the Southern Counties of Scotland* (1873), the *Complaynt of Scotland* (1874), and the *Romance and Prophecies of Thomas Erceldoune* (1875). In 1884 he received a civil-list pension of £270, in 1900 was chosen Romanes lecturer at Oxford, and in 1908 was knighted. He was honored by degrees from some of the great universities of the world. A full account of the beginning of the dictionary and of its making is to be found in Dr. Murray's address to the Philological Society (1879). See Dictionary.

MURRAY, or **MORAY,** mŭr'ĭ, James Stuart, Earl of (?1531–70). A Scottish statesman. He was the natural son of James V of Scotland and half-brother of Mary, Queen of Scots. Destined for an ecclesiastical life, he was educated from 1541 to 1544 at St. Andrews, and early received ecclesiastical benefices. He accompanied his sister Mary to France in 1548, returning the following year to gain as a youth military experience and renown by driving a strong party of English from the coast with great loss. It is probable that he began to sympathize with Protestants as early as 1552, and it is certain that he was an attendant on Knox's lectures in 1555, and joined with others in urging his return from Geneva the following year. From 1556 on he was the consistent leader of the Scottish reformers, and after 1558 till his death he was the most powerful single factor in Scottish politics. He was present at Mary's marriage to the Dauphin of France, afterward Francis II, and was sent to France in 1561 to invite the widowed Mary, after the death of the Queen Regent, to return to Scotland as its Queen. For a few years Lord James Stuart, as Mary's chief minister and adviser, seemed to subordinate his own ambition to the good of Scotland, the preservation of his religion, the future union of England and Scotland, and the success of his sister's reign. In 1562 Mary created him Earl of Mar, but he soon resigned this title to become the Earl of Murray. When it became evident that she would not be acknowledged by Elizabeth as her successor, Mary turned to a Catholic alliance, which forced Murray to break with his sister, and a series of intrigues and counterintrigues began. At first inclined to favor the marriage of Mary with Darnley, he soon saw that it meant Catholic supremacy, hence he opposed it finally by an appeal to arms, but was defeated and forced to take refuge in England (1565). In 1566, after intriguing with Bothwell, professing at the same time friendship for Darnley, and being cognizant, at least, of the plan to murder Rizzio, Murray returned to Edinburgh to regain his power. For the moment outwardly reconciled to his sister, he went to France, but returned shortly at the request of the lords, who had taken arms, to become Regent of the Kingdom. After Mary's escape from prison he defeated her forces at Langside, near Glasgow, 1568, and on her flight to England he became one of the commissioners sent to that country to conduct the negotiations against her. Later, however, he urged Elizabeth to permit Mary to return to Scotland, but was assassinated in 1570 by Hamilton of Bothwellhaugh before his plans had matured. He was a cold, ambitious man, endowed with great abilities, personally moral, but in politics without scruples. Consult authorities cited under Mary Stuart.

MURRAY, Sir James Wolfe (1853–1919). A British army officer. He was educated at Harrow and Woolwich and entered the Royal Artillery in 1872. He served in the Ashanti campaign of 1895 and in Natal in 1899–1900; was quartermaster-general in India in 1903–04 and master general of ordnance in 1904–07; commanded the Ninth Division in India in 1907–11; then commanded the Imperial troops in South Africa; and in 1915 succeeded French as chief of the British Imperial general staff. Murray was made K.C.B. in 1900.

MURRAY, John (1741–1815). The founder of the Universalist body in America. He was born at Alton, England, Dec. 10, 1741. At the age of 11 his parents removed to Cork, Ireland. He became a Methodist under the preaching of Wesley and Whitefield. Having read a book by James Relly, a Universalist, he was led to adopt his views, and for this was excommunicated at Whitefield's Tabernacle, London. Persecution for opinion, pecuniary embarrassment, and grief for the loss of his wife caused him to seek retirement in America. He preached his first sermon in America Sept. 30, 1770, in a small church, in an obscure place in New Jersey, called Good Luck. Believing fully in the doctrine of universal salvation, he gave himself to earnest labor, first in New Jersey and New York, afterward in Newport, Providence, Boston, Portsmouth, Norwich, and other places in New England. In 1774 he fixed his residence in Gloucester, Mass., where he was represented as a Papist and a secret emissary of Lord North in the interest of the English ministry. He was abused, and by a vote ordered to leave the town, but the interference of powerful friends saved him and he was allowed to remain. In 1775 he was appointed chaplain of a Rhode Island brigade encamped near Boston. Ill health compelled him to leave the army, and he returned to Gloucester, where he was settled over a society of Universalists. He was instrumental

in the organization of a convention of his sect, which met at Oxford, Mass., September, 1785, and took the name of Independent Christian Universalists. In 1793 he was installed pastor of a society of Universalists in Boston, where he remained till his death, Sept. 3, 1815. He published *Letters, and Sketches of Sermons*, three volumes, and an autobiography (1813), continued by his wife (9th ed. by Demorest, 1870). Consult R. Eddy, *Universalism in America*, vol. i (Boston, 1886).

MURRAY, originally **MACMURRAY**, JOHN (1745–93). The first of four great English publishers, John MacMurray, of the stock of the Murrays of Athol, was born in Edinburgh. Having served as lieutenant of marine (1762–68), he retired on half pay and began to publish and sell books in London. John MacMurray purchased the bookselling business of Paul Sandby, opposite St. Dunstan's Church, London, and, dropping the Scottish prefix, became a bookseller at 32 Fleet Street. He brought out the *English Review* (1783–96), published, among other notable books, the first two volumes of the elder Disraeli's *Curiosities of Literature*, and was one of the original proprietors of the *Morning Chronicle*. He was succeeded in due time by his son JOHN (1778–1843). One of the earliest hits of John the second was Mrs. Rundall's *Domestic Cookery* (1808), which had been through 65 editions by 1841. With the coöperation of Scott, Canning, and others, he founded the *Quarterly Review*, a Tory organ, in opposition to the Whig *Edinburgh Review*, then at the height of its influence. The first number was published Feb. 1, 1809, under the editorship of William Gifford. The new periodical was completely successful, and brought Murray into communication not only with the chief writers but also with the conservative statesmen of the time. A still more fortunate acquaintance was that with Lord Byron, whose *Childe Harold* (first two cantos) was published by Murray in 1812. Murray now (1812) removed from Fleet Street to Albemarle Street. Almost all the literary magnates of the day flocked to Murray's house, and it was there that Scott and Byron first met. As Byron's publisher he made fame and a fortune, and he paid the poet handsomely—nearly £20,000 all told; and his dealings with Crabbe, Moore, Campbell, and Irving were princely. The second John Murray was succeeded by his son, JOHN MURRAY the third (1808–92). The long-famous Murray guidebooks to various European countries were from his pen; and many great works in history, biography, travel, art, and science were issued by him. Among his successes were Livingstone's *Travels and Last Journals*, Smiles's *Life of George Stephenson*, and Darwin's *Origin of Species by Natural Selection*. At his death he was succeeded by his son, the fourth John Murray (1851–), who, with his brother A. H. Hallam Murray, conducted the business. Consult S. Smiles, *A Publisher and his Friends* (2 vols., London, 1891), for the second John Murray; and three articles by F. Espinasse, "The House of Murray," in the *Critic* (ib., 1860).

MURRAY, SIR JOHN (1841–1914). A British naturalist and oceanographer. He was born at Coburg, Ontario, studied at Victoria College there and at the University of Edinburgh, and devoted himself to natural science. In 1868 he went through the Arctic regions on a whaler studying fauna and flora; from 1872 to 1876 was a naturalist of the *Challenger* expedition; and, after six years' service as assistant, became editor in 1882 of the scientific reports of the *Challenger* voyage. He contributed to the *Narrative of the Cruise of H.M.S. Challenger* (1882–85) and wrote the *Challenger Report on Deep-Sea Deposits*, with Renard (1890). He participated in the *Michael Sars* North Atlantic expedition in 1910, gathering material for *The Depths of the Ocean* (1912). He published also *The Ocean: A General Account of the Science of the Sea* (1913). Murray was knighted in 1898.

MURRAY, JOHN. See DUNMORE, JOHN MURRAY, EARL OF.

MURRAY, JOHN CLARK (1836–). A Canadian writer on philosophy and psychology, and a university professor, born at Paisley, Scotland. He studied at Glasgow, Edinburgh, Göttingen, and Heidelberg. In 1862 he became professor of mental and moral philosophy in Queen's University, Kingston, Canada, and in 1872 he was called to a similar chair at McGill University, Montreal. Murray received the degree of LL.D. from Glasgow. He is author of *An Outline of Sir William Hamilton's Philosophy* (1870); *Ballads and Songs of Scotland* (1874); *Memoir of David Murray* (1880); *Handbook of Psychology* (1885); *Solomon Maimon: An Autobiography*, translated from the German (1888); *An Introduction to Ethics* (1891); *An Introduction to Psychology* (1904); *A Handbook of Christian Ethics* (1908).

MURRAY, LINDLEY (1745–1826). An English grammarian of American birth, born at Swatara, Lancaster Co., Pa., April 22, 1745. He was educated at an academy of the Society of Friends, and, on his father's removal to New York, was placed in a counting house, from which he escaped to a school in New Jersey. He afterward studied law and had a good practice in New York. During the Revolutionary War he engaged in trade with such success as to accumulate a handsome fortune. His health failing, he went to England (1784) and purchased an estate at Holdgate, near York, where he devoted himself to literary pursuits and botany. His garden rivaled the Royal Gardens at Kew. In 1787 he published his *Power of Religion on the Mind*, which passed through 20 editions. His *Grammar of the English Language* was issued in 1795, and was followed by *English Exercises*, the *Key*, the *English Reader* (1799), and a *Spelling Book* (1804), which went through some 50 editions. Murray died Feb. 16, 1826. Consult the *Memoir of Murray*, containing an autobiography by Frank (York, 1826), and *Life* by Egle (New York, 1885).

MURRAY, or **MORAY**, mŭr'ĭ, SIR ROBERT (?–1673). A Scottish statesman. He was educated at St. Andrews University, entered the French army, and, through the influence of Richelieu, rose to the rank of colonel. He was chosen secret envoy to negotiate a treaty between Scotland and France, and while at Newcastle in December, 1646, formed a plan for the escape of Charles I, which came to nothing through the King's irresolution. In 1651 he was appointed justice clerk, and soon afterward was made a Privy Councilor and a Lord of the Session, but never took his seat upon the bench. After the Restoration, as Lord of Exchequer and Deputy Secretary he was one of the triumvirate, the other two members of which were Lauderdale and the King, that ruled Scotland

from 1663 till 1670. He was one of the founders of the Royal Society, the oldest scientific society in Great Britain. As a chemist and musician he had a good reputation in his time.

MURRAY, WALTER CHARLES (1866–). A Canadian educator. He was born at Studholm, New Brunswick, and was educated at New Brunswick, Edinburgh, and Berlin universities. He was professor of philosophy and economics at New Brunswick University (1891–92); George Munro professor of philosophy and lecturer on education at Dalhousie University (1892–1908), and in the latter year was appointed president of the provincial university of Saskatchewan. He was elected a director of the Dominion Educational Association. He published *Studies in Mind Growth* (1904) and *Local Government in the Maritime Provinces* (1909).

MURRAY, WILLIAM, first EARL OF MANSFIELD. An English jurist. See MANSFIELD, WILLIAM MURRAY, first EARL OF.

MURRAY, WILLIAM HENRY HARRISON (1840–1904). An American Congregational clergyman, lecturer, and author. He was born at Guilford, Conn., and graduated from Yale in 1862. In Connecticut he held pastorates at Washington (1863–64), Greenwich (1864–66), and Meriden (1866–68). From 1868 to 1874 he was pastor of the Park Street Church, Boston. In 1869–73 and in 1875–78, while pastor of the Independent Congregational Church, he gave several series of popular sermons, or Sunday evening lectures, before large audiences in Music Hall, Boston, published as *Music Hall Sermons* (2 vols., 1870–73). Subsequently he withdrew from the ministry and followed a varied career in business, lecturing, and writing. His writings on life in the woods and mountains, which brought him the nickname of "Adirondack Murray," include: *Adventures in the Wilderness, or Camp Life in the Adirondack Mountains* (1868); *The Perfect Horse* (1873); *Words Fitly Spoken* (1873); *Daylight Land* (1888). His *Complete Works*, including a number of "Adirondack Tales," were published at Hartford in 1900 (7 vols.). Consult H. V. Radford, *Adirondack Murray* (New York, 1905).

MURRAY, WILLIAM VANS (1762–1803). An American diplomat, born at Cambridge, Somerset Co., Md. He received a classical education and went to London, where he studied law for two years in the Inner Temple. Returning to Maryland in 1785, he was admitted to the bar, and began the practice of his profession, in which he soon attained prominence. From 1791 to 1797 he was a Federalist member of Congress. In 1797 he was appointed by President Washington United States Minister to the Netherlands, and in 1799, with Oliver Ellsworth (q.v.) and William R. Davie, was sent to Paris to negotiate a treaty which should adjust the difficulties that had brought France and the United States to the verge of war. The successful negotiation of the convention signed at Paris, Sept. 30, 1800, was said to be largely the work of Murray. He was the author of a valuable brief treatise on *The Constitution and Laws of the United States.*

MURRAY BAY, or **MALBAIE.** A summer resort and the capital of Charlevoix County, Quebec, Canada, on the left bank of the St. Lawrence River, about 80 miles northeast (direct) of Quebec, with which it has steamboat communication (Map: Quebec, H 3). Situated on the Murray estuary which forms the bay, it is the principal watering place on the north shore of the St. Lawrence, and is much frequented for its scenery, invigorating air, bracing though cold bathing, its boating, and fishing. It has county buildings, a Roman Catholic convent, and a boys' college. The town, of which lumber, flour, and carding mills, together with cheese factories, are the chief manufacturing establishments, is at the mouth of the Murray River, the dependent summer colonies being at Pointe à Pic (population, in 1911, 617) and Cap à l'Aigle, the extremities of the bay, 3 miles distant. It was one of the stations for United States prisoners of war in 1776. Pop., 1901, 826; 1911, 1449.

MURRAY RIVER. The principal river of Australia, draining, together with the Darling, practically the whole southeastern quarter of the continent. It rises in the Australian Alps near the east boundary of Victoria, and flows for two-thirds of its course northwestward, forming the boundary between Victoria and New South Wales (Map: South Australia, F 5). After entering South Australia it makes an abrupt turn to the south and enters the Indian Ocean through Encounter Bay, 40 miles southeast of Adelaide. Its length is about 1500 miles. For the first 60 miles of its course it passes between precipitous rocky cliffs in one place, known as the Murray Gates, reaching the height of 3000 feet, while some of the highest peaks of the continent are close to its banks. After passing through the Gates the hills become gradually lower, and finally the river enters the immense Australian plains. Here the Murray is sluggish, with numerous windings, and flanked by lagoons. It receives here scarcely any tributaries except a few very large ones coming from the mountains. Among these are the Murrumbidgee (q.v.), which is longer than the main stream from the point of confluence, and the Darling (q.v.), whose length exceeds that of the entire main stream. During the dry season the river loses by evaporation and shrinks even in its lower course to a width of less than 300 feet, but in winter its volume increases enormously, and great inundations occur. In the wet season it is navigable for small steamers for the greater part of its course as far as Albury, but its mouth, owing to sand bars, is inaccessible for large vessels. There are a number of ports on its shores, whose total shipping probably amounts to more than one and a half million tons annually.

MUR'RAYSHIRE. A maritime county of Scotland. See ELGINSHIRE.

MURRE, mûr (also *marre*, of uncertain etymology). Any of several species of guillemot (q.v.).

MURRELET, mûr'lĕt (dim. of *murre*). Any of several small murrelike birds confined to the North Pacific Ocean. The black-throated, or ancient, murrelet (*Synthliborhamphus antiquus*) is a handsome black-and-white bird about 10 inches long. It breeds from Sitka northward, and is found as far south as Oregon in winter. A Japanese murrelet is closely allied to it. The remaining four species represent another genus (*Brachyrhamphus*) chiefly distinguished by a more slender and less compressed bill. Two of the species are Arctic forms, one coming south to southern California in winter, while the other two occur in southern and Lower California.

MUR'RELL, WILLIAM (1853–1912). An English physician. He was educated at University College, London, where he was scholar and demonstrator (1875–78), at the same time practicing medicine; served as medical examiner at Edinburgh (1882–87) and in the Royal College of Physicians in London (1886–90); and became physician and lecturer at Westminster Hospital. He wrote: *Nitroglycerin as a Remedy for Angina Pectoris* (1882), crowned by the French Academy of Medicine in 1885; *What to Do in Cases of Poisoning* (1882; 10th ed., 1907); *Massage as a Mode of Treatment* (1886; 5th ed., 1890), translated into French and German; *Chronic Bronchitis and its Treatment* (1889); *A Manual of Pharmacology and Therapeutics* (1896); *Aids to Materia Medica* (1898–99); *Forensic Medicine and Toxicology* (6th ed., 1903).

MUR'REY. See HERALDRY.

MURRUMBIDGEE, mŭr'ŭm-bĭj'ē. A river of New South Wales, the second largest tributary of the Murray. It rises on the northeast slope of the Australian Alps, in the southeast corner of the state, within 40 miles of the Pacific coast (Map: New South Wales, B 4). It flows first northward through a hilly country, then westward through the great plains till it enters the Murray 90 miles, in a straight line, southeast of the mouth of the Darling. Its length is 1350 miles, but, though it is longer than the Murray from the point of confluence, it is not of great commercial importance, owing to its shallowness. During the wet season it is navigable 500 miles for light-draft steamers. Its principal affluent is the Lachlan (q.v.). In 1829 Captain Sturt traced the Murrumbidgee to the Murray, and in 1831 Captain Barker, in search of it, was murdered by the natives.

MURRY. See MORAY.

MUR'SA, or **MURSIA.** The Roman name for Eszék (q.v.).

MURSHIDABAD, mo͝or'shē-dä-bäd'. The capital of a district of Bengal, British India, on the left bank of the Bhagirathi, a branch of the Ganges, 115 miles north of Calcutta (Map: India, F 4). Azimganj, on the opposite side of the river, with ferry communication, is usually reckoned part of Murshidabad. The town covers a great area, several miles in length and breadth, but, having lost much of its former importance as a trade and revenue collection centre, it is no longer fully populated. The buildings are for the most part of mud, but there are several brick structures—mosques and tombs—along the river bank; and centrally situated is the Nizamat Kila, or Nawab's palace, a building of great beauty, completed in 1840. It has many treasures, including jewelry, china, arms, and pictures. The town is on the most frequented water route from Calcutta to the United Provinces. Its trade was formerly of great importance, and its banking connections are still considerable, Jain merchants here being among the wealthiest in India. Institutions include a college for education of the Nawab's family. The rearing of silkworms and the weaving of silk are the chief of many industries, which include ivory carving, the manufacture of gold and silver lace, embroidery, hookah pipes, and musical instruments. Murshidabad was the last Mohammedan capital of Bengal, and after the British annexation remained the capital until 1790, when the administrative seat was settled at Calcutta. Population in 1891, of Murshidabad and Azimganj, 35,756; in 1901, of Murshidabad, 15,168, of Azimganj, 13,383; total 28,551.

MURTOS. See MARTOS.

MURU'MURÚ PALM. See ASTROCARYUM.

MURVIEDRO. A town in Spain. See SAGUNTO.

MURZUK, mo͝or-zo͝ok', or **MOURZOUK.** The capital of Fezzan (q.v.), in Italian Libya, north Africa, situated in an unhealthful region in lat. 25° 50′ N. and long. 14° 10′ E. (Map: Africa, F 2). It is surrounded by a wall and has an extensive palace. The inhabitants manufacture leather and textiles; it has also a large transit trade, being one of the three chief caravan stations in the interior. The population is estimated at 6500.

MUS, PUBLIUS DECIUS. See DECIUS MUS, PUBLIUS.

MUSACEÆ, mû-zā'sē-ē (Neo-Lat. nom. pl., from *Musa*, from Ar. *mauz*, banana tree), THE BANANA FAMILY. A family of monocotyledonous plants, almost restricted to the Oriental tropics, from whence many of them have been introduced into the Occidental tropics. This is one of a group of four families which constitute the order Scitaminales (q.v.), an order intercalated between Liliales and Orchidales, at the end of the series of Monocotyledons. Although the plants resemble trees in stature, the apparent stems consist of the long sheathing bases of the leaf stalks, constituting what is called a false stem. From the midrib to the margin of the leaf blade are many fine parallel veins. Hence the wind tears the tissue between them and makes the leaves very ragged. The flowers are borne on spadices in cymes or racemes often with bright-colored bracts which are protected by spathes. The fruit is either fleshy or a three-valved capsule. The family contains about 60 species, many of which are exceedingly important for their fruit (especially species of *Musa*) and for their leaf fibres, which are used in cordage and for textile purposes. A very interesting species is the traveler's tree (q.v.) of Madagascar. See BANANA; HEMP, MANILA; PLANTAIN.

MUSÆ'US (Lat., from Gk. *Μουσαῖος, Mousaios*). 1. A legendary Greek poet and personification of the powers of the Muses. His parents were said to be Eumolpus or Antiphemus and Selene, and in story he was closely connected with Orpheus, of whom he is variously called teacher, son, and pupil. He is especially associated with the Eleusinian mysteries, which he was said to have founded, and many poems apparently connected with this worship, or oracular in nature, were attributed to him. He had no existence, however, outside of legend. 2. A later Musæus, who probably flourished in the sixth century of the Christian era, was the author of a very pleasing amatory poem, in Greek, entitled *Hero and Leander*, discovered in the thirteenth century, of which the first edition was published by Aldus Manutius about 1494; critical edition by C. Dilthey (Bonn, 1874). See HERO.

MUSA IBN NUSAIR, mo͝o'sà ĭb'n no͝o-sīr' (c.660–c.714). An Arab governor of north Africa, who sent Tarik (q.v.) in 711 to make an expedition into Spain, which led to the Moorish conquest of the peninsula. Musa, jealous of the success of his subordinate, crossed himself in 712 with an army of 18,000 men. He made conquest after conquest, but was checked in 713 by

an order of the Caliph to repair at once to Damascus. He left immediately, his son Abdul Aziz taking command. When Musa arrived at Damascus he was deprived of his command, and is said to have been put to death, while his son met his death in his palace at Seville, possibly at the command of the Caliph of Damascus. Consult *Cambridge Medieval History*, vol. ii (New York, 1913).

MUSÄUS, mụ-zā′ụs, JOHANN KARL AUGUST (1735–87). A German writer, best known for his *Volksmärchen der Deutschen* (1782–86), a collection of tales blending genial humor, quaint fancy, and common sense. Musäus was born in Jena, March 29, 1735. He studied theology, became in 1763 tutor of pages at the court of Weimar and in 1770 professor at the Weimar Gymnasium. His literary career began (1760) with a successful parody of Richardson's *Grandison*. Then, after 18 years' silence, he satirized Lavater's whimsical theories in *Physiognomische Reisen* (1778–79). His sprightly and genial *Freund Heins Erscheinungen in Holbeins Manier* (1785) are interesting because they show the rising influence of Wieland (q.v.). He died at Weimar, Oct. 28, 1787, before completing *Straussfedern*, a series of tales. In 1788 appeared the clever skits *Moralische Kinderklapper*. Other posthumous writings were gathered in 1791 with a notice of Musäus by his pupil and relative, August von Kotzebue (Leipzig, 1791). There is a *Life* by Moritz Müller (Jena, 1867). Consult also A. Stern, *Beiträge zur Literaturgeschichte des 18. Jahrhunderts* (Leipzig, 1893).

MUSCÆ VOLITANTES, mŭs′sē vŏl′ĭ-tăn′tēz (Lat., flying flies); MYIODESOPSIA (Gk. *μυιώδης, myiōdēs*, like flies + *opsia*). The term applied to floating grayish spots before the eyes. Whoever will look through a minute pinhole in a card at the clear sky may see floating before his sight a number of translucent tubes or fibres, and many little beads, of which some are separate, some attached to the tubes, and some apparently within them. Some of the tubes or fibres are straight, others looped or twisted, and others again forked. All these objects are bright in the middle, and bounded by fine black lines. The doublings and crossings of the loops or knots in the twisted fibres appear as black points. Though the eye be fixed, these bodies change their position with greater or less rapidity. Now, in ordinary light and vision these objects are usually unobserved, though some persons can easily see them, especially when looking at a bright surface. They are believed to be caused by shadows cast upon the retina by cells (probably embryonic) which exist normally in the vitreous humor. They occur most often with errors of refraction and disturbances of digestion and are apt to be associated with excess of uric acid. A course of alkaline waters, together with the observance of ocular hygiene and the wearing of suitable lenses, generally affords relief. They are of no pathological importance whatever, but may become very annoying to neurasthenic patients. After a sudden movement of the eyes they appear to settle downward. Fixed black spots, not moving at all while the eyes are motionless, are suggestive of actual disease and demand an ophthalmoscopic examination.

MUS′CARDINE (Fr. *muscardine, muscadin*, It. *moscardino, moscadino*, musk lozenge, from *moscato*, ML. *muscatum*, musk, from Lat. *muscus*, musk), or SILKWORM ROT. The fungus *Botrytis bassiana* and also the serious disease of silkworms which it produces. The fungus consists of erect branching threads, with clusters of spores at the ends of short lateral branches. The spores germinate on healthy silkworms, especially those in the last stage before spinning their cocoons. They germinate also on the caterpillars of other lepidopterous insects, and on the common house fly. Diseased worms die suddenly, become discolored, and are soon hard and dry. Within 24 to 36 hours their bodies may be covered with a whitish powder, the spores of the fungus. For the prevention of this disease absolute cleanliness in the breeding house is necessary; rooms should be cleansed and fumigated after an outbreak to prevent infection of the new brood. The fungus *Metarrhizium anisopliæ* and the disease which it causes in white grubs and other insects are known as the green muscardine; and the fungus *Sporotrichum globuliferum*, which causes disease in chinch bugs, scale insects, etc., is known as the white muscardine.

MUSCARDINE. See DORMOUSE.

MUSCARINE, mŭs′kà-rĭn. See ALKALOIDS.

MUSCAT, mŭs-kăt′. An old name for the Arabian State of Oman (q.v.).

MUSCAT, MUSKAT, or **MASKAT,** mŭs-kăt′. The capital of Oman, in southeast Arabia, situated on the Gulf of Oman (Map: Turkey in Asia (Arabia), J 6). It is fortified and has a good harbor, which makes it one of the most important commercial centres in Arabia, and the port for almost all the trade of Oman, amounting to over $6,000,000 annually. Its exports consist of dates, mother-of-pearl, dry fish, and salt. It is poorly built and unclean. Its climate is very hot and is considered by some authorities as unhealthful. Its rainfall averages four inches. The population is estimated at 24,000, including the adjacent town of Matra. The inhabitants are mainly engaged in agricultural pursuits. Muscat is the seat of a British Resident and is under British influence. In the sixteenth century Muscat was captured by the Portuguese, but was restored to the ruler of Oman in the seventeenth century.

MUS′CATEL′, or **MUSCADEL** (OF. *muscadel, muscadet*, Fr. *muscadet*, from ML. *muscatellum*, muscatel wine, dim. of *muscatum*, musky odor, from Lat. *muscus*, musk). The name given to many kinds of sweet and strong French and Italian wines, whether white or red. Among the finest are the white Rivesalt and red Bagnol wines from Roussillon, the Lunel from the Pyrenees, and the Lacryma Christi and Carigliano of Naples. See WINE.

MUSCATINE, mŭs′kà-tēn′. A city and the county seat of Muscatine Co., Iowa, 30 miles southwest of Davenport, on the Mississippi River and on the Chicago, Rock Island, and Pacific, the Chicago, Milwaukee, and St. Paul, and the Muscatine North and South railroads (Map: Iowa, F 3). It is built on high bluffs at a bend of the river; and among noteworthy features are the Musser Library (public), a soldiers' monument, a public park, two hospitals, and a high bridge across the river. The city carries on considerable trade in lumber and agricultural produce, being known especially for the watermelons and sweet potatoes grown on Muscatine Island, just below the city. It is an important industrial centre, its establishments including canning factories, pickle works, found-

ries and machine shops, sheet-iron, boiler, and engine works, manufactories of various lumber products, potteries, button factories, box and packing-case factories, brick and tile works, carriage and wagon shops, etc. Settled in 1833, Muscatine was incorporated first in 1839. The government, under a charter of 1851, subsequently amended by State special charter laws, is vested in a mayor, elected every two years, and a unicameral council, which controls important powers of confirmation and election in administrative offices. The police judge, treasurer, wharf master, assessor, and school board are chosen by popular vote. The city owns and operates the water works. Pop., 1890, 11,454; 1900, 14,073; 1910, 16,178; 1914, 17,074; 1920, 16,068. Consult I. B. Richman (ed.), *History of Muscatine County* (2 vols., Chicago, 1911).

MUSCHELKALK, mŭsh'el-kâlk (Ger., shell lime). The middle member of the Triassic or New Red Sandstone period in continental Europe. In Germany the formation consists chiefly of limestones, which abound in the remains of mollusca; hence the name muschelkalk. The beds are of much economic importance, containing salt, marl, and gypsum.

MUSCI, mŭs'sī (Lat., mosses). The technical name of the group of plants known as mosses, one of the two subdivisions of bryophytes, the other being the Hepaticæ (liverworts). Mosses are adapted to all conditions, from submerged to very dry, and are most abundantly displayed

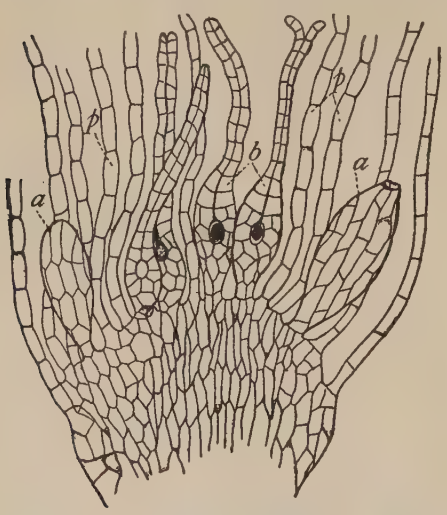

Fig. 1. The so-called flower of a moss in longitudinal section, showing antheridia (*a*), archegonia (*b*), and paraphyses (*p*). Outside all are longitudinal sections of leaves.

in temperate and Arctic regions. They have great power of vegetative multiplication, new leafy shoots putting out from old ones, thus forming thick carpets and cushions. Bog mosses often completely fill up bogs or small ponds and lakes with a dense growth which dies below and continues to grow above. These quaking bogs or mosses furnish very treacherous footing. In their depths the dead moss plants become slowly modified into peat.

There are two great groups of mosses, the *Sphagnum* forms (peat or bog mosses) and *Bryum* forms (true mosses). The life history of a true moss shows a distinct alternation of generations (q.v.). When a spore germinates, there is first developed a small, green, thready body (protonema), upon which appear buds that give rise to the ordinary leafy moss plant. Upon this leafy plant the sex organs (antheridia and archegonia) are borne (Fig. 1), and hence it is the sexual phase (gametophyte) in the

Fig. 2. 1, gametophyte, showing original spore (*y*), protonema (*p*), buds (*b*) which develop the leafy branches (*s*). 2, a young sporophyte (*c*) emerging from the leafy plant (*s*).

alternating generations. The sex organs produce a fertilized egg, which upon germination does not reproduce a leafy moss plant but a structure of totally different character, viz., a stalked spore case (sporogonium), full of asexual spores, commonly called the moss "fruit." Since this sporogonium has no sex organs, it is the sexless phase (sporophyte) in

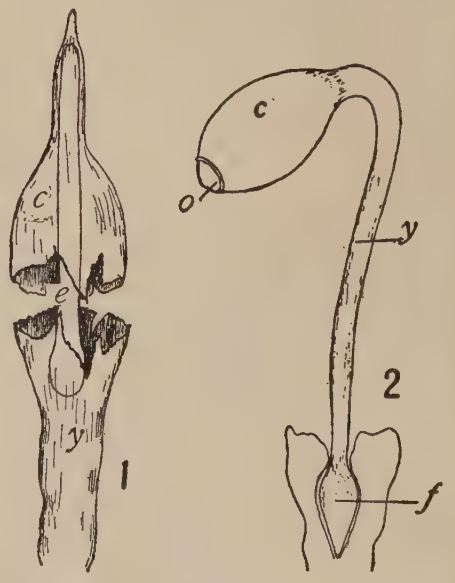

Fig. 3. 1, the young sporophyte (*e*) rupturing the bladdery archegonium and carrying up the upper portion (*c*), as a hood (calyptra). 2, mature sporophyte (sporogonium), showing foot (*f*), seta (*y*), capsule (*c*), and operculum (*o*). Both diagrammatic.

the alternation. When these spores germinate they produce leafy moss plants (gametophytes) again, and so alternation continues. (See Fig. 2.) The spore case (capsule) of an ordinary

MOSSES AND LICHENS

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1 BEARD MOSS – USNEA BARBATA
2 SAFFRON-COLORED STICTA – STICTA CROCATA
3 CRESTED CLADONIA – CLADONIA CRISTATELLA
4 YELLOW EVERNIA – EVERNIA VULPINA
5 FERN MOSS – THUIDIUM RECOGNITUM
6 TREE MOSS – CLIMACIUM AMERICANUM
7 BROOM MOSS – DICRANUM SCOPARIUM
8 HAIR-CAP MOSS – POLYTRICHUM COMMUNE
9 PEAT MOSS – SPHAGNUM SQUARROSUM

moss, generally pendent from a slender stalk (seta), is a very complicated structure. It is usually somewhat urn-shaped, with a little conical or flattish lid (operculum), which is thrown off when the spores are to be discharged. Often also the mouth of the urn is guarded by beautiful hairlike or toothlike structures which converge towards the centre and are collectively known as the peristome (around the mouth). Through the centre of the capsule there runs an axis of sterile tissue, called the columella; while capping the top of the capsule like a loose hood is the calyptra, which is the dead and ruptured female sex organ (archegonium) that has been carried up by the elongating sporogonium (Fig. 3). Consult A. J. Grout, *Mosses with a Hand-Lens* (2d ed., New York, 1905), and E. H. Hale, *Flowerless Plants* (ib., 1909). See BRYOPHYTES.

MUS'CIDÆ (Neo-Lat. nom. pl., from Lat. *musca*, fly). A family of dipterous insects comprising the typical or true flies. The bristle of the antennæ is feathery, and the abdomen is smooth except for a certain number of bristles near the tip. The larvæ as a rule feed upon decaying animal or vegetable matter, more abundantly upon the former. The group comprises many species and includes some of the most common and abundant forms, such as the house fly, the horn fly, and the stable fly (qq.v.).

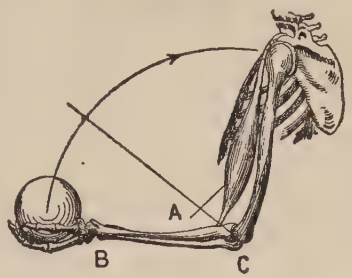
MUSCLE, DISEASES OF. Inflammation of muscle tissue is called myositis (Gk. *μῦς, μυός, mys, myos*, muscle + *itis*). It may be acute or chronic. The acute form may be due to infection or injury and sometimes terminates in suppuration. There are slight tenderness, swelling, and œdema. In trichinosis the muscles are inflamed and tender from the presence of a minute worm, the trichina. A chronic form of the disease, known as myositis ossificans, is a progressive affection, either congenital or beginning in infancy, and confined almost exclusively to the male sex. The affection is characterized by the gradual formation in the muscles, generally of the back, of masses of bone tissue; pronounced deformity results, the respiration becomes impeded, and death occurs in about 10 years. The pathology is obscure, and no curative treatment is known. A similar condition may develop after severe injury, but in this form the ultimate prognosis is good.

The voluntary muscles may become atrophied from want of use, from long-continued pressure, from injury, from interference of the blood supply, or disease of their supplying nerves or their centres in the spinal cord, as is often seen in lead poisoning or infantile spinal paralysis. (See POLIOMYELITIS.) Muscles may become contracted from disease or injury or may be dislocated as a result of accident. The long head of the biceps is most frequently displaced. Diseases of the joints, such as rheumatoid arthritis of the shoulder, may also bring this about. Other conditions which may be occasioned by injury are wounds and contusions, hernia, rupture, and strain, the latter term applying to a condition in which the muscle is unduly stretched and some of its fibres broken. Muscles may become hypertrophied by excessive use. In pseudohypertrophic paralysis the bulk of the muscle is apparently increased; but in reality there is less muscle structure than normal, the increase consisting of fat and connective tissue.

Gradual wasting of the muscles is observed in many nervous diseases. A specific form, progressive muscular atrophy, known also as wasting palsy, chronic anterior poliomyelitis, and Duchenne-Aran's disease, occurs in males between 25 and 50 years of age and in many instances is believed to be hereditary. Several etiological theories are put forward, but the ultimate causation of the disease is obscure.

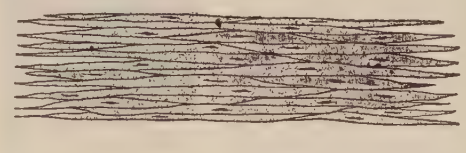
The term "dystrophy" is applied to conditions of progressive muscular weakness with atrophy, in which the seat of the lesion is in the muscle itself rather than in the spinal cord or nerve fibres. Many types of progressive muscular dystrophy have been described, among which may be mentioned Erb's paralysis and Landouzy-Déjérine's paralysis, the one beginning in childhood, the other in infancy. Pseudohypertrophic paralysis is sometimes classed as a dystrophy.

MUSCLE and MUSCULAR TISSUE (Lat. *muscles*). While contractility is a property of



A. BICEPS MUSCLE.

all active, living protoplasm, it is in muscular tissue that this property reaches its highest development, the ability to contract along certain definite lines being the peculiar function of this tissue. Muscle tissue occurs in three different forms. 1. *Striated Voluntary Muscle.*—This form is found in all those muscles which are under the control of the will, in fact all those which in the common use of the term are called



INVOLUNTARY MUSCLE IN LONGITUDINAL SECTION.

muscles, such, e.g., as the biceps, triceps, etc. 2. *Nonstriated Involuntary Muscle.*—This form occurs in the muscles which are not under the control of the will, but which carry on the automatic functions of life, such as the muscles of the intestine, which control its peristaltic action, or the muscles of the arteries and veins, which govern their contractility. 3. *Striated Involuntary Muscle or Cardiac Muscle.*—This form is peculiar to the heart, and appears to occupy an intermediate position between the other forms of muscular tissue.

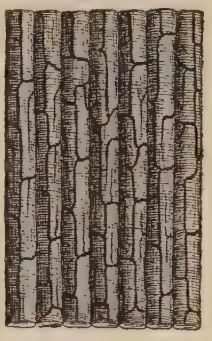
INVOLUNTARY MUSCLE IN TRANSVERSE SECTION.
Ar. t., areolar tissue.

1. *Striated Voluntary Muscle.*—This constitutes the ordinary voluntary muscles of the skeletal system, and occurs in the pharynx,

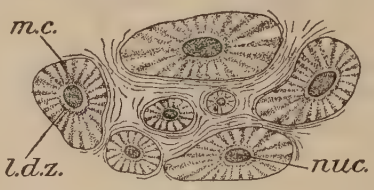
larynx, diaphragm, generative organs, etc. It is composed of long cylindrical fibres, each one of which represents a highly specialized development of a single cell. The muscle fibre consists of the muscle substance proper, the muscle nuclei, and an external sheath or sarcolemma. The muscle substance of a fibre shows a longitudinal striation which indicates its division into ultimate fibrillæ, while transversely it consists of alternate light and dark bands or disks. The light disk is crossed by a delicate dark line, the line or membrane of Krause. A light line across the dark disk (Hensen's line) has also been described, but is probably an artifact. The minute bit of muscular tissue separated off by Krause's line at either end and by the dividing line between the fibrillæ on each side is known as the sarcous element of Bowman, while the appearance presented by the crosscut ends of the fibrillæ composing a single fibre is called Cohnheim's field. Each fibre is inclosed in a transparent, very delicate, but tough and elastic sheath, known as the sarcolemma or myolemma, the former term being derived from the Greek words *sarx* (flesh) and *lemma* (skin or husk), the latter from the Greek words *mus* (muscle) and *lemma*. Just beneath the sarcolemma, in the protoplasm, lie the muscle nuclei. They are oval or spindle-shaped, their long axes corresponding to those of the fibre. The individual fibres are held together by a delicate connective tissue called the endomysium; they are bound together into bundles or fascicles by a coarser connective tissue, the perimysium; while the entire muscle is surrounded by a connective tissue sheath, the epimysium. In short muscles single fibres may extend the entire length of the muscle. In longer muscles individual fibres do not extend the entire length of the muscle, averaging 25 to 50 millimeters in length. Very long fibres, 100 to 120 millimeters long, are sometimes found. The fibres taper somewhat at their ends and terminate, if in the middle of the muscle, by a blending of the sarcolemma with the endomysium of the neighboring fibres; if in tendon, periosteum, or perichondrium, by union of the sarcolemma with the connective tissue. Striated muscle is extremely vascular. The larger vessels run in the perimysium, where they branch, and these smaller branches give off capillaries which form a rectangular network among the individual fibres. The larger nerve trunks run in the perimysium, where they subdivide and send branches to the muscle fibres. Here they terminate in special end plates. See NERVOUS SYSTEM.

VOLUNTARY MUSCLE IN TRANSVERSE SECTION.

m. f., muscle fibres; *end.*, endomysium; *per.*, perimysium.



INJECTED VOLUNTARY MUSCLE.



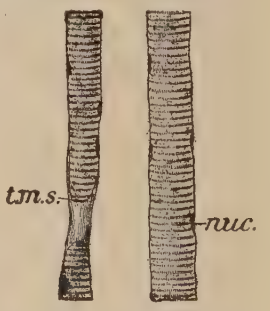
SECTION OF HEART MUSCLE (striated involuntary muscle).

m. c., muscle columns; *l. d. z.*, zone of less differentiated sarcoplasm; *nuc.*, nucleus.

2. *Nonstriated Involuntary Muscle.*—This form of muscular tissue, while not occurring in large masses, has an extremely wide distribution. It forms the muscularis mucosæ and muscular coats of the gastrointestinal canal, the muscular walls of the arteries and veins, of the trachea and bronchi, of the larger ducts of glands, and occurs in the urinary tract and in the male and female generative organs. It consists of long, slender, spindle-shaped cells from .075 to .230 millimeter in length and from .004 to .010 millimeter in thickness. Its substance shows fine longitudinal markings. A delicate sheath or cell wall has been described and within this is the semifluid granular protoplasm of the cell body. In the centre of the latter lies a long rod-shaped nucleus towards each end of which a few fine granules are found. These cells are arranged in bundles, the individual cells being held together by a cement substance, the bundles being surrounded by connective tissue. Blood vessels ramify in this connective tissue, where they break up into capillaries which form a network among the muscle cells. Nerves, mainly of the sympathetic system, pass to the individual muscle cells.

INVOLUNTARY MUSCLE.

Smooth muscle fibres from the small intestine of a frog.

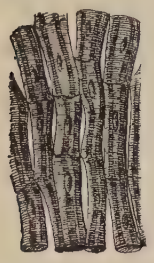


VOLUNTARY MUSCLE.

nuc., nuclei; *t. m. s.*, termination of muscular substance.

3. *Striated Involuntary Muscle* (*Cardiac* or *Heart Muscle*).—This is a type of muscular tissue peculiar to the heart. It resembles the smooth involuntary muscle in being composed of nucleated cells. These cells are, however, much larger and broader than the smooth muscle cells, are more or less rectangular in shape, and send off lateral branches which join similar branches of neighboring cells, with which they are connected by cement substance. The cell

protoplasm shows both longitudinal and transverse striations, but much less marked than in striated voluntary muscle. A cross section of a cell gives somewhat the appearance of Cohnheim's field, but the fibrillæ show a more or less radial arrangement about the circumference. The nucleus is round or slightly oval in shape and is situated near the centre of the cell.



HEART MUSCLE.

Development. Muscle is developed from the mesoderm or middle layer of the embryo. Smooth muscle cells are produced by a differentiation of mesodermal cells. Voluntary striated muscle is developed by a still further specialization of these mesodermal cells, the nuclei proliferating and longitudinal and transverse striations appearing in the protoplasm. In this way the cells become gradually transformed into the fibres of voluntary muscle. Heart muscle has the same derivation, and represents an intermediate stage of development between the more primitive smooth muscle cells and the more highly specialized striated muscle fibres. For diseases, see MUSCLE, DISEASES OF.

MUSCLE READING. The intuition of a person's thought by physical contact. Every complete mental process tends to issue or express itself in movement; the psychophysical organism is essentially a motor organism. In many cases these expressive or concomitant movements are involuntary and unknown to their performer. It is often possible, by close attention to them, to get an inkling of the object or direction of the agent's thought. Some persons, indeed, have a peculiar aptitude for this muscle reading, or (as it has been wrongly termed) mind reading, so that they are able, by taking into account all the objective indications presented by the agent, to reproduce in somewhat surprising detail the course of his thought.

Muscle reading was much in vogue a few years since as a drawing-room game. On the stage it is customary for the mind reader to lay the hand of the subject upon his forehead or to take the subject's hand in his own. By minute observation of the subject's involuntary movements, of his tremor or flush of excitement, etc., it is possible for the reader to guess, in many instances, the number of a watch, the place and character of a hidden object, etc.; the subject being completely unaware that he is giving any suggestion, and the suggestions themselves being unnoticeable to the audience. With the most successful mind readers the process of observation has itself become habitual and therefore partly unconscious, so that they are unable to explain their modus operandi, even if they desire to do so. Their extreme fatigue, at the conclusion of a performance, indicates, however, that attention has been under great strain.

This appreciation of unconscious movements and of vasomotor changes in the subject is sufficient to explain all the feats of mind reading that are on record, surprising as some of them may appear. Consult Preyer, *Die Erklärung des Gedankenlesens* (Leipzig, 1886), and Joseph Jastrow, *Fact and Fable in Psychology* (Boston, 1900).

MUSCLE SENSE. Historically, a sixth sense, supposed to furnish in connection with the movement of voluntary muscle a specific quality, directly concerned in the perception of position and movement of the bodily frame and less directly in the perception of space at large. Experimental psychology has shown, however, that special sense qualities arise not only from the muscles but also from the tendons and from the structures about the joints, and that movements of the head or of the body as a whole give rise to still other qualities, those of the static sense (q.v.). To all these qualities taken together the term "kinæsthetic sensations" is at present applied, and the term "muscle sense," except in an historical context, has tended to fall into disuse.

In consequence of the inaccessibility of the end organs and of their spatial contiguity with one another and with the cutaneous endings, kinæsthetic sensations cannot easily be isolated for study. They seem, furthermore, to possess a textural similarity to one another and to cutaneous pressure, and a tendency to fuse readily together into complexes, so that their individual recognition is especially difficult. If, however, the position of the arm be kept constant, so that there is no change of articular conditions; if the skin and subcutaneous tissue be anæsthetized by ether or by a cocaine injection; and if the body of the muscle be then pressed, or stimulated by an electric current, the specific sensation of voluntary muscle may be experienced. With moderate intensities of stimulus the sensation is a dull, dead, diffuse pressure, most nearly akin to pressure sensations obtained by pressing a blunt object lightly upon the normal skin; with stronger intensities the sensation has a dragging or grinding character, presently becomes sore and achy, and finally merges into dull pain. The sensation with these higher degrees of intensity seems to be the characteristic part of the feeling of fatigue.

Less complete isolation is possible in the case of tendinous and articular sensations. Articular sensations may be approximated if we bend the hand with relaxed fingers slowly and evenly about the wrist, ruling out or abstracting so far as possible from the cutaneous sensations and attending to the sensation complex localized within the wrist joint. Under these conditions the complex is distinguishable from the dull, dead muscular quality. The impression is very like that obtained by turning a soapy finger within the loosely shut other hand; i.e., is like cutaneous pressure over a considerable area. Analysis of a number of other experiences, such as those of severe muscular work, of supporting or lifting a heavy weight, of tightly clenching the fist, or even of expectant attention, brings to light a third quality which we term effort or strain. The sensation seems to have its origin in the tendon. It is more lively, thinner, more definite and cleaner-cut than muscular pressure; it is also distinguishable from cutaneous and articular sensation. Like the dragging sensation of the muscles, it takes on the character of dull pain with higher intensities of stimulus.

The assignment of nervous end organs to the above-mentioned qualities must remain at present a matter of probability rather than of certainty. Medullated fibres ending in the substance of the muscles take on differentiated forms known as the muscle spindles. The ten-

dons contain similar structures, known as the spindles of Golgi. Pacinian corpuscles and histologically related bodies are widely distributed. They are especially plentiful in muscle and tendon fascia and in the synovial membrane and ligaments of the joints; they are also found in adipose tissue, in the periosteum, in the body of the tendons and muscles, in the walls of blood vessels, and elsewhere. Sensory nerve endings occur, further, in the substance of the bony tissue. Considerable evidence exists for assigning the dragging and achy sensations of the muscle to the muscle spindles, and the sensation of strain to the spindles of Golgi. The Pacinian corpuscles appear to be connected with articular pressure. If they are differently tuned, as the pressure and temperature organs of the skin appear to be, it seems probable that when intensely stimulated they may also be responsible for dull muscular pressure.

As already mentioned, kinæsthetic sensations do not ordinarily appear alone, but fuse with one another and with other sensations in the form of perceptions; and they appear to be especially prominent in the perception of bodily movement. The relative importance in this perception of the various qualities mentioned, however, is at present a matter of some dispute. On general principles it seems hardly possible that muscular and tendinous sensations can play the leading part, simply because movements of equal range and like direction are constantly made with very different conditions in these parts,—with the limb flexed or extended, free or heavily weighted,—so that variations in the intensity of the sensations there aroused can hardly serve as unambiguous cues. Experimental and pathological variations seemed also, at first, to argue for the undivided importance of articular sensations. If articular sensitivity was impaired, the perception of movement was blunted; and if with impaired sensitivity articular stimulation was increased in intensity, the perception was sharpened; whereas muscular and tendinous sensations might, apparently, be ruled out without decreasing the accuracy of perception. More recent experiments, however, appear to indicate that, at least under normal conditions, the other kinæsthetic qualities and cutaneous sensations may furnish subsidiary cues whose absence results in decreased accuracy of perception. With the normal forearm laid passively on a board hinged beneath the elbow, e.g., it is found that we are able with closed eyes to appreciate a gentle movement of the arm through an arc of as little as $\frac{1}{800}$ of a degree. If the skin is anæsthetized, however, the movement must be about a hundred times as great in order to be perceived. In general, experiment tends to show that external pressures upon the skin and distentions and other movements of the skin brought about by movements of the subcutaneous tissues are normally of great importance in our estimation of the rate, range, and direction of movement. It appears, furthermore, in experiments with the elbow board, that a faradizing current passing through the wrist, and apparently anæsthetizing the sensory endings in the muscles and tendons there attached, may be as effective in impairing the accuracy of perception of movement about the elbow as a current passed through the elbow joint itself. Still other experiments upon active movement, upon the after image of movement, and upon movement illusions in the limbs, tend to show that patterns of muscular and tendinous sensations may sometimes become important in this perception.

MUSCLE SENSE IN ANIMALS. See KINÆSTHETIC SENSATIONS IN ANIMALS.

MUSCLE SHOALS. The location of a dam and power development on the Tennessee River about 37 miles up stream from Florence, Alabama. This project to develop power and at the same time facilitate the navigation of the Alabama River came into general prominence during the World War. The "National Defence Act" of 1916 authorized the establishment of a nitrate plant in order to meet the government's needs for military explosives. The construction of the Wilson Dam, (Dam No. 2 of the complete project), was directed by the President, February 23, 1918, and some $17,385,000 was allotted for its construction. By 1922 it was about two thirds finished. In April, 1921, increased interest was aroused in the matter by the proposal of Henry Ford, to take over the dam and power plant and use it as the basis of a large industrial development. Mr. Ford's proposal was rejected by the Senate Committee, and up to August 1, 1922, no decision on the matter had been reached.

MUSCOGEE. See MUSKOGEE.

MUSCOGEE INDIANS. See CREEKS.

MUS'COVITE. A very common mineral of the mica group, which is in composition a hydrous potassium-aluminium silicate and which crystallizes in forms of the monoclinic system. Its usual color ranges from gray to brown, but it also occurs in different shades of green, violet, yellow, and sometimes rose red. It has a vitreous lustre that is more or less pearly or silky, and its specific gravity is from 2.76 to 3. Muscovite is one of the essential constituents of granite, gneiss, mica schist, and certain other rocks. It is widely distributed in nature, occurring most abundantly in Tirol, Styria, on the St. Gotthard, and elsewhere in Switzerland, as well as at Paris, Me., Grafton, N. H., Chesterfield, Mass., and numerous localities of North Carolina, in the United States. The fact that it has a cleavage parallel to the base, and is easily separated, forming thin elastic plates which are transparent to translucent, led to its use as the material for window panes in Russia, whence its name of *Muscovy glass*, and to its extensive and similar use in stoves under the misleading name of isinglass. It is also employed commercially in wall paper, as a filler, in electrical machines as an insulator, and to a certain extent as a paint. See MICA.

MUS'COVY. A name formerly applied to Russia, whose capital down to the beginning of the eighteenth century was Moscow.

MUSCOVY DUCK (corrupted from *musk duck*). A large South American duck (*Cairina moschata*) in which the male is much larger than the female and has fleshy wattles on the forehead and lores and a crest of long feathers. This duck has long been domesticated in Brazil and in Europe, where it is especially in favor in Germany. In the United States they are less esteemed, because of their quarrelsome nature and ability to harm one another or their companions in the poultry yard. Two varieties are recognized, colored and white, which are thus described in Howard's *Farmers' Bulletin, No. 64*, of the United States Department of Agriculture (Washington, 1897): The head of the colored muscovy is glossy black and white; the bill is

dark horn in color; eyes, brown; the back in color of plumage is lustrous blue black, which is sometimes broken with white; the color of the breast and body is the same as that of the back. The wing coverts are rich, lustrous green black, and the tail feathers may be either black or white, the latter being preferred. The thighs, like the tail feathers, may be either black or white, white being preferred; the shanks, toes, and webs vary in color from yellow to dark lead or black. The white muscovy in color of plumage is pure white throughout; feathers of any other color will disqualify the bird for show purposes. The eyes in the white variety are of a leaden-blue or gray color, while those of the colored are brown. The shanks, toes, and webs are of a pale-orange or yellow color. The standard weight of the adult drake is 10 pounds; adult duck, 8 pounds. The flesh is good and loses in cooking the musky odor of the living bird. See DUCK.

MUS'CULAR FORCE, ORIGIN OF. This subject has occupied the attention of physiologists for many years, and numerous theories have been offered to explain the phenomena of muscular energy. The older observers, represented by Liebig, held that nitrogenous food went to build up and maintain muscular tissue and that energy was evolved in the oxidation of this class of food, the waste being represented in the excreted urea. The nonnitrogenous foods (carbohydrates and fats) were supposed to be entirely devoted to the production of heat. Muscular work should therefore cause a distinct increase in the elimination of urea. But this theory is invalidated by the fact that the excretion of urea does not keep pace with the production of energy. Later observers have taken the opposite view, that force is generated by the oxidation of nonnitrogenous substances, and that the nitrogen constituents of muscle are rather to be looked upon as forming a part of the machine in which the former substances are burned than as constituting the fuel themselves.

Herman holds that muscular activity depends upon the splitting up and subsequent re-formation of a complex nitrogenous body which he calls *inogen.* From the decomposition of this body there result carbon dioxide, sarcolactic acid, and a gelatino-albuminous body. Of these the carbon dioxide is carried away by the blood, and the acid and the albuminous substance, at least in part, go to rebuild the inogen. The other materials of which the inogen is formed are supplied by the blood. Of these materials oxygen and some carbohydrate substance form a part. The decomposition takes place both in resting and active muscle, but is much greater in the latter. This theory explains certain known facts of muscular metabolism: that muscle absorbs oxygen and gives off carbon dioxide during both rest and activity, and that increased exchange of these gases takes place during the latter condition; that this process is attended by the production of heat; and that muscle during rest produces nitrogenous crystallizable substances such as creatine from the metabolism going on constantly during life.

Greene thus sums up what is at present really known as to chemical changes in contracting muscle: 1. The alkaline muscle becomes acid from the presence of sarcolactic acid. 2. The muscle gives out carbon dioxide and takes up oxygen, but the amount of the carbon dioxide given out is not entirely dependent upon the oxygen taken in, and must arise partly from some other source. 3. Certain imperfectly understood chemical changes occur, probably connected with the foregoing phenomena, in which glycogen is converted into dextrose and the latter oxidized.

For a full discussion of this subject, see Michael Foster, *Textbook of Physiology* (new ed., New York, 1904), and W. S. Kirke, *Handbook of Physiology,* revised by C. W. Greene (8th ed., ib., 1914). See also PHYSIOLOGY.

MUSCULAR RHEUMATISM. See RHEUMATISM, MUSCULAR.

MUSCULAR SYSTEM, EVOLUTION OF. The muscular system comprises those tissues or masses of tissue which have the property of contractility and whose function it is to accomplish the movements of the parts or of the whole of the animal body. Contractility is one of the properties of simple protoplasm. Thus, the amœba progresses by the extension of some portion and the contraction of other parts of its body. The cortical layer of *Paramœcium* is a specially contractile region in the protoplasm. In the *Stentor* and the stalk of *Vorticella* there are protoplasmic differentiations that resemble muscle fibres.

Many of the outer-lying ectoderm cells of *Hydra* show considerable differentiation; they are conical in shape, with the broad surface outward. On this external surface a thin, cuticle-like layer has been demonstrated. Internally the cell ends in a contractile basal portion or process which lies parallel to the long axis of the body of the hydra and between the ectoderm and entoderm. The whole of these cells are contractile, but the long processes are specially so. These processes were formerly known as neuromuscular, but with the discovery of special nerve cells the muscular function alone must be conceded to them. Like the muscle cells of vertebrates they contract when properly stimulated. Here, then, are ectodermic muscle cells, the entire protoplasm of which, like that of the amœba, is irritable and contractile, but with a portion of the cell more clearly set apart to perform the contractile function than in any protozoan. In the jellyfishes, such as *Aurelia,* a muscle cell is likewise composed of two parts—a contractile portion (which shows cross striations) and, attached to the striated portion, a protoplasmic, nondifferentiated, noncontractile portion which may bear cilia on its external surface. This muscle-bearing epithelium is arranged in a bundle or ring around the edge of the subumbrella. It is the contraction of this muscular zone that propels the jellyfish through the water. In the tentacles and about the lips unstriated muscle fibres occur. The contraction and extension of the body of the sea anemone, as well as of its gullet and mesenteries, and its ability to move slowly from the point of attachment, are accomplished by means of a well-developed muscular system. This consists of bands of longitudinal muscle fibres which run on the mesenteries from the base to the disk; of parietal muscles which pass obliquely across the lower and outer angle of the mesentery; and of a thin sheet of transverse muscles. The contraction of the longitudinal muscles draws the animal towards the base, and that of the transverse muscles causes the contracted animal to extend again. A band of circular muscles at the junction of column and disk causes the disk

and contracted tentacles to be inclosed within the body of the anemone. In addition to the bands of muscles, scattered fibres occur both in the body wall and in the gullet, which consist partly of spindle-shaped, nucleated fibres and partly of such striated muscle processes as occur in *Hydra*. The latter are mostly found in the transverse muscles of the body and the tentacles, and are of entodermal origin, as also are the muscle bands of the mesenteries. Other longitudinal muscles are of ectodermic origin. Some of the muscles, however, sink so far down into the middle layer or mesoglea as to seem to belong to it alone. This is significant because all the musculature of animals above the cœlenterates lies between the ectoderm and entoderm.

The musculature of flatworms falls under two groups: (1) the dermal musculature and (2) the dorsoventral musculature. The dermal musculature lies either under the basal membrane of the epidermis or under the cuticle. It is composed of distinct layers. In each layer all the fibres run in one and the same direction. There are longitudinal muscles, transverse and diagonal muscles. The musculature is stronger on the ventral creeping surface. In cestodes the diagonal layer is replaced by a second circular layer. The dorsoventral musculature runs from the dorsal to the ventral surface, and is much displaced at sexual maturity by the male and female germ glands. Below the cuticular layer of roundworms there is a well-developed muscular layer in the form of a tube, and composed of outer circular fibres and inner longitudinal ones. This muscular tube effects the writhings and undulations of the body. As in the cœlenterates, the muscle element is composed of a single cell, made up of a protoplasmic (often glandular) portion and a fibrillar part. The fibrillæ rarely show any evidence of cross striation, the lateral lines are free from muscle fibres, and the longitudinal sheet is thus broken up into bands.

The muscular system of mollusks is also well developed. The muscle fibres, both of bivalves and gastropods, are all of the unstriated sort, because of the slow movements of the animals. These fibres occur usually in distinct bands or sheets, and frequently are combined for greater power to form very large muscles, such as the two abductors of *Anodonta*, which close the shell. Other important muscles are those of the foot, including two protractors and one retractor; and in the snail those that work the radula of the mouth, the retractors of the horns and penis, and those that pull the head into the shell. The muscles are fastened to the shell, upon which they make certain distinct markings at the points of attachment, called scars.

The musculature of segmented worms, like that of the roundworms, is composed of a dermomusculature tube which is composed of an outer circular and an inner longitudinal layer of fibres. The fibres are in the form of bands. The pharynx, mouth, gut, parapodia, and septæ have special muscle fibres. In leeches, in addition to the circular and longitudinal bands of muscle fibres, there are bands reaching diagonally from the dorsal to the ventral surface of the body.

Among arthropods the musculature of the Crustacea is well developed and very complex, but there is little evidence remaining of the dermomuscular tube of worms. It is assumed that the dorsal and ventral pair of longitudinal muscles correspond to the four similarly situated bands of muscle in the Polychæta. Perhaps traces of the circular musculature of annelids are found in the muscles that are attached to the basal parts of the appendages on the one hand and to the integument of the body on the other. Certainly the firmer exoskeleton makes greater localization of the musculature possible. In the limb-bearing portion of the abdomen and the thorax there are paired dorsal and ventral muscle bands. In the limbless part of the abdomen there is a thick layer or tube of longitudinal muscle fibres, interrupted at each septum by the connective tissue that separates the myomeres. Thus the muscle itself is separated into myomeres. The abdomen is bent upward, downward, or sidewise by the contraction of the muscle fibres in the corresponding portion of the body. The appendages are moved by muscles that pass out into them from the trunk. The muscles are either attached to the cuticular outer covering or to inward projecting parts of it, and often terminate in sinewy pieces that are white and are composed of bundles of cross-striated fibres—the kind of fibre that characterizes all rapidly moving muscle. In *Peripatus*, however, the muscles are unstripped, save those which work the jaws. In insects, the thorax and metathorax, as in the case of the grasshopper, are crowded with leg and wing muscles. In the cockroach, where the wings are little used, the wing muscles are poorly developed.

The musculature of *Amphioxus*, like that of the abdomen of Crustacea, is divided into metameres. Of these muscular segments or myomeres there are about sixty, V-shaped on surface view, with the apex of the V extending forward. The myomeres are composed of striated muscle fibres which extend longitudinally and are attached to the septæ immediately in front and behind them. The myomeres of the two sides alternate. The musculature of the dorsal wall is the thicker.

In cyclostomes, as well as in *Amphioxus*, the muscles of any myomere are attached to the anterior and posterior myocomata of that segment. In selachians a significant change has occurred—the first step towards the complicated conditions of higher vertebrates. Certain of the ventral lateral muscles on either side of the median line become differentiated from the others, in that their fibres move out from the general level in correspondence with their greater functional activity. Thus, while the dorsal trunk muscles retain their primitive character, the ventral muscles have become separated into two masses: a pair of strong mid-ventral ones which are known together as the rectus abdominis, and the remaining muscular mass. We next find that in this latter mass the direction of the muscle fibres, which in *Amphioxus* and cyclostomes is horizontal, has become in selachians oblique; so that, from the mid-ventral line, they pass dorsoposteriorly. The remaining less differentiated portion of the ventral musculature is known as obliquus abdominis, or oblique abdominal muscle. Two kinds of changes have now occurred in the vertebrate musculature: (1) There is the functional differentiation of parts of muscles by which they become cut off from the remainder, and (2) changes in the direction of muscle fibres by which originally axial muscles have become oblique. In the lowest vertebrates the anterior and posterior ends of muscles are attached to the adjacent myocomata.

With the development of ribs from the fibrous tissue of the myocomata, muscular attachment has, in part, fallen upon them. The derma, indeed, is differentiated from the same tissue as the myocomata; hence it is not surprising that, in the migrations on the ends of muscles to adapt themselves to the new conditions, we find that some muscles are attached to the derma. Finally, some muscles, whose ends come thus to lie outside of the myomeres, may extend alongside of several somites without signs of metamerism. Thus, by these simple modifications, we gain the complex musculature of the higher vertebrates, where there are trunk muscles of different sizes and lengths, often without metamerism and attached to bony parts such as ribs, or to the skin. In *Amphioxus* the myomeres are arranged with reference to the sagittal plane from which they extend obliquely outward and backward. In cyclostomes the obliquity is so great that the myomeres overlap each other like the shingles on a roof, so that a cross section of the body may cut three or four myocomata on each side. In many fishes the free edge of the myocomata, as it appears at the surface, is not merely bowed, but is zigzag.

The most typical condition of the amphibian musculature is shown in Urodela. The dorsal lateral muscles retain most nearly the fishlike condition and lie in metameres. When the ribs and transverse processes of the vertebræ become developed some of the muscles gain attachment to them, and thus give rise to the intercostal and intertransversal muscles. The ventral lateral muscles of fishes are disposed in two regions. In Amphibia they comprise four regions, derived from a migration and splitting of the two lateral muscles of fishes. In addition, lying under the internal oblique, there is a muscle that probably has no representative in fishes. It is unsegmented and lies deeper than the skeleton and immediately within the peritoneal lining of the body cavity. The Anura differ from the Urodela chiefly in the absence of the transversal abdominis, and in the diminution or disappearance of myocomata in the adult.

In reptiles, as in Amphibia, the dorsal musculature retains more nearly the primitive condition. With the ossification of the skeletogenous tissue and the consequent attachment of the muscles to the bone, has come about the differentiation of the so-called interspinales, semispinales, intertransversals, longissimus dorsi, and others. The last-named muscle is to be regarded as a part of the dorsal musculature that has lost its metamerism, and now passes from the pelvic girdle to several of the spines of the thoracic vertebræ. The ventral musculature has become still more complicated, owing, according to Wiedersheim, to the changed rhythmic method of respiration, controlled through the more and more greatly developed lungs. To meet the needs of respiration the ribs must be moved. The muscles which perform this function have become more powerful in that the ribs have become buried in them. The musculature of successive myomeres, which projects outside or inside the ribs, becomes united into a single sheet. With the disappearance of the ribs in the lumbar region of reptiles a modification of the intercostals must of course take place. A continuous muscle is developed between the last rib and the pelvis.

The phylogeny of many of the muscles of mammals is not known. The more important muscles resemble those of reptiles.

Two kinds of muscular fibres are found in the vertebrate body. All the quickly moving voluntary muscles are composed of striated fibres. The involuntary muscles are unstriated. The muscle fibre of vertebrate muscle, like that of invertebrates, is formed by the differentiation of a muscle cell. Only in the muscle cell of the lower invertebrates a much smaller portion of the cell is transformed into fibre structure than is the case in vertebrate muscle fibre. The differentiated portion of vertebrate muscle fibre is composed of fibrillæ and forms the main bulk of the cell. The fibrillæ are embedded in the undifferentiated part, which also surrounds them in the form of a sheath and contains the nuclei.

Bibliography. Arnold Lang, *Text-Book of Comparative Anatomy* (2 vols., London, 1891–96); *Cambridge Natural History* (10 vols., ib., 1895–1904); Parker and Haswell, *Text-Book of Zoölogy* (ib., 1897); R. E. E. Wiedersheim, *Comparative Anatomy of Vertebrates*, trans. by W. N. Parker (3d ed., New York, 1907); Benedict and Cathcart, *Muscular Work* (Carnegie Institution, Washington, 1914).

MUS'CULUS, Wolfgang (properly Müslin) (1497–1563). A German reformer and theologian, born at Dieuze in Lorraine. At 15 he entered a Benedictine cloister at Lixheim, but left in 1527, having been turned to Protestantism by Luther's writings. In 1531 he became pastor at Augsburg, and for seventeen years was prominent in that city. Musculus was long an eager partisan of union between the Lutheran and Reformed churches and took part in the Wittenberg Agreement (1536), and in the colloquies of Worms and Ratisbon (1540–41). At the time of the Augsburg Interim (1548) he went to Switzerland, and in 1549 became professor of theology at Bern. His views were more strongly Calvinistic in his later years, and with Calvin and Vermigli he may be reckoned as a leader of the sixteenth-century Reformation. Consult Grote, *W. Musculus* (Hamburg, 1855).

MUSÉE, mụ'zâ' (Fr., museum). The first part of the names of a number of museums in Paris, of which the most important are: 1. Musée Carnavalet, devoted to Parisian history and archæology, occupying a mansion on the Rue des Francs-Bourgeois formerly known as the Hôtel de Ligneris, begun in 1544 by P. Lescot (q.v.) and extended 1660 by N. F. Mansart (q.v.); with two fine courts, and sculptures by Jean Goujon. 2. Musée de Cluny (see Cluny, Hôtel de). 3. Musée Galliéra, devoted to municipal art and temporary exhibitions: a handsome modern building and court by Ginain (1888) on the Rue Pierre Charron. 4. Musée Guimet, a museum of Oriental art and religions, on the Place d'Iéna, founded by the late Émile Guimet of Lyons. 5. Musée du Louvre (see Louvre). 6. Musée du Trocadéro or Musée de Sculpture Comparée, a vast collection of casts of historic masterpieces of sculpture in the wings of the Trocadéro (q.v.) Palace.

MUSÉE SOCIAL, sō'syâl' (Fr., social museum), The. An organization whose object is to furnish the public with information regarding movements having for their aim the improvement of the moral and material situation of the laboring classes. It resulted from the interest in the social science exhibition at the Paris Exposition of 1889, but was not formally

inaugurated until March 25, 1895. The Comte de Chambrun gave the institution an endowment of over 2,000,000 francs. Special collections of all matters pertaining to labor, trade-unions, old-age pensions, housing reform, etc., are made and indexed for ready reference. Studies of labor conditions in various countries have been undertaken, and the results published in monographs. Although young, the Musée has proved of great usefulness. It was very active in preparing the excellent exhibit of social economy in the Exposition of 1900. The more important publications of the Musée are contained in the *Bibliothèque du Musée Social*. It issues a small monthly "circulaire" containing general matter pertaining to labor.

MUSES (Lat. *Musa*, Gk. Μοῦσα, *Mousa*). In Greek mythology, the inspirers of song and music. In the Homeric epic their personality and number are vague, the poet now invoking but one Muse, now a number; only in a very late passage in the *Odyssey* are nine mentioned. In Homer, again, they are divine singers, dwelling on Olympus, and singing at the heavenly banquets; since they see and remember all things, they can inspire the bard. In the *Theogony* of Hesiod, 77 ff., the canonical number, nine, and the separate names appear. Originally probably nymphs of fountains on Mount Olympus, they seem to have been worshiped first in Pieria, whence the cult spread southward and established itself on Mount Helicon at Ascra, and in Thespiæ. We hear of shrines also at Delphi and at Athens, both on the Ilissus and on the Museum Hill, which thus obtained its name. They always loved fountains, e.g., Castalia, Aganippe, Hippocrene. There are grounds for believing that, like the Charites and the Horæ, the Muses were originally three, but nine was their number on Helicon, and this became universally accepted, as well as the tradition that they were the daughters of Zeus and Mnemosyne (Memory). In art the Muses are frequently represented. On the François vase, an Attic work of the early sixth century B.C., they appear at the marriage of Peleus and Thetis, with Calliope playing on a Pan's pipe at their head. Later artists used them freely, especially in connection with Apollo, or with the mythical poets Orpheus and Thamyris. On the basis by Praxiteles at Mantineia they are represented as present at the contest between Apollo and Marsyas. It is to be noted, however, that, while there is a tendency to develop definite artistic types for some of the figures, the division of the several branches of poetic art among the Muses and the adoption of fixed attributes to distinguish them is a product of a comparatively late period in the Roman Empire. Even the Hesiodic names did not designate the functions of the Muses, and in the popular usage seem to have been but little employed. The functions of the Hesiodic Muses were thus assigned in the later writers: Clio, history; Calliope, epic poetry; Polyhymnia, sacred hymns; Euterpe, music of the flute, lyric poetry; Terpsichore, melic poetry and the dance; Erato, the choral lyric; Melpomene, tragedy; Thalia, comedy; Urania, astronomy. The Romans identified the Greek Muses with their own Camenæ (q.v.). Some variations in this classification are found. Consult: H. Deiters, *Ueber die Verehrung der Musen bei den Griechen* (Bonn, 1868); O. Bie, *Die Musen in der antiken Kunst* (Berlin, 1887); the article "Musen" in W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. ii (Leipzig, 1890–97); Arthur Fairbanks, *The Mythology of Greece and Rome* (New York, 1907). See also the articles on the individual Muses.

MUSES' LOOKING-GLASS, THE. A play by Thomas Randolph published in *Poems with Muses' Looking-Glass and Amyntas*, 1638. An altered version, entitled the *Mirrour*, appeared in 1758.

MUSEUM, mû-zē'ŭm (Lat. *museum*, from Gk. μουσεῖον, *mouseion*, temple of the Muses, place for study, museum, from Μοῦσα, *Mousa*, Muse). An institution for the preservation, study, and exhibition of objects of art or those of natural origin. The term was originally applied to a place or temple sacred to the Muses, but a little later was bestowed on institutions for the pursuit of the higher branches of learning, such as art and philosophy, the first recorded use of the word for this purpose being the famous *Museum* of Ptolemy Soter at Alexandria. The application of the word to institutions for the preservation and exhibition of works of art or specimens of natural history is comparatively recent, as are the institutions themselves, and seems to have come into vogue with the systematic gathering of objects for public exhibition. Such collections were originally known as cabinets; and while the term was to some extent restricted to small private collections, it was also given to many of very considerable size, such as the State Cabinet of Natural History at Albany, N. Y.

The germ of the modern museum has been thought by some to lie in votive offerings placed in pagan temples or deposited in churches, and in objects of sacred or historical interest preserved in churches and monasteries. And it may be said that one of the earliest references to the preservation of specimens of natural history is the account of the skins of what are now supposed to have been gorillas brought home by Hanno and presented by him to the Temple of Astarte in Carthage. Museums of art and of natural history had their origin in collections made by the rich and powerful without at first a more definite purpose than to gratify their own pleasure or curiosity. Somewhat later men of science gathered material to further their own special lines of research, and many of these private collections eventually developed into public museums. Thus some of the national museums of Europe had their beginnings in collections made by former sovereigns, while the British Museum grew out of the cabinet and library of Sir Hans Sloane. The Ashmolean Museum, at Oxford, England, was the result of the labors of Elias Ashmole, who began collecting in 1667, while the Museum of the Royal College of Surgeons, London, is based on the anatomical material gathered by the famous surgeon John Hunter, and the Hunterian Museum of the University of Glasgow was founded by his brother, William Hunter. It may be of interest to note that the exploration of America did much to promote the growth of museums and that the cabinets of Sloane and Ashmole, particularly the latter, comprised many specimens from the New World. Incidentally, too, public houses may be credited with some slight share in the development of museums; for, in England at least, they formed small collections of curiosities to attract visitors, and Artedi, in his work on fishes, mentions three taverns where

he had seen specimens of American fishes. Directly related to these, and representing another stage in the development of museums, was the establishment of miscellaneous collections, more or less scientific in their nature, to which visitors were admitted upon the payment of a fee. President Adams mentions a collection of this sort in Norwalk, Conn., formed by a Mr. Arnold prior to the Revolution, but the best of the type in America were those of the Peales in Philadelphia and Baltimore. Two noteworthy foreign collections were those formed by Sir Ashton Lever, at Manchester, in 1775, and by William Bullock somewhat later at Liverpool. These were eventually taken to London, where they flourished at different periods, and their importance may be inferred from the fact that when these collections were sold various foreign museums sent representatives to attend the sale. Such large private establishments were the immediate precursors of the present state and governmental institutions. These represent the general acknowledgment of the value of museums, and are held to mark a stage in the progress of civilization beyond that of the art gallery or library, since the development of science is far later than that of art or literature.

Great public museums are of comparatively recent date, for while Bacon in his *New Atlantis* outlines such an institution, the establishment of the British Museum in 1753 was the first realization of this idea. In 1789 France transformed a royal into a national collection by opening the Louvre to the public, but the United States did not formally establish a national museum until 1876, although it practically came into existence in 1846, when the Smithsonian Institution was made the custodian of the national collections. The influence of the many expositions held during the latter half of the nineteenth century on museums has been very great; the construction of the first building for the United States National Museum was a direct result of the Centennial Exposition of 1876, and the Field Museum of Natural History, Chicago, owes its origin to the exhibition of 1893. The South Kensington Museum, now called the Victoria and Albert Museum, in London, the Ethnological Museum of the Trocadéro in Paris, and the Glasgow Art Gallery and Museum are largely due to similar causes.

The development of museums has not merely been in their size and number, but in their scope and functions as well. Originally the specimens exhibited comprised the greater or more important portion of the collections, and were mainly for the benefit of men of science. The modern plan, especially in museums of natural history, is to restrict the number of pieces on exhibition and to select for this purpose those of the greatest educational value; the bulk of material is placed in the reserve series, and is kept thus not merely for study, but for its better preservation, since light is one of the greatest enemies of museum specimens. The constantly increasing size of collections has had something to do in shaping this policy, but it is largely the result of a recognition of the fact that, so far as the general public was concerned, the educational influence of museums depended more on the quality of the things exhibited than on quantity. This has led to careful study of the best methods of arranging and labeling objects on exhibition and so displaying them that they may attract and interest even the casual visitor. No man probably had more to do with bringing about this state of affairs than the late Sir William Flower, Director of the Museum of the Royal College of Surgeons, and subsequently of the British Museum, while in the United States Dr. G. Brown Goode (q.v.) stands preëminent among those who have been most instrumental in making museums instructive to the public. There has been a corresponding evolution in the publications issued by museums, in making them of interest to the general public and not restricting them to papers of a technical nature. We have seen that private collections were formed not only for the preservation of material, but for its study, and this led to the publication of information thus acquired. The germ of museum publications, however, is to be found in the illustrated descriptive catalogue of small private "cabinets." The oldest of these works is that issued by Gesner in 1565, describing one of the first systematic collections, that of Johann Kentmann of Dresden. Public museums have followed the same path as private collectors; and while, like individuals, their publication was at first through the medium of scientific societies, the tendency is for museums to become their own publishers. As the transfer of great collections from private to public ownership made them accessible to a greater number of students than before, this in turn has led to the issuing of memoirs by other than regular members of their staff. Many museums also issue guidebooks, handbooks, or articles of a somewhat popular nature relating to their collections, and in line with this are courses of lectures on topics illustrated in the various departments of the institution. The steady trend of museum development has been in the line of extending their educational influence and making them of value to the many instead of to a favored few. Dr. Goode summed up the objects of museums as record, research, and education; the preservation of material, its study, and the publication of information in the shape of books, and the spread of knowledge by the display of specimens. In a broad way museums may be divided into museums of natural history and museums of anthropology, the former including all natural objects, the latter man and his works. Following Dr. Goode, they may be classified under the following heads: museums of art, natural history, history, anthropology, technology, and commerce. Or, following the same authority, museums may be classed according to their purposes as national, local, provincial, or city; college, or school; professional, or class museums, and museums of special research.

The exhibits of art museums call for a somewhat different arrangement from those noted above; for the æsthetic enjoyment of art objects is at least as important a factor as their educative value. This was formerly the guiding principle in the arrangement of art museums. The finest specimens were placed in a single room, as in the Tribuna of the Uffizi, or the Salon Carré of the Louvre. But it soon became evident that works of art are seen to best advantage with those of the same epoch and school, and this classification has been generally adopted. Furthermore, it is essential that all important examples should be on exhibition. The establishment of art museums began in Italy, where in the fourteenth century the rulers and the nobility began to make collections of

coins and gems. Busts and statues were added later, and it was not until the seventeenth century that pictures and drawings were also introduced. The oldest important collections on record are those brought together by Cosmo de' Medici (1389–1464), which, with the other Medicean treasures, form the nucleus of the present Florentine collections, particularly rich in Renaissance art. (See UFFIZI PALACE; PITTI PALACE.) The two chief museum centres of Italy, besides Florence, are Rome, with the magnificent papal collections of the Vatican (q.v.) for classical, and the Lateran for Christian, art, besides important museums belonging to the state; and Naples, whose museum is particularly rich in classical (Greek) antiquities. Almost every important Italian city has a noteworthy museum. (See VENICE; MILAN; ETC.) The principal museum of France is the Louvre (q.v.) in Paris; the provincial collections are important only for local antiquities and French painting. Among German cities, Berlin has a fine group of well-arranged museums, representing all branches of art; Dresden is particularly rich in painting; Munich in antique sculpture and painting; and Nuremberg in the decorative arts. Vienna also has a fine group of museums, of modern construction and particularly rich in painting. The principal collections in London are the British Museum, the National Gallery, and the Victoria and Albert Museum (qq.v.). The Rijks-Museum in Amsterdam is the most important in Holland; the Prado (Madrid) in Spain; and the Hermitage, Petrograd, in Russia. There are museums of some importance in all the Scandinavian capitals, and at Zurich and Basel in Switzerland. The museums of Athens are important for the study of originals of Greek sculpture, and that of Cairo is by far the richest in Egyptian antiquities. In the United States the oldest public museum is that of the Pennsylvania Academy of Fine Arts (1805), the most important is the Metropolitan Museum of Art (q.v.), in New York, and next to it the Museum of Fine Arts in Boston. Other noteworthy museums are the Art Institute, Chicago (1879), the Corcoran and National galleries, at Washington, and those of Worcester, Mass., Buffalo, Detroit, Toledo, Pittsburgh, St. Louis, and San Francisco. During recent years art museums have been established in almost every important American city. See articles on the various cities.

The museum of natural history covers a wide field and includes many branches, any one of which is capable of separate treatment. Thus there are museums of zoölogy, botany, geology, paleontology, and mineralogy, or paleontology may be included as a part of a zoölogical, geological, or anatomical museum. The natural history collections of the British Museum constitute the largest and most celebrated museum of natural history in the world, while other famous collections are those of the Jardin des Plantes, Paris, and those of Vienna, Leyden, and Berlin. The most important museums of natural history in the United States, all of which have been extended beyond the province indicated by the name, are the collections of the United States National Museum at Washington, the American Museum of Natural History in New York, and the Museum of Comparative Zoölogy at Cambridge, Mass.

Historical museums are for the preservation of objects illustrating the history of any country, place, or period, or the development of some special subject, and here they may trespass on the province of the museum of art or of technology. Historical collections form a branch of the United States National Museum, but there are many local collections. The National Museum, Munich, is an example of a general historical museum; the Cluny Museum, Paris, is devoted to a single period; the Naples Museum tells the story of Pompeii; while the Guimet Museum, Paris, illustrates the history of religious ceremonial, and the Museum of Artillery, Paris, traces the development of weapons from the rude axe of the Stone age to the modern rapid-fire gun. Anthropological museums, in the widest sense, treat of the history of man and his relations to the universe about him. This calls for illustrations of his various activities, so that an anthropological museum may comprise art and historical collections, although these are usually treated separately. The physical characteristics of man, his clothing, weapons, ceremonial objects, household furniture, methods of transportation and of shelter are the subjects most commonly illustrated. Ethnology is that branch of anthropology which deals with the characteristics, occupations, arts, and industries of the races of men as distinguished from one another. Archæology treats of the history of ancient man, and sections of a large museum or an entire museum may be devoted to the illustration of either of these subjects. The department of anthropology of the United States National Museum is very extensive, and so is that of the American Museum of Natural History, New York. The Peabody Museum of Archæology and Ethnology, Cambridge, Mass., is particularly rich in American antiquities, and so is the Archæological Museum of the University of Pennsylvania. Abroad there are important anthropological museums in Berlin, Dresden, and Munich; the Trocadéro, Paris; and the Pitt Rivers collection at Oxford, the latter being specially arranged to illustrate the development of the arts.

Technological museums deal with various phases of the industrial arts. They display specimens of the raw materials that enter into the composition of a given product, trace the various processes to which these are subjected, show the tools or machinery by which they are manipulated, and finally the finished object or substance. The subjects for technological museums are almost endless; shipbuilding, spinning and weaving, dyestuffs, drugs, foods, and electric apparatus naturally suggest themselves. The South Kensington Museum (now the Victoria and Albert), London, contains a larger technological collection than any other institution. This is now under the charge of the National Board of Education, and its influence is not confined to London, for a part of its work consists in lending carefully selected collections to local museums and technical schools in other portions of Great Britain. Certain collections, including those illustrating marine architecture and engineering formerly in the Victoria and Albert Museum, have been taken to form the Science Museum, located near by. In America, the United States National Museum and the Field Museum of Natural History, Chicago, have important technological sections, the former having much material illustrating the development of electrical apparatus, while the latter is rich in objects showing the growth of methods of trans-

portation by rail. The technological and historical collections of the United States National Museum now practically constitute a separate museum though under one control. The Army Medical Museum, Washington, while devoted to the subject of the structure of man, the effects of injuries and diseases, and their treatment, is a technological museum in so far as it traces the development of surgical appliances. Commercial museums are devoted to advancing the interests of trade. They exhibit raw materials and finished products, illustrations of methods of packing and modes of distribution, and gather and furnish information as to prices and character of goods needed in and furnished by different countries. Laboratories for the analysis of various substances and the testing of materials form part of the equipment of such an institution. The Musée de Mille, Ghent, is one of the oldest European commercial museums. The Commercial Museum, Philadelphia, is the sole institution of its kind in the United States.

The past 15 years have seen many museums, varying widely in their scope, founded in many countries; have witnessed an increasing recognition of their educational value and the establishment of more direct relations between museums and schools. These have been brought about by courses of lectures, loan of material, arrangement and labeling of exhibits, while direct provision is frequently made for children either by special museums or by setting aside certain rooms or collections.

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MUSEUM PEST. Any one of several species of insects which feed upon the prepared and mounted skins of birds, mammals, reptiles, and upon dried collections of insects and other animals preserved in museums. Perhaps the most abundant and injurious of the museum pests are the beetles of the family Dermestidæ. (See DERMESTID BEETLES; also BACON BEETLE and CARPET BEETLE.) Others of these insects are the larvæ of small moths of the tineine series. Some of the common clothes moths (q.v.) are museum pests which, possibly originally feeding upon skins, have come to feed upon fabrics made from animal substances, such as wool or hair. One of the most injurious of this group is *Tinea pellionella*, which is one of the case-making clothes moths. Other substances stored or displayed in museums are attacked by other insects: the larva of a little geometrid moth, known as *Carphoxera ptelearia*, feeds on dried plants stored in herbaria; and the allied *Acidalia herbariata*, as its name indicates, has long been known to injure herbarium specimens in Europe, but is on the whole more injurious in herbalists' shops than in museums. Some of the dermestid beetles will even injure the horns of large mammals, and the bones as well, provided they are not thoroughly poisoned. A museum room once thoroughly infested with these creatures can be most readily freed from them by fumigation with bisulphide of carbon or hydrocyanic-acid gas.

MUSGRAVE, mŭz'grāv, SAMUEL (1732–80). An English physician and classical scholar, born at Washfield, Devonshire. He was educated at Oxford and, having received a Radcliffe traveling fellowship, spent some years abroad, visiting Paris (175¢) to collate manuscripts for his edition of Euripides. He was in Paris again in 1763–64. From 1766 to 1770 he practiced medicine at Exeter and Plymouth. During this period he issued a pamphlet charging that the Peace of 1763 with France had been concluded only because certain members of the English ministry had been bribed by the French government. Discredited by an investigation into this charge by the House of Commons, he lived in modest circumstances in London till his death. He is now known chiefly for his edition of all the plays of Euripides (1778) and for his *Exercitationes Euripideæ* (1762).

MUSGRAVE, WILLIAM EVERETT (1869–). An American physician, born at Farmington, Tenn. He graduated M.D. from George Washington University in 1901. In 1902 he went to Manila, Philippine Islands, where he was pathologist of the Bureau of Science until

1909, then chief of clinics at the Philippine General Hospital and at the University of the Philippines, where he was also dean and professor of medicine. In 1905–06 he was president of the Medical Society of the Philippine Islands. In the *Bulletin of the Manila Medical Society*, which he edited, various of his papers appeared.

MUSGU. See Mosgu.

MUSH, mōōsh. The capital of a sanjak in the Vilayet of Bitlis, Asiatic Turkey, on the east branch of the Euphrates, 80 miles south of Erzerum (Map: Turkey in Asia, D 2). It lies at an elevation of 4200 feet at the entrance to a mountain ravine on the south side of a fertile wheat, vine, and tobacco growing plain. The town is noted for its uncleanliness and has few good houses. It is the see of Roman Catholic and Gregorian bishops and has an American mission with Protestant schools. There is an active trade in the agricultural products of the district, and embroidered caps are manufactured. It has historical reminiscences of Xenophon and of Moses Khorene, the historian. In the vicinity at Sasun occurred a terrible massacre of Armenians by the Turks in 1894. Pop., about 27,000, one-half being Armenians.

MUSHET, Robert. See Iron and Steel, Metallurgy of, *Bessemer Process.*

MUSHKAIA, or **MUSHKI.** See Moschi.

MUSH'ROOM (OF. *mouscheron, mouseron,* from OF., Fr. *mousse,* moss, connected with AS. *mēos,* OHG. *mios, mos,* Ger. *Mies,* Môos, OChurch Slav. *mŭchŭ,* Lat. *muscus,* moss). The popular name of edible fungi of the family Hymenomycetaceæ, especially species of *Agaricus* and *Morchella.* The name "toadstool" is generally applied to species which have an umbrella-shaped cap. The common idea that all such are poisonous is erroneous, because some of the most highly prized species have this habit of growth, and perhaps most of the others are not injurious. The mushroom as it is generally seen is only the fruiting body of the fungus, which arises from a more or less matted mycelium or spawn. The mycelium or vegetative part consists of numerous slender white threads running in every direction through the soil. Upon these threads small knots develop, increase in size, and finally appear as the ball-like or button-like young mushrooms, which consist of a stalk, terminated by a cap or pileus, bearing upon its underside numerous thin spore-bearing plates or gills radiating from the centre or attachment of the stalk. Near the top of the stalk is a more or less perfect ring (annulus), the remnant of the delicate veil (indusium) that covered the gills during the button stage, but ruptured as the mushroom grew.

The common mushroom (*Agaricus campestris*), one of more than 1000 species of the genus *Agaricus,* is common in fields and pastures, seldom in woodlands unless open and grassy, growing throughout the summer, but most abundant in the early autumn. It is the most commonly cultivated species, is extensively grown for market, especially near large cities, and is about the only species imported and offered for sale in American markets. This species never attains a very large size; when young the stalk and fleshy cap are white, changing to light brown when older. The stalk is solid and tapers slightly towards the base. The ring is usually conspicuous, the gills pink when young, changing to brownish purple in older specimens. Mushrooms are usually gathered for market when in the ball or button stage before the veil has been broken. They have a pleasant taste and smell and, when the flesh is bruised, turn a reddish brown. The horse mushroom (*Agaricus arvensis*), a close relative, looks very much like the common mushroom, but is much larger, and the top of the cap is more shining white. The stalk becomes a little hollow with age; the gills are white at first, changing to brownish purple when comparatively old.

The methods employed in cultivating the common mushroom do not offer any great difficulties. They may be grown out of doors or where the temperature is fairly constant, as in dry cellars or in caves, abandoned mines, and quarries. Beds are made containing at the bottom a deep layer of fresh stable manure, over which is a layer of well-rotted manure. In this the spawn is planted after the temperature of the bed has fallen to about 90° F. The commercial spawn comes in two forms, bricks and flakes, made of horse manure impregnated with the mycelium of the fungus. When planted, both kinds are broken up and distributed through the bed. The beds, which must be kept moist, but not wet, are then well covered with straw or mats to keep the surface moist. After a week or 10 days the mulch is removed and the beds covered with good loam to a depth of 2 inches. They may be again covered with the mulch, which should be removed when the mushrooms, which should be gathered daily, begin to appear. Mushroom culture is sometimes interfered with by parasitic fungi, especially by species of *Mycogone,* and serious losses have been reported in Europe and America. The parasite discolors and distorts the mushroom and may cause failure of the crop. The removal of all diseased mushrooms and the fumigation of houses and caves with formaldehyde gas are recommended as preventive measures.

In addition to the species of *Agaricus* described above, there are a great many other edible species of mushrooms belonging to other genera. Among them are the horsetail or maned agaric (*Coprinus comatus*), the ink caps (*Coprinus atramentarius*), and the glistening comatus (*Coprinus micaceus*). These have black spores; the cap does not expand, but remains more like a partly closed umbrella. When old, these species become very watery and dissolve, forming a black, inky fluid. For eating they should be taken only while young. The parasol fungus (*Lepiota procera*) is a white-spored edible mushroom rather abundant in grassy places. It is rather tall on a slender stem. The cap is whitish or light brown and covered with coarse scales. The ring is free and not fastened to the stalk. Another highly prized species is the chanterelle (*Cantharellus cibarius*), an egg-yellow species common in moist woods. The cap has an irregular, crumpled margin, is more or less depressed on the upper surface, and has shallow, blunt gills prolonged down the stalk. The fairy-ring fungus (*Marasmius oreades*), common in lawns and meadows, is also edible. There are some species having the same habit of growing in circles that are reputed poisonous. The edible ones are white-spored, have hollow stalks, and are seldom more than 2 inches across the pale-yellow or drab cap, which is often concave on top and raised in the centre. One class of gill-bearing fungi exude, when broken, a milky juice. The species of this kind belong to the genus *Lactarius.* Some have a very acrid juice, but one (*Lactarius deliciosus*) is considered very choice by mushroom lovers. It grows

in damp woods in mountainous regions, but is not common in lowlands. It cannot be mistaken for any injurious species, as the milk exuded by it is always red with a tinge of orange and slowly changes color to greenish. The fungus is a little lighter in color than the milk exuded by it.

Boletus is another of the common genera. The species are rather difficult of identification and should not be eaten by a novice. Some of the Gasteromycetes, e.g., the puffballs (*Lycoperdon giganteum* and *Lycoperdon cyathiforme*), are common edible species. The former attains a diameter of 10 inches or more and has a smooth, white, kidlike surface when young, with a firm white or pale-yellow flesh. The other is 6 inches in diameter, flattened and tessellated on top, and contracted at the base. In color it varies from white to brown. The puffballs should be taken while young and before the spores are developed. One species (*Scleroderma vulgare*), related to the ones just described and suspected of being injurious, may be recognized by its tough, hard, yellowish-brown, warty exterior and purplish-black interior mottled with white. Among the most highly prized of edible fungi are the morels and truffles (*Tuber melanosporum*).

Since several species of mushrooms have not yet been proved harmless and since occasional cases of poisoning are still attributed to their use as food, the following rules, formulated by Farlow, are given as guides for the inexperienced collector: "Avoid fungi when in the button or unexpanded stage; also those in which the flesh has begun to decay even if only slightly. Avoid all fungi which have stalks with a swollen base surrounded by a sac-like or scaly envelope, especially if the gills are white. Avoid fungi having a milky juice, unless the milk is reddish." These rules are not absolute, because there are exceptions to them, but are safe for the novice to follow. See FUNGI, EDIBLE AND POISONOUS.

Mushrooms as Food. Since mushrooms and other edible fungi are often said to be nutritious food, to contain large quantities of protein, and to rank close to meat as sources of nitrogenous material, extravagant statements have been made concerning them. When fresh, mushrooms have the following percentage composition: water, 88.1; protein, 3.5; fat, 0.4; nitrogen-free extract, 6; crude fibre, 0.8; ash, 1.2. Other edible fungi closely resemble them so far as analyses have been reported. Like all green vegetables mushrooms have a high water content in proportion to their bulk, and, as regards protein content, they rank about the same as potatoes, to which they are decidedly inferior in food value, since they contain much less carbohydrates, and the nitrogen present is largely in the form of non-albuminoids, which are thought to have little food value. The numerous studies which have been made show that mushrooms are not thoroughly digested. Recent experiments show that 25 to 59 per cent is indigestible. See FUNGI, EDIBLE AND POISONOUS.

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MUSHROOM GNAT. The name given by mushroom growers to any of the fungus gnats of the family Mycetophilidæ. (See GNAT.) These are small, mosquito-like creatures with feathered antennæ and frequent, as a rule, vegetable matter or fungi, upon which their larvæ feed. The larvæ are slender, white, wormlike creatures, with a distinct black head. The larva of one species of the genus *Sciara* is especially injurious to mushrooms, which it eats into and ruins. In mushroom cellars, fumigation with tobacco or pyrethrum will kill the flies.

MUSHROOM POISONING. A severe and frequently fatal form of poisoning from eating noxious varieties of mushrooms or other fungi, the most common being the fly fungus, or *Amanita muscaria* (see AMANITA), the active principle of which is muscarine. Individuals who have eaten a poisonous fungus are seized within a short time thereafter with severe abdominal pains and rapidly become cyanosed; collapse and muscular spasms set in, soon followed by death, unless prompt treatment is instituted. The treatment is to wash out the stomach with a stomach pump, empty the intestines by means of a purge, and administer stimulants. The physiological antidote for muscarine is atropine; this or tincture of belladonna should be given as soon as the stomach and bowels are emptied. See FUNGI; MUSHROOM.

MUSIC (OF., Fr. *musique*, from Lat. *musica*, from Gk. μουσική, *mousikē*, music, from μουσικός, *mousikos*, relating to the Muses, from Μοῦσα, *Mousa*, Muse). Music is a mode of motion. It is a modification by art of aërial vibrations, whose impact upon the auditory nerve makes mental varying images. Sound, the raw material from which music is fashioned, is produced by motion.

Matter is the stimulus; sensation is the result. "The kind of motion, however, that goes to produce sound is not that of matter precisely, but rather of the molecules or ultimate particles of which matter is composed. When the state of equilibrium of an elastic body is disturbed by a shock or by friction, it tends to regain its condition of equilibrium, but does so only after a greater or less number of vibrations, or oscillating movements, of the molecules of which the mass of the body is composed." Thus J. A.

Zahm, a profound investigator in acoustics and a follower of the great Helmholtz, whose masterly tonal researches are set forth in his *Die Lehre von den Tonempfindungen*. The nature of sound, Lord Bacon observes, "in general hath been superficially observed. It is one of the subtilest pieces of Nature." The nineteenth century has endeavored to wipe away Bacon's reproach, for the studies and experimentings of such men as Helmholtz, Rudolf König, Blaserna, Tyndall, Stumpf, and others have lifted into light the darkest problems of acoustics. The latest researches teach us that sound vibrations—vibrations audible to the ear—have a rapidity which ranges from 16 to 36,500 per second. Heat vibrations begin at 134 trillions per second; light vibrations, visible to the eye, at 483 trillions. The gamut of the rainbow has its velocity measurements. Chemical vibrations, "shown only by certain reactions in prepared photographic plates," are beyond our sense perceptions. Sonorous vibrations, then, are really the slowest of all. Dr. William Ramsay asserts, in his *Essay on Smell*, that the sense of smell is excited by vibrations of a lower period than light and heat. Sounds of a musical character rarely extend beyond a minimum of 16 and a maximum of 4138 vibrations, respectively the rates of vibration of the lowest tone of an organ with a pipe of 32 feet and the top note of a piccolo. The production of sound, its transmission, and its aural perception may all be demonstrated with a long piece of stretched string. In its position of equilibrium it represents a straight line; pluck it and its elasticity will cause it to return. This is a simple vibration. But the string also goes in the opposite direction, and this is a double vibration. Like a pendulum the vibrations of the string are isochronous, each occupying exactly the same length of time. By shortening the string or increasing its tension we get vibrations of various velocities, and the ear perceives various pitches from 16 vibrations to the second up to 4224 vibrations. Increase the tension beyond this point and shrillness results; below 16 a dull unmusical whirring. The same results acoustically may be produced with pipes of varying lengths. The vibrations are, as in the case with strings, isochronous; they vary in rapidity according to the length of the pipe; subdivide them and harmonics are produced. Nodes and vibrating segments are the crude material of music; pitch, loudness, and timbre or quality determine the tone. All these qualities depend upon the rapidity of the vibrations. It is demonstrated that the number of vibrations of strings is inversely proportional to their length; that the number of vibrations of strings is in inverse ratio to their diameter; that, experimenting with two wires at tension, but of differing density, we get the rule that the number of vibrations of a string is inversely proportional to the square root of their density; finally, as Helmholtz shows by varying the stretching weight, that the number of vibrations of strings is directly proportional to the square root of their stretching weights. Thus, the longer, thicker, heavier a string is, the slower are its vibrations and the deeper is its tone. The shorter, finer, lighter, tenser it is, the more rapid are its vibrations and the higher is its tone. Now the sound produced by a string vibrating its entire length is its fundamental or natural tone. It can produce many other sounds at the same time, subdividing them as it vibrates; these are the overtones or harmonics, partial and concomitant sounds. The series of harmonics theoretically may be divided infinitely, but for musical purposes they are numbered in accordance with the number of vibrating segments or loops. The nodes exceed by one in number the loops, taking the ends of the tense string as nodes. The fundamental vibrating with one loop is the first harmonic of the tone, and the harmonics on the numerical order are constantly nearer and nearer together, the successive intervals being an octave, fifth, fourth, third, second. We are at the very beginnings of the scale. The clay is ready for the musical sculptor. Mersenne's law is that the loudness of sound varies inversely as the square of the distance of the sonorous body from the ear. So the range of audition is over 11 octaves, but this is for an exceptional ear.

Musical sounds differ from each other in loudness, in pitch, and in quality. Biot says that "all sonorous bodies yield simultaneously an infinite number of sounds of gradually increasing intensity." This phenomenon is similar to that which obtains for the harmonics of strings, but the law for the series of harmonics is different for bodies of various forms. May it not be this difference which produces the particular character of sound, called timbre (*Klangfarbe*, clang tint), which distinguishes each form of body and causes the sound of a string and that of a vase to produce in us different sensations? May it not be owing to the diminution of the intensity in harmonics of each series that we find agreeable certain concords that would be intolerable if produced by sounds equally loud? And may not the quality of each particular substance—of wood or metal, e.g.—be due to the superior intensity of one or another harmonic?

We have now some dim idea of the natural laws which give us force or loudness, pitch, and quality in music. The whole subject in all its fascinating range and variety is admirably treated in Zahm's *Sound and Music*. Therein may be learned much about the production and transmission of sound, its velocity, reflection, refraction, resonance, and interference. Of pitch it may only be said here that its standard in music is the A string of the violin, which gives the tuning note for orchestras. It corresponds to *a'* above middle C of the pianoforte. *a'* as a vibration number of 435 was chosen in 1859 as a standard pitch. This is called the French pitch, and its exact vibrations are really 435.45. It is the standard pitch of our orchestras and since 1892 for all pianofortes. (See PITCH.) All the modifications of sound made by the ingenuity of man in his inventions of string, wood, brass, pipe—as in the organ—and percussion instruments, from the drum to the piano, give us variety in tonal timbre and are based on the human voice, which with its bass, tenor, alto, and soprano served as a model for the viol family.

Helmholtz has considered the analogies of light and sound, both being modes of vibratory motion. In his psychological optics he gives the following analogies between the notes of the piano and the colors of the spectrum:

F♯	End of the red	d♯	Cyanogen blue
g	Red	E	Indigo blue
g♯	Red	f	Violet
A	Red	f♯	Violet
A♯	Orange-red	g	Ultra-violet
B	Orange	g♯	Ultra-violet
C	Yellow	a	Ultra-violet
C♯	Green	a♯	Ultra-violet
d	Greenish blue	b	End of the solar spectrum

Upon this laboratory experiment some imaginative theorists have endeavored to rear a system of musical æsthetics, but unsuccessfully, though we have come to speak naturally of color in music. Tone and color, while related, as are all things mundane, are far asunder in terms of art; in fact, when used in their proper meaning, they constitute the foundation of two widely different arts—music and painting. Whenever the musician speaks of "color," he employs the word only with a figurative meaning, as synonymous with "timbre," "clang tint." Especially the modern school of piano playing is concerned with "tonal color," a term denoting those infinite and subtle varieties of tone produced by the different touches.

In March, 1915, the Russian Symphony Orchestra produced in New York a symphonic poem, *Prometheus*, by Scriabine (q.v.), in which the composer actually carried out Helmholtz's theory. As each chord was played its corresponding color was projected on a screen. The verdict of all musicians was unanimous—that no relation could be perceived between sound and color.

As the receptive organ of tone and its transmitter to the brain, the ear plays as important a part as tone itself. Without it there would be no music, paradoxical as it may sound, for it is the eye that perceives, the ear that hears, the hand that feels, which give us our picture of the world. Under this hypothesis the world, then, is idea, idealists and materialists meeting amicably on the little strip of territory called sensation. The complete apparatus of the ear, the wonderful "lute of three thousand strings," called the cortical fibres after their discoverer Corti, should be carefully investigated by the student. We may now truthfully affirm, after briefly studying the production of sound and its modifications by instruments, that music is a mode of motion.

But music as a pleasure-evoking emotion! Whence comes it, what is its psychologic basis? It is purely human, for not the most fanciful of poets or extravagant of psychologists can torture into formal beauty the songs of birds, the growling of the tempest, the sound of the sea. All these things and many more may furnish the starting point, the springboard of the composer's imaginings, but artistic they are not. There is no real music in nature. As a play impulse, art has been considered and discussed by many modern writers. Schopenhauer, whose intuitions are often superior to other men's logic, calls art "a momentary liberation," and Herbert Spencer develops his idea, linking it with biological conditions. In his *Principles of Psychology* he says that a characteristic of nerve processes is that the superfluous integration of ganglion cells should be accompanied by an inherited readiness to discharge. Thus the "aimless activity" we call play is the result of a force expended, a force that man as a highly developed animal has more of than is needed for the struggle of existence. In many animals he finds imitation a factor, but Karl Groos in his *Play of Man* believes in impulse and intuition—"the inherited impulse towards prescribed reactions in certain brain tracts seems to be in itself a sufficient cause for play without the necessary accompaniment of superfluous energy." Schiller calls play a harmless expenditure of exuberant strength which is its own excuse for action. Lazarus is the exponent of the reaction theory. When we are tired of natural or physical labor, we play, thus recreating ourselves. Professor Groos, however, finds in both the surplus expenditure and the recreation theories only partial statements of the truth. For him play is the impulse towards repetition, and this is a physiological reason for playing to the exhaustion point, which we notice so often, even if we are tired at the beginning. "Let us recall first," he writes, "the tremendous significance of involuntary repetition to all animal life, for just as the simplest organisms in alternate expansion and contraction and the higher ones in heartbeats and breathing are pervaded by waves of movements, so also in the sphere of voluntary activity there is a well-nigh irresistible tendency to repletion." Play, too, furnishes distraction from quotidian cares. It is an educational factor of prime importance, elaborating immature capacities and influencing the evolution of hereditary qualities. Schiller declares that man alternates between weak and sensuous pleasures, and his dictum that man is fully human only when playing has, as Professor Groos declares, "definite biological meaning." Conrad Lange defines art "as the capacity possessed by men of furnishing themselves and others with pleasure based on conscious self-illusion, which by widening and deepening human perception and emotion tends to preserve and improve the race." This is but an amplification of Schiller's remark. And art is but the play impulse immeasurably elevated, yet at its roots possessing a sham objective character. The earliest form of musical art, the pantomimic dance, was "an expression of muscular force simulating the acts of life." It was symbolical, it expressed a feeling, a state of mind. In its genesis art was play of a semiphysiological character. Primitive dancing comprised music and poetry in solution; later on they became separate and independent arts. Rhythm, the father of organized music, played a big rôle, for rhythm is cosmic, it is manifested in the heartbeat—the unit of measure for all the temporal arts—the tides and the movements of the bodies in the interstellar depths. Dancing accompanied by rudimentary songs—perhaps of only two or three tones—is the first step of the musical art. Emotions were translated in the rough, yet effectively; the pantomime of the savages is always clear, attempting as it does the expression of love, anger, terror, hatred, and happiness. How much the sexual attributes play in the beginnings of art we cannot say, but music in the light of modern researches may no longer be called the Heavenly Maid. Far from it indeed, for, as Havelock Ellis truthfully says: "In music the most indefinite and profound mysteries are revealed and placed outside us as a gracious, marvelous globe; the very secret of the soul is brought forth and set in the audible world. That is why no other art smites us with so powerfully religious an appeal as music; no other art tells us such old forgotten secrets about ourselves. It is in the mightiest of all instincts, the primitive sexual traditions of the races before civilized man, that music is rooted. . . . The sexual instinct is more poignant and overmastering, more ancient than any as a source of beauty. . . . Beauty is the child of love." Music is an emotion become æsthetic. Human beings, as Ribot says, began by thinking that beautiful which resembled themselves. Primitive art was addressed to the individual of our own species. As it became more disinterested it exhibited re-

ligious qualities and eventually was transformed into a ritual, a ceremony for the expression of awe or thankfulness to the deity. It had a specific character and one that had but remote affiliations with our modern conceptions of art. The natural extrusion of sympathy, the conquest of nature by the intellect, has given us two of the most modern arts—music and landscape painting. Neither of these had any real existence in the Old World civilizations; indeed, a feeling for nature in poetry and painting may be said to date from yesterday. The patient flowering of savage, rhythmic cries into the score of a Beethoven symphony is only comparable—to mention purely human processes—to the evolution from a South Sea Islander's simple mud hut to the magnificent complexities of a Gothic cathedral. From the sheltering needs of the body comes the noble art of architecture; from the social needs of intercourse, self-expression, come poetry and music. Both were the irrepressible and the irresponsible exhibition of surplus energy, of the play impulse. And on this side is music purely sensuous.

Kant defines the beautiful as that which "through the harmony of its form with the faculty of human knowledge awakens a disinterested, universal, and necessary satisfaction." We are now another remove from the utilitarian, for in a certain sense all art is useless, inasmuch as it bestows no material benefits. Its beauty is its excuse for being, and music, being the least representative of the arts, copying no material forms, is therefore easily the most ideal of all the arts and the most inutile. Apprehended in time and not in space, it addresses itself to the imagination. And here we are confronted by the crux of Hanslick and other æstheticians of the formal. "Definite feelings and emotions are unsusceptible of being embodied in music," he declares. Music does not express emotion, it expresses itself. It is sound play; it consists of exquisite arabesques; it is a formal pattern of tone, and all the wonderful things attributed to it exist only in the overheated imagination of its hearers. Precisely so, and it is this almost miraculous subjectivizing process that proves the weakness of Hanslick's thesis. No other art attacks so powerfully the emotions. "Music acts like a burn, like cold, heat, or a caressing contact. Music acts on the muscular system, on the circulation, the respiration . . . and is the most dependent on physiological conditions. The primary effect is a physical one." Beauquier says: "Musical vibration is only one particular mode of perceiving the universal vibration. . . . Musical art is the art of sensibility par excellence, since it regulates the great phenomena of vibration into which all external perceptions resolve themselves and transfers it from the region of the unconscious, in which it was hidden, to that of consciousness." Again Ribot: "While certain arts at once awaken ideas which give a determination to the feelings, music acts inversely. It creates dispositions depending on the organic state and on nervous activity, which we translate by the vague terms joy, tenderness, serenity, tranquillity, uneasiness. On this canvas the intellect embroiders its designs at pleasure, varying according to individual peculiarities." Let us admit, then, with Hanslick and the formalists, that music does not *express* emotion; yet this does not preclude the idea of an emotional content in the listener, who projects his personality into the forms. In music the forms and the subject are identical; we cannot dissociate the pattern of the love theme in *Tristan und Isolde* from its emotional effect. The sound once set in motion, we are at liberty to dream, to thrill, to weep, to sigh with all the moods superinduced by a master. And this playing upon our nerves, our imagination, is intentional. In modern times music has become an instrument of overpowering emotional significance. Eighteenth-century music, with its gay scheme of decoration, its pretty recurring patterns, its play of forms, and its freedom from the overwrought, the intense, can well be utilized by Hanslick as an example of music for music's sake. It expressed little in the latter-day connotation of the word; so to modern music, especially Beethoven, we might truthfully give the title of classic, as it fulfills many of the requisites of antique art—its dignity, symmetry, grandeur, and profound emotional quality. The position of the formalist school is based on a half truth. A study of the nature of emotions would have cleared the ground long ago of encumbering verbalisms. Ribot defines the technique of an emotion thus: "First an intellectual state, then organic and motor disturbances, and then the consciousness of these disturbances, which is the psychic state we call emotion." This clear definition of a very complicated process may be applied to the effects of music upon a sympathetic listener—naturally sympathy must be granted, else all music addresses itself to the deaf. A vast mirror of subjectivity, music appeals to each of us according to our temperaments. It paints upon the background of our consciousness enlarged meanings of ourselves. Composed of alternate sound and silence, it reaches our very soul with its rhythmic pulsings and sensuous qualities. It is at once the most impersonal and most personal of all the arts. It traverses the keyboard of our desires and arouses noble ambitions or sensual crises as well. It is an unmoral art; it can be impressed with equal facility in the service of church or tavern. Its very plasticity makes it an agent for evil and nevertheless a powerful aid to worship. It is because of this easily molded nature that music has served in every camp, has gone to the wars, has sounded the psalms of peace, has been the bone of contention between warring schools and factions, has led the bride to the altar, and intoned the grief for one lying dead. Music, in some form or other, has always accompanied man on his march through the ages, tracing in spiritual mimicry his evanescent emotional gestures. Captive to his baser senses, a column of smoke by day, this agile protean art has played the pillar of flame, a burning eloquent sign in the darkened skies of revolt, superstition, and misery. A potent symbol, "a mighty fortress" during the Middle Ages, music served the Church faithfully, and when enfranchised it has as faithfully recorded the great emotions of secular souls. Ariel and Caliban—to what purposes has this versatile art not been put? At first man played upon a reed to his mate; then he grew in love with his tune for its own sake. To-day, after putting the art through all its probable paces, it has been harnessed to the Drama, and, from being the exponent of pure, formal beauty, it is pressed into the service of the Characteristic. The Chinese, thousands of years ago, discovered the charm of ugliness, and it would seem that modern music is striving for that goal. Rosenkranz has written a volume on

Æsthetics of the Ugly, and in the general hurly-burly, topsy-turvying of the arts it would not be improbable if music played the part of devil's advocate in the new æsthetic dispensation. The line of demarcation between the beautiful and the ugly is slight, for beauty is a relative quality, and ugliness often proves its capital foil. To show how shifting has been the standard of musical beauty one has only to consult history or personal memories. A decade may transform the musical map, deposing reigning monarchs and elevating to the purple the veriest newcomer. Music is a fickle goddess.

How far symbolism may be pushed in music is seen in the attempts to pin down the phrase to precise meanings. It is true that there is a key symbolism, that not by chance have the great composers selected certain keys—keys that, in Wordsworth's happy expression, are inevitable. Beethoven's Fifth Symphony is inconceivable in C sharp minor or E flat minor. C minor is a portion of its life. Berlioz has compiled a table of key characteristics, and a certain theorist does not hesitate to call F major rugged; B major, energetic; E major, radiant, warm, joyous; A major, frank, sonorous; D major, gay, brilliant, alert; and so on through the list. Here again temperament counts, all else is purely arbitrary. Music has the power of evoking moods, that is a common experience; and it has on the formal side analogies to architecture, for it is structural, it is architectonic, and its subject is imitative of no known model. This has led Walter Pater to asseverate that all the arts in common aspire "towards music, music being the typical or ideally consummate art, the object of the great *Anders-Streben*—reaching forward—of all art, of all that is artistic or partakes of artistic qualities." It is "the blending of the animative thought and embodying vehicle," the absorption of the matter into the form of which music is the one perfect example among the arts, that attracted Pater. "All art constantly aspires towards the condition of music," he wrote, and made of sensual presentation, emotional suggestion, and technical perfection the archetype for all the arts. The danger of this view lies in the slighting of music's tremendous evocation of our subliminal depths, of spiritual shades. These cannot be exorcised by technical loveliness or richness of emotional eloquence. Beethoven has taught us in his symphonies that from tone may be wrung almost an ethical meaning. The Platonic theory of an ideal type for all the arts could not have failed to impress Pater. But it stops at the outer porches of the ear, the tone which should penetrate to the inner sanctuary losing on the way some of its grosser connotations. His doctrine is that art is always striving to be independent of mere intelligence, that the vaguer the subject the greater the impact of the thrill upon our souls. Gustave Flaubert, who is the creator of both the realistic and the symbolistic school, had some such idea; for he wished his prose to be as independent as music, to float in mid-air by reason of its euphony and rhythm. And there can be no doubt that it is the perfect balance found in Beethoven's phrases, both the meaning and the music, that makes of them the greater type for all future symphonists. Poetry is the usual standard for painter, poet, sculptor, and composer, and, as John Addington Symonds shows, this is as much of a heresy as Pater's. F. W. H. Myers writes: "The range of human thoughts and emotions greatly transcends the range of such symbols as man has invented to express them, and it becomes, therefore, the business of art to use these symbols in a double way. They must be used for the direct representation of thought and feeling, but they must also be combined by so subtle an imagination as to suggest much which there is no means of directly expressing. This power gives birth to the art of the musician, whose symbols are hardly imitative at all, but express emotions which, till music suggests them, have been not only unknown, but unimaginable." To each art its particular province. There is music in Milton; Wagner is a great painter; Bach an architect; and through the marmoreal prose of Flaubert rings the sound of the sculptor's chisel. But this "reaching forward" is, as Symonds says, "at its best a way of expressing our sense of something subjective in the styles of artists or of epochs, not of something in the arts themselves." The subjectivity of a critic prompts him to select a particular art as the type for all. Wagner, in a superb effort, attempted to house all the arts within the walls of a mighty synthesis. Music, however, won the victory; it is Wagner the composer who will live, not Wagner the dramatic poet or Wagner the scene painter. The intellectualists are quite as wrong in their endeavor to force upon music the office of preacher or philosopher. By reason of its limitations music is not well adapted for the expression of an intellectual content. It gives us the maximum of sensuous effect, though we do not agree with Symonds that in it is the minimum appeal to the intelligence. If this were so, Bach, Beethoven, Chopin, Brahms, Wagner, Richard Strauss would not be in the same category with Dante, Michelangelo, Milton, Shakespeare, Shelley, Swinburne, and Rodin. Besides, has not Spencer said, "The emotions are the masters, the intellect is the servant"? Great intellectuality, great emotional temperaments go to the making of great composers as well as of great architects, poets, dramatists, painters, and sculptors. Architecture is not emotional like music, but it is more concrete, it arouses the sense of the sublime—which music does, too, under certain conditions. Sculpture is impressive in its symbolism of the human form and its evocation of harmonious lines; of all the arts it is the most unlike music. Painting, with its illusions of life on a flat superficies, has certain affinities with music, while music and poetry have several qualities in common—the subtleties of sound and the power of continuous narration—though here music speaks a tongue not to be translated into words. It gives the sense of situation, not action, the prism of the arts, as Symonds phrases it, "each distinct, but homogeneous, and tinctured at their edges with hues borrowed from the sister arts. Their differences derive from the several vehicles they are bound to employ. Their unity is the spiritual substance which they express in common. Abstract beauty is one and indivisible. But the concrete shapes which manifest this beauty decompose it, just as the prism analyzes white light into colors."

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MUSIC, Conservatory of. A school for instruction in music. See Conservatory.

MUSIC, History of. The beginning of music goes back to the beginning of the human race. Investigations, especially in recent decades, among widely different savage nations have established the fact that all primitive music rests upon the pentatonic scale. It is not merely a coincidence, therefore, that the oldest musical systems of the civilized nations of antiquity likewise are built upon this pentatonic scale of five whole tones, which became heptatonic through the addition of two semitones only when a nation had reached a certain degree of culture. For primitive musical systems, see the special articles on Arabian, Celtic, Chinese, Egyptian, Finnish, Folk, Greek, Hebrew, Hindu, Indian, Japanese, Magyar, Scotch, Slavonic Music; Modes; Plain Chant.

It is impossible to tell with certainty when and by whom a second voice, moving in another interval than the octave, was first introduced. Hucbald (q.v.), the foremost theoretical writer of the tenth century, describes the beginning of harmony as the simultaneous progression of two parts in parallel fifths, known as *organum*. In the next century Guido of Arezzo (q.v.) substituted fourths for the fifths, and this innovation soon led to the employment of the remaining intervals. When after several thousand years music had progressed so far, it had at last found its true material, which is not the single tone and its melodic progression, but the chord and its harmonic progression.

I. *Old French School* (c.1100–1350).—The principal merits of this school are the invention of the *faux-bourdon* (a progression of voices in sixths and thirds) and the *discant* (contrary motion of voices). This contrary motion led to counterpoint, and this again to the establishment of a system of notation in which the different values of the notes in regard to time were definitely fixed. (See Mensurable Music.) After a *discant* was once set in contrary motion to a *cantus firmus* composers soon conceived the idea of adding a third and even a fourth voice. But the masters of the Old French school did not stop here; they succeeded also in imparting complete independence to the individual voices. Three art forms were developed —the *motet*, *rondellus* (rondeau), and *conductus* (conduit). In all these forms are found well-defined passages of writing which to-day we call canon and imitation. The prominent masters are Leonin, Perotin, De Garlande, Franko of Paris, De Vitry, De Machault, De Muris.

II. *Gallo-Belgic School* (c.1350–1500).—The masters of this school began to feel the emptiness of consecutive fourths and fifths, and so used sixths and thirds more freely. Greater attention was given to the leading of the voices, and technique made great strides. Occasionally the compositions rise above the level of mere technicality. The principal masters are De Zeelandia, Faugues, Dufay, Binchois, Busnois, Regis.

III. *School of the Netherlands* (c.1450–1600).—This school divides itself into four distinct periods: 1. Okeghem developed the art of canonic writing to such an extent that it became merely ingenious trickery. Instead of unified forms, the works of this school present a conglomeration of detached details. Okeghem's successors were Hobrecht, Tinctor, Jannequin, Brumel, Compère. 2. The leader of the second period is Josquin Deprès, a pupil of Okeghem. He and his contemporaries strove to make their skill subservient to artistic purposes by emphasizing the symmetry of form and by paying attention to the development of their themes. The leading composers are, besides Deprès, Agricola and Mouton. 3. The extreme artificiality of the two preceding periods led to a reaction in favor of a more simple and natural style. The masters started from Josquin's principle of symmetry. They also developed the purity of harmonic writing and insisted upon definite melodic phrases. Several of them carried this style to Italy, where they became the founders of new schools. These composers were Gombert, Willaert, Goudimel, Arcadelt, Van Rore. 4. The fourth period shows the influences which the Italian schools had begun to exert over the mother school. Whereas the importance of earlier schools rests entirely upon the vocal works, the fourth period marks the rise of instrumental music (organ) in the works of Sweelinck, who practically became the founder of the famous school of the North German organists. The whole school of the Netherlands reached its culmination in the works of Orlando di Lasso, a master scarcely inferior to the great Palestrina. The great musicians of this period are Sweelinck, Lasso, Di Monte, Pevernage.

IV. *Old English School* (c.1220–1600).—1. England possesses the oldest-known specimen of polyphonic writing, the famous canon "Sumer is icumen in." As long as the school of the Netherlands was regarded as the oldest, this manuscript puzzled musical historians. Coussemaker in 1865 proved the existence of the still older French school (I), and so this canon is now assigned to the year 1226. During the fifteenth century a school showing the same general characteristics as the Old French school must have existed in England, if we may judge from a few preserved compositions by John of Dunstable, Power, and Benet. 2. The reign of Henry VIII witnessed a considerable musical activity, but no new style was created. The representative composers, Redford, Johnson, Merbecke, and Tye, show the influence of the school of the Netherlands. 3. These men really prepared the way for the next generation, when the style of the school of Venice predominated. Of this period numerous large choral works and madrigals have been preserved. The chief composers are Farrant, Tallis, Byrd, Gibbons.

V. *School of Venice* (1527–1612).—Willaert

brought the musical art of the Netherlands to Venice, where he settled in 1527. Under the influence of the more impressionable Italian musicians he gradually acquired a new style. In the style of the Netherlands each voice was practically independent, and its relation to a definite chord was not strongly pronounced. The Venetian masters established the chord as their basis, and, instead of simultaneous progressions of voices, we find, rather, progressions of chords. The independence of the separate voices was restricted, but not abolished. The custom of writing for a double chorus was introduced, the madrigal was perfected, and for the first time vocal works with instrumental accompaniment appear. The great composers of this school are Willaert, A. Gabrieli, Van Rore, Zarlino, Merulo, Donati, G. Gabrieli.

VI. *School of Rome* (1535–1674).—Italy owes it to this school that she once was regarded as the most musical nation. While the Venetian school regarded the chord as a basis, and gained their effects largely by means of modulation, the Roman masters restored greater freedom to the individual voices and subordinated technique to art. The introduction of secular themes into sacred works had led to serious abuses, but the Roman masters, especially Palestrina, proved that the contrapuntal style is not antagonistic to the dignity proper to Church music. To the Roman school also belongs the honor of having originated the oratorio (Carissimi) and a distinct instrumental style (Frescobaldi). Merulo in Venice had done much to develop the toccata, but not until Frescobaldi appeared did instrumental music become entirely free from the influence of vocal music. The greatest masters are Ferrabosco, Festa, Animuccia, Palestrina, Nanini, Anerio, Allegri, Frescobaldi, Carissimi.

VII. *Spanish School* (1540–1608).—Spain at no time succeeded in establishing an original school. During the sixteenth century several Spanish composers lived in Rome, and returning to their native land, carried with them the art of the Roman school, so that in reality the Spanish school forms only a part of the Roman school. The most prominent Spanish masters are Da Vittoria and Morales. The Portuguese composer à Goes shows the influence of Gombert, which can be accounted for by the fact that this Flemish musician spent some years in Spain.

VIII. *German Polyphonic School* (1500–1625).—This school divides itself into two periods, the former showing Flemish, the latter Venetian, influences, but in the frequent and bold use of dissonances the German masters go beyond their predecessors. The chief composers showing Flemish influences are Isaak, Heinrich Finck, Senffl, Hermann Finck. Those showing Italian influences (almost all pupils of G. Gabrieli) are Gallus, Gumpeltzhaimer, Hasler, Aichinger, Prätorius.

IX. *School of Protestant Church Music* (1540–1672).—1. In Germany, the Reformation popularized Church music by the introduction of congregational singing. For untrained voices simple music was needed, and this need gave rise to the *chorale*, which originated in the singing of sacred words to popular folk songs. The musicians whose importance rests chiefly upon their chorales are Luther, Walther, Eccard, Calvisius, Franck, Schein. 2. From the earliest times it had been customary in the Catholic church to recite during Holy Week the Passion of Our Lord according to the Gospels. Luther desired to preserve this custom for the Reformed church. He translated the text and had various composers furnish the music. Thus arose the *passion*, to the cultivation of which many German masters devoted their best energies. Along this line vocal polyphonic music steadily developed until, in the works of Schütz, German music reached an originality that places it on a level with the famous Italian schools. The German school combines the beauty of the Roman school with the massiveness of the Venetian. In addition, there are a tenderness and a subjective, passionate element quite distinct from the colorless solemnity of the early Italian music. The important masters are Schütz, J. C. Bach, J. M. Bach.

X. *School of German Organists* (1620–1722).—1. While vocal music was steadily advancing, instrumental music, although of later date, was not neglected. Sweelinck had founded a great school in the Netherlands, which trained many Germans, who carried the art into their native land. There the cities of Hamburg and Lübeck became the centres of a new instrumental school whose basis was the chorale. The principal forms cultivated were the *toccata*, *ciaconna*, *fugue*, and, towards the end of the period, the *sonata*. The great North German masters were Scheidt, Scheidemann, Reinken, Buxtehude, Kuhnau. 2. While the North German masters developed the style of Sweelinck, a group of composers in the middle and south of Germany worked along similar lines, but under the influences of Frescobaldi and the Roman school. The authority of the Italian sonata writers had by this time extended to Germany, and the forms of the *sonata da chiesa* and the *sonata da camera* were cultivated. Nor was the fugue neglected. All the great composers used the Italian forms, but infused their own individuality into them, and thus prepared the way for J. S. Bach, who wrested the leadership in musical affairs from Italy and transferred it to Germany. The German masters who aided in this great work are Kerl, Froberger, Pachelbel, Muffat, Biber.

XI. *School of Florence* (1594–1676).—While the earlier Italian composers cultivated almost exclusively the polyphonic style of vocal music, a school with widely different tendencies sprang up in Florence. The revival of the learning of Greece led to an attempt to reconstruct the ancient drama. Thus arose the monodic style, in which one voice sings while instruments furnish the accompaniment. In 1594 Peri set an entire drama, *Dafne*, to music in this manner. Crude as the attempt was, it found favor, and in less than half a century the new style had conquered all Europe. Its development was not confined to Florence; in fact, its greatest exponent, Monteverde, was a native of Cremona, although he lived chiefly in Mantua and Venice. But, as the style originated in Florence, it seems advisable to classify all composers identified with its development under the Florentine school. This school first dispensed with the preparation of dissonances, and greatly developed the orchestra, establishing the strings as its foundation. The works of this school were first designated by the title *dramma per musica*. About 1650 we find *opera per musica*, which soon afterward became simply *opera*. The principal names of this division are Peri, Caccini, Monteverde, Cavalli. See OPERA.

XII. *School of Naples* (1675–1757).—As

early as 1475 a Flemish master, Tinctor, settled in Naples, but not until 200 years later did a distinct school arise. From Rome and Venice the Neapolitans adopted the polyphonic Church style, from Rome the oratorio, and from Florence the musical drama. The new school paid more attention to the melodic outline of the highest voice, perfected the form of the *aria* (q.v.), and introduced it into their dramatic works. Whereas the Florentine musical drama consisted of continuous recitative by a single voice, the Neapolitans introduced not only the aria, but also choruses, duets, trios, etc. The Florentines had emphasized the *dramatic*, the Neapolitans emphasized the *musical* element. They also cultivated the form of the concert overture. (See OVERTURE.) Transferring the form of the *sonata da chiesa* to compositions for the clavichord, and introducing a secondary against a principal subject, they prepared the way for the modern sonata. The principal masters are Stradella, A. Scarlatti, Durante, Logroscino, Leo, D. Scarlatti.

XIII. *Early French Opera* (1645–1764).—After the Old French school had been supplanted by that of the Netherlands we have no more records of music in France until 1645, when a work of the Florentine monodic style was produced in Paris. The rise of the French drama through the works of Corneille, Racine, and Molière turned the general attention to the stage. Lully became the founder of a distinct school of French opera. The characteristics of this school are better dramatic characterization and the raising of the chorus to an active participation in the dramatic development. The orchestra also is increased by the addition of kettledrums and trumpets, and the character of the wood wind is recognized. The important names are Cambert, Lully, Marais, Rameau.

XIV. *Later School of Venice* (1650–1739).—The German Protestant masters had introduced a subjective and emotional element into their Church music. This became the keynote of the later Venetian masters. A distinctive feature is the development of some particular theme which begins in a low register and gradually rises higher and higher, leading to an effective climax. The growth of the orchestra also gave the composers an opportunity to heighten the effect of their vocal polyphonic works. The chief masters of this school are Legrenzi, Lotti, Caldara, Marcello.

XV. *English Music during the Restoration* (1660–94).—After the death of Gibbons in 1625 music declined rapidly in England. This decline was due to the unsettled state of affairs during the reign of Charles I and the fanaticism of the Puritans, who objected to the cultivation of music and destroyed many valuable manuscripts. When, at his accession in 1660, Charles II attempted a restoration of music, practically a new start had to be made. In spite of many drawbacks, however, music soon attained its former importance. Purcell, the greatest musical genius England has ever produced, now appeared, and under his inspiration English music rose to such a height that for a short time England boasted a national school of opera. The principal composers of the Restoration are Humfrey, Wise, Blow, Purcell.

XVI. *Italian Sonatists* (1620–1800).—Up to the seventeenth century the organ was the great means of developing instrumental music (toccata, ricercare, fugue). By the beginning of that century the violin had been considerably perfected and attracted a number of musicians in northern Italy. These composers prepared the way for our highest musical art form, the sonata. About 1650 a distinction began to be made between *sonata da chiesa* and *sonata da camera;* the former consisted of several movements of contrapuntal writing, the latter employed various dance forms. Great attention was paid to thematic development. The instrumental concerto was introduced and the *concerto grosso* was cultivated. The principle of musical dualism, first announced by Scarlatti, was strongly emphasized. While in the eighteenth century all the art forms in Italy declined, this school of sonata writers was the only one that made progress in the art. The principal masters are Legrenzi, Bassani, Torelli, Veracini, Corelli, Tartini, Boccherini.

XVII. *German Singspiel* (c.1630–1800).—1. In the beginning of the seventeenth century there arose in Germany the so-called school comedy—dramatic representations by students. Each act was preceded by a short musical dialogue introducing mythological personages. This custom led to the establishment of the German *singspiel* (q.v.), in which the acting personages were shepherds, shepherdesses, nymphs, etc. These *singspiele* finally gave rise to a national German opera in Hamburg, but not until Hiller in Leipzig established the *singspiel* upon the basis of the folk song did this form rise to an artistic level. The composers of this form are Strungk, Kusser, Keiser, Mattheson, Handel, Telemann, Hiller, Dittersdorf, Schenck, Weigl, Winter. 2. While the *singspiel* was popular with the masses, the German princes, decrying everything that was German, favored the Italian opera. Especially Vienna and Dresden became strongholds of the foreign style. Many German composers began to write Italian operas, and thus aided the rapid decline of dramatic composition. Among these composers we find Hasse, Graun, Doles, Naumann. See OPERA.

XVIII. *Decadence of Italian Opera* (c.1750–1810).—With the aria the Neapolitan school had given to music that form which was soon to bring about a general decline of dramatic music. Dramatic truth counted for nothing; sensuous charm of melody and display of vocal art were paramount. Composers became the slaves of singers. The ballet became an important factor in the opera. Naturally composers did not waste time in studying counterpoint and polyphonic writing when success was so easily won by writing pretty melodies over the plainest harmonic accompaniment. The principal names of this period are Porpora, Pergolese, Jommelli, Piccini, Sacchini, Paisiello, Salieri, Cimarosa, Zingarelli, Righini, Paër. See OPERA.

XIX. *Mannheim Symphonists.*—About the year 1740 a remarkable change of style is noticeable. Polyphony (q.v.) gave place to homophony (q.v.). While in their chamber music the Italian sonatists assigned to the first violin a leading part, to which all other instruments were very much subordinated, a group of German composers, mostly residents of Mannheim, took up the sonata form (q.v.), but by treating all instruments polyphonically made them participate in the thematic development. By emphasizing the second subject and making it participate in the general development as much as the principal subject, they created musical

dualism as a principle of the new style. Thus these masters originated the modern sonata and symphony and established the foundations of the modern orchestra. Above all these composers towers Johann Stamitz (q.v.), whose symphonies and chamber music strike a decidedly individual note and prove the new form capable of far greater freedom than the older forms of the severe contrapuntal art. Strange to say, for more than a century the work done by these Mannheim composers had been buried in oblivion, until early in the twentieth century Dr. Hugo Riemann discovered and republished these works, which are indispensable as the natural connecting link between the Italian sonatists and the great German classic masters. The most important composers of this group are, next to Johann Stamitz, his two sons Karl and Anton, F. X. Richter, Holzbauer, Schobert, Toeschi, Cannabich, J. C. Bach, Malder, Fraenzl, Beck, Eichner.

XX. *The Classic Masters* (c.1700–1827).—Bach marks the culmination of the polyphonic period of music (see Polyphony), as well as the beginning of the new homophonic-harmonic period. (See Homophony.) In him the *passion* (q.v.) and the *instrumental fugue* reach their highest development. He brings equal temperament (q.v.) into universal use. Handel brings the *oratorio* (q.v.) and the *vocal fugue* to perfection. Taking up English music where the premature death of Purcell had left it, he gives a new impetus to English music. Gluck reforms the opera by emphasizing the dramatic in opposition to the purely musical element, without, however, disturbing the forms of the aria, chorus, duet, ensemble, etc. He greatly advances the art of orchestration. Haydn takes up the new instrumental style of the Mannheim symphonists, perfecting the sonata form and considerably advancing the art of orchestration. Mozart invents no new forms, but fills those existing with the contents of his wonderful genius. He is a universalist, equally great in all the forms he handles. In the works of Beethoven absolute music reaches a point which would indicate the highest possible development, beyond which no progress can be imagined. He greatly enlarges the forms of Haydn and Mozart, and replaces the *minuet* (q.v.) of the symphony by the *scherzo* (q.v.). He strikes passionate accents never heard before in music, and discloses marvelous depths of emotion. Schubert creates the art song (*kunstlied*). (See Lied.) In the field of instrumental music he follows the path opened by Beethoven, but preserves his own strong individuality. See the separate articles.

XXI. *English Music since Handel* (1750–1829).—When Handel settled in England in 1718 the national opera of Purcell had been entirely superseded by the Italian. Handel's own Italian operas exerted no uplifting influence, and have shared the fate of the works by his contemporaries. But when Handel began to cultivate the oratorio he laid the foundation of his fame, which shed lustre on contemporary English music. Unfortunately, he remained the only master. His contemporaries and immediate successors were unable to carry on his work, although they made earnest efforts. They therefore turned their attention to the opera—not the foreign Italian product but the national English opera. They even succeeded in establishing a style of their own different from the German *singspiel* or the French *opéra comique*. The spoken dialogue occupied altogether too much space, and, although the musical numbers were not lacking in a certain freshness and melodious charm, they were utterly devoid of all dramatic expression. Hence this national opera died with its authors. The most prominent composers are Arne, Arnold, Dibdin, Storace, Hook, Shield.

XXII. *Italian Opera Buffa* (c.1730–1816).—The short intermezzi (q.v.), which originally were interpolated between the acts of the *opera seria*, were gradually expanded and finally completely separated from the serious work. While the *opera seria* treated tragic subjects of mythology, this new *opera buffa* treated comic situations drawn from everyday life. Logroscino (q.v.) may be regarded as the founder of this type. He also established the elaborate ensemble at the close of each act, which soon was also adopted by the serious composers. The first work of this kind which created a European sensation was Pergolese's *La Serva Padrona* (1734); the last and unsurpassed masterpiece, Rossini's *Il Barbiere di Seviglia* (1816). In our own day the *opera buffa* has been successfully revised by Wolf-Ferrari (q.v.) with his *Il Segreto di Suzanna* (1911), *Le Donne Curiose* (1912), and *Amore Medico* (1913). Several of the masters of the *opera seria* also excelled in this lighter kind. The principal names are, besides those mentioned, Leo, Hasse, Cimarosa, Paisiello, Piccini, Jommelli, Mozart.

XXIII. *French Opéra Comique* (c.1760–1870).—This school presents three sharply marked periods. The productions of the first period somewhat resemble the German *singspiel*. The subjects are taken from everyday life or fairy tales. The secco-recitative of the Italian *opera buffa* gives place to the spoken dialogue; for the aria is substituted the French *chanson*. The works of the second period (c.1800–30) show the influence of German romanticism. The purely comic subjects are replaced by a mixture of comedy and romanticism. The music assumes a more serious character, and better musical characterization is attained; the orchestra becomes an important factor, and the ensemble is strongly influenced by that of the *grand opéra*. In fact, some of the masters of the *grand opéra* belong equally to the *opéra comique* (Cherubini, Auber, Halévy). In the works of the third period we find very often that the only comical thing about them is their designation as *opéra comique*. Composers do not hesitate to choose tragic subjects. And yet such works are called *opéra comique*, because they differ from *grand opéra* by the fact that there is spoken dialogue. Nothing can very well be more tragic than Bizet's *Carmen*. But it contains spoken dialogue; hence it is *opéra comique*. In *opéra comique* there is generally a healthier musical atmosphere, less striving for mere effect, more truthful dramatic expression, less artificiality. The great masters of this school are Philidor, Monsigny, Grétry, Cherubini, Méhul, Isouard, Auber, Boïeldieu, Hérold, Halévy, A. Thomas.

XXIV. *French Grand Opéra* (1774–1864).—A peculiarity of the French opera is the fact that several of the masters who have contributed most materially to its advancement were foreign born. After the death of Rameau French national opera was at a standstill, and for some time the Italian opera gained ground. Then a

German, Gluck, appeared with his reforms. The success of his *Iphigénie en Aulide* in 1774 marks the beginning of a new era of French opera. The new style was taken up by two Italians, Cherubini and Spontini, who finally established the *grand opéra*. Then native French composers began to take part. The characteristics of this school are the prevalence of tragic subjects; the absence of spoken dialogue; the great attention paid to declamation, which very often degenerates into empty rhetoric and hollow pathos; a heavy orchestration, whose aim is for striking effects; and elaborate ensembles and finales. The introduction of a ballet after the second act is indispensable. In the choice of subjects those taken from history are specially favored. This school may be divided into two periods, roughly separated by the year 1830. The characteristics just mentioned apply more strictly to the second period (Meyerbeer); while the works of the first period, as a rule, are marked by a greater earnestness of purpose as far as the purely musical setting is concerned. The principal composers are: Gluck, Berton, Gossec, Cherubini, Lesueur, Spontini, Auber, Rossini (*Tell*), Meyerbeer, Halévy. See OPERA.

XXV. *Italian Bel Canto* (1813–68).—We have seen that the opera in Italy declined rapidly after the middle of the eighteenth century. With the appearance of Rossini a new school may be said to begin. Even before him singing was the chief attraction; but his predecessors relied upon the technical skill of the singers to please the audience. Rossini surpassed all Italian operatic composers before him in the charm of melodic invention. It is this sensuous charm of melody that distinguishes the school of the *bel canto* from the school of decadence. Besides Rossini, the principal exponents of this style are Donizetti and Bellini. Of only secondary importance are Generali, Mercadante, and Pacini.

XXVI. *German Romanticists* (1818–80).—The German romantic opera was developed from the *singspiel*. About the middle of the eighteenth century witches, gnomes, ghosts, and all kinds of spirits were introduced into the *singspiel*, which thus gradually gave rise to a new kind, the *zauberoper* (magic opera). Although the texts of these productions were silly, and the attention was distracted from the purely musical element to the scenic decorations, yet this *zauberoper* led opera into the realm of the mysterious, fantastic, and wonderful, where it has scored its greatest triumphs. The real beginning of the Romantic school is marked by the appearance of Weber's *Freischütz* (1818). With the appearance of romanticism music becomes more and more the individual, subjective expression of each composer, so that it is exceedingly difficult to arrange composers into groups. One characteristic of the Romantic school in general is the great advance in orchestral tone coloring over the classic masters and a decided preference for dissonances. Not only do the different instruments become so many separate voices, but a distinction is made even between the various registers of the same instrument. Harmony becomes greatly enriched and is the principal means of emotional expression, while rhythm assumes greater diversity and complexity. Music in general becomes more intense and passionate. The instrumental composers at first fill the classical forms with romantic contents, and then originate new forms. In the field of dramatic music the principal composers are Weber, Spohr, Marschner, Lortzing, Holstein, Nicolai, Flotow, Kretschmer, Goldmark, Götz, Nessler, Brüll. Those who devoted their energies to instrumental and choral works are Spohr, Schumann, Mendelssohn. The latter master has much in common with the classicists, and became the head of a school whose principal representatives are Hiller, Reinecke, Jadassohn, Hauptmann, Richter, Moscheles. The influence of Schumann is perceptible in another group of masters, of whom the most prominent are Franz, Volkmann, Jensen, Huber, Heller. Midway between these two schools, and preserving characteristics of their own, are Raff, Rheinberger, Wüllner, Klughardt.

XXVII. *German Lied* (1815–). The one form which was originated and brought to highest perfection by German masters is the *lied*. So specifically is it a product of German genius that other nations who have adopted the form have never attempted to translate the name into their own language. Long before Schubert German composers had written songs, frequently in conscious imitation of the simple folk song. But even Mozart, Beethoven, and Weber failed to recognize the possibilities of raising the song to the level of a high art form. In his very first lyrics Schubert surpassed all predecessors. In his short life he composed over 600 poems expressing the entire gamut of human emotions, thus proving the universality of his genius, and pouring out a profusion of divine melody. Successive masters enriched the piano part, until Hugo Wolf (q.v.), by transferring the principles of Wagner's music drama to the lied, endowed the instrumental portion with truly symphonic power. In Germany, at least, there is scarcely one composer of prominence since Schubert who has not cultivated the lied more or less. The fame of Robert Franz and Hugo Wolf rests entirely upon their imperishable masterpieces in this field. The masters who have materially contributed to the development of this form are Schubert, Schumann, Franz, Brahms, Mendelssohn, Liszt, Rubinstein, Grieg, Tschaikowsky, Jensen, Cornelius, Wolf, Strauss.

XXVIII. *Wagner, Liszt, Brahms* (1843–87).—Among the great German masters of the nineteenth century three stand forth so prominently that it is impossible to classify them. Wagner and Liszt became founders of two distinct schools, whereas Brahms stands alone, without followers. Wagner began as the successor of the romantic opera of Weber. His reformatory work is concerned, not with the opera in particular, but with dramatic composition in general. He emphasizes the drama and asserts that music must only follow and intensify the text. He considerably curtails the introduction of the chorus, ensembles, etc. The voices declaim in a highly dramatic kind of recitative, while the development of the musical ideas is assigned to the orchestra. The unifying principle of his works is the leitmotiv (q.v.), which constitutes the basis of the *musical drama* (q.v.). The music drama is a combination of the dramatic, musical, and plastic arts into one new art form. Wagner demands first of all a *drama*, not a text or libretto (q.v.); all the resources of music are to be employed towards a true interpretation of this drama; and the plastic arts are to combine with music. The orchestra is enormously enriched by new tone

colors and means of expression. (See MELOS; OPERA; WAGNER.) Liszt applied Wagner's principle of descriptive music to purely instrumental music and became one of the founders of modern programme music (q.v.). Unable to make the classic form of the symphony serve his purpose, he invented the *symphony poem*. In the field of piano music he becomes the originator, with Schumann and Chopin, of modern pianoforte technique. Together with Wagner and Berlioz he also laid the foundations of a new school of conducting (the interpretative conductor). (See CONDUCTOR; LISZT.) Brahms, in an age of musical excitement and innovations, stands forth as the keeper of classical forms. He successfully carries on the style of Beethoven's third period, faithfully preserving the form, but showing the possibility of filling it with new and original contents. Thus he proves that absolute music is unlimited in its scope and power of expression; that its capabilities were not exhausted even by the titanic Beethoven; that any original genius can employ those forms for conveying his ideas; that the polyphonic art of Bach can successfully be combined with the homophonic-harmonic art of Beethoven and with romanticism. See BRAHMS.

XXIX. *Berlin Academicians* (1830–1900).—While Brahms was not hostile to the development of music, a number of composers refused to recognize that romanticism was an advance in the art of music. They closed themselves to the new influences and sought their ideals in the past. The strongholds of this school were several Berlin institutions, notably the Singakademie. (See CHORAL SOCIETIES.) The energies of these masters were directed to the cultivation of the polyphonic style of the older Italian schools and Bach. But some of the later masters finally adopted the principles of romanticism. The important names are: Dehn, Grell, Kiel, Bargiel, Blumner, Becker, Bruch, Hofmann, Herzogenberg, Gernsheim, Moszkowski, P. Scharwenka, X. Scharwenka, Goldschmidt.

XXX. *Neo-German School* (1847–).—The beginning of Liszt's activity in Weimar in 1847 may be regarded as the commencement of this school. Liszt attracted a great number of young musicians who enthusiastically devoted themselves to the cultivation of programme music, carrying out Liszt's ideas. But the Neo-German masters did not devote their energies entirely to the field of instrumental music. Wagner's works attracted more and more admirers, and composers began to imitate him. Up to the present day a great many dramatic works constructed upon Wagner's principles have been written. The failure of all would seem to indicate that one might almost be justified in stating that Wagner's art form is one suited to his own gigantic genius, but hopeless for lesser masters. This would seem to be confirmed by the fact that the new dramatic works that have achieved success are all by non-German composers who adopted many of Wagner's ideas, but not his form in toto. The Neo-German school has been marked by earnest effort, but its composers have made no lasting impression. The only one whose work seems destined to outlive contemporary criticism is Richard Strauss, a man of pronounced originality. The dramatic composers of this school are Cornelius, Ritter, Bungert, Kistler, Humperdinck, Kienzl, D'Albert, Weingartner, Schillings, S. Wagner, R. Strauss, Blech, Reznicek, Urspruch, Pfitzner, Bittner, Braunfels, Istel, Kaskel, Thuille, Waltershausen, Zemlinsky. The instrumental composers are represented by Krug, Nicodé, Mahler, Hausegger, Boehe, Reger, Scheinpflug, Korngold, R. Strauss.

XXXI. *Modern Italy* (1851–).—Beginning about 1750 the history of Italian music is practically the history of the decline of the opera. When Verdi scored his first success in 1839 no one dreamt that this man, beginning in the degenerate style, would raise the Italian opera to a high level. In *Rigoletto* (1851) there is a very perceptible effort for dramatic truth and characterization, which the school of *bel canto* entirely ignored. The successive works advance along this line until in *Aida* (1871) we have a rare combination of exquisite melody, dramatic characterization, and truth of expression. *Othello* (1887) and *Falstaff* (1893) mark the culmination of Italian opera. Wagner's principle of dramatic truth is strictly observed. Nevertheless these works are not imitations of Wagner. Verdi has retained all the forms of the opera, but has knit them together into an artistic whole. The principle of the leitmotiv is not used. The orchestration shows a mastery never exhibited by any previous Italian composer. The influence of Verdi is noticeable in a number of composers known as the *Veristic* school (Mascagni, Leoncavallo). Among the many operatic composers, none of whom can approach Verdi, the following deserve mention: Boito, Ponchielli, Marchetti, Faccio, Coronaro, Puccini, Smareglia, Giordano, Montemezzi, Wolf-Ferrari, Zandonai, Catalani, Alaleona, Mulé, Molinari, Marinuzzi, Fano, Zanella. The elevating influence Verdi exerted upon dramatic music turned some serious composers to the field of instrumental and choral music, which had been sadly neglected in Italy. The principal instrumental and choral composers are Pincelli, Sgambati, Cesi, Grazzini, Mancinelli, Martucci, Franchetti, Perosi, Sinigaglia.

XXXII. *Modern France* (1830–).—So far we have spoken of musical development in France only in connection with the theatre. Instrumental music had not been cultivated to a very great extent. But we cannot disregard the name of the family of Couperin during the seventeenth and eighteenth centuries. Several members have become famous through their contribution to the perfection of the suite form. Under section XXIV the history of dramatic music up to the death of Meyerbeer has been given. Berlioz first awakened a deeper interest in instrumental music. This master was led to instrumental composition through the influence of Beethoven, but, uninspired by the classic forms, he became the originator of programme music (q.v.). His works, all conceived in large forms, lack symmetry of construction and have not yet found universal recognition. But Berlioz first aroused general interest in France for instrumental music and, independently of Wagner, did much for the art of orchestration. Soon other composers began to cultivate instrumental music; and these used the classical forms. After Berlioz's ideas of programme music had been adopted by Liszt, who established the symphonic poem as a recognized art form, French composers accepted the idea. All through the past century German classical and romantic influences have been at work in France. The mingling of these in-

fluences with the individuality of the French masters has been productive of excellent results, and to-day France can boast an influential instrumental school. The principal masters are David, Franck, Lalo, Saint-Saëns, Bizet, Delibes, Godard, D'Indy, Chausson, Hahn, Guilmant, Pierné, Ropartz, Schmitt, Ravel, Dukas, Fauré, Debussy, Vierne. But dramatic music did not remain at a standstill; the German romantic opera and lyric drama influenced French dramatic composers. Although the grand opera (the historic and heroic opera of Meyerbeer) was in danger of losing sight of dramatic truth in its striving after mere effect, the *opéra comique* and the later lyrical French drama are distinguished for truth of expression and successful musical characterization. Wagner's works have exerted only a wholesome influence, for French composers wisely did not imitate his form, but only followed the German master in the art of orchestration, as well as in a few other principles which can be safely adopted without danger of losing individuality. The most prominent dramatic composers are Gounod, Saint-Saëns, Bizet, Massenet, Chabrier, Guiraud, Reyer, Massé, Bruneau, Charpentier, Messager, Février, Aubert, Wolff, Leroux, Hue.

XXXIII. *Poland* (1830–).—The Slavic and Scandinavian nations took no important part in the development of music until the last century. (For a complete account the reader is referred to the articles on Scandinavian Music and Slavonic Music.) Polish music is chiefly represented by the works of Chopin, who is one of the founders of a new school of piano playing. His original harmonic combinations have become a great means in modern emotional expression. He also showed how embellishments can be made an important factor of expression. The other Polish masters show less national characteristics, and those living at present in Germany are more German than Polish. The principal Polish masters are Moniuszko, Kurpinski, Dobrzynski, X. and P. Scharwenka, Moszkowski, Zelenski, Noskowski, Karlowicz.

XXXIV. *Russia* (1836–).—The beginning of a distinct school may be dated from the first performance of Glinka's *Life for the Czar*. At first the national school cultivated chiefly dramatic composition, but soon composers turned also to instrumental music, in which line several have achieved marked success. The characteristics of Russian music are strength and great variety of rhythm, amounting almost to irregularity. The prominent masters are Bortnianski, Verstowski, Glinka, Dargomyshzki, Serov, Borodin, Cui, Balakirev, Mussorgski, Tschaikowsky, Rimski-Korsakov, Arenski, Glazunov, Rubinstein, Rachmaninov, Glière, Sapelnikov, Senilov, Vassilenko, Zolotariev, Taneiev, Tcherepnin, Rebikov. See Slavonic Music.

XXXV. *Scandinavia* (1840–).—Like the Russians, the Scandinavians established a distinct school by emphasizing the national element in music as it was presented in their folk music. Denmark made the beginning, but Norway soon took the lead. The characteristics of the school are an artistic use of dissonances and an emphasis of rhythm as well as melody. The principal masters are: Denmark—Berggren, Hartmann, Gade, Enna, Neilsen, Schiöler, Börresen; Sweden—Hallström, Södermann, Hallén, Sjögren, Stenhammar, Peterson-Berger, Alfvén, Aulin, Atterberg; Norway—Kjerulf, Svendsen, Nordraak, Grieg, Sinding, Hamerick, Cleve, Schjelderup. See Scandinavian Music.

XXXVI. *Finland* (1850–).—The beginnings of national Finnish music form a connecting link between the music of Scandinavia and Russia. The original folk music, brought into contact with German classicism, romanticism, and Wagnerism, soon yielded a typical national art music, quite distinct from that of Scandinavia, Russia, or Germany. Its development has been unusually rapid, and to-day Finland is almost the only country where impressionism has not arrested the natural progress of the national art. The important masters are Pacius, Wegelius, Sibelius, Kajanus, Järnefelt, Merikanto, Mielck, Melartin, Palmgren. See Finnish Music.

XXXVII. *Bohemia* (1860–).—The attempts of Russian composers to establish a national opera led Bohemian musicians to make the same experiment in their own country. A distinct Bohemian school may be said to begin with Smetana's *The Bartered Bride* (1866). Smetana also was the first notable instrumental master. He and, still more, Dvořák have made the Bohemian school famous, but the merit of the instrumental works overbalances that of the dramatic compositions. The forms cultivated are those of the German classic and romantic masters. The principal composers are Skraup, Skuhersky, Schebor, Rozkosny, Smetana, Dvořák, Fibich, Hřimaly, Albést, Weiss, Novak, Suk, Nedbal. See Slavonic Music.

XXXVIII. *The Netherlands* (c.1800–).—Although after the time of the great contrapuntal schools of the fifteenth and sixteenth centuries we meet no distinct school in the Netherlands, music was not neglected in those countries. But the influences of the neighboring countries, France and, especially, Germany, always predominated, thus preventing the rise of a national school. Both Belgium and Holland have produced a number of excellent composers. But the importance of the Netherlands during the nineteenth century rests more upon the contributions to musical history. In this line Belgian writers are second to none in the world. Without the labors of Fétis, Coussemaker, and Gevaert our knowledge of the musical past would be very incomplete. Besides, Belgium has produced some of the greatest instrumental performers (De Bériot, Vieuxtemps, Léonard, Servais, Ysaye). The more prominent of the composers are: Belgium—Janssens, Benoit, Mertens, Wouters, Van den Eeden, Tinel, Mathieu, Gilson, Blockx, Dupuis; Holland—Verhulst, Koning, Coenen, Silas, Hol, Thooft, De Hartog, Averkamp, Brandts-Buys.

XXXIX. *Modern Spain* (1890–).—Whereas in all other countries the influence of Wagner reacted unfavorably upon composers, this very influence proved a blessing in the case of Spain, because it effectively checked the strong Italian influences which had prevailed for three centuries and suppressed all originality. Fortunately Wagner was not blindly imitated; his influence acted more in the nature of a powerful stimulus. Operatic composers did not abandon national subjects nor the characteristics of their national folk melodies, but infused more seriousness into their work and strove for higher ideals. In the field of instrumental composition, however, almost all contemporary composers have adopted rather openly the idiom of the French impressionists.

The more important names are Bretón y Hernandez, Chapi, Pedrell, Albeniz, Granados, Manén. See SPANISH MUSIC.

XL. *Modern England* (1830–).—The predominance of spoken dialogue had caused the downfall of the English opera. About 1830 some English composers attempted to write national operas with a moderate amount of dialogue. The works of Weber assisted them in their efforts, but, as these earlier works were of a lighter character, English opera soon assumed the character of operetta. The appearance of Sullivan established this form upon a firm basis. In the field of grand opera England has as yet produced no successful work. The cultivation of instrumental music, through the influence of Beethoven, has yielded more satisfactory results, but the best work has been accomplished in the field of choral music. The modern English composers have not succeeded in developing a characteristic style, but their works show solid workmanship and mastery of form. The weak point is thematic invention; the themes lack spontaneity. The list of English composers is a very long one. The following deserve special mention: dramatic music—Bishop, Balfe, Barnett, Macfarren, Wallace, Benedict, Sullivan, Stanford; instrumental and choral music—Costa, Bennett, Barnby, Stainer, Parry, Cowen, Mackenzie, Coleridge-Taylor, Elgar, German, MacCunn, Holbrook, Bantock, Grainger.

XLI. *United States* (1880–).—We have seen that the English School of the Restoration (XV) was obliged to rebuild what the Puritans had destroyed. Music beginning in America with the Puritan psalm tunes and under Puritan influence naturally could not develop. Its growth came only with foreign influences; and even then considerable time had to elapse before any works by American composers appeared. About the middle of the eighteenth century operatic performances of foreign works (chiefly English) began to be given, and before the end of the century crude attempts at original composition in the smaller forms can be chronicled. Not until early in the nineteenth century performances of better operas and larger vocal and instrumental works had resulted in a certain degree of musical culture, did any native composers attempt some of the larger forms. Naturally all these early efforts show no trace of originality. Among the more prominent of these pioneers—all born before 1850—may be mentioned Fry, Bristow, Paine, Pratt, Millard, Penfield, Buck. The work of their immediate successors, though still lacking the strong individual note, and showing largely German influence, is of vastly better quality and occasionally rises to the level of distinction. The principal composers of the latter half of the nineteenth century are Chadwick, Foote, Whiting, Bird, E. Nevin, Bartlett, Shelley, B. O. Klein, Gleason, Kaun. Far above them towers MacDowell (q.v.), a man of striking individuality. Withal, it would be difficult to point out in his works anything specifically American. In order to produce typically American music two ways have been tried—the introduction of Indian themes and of negro melodies. Neither method has yielded the desired result; for neither the Indian nor the negro represents the American nation of to-day. The national music of all European nations has been reared on the immense store of their respective national folk melodies, accumulated for centuries; and not until there exists a similar abundance of typical American folk melodies will the American composer have the necessary basis for a national music which shall be characteristic of the American nation of some future day. Since the beginning of the present century French influence has gradually been superseding the German, and the majority of the younger composers, in spite of all experimenting with Indian and negro melodies, follow in the wake of the Impressionists. Among the more prominent of the composers of the present day are Herbert, Parker, Stillman-Kelley, Loeffler, Hadley, Saar, Strube, Busch, Converse, A. Nevin, Stock, Brockway, Cadman, Stojowski, Humiston, Mrs. Beach, Kroeger, Powell, Kramer.

TWENTIETH-CENTURY TENDENCIES (1900–)

At no time in the history of any art does the end of a century coincide exactly with the close of a period of artistic activity, and all boundary lines drawn around certain art periods are more or less arbitrary and invariably overlap. Most tendencies in the music of the present day have their beginnings in the last century, but have developed or assumed definite shape within the present century. It is, then, chiefly as a matter of convenience that the year 1900 is taken as a dividing line.

After the death of Wagner and the universal recognition of his genius his influence during the last two decades of the nineteenth century dominated not only dramatic composition but every form of music, without, however, producing much of value. When the composers realized the futility of their efforts in this direction they cast about for something new. "Originality at any cost" became the watchword. Beethoven, Chopin, and Wagner, men of extraordinary inventive power, made sure that they stood upon the solid foundation laid by their great predecessors before they struck out along the new paths which inner necessity impelled them to follow. They never lost sight of the fundamental principles. To-day the case is just the reverse. Composers whose chief shortcoming is lack of thematic invention disregard fundamentals and seize upon accidentals, which are emphasized out of all proportion to their intrinsic value or importance. Thus their harmonic system is founded, not upon the eternal basis of consonance, but upon dissonance. Excessive modulation has practically obliterated tonality. The remarkable advance in orchestral technic, instead of being a blessing, is really a curse, since it originated in a desire to hide insignificant musical ideas under a dazzling exterior. Pure music is no longer written for art's sake, but to express something or other. This frantic striving for "expression" has resulted in deadly monotony, for the constant employment of strange harmonies and an enormous technical apparatus make climaxes and contrasts impossible. Twentieth-century music addresses itself to the nerves, that of the preceding century to the heart.

This modern tendency is known as impressionism. It originated in France during the last century, and for some time its principal and practically only exponent was D'Indy. (See INDY.) The great success of Debussy (q.v.) at the beginning of the present century led composers, irrespective of nationality, to adopt

this new idiom. Just as Wagnerism had done before, so now impressionism has leveled all distinctions as to nationality and individuality. Although each belongs to a different nation, Samazeuilh, Scriabine, Albeniz, Szymanowski, Scott, Loeffler, Rangström, all are Impressionists, all write the same idiom, and a work by any one might as well have been the work of any other member of the group. Whereas with Debussy this language is natural and free from the excesses of the imitators, it soon became a caricature. These imitators seized on the idea of creating only "mood" or "atmosphere," a procedure that relieved them of the necessity of thematic invention and logical development. The compositions of Futurists appeared on the programmes of many of the world's foremost organizations. Conditions during and after the World War appeared to favor the spread of these futuristic tendencies among younger composers.

The following are the principal exponents of Futurism: FRANCE: The group known as "Les Six" [Auric, Durey (deserted in 1921), Honegger, Milhaud, Poulenc, Tailleferre], Grovlez, Inghelbrecht, Samuel-Rousseau, Satie. ITALY: Camussi, Casella, Malipiero, Mangiagalli-Pick, Marinetti, Molinari, Mulé, Oddone, Ottolenghi, Pizzetti, Pratella, Respighi. GERMANY: Fried, Kaiser, Schönfeld, Schreker, Wellesz. RUSSIA: Prokofiev, Rebikov, Skriabin, Stravinsky. ENGLAND: Bax, Bliss, Goossens, Holst, Ireland, Quilter, Scott, Somerville, Williams. HUNGARY: Bartók, Stojanovits. POLAND: Rózicky, Szeluta, Szymanowski. SPAIN: Albeniz, de Falla. UNITED STATES: Bloch, Carpenter, Griffes, Loeffler, Ornstein, Schelling, Whithorne.

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H. Riemann's *Musikgeschichte in Beispielen* (3 vols., Leipzig, 1911) contains 150 specimens of compositions of all styles from the thirteenth to the eighteenth centuries.

See LIED; OPERA; ORATORIO; OVERTURE; PROGRAMME MUSIC; SONATA; SYMPHONY; BACH; BEETHOVEN; BRAHMS; CHOPIN; DEBUSSY; SCHUBERT; SCHUMANN; STRAUSS, RICHARD; VERDI; WAGNER.

MUSIC, MILITARY. See BAND, MILITARY.

MUSIC, PSYCHOLOGY OF. The psychology of music deals with the mental processes which furnish both the motives for its production and the ground of its appreciation. It has an individual and a social aspect; for music as an art involves not only the individual consciousness, as such, but also, since it is a means of expression and communication, the modification of one mind by another. See MUSIC.

The mental elements primarily involved in music are sensations of tone. Of the 10,000 tones which may be distinguished in consciousness, music uses a comparatively small number. Our own elaborate musical system includes only 85 or 90, ranging from about 40 to 4000 vibrations per second—something less than seven octaves. The simple tonal sensation is produced by an uncompounded pendular vibration of the air. The note (compound tone or simple clang) is composed of a number of simple sensations, called partials or partial tones, one of which (the lowest) is the fundamental; the others are called overtones. The character (timbre, clang tint, quality) of the note is determined by the number and relative intensity of the various partials. (See CLANG TINT, EXPLANATION OF.) Every simple tone has several aspects or attributes—pitch (high or low); intensity (loud or soft); duration (long or short); tonality (the octave relation; every c or d of the scale is, in a sense, a repetition of every other c or d); volume (large or small). By the combination and variation of these attributes, although some are more important than others, all classes and forms of music are produced. There is, first of all, the combination of qualities and intensities in the note or compound tone, which is the practical basis of music. Above this stand the alternations of intensity, which produce rhythm (q.v.); the successive rise and fall of pitch, which forms the essence of melody; and the synchronous combination of pitches (see FUSION), known as harmony. The attribute of tonality has doubtless played a part, along with fusion, in determining the limits of scales and in the development of form. These, however, are only the materials: the psychological problem is, first, to inquire into the specific manner in which they are employed, and, secondly, to discover the motives and the nature of the psychological processes which gave rise to the production of music. Our primary task, therefore, is the analysis of music itself; and since our own music has developed not only in a high degree but also in a single direction, we must study other musical systems as well. Research of this kind has been made possible in recent years by the collection of phonographic records of exotic music from all parts of the world. The largest and most representative series (more than 5000 phonograms) is housed in the psychological laboratory of the University of Berlin, where under the direction of Stumpf the work of transcription and comparison is steadily going forward. Enough has already been done to afford some insight into the principal factors which determined the origin and development of music.

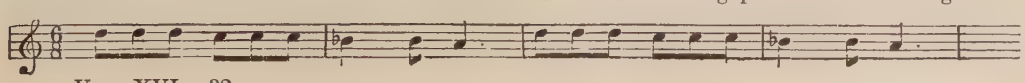
The starting point is to be found in the innate tendency to give expression to feelings and ideas by bodily movements. (See EXPRESSION, EXPRESSIVE MOVEMENTS.) When expressive movements are used with intent to communicate, language appears first in the form of gesture (q.v.) and later in that of vocal utterance. It is not, then, until sound becomes a medium of communication that we may expect the step which leads directly to the origin of music. Vocal utterance could not in itself have given rise to an art of music; for many insects, birds,

and most of the higher vertebrates below man produce sounds without exhibiting the slightest evidence of an intent to employ them in the sense in which we speak of music as an art. An examination of the earliest forms of music reveals the fact that primitive man had somehow recognized a fairly constant relation between tones, and upon this relation his music was based. No hypothesis of the origin of music, therefore, which fails to take account of this fact can be satisfactory. Darwin's theory that music arose by way of sexual selection, Spencer's theory that it began with the cadences of speech, and Buecher's theory that it developed out of the natural tendency to produce sounds while working in rhythm, are accordingly all at fault. This basal relation, however, is of two kinds—consonant interval and tonal distance. They are alike in that both are differences between the pitch of tones; they differ in that the former are recognized and felt as such, may be reproduced independently of any fixed pitch, and are as a consequence readily transposed, while the latter are approximately equal steps from a principal tone, as if distance were successively added to distance. All *primitive* music is based, apparently, on the one or the other of these relations, although there is one instance at least, the Malu music of Murray Island, where both appear to have been recognized independently. Stumpf derives the perception of consonant intervals from vocal signals or calls which demand the production of a fixed and relatively high tone more musical in character than the indeterminate pitch of ordinary speech. If the calls are given in concert by men, women, and children, whose voices vary by octaves, fourths, and fifths, we have, in Stumpf's view, the optimal conditions for the recognition of these particular intervals, to which smaller intervals are later added. However that may be, the evidence goes to show that these three intervals do in fact furnish the basis of many primitive melodies. A characteristic example is found in the Sarawak music of Borneo, which appears to be based upon the descending fourth; within this interval one tone frequently appears, and occasionally a second tone, while the interval itself furnishes the framework of the melody. Fifth and octave, however, are also employed.

How the principle of tonal distance came to be discovered we can only guess—perhaps from a playful manipulation of the vocal apparatus, perhaps from the rhythmical intonation of words in an approximate monotone, such as occurs in the ceremonies of certain American Indians. At any rate, melodies of this type seem to be the oldest form of primitive music, and the purest in the sense that they have taken shape without the aid of musical instruments. In one instance, that of the Veddas of Ceylon, the successive tones rise and fall about a principal note. If, as frequently happens, the entire melody consists of two or three notes of different pitch, the principal tone is the lowest; if, however, the range covers four or five tones, the principal tone is the last but one. The tones are further grouped into small phrases or motives, which are repeated with slight variations. The Malu music of Murray Island, mentioned above as a case in which both tonal distance and consonant intervals appear, seems originally to have been of the distance type. In the earlier forms the melodies consist of short rhythmic phrases which descend by approximately whole tones until a low pitch is attained, when a return is made to the pitch at which the melody began and the entire melody is repeated. In later forms the octave is found either as a descending *portamento* at the end of the melody or as a rise when the low point of the melody is reached. The fifth seems to enter solely through confusion with the octave. Still later these intervals are employed more freely, as consonants in melody that is otherwise based on tonal distance. We have finally to consider a form of exotic music, not primitive but highly sophisticated, which may have been derived either from tonal distance or from consonant interval. The Javan and Siamese scales are formed by dividing the octave into equal steps; in the former there are five, in the latter seven intervals. Since the intervals are equal, these isotonic scales may be regarded as artificial examples of tonal distance; but since the consonant octave forms the starting point for the mathematical division, and the fourths and fifths are impure, they may also be regarded as degenerate forms of a music originally based on consonance. The latter hypothesis seems the more probable.

When we compare the two fundamental forms of melody, the one based on interval, the other on tonal distance, with regard to their inherent possibilities of development into music like our own, the former is decidedly superior. It is true that in the Vedda melodies we find a principal note which suggests the keynote of Occidental music, and the recurrence of phrase or motive which has played so important a part in the general development of musical form; but these are also found in Sarawak music. Moreover, the employment of consonant intervals not only permits of ready transposition, which results in a greater freedom of outline, but also makes possible a true polyphony and the ultimate acquisition of harmony. The development of music, therefore, when taken as a whole, seems to have been largely conditioned upon the discovery of, and the feeling for, consonant intervals. We have now to seek for the motives which furthered its growth and the characteristics which marked its progress. The chief motive is to be found in the religious ceremonials of primitive society. The dance, which was an important feature of the ceremonials, was accompanied by the voice and by at least one musical instrument, the drum. We may expect it, therefore, to impress its rhythm upon the gradually developing melodies.

Melodies themselves, however, are conditioned upon the organization of successive tones into unitary groups or wholes; for melodies are not constructed of successive sounds with determinate pitch relations; the sounds are bracketed together into a motive with a recognized individuality, much as a number of articulate sounds combine to form a word which seems to be simple and unitary. And just as a poem is built with words, so is a melody constructed of motives. At first these motives are quite short and are repeated over and over again, as in the following phrase of the aborigines of



Australia. Next there is a slight variation of the motive in repetition, and the new form may again be repeated many times, perhaps with a final return to the original form. Then the motive is transposed a fourth or a fifth in the repetition. Gradually the number of repetitions becomes less and the variation more frequent. The nature of variation, in exotic music, is often exceedingly complex; whereas in our own system it is usually limited to the direction of the tonal movement and to the rhythm, in exotic music it includes minute changes in pitch, in stress, and in the method of attacking the notes. Furthermore, exotic music shows form qualities which belong not to the motives but to the melodies taken as wholes. The characteristic of Malu music, where there is a general downward tendency of the melody, is an early instance of melody form; but in some cases the melody forms are so subtle as to be almost indiscernible to our ears; thus, the Ragas of India are melody forms of such intricacy that, although a native singer is able to say in what Raga his song is composed, the European can scarcely distinguish one Raga from another.

The rhythm of exotic music, because of its purely melodic character, has also developed in a manner foreign to that of our music. The reason is that concerted singing and playing, with attention directed to the harmonic effect, tend to force the music into two-part or three-part rhythms, while the more free melodic forms have permitted a rhythmic development of great complexity. Thus, in exotic music, not only are five-part and seven-part rhythms common, but combinations of these with two-part or three-part rhythms are also not infrequent. It often happens, too, that a melody produces one rhythm while the drum which accompanies it plays another and a different rhythm; cases are even reported in which several rhythms are played simultaneously. Rhythmic forms are also known; the Talas of India stand to rhythm as the Ragas to melody. Those of a simpler type consist of short rhythmic motives, played on drums, which may be repeated or otherwise developed in much the same way as the melodic motive. The melodic and rhythmic forms seem to mark the end of the development of pure melody or homophony. Further development follows, apparently, from the combination of melodies, which eventually leads to harmony.

While, as has been said, true harmony is not found in exotic music, we yet observe phenomena which seem to represent its first beginnings. There are numerous instances of organum, i.e., of the singing of melodies in parallel octaves, fourths and fifths, in some cases (the Solomon Islands) even in parallel thirds, sixths, and seconds. Examples are also found of bourdon, or vocal organ point, in which a single tone is sustained throughout the melody, either above or below, or, if there are two additional voices, the one above and the other below. Or again there may be an alternation of two or more notes in rhythmic figures, much as in our ostinato or ground bass. There are also cases, found throughout the Far East and also in the Sudan, to which Stumpf has given the name of heterophony—cases in which one instrument plays a melody while the other members of the orchestra play more or less free variations of the theme, a practice which is thought to have been common in old Greek music. Finally, there are evidences of a nearer approach to our polyphony, when several different melodies are sung simultaneously but only occasionally come into unison or consonance. Since polyphony has played so important a part in our own musical history, and since our feeling for harmony is the product only of the last few centuries, it seems reasonable to suppose that the rude polyphony of exotic music is a link connecting it with Occidental music. The chief characteristics of our system have already been pointed out—the supreme importance of the keynote or tonic, the relative simplicity of rhythm, and the dominance of harmony over melody. It may be added that in the harmonic structure of sonata form, with its modulation from the tonic to the key of the dominant, followed by the free excursion into other keys, with a subsequent return to the tonic, we find a harmony form which is comparable to the melody forms and the rhythm forms of exotic music.

The important steps in the development of music thus seem to be (1) the perception of tonal distance and of consonant interval; (2) the organization of the tonal material either about a principal note or in motives; (3) the further organization of the motives into a melody; (4) the combination of melodies with regard to consonance; and (5) the development of harmony. When we attempt to describe the psychological motives and processes which underlie the whole complicated structure, we must be content, in the light of our present knowledge, with broad generalizations. Throughout the entire development of music we have the underlying fundamental tendency to give expression to feelings and ideas. With this as the basis the first two steps follow as a result of the universal determining tendency to discriminate, to organize discrete elements into wholes and to give them meaning. Musical meaning, however, is not an intellectual meaning, in the sense that it can be put into words; it is the affective, æsthetic, and empathic response which the organism makes to tonal stimuli, and it is carried by the group of organic and kinæsthetic sensations, plus whatever imagery there may be, which acrues to a tonal experience. The third step follows again from the preceding; but now the feeling to be expressed is particularized; the composer has something to say and may have a more or less conscious plan for saying it; he is guided at every point by emotional reaction, by æsthetic judgment, by the logic of his art. This set of principles then gives rise to the fourth and fifth stages of development; the composers who produced our music a few centuries ago found consonance more pleasing, more beautiful, and more logically satisfying than anything melody could give; and our system is the result.

The conditions of the appreciation of music are the same as those of its production, with the difference that the listener interprets a meaning which the composer has sought to express. But the elements of which music is made are so numerous, and the dispositions which the listener brings to the hearing are so varied, that differences in appreciation may be very considerable, both as between individuals and in the same individual at different times. The auditor who brings to the hearing a sufficient culture finds his greatest pleasure in the unfolding of the work of art, in apprehending the

development of the musical idea, perhaps also in appreciation of the composer's skill in the handling of his materials, or in the adequacy of the performance. Another type of auditor, or even the former in certain moods, bathes in the flood of feelings and emotions which are directly aroused by the music. A third type finds its chief enjoyment in the motor reactions set up by the rhythm of the music; in this case the rhythmical element alone makes a strong appeal. Finally, there is a type that finds in music a stimulus to the imagination; whose principal pleasure lies in reverie, in dreaming day dreams. These types, however, are neither rigid nor permanent; a shift of attitude towards the performance brings a change in the mode of enjoyment. The universal enjoyment of music is due to its manifold nature and to the corresponding multiplicity of its appeal.

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MUSIC, SACRED. See SACRED MUSIC.

MUSICAL ART SOCIETY. See CHORAL SOCIETIES.

MUSICAL DICTATION. A branch of musical training of very recent date. The instructor sings or plays short musical selections or phrases which the pupil is required to fix in musical notation on paper. The object of musical dictation is not only to train the ear, but chiefly to develop the power of quickly grasping and fixing musical ideas. The beginning is made, of course, with simple melodies progressing in simple intervals. Gradually melodies with more difficult intervals are introduced. The next step is to melodies with a simple harmonic basis. A class for musical dictation was established at the Conservatory in Paris in 1871. Some of the German conservatories soon followed (Hamburg, Dresden, Karlsruhe, etc.). Consult: Albert Lavignac, *Cours complet de dictée musicale* (Paris, 1882); H. Götze, *Musikalische Schreibübungen* (Breslau, 1882); F. L. Ritter, *Musical Dictation* (London, 1886); Hugo Riemann, *Katechismus des Musikdiktats* (Leipzig, 1889).

MUSICAL DRAMA, or MUSIKDRAMA. A term now generally employed to distinguish the later works of Wagner (*Tristan und Isolde, Die Meistersinger, Die Nibelungen, Parsifal*) from his earlier ones, or operas (*Rienzi, Der fliegende Holländer, Tannhäuser, Lohengrin*). Of a musico-dramatic work Wagner demands that the literary drama be the first and music the second consideration; whereas in the opera the music was almost the sole consideration. In his introduction to *Oper und Drama* Wagner declares emphatically: "The error in the art form of the opera consisted in the fact that a *means* of expression (music) was made the *end;* the *end* of expression (the drama) a *means.*" After *Lohengrin* Wagner wrote chiefly theoretical works dealing with the method to be followed by the poet and composer in the production of a new form of art which was to take the place of the opera. Several years elapsed before he began the composition of *Die Nibelungen,* according to his new artistic convictions. In the musical drama the fundamental material from which the music is constructed is the *leading motive.* (See LEITMOTIV.) By this means artistic unity is obtained, whereas in the opera the different *numbers* may be artistic wholes, but can never be welded intimately together into the higher unity of the entire drama. Wagner's musical dramas have exerted a powerful and lasting influence upon all dramatic composers. For full information, the reader is referred to Wagner's *Oper und Drama,* vols. iii–iv of his *Gesammelte Schriften und Dichtungen* (Leipzig, 1887). See also MELOS; OPERA; WAGNER.

MUSICAL FESTIVAL. The performance of some large choral or orchestral work with a very large chorus or orchestra. The real era of musical festivals begins with the festival performances of the great Handel Commemoration held in London from 1784 to 1787 and again in 1791. It is true that previous to this time regular musical festivals were held in England, but they were practically unknown on the Continent. In England choral singing had always been more extensively cultivated than in any other European country, and the efficiency of English choirs led Handel to turn his attention in the direction of writing for large choral bodies in his oratorios. Since the first performance of *The Messiah* in 1749 it has remained a custom in London to perform that work with greatly augmented chorus and orchestra every year at Christmas. These performances on a grand scale in the English capital roused a feeling of national pride in the Germans, who felt that the great master belonged to them by birth. Festival performances of Handel's oratorios were first given in Berlin on the London plan and were imitated in other German cities. Soon the works of other composers were performed in a similar manner. And as on such occasions there was always a large orchestra, it was but natural that this body of instrumentalists was utilized in the performance of large orchestral works. Thus, at the beginning of the nineteenth century several organizations devoting their energies to the production of any great work, whether choral or purely instrumental, sprang into existence in various parts of Germany. Among these the oldest and even to-day most famous are the Gesellschaft der Musikfreunde in Vienna and the Niederrheinische Musikfeste, which take place yearly in some city of the lower Rhine district. The United States has not been behind in following the example of England and Germany, and many festivals are held yearly in several of the larger cities. On such occasions it is nothing unusual to find a chorus numbering from 1000 to 2000 voices and an orchestra of from 100 to 200 performers. These musical festivals have also powerfully affected the mode

of conducting and have done very much towards establishing the universal custom of conducting by means of the bâton. Whereas formerly the conductor always presided at the piano, the handling of large bodies of singers and players necessitated the undivided attention of the conductor upon those whom he directed; and the singers, in turn, became likewise more dependent upon signs and gestures from the conductor. See CHORAL SOCIETIES; CONDUCTOR; and for an account of the principal musical festivals, see BAYREUTH MUSICAL FESTIVAL; BETHLEHEM MUSICAL FESTIVAL; CINCINNATI MUSICAL FESTIVAL; GESELLSCHAFT DER OESTERREICHISCHEN MUSIKFREUNDE; GEWANDHAUS-CONCERTE; LEEDS MUSICAL FESTIVAL; LOWER RHENISH MUSICAL FESTIVAL; SACRED HARMONIC SOCIETY; SALZBURG FESTIVAL; SOCIÉTÉ DES CONCERTS DU CONSERVATOIRE; SONS OF THE CLERGY; TONKÜNSTLER-SOCIETÄT; THREE CHOIRS FESTIVAL; WORCESTER FESTIVAL.

MUSICAL GUILDS. See GUILD.

MUSICAL INSTRUMENTS. The origin of many musical instruments dates back to the earliest times. Not a few of these ancient instruments are the prototypes of some of our modern ones. Monuments recently unearthed at Thebes and in the upper valley of the Nile contain representations of harps and flutes; and the relation of our modern instruments to the old Egyptian models is not difficult to perceive. In the case of other instruments the relationship is not so easy to trace, owing to the considerable modifications which they underwent in the course of centuries and in passing from one nation to another. Even so recent an instrument as our grand pianoforte can be traced through its many and vital changes to the dulcimer (q.v.), known to the Arabs and Persians. Hand in hand with the evolution of the art of music went the invention and perfection of musical instruments. Many of these were extensively used and admired in their day, but soon were superseded, so that to-day our museums are filled with various instruments of all times and nations preserved only as curiosities. Thus the large family of lutes is now entirely obsolete; and yet at one time these instruments enjoyed the same popularity as the pianoforte does to-day, and no orchestra was complete without them. If we except the stringed instruments, it may safely be asserted that no instrument found in the modern orchestra is the same as it was a century ago. All the instruments of the wood-wind family have been vastly improved; the natural horns and trumpets have given way to the improved valve horns and trumpets; the serpents and ophicleides have been entirely superseded by the trombones and tubas. It may be said that the modern orchestra comprises the best and most efficient instruments now known, and the test for admission into this select family is sonority and beauty of sound. Musical instruments are generally divided into four large groups, according to the manner in which the sound is produced, viz.: (1) stringed instruments, (2) wind instruments, (3) instruments of percussion, (4) keyed instruments. This latter group embraces the organ and pianoforte, the former being really a wind, the latter a stringed instrument. Both organ and piano differ from the other instruments of those groups in the use of a keyboard.

Stringed Instruments. Stringed instruments are divided into two principal classes: (*a*) those in which the tone is produced by drawing a bow made of horsehair across the strings, (*b*) those in which the tone is produced by plucking the string either with the fingers or a small instrument called *plectrum*. The instruments of class (*a*) have but few strings (generally four), and depend for the production of their complete range upon stopping, i.e., shortening the vibrating portion of the string by means of the fingers. To this class belong (1) the violin, (2) the viola, (3) the violoncello, (4) the double bass (qq.v.). Some of the instruments of class (*b*) have few strings like those of class (*a*); others have a separate string for each note. Those having few strings are: (1) the mandolin, (2) the guitar, (3) the banjo. Those having many separate strings: (1) the zither, (2) the harp (qq.v.). Formerly there were in use instruments that were played with a bow, which also had additional strings to be plucked with the fingers. (See THEORBO.) Among the stringed instruments by far the most important are those constituting the viol family, class (*a*). The present perfection of these instruments is the result of a slow evolution of possibly a thousand years. But so far we have no evidence whatever that any instruments of the viol family were known in antiquity. Because Arabic authors of the fourteenth century mention stringed instruments, it was supposed for some time that viols originated in the Orient. This has been disproved by Gerbert, who in the second volume of his *Musica Sacra* published a representation of a European stringed *lyra* of the ninth century very similar in shape to the later *giga*. Even earlier, however, the crowd (q.v.) was known in Wales. For several centuries viols were built in two shapes—either with a flat body like the violin or with a pear-shaped body like the mandolin. During the fifteenth and sixteenth centuries stringed instruments of all possible varieties of shapes were built. These, however, were all superseded in the course of the following two centuries, when the art of violin making reached its height. After the violin had been perfected the same attention was also bestowed upon the instruments of lower pitch of this family, such as the bratsche, viola da gamba, viola d'amore, etc. (See VIOLIN; VIOLONCELLO.) A full account of how the viol family came to be the foundation of the modern orchestra will be found under ORCHESTRA.

Wind Instruments. Under this heading are included all instruments on which the tone is produced by setting a column of air in motion. According to the material from which they are made, they are subdivided into (*a*) wood-wind instruments, (*b*) brass instruments. Many of the wind class are transposing instruments, i.e., the tones actually produced upon them are not the same as those written for them. Let us take the clarinet family as an example. The compass of the clarinet in C is from e to c^3. It is possible to obtain notes below and above this range by building clarinets in different keys. Thus the clarinet in A produces the same series of tones a minor third lower, so that the lowest tone is $c\sharp$ and the highest a^3. The clarinet in E♭ produces the tones a minor third higher, so that its lowest tone is g and its highest $e\flat^3$. Hence the music for any transposing instrument must be written in a key *above* or *below* the key of the composition by the same interval as the key of the instrument is *below* or *above* C.

MUSICAL INSTRUMENTS

1. ÆOLIAN HARP
2. THEORBO
3. LUTE
4. CROWD or CRWTH
5. HURDY-GURDY
6. ALPENHORN
7. COR ANGLAIS
8. BARYTON
9. MONOCHORD
10. REBEC
11. SHOPHAR
12. LYRE

From the Crosby Brown Collection in the Metropolitan Museum of Art, New York

For instance, a piece is written in A♭ major and the composer desires to employ the E♭ clarinet. Since every tone sounds a minor third higher than the written note, it is necessary to write this particular clarinet part in a key lying a minor third below A♭, i.e., in F. See TRANSPOSING INSTRUMENTS.

a. The Wood Wind.—The instruments belonging to this class are generally made of wood, but ivory is also used, and quite recently flutes have been made of silver. The instruments of the wood-wind family are: (1) the flute, (2) the piccolo (a small flute with very shrill tones), (3) the oboe, (4) the English horn, (5) the heckelphone, (6) the clarinet, (7) the bassoon, (8) the double or contra bassoon, (9) the saxophone, (10) the sarrusophone, (11) the flageolet (qq.v.). This last instrument was extensively employed by Gluck and Mozart, but is now obsolete. Of the wood-wind instruments the English horn, the clarinet, the saxophone, and the sarrusophone are transposing instruments, as was also the flageolet. All the wood-wind instruments have a rich, mellow tone approaching that of the human voice more closely than any other instruments.

b. The Brass.—The members of this class consist of (1) the horn, (2) the cornet, (3) the trumpet, (4) the trombone, (5) the tuba, (6) the ophicleide, (7) the serpent (qq.v.). The two last named are obsolete. With the exception of the trombone, all these instruments are transposing instruments. The tones produced by brass instruments are distinguished as *natural* and *harmonic* tones. The former are produced upon the open tube by regulating the force of the air current by means of the lips; the successive tones produced are the harmonics or overtones of the fundamental. (See HARMONICS.) All tones produced by the aid of the valves are called harmonic tones. In the case of the trombone the length of the vibrating air column is regulated not by valves but by a slide. Formerly the horns and trumpets had no valves, and these instruments are to-day called *natural* horns and trumpets. To produce a complete scale on them it was necessary to insert the left hand in the opening. They have now been entirely superseded by the valve horns and trumpets. The trumpets must have undergone considerable change since the days of Bach and Handel, for in the works of these masters we find passages written for trumpets which no one can execute to-day. All the brass instruments are built in many keys, so that it is easily possible to write four-part harmony for only one group of brass instruments. For instance, in the case of trombones there are four varieties—the alto, tenor, bass, and double-bass trombone. The latest additions to the family of brass instruments are the tubas, which Wagner had constructed especially for his *Ring des Nibelungen*. See TUBA.

Instruments of Percussion. The instruments of percussion may be divided into two principal classes: (*a*) those which have definite pitch, (*b*) those which have not. The former class comprises: (1) the kettledrums, (2) the glockenspiel, (3) the xylophone, (4) the celesta. The latter class includes: (1) the bass drum, (2) the small drums, (3) the tambourine, (4) the tamtam, (5) the cymbals, (6) the triangle, (7) the castanets (qq.v.). The chief use of instruments of percussion is for marking the rhythm. Those instruments that are devoid of definite pitch are capable only of rhythmic figures; whereas the glockenspiel and xylophone can play melodic figures as well. Of all the instruments of percussion the kettledrums are the most important and most generally used.

For description of the keyed instruments (*pianoforte* and *organ*), the reader is referred to the extensive special articles.

Under the above headings the instruments at present in use in the orchestra have been described in their general features and especially in their relation to other members of the same family. Besides the instruments mentioned, many others have been in use in former times. There are still others in actual use, but as they are not employed for music of a high character, they have not been discussed. The following is a list of instruments of these classes: alpenhorn, bagpipe, basset horn, bugle, cembal d'amore, chimes, clavichord, concertina, crowd, dulcimer, flügelhorn, glass chord, harpsichord, hurdy-gurdy, jew's-harp, kazoo, krummhorn, lur, lute, lyre, ocarina, psaltery, shawm, spinet, theorbo, viol, virginal. Instruments of the nations of antiquity and of Oriental nations are treated in the special articles on the music of those nations.

Besides the instruments employed in musical performances there are a few that are built solely for the purpose of acoustic experiments. These are (1) the monochord, (2) the siren, (3) the tuning fork (qq.v.).

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MUSICAL NOTATION. The art of expressing musical compositions in writing by means of certain conventional signs called notes. The oldest system of notation of which we have any knowledge is the *alphabetical notation* of the Greeks. The detailed descriptions of this system left to us enable us to decipher without much difficulty the few remnants of Greek music recently discovered. The Greeks employed uncial letters which appeared in a great variety of positions—inverted, sideways, divided in halves,

etc. Thus no less than 120 different combinations were obtained.

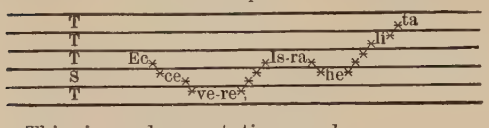
Example 1.

ΑΒΓΔΕΖΗΘΙ

Long after the downfall of Greece this system of notation remained in use, especially in the writings of the theorists. During the sixth century A.D. Roman letters were first used. Boëthius employed the first 15 letters of the alphabet; but these were later reduced to seven and applied to the degrees of the scale. These letters—as the Greek letters had also been—were placed in a straight line above the syllables of the words. Although in themselves sufficiently definite, the letters did not present to the eye the rising or falling of the melody, as does our modern notation. This need gave rise, in the eighth century, to a series of dots, hooks, curves, and peculiar figures which were placed above the syllables of the text at distances proportionate to the musical pitch of the note. These characters are known as *neumes*. (See NEUMES.) From a combination of the signs of these neumes and the alphabetical notation arose our modern system. But its progress was slow, and the complex system of *mensurable music* (q.v.) had first to outlive itself before the present simpler system was established.

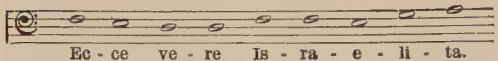
The Stave. The introduction of lines we owe to the neumes. In the tenth century Hucbald took up the idea of using lines. He wrote the syllables between the lines, and at the beginning he indicated by the letters T and S whether the voice was to proceed by tones or semitones.

Example 2.



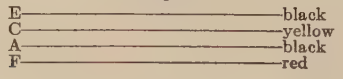
This, in modern notation, reads

Example 3.



By increasing the number of lines Hucbald was enabled to write even four-part compositions in this manner. Soon after his time dots were used *on the lines*, leaving the spaces vacant, and the degree of the scale was indicated by a Greek letter placed at the beginning of each line. But the great number of lines necessary rendered the reading of this manner of notation difficult, and it was soon abandoned. Guido of Arezzo in the eleventh century added two black lines to the red and yellow lines of the neumes, in such a manner that the upper black line above the yellow represented E and the second black line, drawn between the yellow and red lines, A.

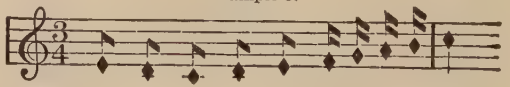
Example 4.



Whereas before his time only the spaces *or* the lines had been used, Guido made use of both lines *and* spaces. The advantages of this system were so obvious that this stave was soon adopted in every country of Europe. As long as music was homophonous, i.e., consisted of only a single melody, this stave answered all purposes. But the growth of polyphony soon rendered a greater number of lines and spaces an absolute necessity. No one seems to have thought of the simple idea of writing each voice on a separate stave. Instead the four lines were extended to six, eight, twelve, and even more. In the Paris Library there is a score, dating from the middle of the thirteenth century, in which all the voices are written on a single stave. The difficulty of reading scores written in this manner led musicians to adopt a uniform stave of nine lines arranged in two groups, each containing four black lines. The two groups were separated by a red line. In the fifteenth century we find three staves employed for different kinds of music. Plain-chant melodies were written on a stave of four lines; all other vocal music on a stave of five lines; and a stave of six lines was used for all compositions written for the organ and virginal. After the invention of music printing the five-line stave became the universal standard of all music, except the plain-chant melodies, which to this day are written on a stave of four lines.

The Form of the Notes. As long as music had no distinctive rhythm of its own and the musical accents were determined only by the word accent, Guido's system of using simple dots answered all purposes. But it was not long before the need of notes having a fixed time value made itself felt. Franco of Cologne, in the twelfth century, replaced the dots by notes of various shapes to indicate their relative duration. He also indicated the time value of pauses or rests by a series of signs corresponding in duration to the different notes. A full account of this complicated system will be found under MENSURABLE MUSIC. This system has become the foundation of our modern system of notation. The notes of larger value, the *large*, *long*, and *breve*, have disappeared, *the semibreve* having become our standard of value or *whole* note. The development of instrumental music during the eighteenth century brought with it a great advance in the technique of the instruments, and this led composers to write passages requiring more rapidity of execution than is possible to obtain from choral masses. Round notes were substituted for the square ones, because the former can be written more easily and rapidly. Another important innovation, and one which greatly facilitated the reading of scores, was the joining of all notes having hooks into groups readily recognized by the eye. Thus a passage which formerly was written

Example 5.



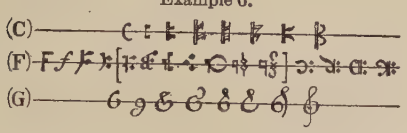
became

Whereas formerly the *semifusa* (corresponding to our sixteenth) was the note of smallest value, the increased rapidity rendered possible by instrumental technique led to a subdivision of sixteenths into thirty-seconds, and of these latter even into sixty-fourths. The signs denoting the rests in mensurable music have been adopted into the modern system without modification.

The Clefs. The oldest of the clefs is the F clef, which in its original form as a red line dates back to the tenth century. Almost as old is the C clef, which originally was a yellow line. These colored lines were used without a clef signature, as it was understood that every note upon the red line represented F and every note upon the yellow line C. Later on the colored lines disappeared, black ones being substituted and the letter F or C placed at the beginning. (See NEUMES.) The modern forms of these clefs are the result of a series of modifications of the plain letters.

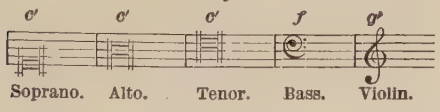
The G clef is more recent than the other two, but its present form is the result of similar changes of the letter G.

Example 6.



Originally the different clefs had no fixed position as they have to-day. In order to avoid the use of ledger lines (which, in fact, were unknown), the position of the clefs was constantly shifted, so as to bring the range of every voice within the limits of the stave. In old manuscripts we find every clef, at various times, on every line of the stave. Even within the same melody the clef changes frequently. This arbitrary use of the clefs continued until the seventeenth century. The establishment of opera (q.v.) brought with it the introduction of many new instruments. To bring the range of all these instruments within the limits of the stave could not be accomplished any longer by the transposition of clefs. Previously some polyphonic writers of the sixteenth century had on very rare occasions resorted to the use of a single ledger line above or below the stave. This idea was taken up by the operatic composers, and thus ledger lines became a fixture in music. Now that there was no longer any need for the constant transposition of clefs, the positions of those that remained in use became definitely fixed. Each voice part had its own clef, as also the violin.

Example 7.



In this form the classic masters have used the clefs. For the pianoforte the G and F clefs are used; the higher-pitched orchestral instruments play with the G clef, those of lower pitch the F clef. The viola is the only one for which the alto clef (C) is retained. During the nineteenth century the C clefs were superseded even in vocal music by the G clef.

Time Signatures. Before the introduction of mensurable music there was no need of time signatures. The signatures used in mensurable music will be found in the special article on MENSURABLE MUSIC. When, in the seventeenth century, the bar was introduced, composers soon saw an opportunity for reducing the very complicated and cumbrous time signatures of mensurable music. The underlying principle of rhythmic division into binary and ternary forms still remained the basis. But, whereas in the older system ternary division (perfect) was the principal consideration and binary division (imperfect) only secondary, the new system inverted these relations by recognizing only binary division as natural. Ternary division was retained, but was regarded only as a modification of the natural binary division and obtained by the use of a dot which increased the value of the note by one-half. Moreover, all notes were referred to the whole note (the semibreve of mensurable music) as the standard of value. Thus, the whole note was divided into two half notes, each half note into two quarters, etc. The time signatures of this new system were expressed by fractions, the denominators indicating the subdivision of the standard whole note and the numerators the number of subdivided notes to be allotted to each measure. The only signs still retained from mensurable music are the semicircle for common time (four quarters in a measure) and the semicircle with a line (alla breve), where the line still has the meaning of reducing the notes to half their duration.

The Bar. The earliest example of the use of vertical bars is found in Agricola's *Musica Instrumentalis*, which was published in 1528. The object of these bars, however, was only to keep the notes of the different voices one under the other, rather than to indicate rhythmic divisions. A few original drafts of older compositions give evidence that composers during actual composition did use bars to indicate the rhythm, although all the part books up to the seventeenth century were printed without bars. The general use of bars we owe to the early composers of operas. Peri, in 1600, published the score of his *Eurydice* exactly as he had written it. In order to indicate clearly the connection between the different notes in the voices and accompanying instruments he drew vertical lines through the whole length of the stave. Caccini and Monteverde adopted this plan. The great facility of reading music printed in this way immediately led to its universal adoption. The new system of music, having established new signatures for time, allotted a certain number of beats to each bar, and in this way the bar became what it is to-day.

Accidentals. In spite of the strict laws governing plain chant and the use of the old Church modes, the human ear from the earliest times felt the need of a leading tone. The tone of the scale that was subject to this modification was B. Thus at a very early time this letter was written in round (♭) and later square (♮) form to indicate whether the lower or higher tone was to be sung. It is easy to see how from these two forms arose our flat and natural (♭♮). Towards the end of the thirteenth century the sign ♮ was carelessly written ♯, and being applied to other tones than B, denoted the higher of the tones on the same degree. Thus, F♯ denoted the modern F♯, but F♭ was the same as our F natural, just as B♭ was regarded as the *natural* tone and B♯ (our B) a chromatic alteration of B♭. As a key signature the sign ♭ appears first in the Church modes, but denoted only a transposition of the original mode. (See MODES.) Even in the eighteenth century a ♭ was used as a sign of resolution for a note having a ♯ or ♮ (these two signs were identical); and vice versa a ♯ or ♮ served to resolve a ♭. The signs of the double sharp and double flat (×, ♭♭) cannot be traced further back than the

beginning of the eighteenth century. The sign × arose from writing the older ♯ in this position 𝄪. Before the beginning of the seventeenth century accidental sharps, flats, or signs of resolution appeared very seldom in writing. The singer was supposed to introduce the necessary chromatic alterations during the actual performance. As long as the Church modes reigned supreme no use was made of regular key signatures. A flat or sharp placed at the beginning of a piece denoted only transposition. But as soon as the modern major and minor scales displaced the modes the necessity of key signatures arose, in order to avoid the great number of accidentals.

Expression Marks. Towards the end of the eighth century we find in one old manuscript written in neumes small letters interspersed with the characters of the neumes. These letters refer to the expression. We find a small *f* (*fragor*), *b t* or *t* (*bene teneatur* or *teneatur*), *c* (*celeriter*), etc. This manuscript is the famous Antiphonary of St. Gall. The works of the great polyphonic masters of the fifteenth and sixteenth centuries are utterly devoid of any marks of expression, nor are any evidences of expression marks to be found in works written between the eighth and fifteenth centuries. There really was no pressing need for such marks, for all music was vocal, and the text gave a sufficient clew to the singers, who were all thoroughly trained musicians. But the development of instrumental music gave rise to various marks of expression. Hand in hand with the development of instrumental music went the perfection of the musical instruments. Many new effects were discovered, and to express these composers were obliged to use words. Monteverde in his opera *Orfeo* (1608) demands that the trumpets play with mutes, and this is indicated in the score by the words *con sordini*. The same composer introduced a number of new effects in his *Tancredi e Clorinda* (1624), among which were the *tremolo* and the *pizzicato* for strings. Such effects were called for by the actual words placed in the score. These are the earliest instances of expression marks. Operatic composers immediately followed the practice established by Monteverde. Among the earliest of purely instrumental masters who employed words to help the performers was Frescobaldi (1583–1644). He was particularly careful to indicate the tempo. One of his favorite marks is *adagio*. Soon the words *allegro, largo, grave, moderato* came into general use. In the course of the eighteenth century nearly all the important marks of expression and time were in use. The nineteenth century substituted convenient signs for some of the most frequently recurring marks, such as *crescendo* <, *diminuendo* >, *staccato* . . . . , *legato* ⁀, *sforzando* ∧, etc., and increased the vocabulary of musical expression considerably. Some of the German masters of the last century, notably Schumann and Wagner, attempted to substitute a German terminology for the Italian. But the Italian terms are more definite, because two centuries of constant use have familiarized them to musicians of every nationality.

Another system of musical notation used formerly, especially for the lute, is discussed under TABLATURE. For the new system of designating chords by figures, used in theoretical treatises, see NUMERICAL NOTATION.

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MUSICAL SAND. There are a large number of beaches, oftentimes, however, of very small extent, whose sand has the peculiar property of giving out a distinct musical tone when stepped upon. The musical note appears to depend upon the fact that the grains of sand are of such very uniform size that, as they slip past each other under pressure, the vibrations of the particles respectively reënforce each other so that sounds which would otherwise be inaudible become distinct, and the crunching noise which is heard when the foot presses down upon snow or ordinary sand becomes a clear musical note.

MUSIC BOX. A case containing mechanism constructed in such a manner that music can be produced automatically. Machines for making mechanical music have been known since the invention of clocks, but real music boxes were not introduced till after 1750. They have been greatly improved since then, and some modern musical boxes can play over 100 tunes. The mechanism is similar to that of the barrel organ. The principal parts are the comb, the cylinder, and the regulator. Bells, drums, and castanets are frequently added to produce musical effects, and there are occasionally combinations of reeds and pipes. The musical boxes of Prague, Sainte-Lusanne in France, and Geneva, Switzerland, are especially famous.

MUSIC DRAMA. See MUSICAL DRAMA.

MUSIC FESTIVAL. See MUSICAL FESTIVAL.

MUSIC OF THE SPHERES. See HARMONY OF THE SPHERES.

MUSIC RECORDER. See MELOGRAPH.

MUSIL, mōō-zēl′, ALOIS (1868–). An Austrian Orientalist, born at Rychtarov in Moravia. He studied theology at Olmütz and attended the Ecole Biblique of Jerusalem (1895) and the University of St. Joseph at Beirut (1897). He was afterward at various times in London, Cambridge, Berlin, and Constantinople, and became a professor in the University of Vienna. His 11 exploring expeditions in the Holy Land were of particular importance for his investigations of eastern Palestine. In 1910 he claimed that he had identified Mount Sinai. He published valuable maps, based on actual surveys, of Arabia Petræa (1:300,000; 1907), Kuseir 'Amra, and northern Arabia, and wrote: *Arabia Petræa* (1907 et seq.); *Nord-Arabien* (1908–09); *Im nordlichen Hegâz* (1910); *In nord-ost Arabien und Süd Mesopotamien* (1913).

MU'SIMON. See MOUFLON.

MUSIN, mụ'zăn′, OVIDE (1854–). A Belgian violinist, born at Nandrin, near Liége. He studied at the conservatory of that city under Heynberg and Léonard, followed the latter to the Paris Conservatory, where in 1868 he won a gold medal, and taught for a year before leaving on his European and American concert tours that ultimately led him around the world. In 1898 he became violin professor at the Liége

Conservatory, but continued to spend much time in the United States. In 1908 he established the Musin Violin School in New York.

MUSK, or **MUSK DEER** (OF., Fr. *musc*, from Lat. *muscus*, from Gk. *μόσχος, moschos*, from Ar., Pers. *musk*, musk, from Skt. *muska*, testicle, mouse, from *mus*, to steal). An aberrant deer of the subfamily Moschinæ, which differs from ordinary deer in the lack of antlers, in the possession by the male of long upper canines which project downward outside the lips, and in certain anatomical features. Hence there has been much discussion whether the animal should be included in the Cervidæ. There is only one species, *Moschus moschiferus*, of the high Himalayas, Tibet, and eastern Siberia—a small animal which stands about 20 inches high and has a clumsy form. Its favorite haunts are the tops of pine-covered mountains, but its summer range extends far above the region of pines. Its habits are nocturnal and solitary, and it is extremely timid. It is much pursued by hunters on account of its odoriferous secretion, which has been known in Europe since the eighth century and is much valued as a perfume.

Musk. This secretion is produced in a glandular pouch situated on the hinder part of the abdomen of the males, and its natural use seems to be that of increasing sexual attractiveness. The musk bag, or pod, is formed by an infolding of a portion of the skin of the belly, within which a number of membranes are contained, and between these membranes are glands by which the musk is secreted. When newly taken from the animal, musk is soft and almost resembles an ointment; it is reddish brown and has an excessively powerful odor. Very little of it reaches Europe unadulterated. Musk is usually imported either in the form of grain musk, i.e., the musk which has been collected chiefly from stones upon which it has been deposited by the animal, in which state it is a coarse powder of a dark-brown color; or in the pod, dried with the musk inside. Of both kinds the annual importations to the United States are about 15,000 ounces, chiefly from China and India. Small quantities are used in medicine, but the greater part is employed by perfumers. The kinds generally known in trade are the Tonquin, or Chinese, and the Carbardine, Kabardine, or Siberian, which is inferior. Genuine musk has the valuable property of adding to the permanency of other odors. On account of its properties as a stimulant and antispasmodic, it is also used to some extent in medicine.

Consult Sir William Flower, a monograph in *Proceedings of the Zoölogical Society of London* (London, 1875), and Richard Lydekker, *Deer of all Lands* (ib., 1898). See PERFUMERY, and Plate of FALLOW DEER, MUSK, ETC.

MUSKAT, mŭs-kät′. A town of Arabia. See MUSCAT.

MUSKAU, HERMANN LUDWIG HEINRICH, PRINCE PÜCKLER. See PÜCKLER-MUSKAU, H. L. H.

MUSK DUCK. 1. A very large Australian sea duck (*Biziura lobata*), which has a musky odor. The male is decidedly bigger than the female and has a lobe of skin depending from its chin. 2. The muscovy duck.

MUSKEGON, mŭs-ke′gŏn. A city and the county seat of Muskegon Co., Mich., 40 miles by rail northeast of Grand Rapids and extending 7½ miles along the south shore of Muskegon Lake from Lake Michigan to the mouth of the Muskegon River. It is the largest city and harbor on the east shore of Lake Michigan, with all-year steamship service to Chicago, Milwaukee, and other ports, and is on the Pere Marquette, the Grand Rapids, and Indiana, the Grand Trunk, and the Grand Rapids, Grand Haven, and Muskegon (interurban) railroads (Map: Michigan, C 5). Much fruit, celery, and garden truck are shipped annually, and the principal manufactured products are furniture and office equipment, pianos, refrigerators, billiard tables, curtain rollers, knit goods, paper, boats, electric cranes, motors, and machined and cast automobile parts. The industries are greatly facilitated by two dams on Muskegon River which develop 75,000 horse power. Resorts in the vicinity attract summer tourists in great number. Through the liberality of Charles H. Hackley the city possesses a fine art gallery, a public library, a hospital, public square, many statues, a gymnasium, and grammar, high, and manual-training schools fully equipped—all maintained through endowments by the donor. Under a charter of 1901 the city is governed by a mayor, elected annually, and a unicameral council. Muskegon Heights, an industrial suburb, and North Muskegon, though closely affiliated with Muskegon, have separate city charters and administrations. The water system, supplied from Lake Michigan, is operated by the city; gas, electric, and street-car systems are privately owned. Jean François Recollet established a trading post here in 1812; Muskegon was incorporated as a village in 1861 and chartered as a city in 1870. During the early eighties it was one of the largest lumber-producing cities in the world, but now has no mills. Pop., 1900, 20,818,; 1910, 24,062; 1914 (U. S. est.), 25,442; 1920, 36,570.

MUSKELLUNGE, mŭs′ke-lŭnj. A common variant of maskinonge (q.v.).

MUSKET. See SMALL ARMS.

MUSKHOGEAN (mŭs-kō′gē-an) **STOCK.** A North American Indian stock which derives its name from Muscogee, the principal tribe of the Creek Confederacy. (See CREEKS.) This is one of the most important linguistic stocks of the United States. It formerly occupied the greater portion of the territory of the Gulf States east of the Mississippi and comprised the Creek, Choctaw, Chickasaw, Seminole, Apalachee, Alibamu, Koasati, and Natchez, speaking perhaps five distinct languages, with several minor dialects. The difference was greatest between the Muscogee and the Choctaw proper, of which the Chickasaw was a dialectic form. The Seminole is a mixed dialect, based chiefly upon Hichitee, the prevailing language of the Lower Creeks, formerly residing on the Chattahoochee River. The old Mobilian trade language was based upon Choctaw.

Their authentic history begins with the first landing of the Spaniards on the Gulf coast under Narváez in 1527. Thirteen years later De Soto traversed their country from east to west, finding the various tribes in practically the same positions which they occupied up to the period of their final removal to Oklahoma. For three centuries their history is closely interwoven with that of colonization and conquest by the Spaniards, French, and English in the Southern States. Each tribe or village made such alliances as suited its purpose, with the exception of the Chickasaw, who, like the Iroquois in the North, remained the steady allies of the English and, by their command of the

waterway of the Mississippi, were able to check the advance of French colonization by cutting off communication between Louisiana and the Illinois settlements. The Apalachee of Florida were Christianized at an early period by the Spanish Franciscans, but the entire tribe was exterminated by the English and their Indian allies about 1702 and the country left an uninhabited wilderness until it was gradually occupied by vagrant bands from the Creek Confederacy, later known as Seminole, or runaways. The Yamasi of South Carolina were driven from their homes in 1715 as a result of a war with the English and retired to Florida. The Muskhogean tribes played little part in the French and Indian War, but the Creeks took a particularly active part with the English against the Americans in the Revolution. This warlike confederacy again rose against the neighboring American settlements in the War of 1812 and, by the opening massacre at Fort Mims and the desperate encounters at Talladega and Horseshoe Bend, made the Creek War one of the bloodiest pages in American history. The two Seminole wars, which cost the government years of effort and over $40,000,000, further illustrated the fighting temper of the Creek tribes. By these wars and successive treaty sales the Muskhogean tribes were rapidly dispossessed until by the year 1835 practically the whole body had been removed to the west of the Mississippi. Here the four principal tribes, the Creek, Choctaw, Chickasaw, and Seminole, reestablished themselves as nations under organized governmental forms in Oklahoma, where they now reside.

All the Muskhogean tribes were sedentary and agricultural, residing in compact and regular towns and villages, frequently palisaded, and always with a central town house for councils and other public ceremonies, fronting upon a plaza or public square for outdoor gatherings. Their social organization was complex and exact, the rank and duty of each clan being specifically fixed in the tribe. Consult: James Adair, *History of the American Indians* (London, 1775); A. S. Gatschet, *Migration Legend of the Creek Indians* (Philadelphia, 1884–88); J. C. Pilling, *Bibliography of the Muskhogean Languages* (Washington, 1889); J. R. Swanton, *Indian Tribes of the Lower Mississippi Valley and Adjacent Coast of the Gulf of Mexico* (ib., 1911).

MUSK HYACINTH. A bulbous plant. See Grape Hyacinth.

MUSKINGUM, mŭs-kĭn′gŭm. The principal river of eastern Ohio. It is formed at Coshocton by the junction of the Walhonding and Tuscarawas rivers and flows southeastward 112 miles through a rich agricultural region, entering the Ohio River at Marietta (Map: Ohio, G 6). The Ohio and Erie Canal follows its course as far as Zanesville, and slackwater navigation has been secured to Dresden, 92 miles from the mouth of the river.

MUSK MALLOW. A tropical plant. See Mallow; Hibiscus.

MUSK′MELON (so called from its peculiar aromatic flavor), *Cucumis melo.* An annual herbaceous vine of the family Cucurbitaceæ, a native of the warmer parts of Asia and now cultivated in both hemispheres for the sake of its rounded or ovate fruit, which, in its numerous varieties, varies from a few inches to more than a foot in diameter. The rind varies in appearance and texture, and the flesh may be white, red, green, yellow, or of intermediate colors. The muskmelons commonly grown in North America belong to the subspecies *cantalupensis,* or cantaloupe, and *reticulatus,* or nutmeg or netted melons. The cantaloupes are distinguished by their hard, more or less warty and furrowed rinds. They are usually long-season varieties and are commonly grown in the southern United States. The nutmeg varieties have a softer, more or less netted rind, mature sooner than cantaloupes, and are commonly grown in the more temperate regions of North America. As a special truck crop, however, nutmeg or netted melons are also grown in the South and are commonly but improperly classed as cantaloupes. There are smooth-rinded strains of the nutmeg melon, but fruit of the netted strains which fail to develop the netting are apt to be inferior in quality. Muskmelons require a warm, quick soil. In field culture they are planted—6 to 10 seeds—in hills 4 to 6 feet apart either way. To hasten growth and on poor soils two or three shovelfuls of well-rotted manure are placed under each hill. In the North commercial growers start the plants under glass, preferably in a hot bed, and transplant them to the open field when the weather becomes warm enough. The seedlings are transplanted with difficulty and are therefore usually grown on inverted sods or in pots. Other subspecies of *Cucumis melo* are: var. *saccharinus,* or pineapple melon, a sweet-fleshed variety; var. *flexosus,* or snake melon, 2 to 3 feet long and 1 to 3 inches in diameter, sometimes grown for preserves, but more often as an oddity; var. *chito,* also called orange melon, vegetable orange, garden lemon, vine peach, etc., and used for pickles and preserves; var. *inodorus,* a long keeper of poor quality; var. *dudaim,* or pomegranate, dudaim, or Queen Anne's pocket melon, a highly perfumed but inedible sort. See Plate of Cucumber Allies.

The striped beetle and flea beetle are serious pests of muskmelons. Spraying with Paris green or dusting with tobacco dust, air-slaked lime, or road dust when the plants are moist helps to keep the insects under control. Land plaster (q.v.) mixed with kerosene or turpentine is used for the same purpose. The downy mildew and leaf-spot diseases which attack the plant are held in check by applications of Bordeaux mixture. See Fungicide.

MUSKOGEE, mŭs-kō′gē, or **MUSCOGEE.** A city and the county seat of Muskogee Co., Okla., about 130 miles east-northeast of Oklahoma City, on the Missouri, Kansas, and Texas, the St. Louis and San Francisco, the Midland Valley, and the Missouri, Oklahoma, and Gulf railroads (Map: Oklahoma, F 3). It is the seat of St. Joseph's College (Catholic), the Spaulding Female Institute (Methodist), Oklahoma Woman's College (Methodist), and near by is the Bacone Indian University (Baptist), opened in 1884. The noteworthy features include the new post-office building, costing $500,000, a splendid high school, Carnegie library, traveling men's club, town and country club, public parks covering 100 acres, fair grounds, and in the vicinity Fort Gibson, and a national cemetery. Among the more important industrial establishments are hardware and mattress factories, railroad shops, wagon-wood plant, oil refineries, corrugated iron and steel works, and manufactories of oil-well supplies, agricultural

implements, and cotton goods. The surrounding region is adapted to agriculture and stock raising, and oil and natural gas are found in abundance. Muskogee owns its water works, which are valued at $1,000,000. The city adopted the commission form of government in 1910. Pop., 1900, 4254; 1910, 25,278 1914 (U. S. est.), 38,309; 1920, 30,277.

MUSKOKA, mŭs-kō'ka. A lake region of Ontario, Canada, bounded on the north by the Carry Sound district, on the east by Haliburton, on the south by Simcoe, and on the west by Georgian Bay (Map: Ontario, E 3). The region covers an area of about 4000 square miles, 800 feet above the sea and 200 feet above Lake Huron. Besides a lake, river, and county of the same name, it includes extensive forests, several rivers, and from 800 to 1000 lakes and smaller sheets of water. Fine waterfalls also occur, of which the most important are the Bridal Veil Falls on the Shadow River and the High Falls and the South Falls, with a descent of 130 feet, on the Muskoka, near Bracebridge (q.v.). The chief lakes—Muskoka, 20 miles long and 2 to 8 miles broad, Rosseau, 12 miles long and 1 to 6 miles wide, and Joseph—are connected and have regular steamer navigation service in summer, in connection with the Grand Trunk, the Canadian Atlantic, and the Canadian Pacific railways, which traverse the region. The forests abound in game and the lakes with fish, and the district has become popular for its hunting, angling, boating, and bathing.

MUSK OX. The musk ox (*Ovibos moschatus*), although approaching cattle in size, is really quite as closely allied to the sheep. It undoubtedly belongs in the family Bovidæ and is perhaps entitled to have a subfamily division to itself. The genus contains only the single species, at present confined to Arctic America, but formerly ranging over the northern United States as far south as Kentucky and over northern Asia and Europe also, as is shown by the bones found in the Pleistocene deposits of those regions. Its southern limit is gradually retreating northward, and there can be little doubt that the number of musk oxen is steadily declining. The name "musk ox" or "musk sheep" refers to a peculiar musky odor, the origin of which seems to be in doubt; apparently, however, there is no special gland, as in the musk deer and other musky mammals. The legs are short and stout, so that the animal is somewhat lower than a small ox, which it otherwise resembles in size and shape. The hair is amber brown, woolly, and long; thick, matted, and curly on the shoulders, giving the appearance there of a hump; elsewhere it is straight and hangs down so as to conceal the short tail and upper half of the legs. The wool has been spun into fabrics said to be extremely soft. The hoofs are remarkable in being asymmetrical, the outer half being rounded, while the inner is pointed; the sole of the foot is hairy. The head is inclined to be massive, especially in old males, where the horns have extremely broad bases. The latter are elegantly curved, first obliquely downward and backward by the side of the head and then upward and forward. The ears are so small as to be concealed by the hair, and the muffle is hairy, as in sheep and goats. The flesh is coarse-grained, but of variable quality, some individuals being tender and of good flavor, while others are tough and so musky as to be uneatable. Curiously enough, the difference in flavor is apparently not a matter of age or sex. Musk oxen are gregarious, going in flocks of 20 or 30, or rarely as many as 80 or 100, and are said to be very sheeplike in their habits. Although the legs are so short, they run with speed and can climb steep slopes and clamber over rocks with remarkable agility. The young are produced, one at a time, at the end of May or early in June, and the rutting season is in September. The food of the musk ox is grass, moss, lichens, and tender shoots of willow and pine. They are themselves an important item in the larder of the Eskimos and of Arctic explorers. The writings of these explorers contain the best accounts of the animal, whose young have now and then been brought alive to Europe. Consult: Julius Schiött, *Musk Oxen in Captivity* (Washington, 1904); Caspar Whitney and others, *Musk Ox, Bison, Sheep, and Goat* (New York, 1904); J. A. Allen, "Ontogenetic and Other Variations in Muskoxen, with a Systematic Review of the Muskox Group, Recent and Extinct," in *American Museum of Natural History, Memoir*, vol. i (N. S., New York, 1913). See Plate of WILD SHEEP AND MUSK OX with the article SHEEP.

MUSK PLANT, MUSK ROOT, MUSK TREE, MUSK WOOD. Various plants possessed of a musky odor. Among these are the common musk plant (*Mimulus moschatus*); the musk tree (*Olearia argophylla*) of Tasmania; the musk okra (*Hibiscus moscheutos*); the musk mallow (*Malva moschata*); the musk tree of Jamaica (*Trichilia moschata*); and the West Indian musk wood (*Guarea grandifolia*), used in perfumery. The drug called musk root or sumbul, brought from Asia principally through Russia and Persia, is the starchy root of *Euryangium sumbul*, which has a pure musky odor and is used as a substitute for musk.

MUSK'RAT (so called from its musky odor), or MUSQUASH. The muskrat (*Fiber zibethicus*, or *Ondatra zibethica*) is one of the most widely distributed and best known of North American quadrupeds and is peculiar to this continent. It makes its home in the banks or water of streams, ponds, and lakes. It is the largest known species of the subfamily Microtinæ of the family Muridæ and is peculiarly adapted to an aquatic life, although there are other species of the subfamily which are also amphibious. Its body is about 12 inches in length, and its tail about 8 inches. The body is rather stout and thickset, the head is rounded, and the ears are small and close. The front feet are rather small, with four digits and a rudimentary thumb, while the hind feet are stout, with five partially webbed toes, and so attached to the leg that they are well fitted for swimming, yet the sculling movement of the much compressed tail is the principal means of progress in the water. As with other aquatic mammals, the pelage consists of an undercoat of dense, soft fur and an outer coat, on the back and sides, chiefly of long, shining, smooth hairs. So much air is held by these outer hairs that in ordinary excursions the under fur is hardly wetted. The color above is dark umber brown, darkest on the middle of the back and on the tail, while beneath the prevailing shade is gray.

The musky odor from which the animal gets its name is due to the secretion of a large gland in the inguinal region, which is present in both sexes. The muskrat is omnivorous, eating roots (especially of the pond lily), fruits, vegetables,

insects, worms, mollusks, etc., but it is especially fond of apples, in search of which it often wanders far from its home, and thus finds its way occasionally into barns and cellars. In some localities fresh-water mussels are a favorite article of food, and large heaps of the empty shells are sometimes found near muskrat burrows, due to their preference for dining day after day in the same place. Although so widely distributed and abundant, the muskrat is not often seen, as it is mainly nocturnal in its habits and during the day remains in its burrow or house. The home of this animal is either built of sticks, mud, and grass and forms a heap the size and appearance of a small haycock, or else is dug out of the bank of a stream or pond and then forms a burrow of indefinite length, the entrance to which is under water. The character of the home seems to depend upon the nature of the country; where there is an extensive swamp or stretch of shallow water, so that the houses will not be ordinarily exposed to wandering enemies, muskrats seem to prefer these homes; but where they live in or about a narrow stream, with little swamp, the burrow in the bank is the more usual shelter. The houses are always entered from water deep enough so that the passageway shall not freeze up in winter.

The flesh of the muskrat is good eating and was formerly much used by the Indians. The fur is used quite extensively, so that the skins are an article of commerce. For this reason muskrats are extensively trapped, and hundreds of thousands are killed annually. Their numbers nevertheless do not decrease, partly because their natural enemies are fewer, but chiefly because of the fact that the making of slack-water spaces by damming rivers and the digging of canals (whose banks they seriously damage) have greatly extended waters suitable for them in various parts of the country. Trapping is done, chiefly in the winter, by setting small steel traps at the entrance to their houses or burrows or in runways where they come ashore.

The name "muskrat" is applied to a number of other more or less ratlike animals on account of their strong odor. In Europe it is frequently given to the desman (q.v.), while in India it is associated with a shrew (*Crocidura cærulea*) which has well-developed musk glands on the belly and flanks. In South Africa the genet (*Genetta felina*), a viverrine, carnivorous mammal, is sometimes so called.

Consult the works of Audubon, Richardson, Godman, Kennicott, and other early writers; and of C. C. Abbott, H. D. Thoreau, J. Burroughs, D. L. Sharp, R. Robinson, A. L. Adams, W. Cram, J. A. Allen, E. S. Mearns, and other recent naturalists; especially Butler, "Observations on the Muskrat," in *American Naturalist*, vol. xv (Philadelphia, 1885); Herrick, *Mammals of Minnesota* (Minneapolis, 1892); C. H. Merriam, *Mammals of the Adirondacks* (New York, 1895); Cram and Stone, *American Animals* (New York, 1902); E. T. Seton, *Life-Histories of Northern Animals* (ib., 1909); D. E. Lantz, "The Muskrat," in *United States Department of Agriculture, Farmers' Bulletin, No. 396* (Washington, 1910); N. Hollister, "Systematic Synopsis of the Muskrats," in *United States Biological Survey, North American Fauna, No. 32* (ib., 1911). See Plate of BEAVER, COYPU, AND MUSKRAT.

MUSK ROSE. See ROSE, and Plate of ROSES.

MUSK SHEEP. A musk ox (q.v.).

MUSK SHREW. One of a large group of Old World shrews, of which about 80 species of the genus *Crocidura* are known. They are noted for their musky odor, range from the Mediterranean to northern India, and are of terrestrial habits. One of these shrews (*Crocidura cærulea*) is the largest of its race (see SHREW) and as large as a rat. It is gray and is known to Anglo-Indians as the muskrat. It enters houses and at night runs about, catching insect vermin; but counterbalances this beneficial service by leaving behind a musky odor, sometimes unpleasantly strong.

MUSK TORTOISE, MUSK TURTLE, or STINKPOT. One of the mud or box turtles (*Cinosternum odoratum*) of the eastern half of the United States, well known for its strong, musky odor, which exudes from glands in the armpits. It has a disproportionately large head, a long and slender neck, with two yellow stripes on each side, and a dusky shell, clouded and sometimes spotted. It is edible.

MUSKWAKI, mŭsk-wä'kē. An Algonquian tribe. See FOX.

MUSLIM. See MOSLEM.

MUSLIM, mŭs'lĭm, IBN AL WALID AL ANSARI (c.747–803). An Arabic poet who became famous by his songs in honor of the Barmecides (q.v.) and Fadl ibn Sahl, in which he praised wine and love. His divan has been published by De Goeje (Leyden, 1875). Consult Carl Brockelmann, *Geschichte der arabischen Literatur* (Weimar, 1898), and R. A. Nicholson, *A Literary History of the Arabs* (New York, 1907).

MUS'LIN (Fr. *mousseline*, from It. *mussolino*, muslin, made of muslin, from *mussolo*, muslin, from ML. *Mossula*, from Syr. *Mosul*, a city of Mesopotamia on the Tigris, whence the fabric originally came). A cotton fabric of Oriental origin and now the term for goods marked by lightness and openness of texture. No such trade now exists in the Orient; and for muslins of the common kinds at least the Indian market depends upon the manufactures of England and France. Muslin is much less compact in its texture than calico—indeed, it more nearly resembles gauze in appearance; but it is woven plain, without any twisting of the filling threads with those of the warp. The manufacture of muslins is very extensive, especially printed muslins, in which the patterns are produced by the same processes as in calico printing. The term "muslin" is also applied to a coarser and heavier but plainly woven cotton cloth suitable for sheets and pillowcases. This is sold both bleached and unbleached and comes 36 inches wide. See WEAVING.

MÜSLIN, mŭs-lēn', WOLFGANG. See MUSCULUS, WOLFGANG.

MUS'PRATT, JAMES SHERIDAN (1821–71). An Irish chemist, the son of James Muspratt, a well-known chemical manufacturer. He studied under Liebig, at Giessen, 1843–45, and there took the degree of doctor of philosophy, with a thesis tracing the resemblance between the carbonates and sulphites. In 1847 he produced a number of interesting organic substances from the sulphocyanates of ethyl and methyl. On his return to England in 1848 he established and became superintendent of a college of chemistry at Liverpool. From 1854 to 1860 he was engaged on his well-known dictionary of chemistry. The latest German edition of this important work may be found mentioned in the biblio-

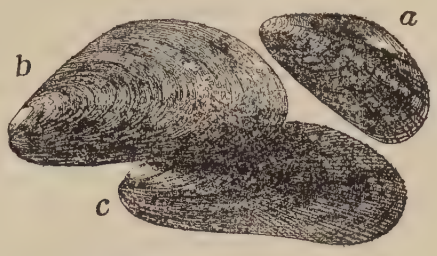
graphic section of the article CHEMISTRY. His *Outlines of Quantitative Analysis for Students* has had a considerable circulation.

MUS'QUASH. The name among the Indians of the Canadian Northwest for the muskrat (q.v.). "Talking musquash" is a phrase in the Hudson Bay region for the gossip of trappers or fur traders about peltries, of which the fur of the muskrat forms a constant and important item.

MUSSAFIA, mụs-sä'fê-ȧ, ADOLF (1835–1905). An Austrian Romance philologist, born at Spalato. He studied medicine, but in 1855 became instructor in Italian at the University of Vienna and in 1867 professor of Romance philology in the same institution. He contributed valuable papers on Italian dialects to the proceedings of the Vienna Academy and wrote: *Altfranzösische Gedichte aus venezianischen Handschriften* (1864); an edition of Fra Paolino's *De Regimine Rectoris* (1868); *Handschriftliche Studien* (1862–70); *Beiträge zur Kunde der norditalischen Mundarten im 15. Jahrhundert* (1873); *Die catalanische Version der sieben weisen Meister* (1876); *Italienische Sprachlehre in Regeln und Beispielen* (27th ed., 1904); and studies of the legends of the Madonna (1884–91). A complete bibliography of his productions may be found in the *Festgabe* presented to him shortly before his death in 1905.

MUSSCHENBROEK, mụs'ken-brụk, PIETER VAN (1692–1761). A Dutch physicist. He was born at Leyden, where he studied medicine, physics, and mathematics at the university, graduating in 1715. He then went to London, where he met Newton. He was appointed professor of physics and mathematics at the University of Duisburg in 1719 and at Utrecht in 1723; and in 1739 he became professor of mathematics at Leyden. His publications include: *Epitome Elementorum Physico-Mathematicorum* (1726), a work that passed through several editions; *Elementa physica* (1729); *Physicæ Experimentales et Geometricæ Dissertationes* (1729); *Introductio ad Philosophiam Naturalem* (2 vols., 1762).

MUS'SEL (AS. *muxle, mucxle,* from Lat. *musculus,* small fish, sea mussel, dim. of *mus,* mouse). The word "mussel" is one of those popular names of such uncertain limits that to attempt to define it is a difficult matter. At the present time it is applied to two totally distinct groups of bivalved mollusks, one marine and the other fresh-water. The first group includes the shellfish of the family Mytilidæ, especially the genera *Mytilus, Modiola,* and *Modiolaria.* This family is characterized by the presence of a well-developed byssus, two abductor muscles, a fringed vestige of a siphon, and an equivalve but inequilateral shell, with a thick epidermis, but with a weak and usually toothless hinge. The common mussel (*Mytilus edulis*) of all northern coasts is in the Old World much raised for food, but its greatest importance in the United States lies in its usefulness as bait for fishermen and as manure for farmers near the coast. It is gregarious and occurs in masses, closely crowded together, adhering to rocks, sand, and each other, by the very tough byssus, the whole beds being thus practically spun together. These beds are generally in shallow water, less than 30 fathoms, and are often exposed at low tide. The shell is oblong with a terminal umbone, and generally about 3 inches long by 1½ inches wide; but under favorable conditions they may become 6 inches or even more in length. The outside of the shell is black, but inside it is pearly blue. When young, mussels move about, but they soon



AMERICAN MARINE MUSSELS.

a, common edible mussel (*Mytilus edulis*); *b,* horse or meadow mussel (*Modiola modiolus*); *c,* ribbed mussel (*Modiola plicatula*).

anchor themselves by the byssus, and unless artificially disturbed will remain fixed throughout life. So strong are the byssus threads that these mollusks have been utilized as an aid in the strengthening of breakwaters, the young mussels being planted on the rocks in myriads and thus assisting in uniting the separate pieces into a rigid whole. The horse mussels belong to the genus *Modiola,* which does not have the umbone terminal. They are more elongated than *Mytilus* and some species reach a much larger size. See Colored Plate of CLAMS AND EDIBLE MUSSELS.

The other group to which the name "mussel" is given is the family Unionidæ, which are fresh-water mollusks of very wide distribution. The family is characterized by the possession of two adductor muscles and regular shells, with thick epidermis and thin nacreous layer, prominent external ligament, and a variable hinge. Upward of 1000 species have been named, a very large proportion of which occur in the United States, where the family is very abundant and widely distributed. It is still an open question as to what constitutes a valid species or even a genus in this family, though several genera, as *Unio, Anodon,* and *Margaritana,* are recognized. These fresh-water mussels occur in lakes, ponds, and streams, generally in large numbers together, and are sometimes 8 inches or more in length, by 4 inches in breadth, but they are usually smaller and narrower. They are sometimes used for food, but are tough and not very palatable. Their chief importance lies in the fact that they frequently produce pearls, and are indeed the only basis of the fresh-water pearl industry. As high as $25,000 has been paid for a single mussel pearl. (See PEARL.) All of the Unionidæ have a remarkable life history, for the eggs when laid find their way into the mother's gills, where they remain until the young are hatched. Although these young have a bivalve shell, they are totally different from the adults and have a very simple structure. At this stage of development they are called glochidia larvæ. After leaving the maternal gills they attach themselves to the skin of a fish, where they give rise to an excrescence which gradually swells until it is a capsule big enough to see with the naked eye. These capsules are almost black and are usually seen on or near the fins of the host fish; they are often very numerous on a single fish. Within the capsule the glochidium lives until it finally

assumes the adult form, when it breaks through the outer wall of the capsule and settles to the bottom as a miniature mussel. The distribution of the species is therefore mainly dependent on the activity of the fishes which serve as hosts.

Fossil mussels are found in most geological formations from those of Ordovician age to those of recent time. They comprise the superfamily Mytilacea, containing the families Modiolopsidæ, Mytilidæ, and Dreissensiidæ. The first, now entirely extinct, are essentially ancestral forms of the Mytilidæ, which range through Devonian to recent formations. The Paleozoic species of this family belong mostly to the genus *Modiola*, which began in Devonian, was abundant in Jurassic and Tertiary time, and still persists as a common shell of the littoral zone of all seas. *Mytilus* began in the Triassic. *Lithophagus* or *Lithodomus*, the mussel which bores cavities in limestone rock, has been recognized in Mesozoic and Tertiary formations. The Dreissensiidæ are of later origin, appearing first in the Tertiary. They are essentially freshwater and estuarine mussels, and have probably evolved from *Mytilus* or a closely allied genus of the littoral zone in late Mesozoic or early Tertiary time. Consult: A. F. Arnold, *Sea-Beach at Ebb-Tide* (New York, 1903); A. G. Mayer, *Sea-Shore Life* (ib., 1905); Lefevre and Curtis, "Studies in the Production and Artificial Propagation of Fresh-Water Mussels," in *United States Fisheries Bureau, Bulletin*, vol. xxx (Washington, 1912), and other publications of this Bureau. See Plate of ABALONE, ETC., and illustration under MOLLUSK.

MUSSELBURGH, mŭs'sel-bŭr-ô. A small seaport town and parliamentary burgh in the County of Edinburgh, Scotland, at the mouth of the Esk, 6 miles east of Edinburgh (Map: Scotland, E 4). Tanning, leather dressing, and the manufacture of sailcloths, nets, paper, wire, oil, and salt are carried on. The surrounding land has coalpits, and is much cultivated by market gardeners. The harbor at Fisherrow is frequented by coasting craft and by small vessels from Holland and the Baltic. There are famous golf links here. Pop., 1901, 11,711; 1911, 15,938.

MUSSEL DIGGER. A popular name for the California gray whale.

MUSSEL PICKER. See OYSTER CATCHER.

MUSSEL POISONING. A severe form of poisoning which arises from eating stale or decomposed mussels or those which have become toxic from their surroundings. The liver of certain mussels contains a substance called mytilotoxin, a very active poison to man. The symptoms of mussel poisoning are profound general nervous depression, with violent gastro-intestinal irritation, and resemble closely those of ptomaine poisoning. Decomposed fish, stale oysters, and certain salted fish, such as the sturgeon of Russia, give rise to identical symptoms. The treatment is promptly to rid the gastrointestinal canal of its contents, to relieve the pain by morphine and warm cataplasms, and to stimulate the patient with brandy, champagne, strychnine, or similar quickly acting drugs. See PTOMAINE POISONING.

MUSSEL SCALE. A diaspine scale insect of the genus *Mytilaspis*, all of the species of which bear scales shaped like a mussel shell or the shell of an oyster. Several species are very injurious to vegetation. The so-called oyster-shell barklouse of the apple (*Mytilaspis pomorum*) is a cosmopolitan enemy of apples and pears, and the long scale and the purple scale of the orange are pernicious examples.

MUSSET, mụ'sâ', ALFRED DE (1810–57). A noted French poet, dramatist, and novelist, born in Paris, Nov. 11, 1810. His father was a man of letters, and Alfred grew up in a literary atmosphere, was graduated with honors at the Collège Henri Quatre, and published at 20 his first verses, *Contes d'Espagne et d'Italie* (1830). This, with *Poésies diverses* (1831) and *Le spectacle dans un fauteuil* (1832), established his fame. The latter contained a poem, *Namouna*, and two short plays in a manner peculiarly his own, *La coupe et les lèvres* and *A quoi rêvent les jeunes filles*. He had already produced on the stage a comedy, *La nuit vénitienne* (1830), a failure. In 1833 he followed the dramatic vein in two tragi-comedies, *André del Sarto* and *Les caprices de Marianne*, possibly his best. *Rolla*, too, belongs to this year, and was once thought the French *Childe Harold*, though now less admired. This sudden flowering of Musset's genius was interrupted by a reckless passion for George Sand (q.v.), whom he first met in the summer of 1833 and accompanied in 1834 to Italy as her secretary. He suffered acutely in this new relation from disillusionment and self-deception. He "was a child all his life and a spoiled child," never more so than in the inevitable estrangement (1835) that cost George Sand few pangs, but marks a cardinal point in Musset's career. He returned sick, experienced another unhappy love and a series of sordid entanglements, and worked intensely and admirably, at intervals interspersed with periods of depression. Through the patronage of the Duc d'Orléans he received a position as librarian in 1838.

Musset's work after the separation from George Sand (*Les nuits, Souvenir, Lettre à Lamartine, Espoir en Dieu*) shows at its best a sad, yet in the main sober, resignation. But during this period he was more occupied with drama and with prose fiction. Of the *Comédies et proverbes*, *Fantasio* and *On ne badine pas avec l'amour* belong to 1834, *Le chandelier* to 1835, *Il ne faut jurer de rien* to 1836. *Lorenzaccio*, an historical drama (1834), had no success. These, as Lemaître points out in his preface to Jouaust's *Théâtre d'Alfred de Musset*, show the most genuine and original dramatic talent of all the Romantic school. Tragedy mingles here with comedy, not as with Hugo by juxtaposition, but by interpenetration, for Musset had too true a taste to yield to the extravagances of Dumas or Hugo. In an essay *La tragédie* (1838) he refuses allegiance alike to French romantic and classic principles, but he combines the outward appearance of restraint with the new liberty to associate the weird and terrible in human life with its higher comic aspects. Thus he succeeded in presenting complex characters better than any of his contemporaries or predecessors in French drama. His wit in dialogue had not been equaled since Beaumarchais. None of these plays was acted in France before 1848, and their influence is hardly noticeable before 1865, but they contain the quintessence of romantic imaginative art. They show most and best the unchecked freedom of fancy that joined with the spirit of realistic comedy in Ponsard, Dumas, and Augier to produce the modern French drama. Musset's prose fiction begins with *Les confessions d'un enfant du siècle* (1836), which in spirit at least is

autobiographic. This was followed by nine *Contes* (1837–44), of which *Croisilles* is best, and a tenth, *La mouche* (1851), one of the last flickerings of his genius. These are interesting chiefly in exhibiting the progress of ethical disintegration. *Margot* and *Le merle blanc* have autobiographic elements. So perhaps has *Mimi Pinson*, a "profil de grisette" (1845). In this story Musset anticipates by some six years a type of the French working girl portrayed by Henri Murger. Mimi has few clothes, but she looks as tidy as she can, and has the pretty manners, the recklessness as to the future, and the easy morality of the *grisette*. Musset's critical essays are also worthy of remark, especially the witty *Lettres de Dupuis et Cotonet*, satirizing modern marriage, journalists, novelists, and, above all, the critics of thoroughbred romanticism. Musset's closing years were marked by dejection and by comparative inactivity. In 1841 he flung at the Germans his fiery war song, *Le Rhin allemand*. In 1845 appeared *Il faut qu'une porte soit ouverte ou fermée*, a *proverbe*. In 1847 *Un caprice* (1837), a little tragedy with a chorus to utter platitudes in Greek style, was performed at the Théâtre Français. Between 1848 and 1851 *Bettine* was played and *Carmosine* was written, but they are scarcely worthy of their author.

Musset died of an affection of the heart, May 2, 1857. His works were published in 10 volumes in 1865.

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MUSSOLINI, mus'sō-lī'nĭ, BENITO (1883–). Italian prime minister and leader of the Fascisti. He was born at Dovia in the province of Forli; interested himself in politics at an early age, inclining toward the radical side; traveled widely throughout Europe, and lived for a time in Switzerland where his imprudence in the expression of extreme ideas led to his expulsion. Later he went to Trentino, where he was active among Irredentists against the Austrian rule. In 1912 he was arrested for opposition to the government's war policy. In 1914 he was engaged in a revolutionary movement in the Romagna and Tuscany, which resulted in the outbreaks of May and June of that year. During the war he abandoned Socialism and pursued a strictly nationalist and patriotic policy, founding the *Popolo di Italia*, which fought against neutrality. He saw active service in the war and was wounded. After his return to civil life he began a campaign against Bolshevism and the organization of the famous Fascisti, which in 1922 became the chief power within the Italian state. On the demonstration of the Fascisti's ability to carry out the threats of their leaders to seize the government if their demands were not met, the authorities gave way, and Mussolini was chosen prime minister October 30th. Parliament conferred complete power on the government for the execution of its policies. Although his early addresses showed that he fully realized his power, Mussolini during the first three months of his administration showed a conciliatory spirit, but later the extremist element among the Fascisti appeared to dictate the government's course, which became more uncompromising.

MUSSORGSKY, mŭs-sôrg'skĕ, MODEST PETROVITCH (1835–81). A Russian composer, born at Karev in the Government of Pskov, March 28, 1835. His earliest instruction on the piano was from his mother, and his progress was so rapid that at the age of 10 he was a performer of no mean ability. When he entered the Military Academy at St. Petersburg, he continued to study the piano with Gerke, but without thought of taking up music as a profession. After graduation he entered one of the crack regiments of the Russian army. In 1857 he made the acquaintance of Dargomyzhki (q.v.), who introduced him to the leaders of the younger national school. Among these it was Balakirev (q.v.) who recognized Mussorgski's unusual dramatic talent. Although he did not give him regular instruction, he supervised in a general way the younger man's study of Beethoven, Schumann, and Glinka. It is much to be regretted that throughout his career Mussorgski was handicapped by his inadequate technical equipment. Resigning his military commission to devote his whole energy to composition, for some years he struggled against poverty. Recognition did not come, and in 1863 he accepted an uncongenial post under the government, which circumstances compelled him to hold till his death. An opera, *Salammbô*, he did not complete, but used much of the music later in *Boris Godunov*. For a time he cultivated the song, producing masterpieces which to this day are unsurpassed and scarcely rivaled by the work of any Russian composer. The two next attempts at opera, *The Match-Maker* and *The Fair at Sorochinsi*, remained fragments. In 1868 he began *Boris Godunov*, a typical national subject treated with wonderful dramatic power. It was completed two years later, but not produced until 1874, after considerable changes had been made. In 1896 it was performed, revised, and completely reorchestrated by Rimski-Korsakov (q.v.), and in this form has become a fixture in the repertory of all Russian opera houses. From 1872 to 1880 Mussorgski worked intermittently on his second completed opera, *Khovanstchina*, also revised by Rimski-Korsakov. He died in St. Petersburg on his forty-second birthday. The list of his works is completed by the enumeration of the orchestral compositions *Intermezzo in modo classico*, *Scherzo*, a fantasie, *A Night on the Bare Mountain*, and *Turkish March;* the choral works *The Defeat of Sennacherib* and *Joshua Navin;* and a suite for the piano, *Pictures from an Exhibition.*

MUS'SULMAN. See MOSLEM.

MUSTAGH (mōō-stäg') **MOUNTAINS.** A

mountain range in Kashmir. See KARAKORAM MOUNTAINS.

MUS'TANG. See Plate of EQUIDÆ.

MUSTAPHA, mus'tä-fä. The name of four Ottoman sultans.—The first (1591–1639), a feeble-minded son of Mohammed III, succeeded Achmet I in 1617, was deposed after three months, came to the throne again in 1622, and was again deposed (1623).—MUSTAPHA II (1664–1704) came to the throne in 1695, and at the Peace of Carlowitz signed away the Morea, the Ukraine, Hungary between the Danube and Theiss, and Azov. He was deposed by a rising of the Janizaries in 1703.—MUSTAPHA III (1717–73) ruled from 1757 until his death. He quarreled with Russia and Poland and involved the country in war which lasted through his reign. His internal reforms were no more successful than his foreign policy.—MUSTAPHA IV (1779–1808) was made Sultan by the Janizaries, who rebelled against Selim III in 1807, and was deposed and killed in the next year.

MUSTAPHA, KARA, kä'rä. A Turkish grand vizier. See KARA MUSTAPHA.

MUSTAPHA FAHMY PASHA (?–1914). An Egyptian statesman. When the English went into Egypt, he immediately entered into close relations with them. He succeeded Riaz Pasha as Premier of Egypt in 1891, but was summarily dismissed in 1893 by the new Khedive, Abbas Hilmi, as being too friendly to the English. Two years later he again became Premier, and held that office until November, 1908. Throughout his term of office he coöperated with Lord Cromer (q.v.) in the governing of Egypt. In 1914 he was appointed president of the council of ministers.

MUSTAPHA RESHID PASHA (1800–58). A Turkish statesman, born at Constantinople. He served as Ambassador at Paris (1834–36, 1841–43, 1843–45) and at London (1836–37, 1838–41), as Minister of Foreign Affairs (1837–38), and as Vali of Adrianople (1843). During 1845–57 he was six times Grand Vizier, and in that capacity championed reform measures. The skillful part he played in connection with the Egyptian question in 1840 and at the time of the Crimean War brought him European recognition. He was largely responsible for the remodeled Tanzimat, or Turkish administrative code.

MUS'TARD (OF. *moustarde*, Fr. *moutarde*, from OF. *moust*, from Lat. *mustum*, must, neut. of *mustus*, fresh), *Brassica*. A genus of plants of the family Cruciferæ, having yellow flowers and linear or oblong pods, which terminate in a sword-shaped, compressed, or four-cornered beak and contain one row of seeds. The black mustard (*Brassica nigra*) is an annual, which grows wild in fields and by waysides in the middle and south of Europe. Its pods are bluntly four-angled, smooth, erect, and lie close to the stem, their valves one-nerved; the leaves are smooth, the lower ones lyrate, the upper linear-lanceolate; the seeds are brownish black. White mustard (*Brassica alba*), also a native of most parts of Europe, is an annual having divergent pods covered with stiff hairs, the valves five-nerved, the seeds yellowish, the leaves pinnatifid. Both these species are cultivated in Europe and to a limited extent in America, for their seeds, which are ground into powder to make the well-known condiment called mustard. The mustard of commerce is frequently mixed with flour and colored with turmeric. The powder of the seeds is also much used in medicine as a rubefacient. Mustard seeds depend for their pungency on the volatile oil of mustard. There is also in the seeds a bland fixed oil, oil of mustard, which is obtained from them by expression, and constitutes about 28 per cent of their weight. White mustard is often sown in gardens and forced in hothouses for use as a salad, and is also sometimes sown as a green manure crop and for feeding sheep, when turnip or rape has failed. Wild mustard, or charlock (*Brassica arvensis*), which is distinguished by turgid and knotty pods with many angles and longer than the two-edged beak, is a troublesome annual weed in both Europe and America. It may be controlled by spraying with a 2 per cent solution of copper sulphate or 12 to 15 per cent iron sulphate at the rate of 50 to 70 gallons per acre. (See HERBICIDE.) Indian mustard (*Brassica ramosa*) is extensively cultivated in India for its seeds, which are used as a condiment, as are those of *Brassica dichotoma* and *Brassica glauca* (regarded by some botanists as forms of *Brassica arvensis*), also cultivated in India. Other species are curled mustard, *Brassica japonica*, used to a considerable extent in the United States for greens; a turnip-rooted Chinese form (*Brassica napiformis*), and Chinese mustard (*Brassica juncea*). Hedge mustard, *Sisymbrium officinale*, tumble mustard, *Sisymbrium altissimum*, hare's-ear mustard, *Conringia orientalis*, and garlic mustard, *Alliaria officinalis*, are introduced species, becoming troublesome weeds in many parts of the United States. See illustration of CABBAGE AND ALLIES.

MUSTARD FAMILY. A family of plants. See CRUCIFERÆ.

MUSTARD OIL, or OIL OF MUSTARD, chemically known as allyl isothiocyanate, C_3H_5NCS. A volatile oil obtained from black mustard, the seeds of the *Brassica nigra*, growing in Asia and in southern Europe. The seeds contain a bland fixed oil which may be removed by expression, but they do not contain the volatile oil ready-formed. The latter is produced by the action of a soluble ferment (myrosin) upon the potassium salt of myronic acid (a glucoside) in the presence of water. Both myrosin and potassium myronate are contained in black mustard seeds. If, therefore, after the fixed oil has been removed, the crushed seeds are treated with water and distilled, the volatile oil is obtained, in much the same way as the volatile oil of almonds is obtained from bitter almonds. (See BENZALDEHYDE.) Mustard oil is a very volatile colorless liquid, having a painfully pungent odor and an acrid taste; when applied to the skin it speedily raises blisters; it is insoluble in water and, if pure, boils at 151° C. Its formation from potassium myronate takes place according to the following chemical equation:

$$\underset{\text{Potassium myronate}}{KC_{10}H_{18}NS_2O_{10}} = \underset{\text{Mustard oil}}{C_3H_5NCS} + \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Acid potassium sulphate}}{KHSO_4}$$

The pungency of ordinary mustard as a condiment is due to the formation of the volatile oil on addition of water. The allyl isothiocyanate prepared by an artificial process in the chemical laboratory is identical with the volatile oil obtained from mustard seeds.

The term "mustard oils" is often applied to organic isothiocyanates in general.

MUSTEL'IDÆ (Neo-Lat. nom. pl., from Lat. *mustela*, weasel, from *mus*, mouse). The family of small carnivores, represented by the weasel and embracing the more highly valued fur-bearing animals. They are related to the arctoid Carnivora, especially the bears, and the family includes three groups, as follows: (1) Melinæ (the Old World badgers); (2) Mustelinæ (grison, marten, sable, wolverine, polecat, weasels, ratel, American badger, and skunks); (3) Lutrinæ (otters). Consult authorities cited under MAMMALIA, especially Beddard. See FUR-BEARING ANIMALS.

MUS'TER (from OF. *mostre*, *monstre*, Fr. *montre*, show, from Lat. *monstrare*, to show, from *monstrum*, portent, monster, from *monere*, to warn). When used in its military sense, this term applies particularly to the assembling of troops for the verification of membership. In the United States the troops are mustered for pay on the last day of each month, each stated muster being preceded by a minute inspection. In the British army there is a special muster parade once each year, when every individual of each command must respond in person to the regimental muster roll. In the United States navy the crew is mustered or assembled at least once (usually two or three times) a day for drill, for instruction, or to ascertain if all are on board. Once a week, on Saturday morning, the crew is mustered and inspected by the commanding officer. It was formerly the practice to have general muster once a month on the first Sunday of each month. General muster is now held less often, on account of the size of the crews of large ships, and usually takes place on Saturdays. The presence of the officers is ascertained by inspection; but the names of the crew are called by the paymaster or his clerk, and each man in turn, except petty officers, as his name is reached, passes across the deck in front of the captain. It was formerly the custom to muster the crew aft and read the Articles for the Better Government of the Navy and then call the muster roll of the crew. The two performances now take place on different days, and on very large ships the Articles for the Better Government of the Navy are read by the divisional officers to their divisions.

MUSU. See MOXOS.

MUSURUS, mōō'sụ-rŭs, MARCUS (c.1470–1517). A Greek scholar, born at Retimo in Crete. He was a pupil of Andreas Johannes Lascaris at Venice. In 1505–09 he was professor of Greek at Padua, and from 1509 onward he held a like professorship at Venice. From 1493 he was associated with Aldus Manutius (q.v.), the printer, and supervised, among other things, the first edition of the scholia of Aristophanes (1498), of Athenæus (1514), Hesychius (1514), and Pausanias (1516). Consult J. E. Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

MÛT, mōōt. An Egyptian goddess, the wife of Ammon (q.v.) of Thebes and the mother of Chons (q.v.). Her name signifies "mother," and in the inscriptions she is entitled "the lady of heaven, the queen of the earth." The chief temple of the goddess was at Karnak; it was connected with the great temple of Ammon by a long avenue of sphinxes and was partly surrounded by the sacred lake Asher. From the latter circumstance Mût is often called "the lady of Asher." She is frequently represented as a lion-headed goddess wearing upon her head the solar disk, but in mural decorations she is more commonly depicted in human form wearing the vulture headdress and other symbols of a queen of Egypt. In the period from Amenhotep IV to Akhen Aton (1375–1350 B.C.) she shared in the persecution set on foot against Ammon and his family. Consult: K. A. Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); Benson and Gourlay, *The Temple of Mût in Asher* (London, 1898); Georg Steindorff, *The Religion of the Ancient Egyptians* (New York, 1905); Mallon, in Joseph Huby, *Christus: Manual d'histoire des religions* (Paris, 1912), containing a bibliography.

MUTANABBI, mōō'tä-nä'bê (Ar. *Abu'l Tayyib Aḥmad ibn al Husain al Mutanabbi*) (905–965). One of the most noted of the Arabic poets of the period of decline. He was born in Syria, the son of a water carrier, and spent several years in the desert *al Samāwa* (Mesopotamia). He was not a fervid Moslem and at one time even put himself forward as a prophet (whence his name Mutanabbi, the one claiming to be a prophet). He was taken prisoner by Lulu, the Ikhshid Emir of Emesa. After being set at liberty he lived in great poverty and neglect, but in 948 became attached to the court of Saif al Daula at Aleppo, whom he accompanied on his raids and whose praises he sang. He left Saif al Daula in 957, going over to his enemy the Ikhshid Kafur of Egypt. In 961 he went to Bagdad and at last to Shiraz, where the Buwayid Adud al Daula became his patron. He was murdered in 965 on the road from Shiraz to Kufa. His *Diwān*, containing 289 poems, has been very widely read in the East, where he is considered the last great Arabic poet, perhaps because of his intense national feeling. No less than 40 commentaries have been written on his *Diwān*. Mutanabbi is the type of the court singer, his theme the battle and the heroic deeds of his patrons. His songs lack the fire of the earlier Bedouin poetry and are artificial, but their technical excellence cannot be denied. They have been edited by Dieterici, with the commentary of *al-Wāḥidī* (Berlin, 1861), and published at Bulak (1860) and Cairo (1870, 1890) with that of *al-'Ukbarī*. Other editions are: Calcutta (1815), Beirut (1860), Bombay (1892). The *Diwān* has been completely translated by Hammer-Purgstall, *Motenebbi der grösste arabische Dichter* (Vienna, 1824); extracts may be found in Rückert's *Hamasa* (Stuttgart, 1846) and in Ouseley, *The Oriental Collection*, vol. i (London, 1797).

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MUTA-NZIGE, mōō'tä-n'zē'gā. See LAKE EDWARD.

MU'TASE. See ENZYME.

MUTATION, mū-tā'shŭn (Lat. *mutatio*, change, from *mutare*, to change, for *movitare*, frequentative of *movere*, to move, Skt. *mīv*, to push). The hypothesis that evolution (q.v.) takes place by means of sudden changes rather than through slow and almost imperceptible

transformations. This idea, though not new, was called into great prominence by the publication in 1901 of *Die Mutationstheorie* by Prof. Hugo de Vries, professor of botany at Amsterdam. Darwin himself, especially in his earlier works, recognized that "single variations" or sports are to be reckoned with as well as natural selection. Through the influence of Wallace and others natural selection had come to be the ruling theory, and it is only in recent years that the significance of sports in evolution has had much place. However, as long ago as 1864 Kölliker made an appeal for heterogenesis (which is identical with the mutation of De Vries) as a factor in the evolution of species. Professor Scott, of Princeton, has used the word "mutation" for gradual modifications. Still other writers have referred to the sudden origin of species as saltatory evolution. But De Vries is the first author who has performed experiments and worked out a theory to fit the facts which they have yielded.

Before taking up the experiments it may be said that mutation involves no necessary abandonment of natural selection, except in so far as it may have been held to account for the actual origination of new characters. Darwin recognized that natural selection improves but cannot originate anything new; mutation, on the other hand, is a means for the development of new characters and even a new assemblage of characters, i.e., a new species. It should be stated, however, that De Vries gives but little place to natural selection, even as a means of improving something already present. His experiments show that there is a definite and rather narrow limit to individual variation, and the full advantage of artificial selection along any given line can usually be obtained within a few generations, as in the parsnip or carrot. He claims also that natural selection never fixes a character, but that reversion to the original may occur after many generations. Mutation, on the other hand, is believed to bring into existence something wholly new, without any transitions or connecting links. The new form, i.e., the mutant, remains fixed from the outset, and, if it is fit, it will remain as a new species.

In 1886 De Vries observed a colony of evening primrose (*Œnothera lamarckiana*) in which were two forms differing strikingly from the common type. Feeling that these aberrant forms doubtless came from the same parentage as the more common forms, he made artificial cultures to see if further aberrant forms would develop. He found such to be the case to an astonishing degree. Out of 50,000 seedlings of *Œnothera lamarckiana* in the various years of study, 800, or about 1.5 per cent, were mutants, while 98.5 per cent came true to seed. More than one-fourth of the 800 mutants were of one type, which De Vries named *Œnothera lata*, i.e., this form appeared anew in cultures more than 200 times. A form which he called *Œnothera gigas* appeared but once. When cultures are made from these new forms, they are found to come true to seed except for occasional mutations; nor was any tendency to reversion observed. To these new forms, as to the two aberrant types observed in 1886, De Vries has given names which imply that these forms are actually new species. They have, he says, all the characteristics of species, differing not in one, but in several, characters and remaining constant in all cultures. He shows that they are as much entitled to be considered separate species as are the various members of the natural group to which the parent *Œnothera lamarckiana* belongs. Indeed, it is possible to identify most of the new species even while yet seedlings. There are no transitions between parent and offspring or between one new species and another. There is no slow and gradual fixation of characters by natural selection, but the new species is complete from the outset. Most of these new forms would doubtless disappear in a natural state, for they would be obliged to engage in a keen struggle with species already present or would gradually suffer the loss of their specific characters through hybridization. However, some new species, especially if stronger than the parent form, might survive and extend their area; the two aberrant types first observed in a field in 1886 are still to be seen there and in greater numbers. Thus, it may be said that De Vries has seen the birth of new species, a phenomenon which all evolutionists have wished to see.

It is of interest to observe that, independently and almost simultaneously with De Vries, Korschinsky brought together a vast mass of data under the title "Heterogenesis and Evolution." From the records of gardeners and horticulturists he concluded that most cultivated varieties of plants have arisen suddenly as sports, i.e., through heterogenesis or mutation.

A large amount of experimental work has been stimulated by the mutation theory, so that the literature has become extensive, including also the cytological features of mutants. The chief objection urged against the theory is the claim that *O. lamarckiana* is a hybrid mixture, and that mutants are simply the products of a splitting hybrid which do not follow the Mendelian ratio. Much experimental work has been done, especially by Davis, in attempting to prove this claim, the difficulty of the proof lying chiefly in the fact that *O. lamarckiana* has disappeared as a wild plant and is known only as an introduced plant and in cultivation. Recently De Vries has shown that *O. biennis*, a species concerning whose purity no doubt has been expressed, is mutating almost as freely as *O. lamarckiana* and in the same directions. Bartlett also has discovered recently wild species of *Œnothera* from Kentucky that are mutating with remarkable freedom.

Bibliography. S. Korschinsky, *Tentamen Florœ Rossicœ Orientalis* (Leipzig, 1901); Hugo de Vries, *Plant Breeding* (Chicago, 1907); id., *Mutation Theory*, translated from the German by Farmer and Darbishire (2 vols., ib., 1909–10); R. H. Lock, *Recent Progress in the Study of Variation, Heredity, and Evolution* (new ed., New York, 1910); J. M. Coulter, *Fundamentals of Plant-Breeding* (ib., 1914); Bailey and Gilbert, *Plant-Breeding* (ib., 1915). The present status of the mutation theory, as presented by De Vries, together with a summary of the recent experimental work, may be found in the *Botanical Gazette*, vol. lix (Chicago, March, 1915). See Biology.

MUTA'TION. See Umlaut.

MUTATION STOPS. See Organ, *The Stops*.

MUTATION THEORY. See Mutation.

MUTAZ'ILITES (Ar. *Mu'tazilah*, from *'azala*, to separate). A Mohammedan sect founded by Wasil ibn Ata (c.745) and his disciple Abu'l Hudhail al Allaf (died c.845). They had rationalistic tendencies, illustrated, e.g., by the

teaching of Abu'l Hudhail that man knows right and wrong by reason, independent of supernatural revelation. Later teachers developed several subdivisions of the sect. See MOHAMMEDAN SECTS.

MUTE (from Lat. *mutus*, dumb; connected with Skt. *müka*, dumb). A small instrument used to modify the sound of any of the string instruments. It is made of hard wood, ivory, or brass, and is attached to the bridge by means of a slit, a leg of it being interjected between every two strings. The use of the mute both softens the tone and imparts to it a peculiar muffled and tremulous quality, which is sometimes very effective. It is much used in dramatic music to give color in dreamlike or mystic situations. Its application is indicated by the letters *c. s.* or *con sordini*, and its discontinuance by *s. s.* or *senza sordini*. Mutes for brass instruments are wooden cones with a hole bored through them to allow the passage of the air. They are inserted into the bell of the instrument. But, as their insertion affects the pitch of the instrument, these mutes must be used with the utmost care. Recently attempts have been made to construct complicated mutes for brass instruments that shall not affect the pitch. In the case of horns and trumpets the left hand is used as a mute. Mutes are also used for drums. On snare drums a piece of cloth or felt is inserted on the lower side between the membrane and the snares. Kettledrums are covered with a cloth or the membrane is lightly touched with the left hand. On the piano the soft pedal is frequently called mute.

MUTES. A term applied in phonetics (q.v.) to articulate sounds, also called occlusives, plosives, or stop sounds, produced by a momentary narrowing or closure, followed by a reopening of some portion of the oral passage. Phonetically speaking, every mute or stop sound consists of three parts, the closing and the opening of the passage and the pause between. If this interval is noticeable to the ear, the consonant is then called double. The mutes are furthermore either voiced (sonant, breathed) if the breath stream makes the glottal chords vibrate, or voiceless (surd, unbreathed) if the glottal chords are at rest, as *b, p; d, t; f, v*. All of the mutes can, however, be formed with a whisper. If the closure is produced in the mouth, after which the breath bursts through the obstacle, the sound is called an oral stop; but if, on the contrary, the breath passes out through the nose, it is called a nasal stop (*n, m*). By philologists mutes are usually designated surd, sharp or smooth (*tenues*); sonant, flat, middle or medial (*mediæ*); and aspirate or rough (*aspiratæ*). Stopped or short mute consonants are produced by a complete closure at some point in the mouth (*k, t*). Open consonants are formed by narrowing the oral passage without complete contact (*th, kh, s*). With respect to the point of occlusion, mutes are classified as gutturals (front or back), *k, kh, g, gh;* palatals, *c, ch, j, jh;* linguals (cerebrals, cacuminals), *ṭ, ṭh, ḍ, ḍh;* dentals, *t, th, d, dh;* and labials (lip stops), *p, ph, b, bh*. According to recent scientific classification, the consonant system is divided, according to the point of formation, into back or guttural, front or palatal, point (including blade), teeth, and lip consonants; according to the conformation of the vocal organs, into open, divided, stopped, and nasal consonants, and trills. The essential psychological condition for the mutes lies not in the closure but in the reopening of the oral passage, while their quality is determined by the presence or absence of breath and by the point of occlusion. Consult Henry Sweet, *Sounds of English* (Oxford, 1908); Walter Rippmann, *The Sounds of Spoken English* (London, 1910); Otto Jespersen, *Lehrbuch der Phonetik* (Berlin, 1913); P. E. Passy, *Les sons du français* (Paris, 1913); Wilhelm Viëtor, *Elemente der Phonetik des Deutschen, Englischen und Französischen* (Leipzig, 1914).

MUTHER, mōō'tẽr, RICHARD (1860–1909). A German critic and historian of art. He was born at Ohrdruf and studied at Heidelberg and at Leipzig, where he took his doctor's degree. In 1883 he was privatdocent at the University of Munich and in 1885 conservator of the cabinet of prints. At Breslau, where he was appointed assistant professor in 1894, he became full professor the next year. He was one of the most prominent German art historians of his time, and is especially known for his writings on nineteenth-century art. His style is bright and interesting, with a slight tendency towards the journalistic, and his criticism, though subjective, is highly appreciative. His principal work is *Geschichte der Malerei des 19ten Jahrhunderts* (1893; Eng. trans., *History of Modern Painting*, new ed., 4 vols., 1907). Another important work, written from the psychological point of view, is *Geschichte der Malerei* (5 vols., 1899–1902; in English as *The History of Painting*, trans. and ed. by George Kriehn, 2 vols., 1907).

MUTI IBN IYAS, mōō'tẽ ĭbn ẽ'yȧs. An Arabic poet of the eighth century. His father was a Palestinian and with Hajjaj against Abd Allah ibn Zubair (q.v.), but he was himself born at Kufa, and after the fall of the Ommiad dynasty he became attached to the court of Al Mansur, where he remained until his death. He is the first representative of the new school of Arabic poetry that flourished at Bagdad and is characterized by delicacy, refinement, and frivolity. Consult: Ignaz Goldziher, *Abhandlungen zur arabischen Philologie*, vol. i (Munich, 1896); Carl Brockelmann, *Geschichte der arabischen Literatur*, vol. i (Weimar, 1898); R. A. Nicholson, *A Literary History of the Arabs* (New York, 1907).

MU'TIA'NUS, mōō'tĭ-ā'nụs, CONRADUS RUFUS (1471–1526). A German humanist, whose name in the vernacular was Konrad Mut. He was born at Homberg, studied under Hegius at Deventer, then at Erfurt, and for seven years in Italy. Thence he brought to Germany the idea of a humanistic association or academy, and by his letters from Gotha became the centre of the *Mutianische Bund*, which included Justus Jonas and Camerarius. Although he did not make common cause with Luther, Mutianus and his followers boldly attacked the abuses of the Church, and it seems certain that the *Epistolæ Obscurorum Virorum* (q.v.) owed their authorship to this circle. Consult C. Krause, *Der Briefwechsel des Conradus Mutianus* (Kassel, 1885), and Gilbert, *Der Briefwechsel des Conradus Mutianus* (Halle, 1890).

MU'TINA. The Roman name of the city of Modena (q.v.).

MU'TINY (from OF., Fr. *mutin*, mutinous, from *meute*, sedition, from ML. *mota*, revolt, *muta*, change, from Lat. *mutare*, to change). Mutiny at military law is unlawful opposition

or resistance to lawful military authority with intent to subvert the same or to nullify or to neutralize it for the time. (Winthrop, *Military Law*, p. 892.) In the United States the acts constituting mutiny are exciting, causing, or joining in any mutiny or sedition in any troop, battery, company, party, post detachment, or guard, and are punishable with death or such other punishment as a court-martial may direct. (Twenty-second Article of War.) The punishment of death or such other punishment as a court-martial may adjudge may be inflicted on any person in the naval service who commits any of the acts which constitute mutiny. (Revised Statutes, § 1624.) In England an annual act of Parliament passes to punish mutiny in the army and navy. (See MUTINY ACT.) Under the British articles "every one commits felony, and is liable upon conviction thereof to penal servitude for life as a maximum punishment, the maximum alternative term of imprisonment being three years, who maliciously and advisedly endeavors (*a*) to seduce any person serving in His Majesty's forces by sea or land from his duty and allegiance to His Majesty; or (*b*) to incite or stir up any such person to commit any act of mutiny, or to make or endeavor to make any mutinous assembly, or to commit any traitorous or mutinous practice whatever."

While mutiny is, in general, a concerted proceeding, a single officer or soldier may commit the offense. It is an offense punishable with death for a soldier or officer being present at a mutiny not to use his utmost endeavor to suppress it, or, having come to the knowledge of a mutiny (or intended mutiny), not to give information of it to his commanding officer. (British and American Articles of War.)

Acts not characterized by an intent to subvert lawful authority, while they do not come within the legal definition of mutiny, may be regarded and punished as conduct tending to mutiny but clear of the completion or commission of the offense. The law makes a distinction between mutiny and mutinous conduct, the latter being charged, and tried by court-martial, not under the mutiny articles, but as conduct to the prejudice of good order and military discipline.

Mutiny at Maritime Law is committed when there is a usurpation of the authority and command of a ship and an overthrow of that of the master or commanding officer. Any conspiracy to accomplish such an object, or to resist a lawful command of the master for such purpose; any endeavor to stir up others of the crew to such resistance, is an endeavor to commit a revolt within the meaning of the Statute of 1790. (1 Stat. L., 113; *Abbott's National Digest*, 3. Mutiny.) The offense of making a revolt or mutiny on a ship is no longer punishable as a capital offense. (Act of March 3, 1835.)

For United States law on the subject of mutiny, see Revised Statutes, § 1324, Arts. 22 and 23; § 1624, Arts. 4 and 8; §§ 4956, 5359, 5360.

MUTINY ACT. An act of the British Parliament passed from year to year, investing the crown with powers to regulate the government of the army and navy and to frame the articles of war. By the Bill of Rights the maintenance of a standing army in time of peace, unless by consent of Parliament, was declared illegal, and from that time the number of troops to be maintained and the cost of the different branches of the service have been regulated by an annual vote. But Parliament possesses a further and very important source of control over the army. Soldiers, in time of war or rebellion, being subject to martial law, may be punished for mutiny or desertion; but the mutiny of Dumbarton's Scottish regiment soon after the Revolution of 1688 raised the question whether military discipline could be maintained in time of peace, and it was decided by the courts of law that, in the absence of any statute to enforce discipline and punish military offenses, a soldier was amenable only to the common law of the country. The authority of the Legislature thus became indispensable to the maintenance of military discipline, and in 1689 Parliament passed the first Mutiny Act, authorizing, for a period of six months, the punishment of desertion by martial law. Subsequently this Act was passed at the beginning of each session and by limiting its duration to one year annual sessions of Parliament were made indispensable. In July, 1879, the Mutiny Act and the Articles of War were consolidated with a few changes into a complete military code called the Army Act, passed annually as before.

MUTSU, mụt'sụ *or* mụt's', MUNEMITSU, COUNT (1842–97). A Japanese statesman, born in Wakayama. He visited Europe in 1871, became Governor of Kanagawa when he returned to Japan, and in 1874 was made Secretary of the Senate. Involved in Saigo's rebellion, he was imprisoned in 1878, but was pardoned in 1882. In 1885 he traveled in America and Europe. He served as Ambassador to the United States in 1888–90, and then, returning to Japan, held the portfolio of Agriculture and Commerce. From 1892 to 1896 he was Minister of Foreign Affairs in the cabinet of Marquis Ito. In 1894 he obtained a treaty with Great Britain, in which the latter gave up the privilege of extraterritorial jurisdiction in Japan, and for this service he was made Count.

MUTSUHITO, mụt'sụ-hē'tō *or* mụ-t'-sē'tō. See MEIJI TENNO.

MUTTON BIRD. See SHEARWATER.

MUTTON FISH. 1. A fish of the large, widespread group of eelpouts, the eelpout or mother of eels (*Zoarces anguillaris*) of the North Atlantic coasts. It feeds upon shellfish, may be caught with a hook in the bays north of Cape Cod, and reaches a weight of six to seven pounds. It spawns in late summer and produces a few large eggs. 2. One of the snappers (*Neomenis analis*) of the West Indies. 3. One of the mojarras (*Gerres olisthostomus*), also called Irish pompano. See MOJARRA.

MUT'TRA. The capital of a district of the same name, in the United Provinces, British India, 30 miles northwest of Agra, on the right bank of the Jumna (Map: India, C 3). The city extends in crescent form for about 1½ miles along the right bank of the river, to which access is facilitated from a paved street by numerous ghats and chatburahs, ornamented with pavilions and temples. It is one of the great pilgrim resorts of India, and the devotional ablutionary exercises of the mixed crowds morning and evening constitute one of the characteristic sights of the city. The part of the city known as Braj Mandal is sacred to the memory of Krishna. Ravines intersect the town, though the streets are wider and straighter than in most Indian towns. The Hardinge, or Holi entrance gate, is a notable

monument, and the houses of some of the wealthier native class are adorned with fine sculptures. There are numerous mosques and temples. The mosque of Aurungzebe is the oldest, dating from 1669. Among interesting remains are the ruins of Akbar's fort, centrally situated on the river bank, and the observatory built by the celebrated astronomer Jey Singh, who became Prince of Amber in 1693, still containing several astronomical instruments. Modern features are the museum, with an extraordinary collection of ancient sculptures unearthed at Muttra, botanical gardens, the European churches, and the extensive military cantonments to the south of the city. As early as the fourth century Muttra is mentioned as a centre of Buddhism. As the reputed birthplace of Krishna and his brother Balarama, it is annually visited by thousands of pilgrims on the occasions of its religious festivals. The river abounds with turtles, and the streets swarm with monkeys, peacocks, parrakeets, and sacred bulls, which are permitted to roam at large, protected and fed by the people. Muttra anciently was of great importance, and its splendor and wealth made it an object of attack to the first Afghan invaders; Mahmud of Ghazni in 1017 plundered and burned the city and carried off idols of gold, silver, and precious stones valued at $15,000,000. In 1500, 1636, 1669, and 1756, it again suffered capture and spoliation. Since the British occupation in 1803 it has regained some of its former importance. During the Indian Mutiny of 1857 the Sepoys here murdered their British officers and joined the insurgents at Delhi. Muttra is increasing in commercial importance. It is a large banking centre, manufactures blank books and brass idols, has cotton gins and compresses, and has a large trade in sugar, cotton, grain, and metals. Pop., 1901, 60,042; 1911, 58,183.

MU'TUALISM (from *mutual*, from OF. *mutu*, from Lat. *mutuus*, reciprocal, from *mutare*, to change). That type of symbiosis (q.v.) in which each symbiont is believed to gain by the presence of the other. It has not been absolutely proved that a case of complete mutualism exists, though in the root tubercles (q.v.) of the Leguminosæ the evidence for mutualism is very strong.

MU'TULE (Lat. *mutulus*, bracket, mutule, modillion). A rectangular block under the corona, or projecting portion, of the cornice of the Doric order. One is regularly placed over each triglyph and metope. On each mutule are worked three rows of six *guttæ* or drops. They probably represent the heads of the nails by which the wooden block (forerunner of the mutule) was fastened in the primitive brick and wood style from which the Doric order developed. Consult A. Marquand, *Greek Architecture* (New York, 1909).

MUTUUM, mū'tū-ŭm (Lat., loan). A loan of any article or commodity for consumption by the borrower, who agrees to return the article in kind. The term and the rules governing such contracts originated in the Roman law, and were adopted into the English and Scots law at an early period and became a part of the common law. A mutuum is not a true bailment, as the article itself is not to be returned; and it does not create a debt, as no money payment is to be made. The title to the commodity lent passes to the borrower, and therefore it seems like a contradiction in terms to employ the terminology of bailments to such contracts. It has been held in a few States that the delivery of grain to a miller for grinding is a contract of mutuum, and that the miller is only bound to return flour of the same quality that the grain delivered would have produced. The important effect of this doctrine on such a state of facts would be that the miller would still be bound to deliver the flour if the grain were destroyed. Consult Story, *Bailments*.

MUY'BRIDGE, Eadweard (1830–1904). A photographer whose work made possible the development of the moving picture (q.v.). His name was originally Edward James Muggeridge. Born at Kingston-on-Thames, England, he early removed to the United States, where he became director of photographic surveys for the national government. In 1870, by a series of negatives of a horse trotting, he demonstrated that in this kind of movement there is a moment when all the feet are off the ground, thus settling an old controversy. Muybridge made experiments on the stud-farm of Senator Leland Stanford at Palo Alto, Cal., and gradually widened the scope of his studies. In 1881 a machine invented by him and called the zoophraxiscope reproduced on a screen horse races, the flight of birds, and athletic contests. The same year he lectured before the electrical congress in Paris; and in London he spoke before both the Royal Institution and the Royal Society. When in England Muybridge lived at Kingston, and it was there that he died. He published: *The Horse in Motion* (1878); *Animal Locomotion* (11 vols., 100,000 photographic plates, 1887), abridged and divided as *Animals in Motion* (1899; 3d ed., 1907) and *The Human Figure in Motion* (1901; 3d ed., 1907).

MUYSCA, mụ-ĕ'skȧ. A confederacy of South American Indians. See Chibcha.

MUZAFFAR ED DIN, mōō-zä'fĕr ĕd dēn' (1853–1907). Shah of Persia, the second son of Nasr ed Din (q.v.). He was born at Teheran, March 25, 1853. He was appointed Governor of the Province of Azerbaijan, but was recalled for failing to suppress an uprising of the Kurds. Already declared heir apparent during his father's lifetime, Muzaffar ed Din became Shah June 8, 1896, after Nasr ed Din's assassination by a Babi (see Babism) on May 1. In early life a fanatical Mohammedan, he showed great tolerance as Shah, particularly in his repression of an outbreak against the Christian Armenians at Kazoni in 1899. At his accession he further relieved his subjects of the taxes on meat and bread and likewise abolished the system of purchase of civil and military positions. European influences, especially those of the English and Russians, were responsible for his changed attitude. He visited Europe in 1900, 1902, and 1905. In 1906 he made the first step towards establishing a parliamentary government by summoning a partially elective National Assembly. See Persia.

MUZAFFARPUR, mŭz'ȧf-ĕr-pōōr'. The capital of a district in Bengal, British India, on the right bank of the Little Gandak River, 37 miles northeast of Patna (Map: India, E 3). It is a well-built town with a numerously attended high school, a college (established in 1899), and a German mission. In its jail are manufactured castor oil, carpets, aloe fibre and cloth. Saltpetre is largely mined in the district, and there is a considerable trade in indigo and saltpetre. Pop., 1901, 45,617.

MUŽÁKOVÁ, mu̯'zhä-kō-vä, JOHANNA (1830–99). A Bohemian novelist, known by her pseudonym, Karolina Světlá. She was born at Prague, and her name was Rott before she married Professor Mužák. After 1858, when her first novel, *Double Awakening*, was published, she produced more than 50 works of fiction, such as *Láska k básnikovi* (Poet's Love, 1860); *Prvni Ceška* (First Czech Woman, 1861); *Vesnický roman* (Village Romance, 1869; Ger. trans. by Alexis, 1900); *Frantina* (1870); *Kriz a potoka* (The Cross beside the Stream, 1868); *Barbara* (1873); besides essays, memoirs, and songs. Mužáková is at her best in novels and sketches dealing with Czech village life. Many of these have been translated into French, German, and other languages. Her collected works appeared at Prague in six volumes (1892–94). —Her younger sister, SOFIA (PODLIPSKA) (1833-97), was a writer of historical romances.

MUZIANO, mōō'tsê-ä'nō, GIROLAMO (1528–92). An Italian painter of the Mannerist school. He was born at Aquafredda, near Brescia, whence he was also called Bressano. He was a pupil of Girolamo Romanino, and afterward studied in Venice. Proceeding to Rome, he adopted the manner of Michelangelo, whose favor he gained by his first painting of importance, "The Resurrection of Lazarus," now in the Quirinal Palace. He is best known for his improvement of mosaics and the foundation of the Academy of St. Luke, which was largely due to his efforts and endowment. He was also celebrated among contemporaries for his landscapes. Most of his pictures are in the palaces and churches of Rome. Among the best are: "Christ Giving the Keys to Peter" and "St. Jerome Preaching," both in Santa Maria degli Angeli, and the "Circumcision" in the church of the Gesù. Though an imitator of Michelangelo, he preserved some of the excellences of Venetian coloring.

MWERU. See MOERO.

MWUTAN-NZIGE, mwōō'tän-n'zē'gā. See LAKE ALBERT.

MYA, mī'ä. See CLAM.

MYALGIA, mī-ăl'jĭ-ä (Gk. *μῦς*, *mys*, muscle + *ἄλγος*, *algos*, pain). See RHEUMATISM, MUSCULAR.

MY'ALI'NA (Neo-Lat., dim. of Lat. *mya*, from Gk. *μύαξ*, *myax*, sea mussel, from *μῦς*, *mys*, muscle, mussel, mouse). A fossil pelecypod somewhat resembling in shape a mussel (*Mytilus*), that is very common in the Carboniferous and Permian rocks, and hence an index fossil of those periods. The genus is of interest also as possibly representing an intermediate stage between the Aviculidæ and Mytilidæ, with both of which families it has characters in common.

MYCALE, mĭk'ä-lē (Lat., from Gk. *Μυκάλη*, *Mykalē*). The ancient name of a mountain, now called Samsun, in south Ionia, Asia Minor (Map: Greece, Ancient, E 3). It terminates in the promontory of Cape Santa Maria, opposite Samos. To the shore of this promontory the fleet and army of Xerxes withdrew in 479 B.C. on the news of the approach of a Greek fleet. The Greeks under the Spartan King Leotychides and the Athenian Xanthippus, father of Pericles, followed them, landed, and after a severe struggle stormed the Persian camp and burned the ships.

MYCE'LIUM (Neo-Lat., from Gk. *μύκης*, *mykēs*, fungus + *ἦλος*, *hēlos*, nail, wart). The characteristic vegetative body of the true fungi. In general it consists of branching, more or less interwoven filaments (hyphæ), which in some cases include a continuous cavity (cœnocytic), and in other cases have cross walls (septate). The mycelium may be very open and delicate, or it may be feltlike, or even form a compact body, as in lichens. The mycelium establishes absorbing connections with its food supply (substratum), and when these connections are definite and more or less specialized, they are called haustoria (suckers). In the case of a parasite the substratum is either the surface or the internal tissues of the host. The mycelium also produces vertical branches (sporophores), which in a variety of ways give rise to spores. See FUNGI.

MYCE'NÆ (Lat., from Gk. *Μυκῆναι*, *Mykēnai*). An ancient city of Greece, on a steep hill in the northeast corner of the Argolic Plain, commanding the passes towards Corinth (Map: Greece, Ancient, C 3). It was said to have been founded by Perseus and to have been ruled by his descendants until they were superseded by Pelops. It is celebrated in legend as the capital of Agamemnon. Here was laid the scene of the terrible story of the house of Atreus, and here was stored the wealth of Agamemnon. After the epic period the city seems to have been completely overshadowed by the power of Argos, but it still preserved a quasi independence, for during the Persian wars, when Argos was friendly to Persia, we hear of 80 Mycenæans at Thermopylæ (479 B.C.), and along with Tiryns it sent 200 men to Platæa. Later Mycenæ joined the Spartan League, but when the Spartans were occupied by the revolt of the Helots, in 463 B.C., the Argives besieged the city and expelled the inhabitants. From that time the place was the seat of a small village community, who in the time of Pausanias showed visitors the graves of Agamemnon and his household. The destruction of the city by the Argives did not greatly injure the massive Cyclopean wall; and this fortification, still preserved to a considerable height, with the Lion Gate (q.v.), so called from the reliefs on the triangular slab over the lintel, and the domed tomb outside, commonly called the Treasury of Atreus, had attracted the attention of archæologists long before Heinrich Schliemann (q.v.) in 1876 began his excavations. These opened an entirely new field in Greek archæology by the discovery just inside the Lion Gate of a carefully inclosed circle, evidently a sacred inclosure, within which at a considerable depth were five shaft graves, hewn in the rock, and containing a number of bodies, with an extraordinary mass of gold and silver ornaments, swords, and vases. These are now in the National Museum at Athens. Over one grave was a small circular altar. Since that time the Greek Archæological Society has continued the excavations, for the most part through Dr. Chrestos Tsountas, whose accurate and careful methods have proved highly successful. Besides the Treasury of Atreus eight other domed tombs and a very large number of smaller rock-cut chambers for burial have been opened. Within the wall a sixth grave was discovered near the others, the foundation walls of smaller houses were laid bare, while near the summit of the Acropolis were found the ruins of a palace showing great similarity to a palace at Tiryns. The discoveries at this site first brought into

prominence that special period of Ægean civilization which preceded the historic Hellenic culture, and hence the name Mycenæan has been given to this age and civilization. For the general characteristics of Mycenæan art and for illustrations, see ARCHÆOLOGY, III, *Mycenæan Period;* ATREUS, TREASURY OF.

Bibliography. Heinrich Schliemann, *Mycenæ: A Narrative of Researches and Discoveries* (new ed., New York, 1880); Carl Schuchhardt, *Schliemann's Excavations*, translated by Eugenie Sellers (London, 1891); Tsountas and Manatt, *The Mycenæan Age* (Boston, 1897); new edition in progress in 1915; H. R. Hall, *The Oldest Civilization of Greece* (Philadelphia, 1901); William Ridgeway, *The Early Age of Greece*, vol. i (New York, 1907); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); H. R. Hall, *The Ancient History of the Near East* (London, 1913); id., *Ægean Archæology* (ib., 1915).

MYCENÆAN (mī'sẽ-nē'an) **PERIOD.** See ARCHÆOLOGY.

MY'CERI'NUS. An Egyptian king, the sixth of the fourth dynasty. His name, written by Herodotus as above and by Diodorus as Mecherinus, is, following the Egyptian form, Menkaura. He built a pyramid southwest of Ghizeh, the third in size and the first in point of preservation. In it in 1837 were found his stone sarcophagus (afterward lost at sea) and fragments of his wooden coffin. Mycerinus was famed for his piety. He is the subject of one of the early poems of Matthew Arnold.

MY'CETO'MA. See MADURA FOOT.

MY'CETOZO'A (Neo-Lat. nom. pl., from Gk. *μύκης, mykēs,* fungus + *ζῷον, zōon,* animal). A name given to the Myxomycetes (q.v.) by those who regard them as animals rather than plants. See PROTOZOA.

MYCONIUS. See MYKONIUS.

MY'COPHYLAX'INS. See IMMUNITY.

MY'CORRHI'ZA (Neo-Lat., from Gk. *μύκης, mykēs,* fungus + *ῥίζα, rhiza,* root). The whole structure formed by the intimate association of certain fungi with the roots of higher plants. The fungi either grow inside the cells of the cortex (endotrophic mycorrhiza) or invest the young absorbing portions of the roots with a jacket of interwoven hyphæ (ectotrophic mycorrhiza, Fig. b). Recent investigations have shown that mycorrhizal fungi are very widespread and that they are associated with perhaps more than half of the higher plants. They are particularly abundant in humus, and the conclusion has been reached that a large number of humus plants are very much benefited by their presence, and further, that some plants, such as the Indian pipe, certain orchids, and even the European beech tree, are unable to complete their normal life cycle in sterilized soil. There are apparently all degrees of interdependence between these fungi and higher plants, ranging from an occasional temporary infection, through stages where there is a regular annual development of the mycorrhiza upon many or all of the roots, as seen on such forest trees as many of the oaks, the hickories, and the basswood, to very close and perpetual unions of the two organisms, extending from the earliest development of the seedlings throughout the entire life of the higher plant.

The English heather (*Calluna vulgaris*) has recently been found to furnish an interesting example of highly specialized mycorrhiza. The fungus is present in the testa of the seed and infects the seedling immediately after germination. Should such an infection fail, as in experimental sterile cultures, the seedlings fail to develop roots, although they may live for several weeks. The fungus persists during the entire life of the heather plant and is present not only in the roots but also in the stem, flowers, and fruit, although limited to the testa in the seed. A similar dependence upon such

MYCORRHIZA.

a, root and rootlets of *Carpinus betulus*, showing the coralloid character of mycorrhiza.
b, end of root of the beech (*Fagus sylvatica*), showing mat of fungus threads; more highly magnified than *a*.

fungi is found in many epiphytic orchids, most of which do not thrive in the absence of the mycorrhiza, while in many the seedlings develop only when infected by the fungus. This explains the practice among gardeners of sowing orchid seeds among the roots of orchid plants. Several of the mycorrhizal fungi have been identified as the mycelial stages of large fleshy fungi belonging to the genera *Agaricus, Russula, Scleroderma,* and *Phoma.*

The physiological relation between the fungus and the higher plants is still very imperfectly known. It is believed that often by its digestive powers the fungus secures and prepares certain foodstuffs, especially those containing nitrogen, and that eventually the higher plants use and benefit by these nitrates. The fungus may also to a certain extent aid in the absorption of the water used by the higher plant. Doubtless in many instances, however, the fungus is simply parasitic upon the roots of its host, getting from it carbohydrate foods. Con-

sult: Frank, *Ueber die Verdauung von Pilzen abzielende Symbiose der mit endotrophen Mykorrhizen begatteten Pflanzen* (Berlin, 1891); Bernard, "Les orchidées et leur champignons commensaux," in *Annales des Sciences Naturelles: Botanique*, vol. ix (9th series, Paris, 1909); Hans Burgeff, *Die Wurzelpilze der Orchideen* (Jena, 1909); W. B. McDougall, "Mycorrhiza of Forest Trees," in *American Journal of Botany*, vol. i (Lancaster, Pa., 1914); Rayner, "Obligate Symbiosis in Calluna Vulgaris," in *Annals of Botany*, vol. xxix (London, 1915). See SYMBIOSIS.

MY'COSO'ZINS. See IMMUNITY.

MYD'DELTON, or **MIDDLETON,** SIR HUGH (c.1560–1631). A British contractor, born at Galch Hill, Denbigh, Wales. He became a London goldsmith and banker, engaged in various commercial undertakings, and was a member of Parliament from 1603 to 1628. In 1609 Myddelton began work on the New River, a canal for supplying London with water from springs in Hertfordshire. He obtained aid from King James in the undertaking in 1612, and in the following year had completed the work. The project greatly impoverished Myddelton, as it returned no profit till 1633. He was created Baronet in 1622. Consult Samuel Smiles, *Lives of the Engineers* (new ed., London, 1904).

MYD'RIAT'ICS (Gk. *μυδρίασις, mydriāsis*, undue enlargement of the pupil of the eye, + suffix *-atic*, pertaining to). Drugs which produce dilatation of the pupil of the eye. Many of them also produce cycloplegia, i.e., paralysis of the ciliary muscle, which controls accommodation. The principal mydriatics for examination of the eye are atropin, homatropin, and cocaine; others less used are hyoscyamin, duboisin, daturin, scopolomin, muscarin, mydrin, euphthalmin, and ephedrin. Atropin is the typical mydriatic, and acts by paralyzing the sphincter of the pupil, at the same time stimulating the dilator. It paralyzes the ciliary muscle completely. Drugs which contract the pupil are called miotics (q.v.).

MYELAT, mē'â-lât (Bur., unoccupied country). A division of Burma, India, comprising 16 of the southern Shan States. Total area, 3723 square miles. The region is sparsely populated. The chief industry is the cultivation of rice and sugar cane. Pop., 1901, 119,415.

MYELI'TIS (Neo-Lat., from Gk. *μυελός, myelos*, marrow). An inflammation of the substance of the spinal cord which may be limited to the white or the gray matter or involve the whole cord or isolated portions of it. When the white matter is inflamed with the meninges it is called cortical myelitis; when the gray matter only is affected it is known as central myelitis. The disease may extend transversely, or may proceed in an upward or downward direction. The causes are, in general, injuries of various kinds, exposure, and overexertion; the infectious diseases, such as measles, typhus fever, and smallpox, rheumatism or syphilis, mercurial or arsenical poisoning; and caries or tumors of the spine or the cord itself. The symptoms depend upon the extent and location of the inflammatory process. A transverse myelitis, e.g., produces paraplegia, or complete paralysis of all the voluntary muscles whose nerve fibres arise from nuclei below the seat of the lesion. There are rectal and vesical paralysis, girdle pains, bedsores, and disturbances of sensation. Treatment is entirely symptomatic. The prospects of recovery are bad in myelitis, particularly in the ascending form and that variety involving the trophic centres. In some mild cases the patients recover completely, in others only partly.

In children a specific form of the disease attacks the anterior horns of the gray matter (when it is called *poliomyelitis*, or infantile spinal paralysis). See POLIOMYELITIS.

MY'ER, ALBERT JAMES (1827–80). An American army officer and meteorologist, born at Newburgh, N. Y. He graduated at Hobart College and took his degree in medicine at the Buffalo Medical College in 1851. In 1854 he was appointed assistant surgeon in the United States army and was assigned to Texas, where he first developed his celebrated signal system of flags by day and torches by night, which afterward came into general use. In 1860 he was commissioned major and made chief signal officer of the army. On the outbreak of the Civil War he was made signal officer on the staff of General Butler and afterward on that of General McClellan, and was successively brevetted lieutenant colonel, colonel, and brigadier general, his last promotion being for distinguished services in organizing, instructing, and commanding the signal corps of the army and for especial service on Oct. 5, 1864, at Allatoona, Ga., where his signal system enabled the apparently doomed garrison to summon assistance from the main army. On July 28, 1866, he was made colonel in the regular army and chief signal officer. In 1870 the signal corps, under his direction, commenced observing and giving notice by telegraph of the approach and force of storms on the northern lakes and seacoast, at the military posts in the interior, and at other points in the States and Territories. In 1873 Myer organized, and thereafter promoted, international simultaneous daily meteorological observations, published as daily bulletins with maps. He published *A Manual of Signals for the United States Army and Navy* (1868). A short time before his death he was promoted to the full rank of brigadier general of the United States army.

MYER, FORT. See FORT MYER.

MY'ERS, CORTLAND (ROOSA) (1864–). An American Baptist clergyman. He was born at Kingston, N. Y., graduated from the University of Rochester in 1887 and from the Rochester Theological Seminary in 1890, and served as pastor of the First Church, Syracuse, N. Y. (1890–93), of the First Church, Brooklyn (1893–1909), and thereafter of Tremont Temple, Boston. He received the degree of D.D. from Temple University, Philadelphia, in 1899. His writings include: *The Best Place on Earth* (1893); *American Guns* (1898); *Why Do Men not Go to Church?* (1899); *Making a Life* (1900; 2d ed., 1913); *The New Evangelism* (1903); *The Boy Jesus* (1908); *Real Prayer* (1911); *When Heaven Touched the Earth* (1912).

MYERS, FREDERIC WILLIAM HENRY (1843–1901). An English poet and essayist, born Feb. 6, 1843, at Keswick, where his father was incumbent of St. John's Church. He was educated at Cheltenham and at Trinity College, Cambridge, graduating with distinction and gaining a fellowship in his college (1865). His taste for poetry was shown in his boyhood. He delighted in Homer, Æschylus, Lucretius, in fragments of Sappho, and in Pindar. Before quitting school he had learned all Vergil by heart. He was for many years inspector of

schools. In 1882 he took an active part in founding the Society for Psychical Research, of which he became president. He died in Rome, Jan. 17, 1901. The verse of Myers, which belongs mostly to an early period, comprises *St. Paul* (1867); *Poems* (1870); *Renewal of Youth* (1882). In these collections are pieces of rare beauty, which give the author one of the first places among the lesser poets. Myers undoubtedly wrote some of the finest essays of his time in *Essays Classical and Modern* (1883) and in *Science and a Future Life* (1893). He also prepared for the "English Men of Letters Series" an admirable *Life* of Wordsworth (1881). His work in psychical research is represented by his contributions to the *Phantasms of the Living* (1886), which embodied the first considerable results of the labors of the Society for Psychical Research. After his death appeared a book on the evidences of immortality entitled *Human Personality and its Survival of Bodily Death*, edited by R. Hodgson and A. Johnson (London, 1903), and *Fragments of Prose and Poetry* (1904). Consult the *Athenæum* (London, Jan. 26, 1901); A. C. Benson, *The Leaves of the Tree* (New York, 1911).

MYERS, Henry L. (1862–). An American legislator. He was born in Cooper Co., Mo., was educated in local schools, and practiced law at Boonville and West Plains, Mo., from 1885 to 1893. Moving to Hamilton, Mont., in the latter year, he was prosecuting attorney for Ravalli County in 1895–99, Democratic member of the Montana Senate from 1899 to 1903, and district judge of the fourth judicial district of Montana in 1907–11. He was elected United States Senator for the term 1911–17.

MYERS, Jerome (1867–). An American figure and landscape painter. He was born in Petersburg, Va., and studied at the art school of Cooper Union and the Art Students League, New York. Myers is best known for his street scenes of New York, especially of the lower East Side. His execution is careful, with moderate color schemes and little contrast of light and shade. An example of his work is "The Night Mission," in the Metropolitan Museum of Art.

MYERS, Philip Van Ness (1846–). An American historian, born at Tribes' Hill, N. Y. He graduated at Williams College in 1871 and studied at Yale Law School (1873–74). After two years in Europe he returned to the United States and became president of Farmers' College, Ohio, in 1879. From 1890 to 1900 he was professor of history and political economy at the University of Cincinnati, where he was also dean of the academic faculty in 1895–97. His publications include: *Life and Nature under the Tropics* (1871); *Remains of Lost Empires* (1875); *Ancient History* (1882; rev. ed., 1904); *Medieval and Modern History* (1889; new ed., 1905); *General History* (1889; rev. ed., 1906); *The Eastern Nations and Greece* (1890; rev. ed., 1904); *History of Rome* (1890); *History of Greece* (1897); *Rome: Its Rise and Fall* (1900; new ed., 1905); *The Middle Ages* (1902); *The Modern Age* (1903); *History as Past Ethics* (1913). Certain of his works became standard textbooks in high schools and colleges.

MYHRMAN, mēr'mân, David Wilhelm (1866–). A Swedish Orientalist, born in Tuna, Kalmar. In 1892 he went to America and studied at Chicago University and at Harvard. In 1902, having taken the degree of Ph.D. at Leipzig, he was appointed docent in Assyriology at Upsala. Besides articles contributed to encyclopædias and periodicals he published: *Die Labartu-Texte* (1902); *Ur babyloniernas och assyriernas religionslitteratur* (1908); *Kitāb mu'id an-ni'am* (1908); *Aramaic Incantation Text* (1910); *Babel och Bibel* (1911); *Nouveaux noms propres* (1911); *Babylonian Hymns and Prayers* (1911); *Tusen nätter och en natt* (1912); *Upptäckterna i Babylonien och Assyrien* (1913). He was coeditor of *Babylonica* (Paris) and *Babylonian Expedition* (University of Pennsylvania).

MYIASIS, mī-yā'sĭs (Neo-Lat., from Gk. *μυῖα, myia,* fly). A medical term for the state of being infested with the larvæ of dipterous insects. A rather large number of flies may infest human beings in this way, and the disease has been divided according as the larvæ are found in the skin, in the ear, in the conjunctiva, in the intestines, in the mucous membranes, in the nose, or in wounds. The most common form is the presence of the larvæ of flesh flies, or blowflies, in open and neglected wounds. In certain portions of the United States, the screw-worm fly (*Lucilia macellaria*) deposits its eggs or larvæ not only in open sores upon the bodies of men and women, but many cases are on record where the eggs have been deposited in the nostrils of persons sleeping exposed in the daytime. These flies are especially apt to be attracted by an offensive catarrhal condition. Scores of maggots have been taken from the nasal passages of such individuals, and a complete destruction of the soft palate has been brought about in this way. The European flesh fly known as *Sarcophila wohlfarti* has been reared from larvæ found in numbers in the nasal cavities and in the ear of man. *Lucilia nobilis* of Europe has also been reared from the ear of a man, causing extensive discharges and much putrefaction. The bluebottle fly (*Calliphora vomitoria*) sometimes causes nasal myiasis, and the common flesh fly (*Sarcophaga carnaria*) has been reared from larvæ found in the nasal passages. There are also cases of myiasis of the vagina. In all of these instances the flies are either Sarcophagidæ or Muscidæ, and the adults were attracted to putrid or septic wounds or to an offensive or purulent discharge from the body, depositing their eggs or larvæ therein. Internal myiasis is nearly always caused by the larvæ or flies of the family Anthomyiidæ. These flies deposit their eggs in spoiled vegetables, which are afterward eaten in the raw state, as in salads. The larvæ of several species have been passed while still alive, and frequently cause intestinal disturbances of a more or less serious character. *Homalomyia canicularis,* e.g., has several times been reared in this way. In the family Sepsidæ the common cheese maggot (larva of *Piophila casei*), taken into the stomach with old cheese, has been found alive in excreta, having passed through the entire alimentary canal. Cutaneous myiasis, aside from that of open wounds, is produced by several of the botflies of the family Œstridæ. In tropical regions there are one or more species of the genus *Dermatobia,* which may lay their eggs upon the skin of human beings, the resulting maggot forming a pus sac below the surface of the skin and, if undisturbed, reaching its full growth in this situation. Such cases as this are not uncommon among the unclothed inhabitants of tropical countries, and persons while bathing occasionally become infested. The best known of these human botflies is *Dermatobia cyaneiventris,* common in South America.

MYKO'NIUS (properly MEKUM), FRIEDRICH (1490–1546). A German theologian of the Reformation. He was born at Lichtenfels in Upper Franconia. At 19 he entered a Franciscan cloister at Annaberg and in 1516 became a priest. In the following year Mykonius embraced Luther's teachings, and about 1524, as pastor of a church at Gotha, became one of the leaders of the Reformation. He rendered especially valuable service in Thuringia and, after 1539, in Leipzig, by reviving the primitive custom of episcopal visits to the different churches. He attended several of the conferences of the Reformation period and in 1538 was sent to England to discuss the articles of the Augsburg Confession. Mykonius' *Historia Reformationis* (1517–42), which contains much autobiographic matter, was published in 1715. Consult Ledderhose, *Friedrich Mykonius* (Gotha, 1854), and the biography by Meurer in his *Altväter der lutherischen Kirche* (Leipzig, 1864).

MYKONIUS, OSWALD (1488–1552). A Swiss reformer and friend of Zwingli. His real name was Oswald Geishüsler. He was born at Lucerne, studied and taught at Basel, then lived for three years (1516–19) at Zurich. After teaching at Lucerne and Einsiedeln he returned to Zurich (1523). About 1532 Mykonius became pastor at Basel, and was soon elected to succeed Œcolampadius as antistes of the district and professor of theology, a choice which met with Erasmus' disapproval. His great labor was the reform of the Swiss schools. In theology he mediated the views of Luther and Zwingli on the nature of the Lord's Supper, and finally came to a mystic interpretation of it. He wrote *De H. Zwinglii Vita et Obitu* (1532) and a commentary on Mark's Gospel (1538). Consult Hagenbach, *Oekolampad und Oswald Mykonius, die Reformatoren Basels* (Elberfeld, 1859).

MYLIT'TA. The name of a Babylonian goddess, according to Herodotus (I, 131, 199). She is identified with Aphrodite. In her honor sacred prostitution is practiced. When a stranger throws his money into the lap of the woman he has chosen, he utters a prayer that Mylitta may be with her. Mylitta is *Mulittu,* from *Mu'alliattu,* probably identical with Hebrew *meyalledeth* (midwife), and designates Ishtar (q.v.) as the goddess assisting women in childbirth. It is not a corruption of Belit, as has been often supposed. Consult: P. Jensen, *Die Kosmologie der Babylonier* (Strassburg, 1890); Zimmern, in Eberhard Schrader, *Die Keilinschriften und das Alte Testament* (3d ed., Berlin, 1902); E. S. Hartland, "Concerning the Rite at the Temple of Mylitta," in *Anthropological Essays* (Oxford, 1907).

MYLIUS-ERICHSEN, mu'lī-us-ā'rĭk-sen, LUDVIG (1872–1907). A Danish author, ethnologist, and explorer, born at Viborg. With Count Harald Moltke and K. Rasmussen (q.v.) he formed the Danish literary expedition (1902–04) to West Greenland, and in the early stages (1902) discovered near Evigheds Fiord two ice-free mountain ranges. Later the party proceeded to Cape York and for 10 months lived native fashion with the Eskimo. The return journey of the expedition to Upernivik across the ice of Melville Bay was the first sledge crossing on record. As commander of the *Danmark* expedition (1905–07) Mylius-Erichsen undertook and carried out the task—considered by many to be impossible—of exploring and charting the entire coast line of unknown northeast Greenland by three months' field work. The expedition made sledge journeys of more than 4000 miles, exceeding the record of any other single Arctic force. The main travel, excluding duplications, of Koch was some 1250 miles, and that of Mylius-Erichsen must have exceeded 1000 miles. Their explorations showed that Peary's chart of a coast trending southeast from Navy Cliff was radically incorrect. Instead, the shore ran to the northeast, adding about 100,000 square miles to Greenland and extending it about halfway from Navy Cliff—where the maps wrongly placed Greenland Sea—to Spitzbergen. Mylius-Erichsen's own exploration disclosed the nonexistence of Peary's Channel, and thus established the continuity of Greenland from Cape Farewell, 60° N., to the most northern land ever reached, 83° 39′ N. He also discovered and explored the great fiords of Denmark, Hagen, and Brönlund. Misled by existing maps, Mylius-Erichsen with Hagen and Brönlund so prolonged his journey that a return to the ship was impossible, and they perished of starvation, exhaustion, and cold. Mylius-Erichsen's observation journals, left at Denmark Fiord, were brought to Copenhagen by Ejnar Mikkelsen (q.v.) in 1912. Mylius-Erichsen wrote: *Tatere* (1898), a drama; *Vestjyder* (1900), tales; *Den jydske Hede för og nu* (1903); *Isblink* (1904), poems from Greenland; *Grönland* (1906); Report on nonexistence of Peary Channel in *Meddelelser om Grönland,* vol. xli (1913), edited by Ejnar Mikkelsen. Consult: Achton Friis, *Danmark-Expeditionen til Grönlands Nordostkyst* (1909); Greely, *True Tales of Arctic Heroism* (New York, 1912); Rasmussen, *People of the Polar North* (Philadelphia, 1908); G. C. Amdrup, *Report on the Denmark Expedition to the North-East Coast of Greenland* (Copenhagen, 1913).

MY'LODON (Neo-Lat., from MGk. *μυλόδους, mylodous,* molar, from Gk. *μύλη, mylē,* mill, millstone + *ὀδούς, odous,* tooth). A gigantic extinct edentate mammal, allied to *Megatherium* and *Megalonyx,* found in the Pleistocene deposits of North and South America. See MEGATHERIUM.

MY'NA, or MI'NA BIRD (Hind. *maina,* starling). A member of any one of several closely allied genera in the starling family Sturnidæ. The common myna (*Acridotheres tristis*) is abundant throughout the Indian region, and has been introduced into the Hawaiian Islands and elsewhere where it thrives. It is 10 inches long, has the upper parts, breast, and sides brown, head and neck black, while there is a bare patch of yellow behind the eye. The wings are bound with white, the lower parts are white, and the bill is yellow. It is a ground-living species, going in large flocks and feeding on insects. The myna has a great variety of notes, some harsh, others pleasing. The loosely built nest is placed in a hole in a house or a tree; five eggs are laid. See HILL MYNA.

MY NOVEL; OR VARIETIES IN ENGLISH LIFE. A novel by E. Bulwer-Lytton (1853). The story, told by P. Caxton, is partly of Hazeldean and partly of London. The principal hero is Harley L'Estrange, witty and brilliant, the friend of Squire Hazeldean.

MYNSTER, mun'stĕr, JACOB PETER (1775–1854). A Danish bishop, born in Copenhagen. He graduated with honors and was pastor at Spjellerup (1802–11). In essays, sermons, and treatises he declared open war on rationalism. As chaplain in Copenhagen (1811–28) he gathered large congregations and won fame. He re-

fused a professorship in Christiania and tutorship to the Crown Prince, gained the doctorate in theology (1815), and became royal confessor and pastor of the royal castle (1828). His *Betragtninger over de kristelige Troslærdomme* (1833) was very extensively read. In 1834 he was appointed Bishop of Zealand. The movement started by Grundtvig and the Christian laity for greater freedom within the Church he tried, without success, to check. Consult H. H. L. Schwanenflügel, *J. P. Mynster* (2 vols., Copenhagen, 1900–01).

MY'OCARDI'TIS (Neo-Lat., from *myocardium*, from Gk. *μῦς*, *mys*, muscle, mouse + *καρδία*, *kardia*, heart). An inflammatory affection of the wall of the heart. It is a term first used by Sobernheim in 1837. Acute myocarditis is considered as an inflammation due to infection. It is a disease secondary to typhoid fever, diphtheria, scarlet fever, cerebrospinal meningitis, variola, erysipelas, malaria, rheumatism, influenza, or septicæmia. Chronic myocarditis, an insidious affection, pathologically an "interstitial fibrosis," is due to sclerosis of the coronary arteries, which supply the heart muscle with blood. See HEART, DISEASES OF.

MY'OLEM'MA (Neo-Lat., from Gk. *μῦς*, *mys*, muscle + *λέμμα*, *lemma*, skin). See MUSCLE AND MUSCULAR TISSUE, *Striated Voluntary Muscles*.

MYOMA, mī-ō'mȧ. See TUMOR.

MY'OMANCY. See SUPERSTITION.

MY'OMOR'PHA. See RODENTIA.

MY'OPHO'RIA. A genus of important Triassic fossils, with smooth or radially sculptured shells and strong radical ridge extending backward from the beaks. There are two teeth in one and three teeth in the other valve. The genus forms a connecting series from the Permian schizodus to the highly sculptured and beautiful trigonias of the Jurassic and Cretaceous periods. See PELECYPODA.

MYOPIA, mī-ō'pī-ȧ (Neo-Lat., from Lat. *myops*, from Gk. *μύωψ*, shortsighted, from *μύειν*, *myein*, to close + *ὤψ*, *ōps*, eye). Short sight. A form of ametropia due to the fact that the anteroposterior axis of the eyeball is too long. Parallel rays of light, therefore, are not brought to a focus on the retina, but in front of it, forming circles of diffusion on the retina.

False or functional myopia may be brought about by spasm of the ciliary muscle, conical cornea, or swelling of the lens in incipient cataract. Myopia may be congenital, or may develop in weakly children from excessive application to study. Artists, engravers, students, and others using the eyes constantly for near work are often myopic. Excessive degrees of myopia are not unattended with dangers, among which may be enumerated detachment of the retina, the development of squint, vitreous opacities, changes in the choroid and retina, and serious impairment of vision, even when correcting lenses are worn. In what is termed malignant or progressive myopia the vitreous may become fluid, the lens dislocated, and the whole eyeball soft, total blindness being the ultimate result. See SIGHT, DEFECTS OF.

MY'OSIN. See GLOBULINS.

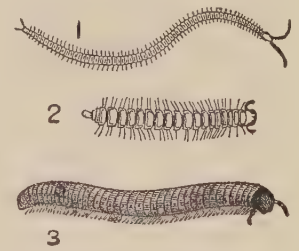
MY'OSI'TIS (from Gk. *μῦς*, *mys*, *μυός*, *myos*, muscle + *itis*). See MUSCLE, DISEASES OF.

MY'OSO'TIS. See FORGET-ME-NOT.

MY'RAND, ERNEST (1854–). A Canadian author. He was born in the city of Quebec and was educated at Quebec Seminary and at Laval University. He entered the Quebec civil service and later became an official in the department of the Provincial Secretary. In 1908 he was elected a fellow of the Royal Society of Canada, which awarded him a diploma of honor for his literary work. He published: *Une fête de Noël sous Jacques Cartier* (1888; 3d ed., 1911); *Sir William Phipps devant Québec, 1690* (1893); *M. de la Colombière, orateur* (1898); *Noëls anciens de la Nouvelle France* (1899; 2d ed., 1909); *Frontenac et ses amis* (1902); *Dialogues du pageants, représentés aux fêtes du Tricentenaire de Québec en 1908* (1908).

MYRES, mīrz, JOHN LINTON (1869–). An English classical scholar, born at Preston, Lancashire. He was educated at Winchester School and at New College, Oxford, was tutor at Christ Church (1895–1907), professor of Greek and lecturer in ancient geography at the University of Liverpool (1907–10), and then professor of ancient history at Oxford. He traveled much in Greece and Asia Minor, and in 1894 conducted excavations in Cyprus. In addition he devoted much attention to anthropological studies. His publications include: *A Catalogue of the Cyprus Museum* (1899), with Dr. Ohnefalsch-Richter; *A History of Rome* (1902); *The Dawn of History* (1911); *Metropolitan Museum of Art: Handbook of the Cesnola Collection of Antiquities from Cyprus* (1914); and papers on Mediterranean anthropology, archæology, and geography in various learned periodicals.

MYR'IAP'ODA (Neo-Lat. nom. pl., from MGk. *μυριόπους*, *myriopous*, having ten thousand feet, from Gk. *μύριοι*, *myrioi*, ten thousand + *πούς*, *pous*, foot). A class of arthropods resembling annelids in their lengthened form and in the great number of equal, or nearly equal, segments of which the body is composed, but in most of their other characters more nearly agreeing with insects, among which they were ranked by the earlier naturalists. They differ from insects and all other arthropods in the fact that the posterior segments of the body bear jointed locomotor appendages. In addition to their affinities with insects, myriapods are wormlike and some of them suggest relations with the thysanurans. They have a distinct head, but there is no distinction of the other segments, as in insects, into thorax and abdomen. They have simple or compound eyes; a few are destitute of eyes. They have antennæ like those of insects. The mouth is furnished with a complex masticating apparatus, in some resembling that of some insects in a larval state, in others similar to that of crustaceans. Respiration is carried on through minute pores or spiracles placed on each side along the entire length of the body, the air being distributed by innumerable ramifying air tubes to all parts. In most parts of their internal organization the myriapods resemble insects, although a decided inferiority is exhibited, particularly in the less perfect concentration of the nervous system. The resemblance is



FORMS OF MYRIAPODS.
1, *Geophilus*. 2, *Polydesmus*. 3, *Julus*.

greater to insects in their larval than in their perfect state. The body of the myriapods is protected by a hard chitinous covering. The number of segments is various, seldom fewer than 24, although in some of the genera they are consolidated together in pairs, so that each pair, unless closely examined, might be considered as one segment bearing two pairs of feet. The legs of some of the lower kinds, as *Julus*, are very numerous, and may be regarded as intermediate between the bristle-like appendages which serve many annelids as organs of locomotion and the distinctly articulated legs of insects. In the higher myriapods, as *Scolopendra*, the legs are much fewer, and articulated like those of insects. Some of them feed on decaying organic matter, chiefly vegetable; those of higher organization are carnivorous. The myriapods do not undergo marked metamorphoses, but the young greatly resemble the adults, although some of them are at first quite destitute of feet; and, contrary to what takes place in insects, the body becomes more elongated as maturity is approached; the number of segments and of feet increase.

Myriapods are widely distributed and are represented in almost every part of the earth. They flourish in moist and dry, hot and cold climates. Like other widely distributed animals, they show great variation in size and color, ranging from microscopic size to a length of more than 6 inches. Some of the Julidæ and Polydesmidæ of the tropics are beautifully and brilliantly colored. Some of the species of *Geophilus* are phosphorescent. Most myriapods inhabit dark and obscure places. Some of the cave-inhabiting species from Wyandotte and Bradford caves in Indiana are described by Packard as light in color, and those from the latter cave have rudimentary eyes. The organs of defense throughout the class vary greatly. In the centipedes the large claws, supplied with poison from a gland, are weapons of offense and defense. The millipedes, on the other hand, rely for defense on an acid secretion from certain glands. Other forms are hairy or bristly. Hairiness was the most common mode of defense among fossil myriapods.

A fossil bristled myriapod has been found in America in Paleozoic strata, and two species have been found in the Old Red Sandstone of Scotland. The highest vetebrates in this deposit are fishes, and the highest plants are conifers. The Paleozoic species, about 40 in number, all belong to an extinct order (Archipolypoda), and most of them were of gigantic size. Later fossil myriapods, contemporaneous with giant fossil Amphibia, occur in the coal measures. One of these forms from Illinois approaches very closely the Julidæ of to-day. Only one species has been found in the chalk layers, but in Tertiary and recent times plentiful remains have been found. The majority of these belong to the Chilognatha and Chilopoda. They have been found in the gypsum of France, in the brown coal of Germany, and in the Green River formation of North America. Amber has also yielded several species.

Classification. The class Myriapoda is now divided into five orders, the Chilognatha or Diplopoda, the Chilopoda or Syngnatha, the Schizotarsia, the Symphyla, and the Pauropoda. To the Chilopoda belong the common thousand-legs of the family Julidæ, as well as the representatives of seven other families, all of which bear two pairs of legs to each of the body segments except the first three. Verloef states that the males of some of the Julidæ undergo certain seasonal changes. In the spring and autumn the form of the legs and other organs changes. These seasonal changes are correlated with the sexual condition of the *Julus*, just as the males of certain birds and fishes show a brighter coloration and other changes at the breeding season. *Julus* will feed freely in captivity if the earth is kept at the proper moisture and proper food is furnished plentifully. They will thrive on grass, leaves, and bits of apple and pear. The eggs are numerous, from 60 to 100 being deposited at a laying. The female forms a receptacle for the eggs some distance below the surface of the ground. It is in the shape of a hollow sphere and is composed of little pellets of mud, which are molded by her jaws and front legs. The nest is perfectly smooth within, but the outside is rough and shows the pellet composition. In the top of the sphere a small opening is left until the eggs are laid. The hole is then plugged up with earth and the eggs are left to chance. The chilopods have many-jointed antennæ and only one pair of legs to each joint. To this group belong the large tropical centipedes of the family Scolopendridæ and the long slender Geophilidæ, as well as the Lithobilidæ and Notophilidæ.

The order Schizotarsia contains but a single family, the Scutigeridæ, of which the common household centipede of the United States (*Scutigera forceps*) is a familiar example. This creature, although viewed with horror by careful housekeepers, preys upon house flies and small cockroaches, and is by no means an entirely undesirable denizen of households. It is prevalent in the Southern States, and extends as far north as the Hudson River Valley. The order Symphyla contains the single family Scolopendrellidæ, which have a great resemblance to certain of the Thysanura among the insects. The order Pauropoda consists of the single family Pauropodidæ, which contains only three genera. The type genus, *Pauropus*, a curious crustacean-like form, was first discovered by Lord Avebury (Sir John Lubbock) in his kitchen garden in 1866.

Consult: S. H. Scudder, "Systematic Review of our Present Knowledge of Fossil Insects, Including Myriapods and Arachnids," in *United States Geological Survey, Bulletin No. 31* (Washington, 1886); C. H. Bollman, "Myriapoda of North America," in *United States National Museum, Bulletin No. 46* (ib., 1893); F. G. Sinclair, in *Cambridge Natural History*, vol. v (London, 1895). See CENTIPEDE.

MYRICA, mĭ-rī'kȧ. A genus of Asiatic and North American shrubs. See CANDLEBERRY.

MYRI'NA. The name of an ancient city on the island of Lemnos (q.v.).

MYRIS'TIC ACID (from Neo-Lat. *Myristica*, from Gk. *μυριστικός*, *myristikos*, suitable for anointing, from *μυρίζειν*, *myrizein*, to anoint, from *μύρον*, *myron*, unguent). A saturated crystalline fatty acid, $C_{13}H_{27}.COOH$, found in nutmeg, the seed of *Myristica fragrans*, growing on the Molucca Islands and cultivated in tropical countries. It occurs in the form of a glyceride in the fat of the nutmeg, or nutmeg butter. It has also been found in small quantity among the products of the saponification of spermaceti and of the fatty matter of milk, and hence this organic acid is one of those which are common to both the animal and vegetable kingdoms.

MYR'MECO'CHORY (from Gk. *μύρμηξ, myrmēx*, ant + *χωρέω, chōreō*, I wander). A type of plant distribution in which the seeds or fruit are conveyed by ants. It was formerly supposed that the ants mistook the seeds for their own pupa and hence conveyed them to their nests. Further investigation has shown that certain oil bodies or elaiosomes attract the ants and are used by them for food. More than 150 species of European plants are known to have seeds possessing these bodies, and hence transported by ants. The record distance of transportation seems to be 20 to 70 meters, and a single colony of ants will convey many thousand seeds during the season.

MYR'MECOPH'ILY. See MYRMECOPHYTES.

MYRMECOPHYTES, mēr'mē-kŏ-fīts (from Gk. *μύρμηξ, myrmēx*, ant + *φυτόν, phyton*, plant), or MYRMECOPHILOUS PLANTS. Plants in which there are symbiotic relations between the plants and ants. Typical myrmecophytes are most commonly found in the tropics, and present peculiarities that are hard to explain in a purely scientific way. In some cases ants cut off leaves, take them to their nests, and raise crops of fungi that serve them as food. In other cases, as in the famous South American Cecropia, ants live in peculiar chambers within the plant, and feed upon products that appear to be useless so far as any other purpose is concerned. They appear, on the other hand, to defend the plants in which they dwell against leaf-cutting ants and other enemies. The relation here outlined is one of the most remarkable known types of symbiosis. The terms "myrmecophily" and "myrmecophilous" should be discarded for "myrmecophytism" and "myrmecophytic." See CECROPIA; MYRMECOCHORY; SYMBIOSIS.

MYRMID'ONES (Lat., from Gk. Μυρμιδόνες). In the *Iliad*, the Achæans of Phthiotis, in the south of Thessaly, ruled by King Peleus and led to the Trojan War by his son Achilles. Later writers discovered an eponymous hero, Myrmidon, son of Zeus and Eurymedusa and father of Actor, the husband of Ægina, daughter of Asopus, who was by Zeus the mother of Æacus. For Æacus Zeus changed the ants (*μύρμηκες, myrmēkes*) on the island of Ægina to men, when its people had died of a plague, and this race later wandered to Thessaly. The story is evidently due to the resemblance which the Greeks saw between the words "Myrmidones" and "myrmekes." Modern scholars have thought that the Myrmidones went from Thessaly to Ægina.

MYROB'ALAN (Lat. *myrobalanum*, from Gk. *μυροβάλανος, myrobalanos*, from *μύρον, myron*, unguent + *βάλανος, balanos*, acorn). The astringent fruit of certain species of Terminalia (family Combretaceæ), natives of the mountains of India. *Terminalia belerica* and *Terminalia chebula* produce most of the myrobalans of commerce, but the fruits of other species often appear. Formerly myrobalans were credited with tonic properties; now they are rarely used medicinally. They are largely exported for tanners' and dyers' use, since they give a durable yellow with alum and an excellent black with iron. A number of species are valuable for timber, the best known of which, *Terminalia catappa*, is a large deciduous tree planted in many tropical countries. It is a popular shade tree in Honolulu, where it is called Mexican almond from the almond-like flavor of the nuts.

MY'RON (Lat., from Gk. Μύρων). An Athenian sculptor, who flourished about the middle of the fifth century B.C. He was a native of Eleutheræ, near the Bœotian frontier of Attica, and is called a pupil of Hagelaïdas of Argos. In his style he belongs in the period of transition just before Phidias, but his works show also a remarkable power of observation and great technical skill. He was a worker primarily in bronze, and also skilled in the engraving of plate. No original work of his has survived, but late copies of some of his statues are extant. Of these the most famous is the Discobolus (q.v.), or discus thrower, of which there are specimens in the Vatican and the British Museum, though the best copy is in the Palazzo Lancellotti in Rome. (See illustration under GREEK ART.) Another work was a group on the Acropolis of Athens showing Marsyas preparing to pick up the flutes thrown away by Athena, but starting back at the approach of the goddess. A copy of the Marsyas is in the Lateran Museum in Rome. In antiquity a bronze cow on the Acropolis, made by Myron, was especially famed for its truth to nature. Many epigrams on his statue of the runner Ladas (q.v.) have also come down to us. Consult: Adolf Furtwängler, *Masterpieces of Greek Sculpture*, English translation by E. Sellers (New York, 1895); E. A. Gardner, *Six Greek Sculptors* (London, 1910); id., *A Handbook of Greek Sculpture* (ib., 1911); R. B. Richardson, *A History of Greek Sculpture* (New York, 1911); H. H. Powers, *The Message of Greek Art* (ib., 1913).

MYROSIN, mīr'ŏ-sĭn. See DIGESTION IN PLANTS; ENZYME.

MYRRH, mûr. An umbelliferous plant. See CICELY.

MYRRH (AS. *myrre, myrra*, from Lat. *myrrha, murrha, murra*, from Gk. *μύρρα, myrrha*, myrrh, from Aram. *mūrā*, Heb. *mōr*, Ar. *murr*, myrrh, from Aram. *mārr*, Heb. *mārar*, Ar. *marra*, to be bitter). A gum resin produced by *Balsamodendron myrrha*, a tree of the natural order Amyridaceæ, growing in Arabia and in eastern Africa. The myrrh tree is small and scrubby, spiny, with whitish-gray bark, thinly scattered small leaves consisting of three obovate obtusely toothleted leaflets, and the fruit a smooth brown ovate drupe, somewhat larger than a pea. Myrrh exudes from the bark in oily yellowish drops, which gradually thicken and finally become hard, the color at the same time becoming darker. Myrrh appears in commerce either in tears and grains or in pieces of irregular form and various sizes, yellow, red, or reddish brown. It is brittle and has a waxy fracture, often exhibiting whitish veins. Its smell is balsamic, its taste aromatic and bitter. Myrrh and frankincense were commonly used by the ancients for fumigation. Myrrh is used in medicine as a tonic and stimulant, in disorders of the digestive organs, excessive secretions from the mucous membranes, etc., also to cleanse foul ulcers and promote their healing, and as a mouth wash and gargle, particularly in a spongy or ulcerated condition of the gums. The best myrrh is known as Turkey myrrh, being brought from Turkish ports. Most of the myrrh of commerce, however, passes either through Aden or through Bombay. The chief constituents of myrrh are a resin known as myrrhin, a gum, a volatile oil known as myrrhol and having the composition $C_{10}H_{14}O$, and a bitter principle. See GUMS.

MYRTA'CEÆ (Neo-Lat. nom. pl., from Lat.

myrtus, Gk. *μύρτος*, *myrtos*, myrtle, from Pers. *mūrd*, myrtle), or MYRTLE FAMILY. A family of dicotyledonous trees and shrubs. It is one of the large families of the order Myrtales, which with Umbellales culminates the dicotyledonous series called Archichlamydeæ. The whole order is characterized by perigynous or epigynous flowers and a strong tendency to develop four-parted flowers. The Myrtaceæ include about 80 genera and 2800 species, well distributed through the tropics, but especially developed in South America and Australasia. Some of the species are gigantic trees, as the *Eucalyptus* or gum trees of Australia and certain species of *Metrosideros*. The timber is generally compact. Astringency seems to be characteristic of the family, and the leaves or other parts of some species are used in medicine for this property. A fragrant or pungent volatile oil is often present in considerable quantity, of which oil of cajeput and oil of cloves are examples. Cloves and pimento are among the best-known products of this family. The berries of several species are occasionally used as spices. A considerable number yield edible fruits, among which are the guava, species of the genus *Eugenia*, and some species of *Myrtus*. A remarkable pairing of genera occurs between South America and Australia, each continent having its own genera, many of them comprising hundreds of species. For example, *Eucalyptus* (200 species) and *Melaleuca* (100 species) belong to the Australasian region, while *Myrcia* (500 species) belongs to the American tropics. The largest genera with a general distribution are *Eugenia* (760 species) and *Myrtus* (100 species).

MYRTILUS, mĕr′tĭ-lŭs. See HIPPODAMIA; ŒNOMAUS; PELOPS.

MYR′TLE (*Myrtus*). A genus of plants of the family Myrtaceæ. The common myrtle (*Myrtus communis*) is well known as a beautiful evergreen shrub, or a tree of moderate size, with white flowers. It is a native of the Mediterranean region and of the temperate parts of Asia. The leaves are astringent and aromatic, contain a volatile oil, and were used as a stimulant by the ancients. The berries are also aromatic, and are used in medicine in Greece and in India. A myrtle wine, called myrtidanum, is made in Tuscany. Myrtle bark is used for tanning in many parts of the south of Europe. Among the ancient Greeks the myrtle was sacred to Venus as the symbol of youth and beauty, and was much used in the festivals. It is often mentioned in poetry. The small-leaved myrtle (*Myrtus microphylla*) of Peru has red berries of the size of a pea, of a pleasant flavor and sugary sweetness. Those of the luma (*Myrtus luma*) are also palatable, and are eaten in Chile, as are those of *Myrtus ugni*, the Chilean guava, which is said to become a large tree with very hard and useful wood. These species have all been successfully grown in California as outdoor ornamental shrubs.

COMMON MYRTLE (*Myrtus communis*).

MYRTLE BIRD. The American yellow-rumped warbler (*Dendroica coronata*). It is about 5¾ inches long, bluish ash above, streaked with black; white below, with a black patch on the breast; crown, rump, and sides bright yellow, and the throat white. It is one of the most numerous and earliest of spring migrants in the United States, and scatters all over the country, but passes on to the north, and few breed south of the latitude of Lake Ontario. The name refers to the prevalence of this warbler in the Southern States in winter, where they feed on berries, especially those of the wax myrtle (*Myrica cerifera*). From the Rocky Mountains to the Pacific coast a very similar species (differing mainly in having the throat yellow) takes the place of the Eastern form; it is known as Audubon's warbler (*Dendroica audubonı*).

MYRTLE FAMILY. A popular name for the family Myrtaceæ (q.v.).

MYSIA, mĭsh′ĭ-ȧ (Lat., from Gk. *Μυσία*). In ancient geography, a district in the northwestern part of Asia Minor, bounded on the north by the Hellespont and the Propontis, on the east by Bithynia and Phrygia, on the south by Lydia, and on the west by the Ægean (Map: Greece, Ancient, E, F 2). Strictly, Mysia was the southeast part of this district. The principal rivers were the Granicus, Scamander, Caïcus, Æsepus, and Rhyndacus. The surface is mountainous in the interior, partly table-land; among the mountains are Ida in the west and Olympus in the north and east. The inhabitants were thought by some ancient writers to be of Thracian, and by others of Lydian, descent; probably there were immigrations from both countries. Mysia was subject to the Lydian monarchy, and under the Persian dominion formed, together with Lydia, one of the satrapies created by Darius. After the death of Alexander the Great it shared in the vicissitudes of Asia Minor during the wars of his successors and the Gallic invasion, but first assumed prominence in history with the rise in the third century B.C. of the Kingdom of Pergamum (q.v.). After 130 B.C. Mysia became part of the Roman province of Asia.

MYSLOWITZ, mĭs′lō-vĭts. A frontier town in the Province of Silesia, Prussia, on the Przemsa, 110 miles southeast of Breslau (Map: Prussia, H 3). It is at the point where the boundaries of Poland, Galician Austria, and Prussia meet. Coal mining, zinc refining, flax spinning, and brickmaking are its principal industries. Pop., 1900, 13,365; 1910, 17,838.

MYSOPHOBIA, mī′sō-fō′bĭ-ȧ. See INSANITY, *Borderland and Episodic States*.

MYSORE, mī-sōr′, or **MAISUR**, mī-sōōr′. One of the most important of the native states of India. It lies between lat. 11° 36′ and 15° 2′ N. and long. 74° 38′ and 78° 36′ E. (Map: India, C 7). Mysore is surrounded by British territory, almost all of which is the Madras Presidency; a portion of the southwest frontier is contiguous with Coorg and of the northwest with the Bombay Presidency. Its area is 29,475 square miles, being thus nearly as large as South Carolina and a little larger than the combined area of Vermont, New Hampshire, Massachusetts, and Rhode Island. The state lies between the Eastern and Western Ghat ranges in the form of a triangle, with the apex at the south in the group of the Nilgiris. It

is an undulating table-land, much broken by chains of rocky hills. The general elevation is about 2000 feet in the north and the south and about 3000 feet at the central water-parting which separates the Kistna and Cauvery basins. Most of the streams, none of which is navigable in Mysore, ultimately reach the Bay of Bengal. The state is naturally divided into two distinct regions—the hill country (Malnad) in the west and the larger, more open country (Maidan) in the east. The Malnad is a picturesque region of mountain and forest; the Maidan is better adapted to agriculture and more populous. Notable are the numerous isolated peaks, called *droogs*, which reach 4000 or 5000 feet. The highest point in Mysore is Mulainagiri (6317 feet), in the west, somewhat north of lat. 13°, in the Baba Bubans. There are three seasons—the rainy, from early June, with some interval in August and September, to mid-November; the cold, which is usually rainless, from mid-November to the end of February; and the hot, which is marked by occasional welcome thunderstorms, from March to the end of May. At Bangalore the temperature range in the rainy season is 64° to 84°; in the cold season, 51° to 80°; in the hot season, 66° to 91° or sometimes 96°. The annual rainfall varies from as little as 19 inches in the north central part of the state to as much as 360 inches on the crest of the Western Ghats.

An extensive system of irrigation is maintained by damming the streams so as to form reservoirs (tanks), from which the water is conducted in artificial channels. These tanks, varying from the size of a small pond to that of a large lake, number nearly 30,000. In general, however, the success of agriculture depends upon rainfall rather than impounded waters. Over 35 per cent of the total area is under cultivation, and less than one-sixth of the cultivated area is irrigated. By far the largest crop is raggee; this crop and rice and other food grains and pulses constitute the great bulk of agricultural produce. Other crops of importance are oil seeds, coffee, cotton, and sugar cane. About 66 per cent of the population is dependent upon agriculture.

The only mining of importance is that of gold. Upwards of 95 per cent of India's gold output is yielded by Mysore. In 1903 the output of the state was 598,769 ounces, valued at £2,283,999; in 1912, 561,065 ounces, £2,158,362. Gold is found chiefly in the Kolar district, in the extreme eastern part of the state. The manufactures include cottons, silks, carpets, ornaments of gold and silver, articles of copper and brass, pottery, articles in carved sandalwood, vegetable oil, leather, etc. A system of railways radiates from Bangalore; the length of railway open to traffic in Mysore is about 500 miles.

The population of Mysore, according to the census of March 10, 1911, was 5,806,193 (2,934,621 males, 2,871,572 females), showing an increase of 4.8 per cent over 1901. In 1871 the population was 5,055,102; in 1881, 4,186,188, the decrease being due largely to the great famine of 1876–78; in 1891, 4,943,604 (18.1 per cent increase); in 1901, 5,539,399 (increase 12.1 per cent). About three-fourths of the people speak Kanarese; about 15 per cent speak Telugu, chiefly in the Kolar district; about 4 per cent speak Tamil, which predominates at the Kolar gold fields; about 5 per cent speak Hindustani. In 1911 the unmarried numbered 1,597,180 males and 1,106,337 females; married, 1,197,404 and 1,205,726; widowed, 140,037 and 559,509. In respect of religion, the Hindus, of whom there are 72 castes, are vastly preponderant; the Lingayats constitute the strongest Hindu sect. In 1911 Hindus numbered 5,340,973; Mohammedans, 314,494; Christians, 59,844; Jains, 17,630; animists, 72,196. In 1901 Christians numbered 50,059. Of the Christians in 1911, 4902 males and 2561 females were of European race, 2673 and 3154 Eurasian, and 24,278 and 22,276 native; Roman Catholics numbered 42,543; Anglicans, 6656; Methodists, 3825; Baptists, 1269; and Presbyterians 1141. Of the total population, persons literate numbered 364,998 (328,816 males, 36,182 females), of whom persons literate in English were 40,641 (34,469 males, 6172 females). Since 1908 primary education has been gratuitous. In 1912 there were 2567 public schools and colleges and 1911 private schools, with a total enrollment of about 124,000 males and 25,000 females. A little over one-eighth of the population is urban. The largest cities are Bangalore and Mysore. Bangalore, including the adjoining British civil and military station, had, in 1901, 159,046 inhabitants, a decline, due chiefly to plague, of 11.8 per cent from 1891; in 1911, 189,485, an increase of 19.1 per cent. Bangalore City had in 1911 88,651 inhabitants (increase 27.7 per cent), and the civil and military station 100,834 (increase 12.5 per cent). The population of Mysore City was 68,111 in 1901 and 71,306 in 1911. Other large towns are Kolar, Tumkur, Channapatna, Davangere, and Tarikere.

The ruler of Mysore is the maharajah, in whose name and subject to whose sanction the administration is carried on by the divan, or Prime Minister, assisted by two councilors. The dynastic capital is Mysore City, but the higher offices of state are at Bangalore. The maharajah resides for a part of the year at each of these places. In 1907 a legislative council was formed, consisting of from 13 to 18 members. A representative assembly, elected by leading merchants, ryots, and local bodies, meets annually at Mysore for discussion and suggestion; it has no legislative powers. There is a chief court of justice consisting of three judges. The state comprises eight administrative districts (Bangalore, Kolar, Tumkur, Mysore, Hassan, Kadur, Shimoga, and Chitaldroog), each in charge of a deputy commissioner. The government of India is represented by a Resident. Revenue is derived chiefly from land tax, excise, forests, and mining leases.

History. Frequently mentioned in Hindu literature under the rule of various dynasties, the territory was merged with the Ballala Kingdom of Delhi after the Mohammedan invasion of the fourteenth century. After the overthrow of the Ballala rule by Ala ud Din, a new state arose, including Mysore and part of the Carnatic, with Vijayanagar as capital. In 1565 its ruler, Rajah Ram, was defeated and killed at the battle of Talikota by a Moslem confederation, and the state again became divided under the rule of several minor chiefs. One of these, Rajah Wodeyar, captured Seringapatam in 1610, and his successors strengthened their rule until, at the close of the seventeenth century, their sovereignty extended throughout Mysore. This dynasty was supplanted in the eighteenth century by Hyder Ali (q.v.), the formidable foe

to the rising British power in India. By the defeat and death of his son Tipu, Sultan at Seringapatam, in 1799, the state came under British control. Part of the territory was annexed to India, and a descendant of Wodeyar was appointed to rule over the remainder. Owing to misrule, the British took charge of the administration from 1831 to 1881.

Consult: Census Commission of India, *Census of India*, 1891, vol. xxv; 1903, vol. xxiv (Bangalore, 1893–1904); R. H. Elliot, *Gold, Sport, and Coffee Planting in Mysore* (London, 1894); Sir Roper Lethbridge, in *Imperial and Asiatic Quarterly Review, Third Series*, vols. xvii, xxiii (ib., 1904–07).

MYSORE, or **MAISUR** (buffalo town). The dynastic capital of Mysore state, India, and headquarters of Mysore district, in the southern part of the state and on the Mysore State Railway in lat. 12° 18′ N. and long. 76° 40′ E. (Map: India, C 7). It is situated in a valley at the northwest base of the temple-crowned Chamundi Hill, which rises 3489 feet above the sea. Formerly the old parts of the city were crowded and unsanitary, but conditions have been greatly ameliorated under the special improvement board formed in 1903. In recent years large extensions have been made to the north and west, increasing the area of the city from about 3 square miles to about 7½ square miles. In the new quarter have been erected many fine public buildings. In the wooded grounds of Gordon Park, on the high ground to the west, are the public offices, surmounted by a dome. In the vicinity are the Maharajah's College, the law courts, and the Victoria Jubilee Institute. The nucleus of the city is the fort, which is quadrangular, three of its sides being about 450 yards long and the remaining or south side somewhat longer. The chief of the numerous buildings within the fort is the maharajah's palace. As the old palace was partially destroyed by fire in 1897, it was decided to build a new palace of more modern design on the same site. The new palace is a decorative structure, embellished with porphyries and other ornamental stones and exhibiting interesting stone carvings done after the manner of the ancient sculptured temples of the region. The leading industry of Mysore is the manufacture of carpets. In 1891 the population was 74,048; in 1901, 68,111 (the decrease, due largely to plague, being 8 per cent); in 1911, 71,306 (increase 4.7 per cent).

Mysore is a place of great antiquity, having given its name to the surrounding country in the third century B.C., but few of the buildings existing to-day are more than one hundred years old. The original fort is said to have been constructed in 1524. Mysore was the ancestral capital of the state, but was superseded in 1610 by Seringapatam (10 miles to the northeast), which remained the seat of the court till the downfall of Tipu Sultan in 1799. Tipu had demolished the fort and palace, which were rebuilt upon the restoration of the Hindu rajah, and the court was removed to Mysore. The principal offices of state are at Bangalore, where the maharajah resides during part of the year.

MYSTACOCETI, mĭs′tā-kō-sē′tī. See CETACEA.

MYSTAGOGUE, mĭs′tā-gŏg (Lat. *mystagogus*, from Gk. *μυσταγωγός*, one who introduces into mysteries, from *μύστης*, *mystēs*, initiate, from *μυεῖν*, *myein*, to initiate, itself derived from *μύειν*, to close the eyes (or lips) + *ἀγωγός*, *agōgos*, leader, from *ἄγειν*, *agein*, to lead). In the Greek religious system, the functionary who directed the preparations of the candidates for initiation in the mysteries (q.v.). He had himself passed through all the grades of initiation, and was probably under the cognizance of the state. Prior to presenting himself for initiation, each votary had to place himself under the guidance of one of these mystagogues, and received instruction from him as to the various purifications and ceremonies to be performed. The mystagogue passed upon the fitness or unfitness of the applicant to receive the rites. In the Christian writers the term is used of the priest who prepared candidates for the sacraments of baptism, confirmation, and the Eucharist.

MYS′TERIES (Lat. *mysterium*, from Gk. *μυστήριον*, *mystērion*, from *μύστης*, *mystēs*, initiate; cf. MYSTAGOGUE). Secret rites connected with the Greek religion. They have been divided into two groups: (1) those in which the participants were a small circle of priests, officially connected with the sanctuary, and (2) those in which the participants were numerous. For a long time the view was prevalent that the mysteries concealed deep truths and the remnants of a primitive revelation too profound for the popular mind. The chief representative of this doctrine was G. F. Creuzer in his *Symbolik und Mythologie der alten Völker* (4 vols., Leipzig and Darmstadt, 1836–43). The deathblow to these theories, so far as critical scholarship was concerned, came from Lobeck, who in his *Aglaophamus* (Königsberg, 1829) showed that such occult wisdom was no part of their teaching. The most celebrated and reverenced were the Eleusinian mysteries, connected with the worship of Demeter (see CERES) and Cora (or Persephone) at Eleusis (q.v.) in Attica. (See ELEUSINIAN MYSTERIES.) With these goddesses there appear in the Eleusinian cult an anonymous god and goddess (*θεός*, *theos*, and *θεά*, *thea*), Pluto, Iacchus, Triptolemus, and Eubuleus, whose connection with the worship is by no means clear. The rites and legends connected with this cult are very similar to those prevailing not long ago among the European peasants, and point clearly to a similar belief in a grain spirit, which dies and is reborn yearly. So far as can be judged, the Eleusinian mysteries consisted largely in the rehearsal before the initiated (*μύσται*, *mystai*) of a sort of miracle play, or ritual drama, in which the rape of Cora, the sufferings of Demeter, and the final reunion of mother and daughter, together with the bestowal of the art of agriculture on man by Demeter, were represented in dramatic form. The initiation seems to have symbolized the redemption of the soul from the powers of the lower world and its reception by the goddess as pure. So far as can be learned from literature and art, the candidate was purified by a sacrifice which he himself brought, and, after fasting and preparation, wandered through a series of dark and confused passages, beset by terrifying sights and sounds, but emerging at last into the light, where he saw the goddesses. We know that candidates had to be initiated first into the Lesser Mysteries at Agræ, near Athens, six months before the ceremonies at Eleusis. The term "Mystæ" seems to include all the initiates, while those who

had been fully received are sometimes called *ἐπόπται, epoptai* (those who see). As to the public ceremonial we are better informed. The Lesser Mysteries were celebrated in the month Anthesterion (approximately February). They were accompanied, like the Greater Mysteries, by a sacred truce. The Greater Mysteries were celebrated in Boëdromion (approximately September) at Eleusis, though there was much preliminary ritual at Athens. On the 14th certain sacred relics (*τὰ ἱερά, ta hiera*) were brought from Eleusis to Athens and deposited in the Eleusinia; the next day seems to have been given to the gathering of the celebrants; on the 16th the Mystæ went in procession to the beach at Phalerum for solemn purification in the salt water; the 17th and 18th were filled with offerings and ceremonies at various sanctuaries in Athens; on the 19th, early in the day, the sacred procession escorted the image of Iacchus and the sacred relics to Eleusis. At the bridge over the Cephissus jests and gibes were exchanged, and it was evening (hence the 20th in Greek reckoning) when they arrived at the great sanctuary. The following nights and days were given up to the performance of the sacred ritual and the ceremonies of initiation, which certainly made a strong impression on the spectators. On the 23d the ceremonies closed with a solemn pouring out of water from two earthen jars towards the east and west. It is certain that no dogmatic teaching formed part of the Eleusinian worship; it is equally certain that those who were fully initiated into the mysteries had a stronger hope than others of a real life beyond the grave, and that in this further life they would enjoy the favor of Ceres. The chief officials connected with this sanctuary were the Hierophant (q.v.), who was always from the Eleusinian family of the Eumolpidæ, and from the family of the Kerykes the Dadouchos or torchbearer, the Hierokeryx or herald, and the priest at the altar. In connection with the celebration a sacred truce, extending from the full moon of the previous month to the tenth day of the following, was proclaimed so that the Mystæ could travel in security. Initiation was open to all ages and conditions, including even slaves, provided they were Hellenes (or later Romans) and were free from any great crime. Eleusinian mysteries were celebrated on a smaller scale at Phlius, Megalopolis, and elsewhere, while at Andania in Messenia they appear in combination with the Samothracian worship of the Cabeiri (q.v.).

Bibliography. C. A. Lobeck, *Aglaophamus* (2 vols., Königsberg, 1829), especially valuable for its collection of Greek and Roman passages bearing on the mysteries; Strube, *Bilderkreis von Eleusis* (Leipzig, 1870–72); Nebe, *De Mysteriorum Eleusiniorum Tempore et Administratione Publica* (Halle, 1886); Andrew Lang, *Myth, Ritual, and Religion* (London, 1887); E. A. Gardner, *New Chapters in Greek History* (ib., 1892); Theodor Mommsen, *Feste der Stadt Athen* (Leipzig, 1898); Foucart, *Recherches sur l'origine et la nature des mystères d'Eleusis* (Paris, 1895); id., *Les grands mystères d'Eleusis* (ib., 1900), very valuable, though the author's theory of the Egyptian origin of the mysteries is not generally accepted; L. R. Farnell, *Cults of the Greek States*, vol. iii (Oxford, 1906); T. G. Tucker, edition of the *Frogs* of Aristophanes (London, 1906); Arthur Fairbanks, *A Handbook of Greek Religion* (New York, 1910); J. E. Harrison, *Prolegomena to the Study of Greek Religion* (3d ed., Cambridge, 1908); and the works cited under Eleusis.

Next to the Eleusinian the most prominent were the Samothracian mysteries of the Cabeiri (q.v.). Originally these seem to have been two in number, though later we find two goddesses added, and the four, Axieros, Axiokersa, Axiokersos, and Kasmilos, were identified by the grammarians with Demeter, Persephone, Hades, and Hermes. The rites were believed to afford protection against the perils of the sea, and were doubtless in early times largely confined to seamen. Consult Conze, *Archäologische Untersuchungen auf Samothrake* (Vienna, 1875–80), and Preller-Robert, *Griechische Mythologie*, i. 2 (Berlin, 1894).

Another sanctuary of the Cabeiri lay near Thebes, where we find the deities worshiped as Cabiros and Pais (boy). The objects found seem to indicate that these mysteries were orgiastic in character. Consult *Athenische Mittheilungen des deutschen archäologischen Instituts*, vol. xiii and xv (Athens, 1888–90).

In the course of time other mysteries, such as those of Isis, Sabazios, Mithras, and other Oriental deities, spread through the Greek world, and at all times there were private sects, like the followers of Orpheus (q.v.), who professed to possess secret teachings which could insure peace and happiness in the other world to those who followed their directions here.

On the general subject of the mysteries, consult, in addition to the books named above: Petersen, *Der geheime Gottesdienst bei den Griechen* (Hamburg, 1848); Aurich, *Das antike Mysterienwesen in seinem Einfluss auf das Christentum* (Göttingen, 1894); Rohde, *Psyche* (3d ed., Leipzig, 1902); O. Gruppe, *Griechische Mythologie und Religionsgeschichte* (2 vols., Munich, 1906); W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. ii (Leipzig, 1890–97).

MYSTERIES OF UDOLPHO. A novel by Mrs. Ann Radcliffe (1794). This once popular romance tells of the castle of Udolpho in the Apennines, where terrific scenes of horror occur.

MYSTERY. The name given to a very early type of the mediæval drama, founded upon some part of the Bible narrative concerned with a mysterious subject, such as the incarnation or the resurrection, and in England often used indiscriminately with that of miracle play (q.v.). The traditions of the ancient drama survived to some extent the fall of the Western Empire, and on them were modeled religious plays, intended less for acting than for reading. There is extant a Greek play entitled *Χριστὸς Πάσχων* (The Passion of Christ), long attributed to St. Gregory Nazianzen, but now thought to be of much later date, which follows the structure of the ancient Greek drama. In the second half of the tenth century Hroswitha or Roswitha (q.v.), a Benedictine nun of Gandersheim in Saxony, wishing to provide her sisters with a substitute for Terence, who was widely read by the learned throughout the Middle Ages, cast six martyrdoms in the form of the old Latin comedy. Through imitations of this kind the classic drama may be said to have continued to exert some influence as late as 1200. But the main impetus to a revival of popular dramatic literature came from the Church. The clergy wished to provide some means of making the great events on which their teaching was

based more vivid and real to their unlettered flocks. This was the more natural because the service of the Church was in its very nature dramatic. Its chief act of worship was, in no abstruse sense, a representation of the sacrifice of Christ, and both the symbolism of the ritual and the responsive nature of the liturgy shared the same character. Especially at the great festivals of Christmas and Easter it was customary to make it still more dramatic by representing the events then commemorated as actually taking place before the congregation. Traces of this procedure are found as early as the closing years of the tenth century. The words used, the directions to the performers, hymns and anthems, were at first in Latin, but as dialogue was introduced they were naturally turned into the vernacular. In the thirteenth century, in fact, mysteries and miracle plays lost the favor of the Church. Having never been a part of the ritual they were gradually, for many reasons, banished from sacred buildings, and the clergy were forbidden to take part in them. They passed first to the churchyard and then to the streets and public squares, where they were performed on movable stages drawn from place to place. Performances of them were given also at court and in the houses of nobles. The actors in England were frequently members of the trade guilds, who arranged for these performances at Christmas, Easter, and Corpus Christi, supplemented by strolling players. In France they came under the control of the *Confréries de la Passion*, which were established in many of the leading towns—societies half religious, half literary, and wholly secularized by the fourteenth century. The plays devoted to the exposition of special mysteries were combined, in England at least, in an immense cycle, covering the entire range of the scriptural narrative from the Creation to the Day of Judgment. In texts belonging to the fourteenth, fifteenth, and sixteenth centuries four of these cycles, more or less complete, have come down to us. They are the York cycle (48 plays), the Towneley (32 plays), the Chester (25 plays), and the Coventry (42 plays); of other cycles there are fragments. The mystery plays died slowly as the regular drama came into existence. As late as 1580, we hear of one being represented at Coventry. The English actor-manager, Ben Greet, produced one of the fourteenth-century plays, *Everyman*—rather a morality than a mystery play, however—in England in 1903, and the following year in the United States.

Bibliography. For both mysteries and miracle plays: Wright, *Early Mysteries* (London, 1838); A. D'Ancona, *Sacre rappresentazioni dei secoli 14–16* (Florence, 1862); Louis Petit de Julleville, "Les mystères," in *Histoire du théâtre de France* (2 vols., Paris, 1886); F. H. Stoddard, *References for Students of Miracle Plays and Mysteries* (Berkeley, Cal., 1887), a classified list; Charles Davidson, *Studies in the English Mystery Play* (New Haven, 1892); K. L. Bates, *The English Religious Drama* (New York, 1893); J. A. A. J. Jusserand, *Literary History of the English People* (ib., 1895); J. M. Manly, *Specimens of the Pre-Shakespearean Drama* (Boston, 1897), arranged so as to show development; A. W. Ward, *History of English Dramatic Literature* (3 vols., New York, 1899); E. H. Moore, *English Miracle Plays and Moralities* (London, 1907); C. M. Gayley, *Plays of our Forefathers* (New York, 1907); A. W. Pollard (ed.), *English Miracle Plays, Moralities, and Interludes* (5th ed., Oxford, 1909); S. B. Hemingway (ed.), "English Nativity Plays," in *Yale Studies in English*, vol. xxxviii (New York, 1909); W. R. Mackenzie, *English Moralities* (ib., 1914); and for reprints, besides the specimens given in books referred to above, *York Plays*, edited by L. T. Smith (Oxford, 1885); *Chester Plays*, edited by Wright (London, 1843–47); *Towneley Mysteries*, edited by Raine (Newcastle, 1836); *Digby Mysteries*, edited by Furnivall (London, 1882); *Miracles de Notre Dame*, edited by G. Paris and Robert (Paris, 1876–81). See DRAMA; MIRACLE PLAY; PASSION PLAY.

MYSTERY OF EDWIN DROOD. The last and unfinished novel by Charles Dickens. The first number appeared in 1870, and only six were finished when he died.

MYSTERY OF MARIE ROGET, mȧ'rē' rō'zhä'. A tale by Edgar A. Poe, published in three parts in *Snowden's Lady's Companion* (1842). It is a sequel to *Murders in the Rue Morgue.*

MYSTIC. A city in Apanoose Co., Iowa, 7 miles northwest of Centerville, on the Chicago, Milwaukee, and St. Paul Railroad (Map: Iowa, E 4). It is in a rich coal district, and coal mining is the chief industry. Pop., 1900, 1758; 1910, 2663.

MYSTIC HEXAGRAM. See HEXAGRAM, MYSTIC.

MYSTICISM, mĭs'tĭ-sĭz'm (from *mystic*, from Lat. *mysticus*, from Gk. *μυστικός*, *mystikos*, relating to mysteries, from *μύστης*, *mystēs*, initiate). A term used in so many senses that it is not easy to define. Two types of definition are found—one which defines mysticism as an experience which assumes to give immediate knowledge of an external Power, without the mediation of history or reason; the other definition would only add to this the emphasis on feeling. It defines mysticism as the sense of union with the Supreme, verified by feeling. The basis of mysticism is in the exaltation of the automatic and passive states and the diminution of the active and individual. Such a state may result in a merely passive reception of any passing impressions or in a wild riot of uncontrolled emotions. In any case the person is carried "out of himself" and is easily led to put a supernatural interpretation upon his experiences. He often regards his feelings as the source of knowledge not otherwise obtainable and is tempted to look upon himself as being favored with a special revelation from divine powers. Mystic feeling, however, need not be religiously interpreted. Music, drugs, the contemplation of nature, and many other experiences may induce the feeling. Even in savage life, however, these feelings begin to be connected with religion. The shaman of Central Asia, the American Indian medicine man, and the emotional religious dances of most savage tribes are examples. In most of the higher religions, persons of the mystic temperament have used the religion to explain their experiences. Religious mysticism exhibits two wholly different qualities, curiously combined, viz., pure individualism and the sinking of personality. The mystic may have fervently striven to attain the exalted state of communion with God, yet, when once it has been reached, conscious activity ceases, and through a sort of passive rapture the subject seems merged in the object

of his yearning. Direct intuition supersedes reason. Mysticism tends to be independent of external authorities, whether of rite, creed, priesthood, or Scripture.

In races which have developed a philosophy, mystic experiences have naturally been subjected to a philosophical explanation. Since the feeling is interpreted as one of union with the Supreme, the philosophy identifies the soul of man with the supreme soul of the universe, whether it calls the Supreme God or gives it some other name. This philosophy tends also to identify all other things, so far as they have reality, with the Supreme, i.e., it tends to become pantheistic. It is often accompanied by a belief that the existence of the visible universe is merely apparent, not real. The most thorough and consistent philosophical mysticism is that of Hindu philosophy, especially the Vedantic school. (See VEDANTA.) This holds that the only reality in the universe is a Supreme, Brahm, of which man is one manifestation, and the sense of personal individuality is illusion. Probably the most complete discipline of mystic practice, to induce the feeling of union with the Supreme and the loss of individuality, is the Hindu yoga. The philosophy, and to some extent the yoga practice, was borrowed by northern Buddhism and carried into Tibet and Japan. In China, Confucianism was antimystical, but Taoism contained mystic elements. Greece had mysticism in the religious mysteries which became popular in her later days, and Neoplatonism was grounded, both as a philosophy and as a religion, in mysticism. The Moslem Sufis of Persia were pantheistic mystics, the roots of their system probably going back to Hindu philosophy. Sufism is noteworthy as giving the best literary expression to mysticism in the symbolic poetry of Hafiz, Rumi (qq.v.), and others. Slight traces of mysticism appear in the New Testament, especially in John, but Christian mysticism as a system is derived from Neoplatonism through the writings of pseudo-Dionysius Areopagita (see DIONYSIUS THE AREOPAGITE) and his great commentator, Maximus Confessor (seventh century). John Scotus Erigena (ninth century) translated the pseudo-Dionysius into Latin, and thus introduced Greek mystical theology in western Europe, where, superimposed upon the mysticism of St. Augustine, it enjoyed increasing popularity. The most flourishing period of Christian mysticism was in the Middle Ages and just previous to the Reformation. Monasticism proved a congenial soil for the cultivation of the mystic spirit, and some of its most perfect types are found among the monks, e.g., in the Eastern Church the Hesychastæ of Mount Athos (see HESYCHASTS) and, in the Western, Bernard of Clairvaux, Francis of Assisi, and Ignatius of Loyola. The monastery of St. Victor, near Paris, was a very influential centre of mysticism in the twelfth century. Several famous mystics appear among the Schoolmen, e.g., Bonaventura, a disciple of the Victorines. Amalric of Bène, a Paris doctor (died 1207), pushed his mysticism to a pantheistic extreme.

Among the Dutch mystics are Ruysbroeck, author of several spiritual tracts (died 1381), Gerhardt Groot, founder of the Brethren of the Common Life (q.v.) (died 1384), and Thomas à Kempis, author of the *Imitation of Christ* (died 1471). Eckhardt (died c.1327) stands in the front rank of German mystics, and among his disciples were Tauler (died 1361) and Suso of Constance (died 1366). The *German Theology*, a popular book of devotion, which strongly influenced Luther, was published by him in 1517 (Eng. trans., 3d ed., New York, 1901). Jakob Böhme (died 1624) belongs to the Protestant school. Certain Protestant sects made mystic elements prominent, as some branches of the Anabaptists and the Friends. Few Protestant churches, however, have been wholly without representations of mysticism. Even in New England, Jonathan Edwards showed a strong mystic strain, and the revivals which began in his time and spread over the land for the next century gained much of their power from the assumption of mystic principles, laying great stress on feeling as a revelation of the will of God, but not leading to the pantheism of philosophic mysticism. Among more recent German mystics are Novalis, the disciple of Romanticism (died 1801). In England we find George Fox (died 1690). Among his contemporaries the Cambridge Platonists (q.v.), especially Cudworth, More, and Smith, were both rationalistic and mystical; George Herbert (died 1633), Francis Quarles (died 1644), Henry Vaughan (died 1695), and later William Law (died 1761) were purely mystical. What is known as Quietism (q.v.) was a movement of the same nature with whose earlier stages St. Francis of Sales, Bishop of Geneva (died 1622), had some sympathy, and which the Spaniard Molinos (died 1696), Fénelon (died 1715), and especially Madame Guyon (died 1717) made more definite. Not a few of the most gifted and honored among mystics have been women, e.g., St. Hildegarde (died 1178), Elizabeth of Schönau (died 1164), St. Catharine of Siena (died 1380), and St. Theresa (died 1582).

In whatever religion it appears, mysticism is always essentially the same. Identical mystic experiences are used as a proof of the truth of Hinduism, Mohammedanism, and Christianity alike. The modern studies of the history and the psychology of religion have made it possible to understand the character of mystic experiences and to see that, while real religious experiences, they offer no objective evidence for any system of religion. The estimate of the religious value of mysticism differs greatly, some holding it to be the very essence of religion, and others regarding its influence as of very doubtful worth.

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MYSTIC SHRINE, Ancient Arabic Order of Nobles of the. An order asserted to have been founded at Mecca, Arabia, in the year of the Hejira 25. The modern order is of comparatively recent origin. The governing body in America is the Imperial Council, with 101 subordinate branches, called Temples. The order is not a Masonic body, but only Masons of the thirty-second degree of the Ancient and Accepted Scottish Rite, or Knights Templars in good standing, are eligible for admission. The membership in America amounts to about 200,500. See Masons.

MYSZ-GMEINER, mês'-g'mī'ner, Lula (1876–). An Hungarian dramatic contralto, born at Kronstadt. At six she took up the study of the violin, at 16 she was receiving vocal instruction from Lassel in her native city, and later she studied at Vienna under Gustav Walter and other famous teachers. After 1896 she visited all the large cities of Austria-Hungary, Germany, Switzerland, Holland, Russia, Belgium, and France; also London, Madrid, and Bucharest. In 1900 she was married to Ernst Mysz, an Austro-Hungarian naval officer.

MYTH (Lat. *mythos*, from Gk. *μῦθος*, speech, legend). A form of folklore (q.v.) which sets forth as an historic tale the processes of nature or beliefs concerning cosmogony (q.v.), religion (q.v.), custom (q.v.), tradition, and the like. The sum total of myths is the material for the science of mythology (q.v.), frequently termed comparative mythology. Within this many subdivisions may be set off, as the Greek myths concerning Diana (q.v.), the Teutonic Valhalla myths (see Valhalla), the Polynesian water myths, or the Hindu myths regarding caste (q.v.). Myth is sometimes distinguished carefully from fable (q.v.) and from legend (q.v.). Thus, we may have the fable of Zeus and the frogs, which points a moral teaching, or the legend of St. Christopher (q.v.), which narrates a miraculous event which may or may not have a moral bearing; but the Zeus myth (see Jupiter) is based on belief in a sky god and is thus a part of nature worship (q.v.). Ethnologists, however, attach relatively little importance to the distinction, since precisely the same tale that is told by one tribe as a purely literary form of amusement may acquire a sacred, or at least serious, aspect among a neighboring people through association with an important supernatural being or religious ceremony.

MYTH'ICAL ISLANDS. Fabulous lands, with which popular lore or the imagination of poets and travelers have, since the earliest times, peopled various parts of the ocean. Among the Greeks the Islands of the Blessed (q.v.), lying far in the western ocean, were the homes of those whom the divine favor saved from the pains of death to live in eternal bliss. Later Plato placed in the same part of the world his lost Atlantis (q.v.). Celtic mythology presents a counterpart of the Islands of the Blessed in the fairyland of Avalon (q.v.), where Arthur was carried after his last battle. Of Celtic origin, too, is the mythical land of St. Brendan (see Brendan, or Brenainn), lying off the western coast of Africa, in search of which expeditions set out as late as the beginning of the eighteenth century. To Christian refugees from the Iberian Peninsula, at the time of the Mohammedan invasion, legend ascribed the settlement of the long-sought-for Island of the Seven Cities (q.v.). More within the realm of fact is Marco Polo's Cipango, identified by some with Japan. The Age of Discovery was fruitful of legendary lands, cities, and islands. Best known among these last were the island of Bimini, in the region of the Bahamas, containing the fountain of youth, and the island of Brazil, which owed its name to its precious dyestuffs.

MYTHO. See Mito.

MYTHOL'OGY (Lat. *mythologia*, from Gk. *μυθολογία*, from *μῦθος*, *mythos*, myth + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The science of myths, either a body of more or less doubtful stories, as when we speak of Greek or German mythology, or a rational account of how all such stories originate. Every race has its own myths, and in the first sense of the word a mythology has only to enumerate and classify the special stories of each race. The second application of the term, however, comprises various theories put forward to explain myths. Thus, we come to what is now called the science of mythology, which deals with the origins of such myths or popular stories.

Myths may be divided into two sets of categories, arranged either according to the intellectual status of the original myth makers or according to the subject matter of the myth itself. Thus, we may have myths of savages, as opposed to myths of cultivated races, and we may have myths of cosmogony, as opposed to myths of heroes. In many discussions of mythology it seems to be assumed that the so-called savage myths treated of the same subjects as do the higher myths, only in a less cultivated manner; but this is an error. Hero myths are sometimes called legends, to distinguish them from cosmogonic myths.

Classification of Myths. The first important fact in mythology is that, however much we use the word "mythology" as if it were especially concerned with gods, no sharp line of demarcation can be drawn among primitive races between such myths and the folk tales dealing with human events. The same plot is now associated with a divine person and again with a human hero. Similarly, it will not do to separate philosophical tales purporting to explain the origin of man and natural phenomena from stories that serve merely to amuse; for often in the same tribe the same story is told with and without the explanatory feature, which is now recognized as secondary, especially by American ethnologists. It is customary to divide myths into historical and scientific, i.e., myths of the past of man and myths to explain natural phenomena. But among the most primitive peoples the two sorts of myths become one. A vague tradition of the wanderings of a tribe is simply united with an explanation of a physical process, and thus the scientific myth is also historical. Mythology has to do with religion only because religion is one of the many fields in which the art of telling stories has exercised itself. It does not follow, however, that a story in regard to the flood or to the way the world was made has any religious significance. The

former example is a very good illustration of how the historical myth may become a religious myth. Thus, in India the story of the deluge was told at first without any suggestion that the flood was a punishment of sin; later, however, it is interpreted as a washing out of sin.

Another important principle in the classification of myths is the relativity of imagination in the myth makers. This disposes of the rather crude demarcation into savage and higher myths. Thus, the Polynesian and Melanesian mythology is almost as rich in stories of the gods as is that of Homer, but for all that some of the island blacks are as savage as those of Africa, and their higher mythology merely means that these savages are more imaginative than are the Mishmis and Kacharis of India, who have an active fear of devils and a very vague idea of any other spiritual power except the ancestral ghost. An excellent illustration of mythology in its lowest stages is offered by the Central Australians. Here the whole burden of myths is concerned with the great deeds of the ancestors in the holy *Alcheringa,* or "time of old." Of real gods there is only a Creator whose cosmogonic work is briefly described as "cutting out the world." The Creator made the world and the half-human ancestors of the tribes, but the mythology is concerned only with the latter. Gods, and especially tales of gods, come much later. If we may conclude that ancestor deeds, and a somewhat adventitious and remote scientific explanation of the universe as formed by a superior being or as consisting of such a being's dismembered parts (another popular savage myth), constitute the basis of mythology, we shall no less truly find that the doings of the demons constitute the next stage. This phase of mythology is usually not developed beyond simple concrete performances. There is very little mysticism, and no system. A certain devil has had a difficulty with some member of the tribe and is either driven off or slays the man, who then becomes a devil in turn. A further stage is reached as the devil becomes more godlike, i.e., is no longer a mere mischief-maker, but a helper of man. This stage may be reached by savages, and it is characteristic of Polynesian mythology that, while mainly concerned with the doings of demons, it rises also to the conception of a kind-hearted demon, although this happens seldom.

At the stage when demons and not gods are the controlling spiritual agency, we find animal myths in their crudest form, often, as in totemic tribes, being identical with ancestor-myths, but, again, without such identification. Thus, when the tribe is descended from an animal ancestor, or the ancestor has become an animal, the two sorts of myths merge; but myths about animals may be current without any notion of relationship between man and animal. The same is true in regard to myths about animated trees and mountains, etc. It is quite impossible to draw a sharp line between this stage and that where demons and animals and cult-heroes are elevated to the position of gods, and tales about them become part of theology.

In general we must distinguish between ancestor and cosmogonic myths, the myths of devils and of sprites, and the myths that collect about higher anthropopathic divinities. Again, not exactly cosmogonic, but quasi-historical, are the myths of floods and wanderings and of early settlements reflected in tales of hyperborean paradises. As the cosmogonic myths are early attempts to give not a religious, but a scientific or at least a logical explanation of the universe, so this class of myths may be called historical, since they are so in form and are so interpreted by the people among whom they are current. The utmost caution must be exercised in attaching any historical value to oral tradition; it seems an established principle that the memory of primitive tribes cannot be safely trusted as to events dating back much more than a century. If there is extraneous evidence that tallies with the myth, the myth is, from the historian's point of view, superfluous; if there is not, it should simply be disregarded for any purpose but that of studying native psychology. In the frequent amalgamation of tribes into a larger political unit myths often lose their original significance and are attached to quite different gods. Even without visible outward change the hero-god becomes modified in spirit, according to the changing theology. Again, as tribes merge and distribute their myths, so myths by their own charm travel from land to land, the characters being changed. Myths in an advanced stage may become purely allegorical, as when a solar culture-hero is represented as destroying barbarism under the guise of a long anthropomorphic tale, such as the epic of the Ramayana in India. Again, in the process of anthropomorphizing, the hero may become so human as to suggest that he was a man, and we thus arrive at the Euhemeristic explanation of all myths as tales told about human beings afterwards elevated to divine rank. Thus, in India the "mortal gods," or gods who had originally been men, are a recognized class, the most conspicuous member of the class being the local Crœsus called Kubera, who is usually regarded as king of the under-world wealth, a Pluto; but in this interpretation he is a god divinized out of a rich man named Kubera.

Explanation of Myths. The example just cited (and analogous cases) led to the notion that all myths were to be interpreted in this way, a view held by some rationalists in India, and favored in Greece by many thinkers, but first reduced to an "atheistic" philosophy of mythology by Euhemerus in the fourth century B.C. In opposition to the older view that myths were to be interpreted allegorically, Euhemerus taught—whether seriously or not is now questioned by some scholars—that the gods were originally men, and that stories about men were transferred to gods, a method here and there countenanced by Plato. Herbert Spencer, who also believes that gods were at first the ghosts of men, has adopted the Euhemeristic explanation in its crudest form. He believes, for example, that there was once a girl called Dawn, and that when she died the Vedic Aryans sang to her ghost the Vedic "hymns to Dawn"—a view consonant neither with the content of the hymns nor with the practices of the poets. At present, if we pass by Spencer's theory with the brief criticism it deserves, there are two accepted schools of interpretation. The older view is that of Max Müller. In its whole form it is quite as unhistorical as Spencer's, but it contains a truth ignored by the opposing school. Müller held that myths were nature poetry, and that many of them in an advanced stage of evolution could be explained by what he called "disease of language," that is, mythology is the result of the misunderstanding, on the part of

a whole people, of their inherited phraseology. Where an old poet referred to sunrise as "the shining one" (feminine) being followed by "the bright one" (masculine), his descendants interpreted the grammatical sex as implying sex in person, and his phrase meant to them "the (male god) Bright (sun) courts Miss Dawn," and so, on the strength of countless errors of this sort, arose mythology, which can be analyzed into its component parts by comparing the names of gods in one language with cognate words in related languages. Müller's error lies in a too sweeping application of this theory, in his lack of appreciation of other causes leading to mythology, and in the weakness of his etymologies. But there is truth in the dictum that a misapprehension makes gods. A Vedic poet sings, "Who is the god whom we should revere?" and his sublime word is interpreted by a later generation as meaning "there is a god called Who, and we should make sacrifice to Who." Then later writers go still further and enjoin upon the priests to make two sets of offerings, one to Who and one to Whom, as distinct deities. The folklore explanation, which has obtained since Mannhardt and Tylor and is steadily gaining ground, rejects both Euhemerism and language disease as factors of mythology, and seeks the explanation of the higher myth in the original conception of the lower. Kronos's brutality and *Little Red Riding Hood* are both stories popular in their day and paralleled by many like stories among savage nations to-day. Such tales are retained, toned down, symbolically explained, but in origin they belong to the tales that please savages. There is no doubt that such is the state of the case, and that *Red Riding Hood* is not a sun myth (exposed to disease of language), but a tale that pleasantly affected peasants. The folklore explanation runs to accumulation of tales, however, without a radical explanation, and it ignores too much what is true in Spencer's mythology, that many tales are simply ghost stories. Nor can it be said that the folklore method is successful in explaining all myths. It is an error to suppose that all myths are psychical reflections of physical or of meteorological phenomena, for much must be attributed, even among savages, to poetical fancy. But what Mannhardt has himself called "nature poetry" and illustrated by modern examples among the Slavs shows that personalities originally solar are sometimes transferred to poetical representatives explicable only in a solar light. The true explanation of mythology will combine the hitherto antagonistic explanations of Lang and Müller, and will also admit that Spencer's theory of ghost mythology is at times applicable. No stereotyped formula can include all the phenomena. In the last analysis will be found folklore, language change, and ghost stories. All three principles are active to-day in India, and probably have always been active among all peoples in proportion to their imaginative powers. The fourth element of poetic fancy affects all the other three. Much that is looked upon as elaborated mythology is nothing but a naïve statement of what appears to the savage as everyday facts, such as the birth of men from beasts or from the elements, the birth of animals from women, metempsychosis, the intimate relations between man and all natural objects. For the mythology of American Indians see INDIANS, AMERICAN. See also AFRICA, *Ethnology;* EGYPT, *Ancient Religion;* GREEK RELIGION; INDIA, *Religion;* INDIAN MYTHOLOGY; SCANDINAVIAN MYTHOLOGY; SLAVIC MYTHOLOGY.

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MYTHOLOGY IN ART. That portion of art which is concerned with the representation of mythological concepts. Religious notions are symbolized at a very early stage in the history of mankind; indeed, they form, generally speaking, the most important subject of ancient art.

Conceptions which can be given in vague and poetic terms in the literature must of necessity in art be represented concretely. The first beginnings are rude and uncouth; yet they develop in the course of time into the most beautiful of all expressions of national art. They are thus important not only from the point of view of history of art, but as one of the main sources for an accurate knowledge of the history of religion. We may trace in them also in many cases the influence which one religion has exercised upon another. If, e.g., we find the bearded figure within a circle as the Iranian symbol of Ormazd, and in Assyrian sculpture see the same figure hovering over a field of battle, it is at once evident that the religious art of Assyria has influenced that of ancient Persia, and the implication follows that the actual concept of the deity of Ormazd has been modified by a Semitic deity.

Nowhere are the distinct national characteristics of mythology so clearly set forth as in art. In the Egyptian paintings and statues of deities we have the stiff outlines and the grotesque animal-headed figures, which stand in marked contrast to the brutal and massive religious art of Assyria and Babylonia. From the point of view of comparative religion the most perfect productions of art are as a rule inferior to the rude and archaic. It might almost be laid down as a rule that the higher the artistic merit, the less the purely religious value. The most important contributions of Assyrian art to a knowledge of its mythology are to be found, not in the finished productions of the late period, but in the more ancient seal cylinders, whose purely artistic merit is often slight. In Greece, in like manner, the early religious art is rude, but here we find in the most archaic periods traces of influence from Egypt, or again, as in certain pictures of the struggle of Hercules with the Nemean lion, an analogue too close to be accidental with Babylonian pictures of the Gilgamish cycle. Though the highest religious sentiments of a people at a given period are embodied in its art, the endeavor to make this embodiment perfect tends in the course of time to an increased purity in the type and symbolization of religious concept. This interacting process is stimulated by the fact that the statue or the painting is conceived to be in itself divine, and at a later period a portion of godhood; later still it is a symbol which may indeed be a god to the vulgar, but to the cultured or to the initiated is but a representation of divinity. Artistic conceptions of divinities naturally vary according to the character of the god represented. Thus, in ancient Mexico we find beside the figure of the beneficent Quetzalcoatl the horrible statue of the war god Huitzilopochtli, on whose altar human sacrifices were offered. In India, as well as in Mexico, in harmony with the grotesque religious legends, we find strange divine figures. The monkey god Hanuman, in harmony with his energetic character, has no touch of the effeminate about him, as has the love god Kama; and in like manner we find the voluptuous figure of Parvati, the wife of Siva, in her kindly aspect, beside the frightful and demoniac figure of Durga, the malignant form of the same goddess. In Greece, where mythology in art was developed to its utmost perfection, we find this principle carried out in its entirety. Beside the austere Athene stands the seductive Aphrodite; with the powerful Hercules is contrasted the delicate, almost too beautiful Apollo; and over all the Pantheon towers the majestic figure of Zeus. See ART, *History;* the various articles on National Art; and, for illustrations, the plates of EGYPTIAN DEITIES; HINDU DEITIES under INDIA; GREEK ART; JUPITER; LYSIPPUS; PARTHENON.

MYTILENE, mĭt'ĭ-lē'nē (Lat., from Gk. Μυτιλήνη, Turk. *Midillü*), or MITYLENE. The largest island in the Ægean Sea, also known as Lesbos (q.v.) (Map: Balkan Peninsula, F 5).

MYTILENE, or **MITYLENE** (modern Kastro, q.v., or Mitilini). The capital of the island of Lesbos (q.v.). It was colonized in very ancient times by the Æolians. Its situation on the southeast coast of Lesbos on a promontory gave it two excellent harbors (Map: Turkey in Europe, F 5). It is famous as the birthplace of Sappho and Theophrastus, among others. Of its internal political history down to the time when Pittacus became practically dictator early in the sixth century B.C., something is to be learned from the fragments of the poetry of Alcæus (q.v.). Meanwhile the city had become the most important centre of the Asiatic Æolians and a great naval power, and had founded colonies in Mysia and in Thrace. After the Persian wars it became an important member of the Athenian Confederacy, but in 428 B.C., the fourth year of the Peloponnesian War, it rebelled against Athenian domination. Defeat after a famous struggle ended its power (427 B.C.). Mytilene fought on the side of King Mithridates in his war against Rome (88 B.C.), and after his defeat suffered for it. Very little of the ancient town remains. Perhaps the most important edifice is the Greek College, an institution which Greek boys of the entire Ægean coast attend. Consult Leithäuser, *Der Abfall Mytilenes von Athens* (Leipzig, 1874), and C. Cichorius, *Rom und Mytilene* (ib., 1888).

MYTILUS. See MUSSEL.

MYXINE, mĭks-ī'nē (from Gk. *μύξα, myxa,* mucus). The single genus of the family Myxinidæ, represented by the single species *Myxine glutinosa,* the hagfish or borer of the North Atlantic coast. These eel-shaped parasitic animals, which burrow into the bodies of fishes, are extraordinary in their reproductive habits. According to Nansen, *Myxine* is generally or always in its young stage a male, while at a more advanced stage it becomes transformed into a female. The ovary is single and on the right side, and there are no oviducts, the mature eggs falling into the abdominal cavity and being extruded through the peritoneal opening at the side of the vent. The eggs are few and large, and each is inclosed in an oblong horny case, with threads at each end, by which the egg adheres to some fixed object until it hatches. See HAGFISH; and Plate of LAMPREYS AND DOGFISH.

EGG OF MYXINE.

MYXOBACTERIACEÆ, mĭks'ŏ-băk-tē'rĭ-ā'sē-ē (Neo-Gk. nom. pl., from Gk. *μύξα, myxa,* mucus, slime + Gk. *βακτήρια, bakteria,* little rods. See BACTERIA, first paragraph). A group of organisms evidently related to the bacteria, but distinguished from them by a remarkably complex colony organization. The individual cells resemble those of bacteria, but

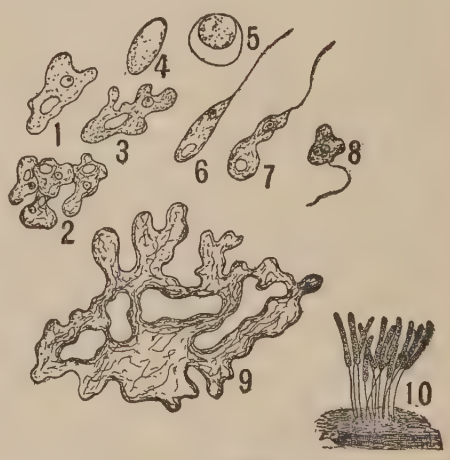
they are combined in structures of definite and even elaborate form. The name suggests a combination of the characters of the slime molds (Myxomycetes, q.v.) and bacteria, the individual cells resembling the latter, and the cells coming together to form a complex body, as the plasmodium of the slime molds is formed.

MYX'ŒDE'MA (Neo-Lat. nom. pl., from *μύξα, myxa,* mucus + *οἴδημα, oidēma,* swelling). A progressive disease, characterized by widespread changes in nutrition and by the invasion of the subcutaneous tissues by solid œdema, dependent on diminished functional activity of the thyroid gland. It has been called *cachexie pachydermique* (Charcot), *cachexia thyroidea* (Kocher), and *hydroparesie* (Féris). Myxœdema is caused by atrophy or destruction of the thyroid gland by disease or as a result of removal of it by operation. When a sequel of thyroid removal it is called *cachexia strumipriva.* It is observed principally in women (in the proportion of 7 to 1) and is, in fact, an acquired cretinism in adult life. By far the greater number of cases occur between the ages of 35 and 45. In some families there is a distinct inheritance of a predisposition to disease of the thyroid gland. Hereditary syphilis may be a factor. The malady is seen most frequently in cold climates and is perhaps most frequent in Europe. It is rare in the tropics. The symptoms develop gradually, in most cases nearly a year elapsing before the disease becomes distinct. Among the principal symptoms are languor or indolence, absence of perspiration, loss of hair, decay of nails and teeth, a stiff gait, a thickening of the skin and of the mucous membrane of the nose, pallor, subnormal temperature, hallucinations of sight and hearing, many mental abnormalities, and even actual insanity. Incomplete myxœdema (*myxœdeme fruste*) is a state in which the symptoms are less marked or have ceased to develop. The treatment consists in feeding the patient with thyroid-gland extract or dried gland, together with tonics, such as phosphoric acid and iron. Thyroid grafting has proved efficacious, temporarily at least, in many patients. A part or the entire thyroid of an animal is transplanted into the peritoneal cavity or subcutaneous tissue of the patient, to whom the gland has been fed for some time previously, as suggested by Victor Horsley. Thyroid gland was first administered by Murray in 1891. Before the thyroid treatment was known the prognosis in myxœdema was uniformly bad, the patient dying in from 5 to 7 years, generally from some intercurrent disease. Under thyroid treatment mild cases can be cured, and in severe cases the symptoms controlled almost indefinitely. The symptoms disappear one by one with astonishing rapidity, and the transformation in the patient's appearance is one of the most remarkable phenomena in medicine. The gland, generally that of a sheep, must, however, be given with great care, degeneration of the heart or of the great vessels being an indication for very small initial dosage. In some patients profuse diarrhœa results, in others vomiting, sweating, headache, swelling of the glands about the jaw, and prostration. The remedy may be used hypodermically. After the symptoms of the disease have disappeared the patient must take a small quantity of the thyroid extract at regular intervals as long as she lives, to maintain the improved condition. See CRETINISM. Consult G. R. Murray, *Diseases of the Thyroid Gland* (London, 1900), and Dock, "Diseases of the Thyroid Gland," in Sir William Osler, *Modern Medicine* (New York, 1915).

MYXOMA, mĭks-ō'mȧ (Gk. *μύξα, myxa,* mucus + *-ωμα, ōma*). A tumor consisting of a gelatinous substance composed of mucin and peculiar branched or stellate cells. It is classed with the connective tissue tumors and has a jelly-like consistency. See TUMOR.

MYXOMYCETES, mĭks'ō-mī-sē'tēz (Neo-Lat. nom. pl., from Gk. *μύξα, myxa,* mucus + *μύκης, mykēs,* fungus). A group of organisms commonly called slime molds. Certain phases of their life history are very animal-like, but the spore case (with its spores) has many plant characteristics, and as the forms are described and classified by the spore cases, the work has naturally fallen within the province of botany. They are here treated as one of the great groups of the fungi (q.v.). The spores germinate in moist situations on the soil and in humus, giving rise each to a motile naked cell provided with a cilium (Figs. 6, 7, 8). These swarm cells swim around in the moisture, increasing in number by division (fission). After an active period they lose the cilia and creep around like amœbæ (Figs. 1, 2, 3), finally approaching one another and fusing in pairs, or perhaps several together. Such fused groups become centres of attraction to many hundreds of swarmers, which contribute their substances to the common mass. The result is a large protoplasmic body, called a plasmodium (Fig. 9), which moves over the surface of the humus and into crevices like a gigantic amœba. Its food is largely bacteria and other fungi, which are taken directly into the protoplasmic body and digested, the hard and worthless portions being discarded.

Vegetating plasmodia shun the light and seek moisture. But these habits are reversed when the spore cases are to be formed; the plasmodia then come to the light and take position in the



MYXOMYCETES.

Chondrioderma: 1, 2, 3, amœboid stage; 4, 5, resting stage; 6, 7, 8, motile stage; 9, plasmodium of *Stemonitis,* 10, sporangia.

driest situations that they can find. This is the time when plasmodia are most conspicuous and are frequently found on stumps, bark, and humus. The largest plasmodia may cover several square inches, but most of them are much smaller, and some are no larger than a pinhead.

The form of the spore cases is exceedingly various, some being large and irregular and others having extraordinary delicacy and complexity of structure, but the general history of spore formation is much the same. The plasmodium excretes a great deal of material (and frequently mineral matter) which forms the wall of the spore case (sporangium) and its stalk if present (Fig. 10). A filamentous network called the capillitium may also be developed inside the spore case, its function being to distribute the spores. The protoplasm which remains after these activities divides up into minute rounded bodies which, investing themselves with walls, become the spores. The plasmodia of slime molds have always been favorite subjects of observation by physiologists, who find in such specimens the largest masses of protoplasm that can be studied.

Consult, for a general account, Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887); and for special descriptive treatment, Anton Bary, *Comparative Morphology and Biology of Fungi, Mycetozoa, and Bacteria* (Eng. trans., Oxford, 1887); Lister, *A Monograph of the Mycetozoa* (London, 1894); T. H. McBride, *The North American Slime Moulds* (New York, 1899); W. C. Sturgis, "Guide to the Botanical Literature of the Myxomycetes from 1875 to 1912," in *Colorado College, Publications, Science Series*, vol. xii (Colorado Springs, 1912).

MYZONTES, mī-zŏn'tēz. Same as Cyclostomi (q.v.).

N

N The fourteenth letter and eleventh consonant of the Roman alphabet. This character has varied very little in form and not at all in value since the origin of the alphabet. The original letter was apparently called *nun*, which in Phœnician and in the North Semitic languages signified 'fish.' Apparently the early pictographic character represented a fish. The small *n* is an outgrowth of the sign used in the Latin uncial alphabet which was a modification of the capital alphabet. See ALPHABET.

Phonetic Character. *N* stands for the dental or alveolar nasal sound which is the equivalent to *d* and *t*. The sound is produced by a check or mute contact and sonant vibration of the vocal cords as in *d* with the addition of the opening of the nasal passage made by lowering the soft palate. The size and shape of the resonance chamber make the difference between *n* and the other nasal letters. Under certain conditions *n* may have a syllabic or vocalic value, as in *rotten, forgotten.* In scientific linguistics this value is represented by *n̩*. It is sometimes silent after *m* or *l* in words usually of Latin origin, as in *damn, hymn, autumn, kiln.* Before *g, k, ch* it receives a semiguttural or palatal coloring to harmonize with the consonant it precedes, as in *long, think, pinch.* Though in Latin or Greek a final *n* of a prefix was usually assimilated to the value of a following consonant, in English it is much more stable (*unleaven, unbalance, unpack*). Among the nasals the linguidental *n* is by far the most frequently used in English, more than twice as often as *m*.

Source. In its historic development *n* represents an original *n* which has been preserved with great constancy through the Indo-Germanic period to the present time. Thus, *night*, Gothic *nahts*, Skt. *nakti*, Lat. *nox;* or again Indo-Ger. **nevos*, new, Skt. *navas*, Gk. *νεός*, Lat. *novus*, Goth. *niujis*, Ger. *neu*, Eng. *new*. In Anglo-Saxon an original Germanic *n* disappears before *s, f,* and *þ*.

As a Symbol. As a numeral N = 90 and $\bar{\text{N}}$ = 90,000. In chemistry N = nitrogen; Na = sodium (i.e., natrum). In mathematics N = an indefinite constant whole number, especially the class of a curve or the degree of an equation.

Consult: Philippe Berger, *Histoire de l'écriture dans l'antiquité* (Paris, 1892); Maurice Prou, *Manuel de paléographie latine et française* (ib., 1910); Sir E. M. Thompson, *Introduction to Greek and Latin Paleography* (London, 1912); Eduard Stucken, *Der Ursprung des Alphabets und die Mondstationen* (Leipzig, 1913). See ALPHABET; LETTERS; LIQUID; NASALS.

NABA, nä'bȧ. A seaport of Japan. See NAWA.

NABAB, nȧ'bȧb', LE (Fr., The Nabob). A story by Alphonse Daudet (1877), based on the career of a contemporary adventurer.

NAB'ATÆ'ANS (Gk. *Ναβαταῖοι, Nabataioi*, Ar. *Nabaṭu*). An Arab people or tribe settled in various parts of the country east and southeast of Palestine, who formed during the Græco-Roman period a petty independent kingdom. Their history is known to us from classical authors, especially Diodorus and Josephus, as well as from numerous coins, and from inscriptions, dating from 169 B.C. to 105 A.D., which have been collected by De Vogué (1868), Doughty (1884), Huber (1884), and Euting (1885). They are located at various places from the Hauran in the north to Madain Salah (Al Hijr in northern Arabia) in the south. The Arabic character of the Nabatæans is evinced by their proper names, though they used a western Aramaic language and script, as the northern Arabic had not yet been reduced to writing. It is uncertain whether they are to be connected with an Arabic tribe descended from Nabaioth, mentioned together with Kedar as a son of Ishmael (Gen. xxv. 13, xxviii. 9, xxxvi. 3; 1 Chron. i. 29; Isa. lx. 7) and several times referred to as *Nabaiati* in the Assyrian inscriptions of Tiglath-pileser, Sargon, and Asurbanipal. The Nabatæans are first met with about 312 B.C. at Petra as nomads, but they were so strongly intrenched here that the generals sent against them by Antigonus, Athenæus, and Demetrius were unable to dislodge them. Though they were nomads they had an extensive trade in myrrh and spices from Arabia Felix, which they sent to the seaports, and in bitumen from the Dead Sea, which they sent to Egypt. The Nabatæan Kingdom arose in ancient Edom upon the ruins of the Seleucid and Ptolemaic empires. Its first prince was Aretas I, to whom the high priest Jason fled in 169 B.C. Its first King was probably Erotimus (Taim-Allat, 110–100 B.C.). Obedas I (90 B.C.) was able to hold his own against Alexander Jannæus, and Aretas III (Philellenos) against Antiochus XII of Cœle-Syria. The latter even conquered Damascus, but was driven out by the general of Pompey. Antony presented part of the land of the Nabatæans to Cleopatra. When Malchus I (50–28 B.C.) refused to pay tribute, his land was overrun by Herod. War broke out between

Herod and Aretas IV (9–40 A.D.), in which the Nabatæans were successful. When Paul was in Damascus that city must have been once again in the power of the Nabatæans (2 Cor. xi. 32). At the time of the Emperor Claudius, King Abias undertook an expedition against Adiabene, but he was beaten back. Damascus was lost to Nero in the reign of Malchus II (48–71). The last King of the Nabatæans was Rabel II (71–106). In 106 Cornelius Palma, Governor of Syria, made the region from Petra in the south to Bostra in the north into a Roman province. In the fourth century two provinces were created—Arabia with Bostra as a centre and Palæstina Tertia with Petra as a centre. The latest inscriptions in Nabatæan characters are those of Al Namarah (328), Zebed (512), and Harran (568); but the language is purely Arabic. Later Arabic writers use the word Nabatæan as the equivalent of Aramæan. The importance of the Nabatæans is due to the fact that they formed a sort of buffer state against the Arabs of the desert and because their country lay in the direct line of the caravan route from Arabia to Syria. Al Hijr was an emporium for the products of Yemen, and many mausoleums built in the rocks and beautifully carved are evidence of the riches which were concentrated here. The national temple was also situated at this place. The chief gods of the Nabatæan Pantheon seem to have been Dusares (*Dhu al Shara*), Manat, Kais, Allat, and Hobal. Consult: J. Euting, *Nabatäische Inschriften aus Arabien* (Berlin, 1885); Emil Schürer, *History of the Jewish People*, vol. i (Eng. trans., New York, 1896); Réne Dussaud, *Les Arabes en Syrie* (Paris, 1907); Brünnow and Domaszewski, *Die Provincia Arabia* (3 vols., Strassburg, 1904–09); Hermann Thiersch, *An den Rändern des römischen Reiches* (Munich, 1911); and the article "Nabatäer," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

NABBES, năbz, THOMAS. An English dramatist of the seventeenth century, born in Worcestershire. His first comedy, *Covent Garden*, was produced in London in 1632–33. His second attempt, *Tottenham Court* (1633), was followed by *Hannibal and Scipio: An Hystorical Tragedy* (1635) and a comedy called *The Bride* (1638); but more talent was displayed in his masques, two of which were published in 1639 under the title *The Spring's Glory*. An edition of his works was published by Bullen (London, 1887; *Old English Plays*, N. S., vols. i and ii).

NABHA, nä'bhȧ. An eastern native state of the Punjab, India (Map: India, C 2). Area, 966 square miles. It produces wheat, pulse, and barley. Pop., 1901, 297,949; 1911, 248,887. Capital, Nabha.

NABIGHA, nä'bĕ-gȧ, ZIYAD IBN MUAWIYA AL DHUBYANI. A famous pre-Islamic poet. Nabigha seems to be a surname indicating that his genius "jets forth vigorously and abundantly." He lived at the courts of Mundhir II, Mundhir III, and Nu'man ibn Mundhir. A too enthusiastic description of Queen Mutajarrida's charm forced him into exile. He became the court poet of Amr ibn Harith of Ghassan, but was finally reconciled to Nu'man. He differs from most of the Arabic poets of the period in being a man of profound religious sentiment. His Divan has been published by Derenbourg (Paris, 1868–69). Consult Carl Brockelmann, *Geschichte der arabischen Literatur*, vol. i (Weimar, 1898), and R. A. Nicholson, *A Literary History of the Arabs* (New York, 1907).

NABLUS. See NABULUS.

NA'BOB, or **NA'BAB** (Hind., Ar. *nawwāb*, deputy, from Ar. *nāba*, to replace, to be a deputy). Under the Mogul Empire of India, the administrator of a province comprised in the region ruled by a *subahdar*, or viceroy. The title was continued under the British rule, but gradually was applied to unofficial wealthy natives. In the United Kingdom and other European countries it is applied derisively to Euro-Indians who, having amassed fortunes in India, return to make an ostentatious display of their wealth.

NA'BONAS'SAR (Assyr. *Nabu-nasir*, Nabu (or Nebo) protects). King of Babylonia (747–734 B.C.). His contemporary in Assyria, Tiglath-pileser IV (745–728 B.C.), succeeded with the help of the Aramæan hordes that at all times were a menace to Babylonian security in obtaining complete control of Babylonia, and emphasized his success by giving himself in his inscriptions the title of King of Sumer and Accad and by worshiping at the shrines of the Babylonian gods in the most important cities of the south: Sippar, Nippur, Babylon, Borsippa, Cutha, Kish, Dilbat, and Erech. It is evident, therefore, that Nabonassar must have been merely a vassal to Tiglath-pileser IV, but a semblance of independence was permitted to Babylonia because of a desire on the part of the Assyrian rulers to deal leniently with the old Empire in the south for fear of incurring the displeasure of the Babylonian gods who were also the gods of Assyria. His name is preserved in the Ptolemaic canon, whose list of Babylonian kings begins indeed with Nabonassar. Why the beginning should have been made with this ruler is not clear. It has been supposed that the Babylonians began a new era—historical or astronomical—at the time of Nabonassar, since that date was adopted as a new astronomical era by the Greeks, but there is no direct evidence. Equally mysterious is Berosus' statement, preserved by Syncellus, that Nabonassar first collected and then destroyed the chronicles of his predecessors. Consult: R. W. Rogers, *History of Babylonia and Assyria*, vol. ii (New York, 1900); C. H. W. Johns, *Ancient Assyria* (ib., 1912); id., *Ancient Babylonia* (ib., 1913).

NABON'IDUS (Assyr. *Nabu-na'id*, Nabu (or Nebo) is exalted; Herodotus (i, 74, 77, 188) has erroneously *Λαβύνητος*, *Labynētos*). The last King of the Chaldæan Empire, sixth in order of succession from Nabopolassar (q.v.), the founder of this Empire. He was the son of a priestess of Sin at Harran and came to the throne in 556 B.C. as a result of a conspiracy formed apparently by the priests of the city of Babylon against Labashi Marduk (Gk. Labosoarchod), the son of Nergalsharuzur (Gk. Neriglossor), which cost Labashi Marduk his life. Nabonidus was a native Babylonian and not, as his predecessors since Nabopolassar, a Chaldæan. In his inscriptions, of which a large number have been found, he appears chiefly in the light of a builder and restorer of the sacred edifices in such ancient centres as Ur, Harran, and Sippar. While he did not neglect the sanctuaries of Marduk and Nebo at Babylon and Borsippa, yet his greater devotion to other centres appears to have aroused the opposition of the priests and of the population of Babylon,

and the neglect of suitable preparation to resist the threatening advance of Cyrus (q.v.) is probably to be ascribed to internal dissensions. In the beginning of his reign the Medes under Astyages attempted to add Mesopotamia to their Assyrian province, but were driven away from Harran by Nabonidus. After the conquest of Media by Cyrus in 553, this King occupied himself with Crœsus of Lydia until Sardis fell in 546, whereupon he turned against Babylonia. Nabonidus was a man of sincere piety who sought by zealous worship of the gods to avert the danger to the state. He rebuilt the ancient temples everywhere and dug in their foundations for the inscriptions of earlier kings. To the researches of his scribes and the excavations of his officials we are indebted for much information. It is not clear whether Nabonidus removed the images of the gods from other cities to Babylon in order to centralize all worship there or to save them. The great inscription of the Marduk priests plainly shows that they were plotting with Cyrus and that the city was delivered to Gubaru through their treachery. Babylon fell, as a Babylonian chronicle puts it, "without battle," in December, 539. Two days before, Nabonidus had to flee from the battle of Opis, as the army deserted to Gubaru, the Governor of Guti, who had sided with Cyrus and led the enemy to Babylon. Belsharazar (see BELSHAZZAR), the Crown Prince, is mentioned with the King in an oath of the year 12 (i.e., 544 B.C.) and elsewhere. What became of him is not known. In 538 Cyrus himself entered the city in triumph. Nabonidus was banished to Karmania, and Gubaru-Gobryas remained for several years governor of the city of Babylon. Consult: R. W. Rogers, *History of Babylonia and Assyria* (New York, 1900); and the Babylonian-Assyrian histories of F. Hommel (Berlin, 1885), C. P. Tiele (Gotha, 1886), H. Winckler (Leipzig, 1892), A. H. Sayce (London, 1900), C. H. W. Johns (London, 1911); also Scheil, in *Revue d'Assyriologie*, vol. xi (Paris, 1914); T. G. Pinches, "Fresh Light on Daniel," in *Expository Times* (London, 1915).

NAB'OPOLAS'SAR (Assyr. *Nabu-apal-uzur*, Nebo, protect the son). The founder of the Chaldæan Empire, King of Babylonia 625–605 B.C. He was not of royal birth, as is indicated by the absence of any reference to his father in the inscriptions that we have of him. By his own efforts he rose to a position of supremacy over the district of Chaldæa lying to the south of Babylonia proper as far as the Persian Gulf, which had managed even during the height of the Babylonian Empire to retain a certain measure of independence, and whose separate position continued to be recognized by the Assyrian kings when Babylonia had come under the control of Assyria. At various times the Chaldæans made attempts to regain their independence, and the growing weakness of Assyria after the death of Asurbanipal in 626 B.C. furnished the desired opportunity for the Chaldæans to reassert themselves and to extend their control from Chaldæa to Babylonia. Nabopolassar refused to recognize Asuritīlilaniukin, declared himself independent, and apparently entered into an alliance with Cyaxares of Media and Psammetichus of Egypt against Assyria. Nineveh was saved in 625 by the prompt appearance of Assyria's ally, the Scythian King Madyas, who drove away the Medes. But about 606 B.C. Nabopolassar, with the aid of the Medes, brought about the fall of Nineveh and the destruction of the Assyrian Empire. The Chaldæan Empire now became the controlling influence in the Euphrates valley, though Assyria proper had fallen to the share of Media. The few inscriptions of Nabopolassar which have been found show him to have been a man of force and energy, who managed not only to maintain his position against great odds, but to hand over to his son, Nebuchadnezzar, an empire almost as extensive and as powerful as was that of Assyria in her best days. He improved and enlarged the famous temple of Marduk in Babylon, and the sanctuaries of Shamash, the sun god, and of Belit at Sippar, and constructed a canal at the latter place to bring the waters of the Euphrates to the city walls. The Chaldæan origin of the last Babylonian Empire led to the use of the term Chaldæa among classical writers for Babylonia. See BABYLONIA. Consult R. W. Rogers, *History of Babylonia and Assyria* (New York, 1900), and the Babylonian-Assyrian histories of F. Hommel (Berlin, 1885), C. P. Tiele (Gotha, 1886), H. Winckler (Leipzig, 1892), A. H. Sayce (London, 1900), C. H. W. Johns (ib., 1911).

NA'BOTH. The owner of a parcel of land, described as a vineyard, in Jezreel, adjoining the palace of Ahab, King of Israel. When the latter proposed to buy the land Naboth refused to sell (1 Kings xxi. 1–14). Thereupon the Queen, Jezebel, is charged with having forged letters in the name of the King, exhorting the elders of his city to secure false witnesses who should swear that they had heard Naboth curse God and the King. Naboth was indeed put to death, and the King took possession of the land. For this Elijah denounced Ahab and predicted the downfall of his house, without suggesting, however, that the Queen was implicated in the crime. Probably the charge against the foreign Queen was popularly believed, and the barbarous murder of Jezebel was justified by it (1 Kings xxi; 2 Kings ix. 21 ff.). The story is interesting for the hints it gives as to local customs and popular ideas in Israel in the ninth century B.C. See AHAB; JEZEBEL.

NABU, nä'bo͞o. See NEBO; NEBO, MOUNT.

NABUA, nä'bo͞o-ä. A town of south Luzon, Philippines, in the Province of Ambos Camarines, 21 miles southeast of Nueva Cáceres. It is situated in a low, marshy region occupied by rice fields. The surrounding country produces rice. Pop., 1903, 18,893.

NABUCO, nä-bo͞o'kô, JOAQUIM (1849–1910). A Brazilian diplomat and writer, born at Recife. He was educated for the law, receiving his degree in 1871. He began his public career as attaché of the Brazilian legation in Washington. Returning to Brazil he was elected to Parliament in 1878 and was active in the cause of the abolition of slavery, visiting Rome in 1888 to obtain the support of the Pope for this measure. Having been closely identified with the Imperial régime, he held aloof from politics for a number of years after the establishment of the Republic in 1889. During this period he devoted himself to literary and historical studies and wrote his most important work, a constitutional history of the reign of Dom Pedro II. He again entered public life in 1899, serving on the commission to settle the boundary

dispute between Brazil and Great Britain. In 1901 he was named Minister to England and from 1905 to his death was the first Ambassador from Brazil to the United States. Active in the promotion of Pan-Americanism and in the development of a better understanding between the American nations, in 1906 Nabuco was president of the Third International Conference of American States at Rio de Janeiro. He was also a member of the Permanent Court of Arbitration at The Hague. Both in politics and in literature he showed himself an idealist. He was besides an able orator and was often called upon to deliver addresses both in his native land and in the United States. His writings, which have taken very high rank and show Anglo-Saxon and French influence, include: *Balmaceda* (1895), *A intervenção estangeira durante a revolta* (1896), and *Pensées détachées et souvenirs* (1906). Consult M. Oliveira Lima, "Ecrivains Bréziliens contemporains: Joaquim Nabuco," in *La Revue*, vol. lxxxvii (Paris, 1910).

NABULUS, nä'bụ-lōōs', or **NABLUS** (a contraction of *neapolis*, the new town). One of the chief cities of modern Palestine, the ancient Shechem (q.v.), by which name it is also known now: geographically the centre of Palestine. It is situated about 35 miles north of Jerusalem, in a well-watered and productive valley, between the mountains Jebel esh-Shemali (Ebal) on the north and Jebel et-Tor (Gerizim) on the south. The city is renowned for the large number of its perennial springs. It is the seat of government for central Palestine and the corresponding region beyond the Jordan, the residence of a Greek bishop, has several mosques and Mohammedan schools, and English and Latin mission establishments. The irrigation system built around the town is one of the most elaborate in Palestine. It has considerable industries, especially the manufacture of soap, and carries on a lively trade with the east-Jordan country and Jaffa. It has about 24,000 inhabitants, most of whom are Mohammedans who bear the reputation of being fanatical. The surviving remnant of the Samaritans, to the number of about 200, are believed to occupy the southwest part of the town. See SAMARITANS.

NA'CHI. See NATCHEZ.

NACHTIGAL, näG'tē-gȧl, GUSTAV (1834–85). A German explorer, born at Eichstedt, near Stendal. He studied medicine at Halle, Würzburg, and Greifswald. He practiced as a military physician in Cologne and in 1863 went for his health to northern Africa, where he became a physician in the service of the Bey of Tunis. In 1869 he was commissioned by the King of Prussia to carry some gifts to the Sultan of Bornu in recognition of the latter's services to various German explorers. After a journey in the Tibbu country he set out for Kuka, the capital of Bornu, where he arrived in 1870. He made a thorough exploration of Bornu, then went to Lake Chad. Making his way to Bagirmi, he followed up the Shari River and its tributaries. In the spring of 1874 he set out for Egypt, going through Wadai, which he was the first European to penetrate. He visited Abeshr, the capital of Wadai, passed through Darfur, and arrived at Cairo in November, 1874. In 1875 he returned to Europe, where his explorations had made him famous. In 1884, as German Imperial Commissioner, he visited the west coast of Africa, where his explorations resulted in the acquisition by Germany (lost in the war in 1915) of Togoland, Kamerun, and Lüderitzland. Before finishing his labors, however, he was taken sick and died. His greatest work, *Sahara und Sudan*, was published in 1879–89. Consult Ruhle, *Gustav Nachtigal* (Münster, 1892).

NACOGDOCHES, năk'ō-dō'chēz. A city and the county seat of Nacogdoches Co., Tex., 138 miles north by east of Houston, on the Houston, East and West Texas and the Texas and New Orleans railroads (Map: Texas, E 4). It has lumber mills, cotton gins, cotton compress, cottonseed-oil mill, brick plants, grain elevators, saw mills, etc.; and, as the commercial centre of a productive cotton-growing and farming region, controls wholesale interests of importance, and a trade in cotton, produce, live stock, tobacco, hides, and lumber. Noteworthy features are the public library, county courthouse, high school, Old Stone Fort, park, and the Aqua Vitæ Mineral Wells. The water works and electric-light plant are owned by the city. Pop., 1900, 1827; 1910, 3369. Nacogdoches owes its origin to a Spanish mission, established here early in the eighteenth century. As an outpost against American encroachment it played a part in the controversy between Spain and the United States over the Spanish possessions in the Southwest. It was captured in 1812 by an American filibustering party under Magee and Gutierrez.

NADAL', EHRMAN SYME (1843–). An American author, born at Lewisburg, W. Va. He graduated at Yale in 1864, was second secretary of the United States Legation at London in 1870–71 and 1877–83, and after 1884 was for several years a member of the staff of the New York *Nation*. He lectured on English composition at Columbia University in 1892–93. His publications include *Impressions of London Social Life* (1875); *Essays at Home and Elsewhere* (1882); *Zwiebak: Notes of a Professional Exile* (1895). He also contributed in similar vein to reviews and other periodicals, and was a contributor to the NEW INTERNATIONAL ENCYCLOPÆDIA.

NA'DEN, CONSTANCE CAROLINE WOODHILL (1858–89). An English poet, born at Edgbaston, Birmingham. She attended classes in science at the Birmingham and Midland Institute and at Mason College, and became a close student of Herbert Spencer, on whose philosophy she frequently gave lectures. Miss Naden published two volumes of poems: *Songs and Sonnets of Springtide* (1881), and *A Modern Apostle and other Poems* (1887), containing pieces, as "The Pantheist's Song of Immortality," that give her an assured place among the lesser poets. Consult the *Memoir* by W. R. Hughes and others (London, 1891); *Induction and Deduction*, a prize essay, ed. by Lewins (ib., 1890); and *Complete Poetical Works*, ed. by Lewins (ib., 1894).

NA'DIR (Ar. *nażir*, similar, corresponding (i.e., to the zenith), from *nazara*, to behold, to be face to face). That point in the heavens which is diametrically opposite to the zenith, so that the zenith, nadir, and centre of the earth are in one straight line. The zenith and nadir are 90° distant from every part of the horizon (q.v.). See ZENITH; MERIDIAN CIRCLE.

NADIR SHAH, nä-dēr' shä (1688–1747). A king of Persia. He belonged to the Afshars, a Turkish tribe. He was born near Kelat, in the centre of the Persian Province of Khorasan.

At the age of 17 he was taken prisoner by the Usbek Tatars, but, escaping after four years of captivity, he entered the service of the Governor of Khorasan, and soon obtained high promotion. Having, however, been degraded and punished for some real or supposed offense, he became an outlaw and for several years was the leader of a band of 3000 robbers. At this period the Persian throne was occupied by a usurper, Mir Vaiz, of the Afghan tribe of Ghilzai, who were bitterly hated by the Persians for cruelty and oppression. In favor of the rightful heir, Tahmasp II, Nadir took up arms against Malik Ashraf, the successor of Vaiz, and in token of his loyalty assumed the name of Tahmasp Kuli, or Slave of Tahmasp. Defeating the usurper in a series of engagements, he freed the provinces of Irak, Fars, and Kirman of even the semblance of Afghan domination. The assassination of Ashraf during his retreat terminated the war. Tahmasp then ascended the throne, and Nadir received for his services the government of the provinces of Khorasan, Mazanderan, Seistan, and Kirman. He was sent against the Turks in 1731, and defeated them at Hamadan, regaining the Armenian provinces which they had seized in the preceding reign. Meanwhile Tahmasp himself had been unsuccessful in his operations against the Turks. Nadir took this as a pretext to imprison the Shah, whose infant son, Abbas II, he placed on the throne in 1732. The death of this puppet, in 1736, opened the way for the elevation of Nadir himself, who was crowned as Nadir Shah, Feb. 26, 1736. To win the support of the Afghans, the new ruler declared the Sunnite form of Mohammedanism to be the state religion instead of the Shiite, which has always been favored by the Persians. Nadir resumed the war with the Turks, and, though totally defeated in the first two battles by the Grand Vizier Asman, turned the tide of fortune in the subsequent campaign, and granted peace to the Turks on condition of receiving Georgia. He also conquered Afghanistan, and drove back the invading Usbeks. His ambassador to the Great Mogul having been murdered together with his suite at Jalabad, and satisfaction having been refused, Nadir, in revenge, ravaged the Northwest Provinces and took Delhi, the capital of the Great Mogul, which was pillaged against his will (1739). With booty to the amount of $400,000,000, including the Koh-i-nur (q.v.) diamond and the famous peacock throne, he returned to the west bank of the Indus. He next reduced Bokhara and Khwarezm, restoring to Persia her limits under the Sassanids, and formed plans, which were never realized, for making Persia a maritime power. Embittered by an attempt to assassinate him in 1741, of prompting which he suspected the heir apparent, Rizakuli, whom he blinded and imprisoned, Nadir's character underwent a sudden change. Formerly open-hearted, liberal, and talented, he became suspicious, avaricious, and tyrannical. He was assassinated on June 20, 1747, by Salah Bey, captain of his guards, and was succeeded by his nephew, Ali, who ascended the throne as Adil Shah, or the "righteous king," but was deposed within a year. Consult H. Maynard, *Nadir Shah* (Oxford, 1885), and Sir H. M. Durand in the *Journal of the Asiatic Society* (London, 1908).

NADLER, nä'dlĕr, Karl Christian Gottfried (1809–49). A German poet, who wrote in the dialect of the Rhenish Palatinate. He was born at Heidelberg and studied law there and at Berlin. His poems, under the title *Fröhlich Palz, Gott erhalts* (1847; 8th ed., illustrated, 1882; also No. 3369 et seq., Reclam ed.), were excellent pieces of genre verse, the drinking songs being peculiarly rollicking and musical. Consult the *Allgemeine deutsche Biographie,* vol. xxiii (Leipzig, 1886).

NADSON, nät'sŏn, Semion Yakovlevitch (1862–87). A Russian lyric poet of Jewish extraction. He was born in St. Petersburg, but spent his early childhood at Kiev. Left an orphan at 10, Nadson was sent in 1879 by his uncle to the Pavlov Military School. Military life proved so distasteful to him, however, that in 1884 he gladly accepted a modest position on a St. Petersburg weekly journal. A sojourn abroad could not check the tuberculosis which had set in very early, and Nadson died at 25. His brief literary career began in 1878, with a poem ("At Dawn") which appeared in a Russian periodical. A volume of collected verse was published in 1885 (17th ed., 1899). Other works were *Literary Sketches of 1883–86* (1886; 2d ed., 1887), reviews and other current comment; *Unfinished Sayings* (1902), posthumous papers; and *Prose* (1912), diary, letters, and an autobiographical sketch. Nadson lacks the energy, the eloquence, and the national sentiment of some of the great Russian poets. Preëminently a poet of youth, of dreamy ambitions and idealism, he owed his large contemporaneous popularity to a reaction from the social and moral disillusionment of the time. But his verse, melodious and plastic, tender and sincere, will make an appeal to all lovers of poetry. Consult R. Newmarch, *Poetry and Progress in Russia* (New York, 1907).

NAEGELI, nā'ge-lē, Karl Wilhelm (1817–91). A Swiss botanist, born in Kilchberg, near Zurich. After studying at Zurich, Geneva, and Berlin he began in 1842 to teach botany in Zurich, was made extraordinary professor in 1848, full professor at Freiburg in 1852 and at Zurich in 1855, and finally was appointed to the chair of botany at Munich in 1858. The name of Naegeli is one of the greatest names in the history of botany. Sachs said of him, "He laid the foundation of knowledge in every department of botany." The extent and importance of his work cannot be indicated in a brief sketch. He is known especially for the theory of cell formation, the micellar theory, growth by intussusception, classification of tissues on the basis of development, and a theory of evolution which he called progressive evolution, but which is now better known as orthogenesis. In coöperation with Schleiden he founded in 1844 the *Zeitschrift für wisscnschaftliche Botanik,* in which was published his discovery of sperms in ferns, his *Zellenkerne, Zellenbildung, und Zellenwachstum* (1844–46). Among his most notable contributions were: *Neuen Algensysteme* (1847); *Die Stärkekörne* (1858); *Die Theorie des Capillaritat* (1866); *Das Mikroskop* (1867); *Die niedern Pilze* (1877).

NÆ'VIUS, Gnæus. One of the earliest Latin poets, born in the earlier half of the third century B.C. Some, on the basis of Aulus Gellius (i, 24, 1), have thought he was born in Campania; he may well, however, have been born in Rome, and so have been a Roman citizen by birth. In his youth he served in the First Punic War, but later made his appearance at Rome as a

dramatic writer (235 B.C.). He was very decidedly attached to the plebeian party, and in his plays satirized and lampooned the Roman nobles with extreme virulence. His rashness ultimately caused his banishment to Utica in Africa (204), where he died after 200. Besides his dramatic writings, comprising both tragedies and comedies, he wrote an epic poem, *De Bello Punico*, in the old Saturnian metre. He was most successful in comedy. Of the plays only a few fragments are extant, but these testify to his vigorous and independent Roman spirit. Evidence of his originality is seen (1) in the fact that his epic dealt with a Roman subject, independently (it was not a translation from the Greek, as the epic of Livius Andronicus had been), and (2) in the fact that he attempted tragedies based on Roman history. See LATIN LITERATURE II, *The Early or Pre-Classical Period.* The fragments may be found in Bothe's *Poetarum Latinorum Scenicorum Fragmenta* (Halberstadt, 1824); Klussmann's collection of the same (Jena, 1843); Müller's *Livii Andronici et Cn. Nœvi Fabularum Reliquiæ* (Berlin, 1885); or Ribbeck's *Scœnicæ Romanorum Poesis Fragmenta*, 2 vols. (3d ed., Leipzig, 1897–98). The fragments of his *Bellum Punicum* may be found in J. Wordsworth, *Fragments and Specimens of Early Latin* (Oxford, 1874); L. Havet, *De Saturnio Latinorum Versu* (Paris, 1880); C. Zander, *Versus Italici Antiqui* (Lund, 1890). Consult: W. Y. Sellar, *Roman Poets of the Republic* (3d ed., Oxford, 1889); J. W. Duff, *A Literary History of Rome* (London, 1909); Martin Schanz, *Geschichte der römischen Litteratur*, vol. i, part i (3d ed., Munich, 1907); F. Leo, *Geschichte der römischen Literatur*, vol. i (Leipzig, 1913).

NÆ'VUS (Lat., mole, wart, birthmark), or BIRTHMARK, MOTHER'S MARK. A congenital mark upon the skin consisting of the product of excessive development of fibrous tissue, hair, blood vessels, or pigment in a circumscribed area. The term is generally and perhaps more properly limited to a variety of angioma, or vascular tumor, usually of small size, composed of enlarged capillaries which communicate freely with other capillaries of the skin. The ordinary form of nævus is the *vasculosus*. This is present at birth or appears during the early months of the child's life, presenting itself as a red stain, or a diffuse flat patch, somewhat elevated above the surrounding surface. It may be a punctate spot, or may cover the side of the face or even the neck and chest, e.g. This variety is called port-wine mark, wine stain, *tache de feu*, or *feuermal*. The *nœvus araneus*, or spider cancer, is not a cancer, but an angioma, consisting of a central elevated red point from which radiate dilated vessels so that there is a rough resemblance to a star. It is commonly single and occurs usually in children of about a year or two years old, and is generally situated on the nose or cheeks. The nævi of vascular variety are found in the papillary layer of the upper part of the corium, and consist of irregularly intertwined and dilated capillary vessels of new growth with free anastomosis. In some there is a layer of connective tissue found encircling the vessels, or an enormous growth of connective tissue, so that the result may resemble elephantiasis (q.v.). The treatment for the removal of nævi is surgical. Excision with the knife, ligature, transfixion of the growth with a cataract needle, compression by means of pads retained in place with a rubber band, chemical caustics, such as nitric acid or the acid nitrate of mercury, multiple linear scarification, X rays, treatment with radium, electropuncture, and electrolysis are the means employed, the last named being the best method of procedure. Vaccination directly upon the nævus is an obsolete means of removal. Port-wine marks may be removed by creating several minute cicatrices with the electric needle. Entire removal of an elevated mass may be effected by electrolysis, as in the case of a tumor (q.v.). Superficial nævi are satisfactorily destroyed, without scarring, by the application of carbon dioxide snow.

NÄFELS, nā'fĕls. A village in the Canton of Glarus, Switzerland, on the Linth, 4 miles north of the city of Glarus (Map: Switzerland, D 1). It was the scene of a famous battle, in 1388, in which 400 natives defeated an Austrian force of fifteen times their number. In 1799 the French under Molitor met and defeated the Russians who were trying to press their campaign into France. The village manufactures cotton, printing and iron construction material. Pop., 1910, 2818.

NAFTIA, näf'tē-ȧ, LAGO, or LAGO DEI PALICI. A small lake in Sicily, near Palagonia, in the Province of Catania. It is situated in a plain, near craggy hills, in an ancient crater about 500 feet in circumference. At several points in the centre the water bubbles violently, sometimes rising to the height of 2 feet or more under the pressure of the outpouring of carbonic-acid gas. The water is greenish, or turbid, and has an odor of naphtha. The atmosphere is fatal to birds attempting to fly across the surface of the lake and to small animals which approach it to satisfy their thirst; while to lean over it is believed to produce dizziness and headache in man. The ancients regarded these phenomena with great dread. Here were worshiped by the Siculi, the pre-Greek inhabitants of the island, a pair of chthonic gods of mighty power, called commonly by the Romans Palici (Gk. Παλικοί). In the great servile revolt against Rome (104 B.C.) the temple here was the headquarters of the conspirators. Consult E. A. Freeman, *History of Sicily*, vol. i (Oxford, 1891).

NAGA, nä'gȧ (Skt. *nāga*, serpent). In Hindu mythology, a member of a fabulous race of semidivine serpents with human faces but reptile forms, inhabiting the lower world (Nāga-loka, world of serpents), where their capital, Bhogavati, was a scene of magnificence and splendor. They were 1000 in number, and Sesha, the sacred serpent of Vishnu, was their king. In one of his preëxistences the Buddha saved the life of a Naga, and in his last existence he often had relations with them. The name Naga was applied also to an actual race of people in Central India, perhaps so called from their worship of serpents, and this people has left historical traces, although fable and myth doubtless become mixed in allusions to the serpent race. See NAGAS.

NAGA. A town of Cebú, Philippines, on the east coast, 12 miles southwest of Cebú. It is a port of call for steamers and coasting vessels. Pop., 1903, 16,884.

NAGANA, nȧ-gä'nȧ. A disease of live stock prevalent in South Africa, caused by parasitic Hæmatozoa, which are carried from a diseased animal to a healthy one by the tsetse fly (q.v.). See SLEEPING SICKNESS.

NAGANO, nȧ-gä'nō. An inland city of Hondo, Japan, about 95 miles south-southwest of Niigata

(Map: Japan, F 5). It is celebrated principally for the Buddhist temple of Zenkoji, one of the most famous temples in Japan, founded in the latter part of the seventh century. The town is visited by many pilgrims, and carries on a considerable trade in textiles and woven goods. Pop., 1898, 31,319; 1908, 39,242.

NAGAR, nŭg'ăr. See BEDNUR.

NAGARI, nä'gȧ-rē. See DEVANAGARI.

NAGĀRJUNA, nȧ-gär'jōō-nȧ, or **NĀGASĒNA,** nä'ga-sā'nȧ. A great Buddhist sage and teacher, the founder of the Mādhyamika school of northern Buddhism, also famous because of his religious conference or discussion with the Græco-Bactrian King Menander or Milinda (q.v.). Among the numerous works attributed to him by tradition is a long commentary on the *Mahāprajñā-pārāmitā Sūtra.* Many medical treatises are ascribed to him by Chinese writers, and he is considered the author of several didactic poems. Consult Walleser, *Die mittlere Lehre (Mādhyamika-šāstra), nach der tibetischen Version* (Heidelberg, 1911); La Vallée Poussin, *Mūlamadhyamakakārikās (Mādhyamikasūtras) de Nāgārjana avec la Prasannapadā* (St. Petersburg, 1913); Wenzel, *Journal of the Pali Text Society* (1866).

NAGAS, nä'gȧz. The natives of the Naga Hills in southeastern Assam. The Nagas of Manipur and the mountains extending to the north (Patkoi, Barai) of this country seem to be Indonesians, more or less pure, while on the Lushai Hills, south of Manipur, are probably Nagas mixed with Kyens and Burmese of Arakan. The Nagas live in permanent villages, the headmen of which hold their power largely by the exercise of sacerdotal functions. Marriage is exogamous, with paternal relationship. Many interesting taboos and kindred usages are in vogue. The Nagas are best subdivided into the Angami and Kanpui of the west, who wear a petticoat or apron, the Lhota and Hot in the centre, who wear a plaid, and the Nangta, or naked, in the east. Consult W. H. Furness, *The Home Life of the Borneo Head-Hunters* (Philadelphia, 1902), and T. C. Hodsdon, *Naga Tribes of Manipur* (New York, 1911). See INDO-CHINESE.

NAGASAKI, nä'gȧ-sä'kē. The capital of an important prefecture of the same name and one of the principal seaports of Japan, situated on a small peninsula in the northwest of the island of Kiushu, in long. 129° 52′ E. and lat. 32° 44′ N. (Map: Japan, A 7). The harbor, about 3 miles long, is one of the safest in the East, and sufficiently deep for vessels of 26 feet draft. The town has water works with filter beds, a meteorological station, schools, a theatre, and hospitals. The principal industrial establishments are the Akunoura Engine Works and several shipyards. The foreign commerce of Nagasaki amounted in 1913 to $10,399,497, of which $2,363,318 represented exports. The principal imports are cotton, coal, sugar, and petroleum, and the chief exports coal, rice, flour, camphor, vegetable wax, and tobacco. Nagasaki is an important coaling station. The principal countries of the world are represented by consuls. Pop., 1898, 107,422; 1903, 153,293; 1908, 176,480; 1913, 160,450. Its commercial importance dates from the sixteenth century, when it became the stronghold of the Japanese Christians and an important centre in the foreign trade of Japan. When the Europeans were expelled from Japan the Dutch were permitted to maintain their factory on the islet of Deshima (q.v.). Nagasaki then became the only point of communication between Japan and Europe. It was opened to foreign commerce by the Treaty of 1858.

NĀGASENA, nä'gȧ-sā'nȧ. See NAGĀRJUNA.

NAGCARLÁN, näg'kär-län'. A town of central Luzon, Philippines, in the Province of La Laguna, 11 miles south of Laguna. Pop., 1903, 10,212.

NAGEL, nä'gel, ALBRECHT EDUARD (1833–95). A German ophthalmologist. He was born at Danzig, studied first at Königsberg and then at Berlin under Gräfe, and, after practicing in his birthplace for several years, became docent (1864) and professor of ophthalmology (1867) at Tübingen. He was also director of the ophthalmic hospital connected with the university. His most important discovery was the identity of the retinas as opposed to the theory of projection. This is explained in his book, *Das Sehen mit zwei Augen* (1861). Nagel's further writings include: *Die Refraktions- und Akkommodationsanomalien des Auges* (1866); *Behandlung der Amaurosen und Amblyopien mit Strychnin* (1871); *Die Vorbildung zum medizinischen Studium und die Frage der Schulreform* (1890).

NAGEL, nā'gel, CHARLES (1849–). An American lawyer and cabinet officer, born in Colorado Co., Tex. His father was opposed to secession and removed to St. Louis, where Nagel studied law at Washington University (graduating 1872) and in the offices of Glover and Shepley. After taking a postgraduate course at Berlin he began a successful practice in St. Louis as a member of the firm of Finkelnburg, Nagel, and Kirby. From 1886 to 1906 he was lecturer in the St. Louis Law School. He was elected to the Missouri State Legislature as a Republican in 1881, but was defeated as candidate for councilman in St. Louis in 1891 and for district judge in 1892, although he had been active in party politics. In 1893, however, he was elected president of the council, serving, during a part of his term, as acting mayor, in which capacity he urged economy and reform in the penal and charitable institutions. During the violent street-railway strikes he headed a volunteer committee of 70 which endeavored to effect peace by arbitrating the differences between the strikers and the traction powers. In 1909 he was appointed by President Taft Secretary of Commerce and Labor, a post which he held throughout the administration and one in which his intimate knowledge of labor and transportation problems was serviceable. He advocated the passage of laws granting reciprocity agreements and the arrangement of ship subsidies as an encouragement of American commerce, and was active in initiating at least 64 arbitrations between railroad employers and their laborers and between numerous other corporations and their employees.

NÄGELSBACH, nā'gĕls-bäg, KARL FRIEDRICH (1806–59). A German classical scholar and professor at Erlangen (1842). He was born near Nuremberg, and was the author of a popular *Lateinische Stylistik* (1846, and often reissued); *Die homerische Theologie* (rev. ed., 1861); *Die nachhomerische Theologie* (1857). He edited the *Agamemnon of Æschylus* (1863).

NAGLER, nä'glĕr, GEORG KASPAR (1801–66). A German writer on art, born at Untersüssbach, Bavaria. After establishing himself at Munich as an antiquary he began the publication of his

Neues allgemeines Künstlerlexikon (22 vols., 1835–52), a monument of industry and careful research. Another important work is *Die Monogrammisten* (vols. i–iii, 1857–63; vol. iv, ed. by Andresen, 1871; vol. v, ed. by Clauss, 1879); besides which he published monographs on Raphael, Dürer, Michelangelo, and Rembrandt, creditable for their day but superseded by more modern works.

NA'GOR (African name). A West African antelope (*Cervicapra redunca*), one of the reedbucks.

NAGOYA, nä-gō'yä. The capital of the Province of Owari, Japan, in the island of Hondo, 94 miles by rail east-northeast of Kyoto (Map: Japan, E 6). It formerly belonged to the house of Owari, one of the most prominent houses in Japan, whose castle, dating from the beginning of the seventeenth century, is the principal feature of Nagoya and contains many specimens of the work of some of the best artists of Japan. Another interesting feature is the Buddhist temple of Higashi-Hongwanji with beautiful specimens of wood carving. In the vicinity of the town is the industrial settlement of Sedo, where the first glazed pottery in Japan was produced in the thirteenth century and where the first work in cloisonné enameling in the country was done in the nineteenth century. Nagoya is still one of the most important pottery centres in Japan, the industry employing almost its entire population. It has also extensive manufactures of cotton and silk and embroideries. Pop., 1898, 244,145; 1908, 378,231; 1913, 447,951.

NAGPUR, någ-pōōr', or **NAGPORE**. A division of the Central Provinces (q.v.), British India, comprising the districts of Nagpur, Bhandara, Chanda, Wardha, and Balaghat. Area, 23,521 square miles; pop., 1901, 2,728,063; 1911, 3,109,838. The surface consists of an alternation of low hills, fertile river valleys, and plains from west to east. Cotton, pulse, rice, maize, oilseed and other seeds, fruits, and vegetables are largely cultivated, and the division is famous for its oranges. The chief minerals are coal, antimony, manganese, ochre, and gold. The Gonds (q.v.) inhabit the hilly sections. Nagpur, formerly a part of the great Mahratta kingdom, was ruled by the rajahs of Berar until 1853, when the dynasty became extinct and the territory was annexed by the British. Capital, Nagpur.

NAGPUR, or **NAGPORE**. The capital of the Central Provinces, British India, and of a division and district, 520 miles by rail east-northeast of Bombay (Map: India, D 5). It is situated in an unhealthful place on the banks of the Nag, a small stream, and with its extensive suburb of Sitabaldi, the European quarter, covers an area 7 miles in circumference. This part is centred by the fort-crowned Sitabaldi Hill. Here, also, on the north, are the bazars and the cantonment with Heslop College, Morris College, and the Victoria Technical Institute. Several fine Hindu temples of Mahrattan architecture, handsome gardens, monumental tanks, and the tombs of the Bhonsla Rajahs and a museum are notable native features. Nagpur is the focus of trade and industry in Central India. There are many large cotton mills and compresses. There are manufactures of silk and cutlery, and a considerable trade in agricultural produce, salt, and European manufactured goods. Nagpur is noted for the oranges which it exports. The city became the capital of an independent Mahratta rajah in 1740. In 1817 it was the scene of an attack by Rajah Appa Sahib with 18,000 troops on the British Residency. The Resident, Mr. Jenkins, who had anticipated trouble and had managed to assemble 1350 men under Colonel Scott, defeated the assailants after 18 hours' fighting. A second battle a month later resulted in the Rajah's submission and subsequent deposition. Pop., 1901, 127,734; 1911, 101,415.

NAGUABO, nä-gwä'bō. A city of the Department of Humacao, Porto Rico, situated near the east end of the island, on the highway running from Humacao to Fajardo (Map: Porto Rico, G 3). It is located at the foot of the Luquillo Mountains, a short distance from the coast. The surrounding district produces chiefly sugar cane, grapefruit, and oranges. Pop., 1899, municipal, 10,873; urban, 1812; 1910, municipal, 14,365; urban, 3303.

NAGUILÍAN, nä'gē-lē'än. A town of north Luzon, Philippines, in the Province of La Unión, on the Bauang River, 11 miles southeast of San Fernando. Pop., 1903, 11,885.

NAGYBÁNYA, nöd'y'-bän'yŏ. A royal free town in the County of Szatmár, Hungary, situated among the Lápos Mountains, 90 miles east of Debreczen (Map: Hungary, H 3). It has a state college, and its chief industries are gold, silver, lead, and copper mining and viniculture, but there are also manufactures of linen and cotton goods and spirits. Pop., 1910 (arrondissement), 30,569.

NAGYBECSKEREK, -bĕch'kĕ-rĕk. A town of Hungary. See BECSKEREK.

NAGYKANIZSA. See KANIZSA, NAGY.

NAGYKÁROLY, -kä'rôl-y'. The capital of the County of Szatmár, Hungary, situated 41 miles east-northeast of Debreczen (Map: Hungary, H 3). It has a fine church, a palace of the Counts Károlyi, a Piarist monastery, and Gymnasium. Its chief products are coarse cloth, linen, leather, cutlery, tobacco, and bricks. It became the seat of the Károlyi family in the fourteenth century. Pop., 1910 (arrondissement), 43,692.

NAGYKIKINDA, -kĭ'kĭn-dŏ, or GROSS KIKINDA. A town in the County of Torontál, Hungary, situated 36 miles by rail west of Temesvár (Map: Hungary, G 4). It has a higher Gymnasium. The products include flour and meal, and there is an extensive trade in agricultural products and domestic animals. Pop., 1910 (arrondissement), 32,987, about one-half Serbs.

NAGYKÖRÖS, -kĕ'rĕsh. A town of Hungary. See KÖRÖS.

NAGYSZEBEN, -sĕ'bĕn. A town of Hungary. See HERMANNSTADT.

NAGYSZOMBAT, -sôm'bŏt. The Hungarian name of Tyrnau (q.v.).

NAGY-VÁRAD, -vä'rŏd, or **GROSSWARDEIN**, grōs'vär-dīn. The capital of the County of Bihar, Hungary, situated in a beautiful plain on the Sebes Körös (the rapid Körös), 38 miles south-southeast of Debreczen, at the intersection of several railroad lines (Map: Hungary, G 3). It consists of the town proper and several suburbs and has many beautiful dwellings. It was formerly strongly fortified, and its ancient fortress, built on a neck of land between the Körös and Pecze, is still utilized as barracks. Grosswardein is the seat of a Roman Catholic and of a Greek Orthodox bishop. Its notable

ecclesiastical buildings include the large Roman Catholic cathedral, the Greek Catholic and Greek Orthodox cathedrals, the church of St. Ladislas, which contains the remains of the sainted King, and the palace of the Roman Catholic bishop. The theatre and town hall are finely constructed new buildings, and there is an archæological and art museum. Educational institutions are very numerous, among them being a celebrated school of law, a priests' seminary, a Roman Catholic and a Calvinistic Gymnasium, a commercial school, a girls' high school, and a library of 15,000 volumes. It has flourishing manufactures of pottery, earthenware, oil, vinegar, machinery, bricks, stoves, art objects, spirits, and starch, and the district produces an excellent quality of wine. The sulphur springs of Hajó are situated 6 miles to the south. The city has running water. Pop., 1900, 50,177; 1910, 64,169. Nagy-Várad, one of the oldest cities of Hungary, is said to have been founded by St. Ladislas in 1080, and was destroyed by the Tatars in 1241. It was held by the Turks from 1660 to 1692.

NAHANE. A Déné tribe in the interior of northern British Columbia, composed of the Tahltan, Takutine, and Kaska. Consult A. G. Morice, in *Transactions of the Canadian Institute*, vol. vii (Toronto, 1904).

NAHANT'. A town in Essex Co., Mass., on a peninsula extending into Massachusetts Bay; reached by electric cars from Lynn (4 miles) and in summer by steamers from Boston (10 miles) (Map: Massachusetts, F 3). It has a large public library. Nahant has been for years a favorite place of summer resort for Boston people, and has many handsome seaside residences. Pop., 1900, 1182; 1910, 1184. The site of Nahant is said to have been the landfall of the Northmen. It was visited in 1614 by Capt. John Smith, and in 1622 was granted to Capt. Robert Gorges. Until 1853, when it was incorporated as a separate town, Nahant was a part of Lynn. Consult Hurd, *History of Essex County, Massachusetts* (Philadelphia, 1888).

NAHARRO, nȧ-ȧr'rō, Bartolomé de Torres. See Torres Naharro, Bartolomé de.

NAHR EL ASI, när' ĕl ä'sĕ. A river of Syria. See Orontes.

NAHUAN (nä'wan) **STOCK.** An American linguistic stock embracing tribes of high and low culture over a great range of territory. A recent study by Sapir goes far to prove what has long been suspected, viz., that the Shoshonean, Piman, and Nahuan language stocks should be thrown into a single great stock. This combined stock would be far the most important in the New World, extending from Idaho to Costa Rica and embracing several millions of souls.

Swanton in his linguistic map of Mexico and Central America gives 19 subgroups for his Nahuan stock (which includes the Piman but not the Shoshonean). The northern tribes seem never to have developed a remarkable culture, although all are in the agriculture, weaving, and pottery-making stage. The Huichol have some interesting customs. In general status they are about halfway between the tribes of central Mexico and the Pueblo Indians of New Mexico and Arizona. They have little god houses which are the most northern examples of the Mexican temple. Concerning the former languages of the states of Zacatecas, Aguascalientes, and San Luis Potosí we have little knowledge except that they belonged to the Nahuan stock.

The Mexicano, or Nahua proper, is distributed in many closely related dialects down the west coast of Mexico from Culiacán to Acapulco. From this southern point it spreads eastward over the valley of Mexico and to the southern shores of the Gulf of Campeche. From here on its southern distribution is discontinuous. Areas of Nahuan speech are found in Guatemala, Salvador, Nicaragua, and Costa Rica. In the valley of Mexico the principal dialects were Aztec and Tlaxcalan. The Guatemala and Salvador tribes were called Pipiles (boys), because their pronunciation was impure. The Niquiran on the shores of Lake Nicaragua gave their name to Nicaragua. The southernmost colony was the Sigua on the Chiriqui lagoon.

The distribution of the Nahuan languages has an archæological as well as a linguistic interest. It can be pretty clearly shown that the spread took place after the invention of agriculture and particularly after the cultivation of maize. Now this important food plant is supposed to be developed from a wild plant that grows on the Mexican highlands. It is not unlikely that the spreading Nahuan tribes were great culture carriers. The earliest horizon of culture in Mexico is called the archaic. It was evidently developed by a people in the agriculture stage. It is found in almost identical form in all the areas in which dialects of the Mexican subgroup of the Nahuan stock were spoken, from Sinaloa to Costa Rica, and is rare elsewhere. After the primary distribution there were doubtless many shiftings of population, for the Nahuan tribes developed war, trade, and government to a high plane. For a historical discussion, see the article Mexican Archæology. See also Indians, American, *Indians of Mexico.*

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NAHUATLAN (nȧ'wä-tlan) **STOCK.** See Nahuan Stock.

NAHUEL HUAPÍ, nȧ-wāl' wȧ-pē', or Tiger Lake. A lake on the east slope of the Andes in Argentina, on the boundary between the territories of Neuquen and Río Negro (Map: Argentina, E 6). It is 75 miles long, with an average width of 10 miles and an area of 309 square miles. It contains a number of islands covered with luxuriant vegetation, and its banks are fertile and well watered. It receives many streams and discharges into the Atlantic Ocean through the Río Negro. The lake was discovered in 1690 by Jesuit missionaries traveling eastward from Chile.

NA'HUM. The seventh of the minor prophets according to the usual arrangement. Nothing is known of his life except what may be gathered from the notice in the first verse of his prophecy, where he is called the Elkoshite. Where Elkosh was is uncertain. It has been located in Galilee and in Assyria; a third identification is with Beit Jibrin (Eleutheropolis) in the Shep-

helah. Nahum's prophecy consists of two parts, besides the introductory verse: (1) a psalm (i. 2–ii. 2), which describes the majesty of God and His punishment of His enemies in somewhat general terms; and (2) the prophecy proper (ii. 3–iii. 19), which foretells the doom of Nineveh. The style is full of animation and fancy and, at the same time, clear and rounded. The text is in part corrupt. The date of the prophecy cannot be fixed exactly, but must have been later than the capture of Thebes in Egypt (the "No" of iii. 8; see No-Amon) by Asurbanipal, 663 B.C., and it must have been before the fall of Nineveh, about 606 B.C. Nahum differs from the other preëxilic prophets whose words have come down to us in absence of rebuke of his own people and his attitude of fierce expectation of punishment of the enemy. The investigations of Bickell and Gunkel have established with certainty traces of an original acrostic arrangement in the psalm, and this artificiality points to a late date for this part of the book; it fits in with the conditions existing during the Persian rule in Palestine, when the religious community of Jerusalem was struggling against great odds, and may have been prefixed by an editor to the genuine prophecy of Nahum as an appropriate introduction. If this be the fact, it would be quite in accordance with the free treatment to which older discourses were subjected by post-exilic compilers.

Bibliography. Consult the commentaries mentioned under Minor Prophets; Gunkel, in *Zeitschrift für alttestamentliche Wissenschaft*, vol. xiii (Giessen, 1893); Bickell, *Beiträge zur semitischen Metrik* (Vienna, 1894); Billerbeck and Jeremias, "Der Untergang Ninive's und die Weissagungsschrift des Nahum," in *Beiträge zur Assyriologie* (Leipzig, 1895); A. B. Davidson, "Nahum, Habakkuk, and Zephaniah," in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1896); S. R. Driver, in *Century Bible* (London, 1906); Haller, in *Die Religion in Geschichte und Gegenwart* (Tübingen, 1913).

NAHUYS VAN BURGST, nä'hois vân bo͝orgst, Hubert Gerard, Baron (1782–1858). A Dutch colonial soldier and geographical author, born in Amsterdam. In 1809 he went to Batavia, where he entered the army and fought against the English in Bengal. In 1814 he was appointed Commissioner to the Prince of Java. Nahuys was pensioned in 1830, and nine years afterward returned to Holland, settling at Breda. His writings, which are of no small geographical importance, include *Schets van Benkoelen op de westkust van het eiland Sumatra* (1826) and *Beschouwingen over Nederlandsch-Indië* (1847; 2d ed., 1848).

NAIADS, nā'yădz (Gk. *Naïdes, Naïdes, Νηϊάδες, Nēïades,* from *νᾶν, nan,* to flow; connected with Lat. *navis,* Gk. *ναῦς, naus,* Skt. *nāu,* ship). In Greek mythology, the nymphs of the springs and hence also of rivers. Caves, especially with trickling water, were sacred to them and were believed to be their dwellings. Owing to the medicinal qualities of some springs, the Naiads naturally appear as healing divinities, and, since divination was associated with the water, they became prophetic. Under their influence the prophet became inspired or even mad. See also Nymph.

NAIANT, nā'ănt, or **NATANT,** nā'tănt (OF., swimming). An heraldic term applied to a fish when borne horizontally across the shield in a swimming position. See Heraldry.

NAIDU, nī'do͞o, Sarojini (1879–). A Hindu author and reformer. She was born in Hyderabad, the daughter of Dr. Aghorenath Chattopâdhyây, an educator, of Bengali Brahmin stock, who had studied at Edinburgh and Bonn. In 1883 she married Dr. Naidu, principal medical officer in the service of the Nizam. She had been educated in England (1895–98)—at King's College, London, and at Girton, Cambridge. King Edward VIII gave her the gold Kaiser-i-Hind for organizing flood-relief work in Hyderabad in 1908. She lectured throughout India on social and religious questions and published two volumes of English verse, *The Golden Threshold* (1905), preface by Arthur Symonds, and *The Bird of Time* (1912), preface by Edmund Gosse, which were translated into many of the Indian vernaculars.

NAIL (AS. *nægel,* OHG. *nagal,* Ger. *Nagel,* nail, Goth. *ga-nagljan,* to nail; connected with OChurch Slav. *nogŭti,* Lith. *nagas,* Skt. *nakha,* nail). The terms "nail," "claw," and "hoof" are popular names for different developments of the same epidermal formation. All are horny secretions formed from the outer layer of the skin, primarily to protect the tip of the digits in the higher vertebrates. Nails have retained this function, while claws have become specialized as weapons of offense or defense, and hoofs are specialized to protect the whole of the terminal joint of the digit. Hoofs are usually thick, heavy, and blunt, and are best developed where the number of digits is reduced; they are characteristic of the great group of herbivorous animals known as Ungulata, and reach their highest development in the horse. Nails are flattened, usually thin, and more or less rounded at the end. They are present in some reptiles, in certain birds (as the grebes), and in many mammals, especially the monkeys and man. Cf. Horn.

Human Nails. These are the elastic, horny plates placed as protective coverings on the dorsal surface of the terminal phalanges of the fingers and toes. Each nail consists of a root, or part concealed within a fold of skin; a body, or exposed part attached to the surface of the skin; and a free anterior extremity called the edge. The skin below the root and body of the nail is termed the matrix, from its being the part from which the nail is produced. This is thick and covered with highly vascular papillæ, and its color is seen through the transparent horny tissue. Near the root the papillæ are smaller and less vascular; hence the portion of nail corresponding to this part is of a whiter color; from its form, this portion is termed the lunula. The chemical composition of the nails is given in the article Horn. According to the observation of Beau, the finger nails grow at the rate of about one-thirtieth of an inch in a week, while the toe nails grow with only about one-fourth of that rapidity. The general state of health influences the growth of nails, and after illness a deficient formation of horny matter may result, shown by the production of a groove across the nail. The breadth and position of this groove indicate roughly the period and duration of the illness. An inflammation of the matrix of the nail is called *onychia.* The affection is apt to be syphilitic in origin. The nail rots and crumbles away at the root; the free edges crack and split; and there are pain, redness, and swelling of the soft tissues. An acute inflammation of the tissues about the nail is termed *paronychia* or *whitlow.* When a nail has

been removed by violence, or has been thrown off in consequence of the formation of matter (pus) beneath it, a new nail is speedily formed, provided the matrix has not been seriously injured.

There is a very common and troublesome affection popularly known as *ingrowing nail*. Its most usual seat is the great toe. It does not in reality arise from any alteration of the nail, but from the adjacent soft parts being constantly pressed against its edge by the use of tight shoes. These parts become swollen and inflamed; suppuration ensues, and an intensely sensitive ulcer is formed, in which the nail is embedded. In obstinate cases it is not infrequently necessary to remove a portion of the nail, an operation which may be done under local anæsthesia without pain. *Subungual exostosis* consists of an overgrowth of bone on the distal phalanx, generally of the great toe, forming a painful swelling, the only cure for which is surgical.

The appearance of the nails is of considerable import in diagnosis. The nails of gouty persons are hard, brittle, and longitudinally striated. Great hypertrophy of the nails, with changes in their structure, is occasionally seen and is termed *megalonychosis*. Its cause is not known. Irregular development, fragility, dryness, and cracking of the nails are observed in syphilis, as a result of trophic changes after nerve injuries and diseases, in Raynaud's disease and in scleroderma. Growth is sometimes arrested in hemiplegia and acute infantile spinal paralysis. In victims of the chloral habit ecchymoses and ulcers may sometimes be seen at the base of the nail.

NAILS. Slender pieces of metal, tapering towards and sometimes pointed at one end and with flattened or rounded heads. Nails are made of many different materials, as copper, zinc, brass, iron, or steel, but the bulk of the nails in ordinary use are made of steel wire. Iron nails, in turn, may be either wrought, cut, or cast, or made from wire.

Until almost the close of the eighteenth century all nails were hand-made. In France for nearly a century light nails for carpenter work have been made of wire, but until 1850 they were made by hand with a hammer. The hand-made nail was pinched in a vise, with a portion projecting. A few blows of a hammer flattened one end into a head. The head was beaten into a counter sunk in the vise, thus regulating its size and shape. In northern Europe, Britain, and America nails were made, at first, by forging on an anvil. The iron used for hand nail making was first formed into nail rods, which were sold in bundles. The nail rods were prepared either by rolling the malleable iron into small bars of the required thickness or by the much more common practice of cutting plate iron into strips by means of rolling shears. In Colonial days the making of nails from these rods was a household industry among the New England farmers.

To America belongs the distinction of having first made cut nails by machinery, and with the advent of machine-cut nails the household industry of nail making rapidly declined. Of these early inventions the only one that has survived is that patented in 1786 by Ezekiel Reed, of Bridgewater, Mass. At the close of the eighteenth century 23 patents for nail machines, or improvements thereto, had been granted in the United States, and their use had been generally introduced into England, where they were received with enthusiasm. In 1883 cut nails were first made of steel.

The manufacture of tacks was also a household industry in New England till well into the nineteenth century. The wire was pointed on a small anvil; it was then placed in a vise, worked by the foot, which clutched it between jaws furnished with a gauge to regulate the length. A certain portion was left projecting, which was beaten by a hammer into a flat head. New England, and particularly the city of Taunton, Mass., is now the centre of the tack-making industry in the United States.

Wire nails were first made in the United States by William Hersel, of New York, in 1851 or 1852. In 1875 Father Goebel, a Catholic priest, went to Covington, Ky., from Germany, where the art of making wire nails was practiced. Goebel began the manufacture of wire nails at Covington, and in 1876 the American Wire and Screw Nail Company was established under his leadership. At first the nails were made by hand, but soon a French machine was imported. In this machine the nails were held in dies to form the head. The blow of the hammer which produced the head was caused by a board or single leaf spring suspended from a ceiling, against which the machine, in rotating, pushed a cam. The release of the latter produced the blow.

For a time the wire nails were made with barbs, that they might hold more securely, and the new industry grew but slowly. In 1876, at the Centennial Exhibition, the company received a silver medal over French and German competitors. This called the attention of the trade to the article, and two other firms at once took up its manufacture. By 1885 there were 26 firms in the business, and the wire nail had been adopted by many manufacturers. Since then their use has rapidly increased.

Two types of wire-nail machines are described in Smith's *Treatise on Wire*. (See *Bibliography* at end of article.) In one type "the wire is automatically straightened from the coil and fed into the machine, where dies grip it, while a pair of nippers cuts the wire off in suitable lengths, when it is automatically pointed and headed. The latter operation is effected by means of the spring-bolt mechanism operated by a cam of the main shaft and remaining inoperative until a sufficient length of wire has been fed to the machine for the next nail. The cutting and pointing are performed in one operation." In the second type the heads are formed by steady pressure instead of intermittent striking.

The older process of making cut nails is, in general, as follows: the ore, whether hematite or magnetic, is smelted in a blast furnace, run into pigs, puddled, squeezed, and, if need be, hammered, rolled in the puddling-ball train, and cut to lengths. These are then fagoted (i.e., piled so as to break joints), reheated to a white heat, drawn, passed through the nail-plate train, and the sheets, of the required width and thickness, allowed to cool. It is next cut across its length (the width of the sheet being usually about a foot) into strips which are a little wider than the length of the required nail. These plates, heated by being set on edge on hot coals, are seized in a clamp and fed to the machine, end first. The pieces cut out are alternate, and slightly tapering, of course, with the fibre, and are squeezed and headed up by the machine before going into the trough.

In 1897 the wire nails produced in the United States amounted to 8,997,245 kegs of 100 pounds each and in 1909 to 13,926,861 kegs. The output of cut nails for the same year was 2,106,799 kegs and, in 1909, 1,009,319 kegs. American wire nails are largely exported to Europe and to other parts of the world.

The accompanying table shows the export of nails from the United States from 1896 to 1914.

NAILS EXPORTED FROM THE UNITED STATES

(From the Statistical Abstract for 1914, prepared by the Bureau of Foreign and Domestic Commerce, under the direction of the Secretary of Commerce and Labor)

FISCAL YEAR	Cut		Wire	
	Pounds	Value	Pounds	Value
1896	20,730,260	$428,630	.....	.....
1897	26,476,585	519,471	.....	.....
1898	32,310,399	612,234	22,894,099	$458,787
1899	32,869,265	604,215	51,193,212	973,434
1900	24,915,866	647,711	84,635,468	2,124,528
1901	25,953,322	575,285	44,612,619	982,313
1902	15,266,626	318,539	46,416,697	947,242
1903	16,129,436	347,607	62,997,105	1,245,946
1904	21,448,899	445,033	72,646,550	1,517,876
1905	20,386,670	404,400	82,558,131	1,793,230
1906	15,427,539	314,485	99,842,011	2,095,488
1907	17,630,335	371,673	89,494,612	2,098,465
1908	14,517,462	335,271	79,612,680	1,983,465
1909	17,950,795	396,262	59,995,196	1,299,086
1910	19,949,278	407,904	81,531,280	1,705,026
1911	22,853,944	434,788	112,094,392	2,364,271
1912	27,669,712	472,217	140,931,548	2,865,980
1913	10,764,208	203,272	122,139,208	2,541,250
1914	10,136,030	191,389	80,310,081	1,693,132

Consult: Smith, *Treatise on Wire, its Manufacture and Uses* (London and New York, 1891); Swank, *History and Manufacture of Iron in All Ages* (Philadelphia, 1892); "Steel Wire and Nail Making," in *Scientific American*, vol. lxxxix (New York, 1903).

NAIN (Gk. *Naín*). A town in Galilee, mentioned once in the New Testament (Luke vii. 11–17), as the scene of Jesus' raising of a widow's son from death. It lay on the northern slope of the Jabel ed Daḥi, popularly known as Little Hermon, and was some 6 miles southeast of Nazareth and some 2 miles southwest of Endor (Map: Palestine, C 2). Its distance from Capernaum, some 20 miles, places it well within the limits of Jesus' second preaching tour, which must have included a more distant circle of towns than the suburban villages of Capernaum visited on the first tour (Mark i. 38). This journey is referred to in Luke viii. 1–3, and is most likely to have included this incident, though it is mentioned in the previous chapter. The site is now occupied by a small and squalid village of mud huts, the modern name of which is *Nein*. Ruins stretching to the north show the place to have been at one time of some importance. Their relatively modern character, however, gives us no evidence as to the size of the place in Jesus' time; while the varied use of *πόλις* (city) in the Gospels indicates nothing definite as to its character. In these ruins there is no trace of city walls (against Tristam, *Land of Israel*, p. 125); so that the gate referred to in the Gospel incident is in all probability merely the ordinary entrance of the road into the town. (Consult Conder, *Tent Work*, p. 63.) The rock tombs to the west are of undoubted antiquity. A little sanctuary, called "The Place of our Lord Jesus," marks the site of an early chapel, erected doubtless to commemorate the incident referred to by Luke. The situation of the village, though only some 700 feet above the sea, commands an interesting view of the plain of Esdraelon, with Mount Carmel to the southwest, Mount Tabor to the west, and Mount Hermon to the northeast. Sir W. M. Ramsay (*Education of Christ*, preface, p. ix, New York, 1911) believes the ancient town to have stood on the top of the hill, though he offers no proof of his view.

NAIN DE TILLEMONT, Sébastien le. See Tillemont, S. le N. de.

NAIN SING (?–1882). A Hindu explorer in Central Asia, born at Namaon. He was trained by a Colonel Montgomerie for exploring work and in 1856 and 1857 was employed in Kashmir and Ladak by the Schlagintweits. His journey to Lhasa (1865–66) was rewarded by the Royal Geographical Society. In 1867 he explored the gold mines of Thok Jalung, and he went with Sir Douglas Forsyth to Yarkand in 1873. His most important journey was from Leh across the unexplored plateau of Tibet in 1874–75, marking its many lakes, to Lhasa, and thence to Calcutta. For a description, with map, of this expedition, consult the *Geographical Magazine* (London, 1876).

NAIPALI (nī-pä'lē) **LANGUAGE.** The Indian language spoken in Nepal. This dialect approaches in general structure more closely to Hindi than to any other of the modern Indian vernaculars. Thus, as examples showing the affinity of Naipali to the New Indian dialects, may be cited Naipali *pāk* (ripe), Bengali *pākā*, Hindi *pakkā*, Sindhi *pakō* (Skt. *pakva*); Naipali *mahaingō* (costly), Hindi *mahaingā* (Skt. *mahārgha*); Naipali *dhīlō* (loose), Hindi *ḍhīlā* (Skt. *śithila*); Naipali *dūt* (milk), Hindi *dudh*, Panjabi *dudd* (Skt. *dugdha*). In inflection also there are parallels, as Naipali *gar chum* (I do), Gujarati *karuṁ chuṁ*. Distinctive marks of Naipali are the occasional aspiration of medial consonants (e.g., *aghi*, 'before,' Hindi *agē*, Prakrit *aggē*, Skt. *agrē*), softening of initial surds (e.g., Naipali *garanu*, 'to make,' Hindu *karnā*, Skt. *kar*), and the use of an agential case as the active subject of a passive voice (a curious phenomenon widespread in the modern Indo-Iranian languages) in *-le* corresponding to the Hindi *-nē* (e.g., Naipali *dūtlē*, '[by the] milk,' Hindi *dudhnē*). The language has a number, possibly one-fifth, of loan words from its Tibeto-Burman neighbors, but has maintained itself on the whole with considerable purity. It has a very scanty literature written in the Devanagari character.

Consult: A. F. R. Hoernle, *Comparative Grammar of the Gaudian Languages* (London, 1880); Dravid, *English Guide for the Use of Nepali Students* (Benares, 1901); L. H. Gray, *Indo-Iranian Phonology* (New York, 1902); Turnbull, *Nepali Grammar, and English-Nepali and Nepali-English Vocabulary* (Darjeeling, 1904); Sylvain Lévi, *Le Népal, étude historique d'un royaume hindou* (3 vols., Paris, 1905–08).

NAIRN, nârn. The capital of Nairnshire, Scotland, a royal municipal and police burgh, 15 miles northeast of Inverness, at the mouth of the river Nairn (Map: Scotland, E 2). It is noted for the excellence of its sea bathing and artificial baths. It manufactures rope and twine and has salmon fisheries and quarries near by. Pop., 1901, 5089; 1911, 5906.

NAIRNE, nârn, Carolina (Oliphant), Baroness (1766–1845). A Scottish song writer, born at Gask, Perthshire. In 1806 she married

her second cousin, Major William Murray Nairne (afterward sixth Lord Nairne); lived in Edinburgh till her husband's death (1829), afterward in Ireland and on the Continent; and returned to Gask, where she died. Between 1821 and 1824 she contributed songs to the *Scottish Minstrel* of R. A. Smith. As a song writer she is highly esteemed. Particularly beautiful are "Land o' the Leal," "Caller Herrin'," "The Laird o' Cockpen," and "The Auld House." Appearing anonymously in her lifetime, her poems were posthumously collected in *Lays from Strathearn* (1846). Consult Rogers, *Life and Songs of Lady Nairne* (Edinburgh, 1869), and Kington Oliphant, *Jacobite Lairds* (Grampian Club, 1870).

NAIRN'SHIRE. A county in the northeast division of Scotland, bounded by the Moray Firth and the counties of Inverness and Elgin (Map: Scotland, E 2). Area, 163 square miles, of which about 26,000 acres are under cultivation. There is considerable agricultural activity on the low fertile soil near the coast, but the land rises into low mountainous regions in the south. The county is known for its cattle breeding, and there are also profitable granite quarries and fisheries. Capital, Nairn. Pop., 1901, 9291; 1911, 9319.

NAIROBI, nī-rō'bē. The capital of British East Africa and of the Province of Ukamba, 327 miles northwest of Mombasa by rail (Map: Africa, H 5). It lies on the Athie Plains, some 5500 feet above sea level, at the foot of the Kikuyu Hills, and is the headquarters of the government of the Protectorate and of the Uganda Railway. The government buildings are situated at the foot of the hills, and beyond them lies a thriving town, with extensive railroad works, government and Roman Catholic schools, excellent hotels, stores, athletic grounds, and a race course. The public buildings include the town hall, the general hospital, the theatre, and Anglican, Roman Catholic, Moslem, and Hindu places of worship. The commercial life of a large East Indian population centres in the picturesque bazar, which runs at right angles from the main street of the town. The official residents are found dwelling upon the hill overlooking the government buildings, and beyond its brow is the cantonment of the King's African Rifles. The civilian inhabitants prefer the suburb of Parklands, situated on the plain about a mile and a half from the town. Pop., 1914, about 30,000, of whom some 1200 are Europeans, 3500 East Indians, and the rest natives of various tribes. In the immediate vicinity are some 400 European farmers, and the town is visited annually by large numbers of sportsmen from all parts of the world, attracted by the big-game shooting for which the Protectorate is famous.

NAIRS, nā'ĕrz, or NAYARS. The landholder class of Malabar, in southwestern Hindustan. Originally the military dominant class, they have assimilated some of the indigenous populations and now form a conglomerate of different castes and tribes; they nevertheless, in many cases, contrast sharply with the Dravidians by their fine type, their light complexion, and their thin and prominent nose. They number over 1,000,000 and are divided into a northern and a southern community, which keep apart from each other. They seem to have some linguistic and somatological affinities with the Indo-Aryans. They are probably a mixed race of Aryans and Malayalas. By all writers they are described as a tall people, gracious in manner. Many of the women are quite pretty. The history of the Nairs begins with the invasion of the ancient Hindus and the establishment of a Brahman aristocracy—a conflict between these privileged classes and the democratic masses ended in victory for the latter and laid the foundations of the prosperity of the Nairs in the thirteenth century. Islam of a sort is in vogue, together with the older Hinduism. Through all these changes the peculiar marriage system, which has made the Nairs of special interest to ethnologists, has not been wholly obliterated. This system, often called the Nair family, is polyandry (often adelphic) with matriarchal joint family. It has now fallen into disuse, but succession is still traced through females, a man's sister's children being his nearest heirs. Consult E. S. Schmidt, "Die Nairs," in *Globus*, vol. lxviii (Brunswick, 1895), and Fawcett, "Nayars of Malabar," in *Bulletin of the Madras Government Museum*, vol. iii (Madras, 1901).

NAISSANT, nā'sănt (Fr., being born). A term applied in heraldic blazon to an animal depicted as coming forth out of the middle—not, like *issuant*, out of the boundary line—of an ordinary. See HERALDRY.

NAIVASH'A. A town in British East Africa, capital of Naivasha Province, 391 miles by rail northwest of Mombasa (Map: Congo, C 3). It stands, some 6230 feet above sea level, on the shores of Lake Naivasha, a picturesque circular body of water, about 13 miles in diameter, which is a famous haunt of hippopotami. The town is the centre of a rapidly progressing district where European farmers are conducting sheep running and wheat growing on an extensive scale. In the neighboring Rift valley there are prosperous ostrich farms, and a considerable volume of maize is raised for export.

NA'JA (from Hind. *nāg*, Skt. *nāga*, snake). A genus of elapine venomous serpents of the tropical parts of the Old World, which includes the cobras. The typical species is the common hooded cobra (*Naja haje*) of Africa, called asp in the north and spy slange or spitting snake among the Dutch of South Africa. Other species are the cobra di capello and hamadryad. See COBRA; HAMADRYAD; PROTEROGLYPHA; and Plate of FOREIGN VENOMOUS SERPENTS with the article SNAKE.

NAJAC, nà'zhàk', EMILE, COUNT DE (1828–89). A French dramatic author, born at Lorient (Morbihan). Except for a short time spent in a government position, he gave himself entirely to the writing of farces, texts for operas, and vaudevilles, sometimes in collaboration and sometimes alone. Among these are: *Un mari en 150* (1853); *La fille de trente ans* (1859), with Scribe; *Le capitaine Bitterlin* (1860), with About; *Un mariage de Paris* (1861), with About; *Nos gens* (1866), with About; *Bébé* (1877), with Hennequin; *Nounou* (1879), with Hennequin; *Divorçons* (1886), with Sardou; *Le fiacre 117* (1886), with Millaud.

NAKAMURA MASANAO, nä'kà-mōō'rà mä'sà-nä'ō (1825–?). A Japanese scholar, born in Yeddo. He went to England in 1866 and remained there for two years, returning home on the outbreak of the revolution. Thenceforth until his death he labored perseveringly in the interest of modern education. His schools and translations exerted wide influence, and his serv-

ices were recognized by posthumous honors conferred by the Emperor.

NAKANE, nä'kä'nā. The name of two leading Japanese mathematicians, father and son. The elder, Nakane Genkei (1661–1733), was born in the Province of Omi and studied under Takebe (q.v.). In early years he was a physician in Kyoto. He was particularly well known in the field of astronomy. His son was Nakane Genjun (1701–61), whose *Kaihō Yeijiku-jutsu* (1729) contained a new method of solving numerical higher equations. Consult Smith and Mikami, *History of Japanese Mathematics* (Chicago, 1914).

NAKED BAT. A large Malayan, long-tailed, emballonurine bat (*Chiromeles torquatus*), remarkable in having the skin entirely hairless except for a fringe of hairs about the neck. It has a projecting, piglike snout and a thick tail. It inhabits the forests of Java, Sumatra, and Borneo, where it appears only at night. Its most curious feature is the presence of a pouch or pocket of skin on each side of the body under the arms, which is present in both sexes and contains the mammæ. In this pouch the young are carried while suckling. Consult Horsfield, *Zoölogical Researches in Java* (London, 1828), and Dobson, *Catalogue of Cheiroptera in the British Museum* (ib., 1878). See Plate of BATS.

NAKHITCHEVAN, nä'ĸē-chĕ-vän'. A former town in the Government of Ekaterinoslav, Russia, situated on a hill on the right bank of the Don, 2½ miles from Rostov-on-the-Don, with which it is now incorporated (Map: Russia, E 5). It has manufactures of silk, woolen, and silver goods and has a considerable trade in jewelry and precious stones with Constantinople, Turkestan, Circassia, and Astrakhan. The town was founded by Armenians from the Crimea in 1779 and is the see of the Russian Greek-Armenian Patriarch. Pop., 1897, 29,312; 1910, 71,000, mostly Armenians.

NAKONG, nä-kŏng' (African name). One of the harnessed antelopes of south Central and East Africa, called also Speke's antelope, sitatunga, and *Tragelaphus spekei*. It is peculiar for its perfectly uniform grayish color when mature. It formerly gathered in herds and was one of the most highly prized of the smaller species. See Plate of GAZELLES AND SMALL ANTELOPES.

NAKSHATRA, nāk-shä'trā (Skt. *naksatra*, star, luminary; of doubtful etymology). A Sanskrit term used in the Vedic period in the sense of star. At a later time it was applied to the asterisms lying in the moon's path or to the mansions in which the moon was supposed to rest in its path. The number of these asterisms was reckoned originally at 27, later at 28; and mythology transformed them into the daughters of Daksha, who became the wives of the moon. Consult Thibaut, "Astronomie, Astrologie, und Mathematik," in Bühler, *Grundriss der indo-arischen Philologie* (Strassburg, 1899).

NAKSKOV, nāk'skōv. A town of Denmark, situated on Nakskov Fiord, on the west coast of the island of Laaland (Map: Denmark, E 4). It is the terminus of the Laaland Railroad, has the largest sugar refinery in the country, with other factories, and has a harbor with considerable shipping and an active trade in grain. Pop., 1901, 8317; 1911, 9480.

NALA, nä'lä. A legendary king of ancient India whose domain was Nishadha, apparently a district between the modern Oudh and Berar. The story of his marriage with Damayantī, the daughter of King Bhima of Vidarbha (modern Berar), together with the events which followed in consequence of his passion for gambling, the loss of his kingdom, his desertion of wife and children, the final reunion with them, and the restoration of his fortunes, forms one of the most romantic episodes of the Mahabharata (q.v.). This episode, entitled the *Nalōpākhyānam* (Story of Nala), has often been separately edited and translated: as an edition of the Sanskrit text, together with Dean Milman's translation (1835), by Monier-Williams (Oxford, 1860, 1876); a versified rendering by Sir Edwin Arnold, *Indian Idylls* (Boston, 1883); a translation into German prose by Kellner, *Nala und Damayantī* (Leipzig, 1886), besides several others by Kosegarten (Jena, 1820), Rüskert (Frankfort, 1828), Bopp (Berlin, 1838), Meier (Stuttgart, 1847), and Holtzmann (Karlsruhe, 1847; Stuttgart, 1854). There are, furthermore, translations into Latin by Bopp (3d ed., 1868), into Swedish by Edgren, into French by Aignan (1823) and by Burnouf, and into Italian by St. Gatti. The poem is marked by a high tone of morality, shown in the rare fidelity of Damayantī, as well as by tender pathos. Among the many ancient traits with which it is replete is the simplicity of the manners of its leading characters—the Prince, e.g., prepares his own food.

The subject of Nala's career was a favorite theme with the Hindus. One of these, the Sanskrit *Nalōdaya* (Rise of Nala), describes in four cantos the restoration of Nala's fortunes. This artificial poem is ascribed to Kalidasa, but it probably belongs to a much later age. It is a remarkable specimen of the so-called Kavya style of artificial composition, abounding in elaborate metrical devices, alliterative versification, intricate rhythms, complicated constructions, and pedantic imagery. It has been edited by Benary (Berlin, 1830), by Yates (Calcutta, 1844), and by Vidyasagara (ib., 1873). An excellent German translation, imitating the artificial devices of the original, was made by Von Schack, *Stimmen vom Ganges* (2d ed., Stuttgart, 1877).

To the same Nala cycle belongs the *Nāishadhīya*, or *Nāishadha-Carata* (Adventures of Nala of Nishadha), written in 22 cantos by one Sri-Harsha, who belongs to the latter half of the twelfth century of our era. An edition of this, with the Sanskrit commentary of Narayana, was published by Röer (Calcutta, 1855) and by Swadatta (Bombay, 1894). Consult Lobedanz, *König Nal und sein Weib* (Leipzig, 1863), and A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

NAMANGAN, nä'män-gän'. A district town in the Territory of Ferghana, Russian Turkestan. It is situated in the elevated valley of the Syr Darya and on the canal of Yangi (fed by the Narym), about 45 miles northwest of New Margelan, the capital of the territory (Map: Asia, Central, O 2). The chief occupations are cotton ginning and the manufacturing of soap, leather, etc. The trade in cotton, fruit, and animal products is important. Pop., 1908, 73,279, including only a few Russians.

NAMAQUALAND, nä-mä'kwä-länd, LITTLE. A region of the Cape Province, South Africa, bordering on German Southwest Africa (Map: Cape of Good Hope, C, D 7). It is a portion of the Cape Province proper, while Great Namaqualand is the south extremity of former German

Southwest Africa. The majority of its inhabitants are Hottentots, numbering about 23,000. It is important on account of its copper deposits. The chief town is Port Nolloth on the coast.

NAMATIANUS, Claudius Rutilius. See Rutilius Namatianus, Claudius.

NAMAYCUSH, năm'â-kŭsh (North American Indian name). The lake or Mackinaw trout (*Christivomer namaycush*), the largest of the Salmonidæ. It is closely related to the chars, from which it differs slightly in the character of the vomerine teeth. It is a very good food fish and is the second in commercial importance of the fish of the Great Lakes. Extreme weights of 125 pounds have been reported, but the average is from 15 to 20 pounds. Its food is fishes and a great variety of other things. The spawning season is during September and November. The namaycush occurs in the Great Lakes and in the inland lakes of New York and northern New England, where the local names "longe" and "togue" are applied to it. It is also found in the headwāters of the Fraser and Columbia rivers and the streams of Vancouver Island. A deep-water variety, called siscowet (q.v.), is found in Lake Superior. Its flesh is fatter and less desirable as food. See Salmon; Trout; and consult authorities there cited. See also Fisheries, and Plate of Trout and Grayling.

NAMDEV. See Marathi.

NAM DINH, näm dēn'y'. A city of Tonkin, French Indo-China, situated 40 miles southeast of Hanoi, on the Tonkin River, 30 miles from the sea (Map: French Indo-China, E 2). It lies in the most fertile region of the delta and is prosperous and well built, with broad, paved streets. It is the seat of a French Resident and the intellectual centre of Tonkin. It is almost as important commercially as Hanoi, has numerous well-stocked shops, regular boat service on the river, and a brisk trade in rice, silk, cotton, and indigo. It has a cotton mill with 25,000 spindles. Pop., about 40,000.

NAME (AS. *nama*, Goth. *namō*, OHG. *namo*, Ger. *Name;* connected with Lat. *nomen*, Gk. *ὄνομα, onoma*, Ir. *ainm*, OPruss. *emnes*, OChurch Slav. *ime*, name, and with Lat. *gnoscere*, Gk. *γιγνώσκειν, gignōskein*, Skt. *jñā*, Ger. *kennen*, Eng. *know*). In law, a word or words employed to designate a person, place, or thing. In early times in England the first, or Christian, name of a person was the only one recognized by the law, and surnames were mere words of description to identify one person from another having the same Christian name. This practice was confirmed and received legal sanction by a statute (1 Hen. V, c. 8), called the Statute of Additions, which provided that not only the name of an individual should be inserted in a writ or indictment, but his estate or degree, his calling or business, and the town or district in which he resided. By reason of the above custom and the statute many persons who had not otherwise adopted surnames were known by the name of their calling, place of residence, or by some other characteristic. Thus, George, the smith, became George Smith, and John of Wessyngton became John Wessyngton.

In law, the middle name or initial of a person is generally regarded as of no importance and not a part of his legal name. Therefore the omission of it in a legal instrument or in legal proceedings is not considered an error, except in a few jurisdictions. In general a person's Christian name should be written out, and in some States the mere initial of the Christian name, together with the surname, has been held insufficient under statutes requiring the names of persons to be subscribed to certain instruments.

Owing to the almost infinite variety of surnames and the consequent difficulty in spelling them properly, the courts have adopted a rule known as the rule of *idem sonans* (the same sound), by which they determine whether or not an incorrect spelling of a name is a fatal error in legal documents. This rule provides that where a name is not correctly spelled, if it sounds identically like the name intended to be written, it will be held sufficient, the error in spelling being disregarded. Thus, the surnames Preyer, Prior, and Pryor have been held to be *idem sonans*. This rule is followed as to legal instruments and transactions generally, but where a name in an instrument varies in some irregular manner from the common method of spelling a name identically the same in pronunciation, the necessity for departing under certain circumstances from the doctrine of *idem sonans* is apparent, as in the case of such as Jaeger and Yaeger, which may be pronounced so as to sound alike, and a person searching against the name of Jaeger would naturally not find the record of the conveyance under Yaeger; and accordingly the courts may hold that the public is not bound by constructive notice in such a case.

Legally a person is under no obligation to bear the surname of his parents nor the Christian name conferred upon him in infancy, and he may, therefore, change his name at will, subject only to the possible inconvenience of proving his identity if it should be called in question. To obviate this difficulty it is usual for a person desiring to change his name, in whole or in part, to make application to some court or judge to authorize the change. The order of the court in such case, being matter of public record, furnishes the means for identification when required. The matter of change of name is in many States regulated by statute, and the application for such change is usually granted as a matter of course, unless it appears that it might result in hindering or defrauding creditors of the applicant.

There are statutory provisions in some jurisdictions requiring the registration of fictitious trade names, where persons adopt them and do not do business under their correct names. Corporations are usually required to adopt names which are not identical with those of other corporations in the same State. At common law there is no property right in a name, but the United States statutes provide for protection in the use of trade names to a certain extent, and courts of equity will sometimes interfere to enjoin the wrongful use of the business name of another, to prevent fraud. See Cognomen; Misnomer; Title; Trade Name; Trade-Mark.

NAME OF JESUS, Litany of the. See Litany.

NAM'PA. A city in Canyon Co., Idaho, 22 miles west of Boise, the State capital, and on the Oregon Short Line and the Idaho Traction railroads (Map: Idaho, B 6). It contains a State sanitarium and a Carnegie library. Gold and silver mines and large bodies of pine timber are tributary to the city, but its chief interests are in live stock, grain, dairying, and fruit growing. It lies in the district of the

large Boise irrigation project. Nampa owns its water works. Pop., 1900, 799; 1910, 4205.

NAMUR, nȧ'mụr'. A province of Belgium, bounded on the north by Brabant and Liége, on the east by the Province of Luxemburg, on the south by France, and on the west by Hainault (Map: Belgium, C 4). Area, 1413 square miles. The province is traversed through the centre by the Meuse River. Its surface is partly level, partly hilly, and in part densely forested. The soil is very fertile, and agriculture is the chief occupation, though a large proportion of the population is engaged in mining and allied industries. About 750,000 tons of coal are mined yearly, and the province is rich in iron, lead, sulphur, alum, and marble. Pop., 1910, 362,846. Namur appears as a county in the tenth century and came successively under the counts of Hainault and Flanders and the dukes of Burgundy, finally constituting one of the 17 provinces of the Netherlands. It was occupied by the Germans during the European War which broke out in 1914.

NAMUR. The capital of the Province of Namur, Belgium, at the confluence of the Sambre and Meuse, 35 miles southeast of Brussels (Map: Belgium, C 4). Two bridges across the Meuse connect it with the extensive suburb of Jambes, and several bridges span the Sambre to the suburb of Salzinnes. An extensive circle of nine detached forts has revived its former military importance, and there are large cavalry barracks in the town. Among many fine churches is the Renaissance cathedral of St. Aubin, built in 1751–67 and noted for the beauty of its statues, carvings, and paintings. The Archæological Museum has a valuable collection of Roman and Frankish antiquities and a library of 20,000 volumes. An art gallery is attached to the Hôtel de Ville. The old citadel near by has been leveled, and the grounds laid out in a recreation park. Namur is an important industrial centre, with iron and brass foundries, and is known for its manufactures of cutlery, machinery, chicory, glass, leather, and bronze art objects. Near by are iron and coal mines, and a good river trade moves down the Meuse. The city was taken by the forces of Louis XIV in 1692, and three years later was besieged and captured by William III. It was taken by the French in 1746 and restored to Austria in 1748. For a third time it fell into the hands of the French in 1792. It was captured by the Germans after a stubborn resistance during the European War which began in 1914. (See War in Europe.) Pop., 1900, 32,333; 1910, 31,273.

NANA, nȧ'nä'. One of the Rougon-Macquart series of novels by Emile Zola (1880).

NANAIMO, nȧ-nī'mō. A city, port of entry, and the capital of the Nanaimo electoral district, British Columbia, Canada, on Departure Bay, on the east coast of Vancouver Island, and on the Esquimalt and Nanaimo Railway, about 73 miles northwest of Victoria (Map: British Columbia, D 5). It is opposite Vancouver City on the mainland, with which it has daily steamboat communication; has a safe and commodious harbor; and is a centre of the coal-mining and herring industries of British Columbia, its coal fields having an area of 200 square miles. It has county buildings, a customhouse, and a Roman Catholic convent. It also has large lumber mills and manufactories of bricks, beer, aërated water, foundry and machine-shop products, explosives, sashes and doors. Copper and brick clay are found in the vicinity. The city dates from the erection of the Hudson's Bay Company blockhouse in 1833. It was incorporated in 1874. The water works and electric-lighting system are owned and operated by the municipality. The United States is represented by a consular agent. Pop., 1901, 6130; 1911, 8306.

NANAK. See Nanek.

NANA SAHIB, nä'nȧ sä'hīb (c.1825–c.60). A Hindu, one of the leaders of the Sepoy Mutiny of 1857. He is said to have been the son of a Brahman from the Deccan, and his real name was Dandhu Panth. He was born about 1825 and was adopted as a son in 1827 by Baji Rao, the childless ex-Peshwa of Poona, whose estate, which amounted to more than $1,000,000, he inherited. He was refused, however, the annual pension of eight lakhs of rupees, or about $400,000, which had been granted Baji Rao after his surrender in 1818. This rankled in his mind, although he was allowed to retain some of the state of a native prince, a retinue of 200 soldiers, with three fieldpieces, and a fortified residence at Bithur, 10 miles west of Cawnpore. He had long maintained an agent in England, Azim Ulla Khan, who told him tales of British weakness. When, therefore, the mutiny broke out in May, 1857, Nana Sahib offered to assist the English, but treacherously placed himself at the head of the mutineers in Cawnpore. The European troops were induced, on June 25, to capitulate to Nana Sahib, who promised they should be sent down the Ganges in safety. They embarked on boats provided for them, but had no sooner done so than a murderous fire was opened upon them. The sepoys were ordered to shoot the men, but to spare the women and children, who were removed to a house in Cawnpore. On July 15, Sir H. Havelock, who had advanced from Allahabad, defeated the sepoys in two engagements, one within 8 miles of Cawnpore; and Nana Sahib thereupon directed that the women and children should be put to death, and that their corpses should be cast into a well, which is now marked with a beautiful statue in their memory. A long series of engagements against Nana Sahib followed, in which he was always the loser; and he was ultimately driven beyond the English frontier into Nepal in 1859, where he probably perished in the jungle. On Oct. 21, 1874, a man supposed to be Nana Sahib was captured at Gwalior, but the identity was disproved. Consult Perceval Landon, *Under the Sun, Impressions of Indian Cities, with a Chapter Dealing with the Later Life of Nana Sahib* (London, 1906), and James Burgess, *The Chronology of Modern India, 1494–1894* (Edinburgh, 1913).

NANCHANG, nän'chäng'. The capital of the Province of Kiangsi, China, situated at the head of the delta formed by the Kan-kiang at its entrance into Poyang Lake, about 175 miles southeast of Hankow (Map: China, L 6). It is an important centre of the porcelain trade and for small manufactures. The city is surrounded by an alluvial plain of great fertility. Pop. (est.), 150,000.

NANCRÈDE, năn-krĕd', C(harles) B(eylard) Guérard de (1847–). An American surgeon, born in Philadelphia. He studied at the University of Pennsylvania and at Jefferson Medical College (M.D., 1883) and early practiced in his native city, holding various surgical

chairs and hospital appointments. After 1889 he was professor of surgery and clinical surgery and surgeon of the university hospital at the University of Michigan, and from 1900 to his retirement in 1913 also held a chair. During the Spanish-American War he served at the front as a surgeon. In 1908–09 he was president of the American Surgical Association. Among his writings are *Lectures upon the Principles of Surgery* (1899; 2d ed., 1905) and the following essays: "Injuries and Diseases of Bursæ" (1882); "Some of the Facts of Listerism" (1882); "Recent Advances in Surgery of the Brain and its Coverings" (1888); "The Laws of Physics and Ballistics the True Explanation of the Lodgment and Deflection of the Majority of Modern Small-Arm Projectiles, not the Ricochet Hypothesis" (1903). Nancrède also contributed interesting essays to a number of medical works.

NANCY, năn'sē'. The capital of the Department of Meurthe-et-Moselle, France, and an important railroad junction, 220 miles east of Paris and 94 miles west of Strassburg, on the left bank of the Meurthe, 6 miles above its junction with the Moselle (Map: France, N., M 4). It is a strongly fortified and well-built city, with fine squares, broad streets, and imposing edifices. The city owes much of its architectural ornamentation to Stanislas Leszczynski, King of Poland, who resided here as Duke of Lorraine. His statue stands in the Place Stanislas, the most important square in the city, which separates the old city on the northwest from the newer quarters on the southeast. It is surrounded by imposing edifices, including the theatre, the Hôtel de Ville, and the Episcopal Palace.

The Hôtel de Ville, dating from the seventeenth century, contains a fine ballroom with mural paintings by Girardet and fine galleries with paintings by Rubens, Van Ruysdael, and other noted masters. The Ducal Palace has been largely destroyed, but the single remaining wing is a good example of the Gothic style and holds the Musée Lorraine, a collection of historical and other antiquities. The cathedral of Notre Dame, a creation of the famous Mansart, is not of special interest, but the fifteenth-century church of the Cordeliers, attached to the Ducal Palace, has many fine monuments of the dukes of Lorraine. The church of Bon Secours contains the tomb of Stanislas. Nancy has seven fine triumphal arches, the most elaborate one being the Porte Royal, constructed under Louis XV. Among other structures of note are the Gothic church of Saint-Epvre, an ancient Gothic castle, and the Palais du Gouvernement, now used for military purposes.

Nancy has a university (see below), a noted school of forestry (the only one in France), a training college, an ecclesiastical seminary, a school of commerce, a conservatory of music, a botanic garden, a public library of over 142,000 volumes and 2127 manuscripts, and is the headquarters of one of the two French schools of hypnotism. There are numerous learned societies. Attached to the school of forestry is a valuable forestry museum. It is the seat of a bishop and the headquarters of the Twentieth Army Corps.

The situation of Nancy on the Eastern Canal and the Rhine-Marne Canal gives it a large trade. Its principal manufactures are tobacco, machinery, embroidery, hardware, boots and shoes, straw hats, gloves, macaroni, chemicals, candles, glass, woolen goods, and agricultural implements. The great breweries here are among the most important in France. Not a few of the artistic specialties in furniture and in printing in France originated here. To facilitate traffic, a belt-line railway has been built. Pop., 1901, 102,559; 1911, 119,949.

Charles the Bold was overwhelmed and slain before the gates of Nancy in 1477 in battle against René of Lorraine and his Swiss mercenaries. Nancy was the seat of the dukes of Lorraine down to 1766, in which year it came to France. It was occupied by the Germans in 1870 and forced to pay a large ransom. The town grew greatly in general importance after the loss of Alsace-Lorraine by France, large numbers of Alsatians coming here to live. Nancy was unsuccessfully attacked by the land and aërial forces of the Germans during the European War which broke out in 1914. See War in Europe.

NANCY, University of. One of the leading universities of France, founded originally at Pont-à-Mousson. It had its inception in the Papal Bull of 1572, issued at the instance of the Cardinal of Lorraine, and consisted at first of two faculties, theology and arts. It was surrendered to the Jesuits to combat heresy. A law faculty was added in 1582 and a medical faculty in 1598. The university maintained a steady growth, and in 1608 its attendance reached about 2000. This growth was checked by the wars of the seventeenth century. In 1768 it was removed to Nancy by the order of Louis XV. During the stormy days of the French Revolution it went down with the rest of the French universities, but was not reorganized at the establishment of the University of France. In 1852, at the instance of 40 municipalities, a rectorate was established, and in 1854 the faculties of letters and science were organized. In 1864 the faculty of law and in 1871 the faculty of medicine, consisting mostly of professors who had come over from Strassburg University, were established. Until 1896 these were known as Facultés de Nancy and were under the control of the University of France; but with the dissolution of that university Nancy became autonomous. The University of Nancy consists of the faculties of law, medicine, sciences and letters, and the school of pharmacy. It also includes the chemical, serotherapic, electrotechnic, and agricultural and colonial institutes. The attendance in 1913 was 2248, about one-third of the students being enrolled in the faculty of sciences. The library contains 107,254 volumes and about an equal number of dissertations.

NANDA DEVI, nŭn'*da* dā'vē. A peak of the Himalaya (q.v.).

NANDU, nän'dōō. The Brazilian name of the South American ostrich. See Rhea.

NANEK, nä'nĕk, or **NANAK,** nä'nàk (1469–1538). Founder of the religious sect of Sikhs (q.v.). He was born at the village of Talwandy, now called Nankana, on the bank of the river Ravi, near Lahore, India, and was a Kshatriya in caste. In his youth he showed a tendency towards mysticism. He was at first a shepherd and afterward became a government official, in charge of the state's granary. He visited all the sacred places of India for the purpose of formulating the religious system he wished to introduce among his neighboring

tribes. He spent two years in the town of Livanobbhon, where he associated himself with Kabir, the founder of a monotheistic sect. It was due to the influence of Kabir, whom Nanek often quotes in his book, that he determined to found a similar sect. Having previously made pilgrimages to Mecca and Medina, he returned to India, where he compiled the great work known as the *Adi-Granth*. For many years he traveled widely and proclaimed everywhere the doctrines of his new religion. He preached the abolition of caste, the unity of God, and the obligation to lead a pure life, and soon had a large following. Upon his death, which occurred in October, 1538, at Kartarpur in the Jalandhar Dob, his disciple Angad or Lakanā assumed the leadership of the sect. Ten apostles, or gurus as they are termed, are traced from Nanek down to Govind Sinh in 1708, with whom the succession stopped. Consult: J. D. Cunningham, *History of the Sikhs* (London, 1849); Ernst Trumpp, *The Adi Granth or the Holy Scriptures of the Sikhs* (Leipzig, 1881); Sir J. J. H. Gordon, *The Sikhs* (London, 1904); M. A. Macauliffe, *The Sikh Religion: Its Gurus, Sacred Writings, and Authors* (6 vols., ib., 1909).

NANGASAKI, nän'gȧ-sä'kē. A seaport of Japan. See NAGASAKI.

NANINI, nȧ-nē'nē, GIOVANNI MARIA (c.1540–1607). An Italian composer, born at Tivoli. He opened the first public school of music ever controlled by an Italian musician in Rome. The famous Palestrina and a nephew, Bernardino, were two of his assistants. He succeeded Palestrina as maestro at Santa Maria Maggiore in Rome and in 1577 became a member of the papal choir. Three years before his death he was appointed maestro di cappella of the Sistine Chapel. A six-part motet, *Hodie nobis Cœlorum Rex*, composed by him is sung annually on Christmas morning in the Sistine Chapel. Some of his most important works remain in manuscript and are the private property of the Sistine Chapel and the Vatican Library. His printed works include motets, madrigals, canzonets, and Church pieces, most of which examples are regarded as representing the best of the Palestrina period. He died at Rome. Consult Giuseppe Radiciotti, *Giovanni Maria Nanini* (Pesaro, 1906).

NA'NISM (from Gk. *nānos, nanos*, dwarf). In plants the condition of inherent dwarfness. It is a transmitted character, and plants possessing it have only dwarf offspring. Sometimes such dwarf plants have appeared suddenly, but have reproduced true to seed, giving rise to a new race of small individuals such as is seen in a mutant from the evening primrose (*Œnothera lamarckiana*). The original plant appeared in the cultures of Hugo De Vries, was much smaller than its parent, and, producing offspring like itself, became known as a new species (*Œnothera nanella*). Among alpine plants some are inherently dwarf, illustrating nanism, while others develop into tall plants under favorable conditions. See DWARF; ALPINE PLANT; ARCTIC REGION; MUTATION.

NANKEEN'. A fabric which was formerly exported extensively from China and was said to be the manufacture of Nanking; the natural color of the *Gossypium religiosum* fibre, from which it was made, a yellowish buff, being a favorite one. In the middle of the nineteenth century this material was much used for clothing, especially for trousers. Lately nankeen has been largely superseded by ordinary cotton, which is artificially colored to imitate the genuine fabric.

NANKING' (Chin., southern capital). The capital of the Province of Kiangsu, China. It is 194 miles northwest of Shanghai, near the Yang-tse River, in lat. 32° 40′ N. and long. 118° 47′ E. (Map: China, L 5). It was made the capital of the Empire and called Nanking in 1368, but was the capital only until 1403. Its official name under the Manchu dynasty was Kiangning. It is an ancient city, having been the capital of its province as far back as 317–582 A.D. It was famous as a literary centre and for its fine arts, manufactures, and monuments. It was captured by the Taiping rebels in 1853, who held it for more than a year. They destroyed the beautiful porcelain tower from fear of its geomantic influences and so injured the city that it has not yet recovered fully. The first British treaty was signed in Nanking in 1842. Its present importance in part is from its military college, arsenal, and factories for the making of war material. It is a centre of missionary activity. The climate is exceedingly unhealthful. The population is estimated at 267,000 according to the customs estimate of 1910. It was opened to foreign trade in 1899, but its commercial importance suffers from its proximity to Chinkiang (q.v.). In the vicinity are the famous Ming tombs. In 1913 the net imports amounted to 6,437,554 hk. tls., and the exports to 1,687,787 hk. tls.

NAN'NING'. A treaty port of south China, in the Province of Kwangsi, situated at the head of navigation on the Yu-kiang River, 320 miles west by south of Canton (Map: China, J 7). It is one of the principal trading stations near the south frontier and is one of the open ports. In 1913 the imports amounted to 3,260,000 hk. tls., and the exports to 1,009,132 hk. tls. The city as a trade centre is second in importance to Wuchow and is clean and well ordered, with numerous educational and banking establishments. Pop., 37,000.

NAN'NINOSE (corruption of American Indian *mananosay*), or **MAN'NINOSE.** A local name in use along the South Atlantic coast for the soft clam (*Mya arenaria*). See CLAM.

NANSEN, nän'sen, FRIDTJOF (1861–). A Norwegian Arctic explorer, naturalist, and author, born near Christiania, Norway. He was educated in the University of Christiania and was trained as a zoölogist. In his twenty-first year he undertook a trip to East Greenland waters for zoölogical specimens; the same year he was appointed curator in the Natural History Museum at Bergen. He became known to the world as the first man to cross the ice cap of Greenland, an adventurous journey from the east to the west coast, undertaken in 1888, which he described in two volumes, *The First Crossing of Greenland* (1890). He spent the winter of 1888–89 among the West Greenland natives, which resulted in a volume on *Eskimo Life* (1893). After his return to Norway he was appointed curator in the Museum of Comparative Anatomy at Christiania University, where he became professor of zoölogy in 1897 and after 1907 was professor of oceanography. From his twenty-third year he was constantly planning for the great journey into the polar regions, upon which he did not embark till 1893. He had unusual natural and acquired qualifications for the work, and his winter among the

Eskimo was of inestimable value to him in his later experiences.

Nansen inferred, partly from the appearance in Greenland of a pair of trousers which had been left upon the ice north of Siberia when the *Jeannette* was abandoned, partly from the presence in Greenland of driftwood from Siberia, and partly from the experience of other explorers, that a ship driven with the ice by prevailing winds might drift from above Siberia across or near the pole. The weight of Arctic authority did not support this idea; nevertheless, with the assistance of the government and private citizens, Nansen built and equipped the Arctic exploring vessel *Fram* (Forward), left Norway in 1893, skirted the north coasts of Europe and Asia, put into the polar pack ice near the New Siberia islands on Sept. 22, 1893, and drifted northwest till March 14, 1895. On that day, with a single companion, Lieutenant Johansen, he left the *Fram* frozen in the pack and started towards the Pole with dog sledges. On April 7, 1895, he reached lat. 86° 14′ N., within 272 statute miles of the North Pole and 184 miles nearer to it than any man had ever been before him. Further progress was impossible, and he retreated to Franz Josef Land, where he and Johansen spent the winter in a snow hut, living on Arctic game.

In the spring they started southward for Spitzbergen, but fortunately found the winter camp of the Harmsworth expedition under Jackson and returned home on the ship of that party, reaching Vardö, Norway, Aug. 13, 1896. Meanwhile the *Fram* drifted around to the north of the Franz Josef Land archipelago, reaching lat. 85° 57′, then blasted her way southward to open water, and reached Vardö within a week after Nansen's arrival there. Nansen wrote: *Farthest North* (2 vols., 1897; new ed., 1897), a popular description of the expedition and a classic in the literature of travel (translated into many languages); *The Norwegian North Polar Expedition, 1893–96: Scientific Results* (6 vols., 1900–06); *Die norwegischen hydrographischen Untersuchungen im Nordmeere* (1906), with B. Helland-Hansen; *The Norwegian Sea: Its Physical Oceanography* (1909); "Videnksab og Moral," in *Samtiden* (1908); *In Northern Mists: Arctic Exploration in Early Times* (2 vols., 1911); *Through Siberia, the Land of the Future* (2 vols., 1914); and numerous articles in scientific journals.

Nansen found no form of life above the eighty-fourth parallel. His discovery of a wide sea of oceanic depth north of the New Siberia islands overthrew the theory of the prevailing shallowness of the Arctic Ocean. He discovered no land except a few little islands near the Asian coast; and the free movement of the ice masses, driven, as Nansen observed, by the winds in every direction, has led some geographers to conclude that there is no large land near the North Pole. (See Polar Research.) In oceanography Nansen did work of great importance. On his initiative there was organized in 1892 the International Commission for Systematic Study of the Ocean, having headquarters in Copenhagen and laboratories in Christiania. Of the laboratories he was director till 1908. Also prominent in a political connection, especially in the movement which led to the separation of Norway and Sweden, Nansen wrote on this subject *Norway and the Union with Sweden* (1905; also in Norwegian, German, and French). To the *Times* (London), the *Temps* (Paris), and to German papers he contributed political articles. From 1906 to 1908 he served as Norwegian Minister to Great Britain. Consult Frederick Dolman, *Dr. Nansen: The Man and his Work* (London, 1897), and W. C. Brögger and Nordahl Rolfsen, *Fridtjof Nansen, 1861–93*, English translation by William Archer (ib., 1906).

NANSEN, Hans (1598–1667). Burgomaster and President of Copenhagen, born at Flensborg. He entered the Icelandic Company, made many commercial journeys to north Russia and Iceland, and became wealthy. In 1639 he was made councilman of Copenhagen and in 1644 burgomaster. During the serious events of 1658–60 the burghers placed their confidence in him, and he came to have influence with the King, as shown by his participation in the change of government in 1660. On his advice the burghers of Copenhagen decided to offer the King the hereditary government; but it seems certain Nansen did not want despotism introduced. In 1660 he was made President of Copenhagen and in 1661 member of the Supreme Court.

NANSEN SOUND. See Heiberg Land.

NANTERRE, nän'târ'. A town of France in the Department of Seine, situated at the foot of Mount Valérien, a few miles west of Paris. According to the tradition, it is the birthplace of St. Geneviève, the patron saint of Paris. It manufactures chemicals and aluminium. Pop. (commune), 1901, 14,140; 1911, 21,349.

NANTES, nänt. An important seaport town, the largest city of Brittany, and the capital of the Department of Loire-Inférieure, France, situated on the right bank of the Loire, 35 miles from the sea and 250 miles by rail southwest of Paris. Here the Erdre and the Sèvre Nantaise join the Loire (Map: France, N., D 5). There is communication with the interior on the Loire and the canal to Brest. This handsome and well-built city has many striking and beautiful buildings, among them the cathedral of St. Pierre with beautiful monuments. The modern Bourse is one of the finest buildings in France. There are a public library containing 210,000 volumes, a museum of paintings and fine arts with works of modern French masters, a museum of natural history, an ecclesiastical college, a training college for girls, a school of medicine and pharmacy with a library of 25,000 volumes, also colleges of law, dentistry, music, art, navigation and technical subjects, several learned societies, and three theatres. A beautiful promenade, formed by the Cours St. Pierre and the Cours St. André, extends from the Erdre to the Loire. It is planted with four rows of trees, bordered with lines of palatial houses, and ornamented with statues. On the banks of the river there are 5 miles of quays. Formerly vessels of 200 tons only could reach the port, but a ship canal on the left bank now admits sailing vessels and steamers of 20-foot draft directly to Nantes. In 1914, $5,500,000 was spent in harbor improvements. In the manufacture of sugar Nantes stands next to Paris and Marseilles, its shipbuilding industry and its tobacco factories are important; there are also iron, copper, and lead foundries, oil and soap works, food-preserving establishments, saw mills, and manufactures of railroad material, of cotton and woolen goods, chemicals, tiles, leather, rope, wood pulp, brushes, glass,

chocolate, and cement. It is the seat of a bishop and the headquarters of the Eleventh Army Corps.

Nantes, anciently Condivincum, was founded before the Roman conquest. It took its present name from that of a Gallic tribe, the Namnetes. It was the capital of the Duchy of Brittany, and its history until the fifteenth century is a record of struggles with successive invaders in defense of its independence. In 1491 the duchy was united to France by the marriage in the castle of Anne of Brittany to Charles VIII, King of France. The castle also witnessed the signing of the famous Edict of Nantes (q.v.) by Henry IV in 1598. From the fifteenth century the commerce of the town began to develop, and in the seventeenth and eighteenth centuries its prosperity increased on account of the slave trade, but by 1790 Nantes had declined greatly in importance. During the Revolution it was the scene of the *noyades* and other atrocities of the infamous Carrier (q.v.). Pop., 1901, 132,990; 1911, 170,535. Consult: E. Maillard, *Nantes et le département au XIXème siècle* (Paris, 1891); F. Lebaudière, *Histoire de Nantes sous le règne de Louis-Philippe, 1830–48* (ib., 1900); G. Durville, *Etudes sur le vieux Nantes* (ib., 1900–01); E. Destranges, *Le théâtre à Nantes depuis ses origines jusqu'à nos jours, 1430–1901* (ib., 1903).

NANTES, Edict of. The name given to the famous decree signed in the city of Nantes by Henry IV of France, April 13, 1598, which secured to the Protestant portion of his subjects partial freedom of religion. The document consisted of 95 patent or public articles and 56 secret or close ones, and among its chief provisions were the following: the proclamation of a full amnesty; the granting of liberty of conscience to the Huguenots; the permitting to Huguenot chiefs and noblemen of public religious exercises attended by themselves, their families, and the families of their dependents. In addition the Huguenots were to be allowed to establish new churches, except in Paris and the surrounding districts and in the royal residences, and to maintain universities, or theological colleges, of which the Huguenots had four, those at Montauban, Saumur, Montpellier, and Sedan. Adherents of the reformed faith were also to be eligible to all civic offices and dignities, but they were obliged outwardly to celebrate the festivals of the Catholic church and to pay tithes to the Catholic priesthood. In each Parlement a *chambre de l'édit* was created to take cognizance of all cases arising out of the act and to supervise its working. Owing to the difficulties and delays in registering the Edict of Nantes, it was not published until a year after it had been signed by the King. It remained in force until revoked by Louis XIV in October, 1685. See Huguenots.

NANTEUIL, nän'tē'y', Robert (1630–78). A French portrait engraver, born at Rheims. He studied in his native city under Nicolas Regnesson. About 1648 he went to Paris and there perfected himself in the use of crayon and pastel. He drew his portraits from life as well as engraved them, and soon attained great popularity. His plates having come to the King's notice, he was appointed designer of the cabinet (1658), and at his demand Louis XIV issued the decree of 1660, dated from St. Jean de Luz, by which engraving was raised to the status of a fine art. He also exercised a strong influence over the school of engraving established by the King. After his death Nanteuil suffered neglect, and has only recently been recognized as one of the greatest portrait engravers of all time. He confined himself to heads, many of them life size, which show rare precision of draftsmanship, masterly modeling, and convincing characterization. They are simply composed and possess decided color and great fullness of tone. He left over 200 plates, including 11 portraits of Louis XIV, 2 of Anne of Austria, 14 of Cardinal Mazarin, and portraits of Madame de Sévigné, Colbert, Nicolas and Basile Fouquet, the Duke de Bouillon, and many other celebrities of the time. Consult Metcalfe, "Robert Nanteuil," in *Prints and their Makers* (ed. by Carrington, New York, 1912).

NAN'TICOKE. A former important Algonquian tribe of Maryland. They were noted for their dark complexion and peculiar customs and ceremonies, from which they acquired the reputation of being a tribe of sorcerers. Their power was broken by the Iroquois in 1678. In 1707 they had seven villages, and in 1722 their principal village still contained about 100 inhabitants and was the seat of an "empress," who ruled over all the neighboring Indians. The whole tribe then numbered about 500. Soon afterward they began a gradual removal to the Iroquois country, and settled in several villages on the eastern branch of the Susquehanna, in southern New York, although a portion of them continued to reside in their old country. In 1753 a part of those on the Susquehanna became incorporated with the Iroquois, but the majority removed to the Ohio and joined the Delaware tribe, with which they became completely merged. There are still several score of mixed-blood Nanticoke in southern Delaware.

NANTICOKE. A borough in Luzerne Co., Pa., 7 miles west-southwest of Wilkes-Barre, on the Susquehanna River and on the Pennsylvania, the Delaware, Lackawanna, and Western, and the Central of New Jersey railroads (Map: Pennsylvania, J 4). It is chiefly engaged in mining and preparing for market anthracite coal, but has also silk-throwing mills, hosiery mills, a canning factory, cigar factory, etc. There is a State hospital here. Settled in 1850–55, Nanticoke was incorporated in 1874; it is governed under the charter of that date, which provides for a burgess, elected every three years, and a unicameral council. Pop., 1900, 12,116; 1910, 18,877; 1914 (U. S. est.), 21,756; 1920, 22,614.

NANTUCK'ET. A town and the county seat of Nantucket Co., Mass., coextensive with Nantucket Island and several small outlying islands, 50 miles southeast of New Bedford, with which it has steamboat communication (Map: Massachusetts, G 8). Nantucket is widely noted as a summer resort, presenting much of picturesque and historic interest. It was formerly the seat of a great whaling industry, but at present the community is engaged principally in fishing and agriculture. The town, including within its corporate limits several villages, contains the Athenæum (public library), Admiral Sir Isaac Coffin's Manual Training School, a museum, and a courthouse. The government is administered by town meetings. Pop., 1900, 3006; 1910, 2962.

In 1659 the first settlers, headed by Thomas Macy, came to the island and settled at Madeket, the present site of Nantucket not having been chosen until 1673. Consult: L. S. Hinchman, *Early Settlers of Nantucket, their Associ-*

ates and their Descendants (2d ed., Philadelphia, 1902); H. B. Worth, *Nantucket Lands and Landowners* (Nantucket, 1901–10); R. A. Douglas-Lithgow, *Nantucket* (New York, 1914).

NANTWICH, nănt'ĭch. A market town and urban district in Cheshire, England, on the Weaver, 18 miles southeast of Chester (Map: England, D 3). The parish church of St. Mary and St. Nicholas is an excellent example of the Decorated and Perpendicular Style. Nantwich was famous in former times for its brine springs and salt works; the baths are still used. Shoes, gloves, clothing, cotton goods, ironware, and ale are manufactured. The town owns its water supply and markets. It is well known as a fox-hunting centre. Nantwich dates from the Roman period, and was formerly called Halen Gwyn (the white salt town). Pop., 1901, 7722; 1911, 7815.

NANTYGLO (năn'tĭ-glō) **AND BLAINA** (blā'nȧ). A town in Monmouthshire, England, 7 miles west of Abergavenny. It has important coal-mining and iron industries. Pop., 1901, 13,500; 1911, 15,395.

NAOGEORG, nä'ō-gȧ-ôrk', THOMAS (1511–63). A German Protestant dramatist, whose name in the vernacular was Kirchmeyer. He was born at Hubelschmeiss, near Straubing, possibly studied at Tübingen, and in 1535 became pastor. His Latin poems, all animated by the most bitter opposition to the papacy, include the dramas *Pammachius* (1538), *Incendia seu Pyrgopolinices* (1541), *Mercator seu Indicium* (1541), and the satiric poem *Regnum Papisticum* (1553). These were often rendered into German, and were long popular, as were his weaker biblical dramas, *Hamanus* (1543), *Hieremias* (1551), and *Judas Iscariotes* (1551).

NAÓN, nä-ōn', RÓMULO S. (1875–). An Argentine diplomat, born in Buenos Aires. He was educated in the university there and later served on the faculties of the National College and the University of Buenos Aires. Entering politics, he was elected representative in the national Congress in 1902 and six years later was made Minister of Justice and Public Instruction. In 1911 he was sent to the United States as Envoy Extraordinary and Minister Plenipotentiary, and when the Legation was raised to the rank of Embassy (1914), he became the first Ambassador. He was secretary of the Argentine delegation to the Second Hague Conference, and in 1914 was a member, with Ambassadors Da Gama and Surez, of the A. B. C. (Argentina-Brazil-Chile) Peace Conference at Niagara Falls, Ontario, which endeavored to adjust the difficulties of the United States and Mexico. For their services the mediators were thanked by Congress and given medals. Naón is author of works on political science, constitutional law, and educational subjects. As a member of the Governing Board of the Pan-American Union Naón actively promoted Pan-Americanism. He received honorary degrees from Yale, Brown, and the University of Pittsburgh.

NAOROJI, nou'rō-jĕ, DADABHAI (1825–). The first Indian member of the British House of Commons. The son of a Parsi priest, he was born at Bombay and educated in the school of that city which afterward became the Elphinstone Institution. He was appointed professor of mathematics and of natural philosophy there in 1854, but after 1855 he lived chiefly in England. He was instrumental in founding the East India Association in 1867, and three years afterward he succeeded in having certain positions in the civil service opened to native Indians. In 1874 he was made Prime Minister to the Prince of Baroda. From 1885 to 1887 he was a member of the Bombay Legislature, and he was president of the Indian National Congress in 1886, 1893, and 1906. He was a Liberal member of Parliament for Central Finsbury in 1892–95, and in 1895 was appointed a member of the royal commission to inquire into Indian affairs. His publications include: *England's Duties to India* (1867); *The Wants and Means of India* (1870), collected articles published in 1887; *Poverty and Un-British Rule in India* (1901); *Correspondence with Lord George Hamilton* (1900–01); *The Rights of Labour* (1906).

NA'OS (Gk. *ναός*, Attic *νεώς*, from *ναιειν*, *naiein*, to dwell). The central chamber of a Greek or Græco-Roman temple. See ARCHITECTURE, *Greece;* CELLA; GREEK ART, *Architecture: The Temple;* PRONAOS.

NAPA, nă'pȧ. A city and the county seat of Napa Co., Cal., 46 miles by rail northeast of San Francisco, on the navigable Napa River and on the Southern Pacific Railroad (Map: California, C 4). The State Hospital for the Insane is situated on the outskirts of the city, and there are several places of interest, including the Napa Soda Springs, Napa Redwoods, Calistoga Hot Springs, and petrified forests. Napa contains also a public library and a fine high-school building. The leading industries are fruit growing and the manufacture of tanned leather, shoes, gloves, wine, shirts, boxes, olive oil, and woolen goods. At Napa Junction there are Portland-cement works, the vicinity having extensive deposits of cement rock. Settled in 1847, Napa was incorporated in 1863. Pop., 1900, 4036; 1910, 5791.

NAP'ANEE'. A town, port of entry, and the capital of the united counties of Lennox and Addington, Ontario, Canada, situated on the Napanee River, 7 miles from its mouth and 28 miles by rail west of Kingston, and on the Canadian Northern and Grand Trunk railways (Map: Ontario, H 5). It possesses county buildings, a collegiate institute, a public park, race track, and its industrial establishments include flour mills, foundries, manufactories of bricks and tiles, furniture, motor boats, and carriages. Pop., 1901, 3143; 1911, 2807.

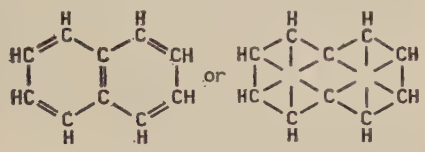
NAPATA, nȧ-pä'tȧ. The ancient capital of Ethiopia (q.v.), mentioned in inscriptions as early as 1450 B.C., and later the seat of independent kings. It was rivaled by Meroë (q.v.) after the Persian period. For the ruins of the city, destroyed by Petronius, see BARKAL.

NA'PERVILLE. A city in Dupage Co., Ill., 29 miles by rail west of Chicago, on the Dupage River and on the Chicago, Burlington, and Quincy Railroad (Map: Illinois, H 2). The city, chiefly a residential place, has the Nichols Library, Edward Sanatorium, and is the seat of Northwestern College (Evangelical Association), established in 1861, and of the Evangelical Theological Seminary. There are quarries, nurseries, and manufactories of lounges, chairs, gloves, brick and tile, and fly net. The water works and electric-light plant are owned and operated by the municipality. Naperville was settled in 1830 and was incorporated in 1857. It has adopted the commission form of government. Pop., 1900, 2629; 1910, 3449.

NAPH'TALI. According to Gen. xxx. 7–8, the fifth son of Jacob and the second born to him by Bilhah. In the actual history of Israel the tribe Naphtali plays but a minor part. Its territory lay in the north, bordering on the Sea of Galilee and Lake Merom, which is probably referred to in Deut. xxxiii. 23, where the Masoretic text has the impossible Darom. (See MEROM.) According to Judg. iv. 6, Barak came from Kedesh in Naphtali, but it is doubtful whether the addition "Naphtali" is correct here, though both the clans Naphtali and Zebulon were involved in the struggle against the King of Hazor. (See DEBORAH.) According to Josephus (*Wars*, iii, 3, 2) the Naphtalites were men of valor. Their dangerous position as a border tribe made them among the first to fall into the hands of Tiglath-pileser IV of Assyria (734 B.C.; cf. 2 Kings, xv. 29). In the religious development of Israel the tribe plays no part, but in the postexile period Tiberias (q.v.), on the western shore of the Sea of Galilee, comes into prominence, and after the destruction of Jerusalem it became one of the centres of Jewish learning. Ancient and modern writers alike praise the soil and the climate of the territory of Naphtali.

NAPHTHA, năf'thȧ (Lat., from Gk. *νάφθα*, Av. *napta*, Pers. *naft*, moist; connected with Lat. *Neptunus*, Neptune, name of the sea god). A term originally applied to an inflammable liquid which exudes from the soil in certain parts of Persia. Subsequently the use of the term spread to include some of the more volatile oils found in Europe and even in America. The product of the oil fields of southern Russia is usually called naphtha, although it differs in no way from the ordinary grades of petroleum. Naphtha properly includes the lighter oils which pass off first in the distillation of petroleum, the gravities ranging from 90 to 62 degrees Baumé. Pennsylvania crude oil contains from 8 to 20 per cent of naphtha. In the refining of such naphtha several products are obtained by fractional distillation; those which pass off first, viz., rhigolene and cymogene, are gases at ordinary temperatures and are seldom saved. The next product is known as gasoline, a material largely used in machines and for illuminating purposes. After this come stove naphtha and gas naphtha, the latter being the base of much of the illuminating gas now made. Petroleum naphtha is often treated with chemicals to deodorize it. Naphtha may also be obtained in the distillation of wood and coal tar. See PETROLEUM.

NAPH'THALENE (from *naphtha* + *alcohol*), $C_{10}H_8$. A crystalline solid chemical compound of carbon and hydrogen, found abundantly in coal tar (q.v.). The crystalline mass obtained from this source is pressed, warmed with a solution of caustic soda, next washed with hot water, then heated with a little strong sulphuric acid, thoroughly washed again with water, and finally distilled in a current of steam or subjected to a process of sublimation. When thus obtained in the pure state, naphthalene melts at 80° C. (176° F.), and boils at 218° C. (424° F.). It has a peculiar characteristic odor, is insoluble in water, but freely soluble in ether and in hot alcohol. It is largely used in the manufacture of coloring substances and to some extent also as an enricher for ordinary illuminating gas. The molecule of naphthalene is composed of two rings of carbon atoms, with hydrogen atoms attached to them, and its constitution is represented by either of the following graphic formulas:



A number of interesting derivatives of this hydrocarbon are obtained by the action on naphthalene of chlorine, nitric acid, etc. The most important derivatives commercially are the so-called sulphonic acids. By acting on naphthalene with an excess of sulphuric acid we obtain naphthalene-sulphonic acid, $C_{10}H_7SO_3H + H_2O$, from which, by substitution processes, a large number of compounds are produced, many of these finding employment in the color and dye industry.

NAPHTHOL (năf'thōl) **YELLOW.** See COAL-TAR COLORS.

NAPIAS, nȧ'pyȧ', HENRI (1842–1901). A French physician, born in Sézanne, Marne. He studied medicine in Paris, graduating in 1870. Settling in the French capital, he filled several hospital offices, becoming a member of the Académie de Médecine and serving as president of the Assistance Publique. Among his books and essays, which number nearly 100 and which deal mostly with public hygiene, may be mentioned: *Des moyens de diminuer les dangers qui resultent pour les travailleurs des differentes industries de l'emploi des substances minerales toxiques* (1878); *Manuel d'hygiène industrielle* (1882); *L'Hygiène scolaire en France, etc.* (1887); *L'Hygiène des crèches* (1891); *Hygiène hospitalière et assistance publique* (1893); *Réglementation des crèches publiques et privées* (1898).

NAPIER, nā'pĭ-ẽr. The capital and chief port of Hawke's Bay County and Provincial District, North Island, New Zealand, on the east coast (Map: New Zealand, N. I., C 6). Wool is the chief export; there are also large exports of timber, canned and frozen meats. The principal public buildings comprise the town hall, a hospital, lunatic asylum, and athenæum. The Anglican cathedral of St. John, the seat of the Bishop of Waiapu, is one of the finest churches in New Zealand; it was built in 1888 of brick, in the early English style. Napier has railway communication with Wellington and New Plymouth. Pop., 1901, 9015; 1911, 10,537 and including the suburbs which lie to the north of the town, 11,736. The population of the provincial district, excluding Maoris, was 48,546 in 1911.

NAPIER, ARTHUR SAMPSON (1853–1916). An English philologist, born in Cheshire. He received his early education at Rugby, attending later Owens College, Manchester, and Exeter College, Oxford, where he was granted the degree of doctor of letters. From 1878 to 1882 he was reader of English at the University of Berlin, where, having continued his studies, he took the Ph.D. at the end of this period. After three years as professor of English at the University of Göttingen, in 1885 he was elected Merton professor of English at Oxford, and in 1903 also Rawlinson professor of Anglo-Saxon in the same institution. He became a fellow of the British Academy and received

honorary degrees from Manchester and Groningen. His publications include: *Ueber die Werke des altenglischen Erzbischofs Wulfstan* (1882), his doctoral dissertation; *Wulfstan-Sammlung der ihm zugeschriebenen Homilien* (1883); *History of the Holy Rood-Tree* (1894), for the Early English Text Society; *Crawford Collection of Early English Charters* (1895), with Stevenson; *Old English Glosses* (1900); *The Franks Casket* (1901); besides many contributions to learned reviews.

NAPIER, nāp'yĕr *or* nâ-pēr', Sir Charles (1786–1860). A British admiral. His father was the Hon. Capt. Charles Napier, R.N., second son of Francis, fifth Lord Napier. He was born at the family seat, Merchiston Hall, Stirling, Scotland, March 6, 1786. At 13 he went to sea as a naval volunteer. He was made a lieutenant in 1805, took part in an important engagement in the West Indies in March, 1806, received command of the *Recruit*, 18 guns, in 1808, and in an engagement with the *Diligent* his thigh was broken. He was put on half pay for a time, but volunteered in the Peninsular army and was wounded at Busaco. In 1814 he was ordered to America and took an active part in the operations against Baltimore. In 1829 he received the command of the *Galatea*, a 42-gun frigate, and was employed "on particular service" on the coast of Portugal. He accepted the command of the fleet of Dom Pedro, the father of the young Queen, Maria da Gloria, in the struggle against her uncle, Dom Miguel, and by defeating the Miguelite fleet hastened the downfall of the usurper. He was made admiral in chief of the Portuguese navy, but soon returned to England. In the war between the Porte and Mehemet Ali he organized a land force, with which he stormed Sidon and defeated Ibrahim Pasha among the heights of Mount Lebanon. He took part in the naval attack on Acre. He next blockaded Alexandria and concluded a convention with Mehemet Ali. For these services he was knighted, and in 1847 he received the command of the Channel fleet. When the Russian War broke out he was sent out to command the Baltic fleet, but had to content himself with a prudent and successful blockade of the strongly fortified ports, which somewhat disappointed public expectations of more daring achievements. He twice sat in Parliament and until his death labored with success to reform the British naval administration. He was a man of great personal courage and decision of character, but selfish, vainglorious, and arrogant. These traits are strongly marked in his works: *The War in Portugal* (1836); *The War in Syria* (1842); *The Navy: Its Past and Present State* (1851). Partiality marks the biography by his stepson Gen. Elers Napier, *The Life and Correspondence of Admiral Sir Charles Napier* (London, 1862).

NAPIER, Sir Charles James (1782–1853). A celebrated British general, son of Col. George Napier. He was born at Whitehall, Aug. 10, 1782, and in his twelfth year received a commission in the Thirty-third Infantry. His first military experience was in Ireland in 1798. His next active service was in Spain during the Napoleonic wars, and he commanded the Fiftieth Infantry at Coruña, where he was wounded and taken prisoner. Marshal Ney dismissed him on parole, and he went to England, but returned in 1810 to the Peninsula after having been exchanged. At Coa he fought as a volunteer and had two horses killed under him. At Busaco a shot in the face broke his jaw and injured an eye; but he recovered in time to be present at the battle of Fuentes de Oñoro and the second siege of Badajoz, both in 1811. In the summer of 1813 he was with the fleet under Beckwith, and afterward under Cockburn, engaged in desultory operations on the coast of the United States. In 1815 he took part in the storming of Cambrai, and marched into Paris with the allied armies. From 1822 to 1830 he was Resident (Governor) of Cephalonia, one of the Ionian Islands, the affairs of which he administered with great energy and intelligence. In 1841 he was ordered to India to take command of the army at Bombay. The most splendid service of his life now began, and resulted in the conquest of Sind against great odds. In the battle of Miani, 1843, Napier with about 3000 troops attacked a strongly posted native force ten times as great, and defeated it, killing more than 6000 men. Thereupon all the ameers surrendered with the exception of Shir Muhammed, who brought 25,000 men into line of battle at Hyderabad. In three hours Napier's little army of 5000 men gained a decisive victory, and a few days afterward the English general was master of Sind. The Governor-General, Lord Ellenborough, made him Governor of the conquered territory, but though his administration was very successful, as were also various campaigns against the hill tribes, Napier retired in 1847, after having quarreled with the directors of the East India Company. During the Sikh War of 1848–49 he again went to India, but arrived too late to take part in the conflict. After having put down a mutiny among the native soldiers, he returned to England in 1850, having quarreled with the Governor-General, Lord Dalhousie. He retired to the Hampshire Downs, near Portsmouth, busying himself with literary labors. There he died on Aug. 29, 1853. Napier was a man brave to rashness, quarrelsome with his superiors, but beloved by his soldiers, and one of the most remarkable of the military men of his time. He wrote: *The Colonies: Treating of their Value Generally, of the Ionian Islands in Particular* (1833); *Colonization, Particularly in Southern Australia: With Some Remarks on Small Farms and Overpopulation* (1835); *Remarks on Military Law and the Punishment of Flogging* (1837); *Defects, Civil and Military, of the Indian Government* (1853). Consult: W. F. P. Napier (brother), *The Life and Opinions of General Sir Charles Napier* (4 vols., London, 1857); W. N. Bruce, *Life of General Sir Charles Napier* (ib., 1885); T. R. E. Holmes, *Four Famous Soldiers* (ib., 1889); W. F. Butler, *Sir Charles Napier* (ib., 1890).

NAPIER, Sir Francis, Baron Ettrick (1819–98). A British diplomat and administrator, born at Thirlestane in Selkirkshire, Scotland. He was educated at Trinity College, Cambridge, entered the diplomatic service in 1840, was attaché at Vienna and at Constantinople, Secretary of Legation at Naples, Envoy at Washington and The Hague, and Ambassador to St. Petersburg (1860–64) and at Berlin (1864–66). At Naples, Berlin, and St. Petersburg he acted with a tact, firmness, and suavity that smoothed over or straightened out difficult situations. The British government, convinced of his ability in other fields, transferred him in 1866 from Berlin to India as Governor of

Madras, where he remained for six years. His administration of this presidency was specially able in measures for the prevention of famine and disease. In the latter he was assisted by the experience of Florence Nightingale (q.v.), with whom he had a lengthy correspondence. He also completed irrigation works then partly finished and devised others which were afterward constructed. He met the famine in Ganjam, in the northern part of Madras, with prompt relief. As head of the senior presidency he did much to soften the often strained relations between the central and the minor governments of India. The assassination of the Earl of Mayo (q.v.) in 1872 made Napier Governor-General of India for a few months, after which he returned to England and was made a peer of the United Kingdom, Baron Ettrick of Ettrick. He was expected to attain high office, but lack of a private fortune hampered his political ambitions and restricted his activity to social and charitable work. He died suddenly at Florence.

NAPIER, JOHN (1550–1617). A Scottish mathematician, born at Merchiston, now a part of Edinburgh. He was educated at St. Andrews and probably also abroad. His natural pugnacity of character often involved him in difficulties with his neighbors and tenants. In 1594 he published his *Plaine Discovery of the Whole Revelation of St. John* (2d ed., London, 1611), in which he sought to prove that the Pope was Antichrist. In somewhat the same spirit, ostensibly to defend his country from "the enemies of God and true religion," he made some secret inventions, including burning mirrors, a piece of artillery, and a chariot of metal, none of which had any more merit than his theological contributions. Napier's fame rests on his mathematical discoveries, and he is chiefly known as the inventor of logarithms (q.v.). In his earlier investigations he seems to have been considering the subject of imaginary roots, and he refers to this as an important algebraic secret. The idea of logarithms seems to have occurred to him as early as 1594, and thenceforward the rest of his life was spent in developing the idea and computing logarithmic tables. He also invented some mechanical devices for computation, known as Napier's rods. (See CALCULATING MACHINES.) By means of these multiplication and division can be performed, and square and cube roots extracted. He was also the inventor of a number of formulas in trigonometry, known as Napier's circular parts. (See CIRCULAR PARTS.) Napier was one of the first English writers to make any valuable contribution to mathematics, and his discoveries mark an epoch in the history of science. His chief writings are: *De Arte Logistica* (written in 1573, published in 1839); *Mirifici Logarithmorum Canonis Descriptio* (1614 and subsequent editions; Eng. trans., 1616 and 1857); *Mirifici Logarithmorum Canonis Constructio* (1619; Eng. trans., 1889); *Rabdologiæ seu Numerationis per Virgulas Libri Duo* (1617). Consult: Earl of Buchan, *Life of Napier* (Edinburgh, 1787); Mark Napier, *Memoirs of Napier* (ib., 1793); Gibson, *Napier and the Invention of Logarithms* (Glasgow, 1914), an address published in the *Proceedings* of the Royal Philosophical Society of Glasgow; E. W. Hobson, *John Napier and the Invention of Logarithms 1614* (Cambridge, 1914). A complete edition of Napier's works appeared in Edinburgh in 1839. A bibliography of Napier's works, by Macdonald, may be found in the English translation of the *Mirifici Logarithmorum Canonis Constructio* mentioned above. In July, 1914, a tercentenary commemoration of the publication of the *Canon* was held at Edinburgh, and the published papers contain some valuable information as to the works of Napier.

NAPIER, ROBERT (1791–1876). A British marine engineer, born at Dumbarton, Scotland. He was for a time apprenticed to his father, a blacksmith, and afterward went to Glasgow, where in 1815, after working for Robert Stevenson (q.v.), he set up a smithy, with two apprentices. In 1823 he built his first marine engine. In 1830 he supplied engines for the Glasgow Steam Packet Company, and 10 years later he supplied the Cunard Company with engines for their first four steamers. His first negotiations were with Samuel Cunard only, but as the latter could not meet the expense necessary to build engines large enough, that fact led to the seeking of additional funds and thence to the origin of the Cunard Company. Napier added shipbuilding to the construction of engines in 1841. He built the *Persia* for the Cunard Company in 1854, the *Black Prince*, one of the two earliest ironclad warships, for the British government in 1860, and afterward over 300 vessels, some of them warships for the British and other European governments.

NAPIER, ROBERT CORNELIS, LORD NAPIER OF MAGDALA (1810–90). A British soldier, born at Colombo, Ceylon. He studied at the East India Company's military college at Addiscombe and at the royal engineering school at Chatham, and from 1828 to 1845 was chiefly employed on the public works. In the latter year, however, he participated in several battles of the First Sikh War. During the Second Sikh War (1848–49) he again saw active service, and at its close was appointed civil engineer to the Board of Administration of the Punjab, in which capacity he inaugurated and partly carried out a comprehensive scheme of public improvements. During the summer and fall of 1857, at the time of the Mutiny, Napier distinguished himself in the movements which resulted in the relief of Lucknow. Later he also planned the recapture of that place. In June, 1858, he coöperated with Sir Hugh Rose in the latter's operations against the insurgent forces under Tantia Topi and the Ranee of Jhansi; and on the 29th, after Sir Hugh's departure, he took the chief command in Central India. In August he coöperated with Brigadier General Smith in the capture of Paori; in December, with slight loss to himself, destroyed Ferozeshah's army, and in April, 1859, captured Rajah Man Singh of Narwar and Tantia Topi. Subsequently he was appointed military member of the council of the Governor-General and aided in the amalgamation of the national army and that of the East India Company. He was given a divisional command in the expedition to China in 1860, in which the French took part. He participated in the assault upon the Peiho forts, dismantled them, entered Peking, and returned to India the same year. Lord Elgin's (q.v.) sudden death left him acting Governor-General for a short time. In 1868 he commanded the English expedition sent to Abyssinia, and his troops, after a difficult march of over 400 miles, stormed the royal stronghold of Magdala. On his arrival in Eng-

land Queen Victoria created him Baron of Magdala. The next year he was appointed commander in chief in India. Six years later he returned to Europe and in 1883 was raised to the rank of field marshal. Consult C. R. Markham, *History of the Abyssinian Expedition* (London, 1869), and H. Escott, *Pillars of the Empire* (ib., 1879).

NAPIER, Sir William Francis Patrick (1785–1860). A British general and historian, born at Celbridge, Kildare, Ireland. He was a brother of Sir Charles James Napier, the conqueror of Sind, and a cousin of Sir Charles Napier, the English admiral. Entering the army as ensign in the Royal Irish Artillery (1800), he became captain of a regiment in Sir John Moore's brigade (1804); took part in the siege of Copenhagen (1807); went with his regiment to Spain (1808); and for his bravery in the Peninsular campaigns was appointed lieutenant colonel (1813). Later he became colonel (1830), then Lieutenant Governor of Guernsey (1842), and general (1859). He was knighted in 1848. Napier passed his last years at Scinde House, Clapham. He gained an immense reputation by his *History of the Peninsular War* (6 vols., 1828–40). This work, which aimed to tell the truth, led to a long controversy with the officers who had taken part in the campaigns. It is, however, believed to be an impartial statement of facts. His *History of Sir Charles Napier's Administration of Scinde* (1851) is written in his boldest style. Consult the *Life* by Lord Aberdare (London, 1864).

NAPIER'S RODS, or Bones. See Calculating Machines.

NA'PLES (It. *Napoli;* anciently, *Neapolis*). The largest city and seaport of Italy, capital of the Province of Naples, formerly the capital of the Kingdom of the Two Sicilies, situated on the west coast of the peninsula, at the foot of encircling hills, on the north side of the Bay of Naples, in lat. 40° 52′ N. and long. 14° 15′ E. (Map: Italy, E 4). It is about 5 miles long and 3 miles broad. The climate is mild, although the variations in temperature and humidity, owing to alternating winds from the north and south, are often great and sudden. The thermometer ranges from 26° F. in January to 97° in July, the average winter temperature being 50°, the average summer temperature 75°. Fogs are rare and snow seldom falls. The rainy season lasts from the end of January to the beginning of April. The heat of summer is tempered by the sea wind that blows until about two o'clock in the afternoon. Vesuvius acts as a great natural barometer: when its smoke blows towards Capri, fair weather is always expected.

The far-famed situation of the city on the sea, amid its amphitheatre of hills, can be compared perhaps only with that of Constantinople. Across the bay to the south is visible the historic island of Capri; on the eastern shore are villas, vineyards, and orange groves grouped around tiny cities; while over all towers Vesuvius with ominous grandeur. The environs in general are unsurpassed for loveliness and the great variety of interest they present. Sorrento, Capri, Ischia, and the Phlegræan district are localities that delight the sightseer. Other striking attractions are the former monastery of the Camaldolites and the hill of Posilipo with its many associations and its fine streets offering magnificent views.

Architecturally Naples is by contrast surprisingly poor. The ancient and commercial part of the city lies east of a line drawn from Capodimonte through Sant' Elmo to Castello dell' Ovo, and is divided from north to south by the Via Roma.

The modern and western part, where are nearly all the principal hotels, is bordered on the south by the famous Riviera di Chiaia along the bay in a curved course of 3 miles. Here the Villa Nazionale stretches away—a splendid park dating from 1780 and extended in 1807, 1834, and subsequently. It is embellished with lordly allées, statues, and miniature temples. It contains the well-known aquarium of Naples, which exhibits a great variety of extraordinary fish, being, in fact, a school established for the scientific investigation of the aquatic fauna and flora of the Mediterranean. The public squares of Naples are adorned with fountains and obelisks, and within the precincts of the city are several highly prized springs of fresh mineral waters.

The handsome Renaissance Porta Capuana is justly celebrated. The castles are numerous. Among the principal ones are the Castello Nuovo (dating from 1283 and renovated in 1905), called the Bastille of Naples, somewhat similar to the Tower of London, and adorned with a fine triumphal arch erected (1470) in honor of Alfonso of Aragon; the Castello Sant' Elmo (1535), commanding a magnificent view from the ramparts; and the historic egg-shaped Castello dell' Ovo. The last (begun in 1154) is situated on an islet connected with the mainland and is one of the conspicuous features. Near it is the street Santa Lucia—the centre of the noisy Neapolitan life, particularly of the lower classes. Women engaged in domestic duties, naked children, and peddlers of all sorts present a unique spectacle here in a city characterized by festivals and processions and bustling traffic. The neighboring royal palace (begun in 1600) is an enormous edifice. It has an imposing façade decorated (1885) with rich statues. The interior is uninteresting.

Of the nearly 300 churches none is very striking. The cathedral, a Gothic edifice, built in 1272–1323 but repeatedly modernized, is dedicated to St. Januarius, and contains the celebrated vials in which the liquefaction of the saint's blood is alleged to take place on three annual festivals. The church also contains the tombs of Charles of Anjou and Pope Innocent IV, besides numerous fine paintings and statues. San Martino (fourteenth century) is an interesting Gothic church, with its belvedere, cloisters, and museum. In the monastery attached to the church of Santi Severino e Sosio are deposited the valuable archives of the former Neapolitan kingdom, consisting of some 40,000 manuscripts, the earliest dating from 703.

Naples is far richer in archæological than in architectural interest. The Museo Nazionale (built in 1586 as cavalry barracks, seat of the university from 1616 to 1780, and devoted to its present purpose since 1790) contains an immense and unsurpassed collection of frescoes, paintings, mosaics, sculptures, antiquities, coins, medals, and inscriptions, including objects excavated at Herculaneum and Pompeii. Among its rarest, most celebrated possessions are the Farnese Bull, the Farnese Hercules, the Mosaic of the Battle of Alexander, the Pompeiian fres-

NAPLES

VIEW OF THE CITY FROM THE TOMB OF VERGIL (UPPER)
PIAZZA DEL MUNICIPIO (LOWER)

coes, and a valuable collection of bronzes and vases. The splendid Galleria Umberto Primo was completed in 1890 at great expense.

At the head of the educational system is the university. (See NAPLES, UNIVERSITY OF.) There are also an engineering school, an Oriental institute, an astronomical observatory, a botanical garden, several unions for the study and diffusion of many branches of knowledge, a marine school, and a royal conservatory of music. The charitable institutions are numerous, on an extensive scale, and richly endowed. Besides that of the university there is the National Library, with 395,439 volumes, 221,859 pamphlets, and 7997 manuscripts in 1913. Naples has many good playhouses. The San Carlos is one of the largest and most famous of opera houses. The marionette theatres and the theatres where the famous Neapolitan Pulcinella is to be seen are a never-failing source of entertainment.

Naples is one of the most important manufacturing centres in Italy. Ships, locomotives and cars, and stationary engines are built, and glass, cotton, wool, gloves, perfumery, linen and silk products are manufactured. The extensive steel works are chiefly in the hands of English firms. Copies of ancient vases and bronzes, lava articles, and coral and tortoise-shell goods are largely dealt in. The commerce of Naples is more important than its industries. It has communication by steamers with nearly all parts of the world. The harbor has been improved in the last decade, and Naples has surpassed Genoa in the amount of tonnage entered and cleared. In 1911 there were entered 9468 vessels, of 8,260,294 tons, and cleared 9462, of 8,273,378 tons; total movement, 16,533,672, as compared with 10,145,000 in 1904 and 6,293,000 in 1898. The chief articles of import are coal, iron, and steel (Great Britain, Germany, and Belgium), grain (Russia and India), lumber (Austria-Hungary), cotton (United States and India), wool, leather, oils, and wines (France), and chemicals (Germany and Great Britain). The leading exports are wine and brandy, dried and subtropical fruits, nuts, paper, and hemp. The number of emigrants leaving the port of Naples in 1907 was 220,109; in 1908, 51,191; in 1909, 184,433; in 1910, 161,868; in 1911, 115,006; in 1912, 144,033.

Naples has been called the most densely populated city of Europe; in modern times its inhabitants have increased at a remarkable rate. Half of the population, including the countless lazzaroni and trovatori, were huddled together in the slums in ancient unsanitary buildings that crowded narrow, crooked streets, until the cholera epidemic of 1884 aroused the whole country. In 1885 the Italian Parliament voted about $20,000,000 towards a systematic renovation which, when entirely completed, was to cost city and nation a far greater sum. A new water supply was introduced from the mountains near Avellino, 50 miles away, and plans were elaborated for a new sewer system, for new streets, new squares, and new buildings. Of 271 old streets 144 were to be abolished and 127 widened; the habitations of 90,000 people were to be destroyed, and the density of the population reduced from 645 to 280 per acre. Prior to the destruction of the slum dwellings a large working-class quarter was erected in the northern part of the city. Gradually the miserable conditions formerly obtaining have vanished. The widening of streets has permitted the introduction of numerous electric tramways. In 1901 the population of the city was 490,183; the commune had 563,540 inhabitants in that year, and, in 1910, 678,031. Est. population, 1915, 697,917.

For the history of Naples see TWO SICILIES, KINGDOM OF THE.

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NAPLES, BAY OF. A bay of the Mediterranean Sea on the southwest coast of Italy (Map: Italy, E 4). It is 20 miles wide from Cape Miseno on the northwest to Point Campanella on the southeast and extends inward about 10 miles. The bay is famous for its beautiful scenery, the view including the city of Naples, Castellamare, and the other towns and villages along the shores, dominated by Mount Vesuvius on the east, while at the entrance to the bay are the lovely islands of Ischia and Capri. The bay offers good anchorage in 7 fathoms of water and is well sheltered except from winds in the southern quarter.

NAPLES, KINGDOM OF. See TWO SICILIES, KINGDOM OF THE.

NAPLES, UNIVERSITY OF. An Italian university, founded in 1224 by the Emperor Frederick II. It was reformed or reconstructed at least three times before 1266, when Charles I of Anjou finally placed it on a sound footing. Among its earliest and most brilliant scholars was Thomas Aquinas, who lectured here during its short but brilliant revival about 1272–74. It was reorganized in 1780, and since the incorporation of Naples with Italy, 1860, it has increased remarkably in numbers and influence. Its faculties are law, medicine, and surgery; physical sciences, philosophy, and letters; and the school of pharmacy. It had in 1913 a budget of nearly 930,000 lire and more than 6600 students, chiefly in law and medicine. Its library contains 353,620 volumes, 58,671 pamphlets, and a large number of incunabula and specimens of Aldines and other famous early books.

NAPO, nä'pō. A tributary of the upper Amazon. It rises on the slope of Mount Cotopaxi in Ecuador and flows southeast, emptying into the Amazon about 50 miles below Iquitos, after a course of 750 miles. For much of its course it forms the provisional boundary of Ecuador on the northeast. In its upper course it flows in a steep incline through a rough and rocky valley, but after emerging from the mountains it

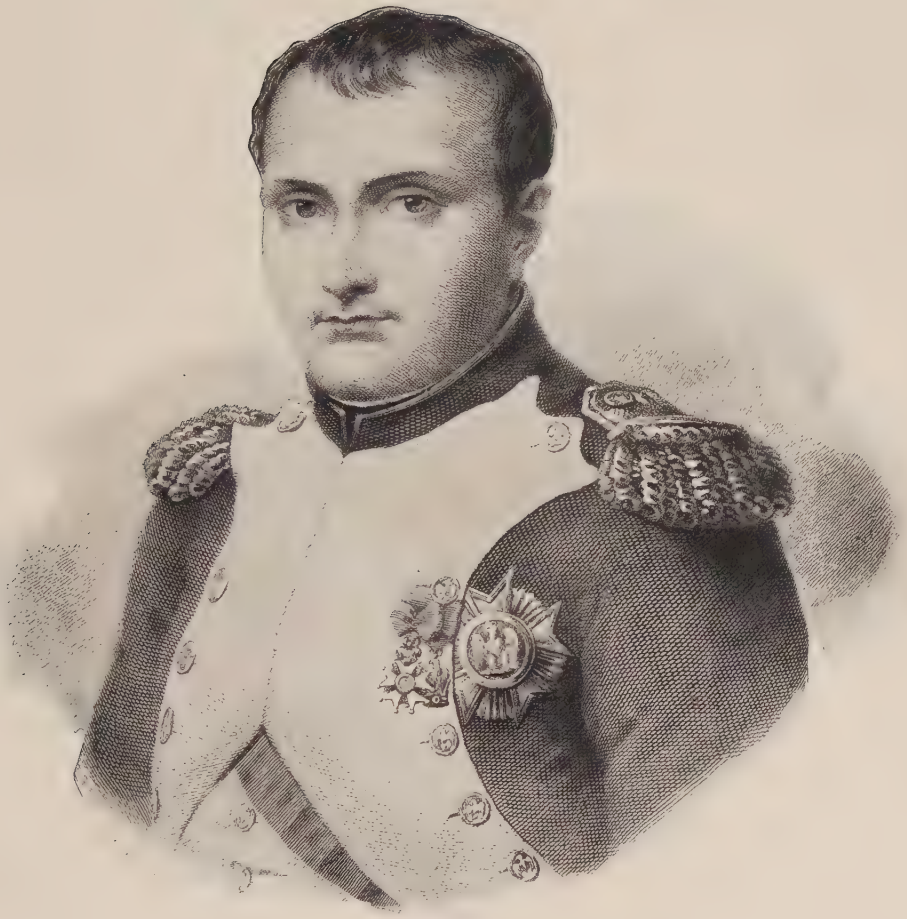
traverses a vast forest-covered plain, almost unexplored, and sparsely inhabited by savages. The Napo is navigable for steamers for nearly 400 miles, but the natural wealth of the region, including gold, sarsaparilla, and rubber, is but little exploited.

NAPO'LEON. A village and the county seat of Henry Co., Ohio, 36 miles southwest of Toledo, on the Maumee River, the Miami and Erie Canal, and the Wabash and the Detroit, Toledo, and Ironton railroads (Map: Ohio, B 3). Its manufactures are important, consisting of windmills, tanks, threshing machinery, separators, flour, etc. Napoleon contains a Carnegie library. The water works and electric-light plant are owned by the municipality. Pop., 1900, 3639; 1910, 4007.

NAPOLEON I, *Fr. pron.* nȧ'pō'lȧ'ôN' (NAPOLEON BONAPARTE) (1769–1821). Emperor of the French, born at Ajaccio, on the island of Corsica, Aug. 15, 1769. The family of Buonaparte (as the name was spelled until 1796) was of Tuscan origin, but had been settled in Corsica since 1529. The parents of the future Emperor were Carlo Maria de Buonaparte and Letizia Ramolino, a descendant of a good Florentine family. Napoleon was the fourth child and the second son. After a few months spent in learning French in a school at Autun, he entered the military school at Brienne on April 23, 1779, and there remained until he was transferred to the great military school in Paris in September, 1784. Just a year later he received his commission as second lieutenant in La Fère Regiment of Artillery, which was stationed at Valence. He served with this regiment until 1791, but passed the greater part of his time (1786–88 and 1789–91) on furlough in Corsica, where he took part in the patriotic movement under Paoli. He was in Paris during the events of Aug. 10, 1792, when the mob of Paris attacked the Tuileries, and on August 30 attained the rank of captain in the army. He returned to Corsica, but this time he had a falling out with Paoli and identified himself with the French Revolutionary party on the island. The defeat of this party compelled Napoleon and the other members of his family to escape and take refuge in France in June, 1793. As yet Napoleon had shown little indication of his genius and of the mighty career he was destined to lead. He had mastered his profession of arms, had shown a capacity for intrigue, and had learned to rely upon himself. In his long leisure hours he had devoted himself faithfully to books of a solid character. He was in the beginning an enthusiastic admirer of Rousseau, and his earliest writings, which date from the Valence period, reveal a depth of sentiment difficult to reconcile with his later career. Buonaparte rejoined his regiment in southern France, participated in the occupation of Marseilles by the Revolutionary forces, and then marched to Toulon to take part in the siege of that town. As *chef de bataillon* in the Second Regiment of Artillery he was practically in charge of the artillery during the siege operations, and won for himself golden opinions from the commissioners of the Convention with the army. One of these commissioners was Robespierre's younger brother, Augustin, whose intimate friend and confidant Buonaparte now became. His conduct at Toulon won him promotion to the rank of general of brigade, but his relations with the younger Robespierre and his outspoken Jacobinism caused his imprisonment after the coup of the 9th Thermidor. An old Corsican acquaintance, Saliceti, was one of the commissioners of the Convention in the south of France at this moment and intervened on behalf of the young artillery officer. Marmont, who was in position to help Buonaparte at this time, said that he did so because he saw "there was so much future in his mind." He was released on Aug. 20, 1794, and after further misfortunes he turned up in Paris, where he found temporary employment in the topographical bureau.

The Convention was now drawing to a close, but was forced to face one more insurrection, one antagonistic to the new constitution of the Year III. (See FRENCH REVOLUTION.) The work of defending the Convention was intrusted to Barras (q.v.), who selected as his second in command Buonaparte, whom he had seen at Toulon, and whom he now found in Paris half fed and shabbily clothed, awaiting the next turn of the wheel of fortune. "From the first," says Thiébault, "his activity was astonishing; he seemed to be everywhere at once: he surprised people by his laconic, clear, and prompt orders: everybody was struck by the vigor of his arrangements, and passed from admiration to confidence, and from confidence to enthusiasm." With the "whiff of grape shot" he swept the Parisian mob from the streets on the 13th Vendémiaire (Oct. 5, 1795). The Convention came to an end, the Directory took its place with Barras as one of the Directors, and Buonaparte succeeded Barras as commander of the Army of the Interior. Barras welcomed the young hero of the hour to his salon, where the grace of person and charm of manner of a young Creole widow, Josephine de Beauharnais, aroused in Buonaparte passionate admiration and love. Despite a disparity of six years in their ages, the influence of Barras brought about a marriage on March 9, 1796. Meanwhile the favor of another Director had brought to Buonaparte a much more important command in the army. Buonaparte had visited the Genoese Riviera in 1794, and at the Topographical Bureau he had taken the opportunity to prepare a plan of campaign in northern Italy, which he now perfected and presented to Carnot (q.v.), who admired it and ordered its execution. Schérer, the general of the Army of Italy, replied that if the Directors wanted the plan carried out they should send down the man who devised it to do it. He was taken at his word; Buonaparte was appointed to the command, and left Paris two days after his marriage, arriving at Nice in March, 1796.

At this moment, after the treaties of Basel, France was still at war with England, Austria, and Sardinia. England was no longer a factor in the military situation on the Continent; Austria had been attacked only in southern Germany, while on the Italian frontier France had done nothing except to make intermittent attacks on Sardinian territory. Italy was made up of patches of Austrian territory and of petty states under Austrian influence, which offered a rich spoil for the conqueror. The main body of the Austro-Sardinian army was at Montenotte, occupying the pass between the Maritime Alps and the Apennines at the headwaters of the Bormida and the Tanaro, two affluents of the Po. One road followed the latter northwest to Turin, the other road followed the Bormida to the northeast to Milan; between the two was an almost im-



NAPOLEON I.

FROM AN ENGRAVING OF A PORTRAIT BY DAVID

passable mountain country. A successful blow would compel the Sardinians to retreat on their capital, Turin, and the Austrians on Milan, their headquarters in Italy, without hope of reuniting their forces. This army of 52,000 men was somewhat scattered and could not be used in full force at any one point, and many of the men were sick. The French Army of Italy was no better off. There were 42,000 poorly equipped, worse clad, and unpaid men scattered in detachments along the Riviera from Nice to Savona. Their new commander, Buonaparte, was a slender, delicate-looking youth of 26, who was known only for some skill shown in handling artillery at Toulon and in Paris. Rumor said he owed his appointment to a discreditable intrigue between Josephine and Barras. Certainly there was little to promise one of the greatest military campaigns in all history, the most dazzling success of modern times. Bonaparte (as he now spelled his name) from the moment of his arrival took hold of things with the grasp of an experienced general skilled in the management of men. His address to his army kindled their imagination: "Soldiers, you are half-starved and half-naked; the government owes you much, but can do nothing for you. I am about to lead you into the most fertile valleys of the world; there you will find flourishing cities and teeming provinces; there you will reap honor, glory, and riches. Soldiers of the Army of Italy, will you lack courage?" Reenforcements arrived which raised the army to about 50,000 men, whom Bonaparte concentrated at Savona. The campaign opened at Montenotte on April 11. Three successive attacks compelled the Sardinians under Colli to retreat towards Turin, while the Austrian commander, Beaulieu, fell back towards Milan. Bonaparte pressed on against Colli, and, though he had no power to negotiate, compelled him to sign the armistice of Cherasco (April 28), which gave France military control of Piedmont and left Bonaparte free to attack Beaulieu. From this moment Bonaparte showed the Directory that they had no ordinary general to deal with. He did not wait for orders. He did things and then reported; he preferred no requests, but presented demands coupled with an ultimatum. Immediately after the signature of the armistice with Colli, Bonaparte reassembled his forces, which had scattered to forage and plunder, and prepared to attack Beaulieu, who had retreated across the Po and the Ticino. Beaulieu expected Bonaparte's attack near Pavia. The French commander turned his flank, seized Piacenza on May 7, and compelled Beaulieu to retreat across the Adda, leaving Milan to the French. Bonaparte pursued the retreating Austrians and defeated them at the bridge of Lodi, across the Adda, on May 10. After this battle it is said the troops gave Bonaparte the endearing name of the Little Corporal. Bonaparte promptly occupied Milan and there displayed his characteristic qualities. He appealed to the popular enthusiasm, and led the Milanese to believe that he was their deliverer. He established a temporary administration, welcomed artists and writers, and showed an interest in the University of Pavia. On the other hand, he extorted a war contribution of 20,000,000 francs and seized and sent to Paris numerous literary and art treasures. The young general did not dally. In a few days he was again pushing on against the Austrians, and on June 3 the siege of Mantua was begun. This strongly fortified town was the key to northern Italy. While the siege was in progress Bonaparte paid his respects to the dukes of Modena and Parma, to the Grand Duke of Tuscany, and to the Pope, each of whom he compelled to buy peace with large sums of money and with treasures of art and literature. The Austrians raised army after army for the relief of Mantua, but in vain. The first, under Wurmser, advanced from Tirol in three divisions, and compelled the raising of the siege of Mantua by Bonaparte, who marched to meet the Austrians and defeated them at Castiglione on August 5. Wurmser made a second attempt by the valley of the Brenta, but was defeated at Bassano on September 8, and driven into Mantua, the siege of which was resumed by the French. Alvinczy, by the way of the Brenta, and Davidovich, by the way of the Adige, brought the second Austrian army into Italy, planning to concentrate 60,000 men at Verona. Bonaparte had to meet them with about 40,000, and at Caldiera, on November 12, he met a severe check; but, driven to desperation, he put forth superhuman efforts, and after three days of fighting defeated the Austrians at the bridge of Arcole (q.v.) and forced them to retreat. Alvinczy, from the wreck of his army and with reënforcements, created the third Austrian army and advanced southward between Lake Garda and the Adige. Bonaparte hastened to meet him, seized the important strategic position at Rivoli, repulsed Alvinczy on Jan. 14, 1797, and hurled him back into Tirol. Turning back on Mantua, Bonaparte captured at La Favorita two days later an important detachment of Alvinczy's force which by a flank movement had almost succeeded in reaching Mantua. Wurmser surrendered Mantua on February 2. In this famous campaign of 1796 Bonaparte relied on three important maxims to which he held fast throughout his career: divide for foraging, concentrate for fighting; unity of command is essential for success; and time is everything. Quickness to divine his enemy's plans, a thorough knowledge of geography which produced combinations that were executed with bewildering audacity, an ability to get a maximum amount of marching and fighting out of an army of young veterans who were poorly shod and clad and ill fed, and the loyal support of his subordinates, Augereau, Masséna, Joubert, Lannes, Marmont, Victor, Murat, and Junot, combined to enable Bonaparte to conquer northern Italy for France. The campaign of 1797 was an act of colossal audacity. With less than 50,000 men Bonaparte drove the Archduke Charles and the Austrians from Italy, forced the passes of the Alps in March, and pressed on directly for Vienna without waiting for Moreau (q.v.) to coöperate. At Leoben, within 100 miles of Vienna, he signed preliminaries of peace with Austria on April 18.

Bonaparte the conqueror began to take wider views of the part he was to play, and played it with a boldness and a skill that dazzled France into complacency. He organized the Italian conquests into the Cisalpine Republic and constituted the Genoese dominions into the Ligurian Republic; he sent Augereau as his secret agent to conduct the military operations of the coup d'état of the 18th Fructidor (see FRENCH REVOLUTION); he lived and acted like a monarch in northern Italy; and finally, disregarding the express orders of the Directors, he negotiated with

Austria the Treaty of Campo Formio (Oct. 17, 1797). Austria gave up her former Belgian possessions and Lombardy, and received most of the territories of the extinguished Republic of Venice. Bonaparte now returned to France, but the Directors were afraid of him and sought to rid themselves of him by dispatching him on some out-of-the-way or hazardous enterprise. It was evident to him that a direct attack upon France's one remaining foe, England, could not succeed, and he suggested instead the campaign in Egypt. The Oriental dream was always before his eyes, and throughout life influenced his policy. He saw in India the source of England's power, and he determined to attack India. He negotiated with Tipu Sultan, a determined foe of the English, and, as the easiest route to India was by the Red Sea, he proposed to conquer Egypt as a stepping-stone to India. An expedition was fitted out with the utmost secrecy at Toulon, and on May 19, 1798, he set sail with a large fleet carrying 35,000 men. He stopped on the way to capture Malta. On July 1 he landed in Egypt and occupied Alexandria on the next day. Advancing into the desert, he encountered and defeated the famous Mameluke cavalry in the battle of the Pyramids on July 21, and three days later entered Cairo. Desaix was detached to conquer Upper Egypt, and Bonaparte devoted himself to consolidate his conquests. On August 1–2, however, Nelson destroyed his fleet in Abukir Bay, and Turkey declared war and planned to recover Egypt. Taking the offensive at the beginning of 1799, Bonaparte invaded Syria, captured Jaffa, and laid siege to Acre. Junot fought an engagement with the Turks near Nazareth, and Kléber found himself attacked by 30,000 of them at the foot of Mount Tabor on April 15, but was rescued by the opportune arrival of Bonaparte. Returning to Acre, Bonaparte found that he was unable to take the place by storm, and having lost 5000 men in fighting or from the plague, he ordered a retreat. Arriving in Egypt, he met another Turkish force, which had landed near Alexandria, and defeated it on July 25. News from France told of the infidelity of Josephine and of the evil plight of France under the decadent Directory, which was being attacked by the newly formed Second Coalition of the Powers of Europe against France. On the night of August 22–23, leaving Kléber in command, Bonaparte escaped from Alexandria and, evading the English ships, landed at Fréjus on Oct. 9, 1799.

On reaching Paris he speedily took counsel with the members of his family and after a scene with Josephine forgave her, though he did not forget her offense. Councils with Talleyrand, Sieyès, and other important men of affairs followed, but most of all with his brother Lucien, who was now President of the Council of Five Hundred. Plans were speedily devised, and on Nov. 9, 1799, the famous coup d'état of the 18th Brumaire took place. The Directory was overthrown, the Council of Five Hundred dispersed by soldiers, and a provisional government composed of Bonaparte and two of the late Directors, Sieyès and Roger Ducos, installed. Sieyès (q.v.) expected to be the managing head of the new combination, but at the first meeting found that Bonaparte had everything in his own hands. In a few weeks the provisional government drew up and promulgated the constitution of the Year VIII, which provided for four assemblies—one to propose laws, one to consider them, one to vote upon them, and one to decide upon their constitutionality—but in spite of this elaborate machinery left practically all the power in the hands of Bonaparte, who became First Consul (Dec. 24, 1799). Bonaparte devoted his attention to centralizing the government. Local initiative was carefully limited so that everything might be controlled from Paris. Prefects were installed in all the departments and subprefects in the minor divisions. This centralized bureaucracy, modeled after the traditions of the French monarchy, has survived to the present day. The new constitution when completed was ostensibly submitted to the people for their approval by means of a plébiscite, which resulted in favor of the constitution by a vote of 3,000,000 to 1562. Having arranged the more important details of the administration and restored internal peace by the pacification of the Vendée, he turned his attention to the military situation. The victory of Masséna at Zurich on Sept. 25–26, 1799, had freed France from the danger of invasion by the Second Coalition, but Italy and southern Germany were once more in the hands of the Austrians, and Masséna with a French army was shut up in Genoa. Bonaparte suddenly and with the utmost secrecy gathered a new army for the invasion of Italy. Instead of taking the expected course of advancing along the Riviera as in 1796 and raising the siege of Genoa, he took his army, whose existence was unknown to the Austrians, across the Great St. Bernard Pass and occupied Milan on June 2, 1800. The surprised Austrian General Melas endeavored to gather his forces and save himself. A detachment under Lannes defeated an Austrian detachment at Montebello on June 9, but on the 14th Bonaparte found himself forced to face the main Austrian army of 31,000 men at Marengo with only 18,000, and with difficulty saved himself from complete defeat. The opportune arrival of Desaix after the battle was really over led to a renewal of the fight, to the astonishment of the Austrians, who were driven from the field. The campaign of Marengo was a masterpiece, but the honors of the victory itself belong to Desaix, who bought it with his life, and to Lannes, Bessières, and the younger Kellermann. Melas evacuated all of Italy west of Mantua, but Austria was not ready to make peace until she had been defeated by Moreau at Hohenlinden (q.v.) on December 3 and Macdonald had crossed the Splügen and threatened Vienna. Negotiations were then opened between Cobenzl and Joseph Bonaparte, and on Feb. 9, 1801, the Treaty of Lunéville was signed. England was now the only remaining foe of France. England forced the French to evacuate Egypt and captured Malta; while Bonaparte forced Naples and Portugal to abandon the English alliance. The faint-hearted Addington ministry in England signed preliminaries of peace with France on Oct. 1, 1801, and on March 27, 1802, Cornwallis and Joseph Bonaparte signed the Treaty of Amiens, which gave France complete peace for the first time in 10 years. The diplomatic genius of Bonaparte shines brightly in these treaties, which enabled him to make real gains for France such as all the wars of Louis XIV had failed to obtain. He carefully hid many things in these treaties for future use, which enabled him to appear as the pacificator and reorganizer not only of France, but of

Europe, and as the founder of a great colonial empire. Seeds for future war were as carefully sown, which were to bring forth fruit at the appropriate season.

Bonaparte had shown himself the greatest master of the art of war and one of the shrewdest of diplomats, when at 30 years of age he undertook the duties of a ruler, lawgiver, and administrator. His greatness lay in the universality of his genius and in his inordinate capacity for hard work. Further, he was able to command the services of many men of extraordinary ability and to make their work his own. His reorganization of the government of France was accomplished in a few months and comprised enough achievements of the first order to have established the enduring fame of several statesmen. This tremendous activity so stirred and inspired his officials that they said "the gigantic entered into our very habits of thought." With Gaudin he reorganized the treasury department, regulated the assessment and collection of the taxes, and organized the Bank of France. With Chaptal he reorganized the local administration with the prefects and subprefects responsible to the central authority, the Council of State. The schism between the Catholic church and the constitutional clergy was healed and the Catholic church restored to its old-time place in France, by the negotiation of the Concordat (q.v.) with Pius VII in 1801. The Lutherans, the Calvinists, and ultimately even the Jews were brought into similarly close relations with the state. The educational system was reconstructed, especially in the matter of secondary schools and of technical education. The work was completed by the establishment in 1808 of the University of France, which comprised the whole teaching force of the Empire. The establishment of the Legion of Honor in May, 1802, provided a means of recognizing services to the state. The greatest triumph was the codification of the laws of France. See CODE NAPOLÉON.

France had lost her colonial empire in the eighteenth century, and it was the fond hope of Bonaparte that he might restore it and thus rival England in commerce and upon the seas. To this end he began a series of enterprises which embraced every quarter of the globe—North and South America, Africa, India and the East, and Australia. He secured the cession of Louisiana from Spain, and sent an army to recover Haiti, where the blacks had successfully risen against their oppressors. In all these schemes he was checkmated by England, but on the continent of Europe he was hindered by nothing more serious than protests in reaping the fruit of the wars of the French Revolution. He reconstituted upon the new French lines the Batavian Republic, the Cisalpine Republic (which became the Italian Republic), and the Ligurian Republic (1801–02). He extended the bounds of France, which already had the Rhine, the Pyrenees, and the Alps as her frontiers, by the annexation of Piedmont and Parma in 1802. He was actively concerned in the reorganization of Switzerland and of Germany in 1803. The Treaty of Aranjuez (March 21, 1801) bound Spain to France, while Portugal, the faithful ally of England, was humbled by the Treaty of Badajoz (Sept. 29, 1801).

Bonaparte's colonial schemes were frustrated by yellow fever, which destroyed General Leclerc and his army in Haiti and forced the Consul to sacrifice Louisiana to the United States (1803) and abandon his dream of empire beyond the seas. Pique at this disappointment hastened Bonaparte into the predetermined rupture with England. A *casus belli* was found in the question of Malta, which England refused to surrender in accordance with the terms of the Treaty of Amiens. Mortier occupied Hanover, of which George III was King. Gen. Gouvion Saint-Cyr was ordered to occupy the Kingdom of Naples, an ally of England, to offset the occupation of Malta. The French army was mobilized in six divisions and stationed along the Channel from Ostend to Brest. War existed from May 16, 1803, but actual hostilities did not begin until over two years later. In the meantime England recalled Pitt to office (May, 1804). Pitt's great service consisted in securing allies and in forming the Third Coalition against France. In this work he was aided by Bonaparte's blunders, the most notable of which was the execution of the Duc d'Enghien (March 21, 1804), in retaliation for the Royalist plots of Pichegru and Georges Cadoudal. On the day of Pitt's return to power Bonaparte was offered the title of Emperor by the French Senate, and on Dec. 2, 1804, he was crowned Emperor as Napoleon I at Paris in the presence of Pope Pius VII. On May 26, 1805, he was crowned at Milan King of Italy. A few days later followed the last of his series of aggressions, which provoked Austria and Russia into the alliance with England, the annexation to France of the Ligurian Republic (June 4). A month later Russia and England signed their alliance against Napoleon, and on August 9 they were secretly joined by Austria. Sweden, Portugal, and Naples were practically, though not formally, parties to this coalition.

For two years Napoleon had been dallying with a scheme for the invasion of England. In the camps along the Channel he had organized, equipped, and drilled his famous Grand Army, composed largely of veterans of the wars of the Revolution, and at Boulogne special preparations had long been under way for an attack upon England. The summer of 1805 seemed the propitious time for the attack, and Napoleon made elaborate dispositions for obtaining naval control of the Channel and for the transportation of an army of 160,000 men from Boulogne to the Kentish coast. The French fleet under Villeneuve, however, was outmanœuvred and outfought by the English under Cornwallis, Calder, and Nelson. By the middle of August, 1805, the scheme had become impossible of execution. Napoleon, however, had foreseen this possibility; his other acts had already provided him with another chance to employ his army, and he had worked out in his mind the plan of his most brilliantly successful campaign, that of Austerlitz. On August 29 the Army of England was officially denominated the Grand Army and divided into seven corps under Bernadotte, Marmont, Davout, Soult, Lannes, Ney, and Augereau, with the cavalry under Murat and the Imperial Guard under Bessières, in all about 220,000 men under the personal command of the Emperor, with Berthier as chief of staff. War was declared against Austria on September 25, and the next day the movement of the Grand Army into southern Germany began. On the part of Austria the Archduke Charles, with over 90.000 men, the best general and the largest army, was intrusted with operations in Italy, where 50,000 French troops were under

the command of Masséna, while the smaller Austrian army, under the command of the Archduke Ferdinand and General Mack, invaded Bavaria and occupied the untenable line of the Danube and the Iller with headquarters at Ulm. This move left Austria almost bare of troops. Making a feint at repeating Moreau's tactics of 1796 in attempting to turn Mack's left, Napoleon ordered the actual attack to be made on the right. Bernadotte and Marmont occupied Munich, Davout and Soult seized Augsburg, while Ney and Lannes occupied Günzburg and operated to the north of Ulm. Mack made three fruitless attempts to extricate himself, but after defeats at Wertingen, Memmingen, and Elchingen (October 14), he was forced to capitulate with 33,000 men on October 20. Though the Archduke Ferdinand escaped, Napoleon's forces were thus able to advance directly to Vienna, which he occupied on November 13. The Russian forces which had been advancing to support Mack were forced to fall back into Bohemia, where the various divisions were united under the command of Kutusoff and joined by part of the Austrian forces. Napoleon marched northward to meet them, and on December 2 won his greatest victory, Austerlitz. The campaign of Ulm and Austerlitz was won by Napoleon's knowledge of the value of time, the whirlwind rapidity of his movements, and the precision of his combinations. The battle of Austerlitz was won by a masterly use of artillery. The vanquished Emperor Francis I of Austria humbled himself before Napoleon in the Treaty of Pressburg (December 26) and consented to large cessions of territory, including the former Venetian dominions, Tirol (given to Bavaria), etc. The overthrow of Austria resulted in the formal dissolution of the old Holy Roman Empire (Aug. 6, 1806).

What Austerlitz was for Napoleon on land, Trafalgar was for England on the sea. After a brief rest at home, Nelson had been ordered out to attack Villeneuve, who with the combined French and Spanish fleets sailed out of Cadiz and met Nelson off Cape Trafalgar. England's greatest sea fighter won the greatest naval battle of the century, but lost his life (Oct. 21, 1805). After this the French were able to do nothing at sea, and the ports of both France and her allies were generally blockaded by the English fleets. England was undisputed mistress of the seas, while Napoleon began to remake the map of Europe as though he were the undisputed master of the Continent. The most important changes during the year 1806 were the formation under his protection of the Confederation of the Rhine, the establishment of his brother Joseph as King of Naples and of his brother Louis as King of Holland, and the creation of the Grand Duchy of Berg for his brother-in-law Murat. The death of Pitt (Jan. 23, 1806) led to negotiations between Napoleon and Fox, the new Foreign Secretary. These negotiations, as well as those with Russia, came to naught, and to Napoleon's surprise this failure was coupled with the decision on the part of Frederick William III of Prussia to make war upon him. Single-handed Prussia undertook to meet Napoleon, who, as soon as he foresaw that war was inevitable, acted with the same vigor as in the previous year. The Prussian army under Prince Hohenlohe-Ingelfingen and Charles William Ferdinand, Duke of Brunswick, was drawn out in a line 85 miles in length, extending from Gera westward to the borders of Hesse-Cassel, with the bulk at Erfurt. Napoleon left Paris on September 25 and assumed charge of the campaign at Würzburg on October 2. On the 10th Prince Louis Ferdinand was defeated and slain in a skirmish at Saalfeld; on the 14th Napoleon surprised the Prussian army in its attempt to concentrate, and in person defeated Hohenlohe at Jena, while Davout defeated Brunswick at Auerstädt. Murat and Lannes pursued Hohenlohe and forced him to surrender at Prenzlau (October 28), while the other remnants of the Prussian army and the fortresses surrendered without a blow. Saxony, which had acted as the ally of Prussia, went over to Napoleon, and later received as reward the Duchy of Warsaw. From the Prussian capital Napoleon issued the Berlin Decree, which, with the Milan Decree of 1807 and other decrees, was directed against English commerce. See CONTINENTAL SYSTEM.

Prussia, though vanquished, continued weakly the struggle in her eastern provinces, where Bennigsen and the Russians were ready to join in the contest. Murat occupied Warsaw, then Prussian territory, in November, 1806. In December Napoleon entered the ancient Polish capital and was greeted as the restorer of Polish liberties. The French having gone into winter quarters, Bennigsen hoped to surprise them and destroy them before they could again take the field, and accordingly attacked Ney and Bernadotte, but their successful resistance defeated the plan and Napoleon in person pursued Bennigsen, who retreated toward Königsberg, and overtook him at Eylau (q.v.). The ensuing battle (Feb. 7–8, 1807) was a butchery, not a victory. Napoleon hurried up reënforcements to renew the struggle in the spring. Sebastiani, the French Ambassador at Constantinople, persuaded the Sultan to declare war against Russia. Gardane was sent to stir up Persia to like action. Mortier induced the Swedes to treat with France. The campaign for Königsberg began early in June and was marked by the indecisive action of Heilsberg (June 10) and the defeat, four days later, of the Russians under Bennigsen at Friedland (q.v.). On June 25 the Czar and Napoleon held their famous conference of Tilsit (q.v.) on a raft moored in the Niemen. By the Treaty of Tilsit Prussia was humbled even more than Austria had been at Pressburg, while the Czar became the ally of Napoleon and began to plan with him the division of the world between them.

Though England, under the Ministry of All the Talents, had behaved very badly towards Prussia and Russia, she remained the one steadfast foe of the French Emperor, and pursued without wavering her policy of opposition to Napoleon. At Tilsit Napoleon bound the Czar to enforce the Continental System against England, and then began the task of compelling all the lesser Powers to adhere to the system. There were to be no neutrals. Portugal, the constant ally of England, was the first victim. By the Treaty of Fontainebleau Napoleon joined with Spain to dismember that Kingdom, and in November, 1807, a French army under Junot occupied the country with little trouble, the royal family having already started for the New World to establish a temporary capital at Rio de Janeiro. The year 1808 witnessed the unfolding of Napoleon's designs against Spain. Gradually, in spite of all treaties, French

troops were sent across the Pyrenees, where they quietly took possession of various fortresses. Spain was suffering from the family troubles of the Bourbon monarch, and it suited Napoleon's purpose to make use of them and to order the advance of a French army under Murat towards Madrid. This movement precipitated the fall of the Bourbons. Charles IV was compelled by a popular uprising to abdicate in favor of his son, Ferdinand VII (March), and a little later father and son, at a meeting with Napoleon at Bayonne, were forced to renounce the Spanish throne. On June 6, 1808, Joseph Bonaparte was proclaimed King of Spain. For an account of the struggle in Spain and Portugal, see PENINSULAR WAR.

In Austria Francis I had called to office as his chief minister Count Philip Stadion, who, with the aid of Archduke Charles, devoted himself to the task of preparing Austria for another struggle with Napoleon. The misfortunes of Napoleon in Spain and the urgency of England, which offered liberal subsidies and active coöperation, determined the Austrians to try their fortunes once more in the spring of 1809. In April Archduke Charles opened the war by invading Bavaria, while another force under Archduke John invaded Italy. Napoleon reached the scene promptly and in the five days' fighting (April 19–23) around Ratisbon completely defeated the Austrian plan of campaign and forced Archduke Charles to retreat towards Vienna, which the victorious Emperor entered on May 13. He then crossed the Danube and attacked the Archduke, who had taken up strong positions in the villages of Aspern and Essling. Two days of hard fighting (May 21–22) failed to give Napoleon any decided advantage, and he found himself and his army practically prisoners on the island of Lobau in the Danube. With his accustomed vigor he ordered up reënforcements and reorganized the troops under him. On July 5 Napoleon left the island of Lobau and on the 6th defeated the Archduke Charles in a great battle at Wagram. On October 14 was signed the Treaty of Schönbrunn (q.v.), by which Austria was forced to make large cessions of territory to the overbearing conqueror. From 1809 to 1812 the main strength of the French Empire was devoted to continuing the struggle in the Peninsula. A number of isolated events in other parts of Europe, however, made the period important. In pursuance of the Treaty of Tilsit, the Czar robbed Sweden of Finland (1808), and in the same year the French seized Swedish Pomerania. The next year the Swedish Kingdom was the scene of a revolution. Gustavus IV was deposed and his uncle placed on the throne as Charles XIII. Marshal Bernadotte, the brother-in-law of Joseph Bonaparte, was elected heir to the childless monarchy and intrusted with the government of the Kingdom. (See CHARLES XIV.) Denmark had likewise been marked to suffer on behalf of Napoleon's Continental System; but in this instance he was forestalled by England, which seized the Danish fleet in September, 1807. After the Treaty of Tilsit a kingdom of Westphalia was carved out for Jerome Bonaparte in Germany, and numerous changes made in the Confederation of the Rhine. Napoleon enlarged his own Empire by the annexation of Tuscany (1807), the Papal States (1809), Holland (1810), Valais and the German coast line to Lübeck (1810). He also kept the Illyrian provinces, which had been wrested from Austria, for himself. Naples was transferred to Murat after the choice of Joseph as King of Spain. Pope Pius VII, the same pontiff who had consecrated Napoleon as Emperor in 1804, was carried away as a prisoner and kept in confinement. The new Cæsar must have an heir to his Empire, and accordingly Josephine was divorced and a marriage arranged in 1810 with the Archduchess Maria Louisa of Austria, daughter of the Emperor Francis, who bore Napoleon one son, the King of Rome (1811). From Napoleon's policy England profited as much as did France, for the whole commerce of the seas was under her control and she had seized the colonies of France and all those of the countries under French control or influence that she saw fit. During the years from 1809 to 1815 England furnished the inspiration and the sinews of war for every campaign against Napoleon, but it was only in the Peninsula that she was directly responsible for the conduct of the campaign, which was carried on with desperation on both sides till the French were driven beyond the Pyrenees in 1814.

For three years after Wagram Napoleon did not in person conduct a single military operation. Family affairs and the administration of his great Empire occupied all his attention. During these years many changes were taking place which presaged the downfall of the great conqueror. Austria was very cautiously strengthening her position under the skillful direction of Metternich. The regeneration of Prussia under Stein, Scharnhorst, and Hardenberg is one of the most notable events of the nineteenth century. Russia was never content with the French alliance, the enforcement of the Continental System was causing great suffering and discontent, and the Czar Alexander was beginning to lose his enthusiastic admiration for Napoleon, who had offended him by concluding a matrimonial alliance with Austria without waiting for an answer to his request for the hand of a grand duchess in marriage and, most of all, by the annexation of Oldenburg to France. The estrangement was increased by the Cæsarism of Napoleon, who could no longer endure the existence of even a friendly rival. Alexander, duly warned of Napoleon's intentions, turned to England and in 1812 entered into a close alliance with her. With Turkey he negotiated the Peace of Bucharest (May 28), and with Sweden not only peace, but alliance (April 5). Napoleon left Paris early in May and went direct to Dresden, where he took care to bind Prussia, Austria, and the other German states more closely to his cause. Then he entered Poland, where he regulated the internal affairs and supervised the mobilization of his army. On June 22 he issued a declaration of war against Russia. The passage of the Niemen was begun on June 24, and by the end of the month Napoleon had 400,000 men across the Russian frontier. The Czar had between 250,000 and 300,000 men under arms, but only about one-half of this number ready to face Napoleon under Barclay de Tolly and Bagration, who conducted a Fabian campaign. Napoleon found the country devastated and abandoned as he advanced, with no enemy to make a stand against him. Like Charles XII, a century earlier, he was being lured to his ruin. At Smolensk (August 17–18) the French encountered the first serious resistance. Napoleon as he advanced had to

leave large bodies of troops along his line of march, and he detached a large force to the northward to capture Mitau and Riga and threaten St. Petersburg. Russian discontent became pronounced as the people saw Barclay de Tolly and Bagration permitting Napoleon to advance unresisted on their ancient capital, Moscow. The two generals allowed themselves to be superseded by Kutusoff, who chose his ground, and on September 7 offered battle to the French at Borodino (q.v.). It was the bloodiest battle of the century, the losses probably aggregating 40,000 on each side. The loss to Napoleon, who could obtain no reënforcements, was fatal, but still he pressed on and entered Moscow (September 14) only to find himself robbed of the fruit of victory by the terrible conflagration which broke out two days later. With a folly that seemed madness, Napoleon lingered in the city until October 19 before beginning the retreat. The hard-fought drawn battle of Malo-Yaroslavitz (October 24) compelled Napoleon to retreat by the same desert road on which he had advanced, instead of by a more southerly route through country not yet devastated by war. Sufferings from the cold and from lack of food were intensified by the constant presence of the Russians on the flanks and in the rear. The expected supplies were not found at Smolensk, and the sufferings of the French reached their terrible climax at the crossing of the Beresina (November 26–28), where thousands perished in spite of the heroic efforts of Oudinot and Ney. A week later Napoleon turned over the command to Murat and hastened to reach Paris and organize a new army before the news of the great disaster should become known in western Europe. Ney, the bravest of the brave, in command of the rear guard, protected the retreat, but only 20,000 out of the 400,000 who had crossed the Niemen in June recrossed it in December. The disaster, however, was greater than the mere loss of an army of 400,000 men. Napoleon had lost his prestige, and henceforth Castlereagh, the English Foreign Minister, and the Czar Alexander supplanted Napoleon as controllers of the destinies of Europe. The Czar advanced into eastern Prussia, where he installed as Governor the ex-Minister Stein, who placed himself at the head of a great Prussian patriotic rising against Napoleon. Driven by this outburst of national spirit, Frederick William III signed an alliance with the Czar at Kalisz (Feb. 27, 1813). Austria, under Metternich, hesitated between Napoleon and Alexander and offered to mediate. Napoleon sent into Germany a new army made up of conscripts and of troops withdrawn from Spain, and on April 29, at Weimar, assumed the direction of the campaign of 1813, which he had decided to fight on the line of the Elbe, where Eugène de Beauharnais and Davout were struggling to check the Russians and repress the Prussians. Successes at Lützen and Gross-Görschen (May 2) on the great plain around Leipzig enabled Napoleon to occupy Dresden as his base of operations and to advance to Bautzen, where he defeated the allies on May 20–21.

Napoleon should have followed up this movement with vigor, but he hesitated because of the untrained condition of his army and of the attitude of Austria. Bernadotte, after the Treaty of Stockholm with England (March 3), had landed at Stralsund, prepared to take an active part in the overthrow of Napoleon, whom he had learned to hate bitterly. Moreau, the only surviving French rival of Napoleon, was summoned from America to act as chief adviser of the allies. England signed new treaties with Prussia and Russia (June 14–15), and the Czar and Metternich signed at Reichenbach (June 27) a secret treaty, by which Austria bound herself to join the allies if Napoleon did not accept her proposals before the expiration of the truce on August 10. This was equivalent to a treaty of alliance, for it was certain that the Congress of Prague would accomplish nothing. On August 10 the Austrian army under Schwarzenberg began operations in Bohemia in concert with the allied army under Blücher in Silesia. The victory of Wellington at Vittoria (June 21, 1813) encouraged the allies and made a great victory an absolute necessity to Napoleon, who promptly took the offensive and attempted to force a battle with Blücher near Görlitz and crush him and then turn against Schwarzenberg. Blücher evaded battle, and Schwarzenberg advanced to attack Dresden. Napoleon reached Dresden just in time and on August 26–27 won his last great victory. (See DRESDEN, BATTLE OF.) For the moment Dresden was saved, but the success was more than offset by the defeats inflicted upon his subordinates, Oudinot at Grossbeeren (August 23), Macdonald on the Katzbach (August 26), Vandamme at Kulm (August 29–30), and Ney at Dennewitz (September 6). The losses of Napoleon during the 10 days' campaign were almost overwhelming and irretrievable, while reënforcements speedily made good the losses of the allies. Napoleon failed to appreciate that the line of the Elbe had become untenable from the moment that Austria joined the allies, and instead of falling back of the Rhine and offering to negotiate, he continued to struggle to hold Dresden. Constant rains and bad roads had been an important factor in the August campaigns and prevented Napoleon, in spite of his boundless energy and activity, from accomplishing anything in September. This failure was fatal, for in October the allies, who had defined their relations in the Treaty of Toplitz (September 19), took the offensive and developed their campaign with such skill that Napoleon was completely deceived until they had nearly completed their dispositions. Blücher, unperceived, crept around Napoleon's left, got in touch with Bernadotte, and advanced towards Leipzig from the north, while Schwarzenberg was advancing from the south towards the same place. Napoleon left Gouvion Saint-Cyr to hold Dresden and hurriedly concentrated all available forces to protect Leipzig and hold his lines of communication. For three days (October 16, 18, and 19) "the Battle of the Nations" raged around Leipzig, and on the last day the French were driven out of Leipzig in a disastrous rout. (See LEIPZIG, BATTLES OF.) Napoleon retreated hastily behind the Rhine, stopping only to destroy, at Hanau (October 30), the army of Bavaria, which had recently joined the allies. Napoleon made a serious mistake in leaving able lieutenants with large garrisons to hold the great German fortresses, thus depriving himself of the assistance of Rapp, who held Danzig with 8000 men, Davout, who was shut up in Hamburg with 12,000 men, and many others. These places were besieged and captured by the allies during the ensuing months, but the bulk of the allied army pressed on towards Paris. Blücher

with the Prussians and part of the Russians crossed the Rhine at Caub (December 31) and began the invasion of France. Schwarzenberg, with the Austrians and the rest of the Russians, entered France by the way of Basel. To meet this double invasion, Napoleon could only muster a small army. This he interposed between Blücher and Schwarzenberg, whom he defeated in turn. Blücher's army was dispersed in the battles of Brienne, Champaubert, Montmirail, and Vauchamps, between Jan. 29 and Feb. 14, 1814, while divisions of Schwarzenberg's army were severely worsted at Nangis (February 17) and Montereau (February 18).

This first defensive campaign of 1814 is one of the most brilliant defensive fights in military history. The military genius of Napoleon never shone more brightly, though the dulling of his political sense made his failure inevitable. With a little army of worn-out and defeated men, reënforced by a few hastily collected and untrained conscripts, he thrust himself between two vastly superior forces against which he hurled himself alternately with such swiftness, skill, and violence as to shatter the hostile armies and frustrate the plans of the opposing generals. Finally, worn out, he had to succumb to the overwhelming numbers of the foe and to the insuperable obstacles of time and space.

Napoleon, who had refused to accept the proposals of Frankfort submitted by the allies on Nov. 9, 1813, now sent Caulaincourt to meet their representatives in the Congress of Châtillon (Feb. 3–March 19, 1814), but with instructions to "sign nothing." The allies once more defined their relations to one another in the Treaty of Chaumont (March 1), brought up new troops, and prepared to crush Napoleon. Napoleon's second defensive campaign of 1814 was a brilliant failure—a stubborn struggle against the inevitable. The first blows were struck at Blücher on March 7 and 9 at Craonne and Laon, but failed to interrupt Blücher's campaign seriously. An attack upon a part of Schwarzenberg's army at Arcis-sur-Aube met with no better success, and so Napoleon turned to the eastward to threaten Schwarzenberg's line of communication. But the great disparity of forces enabled the allies to neglect this movement and to concentrate on Paris. Schwarzenberg and Blücher arrived before Paris on March 30, and after hard fighting with Marmont, Mortier, and Moncey, occupied the French capital. The Emperor arrived just a few hours too late to strike a blow in defense of his capital, and could only make an obstinate attempt to renew the struggle south of Paris, but Ney and the other marshals finally forced him to listen to reason (April 4) and to bring the campaign to a close. In the southwest Soult had been driven from position to position and was about to lose his last battle at Toulouse. Suchet had withdrawn from Spain too late to help Soult; Augereau at Lyons had failed to disturb Schwarzenberg's left flank. In Italy Murat had deserted to the enemy, negotiated with Austria, and turned the Neapolitan army against Eugène Beauharnais, the Viceroy of Italy, who faithfully and ably faced the triple danger of Murat's treachery, the invasion of the Austrians, and the occupation of Genoa by an English force under Lord William Bentinck. On April 11 Napoleon, the Emperor of the French, formally abdicated at Fontainebleau in favor of his infant son, the King of Rome.

In the stipulations with the allies Napoleon was allowed to retain the title and state of Emperor, but was to be detained as a prisoner on the island of Elba. The relations between the newly restored Bourbons and the allies were settled by the First Treaty of Paris on May 30. The changes which had taken place in Europe since the outbreak of war in 1792 had been such that the old order could not be restored, and accordingly a congress of the Powers was summoned to meet at Vienna to make the necessary new arrangements. These were completed on June 9, 1815. But in the meantime Napoleon had left Elba, landed in France on March 1, made his way to Paris, reëstablished his power, gathered a new army, and advanced to attack the allies, whose representatives at Vienna planned at once to place new armies in the field and overthrow him a second time. (See Hundred Days.) The campaign, which lasted only a week, included Napoleon's defeat of Blücher at Ligny (q.v.) on June 16, Ney's fight with Wellington at Quatre-Bras on the same day, and the final overthrow of Napoleon on the field of Waterloo (q.v.) by Wellington and Blücher on June 18, 1815. After this last battle Napoleon fled to Paris, where he abdicated a second time on June 22. For a few days he hesitated between dreams of again playing a part in France and plans for an escape to America. The first was preposterous, the second impossible, and on July 15 he surrendered himself to Captain Maitland on board the English ship *Bellerophon*. The allies under Blücher had entered Paris a second time, on July 7, and made the final adjustments for the settlement of Europe in the Second Treaty of Paris on November 20. Napoleon was taken to England, and after some deliberation his request to be permitted to settle in England was refused. He was transferred to the ship *Northumberland* and on October 16 landed on the island of St. Helena. In his captivity he was accompanied by his faithful friend Bertrand, and by Gourgaud, Montholon, Las Cases, and a number of other individuals of minor importance. In 1816 Sir Hudson Lowe, a British soldier, arrived as Governor of the island. Napoleon's chief occupations as a captive were his quarrels with Lowe and his monologues with Gourgaud and Montholon, which they wrote out and submitted for correction to the Emperor. These documents form a partial autobiography, valuable not for its facts, but for the light which it sheds upon Napoleon's character. Napoleon gave himself up to long periods of gloom and humored himself in the most inexcusable obstinacies when a more rational behavior would have improved his health and rendered his surroundings more agreeable socially. Cancer of the stomach, which had carried off his father and which was to cause the death of two of his sisters, was slowly undermining his health, and on May 5, 1821, he breathed his last at the set of sun. He was buried with military honors upon the island, but, in accord with his own request, his remains were in 1840 taken from the island, attended by the faithful Bertrand, and under the direction of Louis Philippe placed in a magnificent sarcophagus beneath the dome of the Hôtel des Invalides in Paris. After his death and the restoration of the Bourbons a romantic tradition gathered about the name of Napoleon, which found expression in the literature of the period, notably the poetry of Béranger. He appeared to

many the champion of the people, the bearer of the gospel of the French Revolution to the world, a martyr to the lost cause of democracy. It is in this rôle that he is portrayed in *The Napoleonic Ideas* of his nephew, Napoleon III. To others he was the archadventurer, the traitor to the democratic cause, who exploited the results of the Revolution for his own ends and used the Revolutionary phraseology and idealism to cloak a tyranny more dangerous because more effective than the despotism of the old régime. He is significant historically not merely for the magnitude of his military exploits but for the ideas that these embodied in his own mind and in that of the French people. Napoleon carried to the world by force of arms the ideas of eighteenth-century France. The fabric of feudalism with all its inconsistencies and absurdities crumbled at his touch and in its place appeared the foundations of the nineteenth-century state, strange compound of political democracy and economic class rule. But it was the middle classes who now occupied the dominant position of the old feudal aristocracy. And it was a modern middle-class state with efficient centralized administration, uniform law, postal service and coinage, popular education and popular representation, and freedom of contract in economic matters that Napoleon made possible in every country of Europe to which his influence extended. The remnants of serfdom, the privileges, legal and economic, of the mediæval Church and the landed aristocracy, the archaic political system, in which despotism was combined with disorganization and maladministration, gave way before the bureaucratic, businesslike, logically organized modern state, with a modern ruler at its head, of a type embodied later in Bismarck and Napoleon III—one who was able to yoke the new democracy to the service of an oligarchy, whether plutocratic or aristocratic, who could rear a new despotism under cover of representative institutions and could appease the popular aspirations in internal politics with a brilliant foreign policy and an appeal to the enthusiastic young nationalism to which the downfall of the feudal régime had given birth.

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* This is also in French translation.
† This is also in English translation.

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NAPOLEON II. Son of Napoleon I. See REICHSTADT, DUKE OF.

NAPOLEON III, CHARLES LOUIS NAPOLEON BONAPARTE (1808–73). Emperor of the French. He was the third son of Louis Bonaparte, King of Holland, and of Hortense Beauharnais. (See BONAPARTE.) The law of succession enacted under the First Empire gave the crown, in default of direct descendants of the Emperor, to the sons of either Joseph or Louis Bonaparte. Joseph being childless, the sons of Louis became heirs apparent of the Napoleonic pretensions. Louis Napoleon was born April 20, 1808, in Paris. He spent his boyhood with his mother at her château of Arenenberg in Switzerland, and at Augsburg, where he studied in the Gymnasium. After the death of his elder brother in 1831, he returned to France with his mother, but they were expelled by Louis Philippe, went to England, and thence returned to Switzerland. The death of the Duke of Reichstadt (July 22, 1832), only son of the first Napoleon, left Louis Napoleon the representative of his family, and thereafter the restoration of the Napoleonic Empire became his fixed idea. During the next four years his published works kept him before the French people. Among them were: *Révéries politiques; Projet de constitution; Deux mots à M. de Chateaubriand sur la duchesse de Berri* (in verse); *Considérations politiques et militaires sur la Suisse.* In 1836, believing in the weakness of the July monarchy, he undertook at Strassburg a coup which was so absurd a failure that it covered him with ridicule. He was sent to America, but returned to Europe on account of his mother's illness. She died Oct. 3, 1837, and soon afterward the French government asked for his expulsion by Switzerland. He went to London, where, in 1838, he published the *Idées napoléoniennes*, which had considerable circulation in France. In this interpretation of the ideas of the first Napoleon, whom he pictures as the protagonist of the ideas of the French Revolution of 1789, he outlines his own political philosophy, which was a strange combination of Cæsarism with a revolutionary democracy verging on Socialism. In 1840 he made at Boulogne his second attempt to bring about a military uprising in his favor, but this was as complete a failure as its predecessor. He was imprisoned in the fortress of Ham, where he wrote several works, some political articles, and had a share in editing the *Dictionnaire de la conversation.* He escaped from Ham, May 25, 1846, and made his way to the Belgian frontier and thence to England. He hastened back to France when the Revolution of 1848 broke out, but, although he professed devotion to the provisional government, he was distrusted and asked to leave the country. Notwithstanding his promise to do this, he obtained an election to the National Assembly for Paris and three other departments. He took his seat on June 13, 1848, but resigned on the 15th, after a stormy debate, and left France. He was, however, elected from five departments in September, and returning became a candidate for the presidency. He received 5,500,000 votes in the election of Dec. 10, 1848, his closest opponent, General Cavaignac (q.v.), having 1,500,000. He entered upon his office on December 20. His presidency was a continuous contest with the majority in the Assembly, who continued to doubt the sincerity of the President's devotion to the Republic. This disturbed condition was ended by the coup d'état of Dec. 2, 1851, a thoroughly Napoleonic stroke, carried out with blunt disregard for law or political honesty, by the President himself, assisted by Morny, Maupas, and Saint-Arnaud. The cost of success was the establishment of a repressive tyranny maintained by military force. France submitted to the new ruler, who promised to restore the glories of the past. On December 20–21 the President was reëlected for 10 years by more than 7,000,000 votes, practically without opposition. He had revived the plebiscite, used with such effect by his uncle—a plebiscite so managed that the issue was a foregone conclusion. In the same way, when he had himself proclaimed Emperor, as Napoleon III, just a year after the coup d'état (Dec. 2, 1852), it was made to appear that this also was in accordance with the popular will. The new Emperor had studied his uncle's methods and attempted to imitate him as far as circumstances and his own ability would permit, but he only won for himself the name of Napoleon the Little. He possessed ability, but it was that of the politician rather than of the statesman. He lacked the dash and rapidity of decision which were the chief elements in accomplishing the vast schemes of the first Napoleon. Napoleon III hesitated in deciding upon a policy and was slow in carrying it out when once determined. Some conspiracies against him developed as early as 1853, and three attempts were made to assassinate him—by Pianori and Bellamare in 1855 and by Orsini (q.v.) in 1858.

Napoleon III was looked upon coldly by the "legitimate" sovereigns of Europe, but the aim of his foreign policy was to make France again dominant in European affairs and himself the general arbiter of the Continent. To check the similar pretensions of Nicholas I of Russia in eastern Europe, he joined England in protecting Turkey against Russian aggression, and France took the leading part in the Crimean War (q.v.). The pacification which followed and the adjustment of the Eastern Question (q.v.) were arranged by a congress at Paris. (See PARIS, TREATIES OF.) The three eastern Powers, Russia, Prussia, and Austria, which were the

strongholds of legitimacy and autocracy, as against the democracy of France and England, were Napoleon's natural opponents. In the Crimean War he administered a lesson to one of them. By befriending Italy, which under the leadership of Sardinia was struggling to free itself from Austrian oppression, he found an opportunity to strike at Austria and to uphold in the most marked manner his favorite political hobby, the principle of nationalities. He encouraged Cavour (q.v.) in the advocacy of Italy's cause at the Congress of Paris, and, though the attempt of Orsini upon the Emperor's life almost destroyed the cordial relations that had been cultivated between the courts of Paris and Turin, under Cavour's shrewd management the Emperor finally became more friendly than ever. The two held a private conference at Plombières, July 20, 1858, at which Napoleon agreed to support Sardinia in case of an attack by Austria. Cavour at once forced Austria into aggressive action, and Napoleon, now half repentant of his engagement, took the field. The Italian campaign of 1859, in which Napoleon showed himself utterly incapable of military leadership, was marked by two great battles, Magenta and Solferino, won by the allies. Napoleon then selfishly closed the struggle by the preliminaries of Villafranca. (See CAVOUR; ITALY.) He exacted from Victor Emmanuel the cession of Nice and Savoy, although he had failed to deliver Venetia and the duchies. His later relations with Italy were disturbed by the fact that he felt called upon to uphold the Pope in his temporal possessions, and thus clashed with the national ambition of the Italians for complete unity with Rome as the capital. The protection of French troops was only withdrawn from the Papal States when war with Prussia had begun. During the Civil War in the United States (1861–65) Napoleon took an active part with the English government in the diplomatic intrigues against the United States. He took advantage of the disturbed condition of Mexican affairs and of the preoccupation of the United States to revive his uncle's dream of a Latin-American empire under French protection, by establishing the Archduke Maximilian on the new Imperial throne of Mexico by means of French bayonets. Secretary Seward warned the French Emperor that the government of the United States could only consider this as an infringement of the Monroe Doctrine and an unfriendly act, but no attention was paid to this protest until the termination of the Civil War made it possible to send General Sheridan with an army of seasoned troops to the Mexican frontier, when the French troops were removed and the unstable Mexican Empire collapsed (1867). This struck a great blow at the prestige of the Emperor. In 1863–64, when the Schleswig-Holstein (q.v.) question engaged the attention of the Powers, Napoleon refused to aid Denmark in her fight for the duchies and advocated the recognition of the principle of nationalities through the union of the German portion of the duchies to Germany. On the eve of the War of 1866 Napoleon entered into negotiations with both Prussia and Austria with respect to an alliance, but he was foiled by Bismarck's diplomacy, and the swift issue of the Seven Weeks' War (q.v.) revealed to Napoleon a new military power under masterful guidance, threatening his schemes for European control. Austria ceded Venetia to Napoleon with the understanding that it was to be made over to Italy. This was his last appearance in the rôle of an arbiter in the affairs of Europe.

The internal history of the Empire divides itself into two periods—that of the autocratic and that of the liberal Empire. The former Carbonaro risen to power became a powerful enemy of the democratic movement. At the outset he brought under his own control the finances and public enterprises; public liberty was restricted, and a thorough system of police espionage was organized. Napoleon married, Jan. 30, 1853, Eugénie de Montijo, a young Spanish countess, and gratified his own ambitions and her tastes with a brilliant, extravagant, and frivolous court. The Empress Eugénie's influence was always exerted in the interest of the Ultramontane Catholic party. In these days of his absolute power Napoleon pushed public improvements with great energy. Philanthropic institutions were multiplied in France; industrial development was encouraged; and an era of great material prosperity followed, degenerating into one of speculation and luxurious living in which were the seeds of decadence. Railroads and highways were constructed and lines of steamships were established and subsidized. Canals were built and harbors improved. Manufactures, agriculture, and forestry were all fostered by the state. Stock companies were created, and the *crédit foncier* and the *crédit mobilier* stimulated these enterprises with financial support. Paris, under the Prefect Haussmann, was transformed. As early as the exposition of 1855 Paris was able to show a new city to its visitors, and at the brilliant exposition of 1867 this development was still more marked. Politically there were three parties in opposition—Legitimists, Orleanists, and Republicans. Of these the Legitimists were almost lost sight of, with the exception of a few irreconcilable leaders. The Orleanists were stronger in numbers and in the quality of their adherents and gave the Emperor more anxiety. The great literary leaders were found in their camp, and the French Academy was their stronghold. The really active opposition, however, lay with the Republicans. None of these parties had any legal means of expression or action. In 1858, after the Orsini attempt, the General Security Act was forced through the Corps Législatif, giving the government power to exile or transport without trial any person convicted of a political offense. Wholesale arrests were made under this act for the purpose of intimidating the Republicans. Having alienated the Ultramontanes, upon whose support he had hitherto depended, by the Italian war, Napoleon relaxed some of his repressive measures to gain the support of the Liberals. In 1859 an amnesty decree allowed the return of the exiles of 1851. This was followed by a grant of more freedom of action to the Corps Législatif. The commercial treaty of 1860 with England abolished the prohibitions and lowered many of the high protective duties which had formed a part of the Emperor's commercial system. The restrictions upon the freedom of the press were partially removed. A Liberal opposition now began to organize through a coalition of the opposition parties, and after 1863 there was real parliamentary activity in France. A section known as Liberal Imperialists supported the Emperor, but opposed his reactionary ministers. The ministry, headed by Rouher, and with Drouyn

de Lhuys in charge of foreign affairs, favored a vigorous attitude of opposition to Prussia. The Emperor was broken in health, and after the Prussian triumph over Austria had demoralized his plans and left him discredited with his own ministers, he turned for support to the constitutionalists in the Corps Législatif. The liberties of that body and of the press were much extended, and the right to hold public political meetings was conceded. In 1869 a responsible ministry was granted.

In 1870 the following proposition was submitted to a plebiscite: "The French nation approves the liberal reforms made in the constitution since 1860, and ratifies the senatorial decree of April 20, 1870." This was opposed by the Republicans, but was carried by a vote of 7,000,000 to 1,500,000. This popular support of the Imperial régime was apparent rather than real. Notwithstanding temporary coalitions, the different parties were still irreconcilable. The autocratic and war party, which had voted in the affirmative on the plebiscite, came again into power in the Corps Législatif, with the Duke of Grammont in charge of foreign affairs. Partly compelled by the diplomacy of Bismarck and partly actuated by their own aims, the ministry brought on the war with Prussia, much against the will of the Emperor. (See FRANCO-GERMAN WAR.) The Emperor went to the front, leaving the Empress as Regent, and she constituted a ministry of the war party under General Palikao. Napoleon was captured at Sedan (Sept. 2, 1870), and on the 4th of September was taken to the castle of Wilhelmshöhe, near Cassel. In the wild confusion that attended the news of defeat in Paris and the declaration of the Republic, the Empress fled from the city and went to England, taking up her residence at Chiselhurst, Kent, where she was joined by Napoleon in 1871, after the conclusion of peace. He resided there until his death, Jan. 9, 1873.

Napoleon and Eugénie had one child, a son, Eugène Louis Jean Joseph, Prince Imperial of France, born March 16, 1856. See NAPOLEON, EUGÈNE LOUIS JEAN JOSEPH.

Bibliography. A collection of Napoleon's own works was published in five volumes (Paris, 1869). Many of them, including the *History of Julius Cæsar* and *Napoleonic Ideas*, have been translated into English. The *Posthumous Works and Unpublished Autographs of Napoleon III in Exile* were edited by De la Chapelle and published in 1873. The leading comprehensive histories of the Second Empire are: De la Gorce, *Histoire du second empire* (4 vols., Paris, 1885–98), which partially supersedes the earlier work by Taxile Delord, *Histoire du second empire* (6 vols., ib., 1869–76). Consult also Bernhard Simson, *Ueber die Beziehungen Napoleons III. zu Preussen und Deutschland* (Freiburg, 1882); Adolf Ebeling, *Napoleon III. und sein Hof* (Cologne, 1891–94); Thirria, *Napoléon III avant l'empire* (Paris, 1895); E. Ollivier, *L'Empire libéral* (ib., 1895–1909); A. L. Imbert de Saint-Amand, *Louis Napoléon and Mademoiselle de Montijo* (Eng. trans., New York, 1897); id., *Napoleon III and his Court* (Eng. trans., ib., 1898); id., *The Court of the Second Empire* (Eng. trans., ib., 1898); W. R. Thayer, in *Throne-Makers* (Boston, 1899); A. L. Imbert de Saint-Amand, *Napoleon III at the Height of his Power* (New York, 1900); T. W. Evans, *Memoirs of the Second French Empire* (ib., 1905); André Lebey, *Les trois coups d'état de Louis Napoléon Bonaparte* (Paris, 1906); Karl Marx, *Eighteenth Brumaire of Louis Bonaparte* (Eng. trans., Chicago, 1907); Sir Spencer Walpole, in *Studies in Biography* (New York, 1907); Charles Woeste, *Le règne de Napoléon III* (Paris, 1907); André Lebey, *Louis Napoléon Bonaparte et la révolution de 1848* (2 vols., ib., 1907–08); F. A. Simpson, *Rise of Louis Napoleon* (New York, 1909); Pierre Gérard, *Napoléon III devant l'histoire* (Paris, 1909); Victor Hugo, *History of a Crime* (Eng. trans., 2 vols., New York, 1909); id., *Napoleon the Little* (Eng. trans., ib., 1909); Ernest Barthez, *Empress Eugenie and her Circle* (ib., 1913); also *Cambridge Modern History*, vol. x (ib., 1907), which contains a bibliography.

NAPOLEON, EUGÈNE LOUIS JEAN JOSEPH (1856–79). The only son of Napoleon III of France; better known as the Prince Imperial. He was born in the Tuileries in Paris, March 16, 1856. At the outbreak of the Franco-German War of 1870–71 he accompanied his father to the front and was first under fire at Saarbrücken. When the war began to go against the Imperial arms, however, he was sent to England, where he joined his mother after her flight from Paris. From 1872 to 1875 he attended the artillery school at Woolwich. Upon the death of his father he took the title of Count of Pierrefonds. In 1874 he reached his majority and was proclaimed as Napoleon IV by his adherents. Five years later he joined a British expedition against the Zulus, and while reconnoitring was ambushed and killed (June 1, 1879). He was buried beside his father at Farnborough, England. Consult: Ellen Barlee, *Life of Napoleon, Prince Imperial of France* (London, 1889); M. d'Hérisson, *Le prince impérial* (Paris, 1890); André Martinet, *Le prince impérial* (ib., 1895); R. Minon, *Les derniers jours du prince impérial sur le continent* (ib., 1900); Ernest Barthez, *Empress Eugenie and her Circle* (New York, 1913).

NAPOLEON, JOSEPH CHARLES PAUL, PRINCE (1822–91). A son of Jerome Bonaparte. See BONAPARTE.

NAPOLEON GUN. See ARTILLERY.

NAPOLÉON LE PETIT, *le pe-tē* (Fr., Napoleon the Little). A violent satirical attack on Louis Napoleon by Victor Hugo, written at Brussels in 1852.

NAPOLEON'S TOMB. The magnificent burial place of Napoleon Bonaparte is under the dome of the Invalides, Paris. It was constructed by Visconti and has the form of a circular crypt 20 feet deep and 36 in diameter, open at the top. On the granite walls are 10 marble reliefs by Simart. The mosaic pavement, representing a laurel wreath, bears the names of various battles. In the middle rises the red porphyry sarcophagus, 13 feet long, 6½ wide, and 14½ high, cut from a single block weighing 67 tons, surrounded by 12 victories by Pradier. Above the entrance to the crypt is a sentence from Napoleon's will: "I desire that my ashes shall rest on the banks of the Seine, in the midst of the French people that I have loved so well." On one side is the sarcophagus of the Emperor's friend Duroc, who fell at Bautzen in 1813, on the other that of his faithful companion Bertrand, who shared his captivity. Napoleon's remains were brought from St. Helena to their present burial place by the Prince de Joinville in 1840.

NAPOLÉON-VENDÉE, vän'dā'. A former name of Roche-sur-Yon (q.v.), a town in France.

NAPRAVNIK, nä-präv'nĕk, EDWARD FRANZEVICH (1839–). A Bohemian pianist, conductor, and composer. He was born at Bejšt, near Königgrätz, and studied at the Prague Organ School in 1853–54. He became an instructor in the Maydl Institute for Music at Prague in 1856, and in 1861–63 he directed Prince Yussupoff's private orchestra at St. Petersburg (now Petrograd). In the latter year he was appointed organist of the Imperial Russian Opera, of which he became second conductor in 1867 and chief conductor in 1869. His operatic productions include: *The Inhabitants of Nizhni Novgorod* (1868); *Harold* (1886); *Dubroffsky* (1895); *Francesca da Rimini* (1903). He composed also the overture *Vlasta* (1861); the symphonic poem, *The Demon* (1879); other orchestral selections; and Bohemian and Russian songs.

NAQUET, nà'kā', ALFRED JOSEPH (1834–). A French politician and social reformer, born at Carpentras, Vaucluse. In 1863 he became professor in the medical faculty at Paris and later in the same year professor of chemistry at Palermo, Italy. Returning to France in 1865, he was sent to prison for 15 months in 1867 for his membership in a secret society. Upon the publication of his book, *Religion, propriété, famille* (1869), he was compelled to flee to Spain, but he returned to participate in the revolution of 1870. In 1871 he was elected a deputy for Vaucluse in the National Assembly, where he joined the party of the Extreme Left. He was reëlected in 1876 and 1881, served as a Senator in 1882–89, and was a deputy for Paris in 1890–98. He began his agitation for a divorce law in 1876 in the Chamber of Deputies, and finally secured its adoption in the Senate in 1884. Naquet is author of *Principes de chimie fondés sur les théories modernes* (1865; 5th ed., 1890; Eng. trans., 1868); *La république radicale* (1873); *Le divorce* (1877; 2d ed., 1881); *Questions constitutionnelles* (1883); *Socialisme collectiviste et socialisme libéral* (1890; Eng. trans., *Collectivism and Socialism of the Liberal School*, 1895); *Temps futurs* (1900); *L'Humanité et la patrie* (1901); *La loi du divorce* (1903); *L'Anarchie et la collectivisme* (1904); *Désarmement ou alliance anglaise* (1908).

NARA, nä'rà. The capital of a prefecture of the same name on the island of Hondo, Japan, situated 25 miles by rail southeast of Osaka (Map: Japan, D 6). It was the capital of Japan from 709 to 784. The most interesting temples are the Kasuga, situated in a magnificent park; the Todai-ji with its huge bell, over 13 feet high and more than 9 feet in diameter, and the gigantic statue of Buddha, over 53 feet high; and the Kokubu-ji with the modern statues of Brahma and Indra. Of great archæological value is the storehouse in which specimens of articles used in the Imperial household for over a thousand years have been preserved. The local museum is also of considerable archæological interest. The principal manufactures of Nara are India ink, fans, and modern toys. Pop., 1898, 30,539; 1908, 32,732.

NARAKA, nä'rà-kà (Skt., hell). The hell of the Hindus. The doctrine of a place for the bad, though not necessarily a place of torment, is as old as the Veda. This region was one of bottomless darkness beneath the earth. The faith of the Brahmanic period and of the Upanishads had the same belief, and the descriptions of hell torments became fully developed later. Manu enumerates 21 hells and gives a general description of the tortures which await the impious there. The Puranas, however, are more systematic. The Vishnu-Purana, e.g., not only names 28 such hells, but distinctly assigns each of them to a particular class of sinners. Consult Lucian Scherman, *Materialien zur Geschichte der indischen Visionslitteratur* (Leipzig, 1892), and E. W. Hopkins, *Religions of India* (Boston, 1895).

NARAM SIN ('beloved of Sin'). A Babylonian king of the dynasty of Akkad. He was long supposed to be the son of Sargon I, the founder of the dynasty; but a close study of the list of kings published by Scheil in 1911 tends to render it probable that he was the son of Sharganisharri, or Sargon II, the fourth king of the dynasty, who was apparently often confused with Sargon I. Though Sargon I, Manishtusu, and Rimush are called "kings of Kish," it is held by many scholars that they were the first three rulers of the dynasty of Akkad. Naram Sin fought with Magan in east Arabia, and with the Lulubians. He ruled at Susa, as an Elamitish inscription shows. A statue of this King has been found north of Diarbekr. It is possible that he made a raid on Cyprus. His features are purely Semitic. According to Nabunaid, he reigned 3200 years before his time, i.e., c.3750 B.C. Some scholars have doubted the accuracy of this statement, assuming either a textual error for 2200, a calculation based on the precession of the equinoxes, each degree being reckoned at 100 years instead of 72, or a fancy of the ancient chronologists. In view of the long lists of kings for these remote periods, with altogether probable regnal years attached, it would seem most methodical to accept tentatively the date assigned by Nabunaid's scribes. See BABYLONIA. Consult: Scheil, in *Comtes rendus de l'Académie des Inscriptions et Belles Lettres*, pp. 606 ff. (Paris, 1911); Poebel, in *Orientalische Literaturzeitung*, xv, 481 ff. (Leipzig, 1912); Ed. Meyer, *Geschichte des Altertums*, i, 2 (3d ed., Stuttgart, 1913).

NARANJO, nà-rän'hō. A ruined city of the Maya Indians in the Peten region of Guatemala, not far from the boundary of British Honduras. Over 30 monoliths bearing sculptured figures and dates are found at this site. None of the structures has been excavated, but enormous pyramids arranged around courts served as foundations for a great series of religious and civil buildings. The dated monuments furnish important evidence on ancient Mayan history. The city flourished about 500 A.D. Consult: T. Maler, "Explorations in the Department of Peten, Guatemala," in *Memoirs of the Peabody Museum of American Archæology and Ethnology*, vol. iv (Cambridge, 1908); S. G. Morley, "The Inscriptions at Naranjo, Northern Guatemala," in *American Anthropologist*, vol. xi (Washington, 1909); H. J. Spinden, "Maya Art," in *Memoirs of the Peabody Museum of American Archæology and Ethnology*, vol. vi (Cambridge, 1913).

NARAOIA, năr'ā-oi'ā. One of the remarkable genera of fossil branchiopod crustaceans recently discovered by Walcott in the Middle Cambrian shale (Stephen formation) of British Columbia. It has two nearly equal carapaces, the one covering the cephalic and the other the

thoracic region, and a large number of legs. See STEPHEN FORMATION.

NARBADA, nŭr-bŭd'â. A river of India. See NERBUDDA.

NARBO. See NARBONNE.

NARBONNE, när'bŭn' (Lat. *Narbo*). A town in the Department of Aude in south France, situated 6 miles from the Mediterranean and 37 miles east of Carcassonne (Map: France, S., H 5). The town is divided into old and new quarters by the Robine Canal. The streets of the former present a poor appearance. The church of St. Just was in olden times the cathedral. It is an imposing though uncompleted structure, begun in the thirteenth century, and exhibiting many of the most daring ideas of the Gothic. The Gothic hôtel de ville is a creation of Viollet-le-Duc. It houses the Narbonne Museum with paintings and ceramics. Narbonne has a hydrographical school, a seminary, a college, and a public library of 15,000 volumes. Its industries include coopering and distilling establishments. It produces verdigris, candles, tiles, pottery, dyes, hoops, mosaic work, tools, and leather. It deals in wine, grain, honey, oil, salt, and sulphur. Its honey is famous, and its red wine is peculiar to the district. It has a chamber of agriculture and an œnological station, the latter established in 1894. The town is on a branch of the important Canal du Midi. About 11 miles to the south is the port La Nouvelle, at the end of the Narbonne Canal. It is the harbor for Narbonne and has some manufactories. Pop., 1901, 28,852; 1911, 28,173. Narbo became Roman in 116 B.C. It was at the time one of the leading ports of the Mediterranean, and well known for its beauty and attractions as a city. *Narbo Martius,* as it was called, was the capital of the Provincia Romana and later of Gallia Narbonensis. In 413 it passed under the sway of the Visigoths, and about 720 it fell into the hands of the Saracens, from whom it passed into the possession of the Franks in 759. The viscounts of Narbonne became hereditary feudatories of the French crown in 1080. In 1447 Viscount William III sold Narbonne to the house of Foix, and in 1507 the fief was united with the French crown. Late in the Middle Ages the harbor of Narbonne became practically filled up and the town began to decline.

NARBROUGH, när'brŭ, SIR JOHN (1640–88). An English admiral and explorer. In 1670 he made a notable voyage through the Strait of Magellan and up the Chilean coast. He greatly distinguished himself at the battle of Solebay in 1672, and was knighted by King Charles II and made rear admiral in 1673. The following year he sailed in command of a squadron to the Mediterranean, where he distinguished himself by scattering the pirates of Tripoli and Algiers. In 1680–87 he was commissioner of the navy, and in the latter year sailed to the West Indies in command of a squadron, and died there of fever while superintending the investigation of a sunken treasure ship. He was buried at sea off Santo Domingo.

NARCEINE, när'sē-ĭn. See ALKALOIDS.

NARCIS'SUS (Lat., from Gk. Νάρκισσος, *Narkissos,* from νάρκη, *narkē,* torpor. The flower has narcotic properties). According to Ovid, *Metamorphoses,* iii, 341–510, the son of the river god Cephissus and of the nymph Liriope of Thespiæ in Bœotia. He was a youth of extraordinary beauty, but refused all suitors, including Echo (q.v.). They prayed to Nemesis for vengeance, and she caused Narcissus to see his own image in a forest spring. Enamored of this, he pined away in hopeless love beside the stream. From his body sprang the flower narcissus, which for a little while is mirrored in the waters and then fades. The story, which seems to be of Alexandrian origin, is told with variations by other late Greek and Roman writers; it is a counterpart to the stories of Adonis (q.v.), Linus (q.v.), and Hyacinthus (q.v.). Consult C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911). The bronze statuette in Naples, commonly called Narcissus, really represents the youthful Dionysus.

NARCISSUS. A genus of beautiful bulbous plants of the family Amaryllidaceæ, with narrow leaves and usually white or yellow flowers. The species are natives of southern Europe, northern Africa, and the temperate parts of Asia. Many are cultivated in gardens for the sake of their beautiful and often fragrant flowers, which in general appear early in the season. Some of them are known by the names of daffodil and jonquil. The different species

NARCISSUS.

a, poet's narcissus (*Narcissus poeticus*); *b,* jonquil (*Narcissus jonquilla*); *c,* trumpet daffodil (*Narcissus pseudonarcissus*).

are naturally separated into two divisions—those bearing but one flower on a scape and those bearing more than one. The poet's narcissus (*Narcissus poeticus*) is perhaps the best known and most popular species. It is a hardy plant and bears white fragrant flowers. The jonquil (*Narcissus jonquilla*) bears from two to five very fragrant golden-yellow blossoms on a scape. This species is employed in the manufacture of perfumes. *Narcissus tazetta* is the narcissus of the ancient Greeks and Romans and is now largely grown as a forcing-house plant. There are numerous varieties of this species with white, yellow, single and double flowers. *Narcissus pseudo-narcissus* is com-

monly called daffodil or trumpet daffodil. The plants are ordinarily propagated by offset bulbs which are produced on the bulb. These usually flower the second year after planting. See JONQUIL; Colored Plate of AMARYLLIDACEÆ; and cut in article CORONA.

NARCOT'ICS (Gk. *ναρκοτικός, narkotikos*, benumbing, from *ναρκοῦν, narkoun*, to benumb, from *νάρκη, narkē*, torpor; connected with OHG. *snerhan*, to draw together, AS. *snear*, Eng. *snare*). Remedies which, in moderate doses, lessen the action of the nervous system. Their full operation is sleep or coma. Opium (q.v.) is the type from which most descriptions of this class of medicines have been drawn; but, although most narcotics more or less resemble opium in their action, almost every one presents some peculiarity in the way in which it affects the system. These medicines are primarily stimulating, especially when given in small or moderate doses; but this stage of their action is comparatively short, and when the dose is large the excitement is scarcely perceptible. Their power of inducing sleep has procured for them the names of hypnotics and soporifics; while many of them are termed anodynes, from their possessing the property of alleviating pain. Next to opium and the general anæsthetics, hyoscyamus, Indian hemp, and chloral may be regarded as the most important narcotics. Cocaine should also be included in the list of narcotics. Of late years a number of coal-tar derivatives have been introduced, such as sulphonal, trional, and veronal, which are taking the place, to some extent, of the older remedies.

It has been already mentioned that there are differences in the mode of operation of the different members of this class. Alcohol, e.g., in sufficient doses produces intoxication; belladonna, delirium; opium contracts the pupil of the eye; hyoscyamus dilates it. Each drug affects the organism in its own peculiar way, and a description of its special qualities will be found in the article devoted to it.

Narcotics are usually administered with the view either of inducing sleep or of alleviating pain or spasm. As, however, their action is much modified by a variety of circumstances—such as age, idiosyncrasy, and prolonged use—they should be administered with extreme caution and only under competent advice. But the effects produced by these narcotics have become so generally known that many persons have availed themselves of these drugs, especially morphine and codeine, heroin, and cocaine. The use became so widespread that severe laws, Federal as well as State, were passed, preventing the indiscriminate sale and use of these drugs. Forty-nine political divisions have some form of cocaine legislation, and 37 have laws restricting the use and sale of opium and its derivatives. (Consult *Efforts to Curb the Misuse of Narcotic Drugs*, reprint No. 267 from the Public Health Reports, Washington, 1915.) The various quack medicines for children which are known as *carminatives, soothing syrups*, etc., contain some form of opium, and formerly were a fertile cause of the great mortality that occurs in early life, especially among the poorer classes; but stringent laws have largely eliminated this evil.

NAR'COTINE, $C_{22}H_{23}NO_7$. One of the organic bases or alkaloids occurring in opium, in which it usually exists in the proportion of 6 to 8 per cent. It is nearly insoluble in water and sparingly soluble in alcohol and ether, but dissolves readily in chloroform. Its solutions turn the plane of polarized light to the left; the solutions of its salts (in the presence of free acids) have the opposite effect. Narcotine possesses very slight alkaline properties; its salts do not readily crystallize and are even more bitter than those of morphine, although the substance itself is almost tasteless. See ALKALOIDS.

NARD. A fragrant plant. See SPIKENARD.

NARDINI, när-dē'nē, PIETRO (1722–93). An Italian composer and violinist, born at Fibiana (Tuscany). He was a pupil of Tartini (q.v.) and from 1753 to 1767 was solo violinist of the court chapel at Stuttgart. From 1770 till his death he occupied the position of court conductor at Florence. He was famous for the absolute purity of his intonation and a beautiful singing tone. His compositions consist of six concertos for violin, six violin sonatas, six string quartets, six flute trios.

NARDÒ, när-dō' (Lat. *Neretum*). An episcopal town in the Province of Lecce, Italy, 34 miles south of Brindisi (Map: Italy, F 4). It has a cathedral, an ancient castle, and old walls, and manufactures woolen goods and tobacco. The surrounding country abounds in olive plantations and vineyards. Pop. (commune), 1901, 14,387; 1911, 16,567.

NAR'DUS (Lat., nard, from Gk. *νάρδος*, from Pers. *nard*, from Skt. *nalada*, Indian spikenard). A genus of one species of grass (*Nardus stricta*), often called matgrass, a purplish perennial growing in tufts characteristic of dry elevated situations in Europe, Australia, etc. It has little or no feeding value.

NARES, nârz, SIR GEORGE STRONG (1831–1915). A British Arctic explorer, born at Danestown, Scotland. He entered the navy in 1846 and went on the *Resolute* in the Arctic expedition of 1852. In 1872–74 he commanded the famous *Challenger* expedition, engaged in deep-sea exploration. In 1875, in command of the *Alert* and *Discovery*, he set out on a polar expedition, and proceeding up Smith Sound he reached with the *Alert* the parallel of 82° 27′, the farthest north any ship had then gone. Markham, his lieutenant, went on sledges in 1876 as far as 83° 20′, another record at the time. Another lieutenant, Aldrich, extended the coasts of Grinnell Land 220 miles to the west, while Beaumont reached St. George Fiord in Greenland and sighted Cape Britannia. An outbreak of scurvy obliged the return of the expedition in 1876. In this year Nares was made K.C.B. In 1878 Nares surveyed Magellan Strait and parts of the Pacific. He served as professional officer of the Board of Trade (1879–96), during this period being made vice admiral (1892), and in 1902 became acting conservator of the river Mersey. He wrote: *Reports on Ocean Soundings and Temperature* (1874–75); *Official Report of the Arctic Expedition* (1876); *Narrative of a Voyage to the Polar Sea* (1878). Consult *Arctic Expedition, 1875–76: Report of the Committee of Enquiry* (London, 1877).

NARES, ROBERT (1753–1829). An English philologist, born at York. After studying at Christ Church, Oxford, he took orders, and from 1798 until his death was canon of Lichfield. As critic, essayist, and theologian he held a high rank among the writers of his time. With the Rev. William Beloe he founded the *British Critic* in 1793. Among his many publications should

be mentioned: *Elements of Orthoëpy* (1784); *Chronological View of the Prophecies Relating to the Christian Church* (1805); *A Glossary of Words, Phrases, Names, and Allusions . . . in the Works of English Authors* (1822), which is by far his most important work.

NAREW, nä′rĕf. A river of west Russia, rising in the Government of Grodno. It flows westward, forming part of the boundary of Poland, and joins the Bug 19 miles north of Warsaw. Its length is 271 miles, 212 of which are navigable. The Augustowo Canal connects it with the Niemen.

NARIÑO, nä-rē′nyō. A maritime department of Colombia, located in the southwestern part of the country. It is bounded by the Department of Cauca on the north, the Intendency of Caqueta on the east, Ecuador on the south and west, and the Pacific Ocean on the west. The department was established in 1904 and has an area of 11,580 square miles. It is composed of three nearly equal regions—the western, between the Pacific and the Western Cordillera; the central, between the Western and Central Cordilleras; and the eastern, east of the Central Cordillera. The western region is arid and uncultivated and is inhabited by whites and negroes. The central region is fertile, producing sugar cane, cacao, rice, potatoes, corn, wheat, and barley. Two-thirds of the inhabitants are white and the remainder Indians. The eastern region is undeveloped, and is inhabited mainly by natives, many of whom are uncivilized. Agriculture and stock raising are the chief occupations. Gold mining is carried on, especially in the west. There are manufactures of Panama hats and of shoes. The department has 510 miles of railway and numerous good highways. Pop., 1912, 292,535. Capital, Pasto (q.v.). A large portion of the territory assigned to this department by Colombia is still in dispute with Ecuador.

NARIÑO, Antonio (1765–1823). A Colombian politician, born in Bogotá. In 1795 he translated and published *The Rights of Man,* for which he was arrested and deported to Spain. He escaped to France and England, where he came in contact with Sá de Miranda (q.v.), returning to New Granada in 1797. During the revolutionary movement he advocated a centralized government and was named Dictator by Congress in 1811. He struggled against the Federalists, but was defeated by Congress, which had espoused this cause. Nariño thereupon resigned, but was reinstated by the citizens of the capital and was again proclaimed Dictator (September, 1812). Civil war broke out, Nariño was defeated, and then came to terms with Congress in order to repel the forces of the new Viceroy, Marshal Montalvo (1813). Having resigned the dictatorship, he was placed in command of the Patriot army. Successful at first, he met reverses, his army was scattered, and he was taken prisoner and sent in irons to Spain (1814).

NARNI, när′nē. An episcopal town in the Province of Perugia, Italy, on the Nera, 1180 feet above the sea and 45 miles north of Rome (Map: Italy, D 3). Ruins of a massive marble bridge built by Augustus and of a very ancient aqueduct are still to be seen. Narni has been the seat of a bishopric since 360; its cathedral of St. Juvenalis dates from the thirteenth century. Other buildings include old churches dating from the ninth to the fifteenth century, the castle, now used as a prison, old houses, and the town hall with a finely sculptured façade. Calcium, leather, rubber, and olive oil are produced. Narni, the ancient Nequinum, was colonized by the Romans about 300 B.C. The Emperor Nerva was born here. Pop. (commune), 1901, 12,725; 1911, 12,943.

NARO, nä′rō. A town in the Province of Girgenti, Sicily, situated at an altitude of 1945 feet above the river Naro, 12 miles east of Girgenti (Map: Italy, D 6). It has a sixteenth-century castle of the Chiaramonti and remains of catacombs, grottoes, aqueducts, and other antiquities. There are large sulphur pits near by. Pop. (commune), 1901, 12,866; 1911, 13,802.

NAR′RAGAN′SET. A former leading Algonquian tribe of New England, occupying most of the territory along the western shore of the bay of the same name, in Rhode Island, and claiming dominion over several smaller tribes of the interior and the islands, including Long Island. They befriended Roger Williams, and through his influence refused to join in the Pequot War. In King Philip's War the Narraganset took a leading part under their chief Canonicus. In the celebrated "Swamp Fight" they lost nearly 1000 in killed and prisoners. Canonicus himself was killed soon afterward. Those who surrendered at the close of the war were settled among their former tributaries, the Niantic (q.v.), the whole body thenceforth being known as Narraganset. There were but 16 individuals in 1910. See Mohegan.

NARRAGANSETT BAY. An inlet of the Atlantic Ocean, extending into Rhode Island (Map: Rhode Island, C 3). It is about 26 miles long, from its entrance to its north extremity (the mouth of the Providence River), and about 4½ miles wide at its mouth, while its maximum width is about 8 miles. It receives the waters of several small rivers, such as the Taunton, and the Pawtuxet, and contains a number of islands, of which Rhode Island (q.v.), Prudence, and Conanicut (q.v.) are the largest. At the head of the bay lies the city of Providence, and Newport is situated near its entrance, on the east shore. Consult E. M. Bacon, *Narragansett Bay* (New York, 1904).

NARRAGANSETT PIER. A noted watering place in Washington Co., R. I., 9 miles from Kingston Station, where a branch line connects with the New York, New Haven, and Hartford Railroad (Map: Rhode Island, C 4). It is delightfully situated near the mouth of Narragansett Bay and has a fine beach and splendid drives. Among other attractions of the resort are its scenery, Narragansett Heights in particular commanding an extended view, and the beautifully colored rocks in the vicinity, which are picturesque also in form. There are a number of handsome summer residences and many hotels. Pop. (Narragansett District), 1900, 1523; 1910, 1250. The first settler came to this neighborhood about 1675, and in 1815 the pier from which the place takes its name was built. It was not until after 1876, when a railroad was completed to this point, that "the Pier" became a favorite summer resort. Near by, in December, 1675, General Winslow, at the head of 1000 colonists, defeated the Narraganset Indians, of whom 300 were killed and about 600 captured, while the whites lost 80 killed and 150 wounded.

NARRENSCHIFF, när'ren-shĭf, Das (Ger., The Ship of Fools). The most celebrated work of Sebastian Brant (q.v.).

NARSES, när'sēz (c.477–c.572). A celebrated eunuch statesman and general of the Byzantine Empire. He was an Armenian by birth and may have been sold as a slave in childhood. He rose by successive steps to the post of grand chamberlain to the Emperor Justinian. In 532 he aided in suppressing the Nika riot. In 538 he was sent to Italy to act in concert with Belisarius (q.v.) in the war against the Goths. After gaining some successes Narses came into conflict with Belisarius and was recalled to Constantinople in 539. After Belisarius had been recalled Narses was appointed, in 551, to the chief command in Italy. Near Tagina in 552, after a desperate engagement, the Goths were totally defeated and their King, Totila, slain. In the following year Teja (q.v.) was defeated near Sorrento. Narses took possession of Rome, and completely extinguished the Gothic power in Italy. He was appointed prefect of Italy in 554. He fixed his court at Ravenna, and continued till the death of Justinian in 565 to administer the affairs of Italy with vigor and ability. The only blot on the character of his administration is the avarice with which he is charged by his contemporaries. His exactions pressed heavily on the exhausted resources of the population, though their severity may be in some degree palliated by the splendor and utility of the public works on which he partly expended the public revenues. The Romans, on the accession of Justin, complained of the exactions of Narses, and he was recalled. He is accused of intriguing with Alboin, King of the Lombards, to incite an invasion of Italy. This account is improbable, and is not mentioned by any contemporary. Consult: J. B. Bury, *Later Roman Empire,* vol. i (New York, 1889); Thomas Hodgkin, *Italy and her Invaders,* vols. iv, v (Oxford, 1885, 1895); Edward Gibbon, *Decline and Fall of the Roman Empire,* edited by J. B. Bury, vols. iv, v (London, 1898); *Cambridge Medieval History,* vol. ii (New York, 1913). See Goths; Justinian.

NAR'THEX (Lat., from Gk. *νάρθηξ, narthēx,* casket, a sort of tall, hollow-stalked, pithy, umbelliferous plant). A vestibule to a basilica or church, usually extending across the entrance end, either just inside or outside the entrance and façade. The term is used especially of Early Christian and Byzantine architecture, the corresponding part in the West being usually called portico or porch. There were sometimes an *inner* narthex, forming an integral portion of the interior, within the main façade, and an *outer* narthex, attached to the outside of the façade, or with a separate façade. The outer narthex sometimes formed one of the arcades surrounding the atrium. See Atrium; Basilica; Church.

NARUSZEWICZ, nä'rōō-shā'vĭch, Adam Stanislaw (1733–96). A Polish historian and poet, born at Pinsk, Lithuania. He joined the Jesuits in 1748 and was sent by them to France to complete his education. On his return he became professor of Latin at the Vilna Academy. A second journey through France, Germany, and Italy secured for him the directorship of the Collegium Nobilium at Warsaw. Prince Czartoryski introduced him to King Stanislas Augustus, and the two became inseparable. After the suppression of the Jesuit Order he became Bishop, first of Smolensk and then of Lutsk. He died at Janow, Galicia. His chief work, *History of the Polish Nation* (6 vols., 1780–86; new ed., 1859–60), was the first scientific treatise of its kind. It is the result of a critical collation of original documents in the Polish and foreign archives, and deals with the period previous to 1386. A firm believer in the monarchical form of government, he aimed in his history to warn his countrymen against their narrow-minded egotism and the lawlessness and arbitrariness of the nobility. These ideas are forcefully expressed in a poem published in pamphlet form, *Voices of the Dead.* He also wrote a *Life of Chodkiewicz* (q.v.). (1781) and a *History of the Crimea* (1787). The *Idylls* (highly sentimental and declamatory) and *Satires* are the best known of his poetic productions, collected as *Lyrica* (Warsaw, 1778 and repeatedly).

NARVA, när'vȧ. A town, formerly an Esthonian fortress, in the Government of St. Petersburg, Russia, situated on the left bank of the river Naróva, about 100 miles west-southwest of St. Petersburg (Map: Russia, C 3). The town has several Lutheran and Greek churches. The cathedral contains a fine collection of crosses and crucifixes. Narva has a seventeenth-century town hall, an old castle, two Gymnasia, a theatre, and a number of technical schools attached to the extensive cotton and woolen mills in the vicinity. There is a considerable trade in cotton and lumber. Pop., 1897, 16,577; 1911, 21,478, Germans, Esths, and Russians. The town was founded by the Danes in the thirteenth century, and, after being held for a short time by the Russians, passed to Sweden in 1581. Here, on Nov. 30, 1700, an army of about 40,000 Russians under Peter the Great was completely defeated by some 8000 Swedes under Charles XII. In 1704 Peter the Great made himself master of the town.

NARVACÁN, när'vȧ-kän'. A town of north Luzon, Philippines, in the Province of Ilocos Sur (Map: Philippine Islands, C 2). It is situated on the main road, a short distance from the coast and about 13 miles southeast of Vigan. Pop., 1903, 19,575.

NARVÁEZ, när-vä'âth, Pánfilo de (c.1480–1528). A Spanish soldier and conquistador. He was born in Valladolid, came to America about 1498, and became lieutenant to the Governor of Cuba, Velazquez. In 1520 Narváez was sent with a body of soldiers to reduce Cortés, then in Mexico, to submission. Landing at San Juan de Ulúa, he was surprised one dark night (May, 1520) and seized in his camp by a party under Cortés himself, who then persuaded the soldiers to join in the conquest of Mexico. After about two years of imprisonment at Vera Cruz, Narváez was permitted to return to Spain. There he secured permission to conquer and govern the territory from Florida to the Río de Palmas (Pánuco River). He sailed from San Lucar, June 17, 1527, with a fleet carrying 600 colonists and soldiers, priests, and negro slaves, with a few women. Stopping at Santo Domingo for horses and supplies, about a quarter of his men deserted in order to join in the exodus towards Mexico and Peru. Thence he went to Santiago de Cuba, where he passed the winter, and on Feb. 20, 1528, he set sail for Florida. On April 14 he anchored near a bay, which he named Bahía de la Cruz (variously identified with Clearwater Bay, Tampa

Bay, and Appalachee Bay). On account of the poor condition of the country Narváez, with 300 men, set out May 1 to march through the country, while the vessels were to follow the shore as far as the harbor of Pánuco. Hopelessly misled by Indian guides, lost in the tangled morasses, hungry and footsore, helpless against the harrying, pestering attacks of unseen natives, the Spaniards struggled along across the country and finally reached a little harbor on Appalachee Bay, which Narváez named Bahía de Caballos. Here from scanty materials they constructed five rude boats, in which the 242 survivors embarked on September 22 to follow the coast westward. When passing the Mississippi the boats were driven to sea by the current and two of them were lost. A storm arose and Narváez disappeared. The survivors of the two remaining boats were cast ashore on an island outside Matagorda Bay (November 6). For the fate of the survivors, see NÚÑEZ CABEZA DE VACA, ALVAR. Consult: J. G. Shea, *The Catholic Church in the United States* (2 vols., New York, 1890–92); Woodbury Lowery, *Spanish Settlements within the Present Limits of the United States, 1513–1561* (ib., 1901); E. G. Bourne, *Spain in America* (ib., 1907); Alvar Núñez Cabeza de Vaca, "Relación," in J. F. Jameson (ed.), *Original Narratives of Early American History*, vol. ii (ib., 1907).

NARVÁEZ, RAMÓN MARÍA, DUKE OF VALENCIA (1800–68). A Spanish general and statesman, born at Loja in Andalusia. In early youth he fought in the war of liberation against the French and in 1822 acted with the Liberals and contributed to the suppression of the revolt in the Royal Guards. He withdrew to Loja in 1823 upon the triumph of the Reactionary party, and lived there in retirement until the death of Ferdinand VII in 1833. He was engaged in the Basque Provinces in 1834, then commanded a division under Espartero, and in November, 1836, routed the Carlist leader, Gómez, near Arcos. In 1838 he cleared the District of La Mancha of brigands, and was appointed, in 1840, captain general of Old Castile and general in chief of the army of reserve. He took part in the insurrection against Espartero that broke out at Seville in 1840, but was compelled to flee to France. He succeeded in 1843 in bringing about the overthrow of the government of Espartero, and was made President of the Council and field marshal, and was created a grandee of Spain of the first class and Duke of Valencia in 1845. He entered upon a thoroughly reactionary policy and revised the Liberal constitution of 1837. Petty insurrections broke out, which the rigorous soldier-statesman repressed with an iron hand. But his dictatorial manners alienated even his personal friends, and his ministry was overthrown (Feb. 10, 1846). After serving as special Ambassador at the French court he returned to power in 1847, but soon afterward quarreled with Queen Christina, and retired from office in 1851. In 1856, on the overthrow of the O'Donnell ministry, he again became President of the Council. Intrigues of the court compelled his resignation in 1857. Once more in power in 1864, he was succeeded in the following year by O'Donnell, with whom he suppressed, in 1866, a military revolt in Madrid. He supplanted O'Donnell in the same year, and, despite the efforts of O'Donnell and Prim, retained power until his death, April 23, 1868. Consult: Mazade, *Les révolutions d'Espagne* (Paris, 1869); Prosper Mérimée, *Lettres à Panizzi* (ib., 1881); Hermann Baumgarten, *Geschichte Spaniens von Anspruch der französischen Revolution bis auf unsere Tage* (Leipzig, 1865–71); Antonio Pirala, *Historia contemporánea* (Madrid, 1871–79).

NARVIK, när'vīk. A town on the west coast of Norway, at the inner end of Ofotfjord, surrounded by beautiful woods and lofty mountains, with a large, deep harbor. The town dates from 1892, when it became the western terminal, the most northern railroad terminal in the world, for Luleå Ofoten Railroad, opened 1902 to carry the huge quantities of iron ore from northern Sweden to the Atlantic coast. The export of Swedish iron ore from Narvik, mainly in Swedish ships, was, in 1911, 2,466,415 tons; in 1914, 3,000,000 tons. Through the Ofoten Railroad it has connections with the railroads of Sweden. A Narvik-Tromsö railroad is planned. The town has steamship connections with other coast towns. It exports fresh fish to Sweden, and has schools and newspapers. Pop., 1898, 50; 1910, 4643.

NARWHAL, när'wal (from Swed., Dan. *narhval*, Icel. *nahvalr*, probably from Icel. *nar*, corpse + *hvalr*, whale; so called from the pale

SKULL OF NARWHAL.

The lower jaw has been removed, and the view is of the roof of the mouth, which has been partly cut away to show the deep insertion of the root of the tusk (on the left-hand side) and the abortive tooth on the right-hand side of the upper jaw.

color of the skin). A cetacean of the family Belugidæ, resembling the white whale in form and in the want of a dorsal fin, but remarkably characterized by having no teeth except two in the upper jaw, supposed to be canines, one and occasionally both of which (in the male) develop into spirally twisted straight tusks passing through the upper lip and projecting like horns in front. When, as usually, only one is so produced, it is always the left one. Only one species is known (*Monodon monoceros*), of Arctic seas, where narwhals are often seen in great numbers among the ice fields and in the creeks and bays, always active and playful. A mature narwhal is generally about 15 feet in length, besides the tusk, which is from 6 to 10 feet long. The tusk is hollow nearly to the point, and is spirally grooved. Its use is rather conjectured than known; it is probably a weapon of defense, but it may also be used for breaking thin ice in order to breathe, and for killing fish. The remains of skates and other flatfish have been found in the stomach of a narwhal, and it is not easy to imagine how a toothless animal, with rather small lips, could capture and swallow such prey unless the formidable tusk were first employed. Cephalopod mollusks, however,

are believed to constitute a principal part of the food. The narwhal is pursued by the Eskimo for food and for the sake of its blubber, with which the whole body is invested to the thickness of about 3 inches, weighing nearly half a ton and yielding a large amount of excellent oil. The tusks are also valuable, as they are denser, harder, and whiter than ivory. The kings of Denmark have long possessed a magnificent throne of this material, preserved in the castle of Rosenberg. Great medicinal virtues were formerly ascribed to the tusks. The animal has been called the sea unicorn.

NA'SAL CATARRH. See RHINITIS.

NASAL DISEASE. See NOSE, *Diseases of.*

NASAL INDEX. See INDEX.

NASALS (Fr., Sp., Portug. *nasal*, It. *nasale*, adapted from ML. *nasalis*, of the nose, Lat. *nasus*, nose). A name applied to consonant sounds, such as *m*, *n*, whose quality is affected by the deflection of the breath from the oral to the nasal passages. The voice is made to pass through the nose by relaxation or dropping of the palatal veil that shuts it off from the pharynx. When the nasal sound is uttered with complete closure of the oral passage, it is called a nasal stop or click or mute, or most frequently a nasal merely, such as English *n*, *m*, or *ng*, uttered in the mouth positions of *d*, *b*, *g* respectively. There may be in a language as many such sounds as there are positions of the mute closure. In Sanskrit, e.g., as many as five kinds of nasals have been noted. In English, French, or German, phoneticians distinguish four classes of these sounds: the *back* or *velar* nasal, of which the place of articulation is the middle of the soft palate, except before the front vowels, when it is farther forward, between the soft and hard palate. It is written *ng* or *nk* in English and German; thus, *finger, think; lange, denken.* While in French it is not recognized as an independent sound, there is a palatal nasal formed farther back than the line between the hard and soft palate which is very similar to it; thus, *régner, Cologne.* This is called the *front* or *palatal* nasal. The stoppage of the *teeth* or *dental* nasal is the same as for *d* or *t* in the three languages mentioned. Thus, English *hint, manner;* German *nein, nennen;* French *neuf, bonne.* In French, however, when final and before a consonant, the *n*, together with the preceding vowel, indicates a nasal vowel, i.e., it is uttered in the same position of the mouth organs as a vowel; thus, *un.* These French nasal vowels, of which four are usually indicated (*an, on, in, un*), are distinguished from similar vowels in other languages by the fact that the velum or soft palate is but slightly relaxed during the emission of the sound. The Portuguese nasals, written *ã, ão, ãe, õe, am, em, im, om, um,* are all produced in the position of vowels. Finally, the *lip* or *labial* nasal is uttered in the bilabial position of *b*, *p* in English, German, and French; thus, English *my, summer;* German *mein, kommen;* French *mon, blâmer.* In French again it may have the value of a nasal vowel, as in *emmener.* All of these nasals may be voiceless, especially before a voiceless sound, as in English *length, sneer, lamp.* Nasal semivowels may also be produced in certain positions. The entire utterance may even be rendered more or less nasal by an habitual dropping of the palatal veil. This is noticeable in certain pronunciations of English in America and Spanish in Spain. It is popularly known as the nasal twang. Consult: Jean Rousselot, *Principes de phonétique expérimentale* (2 vols., Paris, 1901–08); K. A. Viëtor, *Elements of Phonetics, English, French, and German,* translated by Rippmann (London, 1910); Walter Rippmann, *The Sounds of Spoken English* (ib., 1910); Roudet, *Eléments de phonétique générale* (Paris, 1910); P. E. Passy, *Les sons du français* (ib., 1913). See MUTES.

NAS'ARÆ'ANS. According to Epiphanius, a Jewish sect, living in Galaaditis, Basinitis, and the region beyond the Jordan, which existed before Christ and did not know Christ. It has been supposed by some scholars that Epiphanius either himself assumed a distinction between these sectaries and the Nazaræans (q.v.) which in reality did not exist or that he misunderstood a passage in Apollinaris of Laodicea. But there seems to be no convincing reason for thinking of a confusion on the part of Epiphanius. The recent discovery of the Jewish sect of the Covenanters of Damascus (see ZADOKITES) shows that in the same region where the Nasaræans are said to have lived there were dissenting bodies of the kind described. In fact, the emphasis upon the hope of a Messiah from Israel and Aaron, not from Judah and David (see MESSIAH), may have given rise to a Jessæan sect, insisting upon the origin of the Messiah in the branch from the roots of Jesse (Isa. xi. 1), and the Hebrew word for "branch" (*neṣer*) is likely to have furnished the name Nasaræans. Consult Gustav Hoennicke, *Das Judenchristentum im ersten und zweiten Jahrhunderts* (Berlin, 1908), and Schmidtke, *Neue Untersuchungen zu den judenchristlichen Evangelien* (ib., 1913).

NAS'BY, PETROLEUM V(ESUVIUS). The pseudonym of the American humorist David Ross Locke (q.v.).

NASCAPI, năs'*ca*-pē, or **NASCAPEE.** The most northeasterly tribe of the Algonquian stock (q.v.), occupying the interior highland region of Quebec and Labrador, northward almost to Ungava Bay. They are closely allied by intermarriage with the Montagnais (q.v.) and trade at the same stations along the St. Lawrence. They depend entirely upon hunting and fishing for subsistence and are still but little changed from their primitive condition. They are supposed to number altogether about 3200 souls. Consult L. M. Turner, in *Bureau of American Ethnology, Eleventh Annual Report* (Washington, 1894).

NAS'CENT STATE (from Lat. *nascens*, pres. p. of *nasci*, to be born), *status nascendi.* The state in which a chemical element exists at the instant of its liberation from a compound. The reacting capacity of an element in the nascent state is far greater than in the ordinary state, i.e., some time after it has been liberated. For example, in the gaseous state hydrogen has no action upon ordinary aldehyde; but when sodium amalgam is brought in contact with an aqueous solution of aldehyde, the latter combines directly with the nascent hydrogen, yielding ordinary alcohol. According to most authors, nascent hydrogen is made up of single atoms, while gaseous hydrogen is made up of molecules, each of which consists of two atoms. Others believe that nascent hydrogen is nothing but highly compressed gaseous hydrogen; for, as a matter of fact, it has been shown that highly compressed hydrogen is capable of acting in many respects like nascent hydrogen, and it can also

be shown that hydrogen is chemically liberated with considerable pressure. Similar remarks apply also to other elements in the nascent state.

NASCIMENTO, näs'sĕ-mān'tō, Francisco Manoel do (1734–1819). A Portuguese poet and a secular priest. Summoned to appear before the Inquisition because of certain heterodox practices, he fled to Holland and then to France, where he spent the rest of his life. While in Portugal, Nascimento formed with some seceders from the Arcadia a counter poetical academy (the Grupo da Ribeira das Naos), whose members observed the Arcadian system of taking pseudonyms, so that he is known as Niceno and Filinto Elysio. At Paris (1817–19) and at Lisbon (22 vols., 1836–40) there appeared two separate editions of his *Obras completas,* neither of which is really complete, but the latter of which is the more useful. Consult: Innocencio da Silva, *Diccionario bibliographico Portuguez,* vols. ii, ix (Lisbon, 1858, 1870); Pereira da Silva, *Filinto Elysio e a sua epoca* (Rio, 1891); Theophilo Braga, *Filinto Elysio* (Oporto, 1891).

NASE'BERRY. See Chewing Gum.

NASEBY, nāz'bĭ. A parish of Northamptonshire, England, 12 miles east by north of Rugby. Pop., under 750. It gives its name to the decisive action of the Civil War between Charles I and the Parliamentary army under Fairfax and Cromwell, which took place here June 14, 1645. The New Model army of the Parliamentarians, numbering about 13,000 men, totally defeated nearly 10,000 Royalists; about 1000 of the latter were killed, and 5000 were taken prisoners; nearly all the Royalist arms and ammunition were also captured.

NASH, Abner (1716–86). An American official, brother of Gen. Francis Nash (q.v.). He was born in Prince Edward Co., Va., but removed to North Carolina, was admitted to the bar, and gained a large practice. He represented Newbern in the First Provincial Congress held in that town in 1774, and the next year was a member of the Provincial Council. He was a member of the body which framed the State constitution in 1776 and was the Speaker of the first House of Commons the next year. In 1780 he was elected the second Governor of the State. His administration was stormy, as the Legislature gave most of his powers to a board of war, and he served but one year. In 1782 and 1785 he represented Jones County in the Legislature and was elected by that body a delegate to the Continental Congress in 1782–84 and 1785–86.

NASH, Charles William (1848–). A Canadian ornithologist, born in the County of Sussex, England, and educated at the Shoreham Grammar School and in the island of Jersey. He went to Canada, studied law, and was admitted to the Manitoba bar (1883), but in 1899 entered the Department of Agriculture, Ontario, and was appointed lecturer on biology by the Farmers' Institute Bureau. Besides serving as associate editor of the *Farming World,* he published: *Birds of the Garden; Wild Fowl of Ontario; Check List Birds of Ontario; Game Fishes of Ontario; Humming Birds of Ontario;* and many other similar works; also *Birds of Ontario in Relation to Agriculture* (1898; 3d ed., 1904).

NASH, Francis (1720–77). An American soldier, born in Prince Edward Co., Va. At an early age he removed to Orange Co., N. C. In 1771 he served as a captain under Governor Tryon in the campaign against the Regulators (q.v.). He was a member of the Assembly in 1771 and from 1773 to 1775. He was also a member of the Provincial Congress of 1775 and by it was commissioned lieutenant colonel of the First North Carolina Regiment in September and promoted to be colonel April 22, 1776. This regiment became a part of the Continental line, and in February, 1777, he was made brigadier general. At Germantown his brigade, which was intended to form part of the reserve, participated in some of the hottest fighting of the day. General Nash was mortally wounded by a cannon ball and was buried at Kulpsville.

NASH, Henry Sylvester (1854–1912). An American Protestant Episcopal theologian, born in Ohio. He graduated from Harvard University in 1878. At the Episcopal Theological School, Cambridge, where he graduated in 1881, he held the chair of literature and interpretation of the New Testament from 1884 to his death. His publications include: *The Genesis of the Social Conscience* (1897); *Ethics and Revelation* (1899); *The History of the Higher Criticism of the New Testament* (1900; new ed., 1906); *The Atoning Life* (1908).

NASH, Sir John (1752–1835). An English architect, born in London. He was a pupil of Sir Robert Taylor. After some years spent in building speculations he began practice in London in 1792 and speedily rose to eminence. He designed numerous mansions, but is chiefly celebrated in connection with the great street improvements in London, especially in the Marylebone region, which he helped to transform into Regent's Park. Regent Street, Haymarket Theatre, Langham Place Church, Park Square, the terraces in Regent's Park, and Buckingham Palace (recently altered) are specimens of his designs. The pavilion at Brighton is another of his works. He died at East Cowes, Isle of Wight, May 13, 1835.

NASH, Joseph (1809–78). An English watercolor painter and lithographer, born at Great Marlow, Buckinghamshire. He studied architecture under the elder Pugin and contributed drawings to the latter's *Paris and its Environs.* He is principally known by his water colors and lithographs illustrating late Gothic domestic architecture and interiors. His publications include *Architecture of the Middle Ages* (1838) and *Mansions of England in the Olden Time* (1839–49; new ed., 1906). His accurate draftsmanship and his knowledge of composition and of the value of light and shade have caused these works to be greatly prized by architects. The figures introduced to illustrate the costumes and habits of the period add greatly to their interest. He also did a series of views of Windsor Castle. There are numerous sketches by him in the South Kensington Museum.

NASH, Richard (1674–1762). An English society leader, better known as Beau Nash, born at Swansea. In 1692 he entered Jesus College, Oxford, but he left before finishing his course and, after a very brief career in the army, entered as a student of law at the Inner Temple in 1693. There he quickly became conspicuous for his good manners, his taste in dress, and his high living. His income being insufficient to meet his demands, he eked it out by gambling and by performing for large wagers such risqué exploits as riding naked through a village on a cow. It was the former occupation that in 1705 took him to Bath, then newly become a fashion-

able watering place. Here was his opportunity. Bath was then a rude little village filled to overflowing with fashionable people who were compelled to pay extravagant rates for miserable lodgings, whose only dancing place was the bowling green, and whose card and tea rooms were canvas tents. Nash set himself to change all this, and in a short time he had succeeded not only in building an assembly house, in procuring decent lodgings, and in reducing the insolent sedan-chair men to humility, but also in making himself the social autocrat of the place. He drew up a set of rules which were enforced on high and low, he practically abolished dueling, and he even assumed the duty of improving the country roads in the neighborhood. During these years his income, principally derived from his partnership in gambling houses and his own skill as a gamester, was large, and he lived in a style befitting "the King of Bath." But in 1740 gambling came under the ban of the law, and, though Nash managed for a time to evade yielding obedience, new regulations in 1745 left him practically without resources. In this plight the town, which owed so much to him, came to his rescue with a pension of £10 a month, and on this he lived until his death. Nash owed but little of his popularity to physical attraction, for, according to Goldsmith, he was large and clumsy, and his features were "harsh, strong, and peculiarly irregular." But he did have "assiduity, flattery, fine clothes, and as much wit as the ladies he addressed." Consult Goldsmith, *Life of Richard Nash* (London, 1762), and Clare Jerrold, *Beaux and the Dandies* (New York, 1910).

NASH, THOMAS (1567–1601). An English author, born at Lowestoft, Suffolk, in 1567. He graduated B.A. from St. John's College, Cambridge, in 1586, traveled in France and Italy, settled in London as an author in 1588, and died obscurely in 1601. His first publication was a sharp review of the state of letters, prefixed to Greene's *Menaphon* (1589). It was followed by a pamphlet in similar vein entitled *Anatomie of Absurdities* (1589). Nash now entered the Martin Marprelate controversy (q.v.), writing abusive satires on the Puritans. He also violently attacked Gabriel Harvey in *Have with you to Saffron Walden* (1596). Of more general interest are his satirical sketches of contemporary manners: *Pierce Pennilesse, his Supplication to the Divell* (1592); *The Terrors of the Night* (1594); *Lenten Stuff* (1599); the picaresque novel called *The Unfortunate Traveler, or Jack Wilton* (1594). This last work was the sternest piece of realism that had yet appeared in English fiction. Nash also wrote a comedy entitled *Summer's Last Will and Testament* (printed 1600) and had a hand with Marlowe in *The Tragedy of Queen Dido* (printed 1594). Nash was given to outright speech and sarcastic mirth. He was well read and avowed himself the disciple of Pietro Aretino. He also knew Brant's *Narrenschiff* and the works of Rabelais, a flavor of which is perceptible in him, as well as English poets, such as Surrey and Spenser. Izaak Walton aptly described Nash as "the master of a scoffing, satirical, and merry pen." Consult his *Complete Works*, edited by Grosart (6 vols., London, 1883–85).

NASHUA, năsh'ū-à. An important manufacturing city and the county seat of Hillsboro Co., N. H., 40 miles northwest of Boston, Mass., on the Nashua River, near its junction with the Merrimac, and on several divisions of the Boston and Maine Railroad (Map: New Hampshire, G 8). It has a public library, a United States Fish Hatchery, Memorial and St. Joseph's hospitals, the Hunt Home, Nashua Sanitarium, fine courthouse and post-office buildings, and a park system comprising 200 acres. A canal, 3 miles long, 60 feet wide, and 8 feet deep, leading from the Nashua River, furnishes excellent water power for large cotton mills. The manufactures include iron and steel, stationary engines, edge tools, furniture, cotton goods, cards and glazed paper, shoes, refrigerators, ice-cream freezers, registers, sash, doors, and blinds, kits and caskets, overalls, boxes, saddlery and hardware, shears and clippers, etc. Nashua is also the distributing centre for a large agricultural district. A modified form of commission government was adopted in 1914. Pop., 1900, 23,898; 1910, 26,005; 1914 (U. S. est.), 26,901; 1920, 28,379. Settled in 1655, Nashua was incorporated as the township of Dunstable by Massachusetts in 1673, was reincorporated by New Hampshire in 1746, received its present name in 1836, and was chartered as a city in 1853. Consult E. E. Parker, *History of the City of Nashua, N. H.* (Nashua, 1897).

NASHVILLE. The capital of Tennessee, and next to Memphis its largest city, and the county seat of Davidson County, on the Cumberland River (mainly on the left bank), 233 miles east-northeast of Memphis and 186 miles south by west of Louisville, Ky., on the Louisville and Nashville, the Nashville, Chattanooga, and St. Louis, and the Tennessee Central railroads (Map: Tennessee, D 2). It has an area of about 18.2 square miles and is regularly laid out on gradually rising ground, which reaches an elevation of 650 feet above sea level. There are two electric interurban railways. Macadam, bitulithic, and wooden blocks are very largely used in the pavement of streets, about 190 out of a total of 275 miles being laid with these materials. There are a number of handsome structures. The State capitol, situated on a hill, cost $1,500,000 and is the most imposing building in the city. The grounds contain the tomb of James K. Polk and a statue of Andrew Jackson. Among other notable public edifices are the United States government building, the courthouse, the city hall, the Tennessee School for the Blind, the Galloway Memorial Hospital, St. Thomas's Hospital, the State penitentiary, and the Parthenon. The Tennessee Industrial School and the Tennessee Reformatory for Boys are at Nashville, and about 6 miles away is the State lunatic asylum. The Hermitage, of historic interest as the home of Andrew Jackson, is some 10 miles to the east. The national cemetery, a short distance north of the city, has 16,643 graves, 4711 of unknown dead.

Nashville is one of the most prominent educational centres in the South. It is the seat of Vanderbilt University (q.v.); Peabody College for Teachers (q.v.); Knapp School of Farm Life; Meharry Medical College (colored); Walden University (Methodist Episcopal), opened in 1866 (colored); Fisk University (q.v.) (colored); Roger Williams University (Baptist), opened in 1865 (colored); Boscobel College, for women (Baptist), opened in 1889; Ward-Belmont College, for women (Presbyterian), opened in 1865; St. Cecilia Academy, for women, founded in 1860 (Catholic); and Buford Col-

lege for Women, opened in 1900. The State library comprises 40,000 volumes, and Watkins Institute, the repository of the collections of the State Historical Society, has the Howard Library of 10,000 volumes and conducts a large night school. The Carnegie Library consists of 94,000 volumes. Nashville ranks second in the State as an industrial city, its 584 manufacturing establishments in 1915 having an aggregate capital of $41,000,000 and a production valued at $45,000,000. First in importance is the manufacture of flour and grist-mill products, the city being the chief centre of this industry in Tennessee. There are also large printing and publishing houses and extensive manufactories of lumber and planing-mill products, stoves, clothing, tobacco, boots and shoes, fertilizers, etc. Nashville controls a large trade in lumber, cotton, grain, and manufactured goods and, as the distributing centre for a considerable area, has important wholesale interests in groceries, dry goods, drugs, and boots and shoes.

The government, under the charter of 1913, is vested in a commission of five members, who are elected for a term of four years; two are elected at one time, and the other three are chosen two years later. The commission has administrative and legislative powers. This body also selects the members of boards which govern hospitals, charities, and schools, and the tax assessor and city attorney. The judge of the city court is elected by the people. The city's budget cannot exceed the amount of revenue collected during the preceding year. Nashville spent in 1914, in maintenance and operation, about $2,300,000, the principal items of expenditure being $498,091 for education, $277,697 for water works, $172,730 for the police department, $176,476 for the fire department, and $198,000 for interest on the debt. In addition to the ordinary expenses there was expended out of proceeds of sales of bonds and special assessments $705,000 for permanent improvements, new parks, streets, sidewalks, etc. The water works are owned by the municipality, were built in 1832, and rebuilt in 1886. The system now comprises 197 miles of mains. There is a municipal electric-light plant. Pop., 1830, 5566; 1850, 10,165; 1870, 25,865; 1890, 76,168; 1900, 80,865; 1910, 110,364, including 2993 persons of foreign birth and 36,523 negroes; 1914, 114,899; 1920, 118,342.

Nashville was first settled in 1780 by a company of pioneers led by James Robertson and, in honor of Gov. Abner Nash of North Carolina, was called Nashborough until 1784, when it was incorporated as a town under its present name. Throughout its early years the settlement was almost continually harassed by the Indians, and on April 2, 1783, a large body of Cherokees made a determined but unsuccessful attack. Nashville was chartered as a city in 1806, was the seat of the State Legislature in 1812–15 and again from 1826 to 1843, and became the permanent State capital in 1843. It was occupied by a Federal army in 1862 and in 1864 was the scene of a hotly contested battle. (See NASHVILLE, BATTLE OF). Many well-known men, including Andrew Jackson, James K. Polk, Gen. Sam Houston, and Thomas H. Benton, made Nashville their home for the whole or a part of their lives. Consult L. P. Powell (ed.), *Historic Towns of the Southern States* (New York, 1900), and L. P. Elliot, *Early History of Nashville* (Nashville, 1911).

NASHVILLE, BATTLE OF. A battle of the Civil War in America, fought south of Nashville, Tenn., Dec. 15 and 16, 1864, between a Federal army in the command of Gen. George H. Thomas and the Army of Tennessee under Gen. John B. Hood.

When General Hood evacuated Atlanta early in September, he moved west into Alabama, hoping to draw General Sherman after him and carry the war back into Tennessee. General Sherman, however, sent General Thomas and a part of his army to oppose General Hood, while he undertook the March to the Sea. General Thomas proceeded to Nashville and assembled the Fourth Corps of the Army of the Cumberland under General Wood, the Twenty-third Corps, Army of the Ohio, under General Schofield, the First and Third Divisions, Army of the Tennessee, under Gen. A. J. Smith, a provisional division including two brigades of colored troops under Gen. J. B. Steedman, and the cavalry corps under Gen. James H. Wilson, about 55,000 in all. General Hood advancing northward into Tennessee was repulsed at Franklin, November 30, by General Schofield, who at once retired within the intrenchments at Nashville. On December 2 General Hood appeared before Nashville and offered battle. General Thomas, feeling that his army was not sufficiently unified, delayed, though ordered to fight at once by the authorities at Washington. On December 15 he advanced from his intrenchments. The cavalry was placed upon the right of a great curve, the Sixteenth Corps next, the Fourth Corps was the centre and the pivot, the Twenty-third Corps, as a reserve, was to the left, and the Provisional Division was at the extreme left. General Steedman attacked Cheatham's corps on the Confederate right, but was repulsed; but Gen. S. D. Lee in the centre and General Stewart on the left were driven back and some unfinished works captured. Late in the day General Schofield with the Twenty-third Corps was moved to the Federal right. During the night General Hood formed Cheatham's corps on the left. No change was made in the Federal disposition. On the morning of December 16 the Fourth Corps made an unsuccessful attack on Overton's Hill on the Confederate right, but Cleburne's old division was transferred from the left to strengthen the right. General McArthur, of the Sixteenth Corps, assaulted General Bate's division on the Confederate left and pierced the line. At this moment some of Hatch's cavalry, which had made a long detour, attacked the Confederate rear, and soon the retreat became a rout along the whole line. General Forrest with the Confederate cavalry came up and covered the rear. General Hood with the fragments of his army retreated across the Tennessee River, and on Jan. 14, 1865, asked to be relieved from command. The Federal troops actually engaged numbered about 45,000; the Confederate about 25,000. The Federal forces lost in killed, wounded, and missing 3057. The Confederate losses in killed and wounded were not given, but 4462 were taken prisoners. Consult: J. W. De Peyster, *Nashville, the Decisive Battle of the Rebellion* (New York, 1876); Hood, *Advance and Retreat* (New Orleans, 1880); J. D. Cox, *March to the Sea* (New York, 1882); Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (ib., 1887); Steele, *American Campaigns* (Washington, 1909).

NASHVILLE, UNIVERSITY OF. An institution of learning, now out of existence. It

donated its grounds and buildings to Peabody College for Teachers (q.v.).

NASIK, nä'sĭk, or **NASSICK.** The capital of a district of the same name, Bombay, British India, on the Godavari River, 95 miles northeast of Bombay (Map: India, B 5). Owing to its proximity to Trimbak, 19 miles distant, the source of the sacred Godavari, Nasik is one of the holy towns of India, and rivals Benares as a place of pilgrimage. It is the chief seat of Brahmanism in the Deccan, housing 1300 Brahman priests and their families. The town is built on both sides of the river, the portion on the right bank, divided into the old and the new town, being spread over three hills; Panchwati, on the left bank, connected by a bridge, contains the principal features of interest. The river is lined with temples, shrines, and ghats for devotional ablutions. The dwellings are mounted on stone piers and are more than ordinarily substantial. Nasik is the chief seat of the copper and brass industry in the province and is noted for its artistic productions; it has also hand manufactures of cotton and paper. Four and a half miles to the south are the celebrated Lena Caves, situated in a conical hill, about 450 feet from its base. They were excavated probably in the second or third century A.D., and contain several rudely sculptured figures, the leading ones representing Buddha. The town is the Nasica of Ptolemy. It was long the capital of a Mahratta principality. Pop., 1901, 21,490; 1911, 33,463.

NASMYTH, nā'smĭth, JAMES (1808–90). A Scottish engineer and inventor. He was born at Edinburgh, where he received his education at the high school, the school of arts, and the university. As a youth he was an expert mechanic and constructed models of steam engines and other machinery. In 1829 he became assistant to Henry Maudsley, a London engineer, from whom he derived much useful knowledge and experience. In 1834 he began the manufacture of machine tools at Manchester, where his business rapidly increased and developed into the well-known Bridgewater Foundry. In 1839 he invented the steam hammer, which he improved from time to time. He was also the inventor of many important machine tools, including a hydraulic punch and a steam pile driver, and he was the first to propose the use of a submerged chain for towing boats on rivers and canals and of chilled cast-iron shot. In addition to his work as a mechanical engineer he was much interested in astronomy and made many observations with reflecting telescopes which were constructed and mounted according to his ideas. His astronomical work includes investigations of the surface of the sun and moon, which form the subjects of several papers which were published in elaborate form. Consult *James Nasmyth: An Autobiography*, edited by Samuel Smiles (London, 1861–62; new ed., 1895).

NA'SO-PHARYN'GEAL TONSIL. See ADENOID.

NASO'REANS. See MANDÆANS.

NASQA. See NASS.

NASR ED DIN, näsr ĕd dēn' (1831–96). A shah of Persia. On the death of his father, Mohammed Mirza, Oct. 15, 1848, he ascended the throne. At his accession he found the country in confusion, but by the aid of his Vizier, Mirza Taki Khan, he established himself firmly and proceeded to carry out numerous reforms. These plans were unfortunately interrupted by the new Vizier, who was an enemy of all progress. Against the Turkomans and other neighboring peoples Nasr ed Din was successful, but in 1871 the English put a stop to whatever thoughts of further conquest he may have entertained by defining the boundaries between Persia and Afghanistan. The Shah made three tours of Europe—in 1873, 1878, and 1889. This cultured and well-meaning ruler introduced many reforms into his Kingdom, and his long reign of 48 years has but one serious blot on it, the persecution of the Babis. He was assassinated May 1, 1896, and was succeeded by his son, Muzaffar ed Din. Consult: Morgan and Burger, *Nasr ed-Din Schah und das moderne Persien* (Dresden, 1889); James Greenfield, *Die Verfassung des persischen Staates* (Berlin, 1904); A. V. W. Jackson, *Persia Past and Present* (New York, 1906).

NASS, näs (properly NASQA, corruptly NISKA). See CHIMESYAN.

NASSAU, *Ger. pron.* näs'sou. Formerly a German duchy, now a part of the Prussian Province of Hesse-Nassau (q.v.). The districts now known by the name of Nassau were anciently occupied by the Alemanni (q.v.). They subsequently became a part of the Frankish realm. After the partition of the Carolingian Empire in the Treaty of Verdun (843) the present Nassau was a part of the Kingdom of Germany and was included in the Duchy of Franconia. About 1100 the Count of Laurenburg built the castle of Nassau, from which his descendant Walram I took the title of Count of Nassau about 1160. In the middle of the thirteenth century Walram's two grandsons, Walram II and Otho, became the founders of two separate lines, ruling respectively in the southern and the northern parts of the country. The descendants of Walram II continued to rule in Nassau until 1866. His son Adolphus was King of Germany from 1292 to 1298. His later descendants established several separate lines, but by the successive extinction of other branches the Nassau-Weilburg family was left as the sole representative in 1816. In 1806 the territories of the line of Nassau-Usingen had been erected into a duchy. In 1836 Nassau joined the Zollverein. Duke Adolphus of Nassau (1839–66) had many difficulties with his subjects, who chafed under his conservative tendencies. He sided with Austria against Prussia in 1866, with the result that Prussia took possession of Nassau. (See GERMANY.) In 1890 the Grand Duchy of Luxemburg passed to the Duke of Nassau.

The younger line of Nassau was founded by Otho I (died about 1292), who in the division with his brother received the northern part of the country. From this line have sprung the stadholders and royal sovereigns of Holland. This junior branch of the house of Nassau acquired possession in 1544 of the Principality of Orange in the person of William the Silent, the great leader of the Dutch in their struggle for independence, who assumed the title of Prince of Orange. With the death of William III of England and Holland in 1702 Orange passed out of the house of Nassau, but the princely title derived from the little state was retained by his successors, and the reigning dynasty in the Netherlands is still styled the house of Orange. Consult Schliephake and Menzel, *Geschichte von Nassau* (7 vols., Wiesbaden, 1865–89).

NASSAU, näs'są. The capital of the Bahama Islands, situated near the east end of the island

of New Providence (Map: West Indies, C 1). Owing to its salubrious climate, Nassau is a winter resort for invalids, chiefly from the United States. The town is well laid out and has fine public buildings and a cathedral. It has a good harbor, admitting vessels drawing 16 feet. The people are engaged in agriculture and carry on considerable trade in cotton, fruit, sponges, and salt. It is the seat of an Anglican bishop. Pop., 11,000, chiefly negroes. Founded by the English in the seventeenth century, Nassau was destroyed by the French and Spaniards in 1703, but was rebuilt 15 years later. In 1740 it was made a fortified port, open to free trade.

NASSAU, Adolph of. See Adolph of Nassau.

NASSAU-SIEGEN, näs'ou-zē'gen, Joan Mauritz, Count and (after 1664) Prince von (1604–79). A Dutch soldier and governor, born at Dillenburg. He early distinguished himself in the service of Holland at the sieges of Breda (1625) and Maastricht (1632). From 1636 to 1642 he was Governor of the Dutch possessions in Brazil. Under his rule the colony was notably prosperous. He defeated the Spanish and Portuguese fleets in 1640, and continued to attack these powers with varying success until his return to Holland (1644). In 1647 he entered the service of Brandenburg, was made Governor of Cleves, and arranged the Treaty of 1661 between Brandenburg and England. Placed at the head of the army of the Netherlands, he defeated the Bishop of Münster (1665). In 1671 he became field marshal, took an active part in the war against Louis XIV in the Spanish Netherlands, and was made Governor of Utrecht (1674). Consult Driesen, *Leben des Fürsten J. Moritz von Nassau-Siegen* (Berlin, 1849).

NASSE, näs'se, Christian Friedrich (1778–1851). A German physician, born at Bielefeld. He received his medical education in Berlin and Halle (M.D., 1800) and practiced in his native town. The years 1810 to 1815 he spent in Göttingen, Leipzig, Dresden, and Weimar. He then accepted the chair of practical medicine at the University of Halle and was called to a similar chair at Bonn in 1822. Nasse was a strong representative of the new school of medicine, making science, especially scientific diagnosis instead of philosophical speculation, the basis for therapeutical medicine. Among his many works are: *Leichenöffnungen, etc.* (1821); *Ueber den Begriff und die Methode der Physiologie* (1826); *Handbuch der speciellen Therapie* (1826–38); *Handbuch der allgemeinen Therapie* (1840–45); *Die Behandlung der Gemüthskranken, etc.* (1844); *Vermischte Schriften, etc.* (1850); *Die Untersuchung des Scheintodes vom wirklichen Tode* (1851).

NASSE, Erwin (1829–90). A German economist, one of the most prominent representatives of the Socialism of the Chair. He was born and educated at Bonn and became professor at Basel, at Rostock, and at Bonn (1860). From 1869 to 1879 he was a member of the Prussian Lower House and in 1889 was appointed to the House of Peers. One of the founders of the Verein für Socialpolitik, he was its president from 1874 until his death. His writings, which were marked by unusual clarity of style, include: *Bemerkungen über das preussische Steuersystem* (1861); *Die preussische Bank* (1866); *Ueber die mittelalterliche Feldgemeinschaft und die Einhegungen des 16. Jahrhunderts in England* (1869; trans. by Ouvry, 1871); "Agrarische Zustände in England," in *Schriften des Vereins für Sozialpolitik*, vol. xxvii (Leipzig, 1884).

NAS'SICK. A town of India. See Nasik.

NAST, Thomas (1840–1902). An American illustrator, caricaturist, and painter. He was born at Landau, Bavaria, Sept. 27, 1840, but when six years old was brought by his parents to America. After studying a short time with Theodore Kaufman he was given employment, (though only 14 years old) as a draftsman on *Frank Leslie's Illustrated Newspaper*. He went to England in 1860 and then traveled to Italy to follow Garibaldi, making sketches of the war, which appeared in the New York *Illustrated News*, the *Illustrated London News*, and *Le Monde Illustré*. Returning to America, Nast entered the service of *Harper's Weekly*, for which, during many following years, his best work was done. In 1862 his drawings of scenes from the American Civil War, published in Harper's periodicals, attracted wide attention. Pointed and severe and displaying an unusual power of individual characterization, extending even to articles of clothing, Nast's cartoons did much to break up the corrupt Tweed ring and to bring to swift judgment public men who failed to keep faith. Many of the political symbols and types still in vogue, such as the Tammany tiger, the Republican elephant, and the Democratic donkey, were originated by Nast. He started the publication of *Nast's Illustrated Almanac* in 1872, and illustrated *The Tribute Book*, Nasby's *Swingin' 'round the Cirkle*, and among other works, Dickens's *Pickwick Papers* and *Pictures from Italy*. Not only a fine draftsman but a clever painter, remarkable for celerity and facility of execution, Nast is known for pictures that show a sturdy realism and possess a certain richness of color, but evidence lack of technical training. Among his chief oil paintings are: "The Departure of the Seventh Regiment" (1861); "The Civil War"; "Lincoln's Visit to Richmond"; "Head of Christ," Metropolitan Museum, New York. In 1894 he was called to the *Pall Mall Magazine*, London, and in 1902 he became American Consul General at Guayaquil, Ecuador, where he died December 7 of the same year. Consult A. B. Paine, *Thomas Nast: His Period and his Pictures* (New York, 1904), and id., *Life and Letters of Thomas Nast* (ib., 1910).

NAST, William (1807–99). An American Methodist Episcopal clergyman, born in Stuttgart, Württemberg, the son of a councilor in the Royal Treasury. He graduated from the University of Tübingen, in the same class with David Friedrich Strauss; came to the United States in 1828; and taught at West Point, Gettysburg, and Kenyon College. In 1835 he entered the Methodist ministry, joining the Ohio conference. He was appointed German missionary at Cincinnati and later at Columbus, founding in the former city (1838) the first German society ever formed in the Methodist Episcopal church. Dr. Nast founded also and edited from 1841 to 1892 *Der christliche Apologete*, the official organ of the German Methodists, later edited by his son Dr. A. J. Nast. The beginnings of the work of the Methodist Episcopal church in Germany may be traced directly to an official visit he made to his native land in 1844. He was a member of a number of General Conferences. Besides translating into German Wesley's *Sermons* and the *Methodist Discipline* and the *Ritual*, he was the author of *The Greek Verb* (1835); *Die Aufgabe*

der christlichen Kirche in neuenzehnten Jahrhundert (1857); *A Commentary on Matthew and Mark*, English and German (1864); *An Introduction to the Gospel Records* (1866); *The Larger Catechism*, English and German (1869); *Die kleiner Katechismus für die deutschen Gemeinden der Bischöflichen Methodisten Kirchen*, English and Swedish (1870).

NASTUR'TIUM. See CRESS; TROPÆOLUM.

NA'SUA. See COATI.

NATA. See NIATA.

NATAL, nà-tăl'. A colony of Great Britain on the southeast coast of Africa, an original province of the Union of South Africa, bounded by the Transvaal Province, Portuguese East Africa, the Indian Ocean, Cape of Good Hope Province, Basutoland, and the Orange Free State Province (Map: Cape of Good Hope, K 7). Its area, including Zululand and the portion of Transvaal annexed in 1902, is 35,290 square miles.

Topography. Natal occupies a part of the seaward slope of the great South African plateau, which falls in a series of terraced escarpments running parallel with the coast around the southern end of the continent from the mouth of the Orange on the west to that of the Limpopo on the east. The ranges culminate in the Drakensberg (q.v.), which forms the natural boundary of the great inland plateau. The average height of the Drakensberg is 9000 feet, and its highest point in Natal, the Montagne aux Sources, has an altitude of 11,155 feet. Below the last ridge of the escarpment is a low coastal plain which widens northward, where it contains a series of large, shallow lagoons, of which the largest is Lake St. Lucia, 55 miles long and 10 miles wide. Natal is watered by numerous permanent rivers of great volume, but, owing to the enormous fall of 8000 to 9000 feet in less than 300 miles, they are all violent mountain torrents falling in a series of cataracts to the sea. The largest is the Tugela.

Climate. The annual precipitation, falling under the influence of the southeast trades blowing over the warm waters of Mozambique Channel, along the coast, is about 44 inches, while in the elevated interior it is much heavier. In regard to temperature Natal presents a series of climatic zones, from the subtropical coastal region with a mean temperature of 68° to the frigid highland region. The former, however, is tempered by cool southeast storms and the latter by the hot winds from the interior.

Flora. The flora is characterized in general by richness and variety, due to the diversity of climates. In the coastal region we find the tropical euphorbias, bamboo, cotton, indigo, sugar cane, coffee, fig, and coconut; in the middle zone the common European cereals, fruits, and vegetables, while higher up are good pasture lands.

Fauna. Nearly all the large wild animals which formerly overran the country have disappeared. Snakes are still found near the coast, including the python, the puff adder, and the venomous cobra.

Minerals. Although coal is the only notable mining product, Natal is reported to be rich in mineral resources. Among the minerals known to occur are asbestos, copper, gold, iron, argentiferous lead, tin, fire clay, graphite, and gypsum. There are extensive coal measures around the head streams of the Tugela. The output of coal in 1911 and 1912 respectively was 2,679,551 tons (valued at £725,448) and 2,765,068 tons (£771,755). The gold output in 1911 was 1706 ounces (valued at £7246) and, in 1912, 1242 ounces (£5276).

Agriculture and Stock Raising. Much of the province is well adapted for either agriculture or grazing. In 1911 there were 481,807 morgen under cultivation (one morgen = 2.11654 acres). The census of that year returned the number of workers on farms at 80,825, including 6944 male and 2352 female whites, 35,958 male and 9541 female South African natives, and 19,618 male and 6412 female persons of other colored races. The leading crop is corn, which constitutes the staple food of the natives. In the year 1910–11 the yield of corn was 1,805,745 muids (of 200 pounds); Kafir corn, 594,132; wheat, 7231; peas and beans, 44,087; and, in muids of 150 pounds, oats, 43,639; sweet potatoes, 285,905; potatoes, 202,641. On the coast and in Zululand there are large sugar and tea plantations. In 1910–11 the production of sugar cane for feed was 36,458 tons; sugar cane for sugar, 1,095,034 tons; sugar, 79,633 tons; molasses, 5,078,600 pounds; rum, 46,733 gallons; tea, 5,007,091 pounds. In 1911 there were 75,567 horses, 15,602 mules, 28,018 asses, 456,087 cattle, 1,519,258 sheep, 989,274 goats, 110,332 swine, and 4111 ostriches. Pastoral production in pounds, according to census returns, for the year ended April 30, 1911: wool, 4,811,315; mohair, 186,178; ostrich feathers, 2573; butter, 1,548,593; cream, 1,068,456; cheese, 15,746; honey, 2149.

Commerce and Communications. A large foreign trade passes through the port of Durban, including transit trade with the Orange Free State and the Transvaal. The chief exports include wool, sugar, hides and skins, tea, coal, corn, and wattle bark. The leading imports are machinery and other iron and steel goods, cotton, and apparel. Since the establishment of the Union separate trade returns have not been made for the provinces, but, as most of the foreign trade passes through Durban, the figures for that port are of interest. Total imports at Durban in 1910 and 1912 respectively, £11,493,136 and £12,021,140; total exports, £4,327,784 and £5,123,478. Of the imports of merchandise to the Union of South Africa in 1912, 30.8 per cent is credited to Durban, and of the exports of merchandise 7.9 per cent. In respect of imports Durban is the first port of South Africa, while in respect of exports Cape Town is far in the lead (76.6 per cent in 1912).

At the end of 1912 there were 5800 miles of main roads. The province has rail communication with the Transvaal and with the Orange Free State and thence with the Cape Province. A Natal line crosses the Cape border into Griqualand East, but does not connect with the Cape system. The railways are of 3 feet, 6 inches gauge. Upon the establishment of the Union the state railways were merged into one system, the South African Railways, under the control of the Union government. The total open mileage of this system at the end of 1912 was 7848, of which 1053 miles, or 13.14 per cent, were in Natal. In addition Natal had 50 miles of private railway. Railway building in Natal began in 1878, when 27 miles were constructed. The mileage increased to 307 in 1890, 570 in 1900, 999 in 1910, and 1053 in 1912. What is known as the Natal Division of the South African Railways comprised 1111 miles

at the end of 1912. The capital cost of this division was £15,283,929 (per open mile, £13,757); earnings in 1912, £2,617,297; working expenses, £1,661,230; excess of earnings, £956,067; interest on capital, £513,988; profit after payment of interest, £442,079. At the end of 1912 the Durban municipal tramways had a length of 19.82 miles and the Pietermaritzburg municipal tramways 8.25 miles. In 1912 there were 249 telegraph offices in Natal, with 2165 miles of line and 6314 miles of wire; telephone wire, 6638 miles.

Government. Natal was annexed to Cape Colony in 1844, but in the following year was placed under separate government. In 1856 it was erected into a separate colony, with partially representative government, and in 1893 responsible government was introduced. Zululand was annexed at the end of 1897, and at the beginning of 1903 the districts of Utrecht Vryheid, Paulpietersburgh, and Ngotshe, formerly belonging to the Transvaal, were annexed. On May 31, 1910, the colony became an original province of the Union of South Africa. The legislative power of the province is vested in the representative Provincial Council (25 members), elected for three years. Its action is subject to the veto of the Governor-General in Council. Executive authority rests with an executive committee, consisting of an administrator, appointed for five years by the Governor-General in Council, and four members elected by the Provincial Council. Of the 130 members of the House of Assembly at Cape Town, 17 represent Natal. Provincial revenue consists of a subsidy voted by the South African Parliament and certain revenues transferred or assigned by the Union government. The seat of the provincial government is Pietermaritzburg.

Education. The 1911 census returned the following degrees of education—persons able to read and write: whites, 43,178 males and 36,877 females; other than whites, 24,203 males and 19,627 females; read only: whites, 518 males and 531 females; other than whites, 4140 males and 3862 females; neither read nor write: whites, 8723 males and 8131 females; other than whites, 483,158 males and 559,950 females. The provincial government controls educational institutions, except those for higher education, which are under the control of the Union government. In 1912 the aggregate number of white pupils in attendance at the government and inspected schools was 16,297, the average daily attendance being 86 per cent. Average daily attendance at government high and preparatory schools was 720. About 1500 pupils attended private unaided schools. White children receiving free education in 1912 numbered 2956. Probably only a small proportion of white children receive no instruction. In 1912 government-aided schools for natives numbered 231, with an enrollment of 17,852; and for Indian children 34, with an enrollment of 3532.

Population. The population at different dates is shown in the table below; the 1901 figures and those for natives in 1891 are estimates.

The figures in the table for 1891 do not include Zululand, and those for 1901 do not include the districts annexed from the Transvaal in 1903. The total for 1904 includes 3774 British troops and their dependents. The natives are classified as Bantus, except 6686 mixed and other colored in 1904 and 9092 in 1911. The Asiatics are almost wholly Indians. The 1911 census (May 7) showed an urban population of 152,988 and a rural population of 1,041,055. Conjugal condition of the white population in 1911: never married, 33,912 males and 26,159 females; married, 17,350 and 16,870; widowed, 1129 and 2508; divorced, 78 and 53; unspecified, 26 and 29. In 1911, of the white inhabitants, Christians numbered 94,432, non-Christians 1492; of the natives (Bantus) 140,965 were Christian and 812,415 had no religion; of the mixed and other colored inhabitants, 10,721 were Christian, 124,989 were non-Christian, and 6599 had no religion. In 1911 Durban with suburbs had 89,998 inhabitants (20,007 white); Pietermaritzburg, 30,555 (14,737); Ladysmith, 5595 (2287).

	1891	1901	1904	1911
Whites...	46,788	63,821	97,109	98,114
Asiatics ...	41,142	74,385	100,918	133,439
Natives ...	455,983	786,912	910,727	962,490
Total ...	543,913	925,118	1,108,754	1,194,043

History. The coast of Natal was first sighted on Christmas Day, 1497, by Vasco da Gama, who named the country in honor of the day (Nativity). The first attempt at settlement made by the Dutch about 1720 proved unsuccessful. In 1824 Captain Farewell and his 20 companions concluded a treaty with Chaka, King of the Amazulus, who had overrun the region during the first decade of the century, but in 1828 the English colony was broken up by Dingaan, the successor of Chaka. In 1835 Captain Gardiner obtained a concession of land from Dingaan and established himself with a number of missionaries at Durban. Two years later the Dutch of Cape Colony, who, in disgust with British rule, had set out in 1835 on their great trek northward, entered the confines of Natal. The first band of pioneers, numbering 79 men under Pieter Maurits Retief, were treacherously murdered by Dingaan, but the tide of Boer immigration continued unchecked, the Zulu power was broken in a great battle on the Bloed River, Dec. 16, 1838, and in 1839 the Republic of Natal was organized, comprising the districts of Pietermaritzburg, Weenen, and Durban. Great Britain, however, continued to regard the Afrikanders as her subjects, and annexed the Republic to Cape Colony in 1843. The greater part of the Boer population trekked westward and northward to found the Orange Free State and the Transvaal. In 1856 Natal was made an independent colony. In 1879 war was carried on against Cetewayo, King of the Zulus; his territory was overrun and occupied; and in 1897 Zululand was annexed to Natal. In 1881 the Transvaal Boers entered the extreme northwestern corner of the colony and defeated the British at Majuba Hill (q.v.). In 1899 and 1900 northern Natal was the scene of fierce fighting between the British and the Boers. At Elandslaagte, Glencoe, and Ladysmith, and all along the line of the Tugela, the most obstinate and sanguinary battles of the war occurred. In 1906 there was a formidable Zulu uprising in the Tugela region. It was suppressed with heavy loss to the natives. In 1909 after a referendum Natal determined to join the Transvaal. In 1910, upon the founding of the Union of South Africa, Natal became one of the original provinces.

Bibliography. W. C. Holden, *History of the Colony of Natal, South Africa* (London, 1855); W. Kermode, *Natal: Its Early History, Rise, Progress, and Future Prospects* (ib., 1882); Henry Brooks, *Natal: A History and Description of the Colony* (ib., 1887); J. F. Ingram, *Natalia: History of Natal and Zululand* (ib., 1897); A. C. Doyle, *The Great Boer War* (ib., 1900); Robinson, *A Lifetime in South Africa* (ib., 1900); Rowell, *Natal and the Boers* (ib., 1900); Russell, *Natal: The Land and its Story* (ib., 1900); Barnett and Sweeney, *Natal: The State and the Citizen* (New York, 1904); Walter Basman, *The Natal Rebellion of 1906* (ib., 1907); H. P. Holt, *Mounted Police of Natal* (London, 1913); also *Statistical Year Book of Natal* (Pietermaritzburg).

NATAL. The capital and chief port of the State of Rio Grande do Norte, Brazil, situated on the right bank of the Potengy River, near the Atlantic, 140 miles north of Pernambuco (Map: Brazil, K 5). The estuary which forms the harbor is obstructed by sand bars, but extensive dredging has opened the port to vessels drawing 22 feet. The port is the chief outlet for the products of the state, and it exports cotton, leather, rubber, woods, and sugar. It is the seat of a United States consular agent. Pop. (est.), 20,000.

NATAL GRASS (*Tricholæna rosea*). A South African perennial grass of rapid growth, attaining a height of 1 to 3 feet, according to soil and moisture conditions. It has been extensively introduced into many of the warmer portions of the globe, and in most places it is highly appreciated as a hay and pasture grass. It is probably best adapted to use as a hay grass as it cures readily and three to five cuttings per season are reported. In India it thrives best at medium to high elevations. In Australia immense yields are reported when grown in river bottoms. In Hawaii it has some value as a pasture grass at medium elevations, but it is considered better as hay. In Florida three cuttings per season have been secured, and it is considered a valuable addition to the forage crops in that State. As hay it is little inferior to timothy, as shown by analysis. Another species, *Tricholæna teneriffæ*, is called red Natal grass in Australia.

NATALIE, nä'tä'lē' (1859–). A queen of Servia, the daughter of a Russian officer named Keshko. In 1875 she married Prince Milan, afterward King of Servia, but their married life was unhappy, and in 1888 Milan procured a divorce. After King Milan's abdication in 1889 she returned to Belgrade and remained for some time with her son, King Alexander; but the National Assembly having requested her to leave the country in the interest of internal harmony, she withdrew in 1891, though with the masses of the people she enjoyed immense popularity, owing partly to her beauty. In 1893 she became reconciled to King Milan. In the following year she was restored by royal decree to all her rights as a member of the royal family, and in 1895 she returned to Belgrade and was received with great enthusiasm. But she made Biarritz, France, her residence, and indeed, after the assassination of Alexander in 1903, she was forbidden to enter Servia. In 1902 she joined the Roman Catholic church.

NATAL SORE. See Boil.

NA'TANT. A term in heraldry. See Naiant.

NATCHEZ, năch'ĕz (from their native name, *Na'chi*). An interesting tribe, of Muskhogean stock, originally residing in nine villages in the vicinity of the present city of Natchez, Miss., with a total population of perhaps 2500. Although comparatively a small tribe, they exercised a commanding influence from the Gulf to the Ohio. Their greatest religious rites were connected with the worship of the sun. They were sedentary and agricultural, expert basket weavers and skillful potters, while their men bore a deserved reputation as proud and determined warriors. In 1716 they quarreled with the French, who had without their consent erected Fort Rosalie in their country. In 1722 a fight occurred at the post, in which several were killed on both sides. Other collisions followed, until the Natchez secretly organized a combination of several neighboring tribes to drive out the white intruders. On Nov. 28, 1729, the Natchez fell upon the garrison and massacred 200 men, only 20 escaping, besides making prisoners of all the women, children, and negro slaves. The war rapidly spread to the outlying settlements, but after a few weeks the Natchez, unable to oppose the French and their Indian allies, fled across the Mississippi and fortified themselves in stockade forts on Black River, La. Here they were attacked in January, 1731, by a strong French force, which succeeded in taking nearly 450 prisoners, the rest escaping during a storm at night. All the prisoners were sold as slaves in the West Indies. The remnant, made desperate by defeat, continued the war, but were obliged to give way before fresh Spanish reënforcements from the west. This ended the war, in which they had probably lost half their tribal population. The survivors took refuge with other tribes, some with the Chickasaw, others with the Creek and Cherokee. A part of them, under the name of Notchee, even found their way to South Carolina and were incorporated with the Catawba. Consult J. R. Swanton, *Indian Tribes of the Lower Mississippi Valley and Adjacent Coast of the Gulf of Mexico* (Washington, 1911).

NATCHEZ. A city and the county seat of Adams Co., Miss., 98 miles southwest of Jackson, on the Mississippi River and on the Yazoo and Mississippi Valley, the Mississippi Central, the Natchez and Southern, and the St. Louis, Iron Mountain, and Southern railroads (Map: Mississippi, C 7). It is built largely on a bluff, 200 feet above the river, the summit of which contains the most costly residences, and the base, or water front, is devoted to shipping. Among noteworthy features of the city are the fine Memorial Park, Fisk Library, Agnes Z. Carpenter Public Library, Jefferson Military College, Natchez Institute, Institute Hall, Elks and Prentiss Club buildings, Natchez Hotel, and the handsome courthouse and ante-bellum city hall buildings. A national cemetery on a bluff adjoining the city contains 3159 graves, 2780 of unknown dead. In it is an observatory commanding fine views. Natchez has steamboat connection with the whole Mississippi valley and is the shipping port of a large cotton region, exporting annually many thousand bales. There are cotton mills, a cotton compress, cottonseed-oil mills, a foundry, saw and planing mills, an artificial ice plant, etc. The government is administered under a charter of 1877, which provides for a mayor, chosen biennially, and a unicameral council that elects the school trus-

tees. The water works are owned by the city. Pop., 1900, 12,210; 1910, 11,791; 1920, 12,608.

In 1716 Bienville built Fort Rosalie on Natchez Bluff. In October, 1729, the place was destroyed, and most of its inhabitants were massacred by the Natchez Indians. In 1763, according to the terms of the Treaty of Paris, the English took possession and renamed the fort Fort Parmure. From this year dates the real foundation of the village. A Spanish force from New Orleans dispossessed the English in 1779, and in 1798 Spain gave way to the United States. Natchez was incorporated as a city in 1803. It was the capital of the Natchez District and Mississippi Territory to 1802. It suffered considerable damage from a tornado in 1840. The city was shelled by Commodore Porter in 1862, and in 1863, soon after the fall of Vicksburg, it was occupied by Federal troops and remained under their control until the close of the war.

NATCHEZ, na'chā', LES. A romance written by Chateaubriand during his exile in England and printed in 1825–26

NATCHEZ TRACE. A famous highway which traversed the present State of Mississippi. It was made possible by treaties entered into in 1801 between the United States on the one hand and the Chickasaws and Choctaws on the other. The road from the national boundary to Natchez was laid out in 1802. Appropriations were made by successive Congresses for the road. The Natchez Trace, after crossing the Tennessee River a few miles below the Mussel Shoals, at Colbert's Ferry, pursued a southwesterly course through the country of the Chickasaws and Choctaws to the Grindstone Ford on the Bayou Pierre, thence ran south and west to Natchez. South of Natchez it followed the general trend of the river to the line of demarcation and eventually connected with the various roads leading to New Orleans. At Nashville, Tenn., this old road connected with the public highway which ran east to Pittsburgh, Pa. The total distance from Natchez to Nashville was 501 miles, and the distance to Pittsburgh was 1013 miles. Numerous stations sprang up along the road between Natchez and Nashville. Under the auspices of the Daughters of the American Revolution granite bowlders have been erected marking the site of this famous old highway.

NATCHITOCHES, năk'ĭ-tŏsh'. An extinct tribe of the Caddoan linguistic family of Indians, living formerly on the Red River in Louisiana. Their habit of life was partly hunting, partly agricultural. They dwelt in permanent houses covered with sod. Their religion demanded under certain conditions the sacrifice of human beings. See CADDOAN STOCK.

NATCHITOCHES, năk'ĭ-tŏsh' *or* năk'ĭ-tŏsh'. A town and the parish seat of Natchitoches Parish, La., 72 miles by rail southeast of Shreveport, on the Cane River and on the Texas and Pacific and the Louisiana and Northwestern railroads (Map: Louisiana, C 3). It is the see of a Roman Catholic bishop and has a State normal school, a high sch ol, and St. Mary's Academy (Roman Catholic). The town is surrounded by a productive district devoted to stock raising and agriculture, its chief products being cotton and sugar cane. Natchitoches owes its origin to a trading post, established in 1714 by the French, and is the oldest town in the State. The water works and electric-light plant are owned by the municipality. The commission form of government has been adopted. Pop., 1910, 2532.

NA'THAN, MAUD (1862–). An American economist, born in New York City, a sister of Annie Nathan Meyer (q.v.) and the wife of Frederick Nathan, to whom she was married in 1880. She made addresses before the International Congresses of Women at London in 1899 and Berlin in 1904, the International Peace Congress at New York in 1907, and the International Conference of Consumers' Leagues at Geneva in 1908. In 1897 she became president of the Consumers' League of New York. She served also as vice president of the National Consumers' League, of the Equal Suffrage League of New York, and of the Equal Franchise League. Mrs. Nathan became known as a magazine writer and as a public speaker, and in 1912 she campaigned for the Progressive party.

NATHAN'AEL (Gk. Ναθαναήλ, transliteration of Heb. *Nethan'ēl*, God gives). One of Jesus' first disciples. He was of Cana of Galilee and, therefore, a neighbor of Philip, who was of Bethsaida. Both may have been disciples of the Baptist. He is mentioned in two passages in the Fourth Gospel (i. 45–51; xxi. 2). In the former passage, after Jesus had called Philip to his following, Philip finds Nathanael and announces that in Jesus of Nazareth had been discovered the one "of whom Moses in the law, and the prophets wrote"—in other words, the Messiah. Nathanael questions so great a religious product from so insignificant and possibly ill reputed a place ("Can any good thing come out of Nazareth?"), but is willing to accept Philip's invitation to make the test of personal acquaintance. Because of this open-mindedness he is greeted by Jesus as "an Israelite indeed in whom is no guile." His question at Jesus' estimate of his character ("Whence knowest thou me?") is not lacking in modesty; it is merely a naïve surprise at Jesus' knowledge of character in advance of knowledge of person and, upon Jesus' reply ("Before Philip called thee, when thou wast under the fig tree, I saw thee"), brings him at once to an acknowledgment of Jesus' Messiahship ("Rabbi, thou art the Son of God; thou art the King of Israel"). In the latter passage he is one of the group of seven to whom Jesus appeared at the Sea of Galilee after the resurrection. For the possible identification of Nathanael with the Bartholomew of the Apostle list, see BARTHOLOMEW.

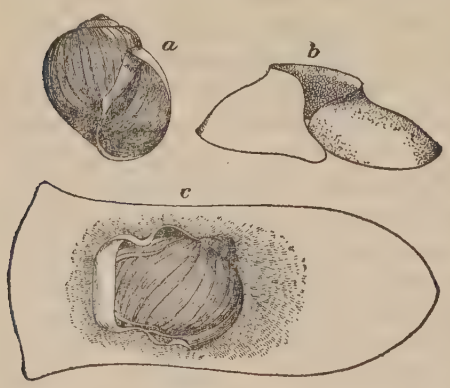
NATHAN DER WEISE, nä'tän dĕr vī'ze. A dramatic poem by Lessing, published in 1779, in which the author clothed in poetic form the principles underlying his controversial writings. The drama is based upon the story of *Melchisedec the Jew*, in Boccaccio's *Decamerone*. The character of Nathan is a monument to Lessing's friend Moses Mendelssohn, the Jewish philosopher.

NATHORST, nät'hôrst, ALFRED GABRIEL (1850–). A Swedish scientist, distinguished for his Arctic researches and expeditions. In 1870 and 1882 he served in scientific expeditions to Spitzbergen. In 1883 he was one of the scientific staff of Baron Nordenskiöld's (q.v.) expedition to Greenland. Leading an expedition in 1898, Nathorst circumnavigated Spitzbergen and visited and explored both the Wyches Islands (King Charles Islands) and Gillis Land (q.v.). He led in 1899 a geological expedition to east Greenland, where he discov-

ered King Oscar Fiord. In 1884 he became director of a section of the Riks-Museum, Stockholm. He was highly honored not only by the scientific societies of Sweden, but also by the universities of Cambridge and Greifswald and by societies of Berlin, Belgium, Vienna, etc. A voluminous and standard writer on Polar subjects in their relation to geology, geography, zoölogy, and especially to paleobotany, Nathorst published altogether more than 300 papers, essays, and books. A memoir on fossil floras of the Arctic region was issued by the Smithsonian Institution. His most important geographical work is *Två somrar i Norra Ishafvet* (2 vols., 1901). *Zur fossilen Flora der Polarländer* (2 vols., 1894–1915) is also especially significant in its field. For scattered memoirs, consult Hulth, *Swedish Arctic and Antarctic Explorations* (Upsala, 1910).

NATHUBHOY, nät'ụ-boi, Sir Mangaldas (1832–90). An East Indian merchant and reformer. He studied English, succeeded to his grandfather's fortune in 1843, and became the head of the Kapol Bania caste. In 1866–74 he was a member of the Legislative Council of India. Interested in social and educational reform, he established a dispensary at Kalyan in memory of his wife and a female ward in the David Sassoon Hospital at Poona and founded eight traveling fellowships in Bombay University. His benefactions amounted to nearly $2,500,000. He was knighted in 1875.

NAT'ICA (Neo-Lat., from Lat. *natis,* buttock). A genus of gastropod mollusks, represented by *Natica heros* (now *Polynices heros*), one of the most common and largest of the univalves and to be found in abundance along the Atlantic coast from New Jersey to Maine. The shell is large, composed of several whorls, with a small flattened spire or apex. The aperture is large, lunate in shape, and can be closed by a large horny door or operculum.



White snail (*Natica heros*).

a, the shell; *b*, an egg case; *c*, animal, with distended foot, in the attitude of walking.

The animal lives partly buried in the sand, near low-water mark. On taking it up the large, round, swollen foot or creeping disk ejects a spray of water as if poured from the rose of a watering pot. The animal has two short, broad, flattened tentacles, but, owing to its burrowing habits, its eyes are wanting. Its eggs are laid in a large, thin circular mass, like a miniature lamp shade, which is a curious object and a good deal of a puzzle to young collectors. Another common but much smaller snail (*Polynices triseriata*) is thought to be the young of this species. It is marked with three rows of bluish or chestnut-brown spots. A rather more southern species is *Polynices duplicata,* in which the umbilicus (open in the other species) is closed or nearly so. See Gastropoda. Consult A. F. Arnold, *The Sea Beach at Ebb-Tide* (New York, 1901), and A. G. Mayer, *Sea-Shore Life* (ib., 1905).

NATICK, nā'tik. A town, including several villages, in Middlesex Co., Mass., 17 miles west-southwest of Boston, on the Charles River and on the Boston and Albany Railroad (Map: Massachusetts, E 3). It has public parks, one containing a soldiers' monument, another a bathing beach, and still another a monument to the memory of John Eliot; the head of Cochituate Lake, one of the sources of Boston's water supply; the Walnut Hill School, for young ladies; the Morse Institute (public library and reading room); the Morse Hospital; and the Bacon Public Library. Another place of interest is the shoe shop where Henry Wilson, afterward Vice President, worked as a cobbler. The principal industries are the manufacture of boots, shoes, shirts, clothing, baseballs, boxes, saws, etc. The government is administered by town meetings. There are municipal water works. Pop., 1900, 9488; 1910, 9866; 1914, 10,026; 1920, 10,907. Natick was founded by John Eliot, who about 1651 brought hither from Nonantum a company of "praying Indians," and for many years it was almost exclusively a settlement of Indian converts. Near the centre of the town is their old burial place. Natick was incorporated in 1781. Consult: O. N. Bacon, *History of Natick* (Boston, 1856); S. A. Drake (ed.), *History of Middlesex County,* vol. ii (ib., 1880); Hurd, *History of Middlesex County, Mass.* (Philadelphia, 1890); W. W. Tooker, "Significance of John Eliot's Natick," in *American Anthropologist,* vol. x (Washington, 1897).

NATIONAL ACADEMY OF DESIGN, The. A society of American painters and sculptors, with headquarters in New York City. The first Academy of Arts in New York was founded in 1802 by prominent citizens, among whom was only one professional artist, Trumbull, but it excited little interest until 1825, when a secession of the younger artists occurred. Dissatisfied with the character of the old society, they formed a new association, called the New York Drawing Association, directed by practical artists. The present name was adopted in 1828, and the society, composed of 30 members, was incorporated. Prof. S. F. B. Morse (q.v.) was the chief organizer of the movement and was twice president of the National Academy, in 1827–45 and again in 1861–62. Other presidents who did much to shape the Academy's policies were Daniel Huntington (1862–70), Frederick Dielman (1899–1909), John W. Alexander (1909–15). J. Alden Weir was elected president in 1915, Mr. Alexander having declined to accept renomination. The election was considered an indication that the more liberal and younger element in the Academy were in the ascendant. The home of the society, the Fine Arts building on Fifty-seventh Street, proved inadequate for representative exhibitions, but the city refused to grant space in Central Park for a new structure, and no other plan had been settled on up to 1915.

The society is governed by a council consisting of its officers and six members, and the instructors in the school of design are chosen from among its ranks. The Academy stood for the conservative, traditional element in art, as opposed to the more modern tendencies which were represented in the earlier work of the Society of American Artists (q.v.); but since the union of the two institutions (see below) it has sought to include in its membership all art tendencies except what it deemed the ultra-radical. It held its eighty-first annual exhibition in 1906. At these exhibitions the Clarke prize of $300 and the Hallgarten prizes of $300, $200, and $100 respectively are distributed, and the Inness gold medal for the best landscape. On July 1, 1906, the National Academy was affiliated with Columbia University and the Metropolitan Museum of Art. In 1906 the Society of American Artists was merged into the Academy, all of its members not already Academicians becoming associates. The number of Academicians, hitherto limited to 100, was increased to 125 painters, 25 sculptors, and 25 architects and engravers. The school of design connected with the Academy has been in existence since 1825, and the instruction includes classes in the antique, life, still life, anatomy, painting, perspective, composition, etching, and medal and coin engraving. These classes are open from October until May and are free to students admitted on the evidence of the school committee. The average attendance of pupils is from 200 to 300. Consult T. S. Cummings, *Historic Annals of the National Academy of Design* (Philadelphia, 1865), and also *Catalogues of the Annual Exhibitions* (New York, 1826 et seq.).

NATIONAL ACADEMY OF SCIENCES. A society incorporated in 1863 for the purpose of examining and investigating any subject of science or art and for making the reports of special investigations at the call of the United States government, which makes appropriations for the expenses of special examinations and reports. The Academy consists of honorary members and foreign associates. Members must be citizens of the United States. One special meeting is held in each year in Washington, beginning with the third Monday in April, and another, called the autumn meeting, may be held at such time and place as the council of the Academy may determine. Special scientific meetings may be held at times and places designated by the council. In 1914 there was inaugurated a series of lectures called the William Ellery Hale lectures. These were established through a foundation offered by the children of William Ellery Hale, which provides for a course of two or three lectures at each semi-annual meeting of the Academy, to be delivered by some scientist of distinction. In the same year was also made the initial award of the Medal for Eminence in the Application of Science to the Public Welfare; this was established through a fund provided by Mrs. Helen Hartley Jenkins in memory of her father, Marcellus Hartley. The medal was awarded to Gen. George Goethals and to W. C. Gorgas for distinguished service in engineering and sanitation respectively in building the Panama Canal. The Academy has conducted or taken part in many important investigations. In 1914, at the request of President Wilson, a member was appointed to serve as one of a special commission to visit the Pribilof Islands for the purpose of advising the government regarding the condition of the fur-seal herd and to make the recommendations concerning the policy which should be adopted with reference thereto. The committee has several funds from which appropriations are made to carry on researches in science. The standing committees of the Academy are: mathematics; astronomy; physics and engineering; chemistry; geology and paleontology; botany; zoölogy and animal morphology; physiology and pathology; anthropology and psychology; weights, measures, and coinage; solar research; publication; finance; and the committee on collection of historical portraits, manuscripts, instruments, and so forth. In addition to the medal awarded above, the Academy presents also every five years the Barnard Medal for Meritorious Service to Science. The Academy has about 140 members and about 45 foreign associates. The president in 1915 was William H. Welch. The *Proceedings* of the meetings are published annually.

NATIONAL ARMS. Heraldic devices typifying national sovereignty whose use has received official sanction. National arms originally were in large part derived from the personal emblems of the ruler and thus gradually came to represent governmental authority, though with changes in forms of government and especially with the rise of democracy these emblems often lost their original significance. In some cases where monarchical government has been supplanted by a republican form there has been a corresponding change in the national arms, as instanced in the case of Portugal in 1910; while in such a democracy as the United States national arms have been sanctioned and adopted without the slightest reference to any emblem of an individual or group of individuals. Likewise in Great Britain, where the arms have resulted from the heraldic devices of individual sovereigns, to-day they are symbolic of governmental rather than personal authority. While the insignia of saints and martyrs usually appear in the heraldic blazonments of nations according to the laws of heraldry, which as is well known dates from the Crusades, yet among the national emblems and symbols there are often found forms of crosses and stars, swastikas, and other devices plainly of prehistoric origin. The reader is referred to the article HERALDRY, especially the section where is discussed the application of its laws and principles to national coats of arms.

NORTH AMERICA

United States. The national emblem consists of arms and crest, the arms being an American eagle displayed proper, bearing on his breast a shield having 13 pales, alternately silver (white) and red. There are seven white pales, thus making a white one come in the centre and making the edges white, the reverse of the order on the national ensign. (See FLAG.) The shield has a chief of blue, i.e., an upper horizontal portion, but on this chief there are no stars. The sinister talon of the eagle holds 13 arrows, proper; the dexter claw grasps an olive branch, proper. The olive branch has 13 leaves and 13 berries, though this number is not specifically prescribed by law. The motto on a ribbon held in the eagle's beak is *E pluribus unum*, meaning "One out of many," and has reference to the formation of one nation by the union of the States.

The crest is over the eagle's head and is a circular golden glory breaking through, and so surrounded by, a white cloud. On the glory are 13 five-pointed stars, described in heraldic language as mullets. These are on a blue ground. The stars are silver (white) and represented a new constellation in the political firmament. On the reverse of the 50-cent coin, where the arms are shown approximately correct, the 13 stars over the eagle's head are without the glory, and the olive branch has no berries.

EUROPE

Austria-Hungary. The arms of the dual monarchy are a black double-headed eagle. The heads are crowned, and the double head indicates the former Holy Roman Empire. Above and between the eagle's heads is the Imperial crown of Austria. The dexter claw of the eagle holds a sword and sceptre and the sinister claw an orb, and on the breast is shown a shield divided equally into three vertical portions—(1) Hapsburg, a golden ground with a rampant lion in red; (2) Austria, a silver fess on a red ground; (3) Loraine, a red bend bearing three eaglets in silver, all on a golden ground. The shield is surrounded by the collars of the Order of the Golden Fleece and of Maria Theresa. On the wings of the eagle are the arms of the 11 provinces, each small shield ensigned with a crown. The provinces represented are, on the dexter wing: (1) Hungary ancient impaling Hungary modern. This is four silver bars on a red ground, said to refer to the four great rivers of Austria, the Danube, the Save, the Drave, and the Theiss. On a red field a triple mount green, with a patriarchal cross silver issuing from a crown gold, for Austria modern. The mountains are supposed to represent the three highest peaks in the Carpathians. (2) Esclavonia; (3) Austria above the Enns impaling Austria below the Enns; (4) Salsburg; (5) Styria; (6) Tirol. At the top of the sinister wing is (7) Bohemia; (8) Illyria; (9) Esclavonia; (10) Moravia impaling Silesia; (11) Carinthia impaling Carniola.

Belgium. The royal arms of Belgium are a golden lion on a black ground; its tongue and claws are red. The shield is ensigned with the royal crown of Belgium, and the supporters are two golden lions. The motto of Belgium is *L'Union fait la force* (Union makes strength). This coat of arms is borne on the central yellow portion of the royal standard, a flag composed of equal vertical stripes of black, yellow, and red.

Bulgaria. A crowned golden lion, salient, bearing a shield with a blue diapered bend dexter on a ground of five bars black on gold.

Denmark. The arms of Denmark are quartered by the Dannebrog. (See NATIONAL FLAGS.) The first quarter represents Denmark and is three blue lions crowned on a golden ground, powdered with red hearts. The second quarter is for Schleswig, two blue lions on a golden ground. The third quarter shows modern Sweden, three open golden crowns on a blue ground; Iceland, a silver hawk on a red ground; the Faro Islands, a silver goat, walking, on a blue ground; Greenland, a rampant silver polar bear on a blue ground. The fourth quarter shows Jutland, a blue lion at the top, on a golden ground, and ten red hearts below; Vandalia, a golden dragon on a red ground. On a secondary shield or inner escutcheon appear the arms of (1) Holstein; (2) Stormerk; (3) Dietarchen or Ditzmers; (4) Lauenburg. On a third shield, hanging in front, or on the centre of the others, Oldenburg impales Delmenhurst. The supporters are two savage men wearing green wreaths and each holding a wooden club. The royal standard is red, with a white cross. The flag is swallow-tailed, and at the space where the cross's arms intersect there is a square of white containing the royal arms.

France. The arms of Republican France are neither official nor an heraldic device. The official seal adopted in 1870 represents a seated figure of France bearing the fasces. It is a more or less conventional representation of the goddess of liberty, with a sheaf of grain, typifying fruitfulness, at her feet, the lamp of truth or reason, and other symbols. The head is decorated by rays. The tricolor or national flag is used exclusively for patriotic display, though a decorative emblem with letters R F was authorized in 1896, while a shield with the national colors and bearing the letters R F and the axe and fasces is frequently employed.

Germany. The Imperial arms of Germany consist of a black eagle displayed, with red claws and beak, bearing upon his breast the arms of Prussia, a golden shield with a black, displayed eagle holding in his dexter talon a sceptre and in his sinister one an orb. On the breast of the Prussian eagle is a small shield quartered black and white, the colors of the Hohenzollerns.

Great Britain. The arms of Great Britain are the personal arms of the King. William the Conqueror bore two golden lions, or leopards, on red, said to represent Normandy and Maine, and when Henry II married Eleanor of Aquitaine he added a lion to represent his sovereignty over that province. These now appear in the first quarter. The lion rampant of Scotland, red on a golden ground, is surrounded by the double tressure, flory counterflory, also red, and appear in the second quarter. The origin of the tressure is uncertain; it probably refers to an *entente* with France. It is shown on the seal of Alexander III (1249). The Irish harp, gold with silver strings on a blue ground, appeared in the royal arms (third quarter) in the reign of James I (1603). Blue is the color for Ireland, not green, as is so often incorrectly used on bunting. The fourth quarter repeats the first, according to heraldic rules. The shield is surrounded by the garter of the Knights of the Garter, and it is quite proper to show the collar of the order as well. The supporters are, dexter, a crowned lion rampant gold for England and, sinister, a silver unicorn rampant with gold collar and chain for Scotland. The motto is *Dieu et mon droit* (God and my right), with the rose, shamrock, and thistle placed about the ribbon. The crest is a crowned lion standing on the crown, upon a helmet placed afronté, with five bars across the face. The royal standard, which is the King's personal flag, hoisted on shipboard or on a building only when the King himself is present, displays merely the arms without crest, supporters, or mottoes and is practically the royal escutcheon in bunting. The arms of the Prince of Wales are the same as the King's, except that they are differenced by a silver label of three points and contain the

crowned arms of the Principality of Wales displayed on a shield of pretense in the centre. The supporters are also differenced by a label.

Greece. A blue shield bearing a silver cross and surmounted by the crown is the arms of Greece. The supporters are two savage men with clubs, standing above the motto. See NATIONAL FLAGS.

Holland. Upon a blue ground dotted with golden billets there is a crowned golden lion rampant, grasping in one paw a naked sword and in the other a sheaf of arrows. The shield is crowned, and the supporters are two crowned lions rampant. The motto on a scroll underneath is *Je maintiendrai* (I will maintain).

Italy. The royal arms of Italy are a crowned black eagle displayed on blue. On the breast is a cartouche, or oval shield, with a white or silver cross on a red ground. The shield is surrounded by the collar of the Annunciation, with its pendant representing that event. The collar is composed of a series of red and white roses and the letters R T F E joined together. In the collar the letters are thus arranged. The meaning is uncertain, but, as they appear in the collar, the reference is probably to the sentence, *Rhodum tenuit fortitudo ejus* (His firmness held Rhodes), referring to the assistance given by Amadeus the Great to the Knights of St. John of Jerusalem in 1310 at the siege of Rhodes by the Saracens. See NATIONAL FLAGS.

Monaco. This small principality has a canopy "of the colors," i.e., like the shield. This is heraldically described as fusily silver and red. The canopy is crowned and is also covered with diamond-shaped figures, white and red, as described. The supporters are two monks with swords. The collar of the Order of St. Charles surrounds the shield. The motto placed over the shield is *Deo juvante* (God helping).

Montenegro. Red, a double-headed eagle, displayed silver, over which is the royal crown. The bird holds sceptre and orb; a small shield on the breast contains the letters H I, and underneath the eagle is a golden lion. The initial, though like an "H," is really Montenegrin "N"—referring to Nicholas, the King. "I" is the Roman numeral.

Norway. A red, crowned shield, in which is a golden lion rampant holding a battle-axe.

Portugal. The arms of Portugal consist of an armillary sphere upon which is placed a silver shield bearing five small escutcheons of blue with five plates or disks of silver in each. The large shield has a red border on which are seven golden castles. See NATIONAL FLAGS.

Rumania. Within a canopy of ermine is a crowned quartered shield: (1) a golden eagle displayed on blue; (2) a lion's head, gold on red; (3) a golden demilion issuing from an antique crown, on red; (4) two dolphins, gold on blue. A small shield of pretense is quartered white and black.

Russia. The Imperial arms of Russia are the black double-headed eagle. On the breast of the eagle is a red shield showing in natural colors St. George slaying the dragon. Surrounding the shield are the collar and pendant of St. Andrew. The heads of the eagle are crowned, and above and between them is the crown of Russia. The talons hold orb and sceptre. The Imperial eagle on the standard has no sceptre and orb, these being replaced by two maps, one of the Caspian Sea in the dexter claw and the Black Sea in the sinister. The beaks hold two maps, the dexter beak showing the Baltic Sea and the sinister the White Sea. On the displayed wings of the eagle are eight small shields representing the provinces of Russia. They are not crowned, but stand for—(1) Kazan, a black dragon; (2) Poland, a silver eagle, displayed; (3) Taurida, an eagle, displayed, with a shield on its breast bearing a triple cross; (4) this escutcheon is divided into three and looks like a division of a window with two curtains drawn aside at the bottom and the blind or shade showing in the exposed space between: (*a*) Kiev, the figure of St. Michael, (*b*) Novgorod, a throne in front of which are two black bears on a golden ground and two fish in base, (*c*) Vladimir, a red lion rampant with golden crown; at the top of the sinister wing are (5) Astrakhan, a royal crown and scimitar; (6) Siberia, two martins on an ermine ground; (7) this shield is quartered: (*a*) Kabarda, arrows and stars, (*b*) Iberia, a leaping horse, (*c*) Kartalinia, a volcano, (*d*) Armenia, a red lion rampant, (*e*) Circassia is shown by the curtain-and-window arrangement—a warrior, and (*f*) Georgia—St. George and the dragon is placed on a shield of pretense; (8) is Finland, a lion rampant with sword and scabbard.

Servia. A crowned red shield within a crowned ermine canopy. On the shield is a silver eagle displayed bearing upon its breast a red shield with silver cross and the date 1804. Between each two of the arms of the cross is a Slav initial letter. The supporters are two natives holding flags of the colors, and the motto is *Spes mihi prima Deus* (My hope is God, first of all). The motto is not now used.

Spain. The arms of Spain are within an ermine-crowned canopy. They consist of a quartered shield representing 1 and 4, Castile, and 2 and 3 Leŏn; a golden castle on a red ground for Castile and a red lion rampant on a silver field for Leŏn. The shield is encircled by the collar of the Golden Fleece. In the lower portion, between the vertical division, or *enté en point*, there is on silver a pomegranate proper, for Granada. Over all a cartouche of France (modern), three golden fleurs-de-lis on a blue field.

Sweden. An ermine canopy on which appears a crowned shield of blue quartered by the gold Dannebrog. The quarters are: 1 and 4, three open golden crowns for Sweden; 2 and 3, a golden lion rampant on three silver bends, wavy, sinister, for Gothland. On a small shield, at the centre of the Dannebrog, is Vasa impaling Pontecorvo. Vasa is tierced in bend, blue, silver, and red, a gold sheaf or vase. Pontecorvo has a blue shield, and in chief an eagle of the French Empire, gold. In base a three-arched, towered bridge over a river, silver. The whole is surrounded by the collar of the Order of the Seraphim. The supporters are rampant lions with double tails.

Switzerland. Switzerland bears a red shield with a white cross in the centre. The arms of the cross do not touch the edges of the shield. See NATIONAL FLAGS.

Turkey. Gold on red, the Arabic cipher of the reigning sultan. See TOGHRA.

SOUTH AND CENTRAL AMERICA

Argentina. This is an oval coat of arms made by a wreath topped by a demisun in

splendor. The oval is divided by a horizontal line in the centre, with blue in the upper half and white below. A pair of hands clasped hold a staff, which is surmounted by a Phrygian cap, used here as the symbol of republican government.

Bolivia. A trophy of flags, three on a side, and the muzzles of four rifles with bayonets. The central space is an oval divided horizontally. The word Bolivia on the gold border of the upper half and nine stars on the blue border below. A landscape of mountain, sun, tree, sheep, and a garb occupy the centre, and a condor spreads its wings above the whole.

Brazil. A five-pointed star of green and white contains a central circle of blue on which the stars of the Southern Cross appear. The border contains 20 stars. The large star lies on golden rays with wreath of laurel, and an upright sword stands behind. The country's name is on a ribbon below.

Chile. A shield of blue (above) and red, bearing a single white star. Supporters an eagle and a stag, surmounted by three plumes, red, white, and blue.

Colombia. A trophy of flags, two on a side. A condor is above a shield containing in chief three gold cornucopias on blue; in fess a liberty cap, red on silver; in base a sea scene with ocean, harbor, ships, and land.

Costa Rica. A trophy of flags and weapons, a ribbon with the country's name, a shield with five golden stars, mountains, ocean, and harbor, with two ships. Above all a fillet with *América Central* on it.

Cuba. A shield, backed by the fasces and the liberty cap, surrounded by the laurel and a native shrub. In chief a landscape of rising sun in red and a golden key. Below the colors blue and white and a scene with a native tree and mountains in the rear.

Dominican Republic. A shield bearing a white cross, the quarters, blue and red alternately, showing a trophy of flags, a Bible, and a cross. A wreath of palm and native shrub. Below a blue ribbon has the country's name and the words *Dios patria libertad.*

Ecuador. A trophy of four flags, an oval with the fasces below and a condor above. In the oval are the sun amid the signs of the zodiac and a scene with mountains, sea, islands, and a steamer.

Guatemala. A wreath surrounding a scroll with the words *Libertad 15 de Setiembre 1821,* backed by guns, bayonets, and swords, forms the arms. The gaudily plumed quetzal is perched upon the scroll.

Haiti. A trophy of cannon, flags and rifles, drums and an anchor. The fasces, from which sprout palms, and above the liberty cap.

Honduras. A landscape with trees and habitations, two cornucopias, an oval bearing the words *Repca. de Honduras libre soberana independiente, 1821.*

Mexico. Above a wreath and standing on the prickly pear, an eagle rising, with a snake in its mouth.

Nicaragua. A trophy of flags, cannon, battle-axes, rifles, and bayonets, inclosed in a wreath of laurel, surrounds a triangle. A water scene with five islands and rising sun; the central island bears the liberty cap upon a pole.

Peru. A shield, in chief a llama gold on blue, a green cinchona tree on white, and below a gold cornucopia, filled with gold coins, on red. The shield is surrounded by a spray of laurel and palm, with a wreath of the same above.

Salvador. A trophy of flags surrounded by a laurel wreath. A triangle with five mountains, the liberty cap with rays on a staff, the date, and a rainbow above the cap. The motto, *Dios—Unión—Libertad.* Completing the white circle of the badge, the words *República del Salvador en la América Central.*

Venezuela. A shield, in chief a garb of gold on red. The flag, with swords on gold. In base a white horse on green earth and backed by an azure sky. Above are two cornucopias, and the laurel and palm flank the shield. The motto gives the dates 1811 and 1864 for founding and independence.

ASIA

The emblems of Japan and China, though national in character, are not coats of arms in the ordinary sense, and naturally they cannot be heraldically described. They are not borne on a shield, and are not armorial bearings in the true meaning of the term. They correspond more nearly to what are called badges, and are emblematic.

China. The national emblem of China is a combination of many elements, but is not strictly a coat of arms. The principal element is the steel blade of a hatchet, colored pale blue. The edge is downward, and the hatchet indicates decisiveness. Upon the hatchet are 10 grains of rice (silver). Inclosed in a red space, bounded by a golden border of slightly diverging sides and pointed top, is a golden rice plant. This represents the nourishment or sustenance of the people. Perched on the sloping back of the hatchet, on the dexter side, is a flowery fowl, somewhat resembling a bird of paradise. The back is green and the breast red. This bird typifies beauty. About it are strands of green aquatic grass signifying purity. A sprig of the same plant is in the beak, while above its head are three stars, drawn like pearls. In one talon it holds a temple cup (silver), which has the symbolic meaning of filial piety. On the sinister side of the hatchet is a green dragon, meaning changeableness. Conventional three-tongued red bursts of flame over and below the dragon indicate brightness. In one claw is the silver cup of filial piety. Above the dragon's head is a crescent moon, and above the whole is a representation of the great red sun. The (pearl) stars above the bird, the moon above the dragon, and the sun above them all typify light. The pointed top of the figure containing the rice plant on the hatchet is intended to suggest a mountain, standing for command. Below the edge of the hatchet, and woven about with artistically twining ribbons, is a curious zigzag symbol, made up of four parts, each like the block letter U laid on its side. These are placed back to back in pairs. It is a very ancient symbol, probably derived from the holding device or buckle for a priest's girdle or belt, and signifies sound judgment.

Japan. The personal badge of the Mikado is a golden chrysanthemum of 16 rays. In the standard it appears on the red ground of the flag, but it has no distinctive background on which it habitually stands. When used by a representative of the Mikado's government it may be displayed on any suitable or convenient color, or it may be shown without a background.

Bibliography. Under HERALDRY and NA-

NATIONAL COATS OF ARMS

MEXICO

GUATEMALA

HONDURAS

SALVADOR

NICARAGUA

COSTA RICA

CUBA

HAITI

UNITED STATES

SANTO DOMINGO

BRAZIL

VENEZUELA

COLOMBIA

ECUADOR

PERU

CHILE

BOLIVIA

ARGENTINE
REPUBLIC

URUGUAY

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TIONAL FLAGS will be found a complete and useful bibliography of works on national arms.

NATIONAL ASSEMBLY. See ASSEMBLY, NATIONAL.

NATIONAL BANKS. See BANKS, BANKING.

NATIONAL CEMETERIES. In the United States, cemeteries provided and maintained by the Federal government for the interment, free of cost, of officers, cadets, and enlisted men of the army, navy, marine corps, and revenue-cutter service, and army and navy paymaster clerks, who have died in the regular or volunteer service of the United States or who die after having been mustered out or honorably discharged. The same rights are accorded any nurses who are honorably discharged or pensioned. The presentation of the commission, warrant, or honorable discharge of the deceased officer, enlisted man, or army nurse, or the letter of appointment of the deceased army and navy paymaster clerk, signed by the Secretary of War or Navy, as the case may be, is sufficient authority for the interment. If the honorable discharge is not available as evidence of service, the interment may be made upon presentation of a pension certificate. Service as an officer or as an enlisted man in the State militia or National Guard, even though the decedent drew a pension on account of such service, does not entitle to interment in a national cemetery unless the organization was mustered into the service of the United States. When the statement of service shows the decedent to have been a general prisoner, a deserter, or a dishonorably discharged man, interment will not be made. Wives of officers and enlisted men may be interred in national cemeteries under regulations prescribed by the War Department. National cemeteries are under the charge of the quartermaster-general of the army, War Department, Washington, D. C., to whom all communications should be addressed. His representative is the officer of the quartermaster corps nearest the cemetery. Superintendents and assistant superintendents, who reside at the cemeteries, have immediate supervision thereof. They are usually selected and appointed by the quartermaster-general from among veterans of the Civil or other wars of the United States. They must be physically and mentally qualified for such duty. There are 84 cemeteries, all of which are within the continental limits of the United States, except one in the city of Mexico, Mexico. They are located as follows:

UNITED STATES NATIONAL CEMETERIES

Alexandria, La.
Alexandria, Va.
Andersonville, Ga.
Andrew Johnson (Greeneville), Tenn.
Annapolis, Md.
Antietam (Sharpsburg), Md.
Arlington, Va.
Balls Bluff (Leesburg), Va.
Barrancas, Fla.
Baton Rouge, La.
Battleground (Washington), D. C.
Beaufort, S. C.
Beverly, N. J.
Brownsville, Tex.
Camp Butler, Ill.
Camp Nelson, Ky.
Cave Hill (Louisville), Ky.
Chalmette, La.
Chattanooga, Tenn.
City Point, Va.
Cold Harbor, Va.
Corinth, Miss.
Crown Hill (Indianapolis), Ind.
Culpeper, Va.
Custer Battlefield (Crow Agency), Mont.
Cypress Hills (Brooklyn), N. Y.
Danville, Ky.
Danville, Va.
Fayetteville, Ark.
Finns Point (Salem), N. J.
Florence, S. C.
Fort Donelson (Dover), Tenn.
Fort Gibson, Okla.
Fort Harrison (Varina Grove), Va.
Fort Leavenworth, Kans.
Fort McPherson (Maxwell), Neb.
Fort Scott, Kans.
Fort Smith, Ark.
Fredericksburg, Va.
Gettysburg, Pa.
Glendale, Va.
Grafton, W. Va.
Hampton, Va.
Jefferson Barracks, Mo.
Jefferson City, Mo.
Keokuk, Iowa.
Knoxville, Tenn.
Lebanon, Ky.
Lexington, Ky.
Little Rock, Ark.
Loudon Park (Baltimore), Md.
Marietta, Ga.
Memphis, Tenn.
Mexico City, Mexico.
Mill Springs (Nancy), Ky.
Mobile, Ala.
Mound City, Ill.
Nashville, Tenn.
Natchez, Miss.
New Albany, Ind.
Newbern, N. C.
Philadelphia, Pa.
Poplar Grove (Petersburg), Va.
Port Hudson, La.
Quincy, Ill.
Raleigh, N. C.
Richmond, Va.
Rock Island, Ill.
Salisbury, N. C.
San Antonio, Tex.
San Francisco, Cal.
Santa Fe, N. Mex.
Seven Pines, Va.
Shiloh (Pittsburg Landing), Tenn.
Soldiers' Home (Washington), D. C.
Springfield, Mo.
St. Augustine, Fla.
Staunton, Va.
Stone River (Murfreesboro), Tenn.
Vicksburg, Miss.
Wilmington, N. C.
Winchester, Va.
Woodlawn (Elmira), N. Y.
Yorktown, Va.

NATIONAL CIVIC FEDERATION, THE. An organization of prominent representatives of capital, labor, and the general public, formed as the direct outgrowth of conventions held in Chicago and New York in 1900–01. Its purpose is to organize the best brains of the nation in an educational movement seeking the solution of some of the great problems related to social and industrial progress; to provide for study and discussion of questions of national import; to aid thus in the crystallization of the most enlightened public opinion; and, when desirable, to promote legislation in accordance therewith. In 1915 the work of the Federation was carried on through the following agencies: 1. The Industrial Conciliation Department, dealing entirely with strikes, lockouts, and trade agreements. Its membership included representatives of the general public and the leading organizations of employers and wage earners. The services of this department have been enlisted in more than 500 cases, involving every phase of industrial controversy. 2. The Industrial Economics Department, organized to promote discussion of practical economic and social problems. 3. Welfare Department, composed of employers of labor in stores, factories, mines, and on railroads, officials who have to do with the working conditions of public employees, chairmen of boards of health, heads of departments of public safety, leading physicians connected with public hospitals, heads of charity boards, and others. 4. The Woman's Department, composed largely of women who are themselves stockholders or who through family relationships are financially interested in industrial organizations. The object of this department is to use its influence in securing needed improvements in the working and living conditions of women and men wage earners in the various industries and governmental institutions and to coöperate, when practicable, in the general work of the Federation. 5. The Department on Compensation for Industrial Accidents and their Prevention, composed of employers, representative labor men, attorneys, insurance experts, economists, State officials, members of State compensation commissions, and others concerned. Its object is to advocate the amendment of State laws on employers' liability, with a view to securing uniform provisions looking towards compensation for industrial accidents, and to look into means of preventing accidents in commercial and manufacturing enterprises. 6. Social Insurance De-

partment, to investigate the need for uniformity of State legislation governing insurance plans relating to sickness, death benefits for widows and orphans, old-age pensions, or unemployment. 7. Department on Regulation of Combinations and Trusts, working for coördination of Federal and State laws and unification of the latter. 8. Department on Regulation of Interstate and Municipal Utilities. It has published *Commission Regulation of Public Utilities*, a compilation and analysis of laws of 43 States and of the Federal government for the regulation by central commissions of railroads and other public utilities. 9. The Pure Food and Drugs Department, composed of representatives of State food and dairy departments, public-health associations, and organizations of physicians, farmers, wage earners, and food and drug manufacturers, as well as large individual employers of labor. Its object is to promote uniform legislation on this subject among the States, work for effective coöperation between State and Federal governments, and stimulate the public to demand a better enforcement of existing laws.

NATIONAL COATS OF ARMS. See NATIONAL ARMS.

NATIONAL CONFERENCE OF CHARITIES AND CORRECTION. A body composed of the State boards of public charities, where they exist; of delegates appointed by the governors of other States; of charity organization societies and associated charities throughout the United States; and of persons connected officially or unofficially with charity work. It holds annual meetings in some city determined upon at a preceding meeting of the Conference. It has no formal constitution. The Conference maintains a bureau of information on all subjects concerning charity and corrections, and publishes annually its *Proceedings* and *National Bulletin*.

NATIONAL CONVENTION, IN FRENCH HISTORY. See CONVENTION, NATIONAL.

NATIONAL COVENANT. The league formed by the Scottish Presbyterians in 1638, being one of the famous covenants (q.v.).

NATIONAL DEBT. See DEBT, PUBLIC.

NATIONAL EDUCATION, SYSTEMS OF. A system of national education may be said to exist wherever the sovereign authority in a nation takes part in the establishment, maintenance, or to any considerable extent the regulation of the agencies for the education of the people. In ancient times and among the antique civilizations that survive to-day state systems of education are found. Such systems are (1) theocratic, where the priesthood, who form a ruling caste or are intimately connected therewith, carry on education; (2) examining, where the state conducts tests for citizenship or official position, thus indirectly determining the character of the instruction; or (3) martial, where the state aims to prepare its youth for citizenship, which is practically equivalent to membership in its army. The Roman government regulated education to some extent, and the emperors endowed many institutions of learning. With the fall of the Roman Empire and the appearance of the mediæval ecclesiastical system, the Church assumed control of education in Europe and resented any encroachment of the state upon its domain. The Reformation, however, by placing wherever it prevailed the control of religion in the hands of the state, transferred to the secular authority the control of education as well. The modern emphasis on the necessity of education for all, not only in religion, but also in letters, led to a broader popular education than had hitherto existed. The multiplication of sects that was an outcome of the Protestant movement brought about so much warfare regarding religious instruction that in most of the advanced nations it has largely or entirely disappeared from the curriculum of the state schools. Thus the modern systems, concerned principally with secular instruction, and controlled by the state, have come to exist.

The development of modern national support and control of education has in general followed this order: first the regulation, then the partial support, and finally the assumption by the state of almost the entire responsibility for the education within its borders.

The result of the vigorous efforts of the most progressive states within the nineteenth century is the almost entire disappearance of illiteracy within their borders. Germany, Switzerland, and Sweden find less than 1 per cent of their conscripts unable to read and write. In Holland, England, and France the proportion of illiteracy grows greater, 3.3 per cent of the French recruits in 1907 being ignorant of letters. In Italy the percentage of illiterate conscripts in 1905 was 30.06, and the marriage register shows that 38.7 per cent of the women called upon to sign it were unable to do so; of the total population over 21 years of age in 1911, 34.7 per cent of the males and 48.5 per cent of the females were illiterate. In Spain the percentage of illiteracy was estimated as 68 per cent in 1889, and this proportion was reduced about 10 per cent by 1900. In the United States in 1900, 10 per cent of the population over 10 years of age could neither read nor write; but this was reduced in 1910 to 7.7 per cent. This large proportion, however, is due to the enormous negro population and to extensive immigration from eastern and southern Europe. Only 7 per cent of the native population over 10 years of age was illiterate in 1900 and 10 years later only 3.7 per cent. Doubtless the proportion of illiterate adults whose parents were native would in America (if we exclude negroes) be about as small as that of illiterate conscripts in the European states having the most effective systems of popular education. In the two years 1913–15 strenuous efforts were made to eliminate illiteracy and classes for adults were established in the more backward parts of the country.

In 1912–13, 19.03 per cent of the population of the United States were enrolled in elementary schools. Canada and Switzerland show about the same percentages. Then follow England, Germany, the Netherlands, and Norway. Italy had only 9 per cent of her population in elementary schools in 1911, while in Russia this percentage was 3.6. The United States also leads in the amount expended for elementary education, whether we calculate the rate of expenditure per capita on the total population or per pupil on the enrollment in the schools. The average expenditure per pupil in average attendance in 1911–12 was $36.30, about double that of either England, France, or Prussia. Italy spent, in 1902–03, $5.30 per pupil; Russia still less. The United States spent on elementary education, in 1911–12, $4.76 per capita on

the total population. England followed with about $1.75 per capita. The statistics given above as well as those that follow are in each case the latest available. In making the comparisons differences in methods of arriving at the totals and other conditions must be taken into account.

CANADA

An outline of the technical and administrative features of the Canadian educational system will be found in the article CANADA. As therein stated, each province is left to legislate for its own educational affairs, but its exclusive lawmaking powers are subject to provisions which safeguard the educational rights of religious minorities as they existed in each province at Confederation (1867), and which in certain cases authorize remedial legislation by the Dominion Parliament. It is difficult to understand the Canadian system apart from its racial and religious factors. Ordinarily the fact that in regard to education each province regulates its own affairs would imply the purely provincial character of educational questions, but in Canada such questions are frequently of national importance and engage the passionate interest of the whole Dominion. The explanation is found in the proportion which (1) Canadians of French descent and (2) Canadians professing the Roman Catholic religion respectively bear to the whole population. In 1911, out of a total population of 7,206,643, the French numbered 2,054,890, or 28.51 per cent; while Roman Catholics of various races numbered 2,833,041, or 39.32 per cent. The result is that a dispute over the educational rights of the French minority in Manitoba at once becomes the intimate concern of the French majority in Quebec; while the increase of the French population in Ontario and the accompanying demand for bilingual schools excite in that province a Protestant reaction which is rapidly communicated to the other provinces. Politically speaking, therefore, an educational dispute in any province is liable to be taken up by racial or religious sympathizers throughout Canada. The educational ideals and practice imposed by the Roman Catholic hierarchy and those inherited by the English-speaking Protestants are the chief agencies by which the political rivalry of two civilizations under one flag is carried on. So long as this continues there is not likely to be any bridging of the educational gap between the Roman Catholic elementary schools, the Quebec classical colleges, and Laval University on the one hand and the English-speaking public schools and the unsectarian universities, whether provincial or of private foundation, on the other. The former are under strict, centralized ecclesiastical direction; the latter are under popular control, provincial and local.

Before 1900 the demand for bilingual schools was commonly made only in behalf of the French-Canadian population. Afterward it became more aggressive, and evidence of its indestructible motive was afforded by the French Language Congress of 1912 at the city of Quebec, which was attended by a thousand delegates from all parts of the continent where French is spoken. Since the beginning of the twentieth century the increasing volume and variety of immigration have extended the demand to include Germans and the different Slav and Scandinavian races. In Manitoba (q.v.) the problem is highly complicated. Bilingual schools are found in districts where the French, German, Polish, Ruthenian, and other nationalities are largely represented. These schools are not legal in Alberta and Saskatchewan, but the demand for them is such that a further increase of foreign immigrants cannot but suggest the political recognition of educational privileges similar to those enjoyed by the French-speaking population. In Ontario, Manitoba, Alberta, and Saskatchewan—British Columbia, and the Maritime Provinces are but slightly affected by this question, and Quebec has a place by itself—the position of the different governments, which most probably would be reflected by the preponderant sentiment of the whole country in a federal election, may be said to be unalterably fixed in favor of assuring English elementary schools for the people and the predominance of the English language in public-school teaching. But this has proved to be quite consistent with a liberal educational recognition of the languages and religious beliefs of the various races which compose the Dominion of Canada. Consult the *Educational Reports* of the different provincial governments.

FRANCE

The system of public instruction in France comprises three departments—primary, secondary, and higher. They are all under centralized control. At the head of the system stands the Minister of Public Instruction, who is a cabinet officer. Each of the great departments has a special director. The central administration includes, in addition, the Superior Council of Public Instruction and the general inspectors. The Superior Council consists of about 60 members, and has advisory and judicial functions. One-fourth of its members are appointed by the President. Other vacancies are filled by the Council itself. It has a committee to consult with the school authorities regarding school matters. Officials exist for the inspection of every phase of school work.

For convenience in educational administration France (including Algeria) is organized into 17 academies. Each one comprises a university, associated lycées and colleges, and the public primary schools within its limits. At the head are a rector, an academic council, composed of professors and officers of education, and an academic inspector. Under the academic inspectors serve the primary inspectors, who come in direct touch with the schools, each one having supervision of about 150. The departments of France, including Algiers, of which there are 90, constitute the next division for school administration. The prefect has the power of appointing elementary teachers, and there is an advisory council for primary schools, composed of teachers, school inspectors, and members of the civic council. In the communes the councils and mayors select sites for school buildings and vote the funds for the communal school expenditures. There are also committees formed to encourage school attendance.

It has been said that the control of schools in France is highly centralized. The President of the Republic appoints the Minister of Instruction, the general inspectors, the professors in the universities, the rectors of the academies, the prefects of the departments. The Minister of

Public Instruction appoints the rest of the officials of the central department, the central examination boards, the academy inspectors, the primary inspectors, the secondary teachers, the officials in the normal schools and in the superior elementary schools. The entire body of educational officials is therefore practically in the hands of the President, the Minister of Public Instruction, and the academic inspector.

The Superior Council deals with programmes for instruction, regulations for discipline, teaching, and school management generally, and hears appeals from the lower councils regarding schools that have been suppressed or have not been sanctioned by the lower authorities. It is the high court of appeal in all contentions. The academic council oversees courses of instruction in either higher or secondary schools, judges cases involving discipline of teachers or pupils therein, or the establishment or suppression of secondary schools. The departmental council has similar functions regarding the primary schools and determines their establishment, location, and the number of teachers. It also inspects them.

By the laws of 1890 and 1896 universities have been organized in each academy. Preparatory to them are lycées, or secondary schools maintained by the state, of which there were in 1912 for boys 112 and for girls 53; communal colleges, or secondary schools maintained by the local authorities, for boys, of which there were 230; and colleges for girls, numbering at that date 79. All these institutions take both boarders and day pupils. Besides these there were 57 secondary courses for girls. The primary schools may be grouped under five heads: (1) The *maternal schools*, which receive children between two and six years of age. From being schools for taking care of children whose mothers were out at service, they have become part of the educational scheme. They are supplemented by infant classes, which prepare the children for the elementary schools, and take the place of the maternal schools in small communities. To them are admitted children from four to seven years of age. (2) The *elementary primary schools* (*écoles primaires élémentaires*). These take children from 6 to 13, the work being divided into three grades of two years each. (3) The *superior primary schools* (*écoles primaires supérieures*). The place of these may be taken by the "complementary courses." The latter are partly review courses, partly advanced, with special attention to training for practical life. In them instruction lasts two years. There are two classes of superior primary schools—the professional and the nonprofessional. The first class includes commercial, technical, and industrial schools. The second has an advanced, liberal course for three years, supplementing it by considerable technical and industrial work during the rest of the time. It takes pupils from 12 to 18. It was originally designed to prepare for the secondary schools, but having a somewhat similar course, and being less aristocratic, it failed. It was revived with the addition of the vocational training in 1886. (4) The *apprentice schools*, which are sometimes classified as superior primary schools. Their name indicates their function, actual shop work being the centre of the curriculum. (5) The *primary normal schools*. Besides these there are two higher normal schools, which prepare teachers for the primary normal schools and the superior primary schools. There are 84 primary normal schools for men and 82 for women. They give a three years' course. The primary-school system is further supplemented by courses for adults offering either elementary, technical, or commercial instruction or lectures on subjects of general culture.

In the primary schools tuition is free. Moreover, by the Law of 1867 a fund to help pupils whose parents cannot supply them with clothes, books, etc., was created. Its establishment in each commune was decreed in 1882, the state agreeing to contribute. It is distributed by local committees, and in many cases children at school are even provided with dinners. In the superior primary schools bursaries exist to support deserving pupils taking the courses. At the age of 16 the holders of bursaries may be transferred to secondary schools with a continuation of their stipends. Bursaries also exist in the secondary schools, awarded on examination to students of limited means. Students are admitted to the normal schools on competitive examination. They are supported while there, and, when they graduate, are pledged to teach 10 years. They receive positions in the order of merit. Secondary and higher schools charge tuition, but, as they are largely provided for by the state, the amount of this is small.

The salaries of all administrators of schools, inspectors, and, except in the case of the communal colleges and in cities having over 150,000 inhabitants, teachers as well, are paid by the state. This brings about general uniformity. The salaries of primary teachers range from $220 to $540 a year; of normal school teachers from $500 to $1100; of professors in the lycées from $650 to $1720; of professors in the universities from $2400 to $3000. In primary schools of all kinds the teachers are divided, according to length of service and efficiency, into five grades, and in lycées into four. Salaries are based on this ranking. The teachers may, when they have served 30 years, and have reached the age of 60, receive a pension which amounts to one-sixtieth of the average salary during the last six years multiplied by the number of years served. To make up for this they contribute to a pension fund 5 per cent of their yearly salaries plus one-twelfth of their first year's salary and one-twelfth of each increase in salary for the first year of such increase. In addition to paying salaries and pensions the state supports the normal schools, the buildings for which are erected and equipped by the departments. The departments also furnish the supplies for them, and pay the office expenses incurred in running the departmental bureaus and the academic bureau of inspection. The communes pay for the supplies of the primary schools and local school officials, for janitors, and for the building and equipping of schools and residences for masters. In the building of primary schools, however, a state loan is available, the amount of which depends on the necessities of the commune, and varies from 15 to 80 per cent of the total cost of the work. The state also loans money to build normal schools. The universities, since their organization in the academies in 1896, have been thrown somewhat on their own resources and those of their localities. The state no longer equips laboratories or libraries, nor maintains new courses, nor builds new buildings.

The courses of study in the primary schools are in general determined by state laws. In addition, the Minister of Public Instruction, in

consultation with the Superior Council, determines the programmes of instruction even in details of considerable minuteness, and also rules for the conduct of the schools. The courses of study for the secondary schools are laid down by law, and the entire course occupies 11 years. Four years are spent in the primary department, and pupils can take this work in the free primary schools. They will, however, be under the disadvantage of not taking a course of three years in a modern language. The secondary school proper has a course of seven years, divided into two parts. During the first four years the work may be in either of two courses, in one of which Latin is obligatory and Greek optional and in the other neither is taken. For the last three years there are four courses presented for choice. These courses emphasize respectively Latin-Greek, Latin-modern languages, Latin-science, and science-modern languages. During the last year of the course options in either philosophy or mathematics are offered.

The programmes in all the secondary schools of France are rigidly laid down by statutes and regulations of the central Department of Education, and generally uniformity exists.

The system of inspection in France comes in to insure this uniformity in curriculum and methods. It extends to sanitary conditions as well as to instruction, although such inspection is in the hands of the regular medical inspectors of the localities. Uniformity of results is brought about by a regular system of examinations carried on by outside authorities. An examination for a certificate of primary studies may be given to pupils at the age of 11, and those passing are exempt from further compulsory attendance. It is carried on in the cantons by examiners appointed by the rectors of the academies. A special departmental commission holds yearly an examination for certificates in higher primary studies. The secondary schools also have their final examinations for the *baccalauréat*, conducted by outside examiners. Indeed, as the primary schools are the product of the central republican governments of France, so the lycées are part of the Imperial scheme of education devised by Napoleon, and both therefore are characterized by the system, uniformity, and dependence on central authority that their origin would insure.

Private schools in France require the sanction of the state, but can receive no support from public funds. The mayor or academic inspector can oppose them in the interests of hygiene, morals, or public order. They are free in regard to their programmes and methods, but their teachers must have received the certificate of capacity. For the most part they have been under the control of religious orders or congregations, and their large attendance was due to the demand for more religious instruction on the part of some classes. These congregations, however, were alleged to be in many cases hostile to the Republic. The Catholic orders were particularly aimed at in this charge. The ministry of Waldeck-Rousseau attacked their independence in the Law of Associations that became law on July 1, 1901. By it all congregations were required to obtain official authorization in order to get legal recognition as such. All unauthorized congregations were absolutely forbidden to give instruction. By this means a careful scrutiny of the conduct of the affairs of such bodies was made possible, and the character of their instruction inspected. The law contemplated the suppression of all congregations that resisted such scrutiny. During the year 1901–02 the ministry presided over by Premier Combes compelled many thousands of unauthorized clerical schools to close their doors. The Act of July 8, 1904, determined that within a period of 10 years from its promulgation all congregational teaching must cease.

The universities of France are discussed more at length under UNIVERSITY.

GREAT BRITAIN

The foundation of the present system is the Elementary Education Act of 1870. It declared that each district where sufficient facilities for elementary instruction were not in existence should provide them. Schools requiring denominational instruction or charging more than ninepence a week for tuition were not regarded as providing sufficient means for this purpose. The Education Department was required to make a statement of what was in each case demanded. In case voluntary provision to meet these demands was not forthcoming, a school board was to be elected in the district, which was to provide, to maintain, and to keep efficient the requisite elementary schools. Children attending board schools were to pay a weekly fee determined by the board, with the consent of the department, but this was to be omitted where parents were regarded as unable to pay. School boards were permitted to make provision for the compulsory attendance of children between 5 and 13 years of age, who were not elsewhere receiving efficient instruction, unless these children had attained the requisite standard of scholarship or were exempt under the Factory Acts. The board schools were to give no denominational instruction. The funds for the support of elementary schools were to be at the disposal of the boards, and were to be derived from parliamentary grants, loans, fees, and local rates. Power was given to the school boards to fix the amount of the local contribution for school purposes. Voluntary schools, wherever they existed, were recognized as before, and, in case they remained properly public and elementary, were to receive grants not greater than the amount contributed from other sources. Local rates were not to be levied for voluntary schools. In 1876 the age of compulsory education was extended to 14 years, and provision was made for the more effective enforcement of the law by punishing delinquents. This law was also made to apply to districts where there were no school boards, and it was enacted that children under 10 years of age should not be regularly employed at labor. In 1880 boards were required to make attendance compulsory. Subsequent legislation improved the evening schools (q.v.), turning their attention to technical and industrial education, started undenominational day training colleges, and greatly developed technical instruction. The poorer rural elementary schools have also received especial help. In 1890 the payment of tuition fees in elementary schools was abolished. In 1899 the Education Department was replaced by a Board of Education for England and Wales consisting of a president, the Lord President of the Council, the principal Secretaries of State, and the Chancellor of the Exchequer. The Act of 1902, which applies everywhere except to London (provided

for under a separate act) swept away the old school boards and attendance committees and replaced them by education authorities which are empowered to provide for all the schools in their respective districts out of the local rates. Whatever schools receive such support are under the general supervision of the local education authority. This authority is the council of the county, the county borough, noncounty borough with a population of over 10,000, or the urban districts with a population of over 20,000. It retains the right of levying the local rate and of borrowing money for school purposes, but hands over to a committee all other educational functions. The Education Committee is appointed according to a scheme determined by the local authority and approved by the Board of Education. A majority of its members are in most cases appointed by the council from its own number. Some of the others must be persons of experience in education, and the committee must include women. The Education Committee has power to determine the secular education to be given in the public elementary schools and to fix the number and educational qualifications of the teachers. Its consent is necessary to the appointment or dismissal of teachers except where religious considerations are involved.

Each school is under a board of managers, who elect teachers, control the school property, etc. The schools provided for wholly by the education authority are governed by managers appointed by it and by local authorities. Moreover, the denominational schools have on their managerial boards appointees from both these sources. No school that does not comply with the requirements of the Education Committee can receive even a government grant.

Parliament grants to all schools as grants in aid a sum equal to four shillings per scholar, and an additional three halfpence per scholar for every complete twopence per scholar by which the amount which would be produced by a penny rate in the area of the authority falls short of 10 shillings a scholar. Besides this grant the government also pays an annual grant of 13s. 4d. for children under five years of age and 21s. 4d. for children over this age; grants for instruction in special subjects, e.g., cookery, handicrafts, domestic science, etc.; grants for areas with small populations; and a fee grant of about 10s. per head for all children in schools complying with the conditions laid down in the Elementary Education Act of 1891. Whatever tuition fees are paid to schools maintained by an education authority are turned over to it, but a certain portion of these, such as may be agreed upon, is returned to the managers of the school. The proceeds of school endowments for the aid of elementary education are primarily devoted to the care of the school property. Whatever surplus there may be is turned over to the education authority.

Great progress has been made in English elementary education since 1902, largely in the direction of enriching the curriculum, providing instruction in special subjects to older children, developing manual work in all grades, paying greater attention to physical training and games, improving the schoolbuildings, and reducing the size of classes. Much social work is done through the schools; e.g., under the Education (provision of meals) Act, 1906, local authorities are empowered to provide meals to poor children, while under the Education (administrative provisions) Act, 1907, medical inspection is provided. More recently they have been permitted by the regulations to establish juvenile labor bureaus to offer vocational guidance to children on leaving school.

For pupils who cannot proceed to secondary schools and wish to continue their schooling beyond the elementary schools, there are the higher elementary schools. The length of the course is three years and the nature of the work is as a rule vocational. Owing to the restrictive character of the regulations of the Board of Education in the matter of higher elementary schools, a new type of intermediate school, known as central schools, with four-year industrial or commercial courses, has sprung up in London, Liverpool, Manchester, and elsewhere.

The managers of denominational schools are allowed to determine the religious instruction given therein and the religious qualifications of the teachers. But a pupil need not attend such instruction, and cannot be excluded from the school for religious reasons.

The Act of 1902 was bitterly opposed by the Nonconformists. The voluntary schools are largely under the control of the Church of England, and the use of a local rate for their support was regarded as taxing Nonconformists for the benefit of the institutions of the Established church.

For the training of elementary teachers there was in 1911–12 a total of 87 training colleges, of which 18 were attached to some university or college of university rank. Teachers are appointed by the education committees, usually on the nomination of the local school managers or the principals, who are always consulted. The average annual salary of certificated masters is about £121 and of mistresses about £80. In 1898 provision was made for pensioning teachers who have reached the age of 65 or have become disabled. The amount is estimated on the basis of length of service, and is partly made up by an annual contribution on the part of men of £3 and of women £2. Government inspectors are appointed by the crown on recommendation of the Board of Education, but besides the government system of inspection a local system has been developed in the larger areas, corresponding in some measure to supervisors or assistant superintendents in large American school systems. The pupil teachers constitute a large proportion of the teaching staff, the law allowing three for the principal teacher in each school and one for every certificated assistant teacher. The system of grants in aid of their training still prevails.

For secondary education England has schools under a variety of authorities. They may be classed, according to method of control, as private enterprise schools, subscribers' schools, companies' schools, endowed schools, and municipal secondary schools under local authorities. There were 6209 such schools in England in 1897. They are not organized under any system, except that the charity and other commissions have been revising the courses of study in the endowed schools. (See ENDOWED SCHOOLS ACTS.) The Public Schools Act of 1868 revised the control and organization of seven great public boarding schools of England. Wales and Monmouthshire have a system of inspection of secondary schools. One of the main purposes of the Act of 1902 was the support of secondary education by public

money. The education authorities are authorized to consider within their areas the needs of secondary education and to take such steps as seem to them desirable, after consulting the Board of Education, to supply or aid in the supply of such instruction. For this purpose the county authorities are empowered to raise a county rate of twopence in the pound, a sum that may be increased with the consent of the Local Government Board. This measure has led to the development of a large number of secondary schools under local authorities and to the more adequate provision of secondary-school facilities for girls. The Board of Education has issued regulations for the management and organization of secondary schools, the two main requirements being the provision of a certain percentage of free places for pupils from elementary schools and the acceptance of inspection by the board. Schools which accept these regulations receive a government grant. A large number of secondary schools which submit to inspection by the board but are unwilling to comply with the remaining requirements are further classed as "efficient," but receive no grant. In 1911–12 there were 995 grant-earning schools and 102 schools recognized as efficient.

The Scotch have had a public elementary system since 1696, when it was ordained that a school should be established in every parish where one was not in existence. The masters were elected by the landowners and the ministers, and held their places for life or good behavior. The act was amended in 1803 so as to require the salaries of masters to be raised, and in 1861 their examination for the right to teach was transferred from the control of the presbyteries to that of the universities. In the meantime considerable support was granted to the schools by the government. Among other changes the English School Code of 1861 was applied in Scotland, but was withdrawn. In 1872 an elementary-education act like the English one was passed. The Scottish law is the better of the two, however, school boards being created in every parish, and the practical control of all elementary schools being given to them. In 1893, after several movements in that direction, all children between 3 and 15 years of age were freed from school fees in the public elementary schools. Education is compulsory for children between 5 and 14 years of age. In 1906 a new classification of schools was adopted—primary, intermediate, and secondary. The primary school receives pupils up to the age of 14, but pupils may take a qualifying examination at the age of 12 and on passing this may elect to continue in a supplementary course (commercial, industrial, rural, or domestic) intended for those leaving at the age of 14, in an intermediate course of three years (12 to 15) which is practically the first stage of a secondary school, or in a secondary school providing a course of at least five years.

The government grants to Scottish voluntary and board schools are, in general, similar to those in England, but only about one-eighth of the elementary schools are voluntary. For the training of elementary teachers denominational colleges had made their appearance before 1839. These have been aided by government grants, and at present over four-fifths of the male and two-thirds of the female teachers have graduated therefrom. The English Pension Act of 1898 was extended to Scotland.

The secondary instruction in Scotland is in the hands of five classes of schools—burgh schools, academies, parochial schools, mixed burgh and parochial schools, and four public boarding schools like those of England. The burgh schools are supported either by endowment or by burgh funds. They are under the control of the authorities of the burgh and are open to the community. Until 1861 the presbyteries controlled them, but at that date this power was transferred to the town councils, and in 1872 to the school boards. These bodies fix the fees. The academies arose in the middle of the eighteenth century as a result of a demand for more economical and scientific instruction. In most cases they came ultimately under the joint control of town councils and proprietors. In 1892 government grants were made to secondary schools, and their inspection was provided for. At the same time secondary-education committees were established as district committees in the 33 counties, the 5 chief burghs, and 1 large parish. These committees are concerned with the distribution in their districts of the government grants, now paid under the Education (Scotland) Fund, 1908, and with all forms of education beyond the resources of individual school boards. Since 1888 the Education Department conducts an examination in the courses provided in the secondary schools leading to the leaving certificate, which under certain conditions is accepted for entrance to the universities. In 1911–12 there were 56 grant-receiving schools, of which 35 were maintained by school boards. For the universities of Great Britain, which through the development of a large number of new degree-granting bodies since 1900 have had a remarkable growth, see UNIVERSITY.

For a further treatment of the English educational system, see GREAT BRITAIN, *Education.*

The educational system of Ireland is distinct from that of England and Scotland. Elementary education is controlled by the National Board, which was founded in 1831. The schools are administered and maintained on denominational lines, but a compulsory conscience clause exists under which pupils are exempted from religious instruction when their beliefs conflict with it. The usual subjects of elementary instruction are given. Irish has developed rapidly in the elementary schools since 1900 and is now studied by more than 200,000 pupils. Under the encouragement of the Department of Agriculture and Technical Instruction domestic-science subjects and manual instruction have also been introduced. In 1912 there were 8255 elementary schools with 668,974 pupils on the roll and an average attendance of 499,038 pupils. The denominational distribution is indicated in the following figures: 4397 schools were attended by 373,154 pupils of the Roman Catholic faith—1549 by 117,985 pupils of the Protestant faith—and 2303 schools were mixed and were attended by 177,579 pupils. The expenditure out of Imperial taxes and rates on elementary education in 1912–13 was $8,829,185.

Secondary or intermediate education is under the supervision of the Intermediate Education Board, which conducts examinations of pupils in secondary-school subjects, on the basis of which grants are distributed, and also, since 1909, inspects schools. The Roman Catholic schools are conducted largely by teaching orders of that denomination, but recently the board is insisting on the appointment of a number of lay

teachers as a condition of the grant. In 1912 the board examined 12,581 pupils (8276 boys and 4305 girls). The expenditure of the board in grants for intermediate education in 1912 was $250,990.

Technical and agricultural education is supervised and subsidized by the Department of Agriculture and Technical Instruction, which, since its establishment in 1900, has greatly assisted the development of technical schools and the teaching of agriculture, science, domestic subjects, drawing, and manual training, not only in the technical schools but also in evening schools and in day secondary and elementary schools. For higher education in Ireland, see under UNIVERSITY.

HOLLAND

The state school system in Holland includes public primary schools, normal schools and courses, burgher schools, higher burgher schools, or secondary schools proper, industrial and technical schools, agricultural schools, and various professional institutions, together with Gymnasia, and three state universities. A few of the primary schools are maintained solely by the general government. Most of them are communal, but a considerable portion of the fund for their support comes from the state. Private primary schools are also subsidized by the government, in case they maintain proper standards. The primary-school system includes, in addition, repetition and evening schools, and both types are maintained by the same agencies and methods as the primary schools in general. So, too, the normal schools are either government schools, or communal schools with subsidies or private schools with similar support. The state normal schools, however, give instruction to the majority of the students taking such courses. The higher burgher schools were, in 1910, 81 in number. Of these 27 were maintained by the government, 47 were communal, and 7 private schools. There were in addition 61 Gymnasia or classical schools (30 publicly and 31 privately maintained).

The history of this school system will serve to explain these peculiarities and also to make somewhat clearer the complexities of the system itself. In 1784 a Society of Public Good was founded at Groningen by John Nieuvenhuysen. Its object was to promote elementary education, and in this it was successful, receiving help from the government. In 1806 an education law of great importance was passed. It consisted essentially of provisions for inspecting schools and examining and certificating teachers. School districts were organized, over each of which an inspector was placed, whose consent was requisite before any one could teach or be a member of a school committee. The inspectors received for their services only an allowance for their expenses. A principal duty was that of examining teachers for certificates. The provincial and communal administrations were urged by the government to provide the means of instruction in their localities, to insure a comfortable subsistence for teachers, and to obtain a regular attendance of children in the schools. Free schools for the poor were, as a result, established in the towns and in the villages—schools to which the poor were admitted gratuitously. The authorities made great and successful efforts to gain a large attendance, and teachers were paid better salaries than elsewhere in Europe. In 1811 M. Cuvier found 4511 primary schools in existence, and 1 in each 10 of the population in school.

Up to 1848 only two important steps had been taken in the further development of the system. Normal schools were established in 1816, and the free schools for the poor were supplemented by institutions of a somewhat higher grade where a small tuition fee was required. Since the free schools could be entered only by those who possessed a certificate of poverty, the children of people with moderate means were excluded from them. The private schools for such children were fast becoming inferior to the free schools which were under public patronage, and it was to supply this want that the towns established intermediate schools (*tusschen schoolen*). In addition, French schools, which emphasized modern languages and commercial branches, and Latin schools, preparing for the universities, were founded.

The constitution of 1848 established liberty of instruction. This conflicted with the provision of the Law of 1806 that the authorizations of the municipal council and of the inspector were necessary for even the teacher in a private school. In 1857 this requirement was removed, only the general admission certificate being demanded in such cases. The constitution of 1848, also, by placing all religious denominations on a footing of equality, gave to the Catholics and liberals a chance to attack the religious instruction in the schools, which according to the Law of 1806 was to have been Christian but undenominational. Their agitation led to a strict enforcement of the law, which in turn roused the antagonism of the orthodox Protestants. The result of a bitter contest was the Law of 1857, which reaffirmed that of 1806, making more explicit its provision that religious instruction, while undenominational, should yet inculcate Christian virtues. It was also provided that the schoolrooms should at special hours be put at the disposal of religious communions for purposes of instruction. This attitude was confirmed by the Law of 1878.

Under the Law of 1857 each commune was required to maintain at its own charge what in the opinion of the state's deputies and the supreme government was a sufficient number of primary schools. If this task was too heavy, the state and the province were to share equally in a grant of aid. It was provided that pupil teachers should aid in the work of instruction. School fees were to be exacted only of those who could afford to pay them. The public schoolmaster was to be selected by the communal council from a list of those who had acquitted themselves best in a competitive examination. A salaried provincial inspector was substituted for the provincial commission of district inspectors. The Minister of the Home Department, assisted by a referendary, was made the supreme authority in matters connected with education.

In 1863 a law was passed organizing secondary instruction as consisting of burgher, higher burgher, agricultural, polytechnical, and industrial schools. This law was amended in 1876 and 1879. The secondary schools are under special commissions and inspectors, and teachers in them are required to have special diplomas and, except in a few cases, to be university graduates.

The Law of 1857 has been twice amended—in 1878 and 1889. In 1878 the school authorities were empowered to increase the curriculum as laid down in 1857, by French, German, English,

general history, mathematics, drawing, agriculture, and gymnastics, whenever they deemed it expedient. It was also provided that each commune should support the necessary number of unsectarian schools; but 30 per cent of its educational expenditures were to be contributed by the state, which also undertook to subsidize private schools under certain conditions. An enormous increase in the state contribution to popular education was thus brought about. In 1889 the method of granting the state subsidy was modified so as to include private schools as well. If the school applying for one is found on inspection to conform to the state regulations, it will be granted an amount dependent on the attendance, the number of teachers, and extent of the curriculum. All schools having more than 41 pupils must have at least two teachers, and an additional teacher is required for an average addition of about 50 pupils. When schools have more than the minimum requirement of teachers, and when they cover more than the required curriculum, additional grants are given. The state also furnishes 25 per cent of the amount necessary to establish a school, and regulates the character and hygienic conditions of the buildings and premises. The Law of 1878 instituted a system of pensions for teachers who had reached the age of 65. The annual amount is one-sixtieth of the annual salary for each year of service. The teachers contribute 2 per cent of their yearly salaries to a pension fund.

The Dutch classify their Gymnasia together with their universities under the head of superior instruction. Such instruction is organized into a system by the Law of 1876. The three state universities are supported and controlled by the national government. See UNIVERSITY.

PRUSSIA

The school system of Prussia may be divided into three departments—elementary, secondary, and higher. The elementary system is designed to educate children of the lower classes whose school training is completed in early years. The secondary schools are intended to prepare pupils for the universities or professional schools, which are for the most part classed as superior schools. The elementary school system may be grouped under five classes: (1) The *infant schools.* These are not supported by state funds, nor are the teachers required to have state certificates of capacity. They are, however, under the supervision of local school boards. Their purpose is to care for children whose parents are obliged to go out to work. Children are admitted ordinarily only in their third year, but in some cases even younger children are cared for. (2) The *Volksschule.* This takes children between the ages of 6 and 14, and during this period attendance is compulsory for all whose education is not otherwise provided. In the larger communities the sexes are taught separately, but in the country districts this is usually impossible on account of the lack of teachers and facilities. The school work occupies six hours a day and about 42 weeks a year. There are three stages and six to eight classes, though the work occupies eight years. The subjects of study are, in the lower stage, religion, German, arithmetic, singing, gymnastics, and needlework; in the middle stage, drawing, science, history, and geography are added; and in the upper stage, geometry. This course is prescribed by law, but within its limits selection and arrangement are left to the school board of the district, subject to the approval of the general board of the royal government. (3) The *continuation schools* give instruction to pupils between the ages of 14 and 18. They review the work of the Volksschule and give some additional work with special reference to trade or industry, or, in the country districts, agriculture. The schools are conducted so far as possible during the day and may not be held after 8 or 8.30 P.M. The tendency is to link up the work with the vocation of the students, and the aim is to secure general efficiency in the vocation and intelligent citizenship. Tuition is charged, but provision is made for those who cannot pay. With the continuation schools may be classed various industrial and trade schools which are day schools and devote more time and effort to prepare for specific vocations. (4) *Middle schools.* These sprang from the old burgher schools of the Middle Ages. They aim to prepare the children of people with more means for a commercial life, although sometimes they are attended by pupils preparing for the secondary schools. Tuition is charged. They continue and broaden the curriculum of the elementary schools and add one foreign language. Nearly twice as many of these schools as are public are private. A considerable proportion of them are mixed schools. They take the place of the Volksschule, but sometimes continue instruction until the seventeenth year. They have, however, not been marked by great success in Prussia, because no privileges are attached to graduation from these schools, and a pupil who can remain at school long enough prefers to attend a secondary school. (5) *Normal schools.* In these there is a preparatory course of three years to which children of 14 are admitted. This is followed by a two years' course in the women's normals and a three years' course in men's normals and the one for governesses. In 1913 there were 212 of these institutions, of which all but about 26 were for men exclusively. Students are admitted on examination, and the attendance is limited to from 30 to 36 in each class. While in the school students receive their support. On graduation they are placed on the list of available teachers and are required to take what is given them or pay back the expenses of their education. Before receiving permanent appointment, however, a probation of from two or five years is required, and an additional examination on educational matters must be passed. The normal-school course consists of pedagogics, religion, German, history, arithmetic, geometry, geography, drawing, writing, music, and a foreign language.

The secondary schools in Prussia, as in Germany generally, are the various classes of Gymnasia and Realschulen. The Gymnasium has a nine years' course. To enter it the pupil must be nine years of age and have had three years of elementary instruction. The Progymnasia give a somewhat shorter course, usually only the six years necessary to gain for their graduates exemption from one year of the voluntary service in the army. Occupying a position between the Gymnasium and the Realschule is the Realgymnasium, which omits Greek and gives more attention to sciences, etc. There are also Realprogymnasia. The Realschule proper gives only a six years' course, but the Oberrealschulen have nine years of work. As a result of a conference on secondary schools that met at Berlin

in 1900, the three classes of schools having a nine years' course are declared to be equal from the point of view of general culture and for purposes of matriculation at the universities, and Greek was made optional in the Gymnasia. The programme of studies was somewhat revised and greater latitude allowed the masters in adapting their work to particular needs. An important feature of secondary education in Germany is the privileges which are secured by the examinations: (1) The Einjährigenschein is obtained on an examination after six years of secondary work and entitles the holder to serve in a regiment of his choice for one year only. (2) The Abiturientenexamen, or leaving examination, entitles students who pass it to enter the universities or higher technical schools without further examination, with certain minor exceptions. The secondary education of girls has been reformed and has come increasingly under public control. Opportunity is now afforded since the regulations of 1908 for girls to continue their higher education beyond the age of 15 as formerly in the Höhere Mädchenschulen. Not only can they specialize in domestic science or for the teaching profession, but they may take secondary courses leading to the universities, similar to those open to boys.

The higher education of Prussia is given in the universities with their four faculties of philosophy, theology, law, and medicine. They are discussed in the article on UNIVERSITY. There are also various polytechnic and agricultural schools that may be included with the institutions for higher education.

At the head of the Prussian school system is the Ministry for Public Worship and Education, the former charge over public health having been removed in 1911 by the creation of a department of public health. For educational purposes two divisions are maintained in the Ministry. The first has control of superior and secondary instruction and the second of the elementary schools. The Minister of Education represents the schools in the Prussian Parliament and plans and oversees legislation on school matters, including finance. He distributes the state school money, appoints the members of provincial school boards, confers titles on school officers, judges on appeal all cases involving dismissal from office or other contentions in school matters, besides fixing the normal course of study. Each of the 13 provinces of Prussia constitutes a division for the administration of secondary education and training of teachers. The immediate superintendence of secondary schools is in charge of the provincial school boards, consisting of from three to five members and a chairman, who is the president of the province. One of these men inspects the Gymnasia, another the Realschulen, and a third the normal schools. This board has the power of appointing and dismissing teachers in secondary schools, except in such as are supported wholly or partly by private funds, where the selection is made by a local board from a list furnished by the provincial school board. The appointment of directors of the schools requires the confirmation of the Minister. To the provincial school boards also fall the control of the seminaries for the training of secondary teachers and the regulation for all the schools of the province, of the school programmes, regulations, leaving examinations, and of textbooks for the higher schools. In each province the general superintendent of the Evangelical church has the function of inspecting the Protestant religious instruction in the secondary schools, and a Catholic bishop has a similar right regarding Catholic instruction. The provinces of Prussia are divided into 36 governments, each of which has a school board consisting of two men appointed by the King for life, four appointed by the provincial school board for six years, and the president of the royal government. In such schools as are supported largely by the state this board appoints the teachers. Wherever, on account of extensive local support or private patronage, local authorities are given the naming of teachers, the school board of the government confirms their appointment or nominates a list from which the selection must be made. It also oversees the conduct and work of the teachers, superintends the elementary schools generally, settles upon new districts and textbooks for local schools. The governments are divided into districts, some of which have inspectors, whom the Minister on examination appoints for life, and who devote their whole time to the schools. Other districts have a number of local inspectors, who until recently were clergymen or had some other occupation besides that of school inspection. The tendency is more and more to appoint inspectors of professional experience. The district has a school board composed variously in different localities of inspectors, members of local councils, and representatives of religious denominations. This board has the power of erecting and organizing schools, determining teachers' salaries (the minimum being fixed by the government), increasing salaries and pensions, and deciding on property liable to a school tax. Each school has a local school board chosen in cities by the central school board. Sometimes, however, it is chosen by the citizens of a community or by a church organization or by a patron, generally according to the source whence the school derives the larger part of its income. The local board looks after repairs, supplies, and attendance, but cannot interfere with the internal management of the school. In many cases it has a voice in electing the teacher or fixing his salary. Many cities have established secondary schools, the funds for which are largely contributed by them. Here the local boards have charge of financial matters, choice of teachers, etc., but the work of the school itself is under the supervision of the provincial boards. The most extreme cases of local control arise in connection with the country Volksschulen, under the patronage of the nobility. Here the patron names the teacher, and sometimes even interferes with the course of study and school hours.

Private schools in Prussia are required to conform to state regulations as to minimum course of study, school methods, etc. They are under state inspection and can employ none but regularly certificated teachers. The number of private elementary schools is insignificant, but of the pupils in middle schools one-third are in private institutions.

Teachers in Prussian elementary schools are ordinarily graduates of teachers' seminaries or training colleges. At the end of each year these institutions hold an examination at which the school inspectors and superintendents of the district and a commission from the provincial school board are present. Practical tests in teaching power are required as well as those on theory. The successful candidate gets a privilege to teach for five years. After two years of satis-

factory work and not later than five years after the first appointment a teacher may take a second examination, the passing of which gives him a right to a permanent position and a pension. This examination is largely on educational matters and includes a practical test. Candidates who are not graduates of teachers' seminaries may be admitted to it, and on passing are allowed to teach. The director of the seminary supervises the work of its graduates and can require them to supply defects by additional work. Those who wish to teach in the higher classes of the middle schools must pass an additional examination given by a special commission, and the same body gives a still further examination to those who aspire to rectorships. To gain the right to teach in the secondary schools a candidate, who must have attended a university for at least six semesters, and often possesses a degree, must pass a state examination given by one of the 10 examining boards appointed annually by the Minister. Those who pass may receive, according to the character of their papers, any of three grades of certificates in the various subjects, and these entitle them to teach such subjects in the lower three, the lower six, or all the grades of the Gymnasia. After passing this examination a candidate enters a seminar, of which there are a number attached to secondary schools. Here he is under practical instruction for a year, entering at its successful conclusion on a year of probationary teaching, for which he receives no remuneration. He is then, provided his work is satisfactory, eligible to a permanent appointment.

Elementary teachers receive free rent and fuel, and often a garden. Their annual salaries range from a minimum of 1400 marks to as much as 3800 marks in Berlin, or in the case of rectors even 6000 marks. The average is, however, about 1200 marks and is smaller in the country than in the cities. Salaries usually are regularly graded, according to time of service, up to a maximum. Women are paid somewhat less than men, and they constitute about 17 per cent of the total teaching force in elementary schools. After 10 years of service the teacher can, if disabled or 65 years old, retire on a pension of one-third of his salary. This amount increases by one-sixtieth for each additional year of service up to two-thirds of the salary. Provision is also made for widows and children of teachers. The annual salaries of secondary school teachers range from 2700 to 5100 marks, and in the case of rectors to 7800 marks. In addition they receive an allowance for house rent. The same regulations as to pensions that apply to primary teachers apply also to secondary ones, and in fact to most state officials, an exception being professors in the universities, who, however, are not required to retire.

For the support of schools in Prussia there are five sources of income. The most important of these is the state itself, which pays about one-half of the total required for teachers' salaries. The other sources are school societies, income from inherited property, Church funds, local taxes, and tuition. In the city schools the local taxes supply the larger part of the income; in secondary schools the tuition furnishes nearly one-half the sum required for support. The country schools, however, receive over two-thirds of their income from the state, the amount being a fixed contribution of 100 marks for each head teacher, 200 marks for each additional regular male teacher, and 150 marks for each female teacher, with 100 marks for each assistant teacher who is in the probation year. The normal schools are supported by the government, as are also the universities and many secondary schools. In the latter tuition is a considerable item. For their organization, see UNIVERSITY.

For the development of the German public educational system, of which the Prussian system is taken as a type, see GERMANY, *Education*.

SWITZERLAND

Each of the 25 cantons of Switzerland has its own separate and independent school organization, and there are very few federal regulations on the subject. The federal constitution of 1874 empowers the Bund to establish and maintain or assist a university or other institution for "higher education." This power has not been used except to continue the support of the federal polytechnic at Zurich and to subsidize various cantonal higher institutions. But by a supplementary article in 1902 it is obliged to subsidize elementary education. In 1910 this subsidy for elementary education amounted to 2,026,500 francs. In the same way the central government has supported vocational education (arts and industries, commerce, agriculture, and domestic and vocational training of women) very liberally, 3,000,000 francs being granted in 1910. The constitution further states that all education, whether public or private, must be under the control of the cantons. They must provide for it and make it compulsory and gratuitous. That they do this well is evident from the fact that in 1898–99 the ratio of attendance to population was greater there than in any other country in the world, while of the recruits in 1899 only 0.23 per cent could not read, a figure reduced in 1910 to 0.1 per cent. All attempts to establish anything like a centralized system have met with determined opposition by those who feared interference with linguistic or religious instruction in the schools. The constitution provides, however, that "it must be possible for the public schools to be attended by the adherents of all beliefs without hurting their freedom of belief or conscience." That not more than 3 per cent of the attendance is in private schools, which are, moreover, patronized almost entirely by children of non-Swiss parentage, attests the satisfactory nature of the religious instruction in the public schools. A few cantons, as Geneva, exclude it entirely from the public system. Three additional federal regulations affect education. The first forbids the labor in factories of children under 14, and limits that of those under 16. The second prescribes an examination for every recruit on entering the army at his twentieth year. The results of this are made known, and it stimulates educational effort, besides bringing into existence improving schools for recruits and increasing the attendance at continuation schools. The final regulation concerns military drill, which by the Acts of 1874, 1877, and 1883 is made a required part of every school programme, to be given to children between 10 and 15 years of age.

At the foundation of the school system of Switzerland we have at present the communal primary schools taking children from 6 to 11 years of age. After this they go either to the cantonal secondary schools proper, or to the advanced elementary schools, the so-called second-

ary schools, the district for one of which embraces several communes, or to the communal continuation schools, usually held in the evening. There are also courses for adults given in the communes. The secondary schools are maintained by the cantons, and include professional and technical schools, with others variously styled middle schools, Gymnasia, or Progymnasia. These are supplemented by cantonal universities and a federal polytechnic. The teachers are licensed by cantonal governments on examination, or in some cantons on a diploma from a normal school. For the higher grades of work an additional examination is required. There were, in 1910–11, 49 normal schools in Switzerland, most of them public institutions maintained by the cantons. In most cantons teachers are elected for life, either by a school board or at a general election. They are also usually pensioned at the end of their term of service. This is, in general, partly provided for by a fund to which they make regular contributions.

At the head of education in each canton there is either (1) an educational council or (2) an education ministry, headed by a director of education, who is a member of the executive council of the canton, or (3) a permanent education council, presided over by a director of education, who is a political officer. The Canton of Bern belongs to the second type, and in the control of its schools it represents the extreme of centralization in Switzerland. The Director of Education controls the inspectors and frames the educational budget. His department determines, on consultation with certain authorities, the curriculum and methods of instruction in all public schools. Private schools must receive his authorization and that of the local school inspectors. The communal council votes the money for its primary schools, and nominates a school board to control the expenditure of this and the details of local school management. Several communes combine to form a secondary school, the control of which is in the hands of a commission, whose members are appointed by the various communal councils and the Director of Education. The middle or higher schools are usually cantonal schools, and are controlled by a commission appointed by the Educational Department. On the other hand, the Canton of Zurich has the least centralized of all the Swiss systems. Its central government is of the third type above mentioned. The Educational Council is composed of six men, four of whom are chosen by the cantonal council and the other two by the whole body of teachers. It controls the organization of education in the canton. The commissions that direct the cantonal schools, i.e., the Gymnasium, middle schools, higher schools, technical institutes, and training colleges, are appointed by the cantonal council on nomination by the Educational Council and Director of Education. For local organization and control of education there are provinces, districts, and communes. Each province has a committee, elected partly by the teachers alone, partly by the rest of the voters. Its function is to visit the schools and supervise their general conduct. There is a district committee elected by the voters to control the secondary school of the district and determine the amount to be raised from local taxation for its support. For the primary school also there is a district organization, including usually several communes, the voters of which have a general assembly to determine school measures. The communal primary school is controlled by its local board. In Zurich alone of all the Swiss cantons there are no school inspectors. In these two cantons, Zurich and Bern, we have illustrated the extremes between which the systems of the other cantons fall.

In Switzerland, generally, the support of all universities and higher secondary schools is by cantonal funds, aided occasionally by the cities in which such schools may be situated. The district and communal schools are supported by local taxes with cantonal aid. There exist for such support permanent communal funds made up of fees and gifts. Moreover, 12 cantons have a permanent cantonal fund for Volksschule purposes. This does not, however, by any means provide for the support of the schools. Of the total expenditure on primary education it is estimated that the local authorities furnish about two thirds, the rest coming from the cantons; but in Geneva, where the French ideas prevail, the canton furnishes 74 per cent of such funds. In general, in the wealthier cantons the canton furnishes more and the commune less of the total raised. The total expenditure on instruction in 1910–11 was 86,400,000 francs (by the cantons 41,800,000 francs and by the communes 44,600,000 francs).

OTHER EUROPEAN SYSTEMS

The systems already described offer examples that are typical of the education in other European states. In Sweden elementary and secondary schools are supported by state subsidies and local taxes. Many schools and universities have in addition to such support the income from endowments. Control of schools is in the hands of local boards, but the central government maintains a system of inspection and requires teachers to be graduates of normal schools. Public elementary education is gratuitous and compulsory between the ages of 7 and 14. In Austria the ideals and methods of Prussian education prevail. The Italian system has the same general features of state subsidies and local and provincial taxes for the support of both elementary and secondary education. The minimum number of schools, the curricula, and the qualifications of teachers are also laid down by the state. Public elementary education is gratuitous and compulsory between the ages of six and nine. The state inspects all public schools, and private schools must receive authorization by the government.

In Spain attempts have been made to establish a complete and efficient system of elementary education. The government determines programmes and inspects schools, but furnishes little assistance to their support. The municipalities bear most of the burden, and the compulsory law is not enforced. For most of the children education is free. In Russia about one-third of the elementary education is carried on by the Church. Nearly all the rest is controlled and supported by the central government acting under the Ministry of Public Instruction. The Church also takes part in secondary education, but here the Ministry bears most of the responsibility. There are a small number of locally supported schools and foundation schools.

UNITED STATES

In the United States the control and support of the education of the people have been left

practically to the several state governments. The central government has, however, dealt with the matter in a few cases. The Ordinance of 1787 provided that one section of each township in the Northwest Territory should be designated as school land and that the proceeds of its sale should go to the support of public schools. After States were organized in this region the funds derived from these lands were turned over to them for educational purposes. Similar grants of land were made to other new States, notably in 1841, in 1849, and in 1860. Up to 1900 about 86,000,000 acres had been devoted to this purpose. These grants were supplemented in 1836 by a gift to the several States of surplus funds in the National Treasury, the sums thus given being by most of them devoted to the support of education. In 1862 the Morrill Act set aside additional lands for the maintenance of colleges in which agricultural and mechanical arts and military tactics were to be taught, and the State universities generally have been the recipients of these gifts. The central government established, in 1867, the Bureau of Education, the main objects of which are the collection of statistics and the preparation of reports.

Each of the several States maintains a system of free public schools, including elementary, secondary or high schools, and, in the case of 39 of them, universities as well. The older States, where great colleges and universities on private foundations have for a long time existed, have not in most cases added such institutions, but have developed, as in Massachusetts, Pennsylvania, and Maryland, systems of annual subsidies to them. For the elementary schools three systems of control exist. The first of these is the district system, according to which the control of each school is left in the hands of a board elected by the people of the district in which it is placed. Under the township system all schools that are located within the region of a township are placed under one board. According to the county system the schools of a whole county are under the control of county boards or school commissions. The district system was developed in New England after the scattering of the population, due to the cessation of the early Indian wars. It spread to the States of the West. Later, owing largely to the opposition of reformers like Horace Mann, who maintained that the district system meant insufficient support and inexpert supervision for the common schools, New England came to adopt the township system. The county system has been peculiar to the Southern States from the first, and to-day it exists also in some of the States of the Middle West, as in Indiana, Iowa, and Missouri, and in California and Washington of the Western States. The township system exists wholly or partially in 18 States and the district system in 33.

With the development of more elaborate school systems the supervision of the State became a more and more prominent feature. New York, in 1812, created a superintendent of common schools. This example was followed by others, and to-day there are State superintendents in all States. In most of them there is also a State board of education, which usually manages State school funds and either directly or indirectly determines the qualifications of teachers. For more minute supervision there is inspection either by a county superintendent or by the township or district committees. In 35 States the county supervision prevails. In New England the town school committees do the supervising. In addition, at least 1243 cities have superintendents for their public schools. The demand for greater uniformity and effectiveness in the schools as a whole has led not only to the creation of larger units for the control or supervision of schools, but also for the establishment of State funds and the levying of State taxes to supplement local contributions to the cause of education.

In the earlier Colonial period secondary instruction was given in what were called grammar schools. These institutions admitted children who had mastered merely the rudiments of English, and prepared them for college. The high schools were, however, preceded by academies. They were introduced into the United States as a substitute for both the grammar schools and the colleges. Many of these academies received, in addition to private endowments, large grants from the States. Some of them grew into colleges and later into universities. Academies for girls were established, and thus the way was paved for the higher education of women. The academies offered a somewhat wider and more liberal course of study than the older grammar schools and colleges, which were concerned mainly with the classics. In this way they led to the more liberal high schools and to the extension of the college curriculum.

The high school sprang up in response to a demand in the early part of the nineteenth century for the secularization and State control of secondary education. The English Classical School, later called the English High School, was founded in Boston in 1821. To-day a free public high school has to be maintained in every township in Massachusetts, and a number of high schools are State-aided. New York, Maryland, Wisconsin, Minnesota, California, and other States have elaborate State laws governing high schools. In a great number of States their creation and control are left to localities, the actions of which in the matter are not regulated by the State. They are found, however, in all important cities, and are springing up rapidly in nonurban areas.

The free elementary school may be said to exist in every locality of the United States, however sparsely inhabited. In the Western and Southern States the remoter districts are greatly helped by the contributions from the State funds, which are distributed in such a manner as to favor especially the smaller schools. The high schools, on the other hand, the existence of which is left almost universally to local initiative, are dependent largely on local support. Outlying districts are, in consequence, frequently without them, and when they exist there the territory that they supply includes ordinarily a number of elementary school districts. The consolidated high school has been found to be the only solution for such areas. Such divisions are either townships, as in New England, or counties, as in Maryland, the South, and occasionally in the West, or simply a convenient grouping of districts into what is called a union or consolidated high-school district. The board governing such schools is usually a specially created one, except where the township or county system prevails. In these cases, as with the district high school, the elementary and secondary schools are both managed by the same board.

The teachers in elementary schools, up to the time of the establishment of county and State supervision, were selected by the school boards at their discretion. To-day licenses or certificates are universally required before one can be elected to a teacher's position. In New England, however, these are granted by the school committees of the towns, and so teachers are licensed by the same board by which they are elected to office. Elsewhere throughout the Union the certification is in the hands of city or county superintendents or boards of education, or State superintendents or boards of education. Certificates of various grades are issued in the several States. High-school certificates are universally distinct from those for elementary teaching. All are granted either upon examination or upon credentials. Local certificates are valid only in the specific division where they are granted, but are frequently accepted as adequate credentials in other localities. State certificates are for longer periods, or even for life, while the local certificates expire after a few years. See NORMAL SCHOOL.

The ideal course of study in the modern primary school in the United States, as outlined by the Committee of Fifteen in 1894, includes reading, writing, spelling, composition, arithmetic, geography, simple lessons in natural science and general history, vocal music, drawing, with physical culture and manual training. In many schools such a programme exists, and in most an effort is made to approximate it. The greatest difficulty arises in the ungraded country schools, where a single teacher is called upon to teach children from 5 to 18 years of age, representing, of course, all or most of the grades of the elementary school. The ideal grammar-school course, as outlined by the same committee, in addition to the subjects of the primary grades, consists of English grammar, algebra, and United States history in the last two years, and either Latin, French, or German in the last year. Only in a few cases, however, are the foreign languages actually to be found in the grammar grades of the elementary school. For rural schools the last few years have seen the development of a great movement to introduce courses of study closely based on the needs of rural life. These are still in process of development. In general, the elementary-school curriculum has been subject to considerable criticism and more especially that part of it which affects the last two grades, the seventh and eighth. The criticism generally takes as its basis the fact that no preparation is given for the life activities which those pupils who leave school forever need, or that no attempt is made to provide some adjustment with the high schools. The first of these criticisms is leading to the development of general prevocational or industrial courses, the second to the reorganization of the high school in some places on a six-year plan beginning with the seventh grade, or the establishment of intermediate schools or junior high schools with three or four year courses beginning at the same period.

The course of study in the high schools is usually arranged with a view to presenting to the pupil from one to four different groups of subjects, any one of which he is at liberty to choose. The first of these groups constitutes the old classical course, but includes, besides Greek and Latin, modern languages or English, or both, algebra, geometry, and some history and natural science. What is commonly called the literary course drops the Greek and substitutes therefor more English, modern languages, or history. The scientific course drops Greek and sometimes Latin, laying stress on the sciences and mathematics instead. Another course, which emphasizes preparation for business and gives instruction in bookkeeping, stenography, typewriting, commercial arithmetic, and law and business methods, is frequently found. The tendency is, however, to hand over such a course to a commercial high school or business college. It is a favorite line of work for evening high schools. Practically all courses embrace algebra, geometry, civics, English, United States history, and physics. The sciences taught in the scientific course include chemistry and often botany and zoölogy. Courses in solid geometry, higher algebra, and trigonometry are often offered in high schools. No part of the educational system of the United States was more under fire during the period 1905–15 than the high school. The reasons can only be stated very briefly. It was felt that as compared with European secondary schools the achievements of the high school were smaller and the work was begun too late. The curriculum was also criticized as being planned almost entirely with a view to college entrance, with the result that those who did not intend to pursue a college career soon dropped out. Perhaps as a consequence of the first criticism, perhaps in order to make a better adjustment with the elementary grades, the "six and six" plan has been started, i.e., six years of elementary education and six years of secondary. The arrangement of the last six follows various plans, but generally the aim is to increase the variety of opportunity and to meet the needs of different groups of pupils, some of whom will remain only three years, some four, and others six. The following types of courses have been established: the general or cultural course, or college preparatory; the manual-training or industrial courses, leading to technical college or work in shops and trades; household-arts courses, preparing for the home or women's occupations; commercial courses; and agricultural courses. The function of the high school becomes increasingly not merely to train for life occupations, but by greater variety of opportunities to test capacity and develop tastes. The whole movement, however, is still in the experimental stage.

The high school is developing into an independent institution with its own aims and purposes, of which preparation for college is only one of many. The "accrediting" system, which prevails in Michigan and California, and by which high schools desiring to pass students without examination into the colleges are inspected by the faculties of the State universities, has been criticized for tending to reduce the high schools to mere feeders for the universities. On the other hand, it must be said that the colleges have very extensively modified and enlarged the curriculum of the old days of purely classical instruction, so that each of the courses offered in high schools, except perhaps the commercial one, prepares for some line of collegiate work. Moreover, the "accrediting" system has been the only system of effective inspection to which the high schools have been subjected, if we do not regard the college entrance examinations as attaining this end.

No effective system of pensioning teachers exists in the United States, although some laws have been passed aiming at this. They have relied, with few exceptions, on the contributions of teachers, and where they have been established new teachers are required to join in as part of the contract of appointment, the old teachers being given an option. On the other hand, the salaries of teachers in the elementary schools compare favorably with those abroad, averaging, in 1912, $78.08 a month for men and $58.08 for women for the country as a whole. The highest average salary for all teachers was $105.33 in California, the lowest $35.77 in North Carolina.

Forty-two of the States and the District of Columbia have compulsory-education laws. The common period during which some instruction must be given is from the eighth to the fourteenth year. These laws, though not rigidly enforced, are nevertheless fairly effective, and attendance for at least a good part of the year is now nearly universal for children of school age.

The evolution and present status of higher education in the United States, the most notable features of which have been the development of the State universities and the transformation of the colleges into universities, are dealt with in the article on UNIVERSITY. For a treatment of the American elementary schools, see the article on COMMON SCHOOLS.

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NATIONAL EDUCATION ASSOCIATION. See EDUCATION ASSOCIATION, NATIONAL.

NATIONAL FLAGS. National flags or ensigns date from a time long before Constantine adopted the monogram of Christ. (See LABARUM.) They are distinctly an evolution. In early days, as man emerged from the primitive state, the need of some tribal emblem made itself felt, and this was supplied by what afterward became the standard. Later on the religious element entered into the composition of flags and banners and coats of arms. See NATIONAL ARMS.

United States. The national flag of the United States of America is dealt with in a separate article under the title flag (q.v.). This is commonly called the "Stars and Stripes." The President's flag is blue, in the centre of which appears a representation of the arms of the United States in their proper colors. See NATIONAL ARMS and also HERALDRY.

The flag of the Vice President is white, and in the centre appear the arms of the United States, the colors being those of the coat of arms, with

slight modifications or minor changes in color necessitated by the white ground on which the coat of arms appears.

EUROPE

Austria-Hungary. The royal and Imperial standard of Austria-Hungary is a golden flag upon which appears a black two-headed eagle displayed, each head royally crowned, and above all the crown of Austria. The flag of the Austrian navy has three equal horizontal stripes—red on top, white in the middle, and red below. The centre of the flag bears the arms of Austria, the shield having a border of gold and surmounted with the crown of Austria. The flag of the merchant marine is like that of the navy except that the lowest band is red in the half next the flagstaff and green in the other, the reason being that the colors of Austria are red, white, and red, and those of Hungary red, white, and green. The merchant flag bears two crowned shields; the one next the staff is for Austria and the other for Hungary. The Hungarian crown is that of St. Stephen and is different from the crown of Austria.

Belgium. The naval and merchant-marine flags of Belgium are alike. The flag is composed of equal vertical stripes, black (next the staff), yellow, and red. The royal standard contains the royal coat of arms of the Kingdom, borne on the central yellow stripe.

Bulgaria. The national ensign or naval flag is a tricolor of horizontal bands—top white, centre green, and red at the bottom. In a space next to the flagstaff is the golden crowned lion rampant on a red ground. The merchant ships use the plain tricolor without the lion.

Denmark. The flag of Denmark is now the oldest unaltered one in the world. The royal arms have as their most striking feature the Dannebrog, or silver cross of Denmark, bordered with red. This cross divides the shield into four quarters, each of which is occupied by a separate device. The origin of the cross is said to date from 1219, when King Waldemar, at a critical moment in his career, averred that he had seen this cross in the heavens. The Dannebrog therefore became for him, as the name implies, the "Strength of Denmark." The flag of the navy is red, swallow-tailed, and has the white Dannebrog upon it. The flag of the merchant marine is a red flag with a white cross upon it and is not swallow-tailed.

France. The tricolor of France has been in official existence only since 1789, the year of the Revolution. Previous to that (and now called France Ancient) was a blue cloth powdered with golden fleurs-de-lis. In the reign of Charles V (1365) the number was reduced to three, typifying the Trinity (now called France Modern). When Henry III (1574) came to the throne, he adopted the *drapeau blanc* as the royal flag.

The tricolor, made up of three equal vertical bands of color—blue next the flagstaff, white in the centre, and red in the fly—now forms the national flag (called France Present). The flag is used by the navy and the merchant marine, as well as on shore by citizens generally. The President's flag carries his initials. When the civic guard was raised on July 14, 1789, it was decided that the colors should be blue and red, the colors of the city of Paris, to which, on the proposal of Lafayette, the white color of the royal Bourbon flag was added. The French tricolor of to-day is, as it were, a compromise flag, in which the colors of Paris are united with the former sovereign's color—white.

Germany. On the Imperial standard of Germany is laid the Iron Cross, black with a white and black border; at the centre of the cross is the German eagle, bearing on its breast the shield of Prussia, and this latter carries a quartered shield with the arms of the Hohenzollerns. The flag of the Imperial navy is white and divided into quarters by the arms of a large black cross having at its centre a circle in black outline containing the black Prussian eagle crowned. The upper quarter next the hoist contains the merchant flag in miniature, upon the centre of which is superimposed the Iron Cross. The merchant flag consists of three horizontal stripes equal in width, the upper being black, the middle white, and the lower red. These colors are derived from the black and white of Prussia and red and white, the colors of the Hanseatic League (q.v.).

Great Britain. The flag of the people in the British Empire is the Union Jack. It symbolizes the parliamentary union of the three constituent parts of the United Kingdom of Great Britain and Ireland. The Union Jack, or union flag, is composed of three crosses—St. George's, the broad upright Latin cross, red upon a white ground; St. Andrew's, saltire or X-shaped cross, white upon a blue ground; and the cross of St. Patrick, a red saltire on a white ground. The arrangement of the arm of the crosses next to the flagstaff is different from those remote from the staff. When James I of England and VI of Scotland united the crowns of those countries each had its own flag, and ships of each country continued to carry each its own colors. When the English and Scottish ships met at sea frequent contentions resulted as one or other hoisted its jack above that of the other. To put an end to these disagreements a flag combining the jacks was devised, and in 1606 a union flag was brought out. It is constructed by laying down the Scottish emblem and placing the English jack on top of it. The Scottish flag is blue, and where the red cross of St. George would touch the blue ground a narrow white border was interposed. The boundary between red and blue is never clear when viewed at a distance, and it is at variance with a rule of heraldry. In the reign of Anne the parliaments of England and Scotland were united, and the union flag was duly sanctioned, so that the flag of 1707 indicated the parliamentary union of the countries. In the jack of Anne the red St. George's cross had a wider border than the "additional jack of James" had, and thus indicated a portion of the original white ground of the English jack. In the year 1801 appeared the union flag as it is now flown. The Irish jack, a red saltire, or St. Patrick's cross, on a white ground, had to be incorporated to indicate the parliamentary union of Great Britain and Ireland.

In order properly to construct the Union Jack imagine a table twice as long as it is wide. The table, if entirely covered by a blue tablecloth, makes the ground for the jack. On this two diagonal lines are laid, and these lines intersect at the centre. Bands of white material are laid on the upper side of each of these diagonals at the left end of the table. At the point of intersection of the diagonals the white

MERCHANT FLAGS OF MARITIME COUNTRIES

AUSTRIA-HUNGARY

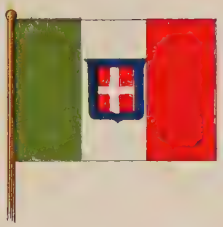
BELGIUM

DENMARK

FRANCE

GERMANY

GREAT BRITAIN



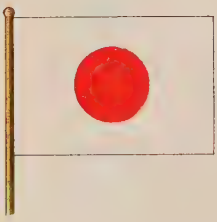
ITALY

MEXICO

RUSSIA

SPAIN

SWEDEN



JAPAN

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bands are cut and placed under the continuation of the same diagonals, the white bands going below the lines which lie on the right-hand end. The red Irish saltire, of the same width as that of the white St. Andrew's cross, is placed in the only space available, on the underside of both diagonals at the flagstaff end and above the diagonals at the right-hand end. As the two quarters next the flagstaff are more important from an heraldic point of view, here the St. Andrew's is above the St. Patrick's cross, thus indicating that Scotland came into the Union before Ireland. In order to avoid the touching of red and blue it is necessary to edge the red Irish saltire with white. The Irish cross is as wide as St. Andrew's, but the white border of the red saltire has to be cut off its own edge, although the red saltire with its border is equal to the full St. Andrew's cross of white. The red cross of St. George is then added. This, with its broad white border, is laid over the two saltires of Scotland and Ireland. The Union Jack is the proper flag for any British subject to use for private or public display. It typifies parliamentary union and is thus in every respect the people's flag.

The Union Jack is used by citizens all over the British Empire. When hoisted for the Governor-General of Canada, a white circular space at the intersection of the arms of the crosses is reserved for the badge. This circle is usually inclosed by a wreath of laurel leaves, when used by a colony, but in the case of Canada the wreath is of maple leaves; and ferns for New Zealand.

In Canada the badge consists of a quartered shield in which appear the arms 1, Ontario. 2, Quebec. 3, Nova Scotia. 4, New Brunswick. This is surmounted by the crown. The lieutenant governors, when using the Union Jack officially, place inside the wreath the arms of their particular province, but without the crown.

There is no distinctive flag for Canada, as the ensigns of the British Empire do not designate territory, they indicate class of service. The Union Jack is used by the people of Canada as in other portions of the British Empire. It is varied only by the Governor-General of the Dominion and by the lieutenant governors of the nine provinces of Canada. The Mercantile Marine flag flown by vessels of Canadian register is the Red Ensign of the Empire, with the badge of Canada (without crown or wreath) in the fly of the flag.

The British ensigns are three in number—the white, the blue, and the red. Each carries the jack in the upper left-hand corner next the staff. The white ensign is the flag of the royal navy. It bears the red cross of St. George in addition to that in the jack. The blue ensign is for all vessels in government employ. When employed by a colonial government the badge of the colony is in the fly. The blue ensign is also the flag of the Royal Naval Reserve. The red ensign is the flag of the merchant service.

For about 200 years the British navy was divided into three squadrons, called respectively the Red Squadron, the White Squadron, and the Blue Squadron. At the time of his death Nelson was vice admiral of the White, as shown on a monument in the Guildhall in London. As the various ensigns of these divisions of the royal navy were more or less difficult to distinguish in action, Nelson ordered the whole fleet to hoist the white ensign at Trafalgar on Oct. 21, 1805. These three divisions were abolished by order in council on July 9, 1864. A song written in America by an Englishman has been applied to Great Britain. Thus the song, "The Red, White, and Blue," perpetuates the memory of these three squadrons. It evidently does not refer only to the colors of a flag. The British ranking order is preserved. In the United States the reverse order prevails. It is thus probably commemorative of the disappearance as such of the red, the white, and the blue squadrons.

Greece. The flag of Greece is simple. The royal standard is a silver (white) cross on a blue ground. The royal shield is ensigned with the crown and placed at the intersection of the arms of the cross. Behind the shield are two sceptres. The flag of the navy contains a canton of blue upon which the white Greek cross stands on blue, and in the fly are nine horizontal bars, four white and five blue, the royal crown being shown in the intersection of the arms of the cross. The merchant flag is similar, but without the crown. The colors of the flag, white and blue, were derived from the arms of Otto of Bavaria, who was called to the throne of Greece in 1833. The motto of Greece, ΑΓΑΠΗ·ΛΑΟΥ·ΙΣΧΥΣ·ΜΟΥ, referring to the new King's choice by the people, reads, "My strength is my people's love."

Holland (The Netherlands). The national flag is a tricolor made up of three equal horizontal bands—red at the top, white centre, and blue below. The navy and mercantile flags are alike. Why the top stripe is red and not orange is not exactly known, though the original upper color was orange after William the Silent, Prince of Orange, had thrown off the Spanish yoke. In 1599 the flag was undoubtedly orange, white, and blue. Fournier, in 1643, wrote of it as red, white, and blue, and under these latter colors the victories of Van Tromp and De Reuter were gained.

Italy. The Italian flag dates back to 1310, when Amadeus V, Duke of Savoy, assisted the Knights of St. John of Jerusalem to victory over the Saracens at the siege of Rhodes. After the battle the Grand Master, in gratitude, presented Amadeus with the silver cross of the order. Amadeus placed it on a red shield with blue border in the arms of Savoy. In 1805 Napoleon made the northern provinces into a kingdom and gave it a tricolor, like that of France, but with the vertical colors green (next the flagstaff), white, and red. When Napoleon was overthrown this flag disappeared. It was revived in 1861 when Victor Emmanuel, King of Sardinia and a scion of the house of Savoy, became King of the southern portion of Italy. In 1870 the northern and southern parts were united as one Kingdom. The Savoy arms on the central white vertical band of Napoleon's tricolor became the flag of united Italy. The shield is crowned when used by the navy, but is plain for the merchant marine.

Monaco. Monaco has a white flag for the Prince, on which is a crowned shield, the field of which is covered with lozenge-shaped figures, red and silver. The collar of the Order of St. Charles, instituted in 1863, surrounds the shield, and the pendant is a Maltese cross. The naval flag is a plain red and white flag, two bands being horizontal, red on top. The merchant flag is the same.

Montenegro. Montenegro has a red flag with a white border, and in the centre are the royal arms crowned, being a double-headed eagle dis-

played, with sceptre and orb. The naval flag is a tricolor—from above red, blue, and white horizontal stripes. On the blue is a crown above the letters *H. I.* The merchant-marine flag is a tricolor with broad horizontal bands, like the ensign, but the crown and initials are not shown.

Norway. It was in 1397 that Sweden, Norway, and Denmark formed one kingdom under the sway of Denmark, but in 1414 Denmark released its hold. The naval ensign is a red flag, swallow-tailed, with a broad blue cross upon it. The cross has a narrow white border, and the fly end of the blue cross projects from the central angle of the swallowtail, as if a pennant had been laid on the flag. Norway achieved its independence in 1814. The merchant flag is red, with a blue cross edged with white. This flag is not swallow-tailed.

Portugal. In 1910 Portugal became a republic, though some memory of its history is retained in the flag. The arms of Portugal are a large silver shield on a green and red ground. On the shield are five small blue shields in the form of a cross, and each shield bears five plates of silver. The large shield has a red border, on which are seven golden castles. This device dates from 1139, when the country, which had been in subjection to the Moors for 500 years, threw off the yoke. Alphonso I defeated five Moorish princes in the battle of Ourique and adopted five small shields to commemorate the victory. The five white spots represent the five wounds of Christ, in whose strength Alphonso believed he had defeated the infidels. The red border was added by Alphonso III in 1252 after his marriage to a daughter of the King of Castile. In the flag this shield is placed upon an armillary circle of gold. The colors of Portugal are green and red, and the national emblem shows the flag divided vertically and equally. It is square, with green next the flagstaff; red is the color for the Republic. John I of Portugal was the father of Prince Henry the Navigator (1415–99). Prince Henry achieved knighthood, and the green is that of the cross and ribbon of the Knights of St. Benedict of Aviz and, with the armillary circle, commemorates Prince Henry's fame. The national ensign is a green and red flag. The proportion of green to red is as 2 to 3. The shield is placed in the centre of the dividing line. The merchant flag is entirely green, with the shield and armillary circle in the centre.

Rumania. Rumania has a tricolor with vertical bands—blue next the flagstaff, yellow centre, and red in the fly. The yellow band contains the arms within a crowned canopy of ermine, which is the quartered shield of the state with supporters. The motto *Nihil sine Deo* (Nothing without God) is below the shield on a black ribbon. The naval ensign contains these arms, while the merchant flag is plain.

Russia. The introduction of the two-headed eagle for Russia dates from 1472, when Ivan the Great married Sophia, a daughter of Constantine Palæologus, and assumed the arms of the Greek Empire. The naval flag is white with a blue St. Andrew's cross upon it. The jack of the navy is made by placing the narrow white cross of St. George on a red ground, and over all the white-bordered blue cross of St. Andrew. This flag resembles the "additional jack of James," except that the colors are different from those of the British jack. The merchant flag is a tricolor of three equal horizontal bands —white on top, blue in the middle, and red below. These colors were originally red, white, and blue. Peter the Great derived them from the Dutch, from whom he learned shipbuilding. This form was the Dutch flag reversed, which is the signal of distress for Holland, and was later altered.

Servia. The merchant flag of Servia is a tricolor of broad horizontal stripes—red above, blue centre, and white below. The royal standard has a crowned canopy of ermine containing a crowned shield and supporters. The shield shows a double-headed eagle displayed, upon whose breast is a red shield containing an upright cross with the date 1804. Each quarter made by the arms of the cross contains a Slav initial letter. The standard has an indented border, the colors are white, red, and blue. The merchant flag is usually a plain tricolor, but sometimes it has the arms inserted.

Spain. The flag of the navy is yellow, the color of Aragon, having on the upper and lower edges a wide stripe of red, the color of Castile. On the broad yellow stripe an oval shield crowned is shown near the flagstaff, on which are the arms of Castile impaling Leon. The merchant-marine flag is a yellow flag upon which two red stripes are laid some distance in from the edge so that the flag is composed of five horizontal stripes—yellow, red, yellow (broad, central), red, and yellow. The crown and shield of Castile and Leon do not appear on this flag.

Sweden. Sweden has for a naval ensign a blue flag upon which is a yellow cross. The flag is swallow-tailed, and the horizontal arm of the cross in the fly projects. The merchant flag is the same as the ensign with the exception of the swallowtail, the merchant flag being rectangular.

Switzerland. The flag of Switzerland is red with a white cross upon its centre. The arms of the cross do not extend to the outer edges of the flag. The national and merchant flags are one and the same. In 1863 an international conference was held at Geneva, in which the rules of war were discussed and field and permanent hospitals, ambulance service, and the many humane methods of caring for the wounded were officially recognized by the signatory powers. A badge was devised as the distinguishing mark of this work. It was the flag of Switzerland with the colors counterchanged, making it a red cross on a white ground.

Turkey. The naval and merchant flags of Turkey are alike and are light red, on which are superimposed a crescent and a star in silver. The crescent moon is near the flagstaff and the star remote from it. The crescent was made the emblem of Byzantium after the siege of that city by Philip, father of Alexander the Great. A night attempt by the followers of Philip to undermine the walls of the city was revealed by the light of the crescent moon. In gratitude for this delivery Diana's symbol became the badge of the city. In 1453 Mahomet II captured the city and adopted the badge for the Ottoman Empire.

ASIA

China. Since China became a republic, in 1912, the flags formerly used have been discarded. The national flag, used also in the merchant service, consists of five broad horizon-

MERCHANT FLAGS OF MARITIME COUNTRIES

ARGENTINE REPUBLIC

BRAZIL

CHILE

CHINA

COSTA RICA

ECUADOR

GREECE

NETHERLANDS

NORWAY

PORTUGAL

PERU

VENEZUELA

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tal bands of color, the uppermost, red, standing for China proper; the next, yellow, for Manchuria; the next, blue, for Mongolia; beneath that is white, for Tibet; and lowest of all is black, for Turkestan. The flag of the navy is red with a blue canton in the upper corner next the hoist, and upon this is a large white sun, from which emanate rays in the form of small triangles. The colors thus employed in the naval flag stand for Mongolia, Tibet, and China proper.

Federated Malay States. The Federated Malay States (Pahang, Perak, Negri Sembilan, and Selangor) have a flag of four horizontal bands of color. Beginning at the top they are white, red, yellow, and black. In the centre of the flag is a horizontal oval of white, on which a tiger is shown in its natural colors on a green grass ground.

Japan. The flag of the Mikado of Japan, which corresponds to the royal standard of European countries, is a red rectangular flag upon which appears in the centre a golden conventional representation of the yellow chrysanthemum. The naval flag is white, with a red disk, representing the sun, placed slightly out of the centre and nearer the flagstaff. From this disk broad fan-shaped bands of red color radiate like the rays of the rising sun. The flag of the merchant marine is white with a red circle in the centre. The present flags were adopted in 1897.

Persia. The Imperial standard of Persia is a blue flag with a white circle in the centre, on which appear the arms of Persia. The military flag, there being no naval ensign, is a horizontal tricolor—green above, white central, and red below. Upon the centre of this flag are the arms of Persia, similar to those on the Imperial standard, but not inclosed in a white circle.

Siam. The standard of Siam is a red flag upon which appear the royal device, a white elephant with trappings and harness, standing on a platform, and in the upper corner next the hoist an anchor and a wheel. The merchant flag has the white elephant only, without trappings or platform, and without wheel and anchor. The origin of this white elephant is said to be that before Xacca, the founder of Siam, was born his mother dreamed that she brought forth a white elephant, and the Brahmans said that after many incarnations Xacca became a white elephant and was received among the celestial deities.

AFRICA

Abyssinia. The national ensign is the tricolor, the colors from the top being green, yellow, red, without any device.

Belgian Congo. Belgian Congo has a blue flag carrying in the centre a five-rayed golden star and showing the Belgian ensign in the canton.

Liberia. The national ensign has 11 horizontal stripes, red and white, with a large white star in a blue canton next the flagstaff in the upper corner. The naval and merchant flags are alike.

SOUTH AND CENTRAL AMERICA

Argentina. The flag of Argentina has three bands placed horizontally. At the top is blue, centre white, bottom blue. For the naval flag the sun in splendor is shown on the central white band.

Bolivia. Bolivia has a tricolor with horizontal stripes. Red is uppermost, yellow in the middle, and green below. For the naval flag the arms of the state are introduced in the centre of the yellow stripe, while the merchant flag is plain.

Brazil. Brazil has a green flag, in the centre of which is a large yellow lozenge with major axis horizontal. On the lozenge is a disk of blue, on which appears a representation of one of the heavenly constellations, and upon this sphere is a band inscribed with the motto *Ordem e progresso* (Order and progress).

Chile. The national ensign and merchant flag of Chile is composed of two equally wide horizontal stripes, white above and red below, with a canton next the flagstaff blue, and bearing a white five-rayed star.

Colombia. The flag of Colombia has at the top a broad, yellow, horizontal stripe occupying half the flag, below which is a light-blue stripe and then a red one. The merchant-marine flag has at the centre an upright red oval inclosing a blue ground on which there is a white star. The naval flag has the state arms in the centre of the flag.

Costa Rica. The national flag is made of five horizontal stripes of color. The top is blue, below white. The central band is red, broader than the others. Below this is white, and lowest is blue. The naval flag shows the arms of the state on the centre of the broad red stripe, while the merchant flag is plain.

Cuba. Cuba has a blue and white arrangement of horizontal stripes, three blue and two white. Next the flagstaff is a triangle with base to the hoist and point in the central blue stripe. The triangle is red, with one white star upon it.

Dominican Republic. The flag of the Dominican Republic has a white upright cross upon it. The upper quarter of the flag next the staff is blue, the corresponding top quarter remote from the staff is red. The lower quarter next the staff is red, and the remaining one is blue. The merchant flag is plain, while the naval flag has the national device shown at the intersection of the arms of the cross.

Ecuador. Ecuador's flag has broad yellow in the upper half of the flag, blue below, and red beneath; the two lower stripes are each one-quarter of the hoist measurement. The national ensign has the state arms in the centre of the flag, while the merchant flag is plain.

Guatemala. The flag of Guatemala is blue, white, and blue, arranged in three broad vertical bands. The state arms occupy the centre of the white band, and upon a scroll under the arms are the words *Libertad 15 de Setiembre 1821.* The merchant flag is without the national device.

Haiti. The merchant flag is plain blue and red in horizontal stripes, the blue above. The naval ensign shows the national badge on a rectangle of white at the centre of the flag.

Honduras. Honduras has the same colors in the national flag as those of Guatemala, but they are arranged horizontally—blue on top, white central, and blue below. The ensign has the national badge in the centre and five gold stars below it. The merchant flag shows five gold stars in the centre of the white stripe.

Mexico. Mexico has a tricolor of vertical stripes. The stripe next the flagstaff is green, the outer one is red. The central stripe is

white, with the badge of the Republic shown upon it for the naval flag. The merchant flag is plain.

Nicaragua. The flag is blue, white, and blue, arranged horizontally, with the arms of the state shown in the central white stripe when used for warships. The merchant flags have a blue anchor instead of the national arms.

Panama. The national ensign is a quartered flag. Next the flagstaff in the upper corner is a blue star on a white ground. The upper quarter remote from the staff is plain red. The lower quarter next the staff is plain blue, while the outer and lower quarter has a red star on a white ground.

Paraguay. Paraguay has a horizontally arranged tricolor of red, white, and blue—red on top and blue below, with the white central band containing in its centre the arms of the state. The ensign has a lion standing, surrounded by a wreath, and above all is a red Phrygian cap carried on a pole. It has a reverse badge on the other side of the flag, different from that on the front; both, however, are oval. The merchant flag is like the ensign except that the badge is different from that on the ensign, being circular in form. Both sides of the merchant flag are alike.

Peru. The President's flag and the ensign of Peru is a vertical tricolor, red, white, and red. The arms of the state appear in the centre of the white band. The merchant flag has the same arrangement of colors, but the state arms are absent.

Salvador. Salvador's ensign is composed of three horizontal stripes—blue above and below and white central. In the centre of the white band are shown the arms of the state, with the words in Spanish *Republic of Salvador and Central America*. The merchant flag is the same as the ensign, but on the centre of the white band are the words in golden letters, *Dios—Union—Libertad*, arranged in a circle without the arms of the state.

Uruguay. Uruguay has a flag composed of horizontal stripes, alternately white and blue, there being five white and four blue. On a white canton there is the golden sun in splendor.

Venezuela. The naval flag is a tricolor with horizontal bands—yellow on top, blue centre, and red below. The arms of the state are placed on the yellow stripe, in the upper corner next the flagstaff. The centre of the flag is occupied by seven white stars arranged in a group. The merchant flag is like the ensign, with the arms of the state omitted, but the seven stars appear.

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NATIONAL FLOWERS. See FLOWERS, NATIONAL AND SYMBOLIC.

NATIONAL FORESTS. See LUMBER INDUSTRY; FORESTRY.

NATIONAL FOR'MULARY, OF UNOFFICIAL PREPARATIONS. A book of medicinal formulæ which are frequently prescribed by physicians or demanded by the public, but which are not recognized by the *Pharmacopœia* (q.v.), either because they were not thought of sufficient importance or because they originated subsequently to the last edition of the official work. The *National Formulary* is compiled by a committee of the American Pharmaceutical Association and published by the society, based upon a similar work prepared in 1882 by the College of Pharmacy of the City of New York, the King's County Pharmaceutical Society, and the German Apothecaries Society of the City of New York. The first edition appeared in 1888, the second in 1896, and the present, the third, in 1906, always following the appearance of the last edition of the *Pharmacopœia*. It contains about 600 preparations, with an appendix of about 75 more which had been dismissed from the *Pharmacopœia* of 1890 and 1900.

NATIONAL GAL'LERY. The term National is often applied to galleries and museums belonging to the state. Thus, there are important national museums at Naples, Florence, Munich, Stockholm, and Copenhagen. The best-known collections bearing the title National Gallery are: one at Washington devoted chiefly to American painting; another at Berlin, devoted chiefly to modern German painting; and the important gallery of painting in London, situated on the north side of Trafalgar Square. The building, in classical Greek style, was erected from designs by Wilkins between 1832 and 1838 and originally cost £96,000. It was enlarged in 1860, 1876, and 1886. The gallery, formed in 1824, rapidly increased in size and received important collections of paintings, presented or bequeathed by Robert Vernon in 1847, J. M. W. Turner in 1856, Wynn Ellis in 1876, Henry Vaughan in 1900, and George Galting in 1910. It has besides received important financial bequests and state aid. The National Gallery is particularly rich in the paintings of the Italian school, including magnificent examples by Crivelli, Piero della Francesco, Giovanni Bellini, Titian, Moroni, and Raphael's Ansidei Madonna; but the early Flemish and Dutch schools (with several fine Rembrandts), and especially the old English masters, are also well represented. The modern British sculptures and paintings are housed in the National Gallery of British Art (Tate Gallery), a branch of the National Gallery, provided by the late Sir Henry Tate (q.v.); and British portraits in

the National Portrait Gallery, founded in 1850. The national collections now embrace 1880 works of art, most of which are in the National Gallery. Consult: J. P. Richter, *Lectures on the National Gallery* (New York, 1898); J. de W. Addison, *Art of the National Gallery* (Boston, 1906); P. G. Konody and others, *National Gallery* (2 vols., New York, 1909).

NATIONAL GUARD (Fr. *Garde Nationale*). From 1789 to 1871 the name of the French militia under municipal control, recruited from the middle class. The French Revolution really brought about the creation of the National Guard, though guards of a like nature had existed in some towns previous to 1789. In that year, however, they were instituted in Paris, on the suggestion of Mirabeau, by the Revolutionary Committee, as a check on the Royalists. The National Guard thus constituted numbered 48,000 men, and Lafayette received the command. Other battalions were organized in the provinces, and very soon, on paper, the total strength of the National Guard of France was 4,000,000—though the actual available force was not more than 300,000. In 1795, after the National Guard had gone through many of the most eventful scenes of the Revolution, it was reorganized on a less democratic basis. The result was that it showed Royalist leanings and became the bulwark of the middle classes against uprisings of the masses. It rose against the Convention shortly before the dissolution of that body, but the movement was promptly suppressed by Bonaparte with grape shot. This was the insurrection of the 13th Vendémiaire (October 5). For a time the National Guard ceased practically to exist. In 1805, however, the Emperor Napoleon reorganized it, and it rendered him good and efficient service, particularly in the disastrous years 1813–14. After 1815 the National Guard was still maintained, but in 1827 it was dissolved by Charles X. Its members were allowed, however, to retain their arms, and many of them participated in the July revolution of 1830, at which time the National Guard as an institution was revived. In 1848 it helped do away with the monarchy and establish the Republic. After undergoing various reorganizations in 1848, 1852, and 1855 it again became firmly established. The National Guard fought in the Franco-Prussian War in 1870, and at the capitulation of Paris its members were allowed to retain their arms. The result was that during the Commune of 1871 numbers of national guardsmen went over to the Communists. (See COMMUNE.) After the establishment of the third French Republic the National Guard was abolished, its place being taken by the system of universal military conscription. Consult C. Poisson, *L'Armée et la garde nationale* (4 vols., Paris, 1858–62), and Thoumas, *Les anciennes armées françaises des origines à 1870* (ib., 1890). For the National Guard of the United States, see MILITIA.

NATIONAL HYMNS. It is only within comparatively modern times that patriotism has found expression through the medium of a *national* song. In the few cases where a national hymn dates back several hundred years it will be found to have assumed its representative character recently. National music is inseparably connected with folk music (q.v.), but is a later development, and instead of representing the work of individuals (influenced by similar conditions and surroundings) it embodies the feelings, tendencies, and ideas of a people. In other words, folk music is individual in its character rather than national. Needless to say, however, it is the forerunner and basis of national music, which often reaches its culmination in the national hymn. The following list of national hymns covers the most important ones. It is compiled largely from Sousa's *Airs of All Lands* (Philadelphia, 1890).

Argentine Republic—"Oíd, mortales, el grito sagrado" (1810) (Hear, O Mortals, the Sacred Call). Music by D. V. Lopez.

Austria—"Gott erhalte Franz den Kaiser" (1797). Words by L. L. Haschka; music by J. Haydn.

Belgium—"La Brabançonne" (1830). Words by Jenneval; music by F. Campenhout.

Bohemia—"War Song of the Hussites."

Brazil—"Hymno da Proclamacão da Republica" (1889) (Hymn of the Proclamation of the Republic). Words by Medeiros e Albuquerque; music by Leopoldo Miguez.

Burma—"Kayah Than" (Sound the Trumpet).

Chile—"Dulce Patria" (national air); by Carnicer.

Costa Rica—"De la Patria." Music by M. M. Gutierrez.

Denmark—"King Kristian stod ved höien Mast" (King Christian Stood beside the Mast). Words by Ewald; music by Hartman.

Ecuador—"Salve, O Patria."

Egypt—"Salaam, Effendina" (March of the Khedive).

Finland—"Vârt land" (Our Land). Words by J. L. Runeberg; music by F. Pacius.

France—"La Marseillaise" (q.v.). Words and music by Rouget de Lisle.

Germany—"Heil dir im Siegerkranz." Words by H. Harries to music of "God Save the King" (q.v.).

Great Britain—"God Save the King" (q.v.).

Holland—"Wien Nêerlands."

Hungary—"Isten âld meg a Magyart" (Lord Bless the Hungarian). Music by F. Erkel.

Italy—"Royal March" (national air); by G. Gabetti.

Japan—"Kêenêe gajo" (May the Empire Last).

Mexico—"Mexicanos, al grito de guerra" (national air) (Mexicans, at the Cry of War); by J. Nunó.

Nicaragua—National air, by Blas Villatas.

Norway—"Ja vi elsker dette Landet" (Yes, we Love this Land of ours). Words by Björnstjerne Björnson; music by R. Nordraak.

Persia—"Salamati Shah." Music by A. Lemaire.

Peru—"Somos libres, seámoslo siempre" (We are Free; let us be so Ever).

Rumania—"Traeasca Regale" (1862) (Long Live the King).

Russia—"Boghe Zaria chrany" (1830) (God Protect the Czar). Words by Zhukovsky; music by A. Lyoff.

Salvador—"Saludemos la Patria" (Let us Hail our Country). Words by J. J. Canas; music by J. Aberle.

Servia—"God in His Goodness." Music by D. Jenko.

Spain—"Himno de Riego." Music by Herta.

Sweden—"Ur svenska hjertans djup" (Out of the Swedish Heart).

Switzerland—"Rufst du, mein Vaterland," to music of "God Save the King."

United States—"Star-Spangled Banner."

Uruguay—"Himmo Nacional de la República Oriental del Uruguay."

Venezuela—"Gloria al bravo pueblo" (1811) (Honor to a Brave Nation). Words by V. Salías; music by J. Landaeta.

Consult: Carl Engel, *An Introduction to the Study of National Music* (London, 1866); Fitzgerald, *Stories of Famous Songs* (ib., 1898); Rousseau and Montorgueil, *Les chants nationaux de tous les pays* (Paris, 1901); Emil Bohn, *Die Nationalhymnen der europäischen Völker* (Breslau, 1908); H. F. Chorley, *The National Music of the World* (London, 1912).

NATIONAL INSTITUTE OF ARTS AND LETTERS. (See ACADEMY OF ARTS AND LETTERS, AMERICAN.) These two organizations received jointly in 1915 the site for a permanent home. It was given by Archer M. Huntington and adjoins the property in New York City which the same donor provided for the American Geographical Society and the Hispanic Society.

NA'TIONALISM. A term applied to the plan of social reform outlined in Bellamy's *Looking Backward*. The scheme involved the nationalization of the processes of production and distribution. It is a form of socialism which emphasizes the social importance of economic equality.

The first Nationalistic Association was organized by a company of Bellamy's readers in Boston in 1889. A statement of its views condemned the system of competition and expressed the belief that it would gradually be supplanted by a system of universal brotherhood. The movement spread rapidly, and by 1891 there were in the United States 162 clubs. In some States, notably California, an active part was taken in politics. In May, 1889, was started a magazine, the *Nationalist*, which existed two years. Its place was then taken by the *New Nation*, founded by Bellamy, which also lasted two years. The Nationalists exercised a considerable influence upon the People's party, but did not play any considerable independent rôle. The movement spread to England, where the Nationalization Society was organized July 3, 1890. See SOCIALISM.

Consult: Edward Bellamy, "The Programme of the Nationalists," in the *Forum* (New York, March, 1894); R. T. Ely, *Socialism and Social Reform* (New York, 1894); Edward Bellamy, *Looking Backward* (new ed., Boston, 1898).

NATIONALISM. A modern historical tendency having for its objective the organization in well-knit political states of populations naturally bound together by ties of nationality. Nationality itself is conceived by the proponents of the tendency as including community of language, traditions, morals, religion, and, in a broad sense, culture (*Kultur*). In the early period of nationalism much stress was laid also upon community of race, but more recent ethnological studies have rendered the hypothesis of race as a basis of culture untenable.

In its modern form nationalism is an outgrowth of the French Revolution, with its emphasis upon the independence and unlimited sovereignty of nations. Before the Revolution England and France were indeed national states, the political organization being coterminous with the cultural; but nationalism had not assumed the form of a conscious force. Conscious nationalism developed in France in her struggle with hostile coalitions. The ideal was taken up by German statesmen, philosophers, and poets during the revolutionary period, and made steady progress, despite the obstacles of particularism, or the sentiment of state autonomy, finally reaching its culmination in the formation of the German Empire, under the statesmanship of Bismarck, in 1871. A similar movement appeared in Italy in the second decade of the nineteenth century, resulting, after a half century of revolutionary activity, in the creation of a united Italy in 1861. The national movement in Greece, originating about the opening of the nineteenth century, was crowned in 1830 by the establishment of Greece as an independent kingdom, though most of the territories inhabited by Greeks remained under Turkish rule. Nationalism in the Balkans, awakened not much later, led to a series of revolts, with resulting experiments in autonomy, and finally the recognition of the independence of Rumania, Bulgaria, Servia, and Montenegro, under the Treaty of Berlin. Norwegian independence (1905) and the creation of an independent Albania in 1913 may be regarded as outgrowths of the nationalism movement, although in the latter case the condition of independence was imposed by the diplomacy of the Great Powers instead of arising out of a spontaneous popular movement.

While nationalism achieved its final purpose in the instances cited, it has failed of its object despite active movements, often accompanied by insurrection, in the cases of Hungary, Bohemia, Poland, Finland, and Ireland. Abortive nationalist movements have also made their appearance in India, Egypt, and the Philippine Islands. Further, even in cases in which a part of a nation has achieved political organization, other parts have remained under foreign rule. Familiar examples of national fragments under alien domination are Alsace-Lorraine under Germany, the Italian-speaking territories of the Trentino and Istria under Austria-Hungary, Bosnia and Herzegovina—largely inhabited by Servians—under Austria-Hungary, and, down to the Balkan wars, the Greek, Servian, and Bulgarian sections of Macedonia, and Thrace under Turkish rule. In each case an active movement (Irredentism) has been conducted in such "unredeemed" territories for annexation to the state representing the national unity. In reaction against Irredentism the states dominating such territory have pursued policies of forced assimilation through the imposition of their language as a medium of public instruction, official business, etc.

Nationalism was the chief cause of military conflicts in the nineteenth century. In addition to the revolutionary struggles inherent in the movement and the wars created by Irredentist agitation, nationalism has in some instances favored foreign war as a force making for domestic unity. This was notably the case with the Franco-German War of 1870, which was regarded as desirable by German statesmen on account of its effect in sinking local jealousies in a vital common cause.

In the United States nationalism as a movement had for its object the subordination of the States to the central government. This object came near to realization in the Constitution; the residual element of State sovereignty was in large measure extinguished by the Civil War. In recent years an attempt has been made to intensify the nationalism tendency through the inauguration of economic policies designed to

give the Federal government a more positive rôle in industrial and social development. This movement, which is represented especially by a section of the Progressive party, has been somewhat vaguely characterized as the "new nationalism." (See NEW FREEDOM.) The new nationalism derives much of its force from the example of German nationalism, which has developed the relations between the state and industry with remarkable success. See SOCIALISM, *State Socialism.*

Nationalism does not imply a self-contained economic policy; on the contrary, it regards the foreign trade and investment relations of citizens as particularly deserving the solicitude of the state; hence an active interest in the export trade, often supported by subsidies, measures designed to further shipbuilding, commercial treaties, and, on occasion, acquisition of colonies. (See IMPERIALISM.) It seeks to put barriers in the way of emigration and to place restrictions upon aliens doing business in the home market. In this respect it is sharply to be contrasted with the cosmopolitan tendencies of nineteenth-century liberalism.

NA'TIONAL'ITY. The condition or status of belonging to a nation or sovereign state. A person so related to a state, as citizen, subject, or national, owes allegiance to such state and is entitled to its protection at home and abroad. Every person is born a national of some state, but, as each country defines for itself by its municipal law what circumstances of birth determine its nationality, considerable divergencies exist. The one universal rule is that a person born in a country of parents who are subjects or citizens of that country is himself a citizen or subject thereof. But the status of a person born of alien parents or of one born in a foreign land varies in different countries. In some countries the locality of birth, irrespective of parentage, is the determining factor; in others the nationality of the parents determines that of the child wherever born; and there is a marked tendency at the present time to employ both principles, so that every person born within a country and in addition every person born abroad of subjects of such country is ipso facto a subject or national thereof.

Great Britain and the United States confer the status of citizens or subjects both on the children of aliens born within their respective dominions and on the children of their own citizens born abroad. Most European states rely on the principle of nationality of the parents and claim no allegiance from the children of aliens who may be born within their territory, but by laws enacted in 1889 and 1893 France claims as her citizens children born on her soil if one of the parents is a French citizen. It is obvious that the combination of the two principles of nationality of parents and locality of birth will often have the curious result of conferring on one and the same person a double nationality. Thus, a child born in the United States of English parents is at the same time a British subject and an American citizen. This difficulty is partially met by the laws of several countries which give to a person with a double nationality the right to disclaim or renounce one of them on attaining his majority.

The nationality acquired by birth may be lost through the acquisition of another nationality by naturalization. Most countries make provision by law for the naturalization of resident aliens, who by that process usually acquire full citizenship, though not necessarily all the political rights of natural-born citizens. The law governing naturalization usually requires the applicant for citizenship to renounce his allegiance to the sovereign or government of the country of which he was at the time a citizen, but it is clear that such renunciation can have no legal effect outside the naturalizing state unless the new status is recognized by the state whose allegiance is renounced.

The maxim that no one can renounce his nationality (*Nemo protest exuere patriam*) is the common law of all modern states and was English law up to the year 1870, when by Act of Parliament (The Naturalization Act, 33 and 34 Vict., c. 14) it became possible for a British subject on acquiring a foreign nationality to renounce his British nationality, and this principle was after much conflict of opinion adopted by the United States in 1868 by an Act of Congress which declares that "the right of expatriation is a natural and inherent right of all people." By a series of naturalization treaties concluded between 1868 and 1902, most foreign states accepted the principle that naturalization in the United States absolved their subjects from their former nationality. Russia, however, still regards as her own nationals all of her subjects who have been naturalized in other countries, and some other states, like Italy, regard such subjects as still liable to military service or as punishable with death if they bear arms against their native country. An American citizen may also forfeit his nationality, if a naturalized citizen, by returning to the country of his former allegiance and residing there for two years or by residing in any other foreign country for a period of five years, unless it be as a representative of American trade or commerce or for purposes of health or education, and unless he intends to return permanently to the United States to reside (Act of Congress, March 2, 1907), and even a natural-born citizen forfeits his American citizenship by leaving the United States and establishing himself in a foreign country without any definite intention to return to the United States.

The foregoing rules with regard to citizenship and naturalization apply to women as well as to men, with the exceptions that an alien woman who marries an American citizen thereby acquires the status of her husband and that an American woman who marries an alien, whether resident in this country or abroad, by that act loses her American citizenship. It was also provided by the Act of 1907, previously referred to, that the citizenship of an alien wife acquired by marriage is not lost by the death or divorce of her husband, and that the American wife of an alien husband may after his death or after divorce resume her American citizenship either by residing in the United States or, if living abroad, by registering as an American citizen within one year with a consul of the United States.

The doctrines of nationality above set forth are a part of the municipal, or domestic, law of the various nations, and do not trench upon international law except in those cases where, by treaty or otherwise, the right of a person by naturalization to renounce a former nationality comes into question. But international law recognizes the right of a state to the allegiance

of all the subjects of a conquered territory or of territory acquired by cession, occupation, or discovery. Thus, the citizens of Alsace and Lorraine were by the Treaty of Frankfort, which brought the Franco-German War of 1870–71 to a close, transferred from French to German nationality. The modern practice of nations has in such cases permitted the citizen or subject inhabitants of such a territory to elect whether they would remain as nationals of the new sovereign or remove to other territory of their former allegiance.

Bibliography. Cockburn, *Nationality* (London, 1869); W. E. Hall, *Foreign Powers and Jurisdiction of the British Crown* (ib., 1894); J. B. Moore, *Digest of International Law* (8 vols., Washington, 1906); Piggott, *Nationality* (London, 1907); T. J. Lawrence, *The Principles of International Law* (4th ed., Boston, 1910); W. E. Hall, *Treatise on International Law* (6th ed., Oxford, 1910); John Westlake, *International Law* (2 vols., New York, 1910–11). See CITIZEN; DOMICILE; JURISDICTION; NATURALIZATION.

NATIONAL LITERARY SOCIETY OF IRELAND. See IRISH LITERARY SOCIETY.

NATIONAL MONUMENTS. National monuments are reservations that have been established by proclamation of the President in accordance with the Act of June 8, 1906, which provides that he may in his discretion "declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic and scenic interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and may reserve as parts thereof parcels of land." The same act authorizes the Secretaries of the Interior, Agriculture, and War to make uniform regulations governing the excavation of ruins and archæological sites and the collection of objects of antiquity by public institutions. Uniform regulations were published on Dec. 28, 1906, and each Secretary issues permits for excavations in the monuments within his jurisdiction.

National monuments are not essentially different from national parks except in methods of establishment and administration. The monuments are as a rule smaller than the national parks. Congress has provided neither funds nor administrative machinery for protecting the lands reserved as monuments. They have consequently been placed under the charge of the nearest administrative officer of one of the three departments. In the list below the area of each monument and the date of establishment are given in parentheses.

The following monuments are under the supervision of the Secretary of the Interior: Natural Bridges, Utah (2740 acres, April 16, 1908, and Sept. 25, 1909), includes the three largest natural bridges known; the Augusta Bridge, the largest, measures 320 feet from wall to wall and has below it a clear opening of 265 feet. Rainbow Bridge, Utah (160 acres, May 30, 1910), includes a natural bridge that has a curved surface above as well as below; it has a height of 309 feet and a span of 278 feet. El Morro, New Mexico (160 acres, Dec. 8, 1906), includes an enormous sandstone rock on which the Spanish explorers of the seventeenth and eighteenth centuries carved many inscriptions that are of historical importance. Muir Woods, California (295 acres, Jan. 9, 1908), is near the city of San Francisco and includes a fine redwood grove which was presented to the United States by William Kent. Petrified Forest, Arizona (25,625 acres, July 31, 1911), includes a large area in which the prostrate trunks of petrified trees are exposed on the surface. Devil's Tower, Wyoming (1152 acres, Sept. 24, 1906), is a steep-sided shaft of rock 600 feet in height. Montezuma Castle, Arizona (160 acres, Dec. 8, 1906), includes an assemblage of cliff dwellings. Tumacacori, Arizona (10 acres, Sept. 15, 1908), includes the ruins of an old Spanish mission. Chaco Cañon, New Mexico, (20,629 acres, March 11, 1907), includes the largest prehistoric ruin discovered in the Southwest. Gran Quivira, New Mexico (160 acres, Nov. 1, 1909), includes one of the earliest mission ruins and some pueblo ruins. Navaho, Arizona (360 acres, March 14, 1912), includes a number of ruins of the cliff dwellers. Pinnacles, California (2080 acres, Jan. 16, 1908), includes a number of steep rock formations, under which are caves. Mukuntuweap, Utah (15,840 acres, July 31, 1909), includes a remarkable cañon from 800 to 2000 feet deep. Shoshone Cavern, Wyoming (210 acres, Sept. 21, 1909), includes a limestone cave which has been explored in part only. Sitka, Alaska (57 acres, March 23, 1910), includes the site of an old Indian village where the Indians defeated the Russians in 1804. Lewis and Clark Cavern, Montana (160 acres, May 16, 1911), includes a limestone cavern of great beauty. Colorado, Colorado (13,883 acres, May 24, 1911), includes many impressive and colored rocks similar to those in the Garden of the Gods. Papago Saguaro, Arizona (2050 acres, Jan. 31, 1914), includes a collection of characteristic desert flora as well as prehistoric pictographs.

The following monuments, most of which are in national forests, are under the jurisdiction of the Secretary of Agriculture: Grand Cañon, Arizona (806,400 acres, Jan. 11, 1908), includes the Grand Cañon of the Colorado River. Cinder Cone, California (5120 acres, May 6, 1907), is of scientific value in the study of volcanic activity. Lassen Peak, California (1280 acres, May 6, 1907), includes the volcanic cone of Lassen Peak, which was supposed to be extinct, but which was in eruption in 1914. Gila Cliff Dwellings, New Mexico (160 acres, Nov. 16, 1907), includes some cliff dwellings in a region where few are found. Tonto, Arizona (640 acres, Dec. 19, 1907), includes two ruins of prehistoric cliff dwellings. Jewel Cave, South Dakota (1280 acres, Feb. 7, 1908), comprises a limestone cavern of considerable interest. Wheeler, Colorado (300 acres, Dec. 7, 1908), includes a number of fantastic pinnacles that are the result of erosion. Oregon Caves, Oregon (480 acres, July 12, 1909), includes a limestone cave that has been only partly explored. Devil Postpile, California (800 acres, July 6, 1911), includes an area of basaltic rock in the form of immense columns. Mount Olympus, Washington (608,480 acres, April 17, 1912), includes a mountain area comprising a number of glaciers as well as the breeding ground and summer range of the Olympic elk.

The following national monuments are under the jurisdiction of the Secretary of War: Big Hole Battlefield, Montana (5 acres, June 23, 1910), embraces a tract on which a battle was fought with the Nez Percé Indians in 1877. Cabrillo, California (21,910 square feet, Oct. 14, 1913), includes Point Loma on San Diego

Bay, where Cabrillo discovered California in 1542.

An annual report on the national monuments is issued by the Department of the Interior.

NATIONAL MUSEUM. See UNITED STATES NATIONAL MUSEUM.

NATIONAL NICKNAMES (ME. *nekename, ekename*, by faulty liaison for *an ekename*, additional name, from *eke* + *name*). National nicknames are as a rule first employed by the people themselves. By the familiar JOHN BULL is meant the English nation. The name was first used in the satire of Dr. John Arbuthnot, *Law is a Bottomless Pit*. The sobriquet of JONATHAN or BROTHER JONATHAN has gone through three distinct phases. First, between 1776 and 1783 it was employed, as a mildly derisive term, by the Loyalists, and applied by them to the Patriots; secondly, between 1783 and 1812 it was adopted by the Americans themselves, who used it to designate a country bumpkin; and thirdly, during the war with England in 1812–15 it came into universal vogue as a national sobriquet. The accepted story attributing the origin of the term to a remark made by Washington in allusion to Governor Jonathan Trumbull of Connecticut originated in 1846, and has recently been shown to be without foundation. UNCLE SAM, the familiar sobriquet of the United States government or people, is commonly stated to have originated at the outbreak of the war with England in 1812, when some one, asking what the letters U. S. marked on casks and barrels meant, was facetiously told that they referred to "Uncle Sam" or Samuel Wilson, an obscure citizen of Troy, N. Y., said to have been an inspector or a contractor. This story has not been found earlier than 1842, when it was given in J. Frost's *Book of the Navy*, p. 297. No doubt Frost copied it from some newspaper, but the story lacks proof. The term Uncle Sam has yet to be traced earlier than the fall of 1813, when we read of "Uncle Sam's men," meaning United States customhouse officers, and are told that "*Uncle Sam*, the now popular explication of the U. S., does not pay well." The term appears to have arisen somewhere in the North, perhaps in New York or Vermont; and its origin was presumably merely a jocular extension of the abbreviation U. S., then very common. For three years it ran a career in the newspapers, in 1816 it appeared in a book, and by 1817 its popularity was well established. The American dubs the Mexican GREASER, thereby aspersing the tidiness of the latter's appearance; while the Mexican or Spanish-American returns the compliment with the term GRINGO (the Spanish word for gibberish), which serves to distinguish an American, or, as in South America especially, an Englishman. NICHOLAS FROG, the typical Dutchman, was first used by Arbuthnot in his *Law is a Bottomless Pit*. JEAN CRAPAUD (toad) is the popular nickname of the French nation, collectively taken, and dates back to the time when the ancient kings of France used for their device in heraldry "three toads, erect, saltant," or in a leaping posture, and Paris was called Lutetia, or Mudland. Its streets were so quaggy that the French court called its inhabitants "frogs." An Australian is said to answer to the name CORNSTALK. For the French Canadian we have JEAN BAPTISTE, JOHNNY, JACK, and CANUCK, this last a word of American Indian origin. JACK CANUCK, the type of the young Canadian pioneer, whether of French or British origin, is represented in some of the Canadian comic papers with his sleeves rolled up and carrying an axe on his shoulder. The French peasant is facetiously called JACQUES BONHOMME. DON stands for a Spaniard, in allusion to the dignity of bearing proper to the type. DEUTSCHER MICHEL, signifying a simple countryman, is the facetious nickname applied to the German people, and intended particularly to satirize the weaknesses and foibles of the national character, especially their proverbial lethargy, heaviness, and credulity. A racial, if not a national, designation for the negro is BLACKAMOOR, while in the United States an "unbleached American" should come if called SAMBO. SAWNEY is the sportive designation sometimes applied by the English to the Scotch, and is probably a corruption of Sandy, the abbreviation of Alexander. It was first given to the Scotch by Coleridge. TAFFY, the Welshman, is a corruption of David, one of the most common of Welsh names. PADDY, from Patrick, refers to the Irish. JOHN CHINAMAN is the popular nickname for the Chinese. The Russian nickname, IVAN IVANOVITCH, denotes the typical muzhik as found all over Russia.

NATIONAL REPUBLICAN PARTY. See WHIG PARTY.

NATIONAL SECURITY LEAGUE. An organization incorporated in 1914 by citizens who were convinced that the United States is not adequately prepared for defense. The league favors an army and navy with citizen reserves which will be sufficient only for adequate protection of the country. It does not believe in a large standing army or in any form of militarism. One of its purposes is to lay before the country the plans of defense which have been studied out by the General Staff of the army and the Naval Board, and which have been approved by the successive administrations of the Army and Navy departments. Its further purpose is to urge citizens to coöperate in insisting that Congress pay heed to these advisers and make necessary provision for the protection of the country. Among the means of bringing about these ends is the appointment of a nonpartisan commission of experts and laymen by Congress to consider the problem of defense and bring its conclusions to the attention of the country. The league has committees on army, navy, militia, extension, membership, and finance. The honorary president at the time of its organization was Hon. Joseph H. Choate. The league is a national body with branches throughout the country.

NATIONAL STANDARDS AND EMBLEMS. See STANDARD; NATIONAL ARMS.

NATIONAL UNION. A fraternal beneficiary secret society formed by prominent members of like fraternities at Mansfield, Ohio, in 1881 and incorporated in that State. It led in adopting assessments, graded according to age. Its government is patterned nominally after that of the United States. It reports 747 senate councils, nearly 62,500 members, and total benefits disbursed, nearly $40,000,000.

NATIONAL UNIVERSITY. The proposal to establish a national university in the United States has been frequently mooted since the idea was put forward by George Washington in his first message to Congress. Washington's purpose was to create a great Federal institution of learning at the national capital to provide opportunities which so many students were

seeking in Europe. The project has had its supporters among several succeeding Presidents and was advocated as recently as February, 1915, by ex-President Taft before the National Education Association meeting at Cincinnati. In the early days of the Republic the constitutionality of the maintenance of such an institution by Congress was questioned. More recently the project has been favorably reported upon by committees of Congress in 1890, 1893, 1894, 1896, and 1902, and numerous bills have been introduced—one as recently as 1914 (Sen. 4881, H. Rep. 11,749)—but never with any success.

In general, it is not now intended to establish a university in the ordinary sense of the term so much as to coördinate the facilities now existing in Washington for graduate study. Since it briefly summarizes the intentions of the supporters of the scheme the chief contents of the bill introduced in 1914 may be quoted. The National University is to be created "for the purpose of promoting the advance of science, pure and applied, and of the liberal and fine arts by original investigation and research and by other suitable means; to provide for the higher instruction and training of men and women for posts of importance in the public service of State and Nation and for the practice of such callings and professions as may require for their worthy pursuit a higher training; and to cooperate with the scientific departments of the Federal government, with the Land Grant Colleges founded in pursuance of the Morrill Acts of 1862 and 1890, with the State universities, and with other institutions of higher learning throughout the country. Persons to be admitted must have B.S. or B.A. degree from an institution of recognized standing, or have pursued an equivalent course." The facilities afforded for research studies in Washington, it may be pointed out, include the Library of Congress, the National Museum, the Smithsonian Institution, the Medical Museum, the Patent Office, the Corcoran Gallery, the National Botanic Gardens, the Geological Survey, the observatories, and the government Bureaus of Standards, Statistics, Plant Industry, Soils, Fisheries, Entomology, and Public Roads, all of which represent an equipment of about $60,000,000, and many of which are already open for purposes of research. See also AMERICAN UNIVERSITY.

NATIONAL UNIVERSITY OF IRELAND. An institution for higher education established by Act of Parliament in 1908. By this Act the existing Royal University of Ireland was dissolved and in its place were established the Belfast University and the National University of Ireland. The latter consists of three constituent colleges—University College, Dublin, Queen's College, Cork, and Queen's College, Galway. The chief purpose sought in this reorganization was to provide an institution that would meet the wishes of the Roman Catholics. While the National University is undenominational and free from tests, religious instruction may be given, but not out of public funds. The university received the sum of $850,000 for buildings and equipment and an annual grant of $320,000. The following faculties are maintained: arts, philosophy and sociology, Celtic studies, law, medicine, science, engineering and architecture, and commerce. The enrollment in 1912–13 was about 1440 in the three constituent bodies (University College, 870; Cork, 429; Galway, about 140).

NATIONAL WORKSHOPS, or ATELIERS NATIONAUX, ȧ'te-lyȧ' nȧ'syǒ'nǒ'. A plan of giving public employment attempted in France in 1848. The provisional government organized on the overthrow of Louis Philippe by the February revolution passed a decree (February 25) defended by its Socialist members—Louis Blanc, and a few others—declaring the "right to work" and pledging the government to guarantee employment for idle workmen. A few days later "national workshops" were established. As a matter of fact there were no workshops opened; the work provided was in the open air, and consisted largely in planting trees, digging, and constructing roads—works for which few of the applicants were adapted. Their number, however, increased from day to day and at one time reached 130,000. No work could be found for many of the applicants; these received 30 cents a day, while those actually employed were paid 40 cents, although the work they performed was scarcely worth the additional 10 cents. Under these circumstances many workers who were in private employ demanded higher wages or were content to give up their places and remain idle so long as they might receive 30 cents per day for doing nothing. Several attempts were made to bring the scheme within the range of practical feasibility; but political disturbances and personal jealousies made it impossible to carry them out. After four months' trial and a total expenditure of 14,000,000 francs, the system was abandoned when General Cavaignac became Chief of the Executive.

The national workshops are sometimes erroneously confounded with the *ateliers sociaux* in Louis Blanc's plan of labor organization.

NATIVE (from Lat. *nativus*, natal, inborn, from *nasci*, to be born; connected with Gk. *γίγνεσθαι*, *gignesthai*, Skt. *jan*, AS. *cennan*, archaic Eng. *ken*, to beget). A term applied in chemistry and mineralogy to elements, especially the metals, when found in nature in a chemically free state.

NATIVE BEAR. The Australian koala (q.v.).

NATIVE COMPANION. The Australian Balearic crane (q.v.).

NATIVE PARAFFIN. See OZOCERITE.

NATIV'ITY (Lat. *nativitas*, birth, from *nativus*, *natal*, inborn), THE. The birth of Christ, a favorite subject in most periods of Christian art. The Virgin is usually represented as the joyous mother in the act of adoration, Joseph as grave and silent; the ox and the ass, which according to traditions witnessed the birth and adored the Christ child, as well as ministering and singing angels, are usually present. In painting the contemporaneous adoration of the shepherds is often added to the scene. The subject occurs occasionally in early Christian sarcophagi, more frequently in ancient and mediæval ivories, and often in illuminated manuscripts. In the revival of sculpture and painting during the thirteenth and fourteenth centuries it is one of the most popular subjects, and is always depicted in the cycle of the life of Christ—by the Pisani in their pulpit reliefs at Pisa, Siena, Pistoia, etc.; by Giotto at Assisi, the Arena Chapel, Padua, and Santa Croce, Florence; by Duccio in his "Majestas," Siena Cathedral; and by many others. In the fifteenth century it was painted with great sweetness by Fra Angelico at San Marco and elsewhere; by Filippo Lippi (Florence Acad-

emy); by Ghirlandaio (Dresden Gallery); by Piero della Francesca and Botticelli (National Gallery, London); by Tintoretto in San Rocco; and, most celebrated of all, by Correggio in his "Holy Night" (Dresden Gallery). (See Plate of Correggio.) The sculptors of the fifteenth century represented the subject in the group called "Presepio," of which there is a good example by Antonio Rossellino in the Metropolitan Museum, New York, and in reliefs. The most celebrated paintings on the subject by Germanic painters are by Hugo van der Goes (Uffizi, Florence), by Albrecht Dürer, especially in his great series of engravings, and by Rembrandt (Pinakothek, Munich). Consult the bibliography of Jesus Christ in Art.

NATOMA, nȧ-tō′mȧ. An opera by Victor Herbert (q.v.), first produced at Philadelphia, Feb. 25, 1911.

NATORP, nä′tôrp, Paul Gerhard (1854–). A German philosopher of the Neo-Kantian type. He was born at Düsseldorf, studied in Berlin, Bonn, and Strassburg, and in 1885 became professor extraordinary and in 1893 professor at Marburg. His works include: *Descartes's Erkenntnisstheorie* (1882); an edition of Democritus' *Ethics* (1893); *Religion innerhalb der Grenzen der Humanität* (1894; 2d ed., 1908); *Platos Staat* (1895); *Socialpädogogik* (1898; 3d ed., 1909); *Platos Ideenlehre* (1903); *Allgemeine Psychologie in Leitsätzen zu akademischen Vorlesungen* (1904; 2d ed., 1910); *Allgemeine Pädagogik in Leitsätzen zu akademischen Vorlesungen* (1905; 2d ed., 1913); *J. H. Pestalozzi* (1906; 2d ed., 1910); *Gesammelte Abhandlungen zur Sozialpädagogik* (1907); *Volk und Schule Preussens vor hundert Jahren und heute* (1908); *Pestalozzi, sein Leben und seine Ideen* (1909; 2d ed., 1912); *Die logischen Grundlagen der exakten Wissenschaften* (1910); *Philosophie: ihr Problem und ihre Probleme* (1911); *Allgemeine Psychologie nach kritischer Methode* (1912); *Hoffnungen und Gefahren unserer Jugendbewegung* (1914).

NA′TROLITE (from Eng. *natron*, from Ar. *natrūn*, *nitrūn*, native carbonate of soda, from Gk. *νίτρον*, *nitron*, *λίτρον*, *litron*, natron, of Semitic origin (cf. Heb. *neter*, from *nātar*, to loose) + Gk. *λίθος*, *lithos*, stone). A mineral sodium-aluminium silicate of the zeolite group. It crystallizes in the orthorhombic system, has a vitreous, sometimes pearly, lustre, is transparent or translucent, and ranges in color from white or colorless to gray, yellow, and red. Natrolite is found in cavities in basalt and other igneous rocks, at various localities in Bohemia, the Tirol, Ireland and Scotland, in Nova Scotia, in the Lake Superior region, and at Bergen Hill, N. J. It is capable of receiving a high polish, and has been used as a gem for rings and other ornaments, especially in the form of the letter N in initial jewelry.

NA′TRON. A hydrous sodium carbonate that crystallizes in the monoclinic system and is found in nature only in solution, as in the Soda Lakes of Egypt. Of similar character is the *trona*, an impure hydrogen sodium carbonate, which occurs as thin crusts along the margin of lakes in Egypt, Siberia, Tibet, and on the borders of the Black and Caspian seas. These minerals form the source of the soda salts of the ancient Egyptians, and were used by them in their arts, especially in embalming (q.v.). Of like character is the carbonate of soda found at the bottom of the lake at Lagunillas near Mérida, Venezuela, which is called by the Indians *urao*. Similar efflorescences are found in San Bernardino and Inyo counties, California, where they are formed by the spontaneous evaporation of saline waters. See Mummy.

NATTER, nät′tĕr, Heinrich (1846–92). An Austrian sculptor, born at Graun, Tirol. He studied at the Polytechnicum in Augsburg under Guyer and at the Academy in Munich. He lived in Munich and afterward in Vienna. Besides many portrait busts of celebrities he produced a number of memorial statues and groups, notably the Zwingli Monument (1885) at Zurich, the Haydn Monument (1887) in Vienna, "Walther von der Vogelweide" (1889) at Bozen, and the heroic statue of Andreas Hofer (1892) on Mount Isel, near Innsbruck, his principal work, though less individual in characterization than his other historical statues.

NATTERJACK, nät′ĕr-jăk (from AS. *nædre*, Goth. *nadrō*, Ger. *Natter*, adder + *jack*). A common, light-colored, rather smooth toad (*Bufo calamita*) of western Europe, found in sandy districts. Its very active habits have given it the name "running toad" in some localities in England.

NATTIER, nȧ′tyȧ′, Jean Marc (1685–1766). A French portrait painter, born in Paris. He was the son and pupil of the painter J. B. Nattier, and also studied under Jean Jouvenet and at the Academy. As a youth he was commissioned by the King to make drawings of the Rubens series, then in the Luxembourg; and in 1715 he went to Amsterdam to paint portraits of Peter the Great, of his wife, Catharine I, and of members of their suite. On his return he was received into the Academy (1718), as an historical painter, but after sustaining financial losses confined himself to portraiture. In this field he soon attained great popularity. If Rigaud is the painter par excellence of the men of his time, Nattier has done as much for the women. He painted repeatedly every member of the royal family, and most of the notabilities of the court. Though not exempt from mannerisms, and flattered rather than individualized, his portraits possess abundant charm, great purity of line, and harmonious refinement. His sitters are usually treated as mythological or historical characters. There are many portraits by him at Versailles, such as those of Maria Leszczynska, Madame Henriette de France, Madame Adelaide, Louise Henriette de Bourbon, and a family portrait of himself with his wife and children. The Wallace collection, London, and the Musée Condé, Chantilly, are rich in fine examples of his work, notably the portraits of Mademoiselle de Clermont; the Louvre possesses five Nattiers, including the celebrated Mademoiselle de Lambesc as "Minerva," and the Metropolitan Museum, New York, contains the Princess de Condé as "Diana." Other well-known works are Madame de Châteauroux as "Dawn" and Madame de Flavacourt as "Silence," Maurice de Saxe, Dresden Gallery, and the Duchesse de Chartres as "Hebe" (1744), Stockholm Gallery. Consult: *Masters in Art*, vol. iii (Boston, 1902), containing an exhaustive bibliography, and Pierre de Nolhac, *Nattier, peintre de la cour de Louis XV* (Paris, 1910).

NAT TURNER'S INSURRECTION. See Turner, Nat.

NATUNA (nȧ-tōō′nȧ) **ISLANDS.** A group of islands in the South China Sea, northwest of

Borneo, belonging to Holland (Map: Australasia, C 2). They are for the most part densely wooded and mountainous, but have some cultivated tracts which produce maize, rice, sago, and coconuts. The area is estimated at 803 square miles, and the inhabitants, who are chiefly Malay fishermen, number about 8000.

NAT'URAL (from Lat. *naturalis*, according to nature, from *natura*, nature, from *nasci*, to be born; connected with Gk. *γίγνεσθαι, gignesthai*, to become, Skt. *jan*, to beget, AS. *cennan*, archaic Eng. *ken*, to beget). In music, the sign ♮, which, placed before a note, counteracts the effect of a previous ♯ or ♭ and restores the note to its normal or natural place. To counteract a double sharp or a double flat (𝄪, ♭♭) a single natural is used, although it was formerly customary to write a double natural (♮♮). This form is superfluous and incorrect. In a key with many sharps or flats a doubly raised or lowered interval is generally restored to the chromatically altered tone required by the key signature. Thus, in G flat a ♭♭♭ would be restored, not to ♭, but to ♭♭, which is indicated by ♮♭. Likewise in a signature with sharps the *natural* sign appears as ♮ ♯.

NATURAL BRIDGE. Any natural structure of rock or earth which spans a depression. Natural bridges may be formed by various kinds of stream erosion, by wave action, by solution, and in a few other ways. There are more than 50 natural bridges of considerable size in the United States. Of these the best known is the celebrated Natural Bridge, in Rockbridge Co., Va., about 16 miles southeast of Lexington (Map: Virginia, E 4). The present structure was left by the collapse of the remainder of the roof of a tunnel formed, according to Cleland, "by water percolating through a joint or fissure athwart the stream, thence along a bedding plane and emptying under a fall or rapid of the stream. The channel thus formed was gradually enlarged until all the water of the stream was diverted from the stream bed below the point of ingress, leaving a bridge." The bridge thus formed has a span of 90 feet, and is from 50 to 100 feet wide. The thickness of its crown is about 40 feet and its arch is 215 feet above the stream. A public road passes over it.

Other remarkable natural bridges, caused by stream erosion, are the Edwin Natural Bridge, in San Juan Co., Utah, height 111 feet, span 205 feet, width 30 feet, thickness of arch 10 feet; the Augusta Sandstone Natural Bridge, near by in the same county, height 265 feet, span 320 feet, thickness 83 feet, width 35 feet; the Nonnezoshi Bridge, about 50 miles to the southwest (discovered in 1909), length 273 feet, height 308 feet; and the Natural Bridge near the railroad station of the same name in Powell Co., Ky., height 32 feet, span 20 feet, thickness about 12 feet. The bridge near Natural Bridge station in Winston Co., Ala., is a remarkably flat and thin arch of sandstone with a span of about 75 feet, of such symmetrical proportions that one could almost believe it to be the work of man. The Massachusetts Natural Bridge, near North Adams, is of the same class as the Virginia example. It is of white marble, spans Hudson Brook, is 44 feet high, about 25 feet wide, and spans about 10 feet. There is a very symmetrical bridge in Santa Cruz Co., Cal., which was formed by wave erosion. In Florida there are several natural bridges formed by solution but differing from the ordinary conception in that they are not elevated above the stream, and the points where the stream disappears and reappears are often so far apart that one cannot be seen from the other. For detailed description of the principal American bridges (with illustrations), consult the interesting article above quoted from, by Professor Cleland, entitled "North American Natural Bridges, with a Discussion of their Origin," in the *Bulletin of the Geological Society of America*, vol. xxi (New York, 1910), and another article by the same author, "The Formation of North American Natural Bridges," in the *Popular Science Monthly* (New York, May, 1911). See NATIONAL MONUMENTS.

NATURAL GAS. See GAS, NATURAL; GAS, ILLUMINATING AND FUEL.

NATURAL HARMONICS. See HARMONICS.

NATURAL HISTORY. A term used at different times and by different authors in a variety of senses. It was applied at first to the study of all natural objects, including minerals, rocks, and all living beings. The study of external nature and of the phenomena or laws governing the movements of natural bodies was formerly opposed to metaphysics, history, literature, etc. After a while astronomy and chemistry were eliminated from natural history; then natural philosophy, or what is now called physics, was separated from chemistry. But natural science, as distinguished from physical science, has made such progress that we must now know whether our naturalist is a mineralogist, a geologist, a paleontologist, a botanist, a zoölogist, or a specialist in some narrower department of biological study. At present natural history is confined to the study of organic nature, or biology, and students of general physiology and morphology are called biologists. See BIOLOGY; BIONOMICS.

NATURAL HISTORY OF SELBORNE. A work by Rev. Gilbert White (1789). It was produced from letters written by the author to Thomas Pennant and to Daines Barrington on outdoor life in a Hampshire village. Written in a style simple and entirely free from self-consciousness, it shows wonderful observation of nature, with a charm that made it an English classic.

NAT'URALISM. In philosophy, a term used to designate various theories of the universe differing widely among themselves in detail and agreeing only in the claim that nature furnishes an adequate explanation of all that is. But it is obvious that with different conceptions of nature naturalism will take very different forms. The important thing in determining what any naturalism maintains is the ascertainment of what such a naturalism considers as nonnatural. Thus, when the prevailing type of philosophy is theistic (see THEISM), naturalism, as opposed to nonnaturalism in the form of supernaturalism, maintains that the universe must be explained by immanent principles and not by reference to anything that transcends the universe as God in theism is conceived as transcending it. Spinoza (q.v.) with his single substance possessed of an infinity of attributes, two of which are mind and matter, and with this substance as his God, is nontheistic and therefore a naturalist. So similarly Hobbes (q.v.) with his predominant materialism, regarding the motion of matter as the universal cause, is likewise a naturalist. So again when the Kantian philosophy (see KANT) discriminates

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THE NATURAL BRIDGE

between the realm of nature as including all actual and possible experience, on the one hand, and inexperienceable things in themselves on the other hand, these things in themselves are a nonnatural element in the system; and with this feature of Kantianism in mind any development of the Kantian philosophy that eliminates the things in themselves and leaves only the world of experience is a form of naturalism. Thus, though Hegel (q.v.) opposed naturalism in the shape of materialism, he has been called a naturalist as denying reality transcendent of experience. But many Neo-Hegelians and Neo-Kantians maintain that the world of nature is organized by a spiritual principle that transcends time, by a timeless consciousness. The objects of this consciousness are in time, but the consciousness itself is not in time; it is eternal. According to this view the realm of objects is the realm of nature; spirit is a higher principle than nature. As opposed to this recent type of idealism we have several forms of naturalism, allied in denying that nature is a realm of objects existing alone for an untimed consciousness. Thus, materialistic mechanism (q.v.) is naturalistic, maintaining that the laws of matter account for all events, and that mind is merely an inefficient futile accompaniment of certain physical processes. So radical empiricism, instrumentalism, and neo-realism (qq.v.) are naturalistic, maintaining, each in its own way, that spirit is not presupposed in all nature but is itself a part of nature. Of all these types of naturalism the one that plays the largest part in recent literature as naturalism is perhaps materialistic mechanism.

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NATURALISM, IN LITERATURE. See REALISM AND NATURALISM.

NATURALISTS, AMERICAN SOCIETY OF. An association organized in 1883 to exchange ideas relating to the problems of natural history. The society now has an active membership of 350. The meetings of the society are held annually.

NAT'URALIZA'TION. The act or process by which in any country an alien acquires citizenship. The process consists of two parts, viz., the formal renunciation of the old allegiance and the assumption of a new allegiance. The rights and privileges of naturalized citizens are enumerated and defined by the municipal law of every state. In few or no cases are they the same as those of native-born citizens. In the United States they enjoy the same civil rights as natural-born citizens, and all of the political rights except eligibility to the offices of President and Vice President. The right of a subject or citizen to renounce his allegiance with a view to acquiring citizenship in another state is now generally recognized. (See EXPATRIATION.) In order to prevent possible conflicts of jurisdiction growing out of the practice of naturalization and the return of naturalized citizens to their native country, it is customary for states to enter into treaties for the regulation of matters relating thereto. Thus, the United States has entered into 11 treaties with foreign powers, in all of which, except that with Great Britain, it is provided that five years of uninterrupted residence with formal naturalization constitutes citizenship on both sides. A majority of these treaties contain the provision that a naturalized citizen returning to his native state shall, after an uninterrupted residence there of two years, be presumed to have renounced his acquired citizenship. It is also a general principle that naturalization does not release an individual from any obligations to his native state which he may have incurred before emigration, as, e.g., military service; and if he returns to such state he may be held to the fulfillment of his obligations without being able to invoke the protection of the United States, unless treaty stipulations provide otherwise.

In the United States the whole matter of naturalization is subject to the regulation of Congress. By the Law of March 4, 1913, the administration of the naturalization laws was placed under the charge of the Bureau of Naturalization, one of the bureaus of the Department of Labor. Books of record are provided by the bureau for each immigration station, and each alien arriving is registered. A certificate of registration is given to such alien, for use in case he desires to apply for naturalization. Exclusive jurisdiction over the naturalization of aliens is given to the United States district courts, United States district courts for the Territories of Hawaii and Alaska, the Supreme Court of the District of Columbia, and to State and Territorial courts of record having jurisdiction in suits in law or equity where the amount in controversy is not limited.

Two years prior to admission to citizenship the applicant must declare before clerk of such court his bona fide intention of becoming a citizen of the United States. Such declaration must state the age, occupation, place of birth, date of arrival in the country, and other particulars that may serve for purposes of identification. Not less than two years, and not more than seven years, after this declaration has been filed, the applicant must file with one of the courts having jurisdiction in the matter a petition signed in his own handwriting, with full name, place of residence, occupation, date and place of birth, etc. The petition must further set forth that he is not a disbeliever in organized government, and that he renounces allegiance to any foreign government, and intends to become a citizen of the United States. The petition must be verified by two credible witnesses, citizens of the United States, who must state that they have known him to be a resident of the United States for at least five years continuously, and of the State or Territory in which the petition is filed for at least one year preceding the application, and that he is of good moral character. Final action on the petition may not be taken within 90 days after it has been filed, and no certificate of naturalization may be granted within 30 days preceding a general election.

No alien may be naturalized who cannot speak the English language. This provision is not applicable to those who are physically unable to

speak, nor to those who shall make homestead entries on the public lands.

Aliens who owe allegiance to the United States (i.e., inhabitants of the dependencies) may file their declaration of intention to become citizens immediately on entering upon residence in the United States, and may after the lapse of not less than two years receive certificates of naturalization. Since 1802 the term of residence has remained at five years. A minor alien who has resided in the United States for three years next preceding his arrival at the age of 21, and who has continued to reside there up to the time of his application, may be admitted to citizenship without the previous declaration, provided he has resided in the United States for a period of five years. Aliens of 21 years and upward who have been honorably discharged from service in the United States army are not required to make the declaration of intention. Similarly aliens who have served five consecutive years in the United States navy, or one enlistment in the marine corps, may be admitted to citizenship without previous declaration of intention. The widow and children of an alien who has declared his intention of becoming a citizen, but dies before completing the steps, have not, since 1906, been regarded as citizens upon taking the oath prescribed by law. An alien woman who marries a citizen of the United States, and who herself might be lawfully naturalized, is considered a citizen. Children born outside of the limits of the United States, but of parents who are citizens, are considered as citizens; but the rights of citizenship in such cases do not descend to children whose parents never resided in the United States. Since 1870 the privilege of naturalization has been extended to aliens of African nativity and of African descent. Chinese aliens are excluded by statute of Congress from the privilege of naturalization.

Consult F. J. Franklin, *Legislative History of Naturalization in the United States* (Chicago, 1906), and G. B. Davis, *Elements of International Law* (3d ed., New York, 1908). See ALIEN; ALLEGIANCE; CITIZEN.

NATURALIZATION. In biology, the establishment of plants and animals in a new region, especially through the agency of man. Primarily, exotic species soon become feral and compete with indigenous species. They frequently never gain a foothold, but if they do they usually spread at first with extraordinary vigor, owing to the absence of their natural enemies. But later an adjustment with the other species in the country occurs, and after that the disproportionate numbers of the introduced form disappear, i.e., the new species become adjusted or naturalized. Compare ACCLIMATIZATION.

NATURAL LAW. Greek Philosophy. Some of the Greek Sophists, and later the Epicureans, held that law and justice were arbitrary conventions established by the weak for self-defense against the natural right of the strong. Socrates, in this as in other matters, antagonized the theories of the Sophists; but it was Aristotle who formulated the conception of natural justice which has remained dominant to the present day. In his view justice is in part legal, in part natural. Legal justice deals with matters which must be regulated, but which may be variously regulated. Natural justice, on the other hand, is not arbitrary; its rules are everywhere similar. The Stoics went further: they asserted that the rules of natural justice were founded on reason and were therefore discernible by reason; and the later Stoics termed this rational order *natural law.*

Roman Jurisprudence. The Roman lawyers noted the fact that many substantially identical rules were observed by all the Mediterranean nations and to this common law they gave the name "law of nations" (*jus gentium*). In the first century before Christ they began to speak of "natural law." In the Roman juristic literature the term is used in four different senses: 1. Natural law is identified with universal law (*jus gentium*). This is practically the Aristotelian sense. 2. Natural law is contrasted with the law observed by all nations; e.g., it is said that by nature all men are free, and that slavery has been introduced by the law of nations. This is the Stoic conception of natural law. 3. Sporadically the Epicurean idea appears, as when it is said that buyers and sellers have a natural right to overreach one another as regards price. 4. Ulpian has a theory which seems to have been peculiarly his own, but to which Justinian gave a factitious importance by including in his *Institutes* Ulpian's definition: "Natural law is that which nature has taught all living things." The illustrations, which refer to rudimentary family life, are rather biological than legal. Although the Roman jurists referred to the law of nature for the interpretation of their own law, and even drew from it supplementary rules where their own law was silent, they referred far more frequently, and for the same purposes, to "natural reason" and to "equity"; and they never ascribed to the law of nature such authority as to question the validity of a Roman rule because it was not in accordance with natural law. See CIVIL LAW; JUS GENTIUM; JUS NATURÆ.

Mediæval Theories. The doctrines of Aristotle and of the Roman jurisprudence were generally accepted in the Middle Ages as authoritative, and many attempts were made to reconcile them. There was a marked tendency to identify natural law with the law of God: in the *Decretum* of Gratian it is declared that natural law is identical with the Golden Rule. Thomas Aquinas divided all law into four classes—eternal, divine, natural, and human. The eternal law is the controlling plan of the universe, existing in the mind of God. A part of this eternal law has been directly revealed to men; this is the divine law. Another part is discerned by human reason; this is natural law. Except in its fundamental principles, natural law is not immutable, for "it seems to be natural to the human reason that it comes gradually from the imperfect to the perfect." Human law is the application of natural law to particular conditions. The practical influence of these theories upon the development of European law during the Middle Ages was slight. In the development of the English common law, as in the development of the Roman Imperial law, appeals to natural reason were far more frequent than appeals to natural law. In England, however, as well as on the Continent, the general law merchant, which was *jus gentium* in the Roman sense, was recognized as natural law.

Modern Theories. *Natural Law as a Factor in Legal Reforms.*—The general effect of the Protestant Reformation was to free the conception of natural law from ecclesiastical associations and limitations and to reëmphasize its rational character. Natural-law theories became

effective factors in the reform of the law. In the seventeenth century natural law was treated as a source of international law, and many rules which had not yet become rules of international custom attained this position through the writings of Grotius, Pufendorf, and others on "the law of nature and of nations." Later during the eighteenth century and the earlier years of the nineteenth, when the great national codes of civil and criminal law were drawn up in Prussia, Austria, France, and other countries, natural-law theories helped to give the legislators a more independent attitude towards established law and custom. In England utilitarianism played a similar part in facilitating law reform.

Natural Rights as the Basis of Political Revolution.—The theory of Cicero and of Thomas Aquinas, that laws in conflict with natural law are not truly laws, developed its revolutionary (not to say anarchistic) possibilities when the interpretation of natural law passed from secular and ecclesiastical authorities to the people at large. The theory that the popular consciousness is the true interpreter of that natural law by which all rulers are bound, found frequent expression before the close of the Middle Ages—e.g., in the writings of Marsiglio of Padua. With the Protestant Reformation these theories became practical forces in matters religious and political, and the tendencies which they represented first obtained a temporary triumph in England under the Commonwealth. Those legal rights which Englishmen had succeeded, through centuries of conflict, in asserting against the crown were brought by the Levelers into connection with the natural-law theories of the Continent, and thenceforth the rights of the individual to life, liberty, and property were "natural" rights. To these were soon added the right to participate in the constitution of government. As formulated by Locke and reformulated by Rousseau, these natural-right theories legitimized the revolutions which established the modern constitutional state.

Reaction against Natural-Law Theories.—The first noteworthy philosophical reaction against the revolutionary natural-law theories was that of Hobbes (q.v.). Equally hostile to natural-law theories was, especially at the outset, the historical school of jurisprudence. The conception of law as a product of historical evolution in each nation led to the assertion that there could be no such thing as eternal or universal law. With the development of comparative study, however, it is again perceived that beneath all the diversity of national laws there is a substantially uniform element which may be called human or universal or natural. This natural law, however, is substantially the *jus gentium* of the Romans or the "natural justice" of Aristotle, and not the natural law of the Stoics or of the Middle Ages; for it is not discerned by reason, it is rather revealed by the conduct of the human race.

The doctrine of a natural law, or law of nature, underlying all positive law and resting upon fundamental human morality, has played an important part in the development of actual legal institutions. Though seldom referred to under that name in English and American legal decisions, it has, under the name of the law of reason or common sense, profoundly influenced the course of our legal development. See JURISPRUDENCE; JUSTICE; LAW.

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NATURAL RIGHTS. See NATURAL LAW.

NATURAL SELECTION. The evolution idea is as old as the time of the Greek philosophers, but that form of it called natural selection, or Darwinism, dates from 1858, when the theory was stated by Darwin (q.v.) and also by Wallace (q.v.), each independently of the other. Nearly a century earlier Buffon, and afterward Erasmus Darwin, had suggested that species were mutable, and that all living beings had descended from some primitive type or germ, the transformation having been effected by changes of climate, food, exercise, and so on. But the real founder of the modern theory of organic evolution was Lamarck (q.v.; see also LAMARCKISM). The chief agents or factors of organic evolution which he proposed were changes of environment, of climate, soil, food, temperature, use, and disuse, while he briefly mentions the agency of competition, the results of geographical isolation, and the swamping effects of crossing, besides use inheritance. Although supported by a few though well-selected facts, Lamarck's views were, owing to the influence of Cuvier and the deep-seated prejudice of the times, ignored and well-nigh forgotten, except to be called up and ridiculed. Yet between the date of Lamarck's death in 1829 and shortly before 1858 nearly 30 naturalists, most of them of eminence, had publicly enunciated in a tentative way evolutional views —among them Grant, Wells, Naudin, D'Halloy, Schaaffhausen, Wallace in 1855, and others. Meanwhile Hutton and Lyell had advanced uniformitarian views in geology. Progress in the knowledge of the flora and fauna of the earth had greatly increased. The cell doctrine had been advanced; the sciences of paleontology, embryology, and morphology had been founded and were rapidly gaining ground.

As early as March, 1852, Herbert Spencer, in an essay published in the *Leader*, advocated the theory of the modification of species by changes of environment, and a few years later adopted the word "evolution," applying it to psychology and later to sociology and comparative religion.

History of the Rise of the Selection Theory. Such was the state of certain isolated scientific and philosophic minds, though the rank and file of naturalists were either indifferent or opposed to the theory of descent, when in 1858 the preliminary essays of Darwin and of Wallace were given to the public. Their views, which were destined to give such a decided impulse to biological inquiry, were independently confirmed by several biological experts after years of experience and research in all parts of

the globe. The botanist Sir Joseph D. Hooker, when surgeon and naturalist of the *Erebus* in the Antarctic expedition under Sir John Ross, published a flora of New Zealand, a *Flora Antarctica*, and in 1859 published his *Introduction to the Flora of Australia*, in which he advocated the selection theory. Before this (1858) Wallace had spent four years on the Amazon, and afterward eight years in the East Indian Archipelago, making large collections and careful observations. Meanwhile Charles Darwin, as the naturalist of the *Beagle* for nearly five years (1831–36) during her voyage around the world, was constantly exercising his marvelous powers as an observer. What chiefly led him, as early as 1839, to begin to favor the theory of descent, were his observations on the fossil mammals, the colossal armadillos and sloths, and the like, of South America, which appeared to be the ancestors of the degenerate forms now living; also the occurrence of local species on each of the Galapagos Islands, which he found to be very similar to those of the South American coast and yet slightly different. The result was that after 20 years of observations, experiments in his garden, and reflection, he elaborated the theory of natural selection.

On the first of July, 1837, he opened his first notebook to record any facts bearing on the origin of species, but "did not become convinced that species were mutable until two or three years had elapsed." More than a year after (October, 1838) he says: "I happened to read for amusement Malthus on *Population*, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observations of the habits of animals and plants, it at once struck me that under these circumstances favorable variations would tend to be preserved, and unfavorable ones to be destroyed. *The result of this would be the formation of new species.*" It is worthy of notice that Malthus was the father of natural selection, that the *Essay on Population* was the source of inspiration of both Darwin and Wallace, and that to this fact is apparently due the exact similarity in, or coincidence of, their views. Darwin's preliminary essay, together with that of Wallace, who also had read Malthus's *Essay on Population* containing nearly identical selection views, was published in 1858. In the following year appeared Darwin's epoch-making *Origin of Species*. His theory was at once accepted by Canon Tristram, Lyell, Hooker, Bates, Huxley, and others in Great Britain; in the United States of America by Asa Gray and Jeffries Wyman, and in Germany by Haeckel, while Fritz Müller, working on the same lines in Brazil, fully accepted and extended his views. That the time was ripe for the development and growth of the evolutionary idea was proved by its speedy and general acceptance by nearly all working naturalists and thoughtful minds. Moreover, the selection phase was easy to understand by laymen, and soon the multitude accepted the new views.

The Natural-Selection Theory Explained. The theory of natural selection is based on the facts of variation. As to the causes of variation, Darwin does not say much in the *Origin of Species*. Basing his theory on the fact that variations are constantly and spontaneously arising, he claimed that the favorable variations have succeeded in the struggle for existence, while those unfit or unfavorable have perished.

He also remarked that, as long as the conditions of life remain the same, we have reason to believe that a modification which has already been inherited for many generations may continue to be inherited for an almost infinite number of generations. We are also told that, as each land had undergone great physical changes, we might have expected to find that organic beings have varied under nature in the same way as they have under domestication. "And if there be any variability under Nature, it would be an unaccountable fact if natural selection did not come into play." "If, then," he asks, "animals and plants do vary, let it be ever so little or so slowly, why should we doubt that the variations or individual differences which are in any way beneficial would be preserved and accumulated through natural selection, or the survival of the fittest? If man can by patience select variations useful to him, why, under changing and complex conditions of life, should not variations useful to Nature's living products often arise, and be preserved or selected? What limit can be put to this power, acting during long ages and rigidly scrutinizing the whole constitution, structure, and habits of each creature—favoring the good and rejecting the bad? I can see no limits to this power, in slowly and beautifully adapting each form to the most complex relations of life."

Geometrical Ratio of Increase of Organisms. "A struggle for existence," says Darwin, "inevitably follows from the high rate at which all organic beings tend to increase." There is a vast destruction of seeds, eggs, embryos, and young. Were this not the case the earth would soon become covered with the progeny of a single pair. Linné pointed out that an annual plant producing two seeds only—and there is no plant nearly so unproductive as this—and these each producing two in the following year, and so on, would in 21 years produce over 1,000,000 plants. The elephant is regarded as the slowest breeder of all known animals, yet a single pair would become in the course of about seven and a half centuries, if all lived to the close of the breeding age, the ancestors of nearly 19,000,000 elephants.

The rate of increase of an animal, each pair producing 10 pairs annually, and each animal living 10 years, is shown in the following table, copied from Marshall's Lectures:

YEAR	Pairs produced	Pairs alive at end of year
1.....	10	11
2.....	110	121
3.....	1,210	1,331
4.....	13,310	14,641
5.....	146,410	161,051
10.....	.....	25,937,424,600
20.....	.....	Over 700,000,000,000,000,000,000

Immense numbers of eggs are laid by certain animals, and yet there are probably no more individuals now than centuries ago, the number of individuals remaining as a whole stationary. The queen bee lays during her whole life 1,000,000 eggs, the conger eel is estimated to deposit 15,000,000, the oyster from 500,000 to 16,000,000, and a very large oyster may produce even 60,000,000 eggs. "Supposing," says Marshall,

"we start with one oyster and let it produce 16,000,000 eggs, the average American yield, and let half, or 8,000,000, be females and go on increasing at the same rate; in the second generation we shall have 64 millions of millions of female oysters. In the fifth generation—i.e., the great-great-grandchildren of our first oyster —we should have 33 millions of millions of millions of millions of millions of female oysters. If we add the same number of males we should have in all 66 + 33 naughts. If we estimate these as oyster shells we should have a mass more than eight times the size of the world."

Darwin also claimed that natural selection "acts solely by accumulating slight, successive, favorable variation," and can produce no great or sudden modification. It can act only by short and slow steps, hence "the canon of *Natura non facit saltum*, which every fresh addition to our knowledge tends to make truer, is on this theory intelligible."

Use and Disuse. Darwin in some cases admits the action of use and disuse. In both varieties and species, he says, use and disuse seem to have produced a considerable effect. His examples are blind cave animals, the burrowing South American tuco tuco, which is occasionally blind, and certain moles; also the loggerheaded duck, which has wings incapable of flight, in nearly the same condition as in the domestic duck. Instincts he regards as having been slowly acquired through natural selection. See USE INHERITANCE.

The Geological Record. He then dwells on the geological record, which, although it is very imperfect, nevertheless strongly supports, he claims, the theory of descent with modification. The extinction of species and of whole groups of species almost inevitably follows from the principle of natural selection, for old forms are supplanted by new and improved forms. The fact, he says, that the fossil remains of each formation are in some degree intermediate in character between those in the strata above and below, is simply explained by their intermediate position in the chain of descent. The grand fact that all extinct beings can be classed with all recent beings naturally follows from the living and the extinct being the offspring of common parents. Species have generally diverged in character during their long course of descent and modification, and thus the more ancient types are in some degree intermediate between existing groups. Recent forms are more improved and generally more specialized than the earlier ones. Yet certain forms have retrograded, while others have retained "simple and little-improved structures," being what are called persistent types.

Geographical Distribution. The facts of geographical distribution are also utilized by Darwin, who calls attention to the past migrations of animals from one part of the world to another owing to former climatic and geographical changes. They also explain why on the same continent under the most diverse conditions most of the inhabitants within each great class are plainly related, the reason being that they are the descendants of the same progenitors and early colonists. They explain why oceanic islands are inhabited by only few species, most of these, as those of Madagascar, being peculiar or endemic species. Moreover, the existence of closely allied or representative species in any two areas, as Europe and North America, implies that the same parent forms formerly inhabited both areas. It is also the rule that nearly all the inhabitants of islands have been derived from ancestors which lived on the nearest mainland. Thus, the plants and animals of the Galapagos Archipelago, of Juan Fernandez and the other American islands, are closely related to those of the neighboring American mainland, while those of the Cape Verde Archipelago and other African islands were derived from the opposite African coast.

Facts of Morphology, Embryology, the Doctrine of Homologies. These were also drawn upon by Darwin. He maintained that adaptive characters, though of paramount importance to the beings, are of hardly any importance in classification, while vestigial characters are often of high classificatory value, the most valuable of all often being embryological characters. "The real affinities of all organic beings, in contradistinction to their adaptive resemblances, are due to inheritance or community of descent."

Natural Selection not the Exclusive Means of Modification. It should be observed that Darwin frankly expressed the conviction that natural selection, though the most important, has not been the exclusive means of modification. He allowed that absence of eyes in cave animals is not the result of natural selection, saying: "I attribute their loss wholly to disuse."

The Causes of Variation. In the first edition of his *Variation of Animals and Plants under Domestication* Darwin, after defining the definite action of the environment, added: "A new subvariety would thus be produced without the aid of natural selection," but this passage was omitted from the second edition. Besides the *Origin of Species* Darwin published a number of other works, the most important of which was *The Variation of Animals and Plants under Domestication* (1868). Towards the end of his life he gave more attention to the causes of variation, which at first he said were unknown, and in the work just cited he says: "Changes of any kind in the conditions of life, even extremely slight changes, often suffice to cause variability" (2d ed., ii, p. 258); and again: "Variations of all kinds and degrees are directly or indirectly caused by the conditions of life to which each being, and more especially its ancestors, have been exposed," adding: "To put the case under another point of view, if it were possible to expose all the individuals of a species during many generations to absolutely uniform conditions of life, there would be no variability" (ii, pp. 253, 255–256). He attributes the differences in races of cats living in Paraguay, at Mombasa, East Africa, and in Antigua, "to the direct action of different conditions of life" (i, p. 49); so with the horses of the South American pampas and of Puno. He refers to Dr. J. A. Allen's conclusions relative to the direct action of the climate in producing geographical varieties of birds, and concludes that "these differences must be attributed to the direct action of temperature" (ii, p. 271). So also, accepting the results of Meehan's comparisons on the leaves of 29 kinds of American trees with their nearest European allies, Darwin candidly admits that "such difference cannot have been gained through natural selection, and must be attributed to the long-continued action of a different climate" (ii, p. 271).

The objections to his theory raised by Darwin himself he discusses with his usual candor. Of these the most important is the absence, to use his own words, of the "interminable number of intermediate forms" which must have existed, "linking together all the species in each group by gradations as fine as are our present varieties." He says he can only answer this objection "on the supposition that the geological record is far more imperfect than most geologists believe." The other objection is the existence of two or three castes of worker or sterile ants in the same community.

Status of Darwinism at the Present Day. Such are the views of Darwin, as published in his *Origin of Species*. Although he pushed the special form of evolution to what one would suppose to be its furthest limits, yet as we have seen he somewhat modified his views later in life. The views of probably a large proportion of the moderate Darwinians at the present time have been expressed in a broad and candid way by Romanes, an able and careful commentator and expounder of the doctrine of natural selection. In his *Darwin and after Darwin* (1892), the most clear and readable exposé of the doctrine, the doctrine is thus stated. All plants and animals are perpetually engaged in the struggle for existence. This strife consists in the fact that in every generation of every species a great many more individuals are born than can possibly survive. Now, nature "selects the best individuals out of each generation to live." "And not only so, but, as these favored individuals transmit their favorable qualities to their offspring according to the fixed laws of heredity, it further follows that the individuals composing each successive generation have a general tendency to be better suited to their surroundings than were their forefathers. . . . And this follows not merely because in every generation it is only the 'flower of the flock' that is allowed to breed, but also because, if in any generations some new and beneficial qualities happen to arise as slight variations from the ancestral type, they will (other things permitting) be seized upon by natural selection, and, being transmitted by heredity to subsequent generations, will be added to the previously existing type." At the present day an increasing number of evolutionists do not regard natural selection as an active cause, but rather as the result of the action of a number of other agents, comprising the Lamarckian factors of change of environment, use, disuse, isolation, and so on. Undoubtedly, as the result of competition, animals have been driven to migrate, to adopt new habits, and thus to undergo modification. Many agree with Herbert Spencer as to the inadequacy of natural selection to account for the origination of new forms. From probably one-third to nearly one-half of the species of plants and animals now existing are climatic, local forms, resulting from the direct action of changes in the conditions of life, such as climate, soil, food, and the like. The great number of species of parasitic animals are the result of the young adopting a fixed or a more or less stationary mode of life. Natural selection is inoperative in the case of blind or eyeless cave and deep-sea animals.

Objections to Natural Selection. The objections now being urged to the special doctrine of natural selection are that, (1) to use Herbert Spencer's word, it is "inadequate"; (2) the favorable variation may be destroyed by the swamping effects of crossing; (3) natural selection is not analogous to artificial selection; nature is continually eliminating monstrosities, sports, variations, instead of preserving them; they are constantly being bred out in wild plants and animals, or those living under natural conditions of existence. The otter or ancon sheep, which under the breeder's care and watchfulness became a peculiar variety, when permitted to mingle or cross with normal sheep became extinct. Natural selection accounts for the preservation rather than the origination of new or incipient forms and structures. For the causes of variation, it is maintained, we must look to the action of the primary factors of organic evolution, viz., to the effects of changes in light, temperature, heat, moisture, dryness, altitude, food, and so on.

(4) It is not necessarily the fittest or most useful structures or individuals which survive. Carnivorous animals in seizing or swallowing immense numbers of eggs, embryos, and adult animals do not select this or that individual, but, on the contrary, old and young, the fit and the unfit, weak and strong, are engulfed in the maw of the whale as it swims through a shoal of minute crustacea; or hundreds of small fishes are indiscriminately, without reference to their fitness, swallowed by sharks. So with aphides existing in hundreds of thousands on some tree, the birds, like old Time of the New England Primer, indiscriminately pick off "all, both great and small." This matter of the survival of the fittest and the extinction of the unfit has perhaps been somewhat exaggerated, although it is granted that competition acts unceasingly in the biological environment.

(5) Darwinians acknowledge, as does Wallace in his *Darwinism*, that no one ever saw a species originated by natural selection; Weismann has frankly affirmed that "it is really very difficult to imagine this process of natural selection in its details; and to this day it is impossible to demonstrate it in any one point." (*Contemporary Review*, 1893, p. 322.) Yet a number of temperature species, races, or breeds have been experimentally produced by changes of temperature. The cases of seasonal dimorphism existing in nature have been exactly paralleled by variations in moths and butterflies subjected in the pupa state to cold or to extreme heat; and dry-season and wet-season as well as summer and winter forms have been produced artificially, besides other variations supposed to be extinct phylogenetic species.

(6) The view peculiar to Darwinism is that some individual variation was nursed and preserved, while all the others less favorable died. Some naturalists claim that the better-founded view is that of Lamarck, that the changes of environment simultaneously affected great numbers of individuals in a given region, which became modified by changes of climate, and so on, en masse. This certainly appears to be the case in local, insular, or geographical races, varieties, or species. What affects one affects all the individuals in a given area isolated by mountain barriers or other natural boundaries. Where natural selection appears to act is in the case of protective mimicry. The initial causes are changes in the amount of light, of shade, heat, and other physical agents, yet natural selection appears to be operative in bringing out the wonderful cases of mimicry

so well known. (See MIMICRY.) While therefore the Neo-Lamarckian readily acknowledges that natural selection results after new variations have arisen, there are those who, like the Rev. Mr. Henslow, maintain that in the case of seedlings natural selection is not concerned in bringing about the survival of the fittest, adding: *"A seedling survives among others solely because it is vigorous."* He claims that as soon as a large number of seedlings appear aboveground, "natural selection at once steps in, so to say, with the result that all those with too weak a constitution to maintain themselves fail to withstand the struggle for existence and to come to maturity, the stronger plants only proving themselves the best fitted to survive. This process of selection, however, is quite independent of any modifications in morphological structure, by which 'varieties' or subspecies are alone recognized." The fact that the majority of offspring always perish in infancy he calls "constitutional selection."

(7) Darwin expressly regarded most variations as indefinite, chance, fortuitous, spontaneous, or promiscuous, "survival of the fittest," as Romanes expressed it, "becoming the winnowing fan, whose function it is to eliminate all the less fit in each generation, in order to preserve the good grain, out of which to constitute the next generation. And as this process is supposed to be continuous through successive generations, its action is supposed to be cumulative, till from the eye of a worm there is gradually developed the eye of an eagle." Other variations Darwin called "definite." In the chapter of his *Variation of Animals and Plants under Domestication* entitled "Direct and Definite Action of the External Conditions of Life" he says: "By the term definite action, as used in this chapter, I mean an action of such a nature that, when many individuals of the same variety are exposed during several generations to any particular change in their conditions of life, all or nearly all the individuals are modified in the same manner." This appears to be practically the same view as that which was advanced by Lamarck and which is called by Eimer "orthogenesis" (q.v.).

Variation as the result of changed conditions is in nearly every case—perhaps four-fifths of all that occur, thus leaving very little scope for the play of chance or fortuitous variations—due to causes of which we are ignorant. Fortuitous variations, in fact, are an almost negligible quantity. Hence the primary postulate of natural selection that variations are in general fortuitous is in the nature of an assumption and not based on observed facts. As the result of recent investigation we are coming more and more to the view that variation in general is the result of the action of changed conditions of life, conditions both physical and biological, and that natural selection is not an active agent.

(8) Since Darwin called attention to the lack of long series of intermediate links between species, naturalists have been more and more inclined to the belief that such series of connecting variations have never existed, but that nature makes leaps, that species often arise by sudden or quick or saltatorial evolution. Certainly neither in the Paleozoic or later strata nor at the present time do we observe these series of minutely graduated numberless annectent forms postulated by Darwin, there still being gaps between the known connecting links. Hyatt, W. H. Dall, Galton, De Vries, and many others have advocated the view of the rapid or sudden modification of structure involving the sudden appearance of species, especially in Paleozoic times. This is seen by the results of the examination of the Steinheim forms of *Planorbis* and of the Tertiary forms of Austrian *Paludina*, where there are often wide gaps even between the connecting links. The new species of evening primrose raised by De Vries originated suddenly, without preparation or intermediate forms. (See MUTATION.) In the great variations observed by C. C. Adams in the forms of the fresh-water snail *Io*, peculiar to the upper tributaries of the Tennessee River above Chattanooga, the variations are evidently due to the varying nature of the bottoms of the streams, the rapidity of the current, and the forced isolation of the varieties, the different forms, from smooth to very spiny, being closely correlated to the varying nature of each stream and different sections of each stream from the headwaters to the mouth. In this case there is apparently no action of natural selection, but a direct response to the environment, and the gaps may thus be either marked or slight. In the hundreds of subvarieties of *Helix nemoralis* the gaps or intervals between such forms are distinct and well marked.

(9) Natural selection is manifestly inadequate to account for the origin of the principal types or classes of plants and animals. They must have appeared with comparative suddenness, as the result of changes of the conditions of life, inducing new needs, new habits, and the origin by exercise of new organs. Thus the types of cœlenterates, echinoderms, crustacea, flying insects, amphibia, reptiles, birds, and mammals were the result of the action of the changed environment, of effort, use, isolation, and heredity, at a time when the ancestral forms were more plastic than their descendants.

(10) Natural selection, it has been claimed, could not have begun to act until the earth had become sufficiently well stocked with plant and animal life to afford materials for competition and survival of the fittest. The first forms of life must have arisen through the operation of the Lamarckian factors. In conclusion it may be said that it still remains an open question whether natural selection is an active or by any means universal agent in evolution. Finally it may be observed that the processes of evolution are in kind like those of simple growth of the individual organism and due to the same factors, and as in ontogenesis there is no one predominant factor, so in phylogenesis there is no one predominant factor, no prepondering mechanism such as has been ascribed to natural selection. In the opinion of some expert working naturalists the greater number of known species have been produced without its aid. It is not of the same nature as artificial selection. Yet the theory is widely accepted, and by its aid Darwin converted the world to a belief in evolution in general.

The views widely accepted as to the relation of natural selection to the other factors of organic evolution may be tabulated thus:

I. Primary factors.

Direct.—Changes of cosmical environment, changes of climate, light, darkness, temperature, dryness, humidity, physical and chemical constitution of the soil and of

waters, mechanical state of the *milieu*, winds, currents of water, biological environment, food, competition, parasitism, symbiosis.

Indirect.—Reaction against cosmical environmental conditions; adaptation, convergence, reaction against biological conditions, mimicry.

II. Secondary factors.

Heredity, vital concurrence, natural and sexual selection, segregation, geographical isolation, amixia, hybridity.

For bibliography, see EVOLUTION.

Germinal Selection. This doctrine, founded by Weismann, is an extension of the general idea of natural selection. To superorganic selection, ordinary individual or personal selection, Roux's theory of histological (histonal) or intracellular struggle for existence, Weismann has added the idea of a struggle among the hypothetical determinants within the germ, or germinal selection. J. A. Thomson has indicated the importance of a form of struggle lying between Roux's histonal selection and Weismann's germinal selection, viz., the struggle between gametes or potential gametes, e.g., between young ova, between sperms, even between ova and sperms. "A vivid realization of this visible struggle," says Thomson, "and the sometimes discriminate selection which it implies, may lead naturally to an appreciation of germinal selection, which deals with the wholly invisible." Although opinions may differ as to the existence of this hypothetical phase of selection, the writer just quoted claims that the theory "justifies itself provisionally as a formula unifying a large number of otherwise unrelated facts of inheritance."

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NATURAL THEOLOGY. The systematic arrangement of that knowledge of the being and attributes of God which may be derived from the consideration of nature and reason. It has had, especially in English thought, two meanings, a wider and a narrower. The first does not differ greatly from what is now called the philosophy of religion. It is the application of the critical principles of science to the assumptions and phenomena of religion. The narrower meaning is the proof of the existence and character of God as shown by the contemplation of nature and especially by the argument from design. This has been the particular meaning of the term for the last century in English theological literature. For all the thought of the Western world the beginnings of natural theology lie in Greek philosophy. Socrates, Plato, and Aristotle taught the existence, the benevolence, and the unity of God by means of the study of nature and human life. The term, however, comes from the Stoics. Augustine (*De Civitate Dei*, vi, 5–12) quotes it from Varro (q.v.). Augustine himself was not averse to the use of reason in the study of the nature of God, as his *Soliloquies* prove. With the Renaissance there was a return to this phase of thought. The first Christian book with this title was the *Theologia Naturalis* of Raymond de Sabunde (1483), which asserts that the revelation in the book of nature is clearer than that in the book of Scripture, since it needs no priests for its interpretation, but only unassisted intelligence. In English thought the deists (see DEISM) first laid emphasis on the value of the study of nature as the basis for religion. They proposed it as a substitute for Scripture, but, as Bacon shows, the same study was already in use for the purposes of sustaining the Christian revelation. Natural theology, he says, "suffices to confute atheism, but not to inform religion." The work of the deists but served to increase attention to natural theology as a proof for Christianity. The Boyle lectures, and later the Bridgewater treatises, were used for this purpose. The greatest book in English on the subject was Paley's *Natural Theology* (1802). This was largely devoted to an argument for the existence of God from the evidences of design in nature. It served as a model for many other books until the statement of the principle of evolution compelled the abandonment of arguments which were based on the conception of God as a skillful mechanician. In America the rationalizing spirit of the New England theology (q.v.) led it to lay much weight upon natural theology, and it was generally made the basis of the system of theology by theologians of this school and by most others during a large part of the last century. The arrangement of topics was usually somewhat as follows: beginning with the principle of causation, which was established as a necessary truth, then followed the arguments for the existence of God, predominantly or exclusively the a posteriori arguments, for a contriver, governor, creator, preserver, and moral governor. The natural attributes of God were deduced, then His moral attributes. The benevolence of God having been proved, the argument could advance to the Scriptures, the inspiration of which was proved by the need of man for revelation and the certainty that a benevolent God would supply so grievous a need. Of late years, largely under the name of the philosophy of religion, a broader and more profound view of the world has produced what in time will be a new natural theology, in the recognition that nature and the course of human history present what may properly be called a revelation of the character of that Final Cause which reason must assume to lie behind the universe.

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NATURAL TONES. A musical term applied to those tones of wind instruments that are produced, without altering the length of the tube (by valves or slides), by increased or diminished force of the air current. The tones thus produced are always overtones of the fundamental tone. But this fundamental tone can be produced only upon instruments having a wide bore in proportion to their length, like the tuba or trombone; whereas the fundamental cannot be produced upon the trumpet, which, consequently, yields only the higher overtones as natural tones. See HARMONICS. Consult E. Ergo, *Dans les propylées de l'instrumentation* (Antwerp, 1908).

NATURE PRINTING. A process by which engravings or plates are reproduced by taking direct impressions of the objects themselves, and printing from them. The process was invented in 1849 by Alois Auer, director of the state printing establishment of the Austrian Empire, and, though very simple, it cannot be applied to any objects except those with tolerably flat surfaces, such as dried and pressed plants, embroidery and lace, and a very few animal productions. The object is placed between a plate of steel and another of lead, both of which are smooth, and polished. They are then drawn through a pair of rollers under considerable pressure, and when the plates are separated it is found that a most beautiful and perfect impression of the object has been made in the leaden plate. This may be used directly as an engraved plate, if only a very few impressions are wanted; but it is too soft to resist the action of the presses for practical purposes; a fac-simile to be used as the printing plate is made in copper by the electrotype process. The inventor published a description of his work in 1854 at Vienna, in which is given a detailed account of the method.

NATURE STUDY. A modern development of the movement of elementary education towards the study of real objects rather than symbols. It arose in response to a demand voiced as early as the year 1845 in America by Horace Mann (q.v.) for early training in the inductive method of thought and in the field of nature.

According to generally accepted ideas on nature study, it must concern itself not only with the common living objects of the child's environment—these the child must be led to examine, to work with himself—but also with the study of lifeless objects and the elementary notions of physical science in so far as they are part of the everyday life of the child. The work must be carried on, so far as possible, to strengthen independence of thought and judgment. The beginnings of the study must be based upon the immediate surroundings of the child, and the field of inquiry may be extended further abroad as the later years of the school are approached. The tasks in the earlier years should be chiefly observational. Nevertheless, the experimental method of study should not be neglected. As far as possible organic forms should be regarded as living things capable of activity and change; the point of view should therefore be dynamic—a matter of great pedagogic importance. The plan of the work may properly be made out so as to include the commoner animals and plants and the everyday phenomena of inorganic nature. Duplication of work should be avoided by increasing the difficulty of the problems and basing them on different material. It is better to study the materials comparatively as far as possible, so that pupils may learn to discriminate and to form general notions. The exhaustive study of one type is of much less value. Outdoor work should be done; in addition to gardening, studies of the habits and haunts of animals, the appearance and disappearance of the birds, the relations of insects to plant life, the appearance of trees in summer and winter dress, and numerous other similar topics may form the basis of study. It is also considered desirable so far as possible to correlate the studies of animals with the studies of physiology and hygiene, especially in its application to human needs. Another subject with which nature study has more recently been connected is geography. It is highly important that the materials should be abundant, that the teacher be not too closely tied to a detailed plan of work, and that he be resourceful in the matter of making the most of what is available.

Nature study as a school subject has been promoted in England by the School Nature Study Union, organized in 1903, and in the United States by the American Nature Study Society, established in 1908.

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NATURE WORSHIP. The worship of all things in nature, including the elements, celestial bodies, plants, animals, and man.

Facts of Nature Worship. The worship of the elements does not seem to occur in the most

primitive religions; in later stages, however, the elements often become the objects of religious regard. Mother Earth has been worshiped by many peoples; the winds are revered even in relatively primitive society. The east wind, a malevolent god among the modern Hindus, was a beneficent Mexican deity. The Yukaghir distinguish 22 directions, all of which are sacrificed to. The worship of fire, not uncommon elsewhere, has reached its culmination in the cults of Mazdaism. Celestial bodies were deified in primitive as well as highly civilized communities. The Hottentots worship the moon and the dawn; sun worship was practiced by the ancient Iroquois, is found among the Indians of the Plains, the Tsimshian of the northwest coast of America, and reached a high state of development among the Mexicans and Peruvians. While even the primitive Australians address appeals to the sun and the lightning, the sun was also a Hindu deity; among the Dravidians it appears as a malignant demon, while it is deemed beneficent among the Munda; the Babylonians were sun worshipers, while in Persia the sun became the centre of the elaborate Mithra cult. The sun is represented in many religions, as in India, under the figure of a bull or horse or bird, or as riding in a car dragged by seven steeds, or as having rays. Sun and moon are the goal of souls in several religions, such as the Polynesian and Hindu. The Egyptians worshiped at the shrine of the sun god Re; they also deified the moon (identified with the ibis god Thoth) and Sirius (often identified with Isis). Among their deities were also the constellations, "the never-resting ones," and the circumpolar stars, "the imperishables." Important as the celestial bodies thus prove to be in worship and cult, they played an even more conspicuous rôle in mythology (q.v.), their precise position and functions in that vast domain having given rise to innumerable theories and speculations.

Stones were worshiped among the Lapps, Finns, African negroes, and South Sea Islanders. Among these sacred stones some are huge rocks, others have shapes suggesting animals or man, still others are heavenly stones. The latter were known to the Greeks and Romans and are still worshiped in many places. A special form of stone worship is fetishism (q.v.), a term more commonly applied to the worship of artificial objects. While Africa is recognized as the classic land of fetishism, the cult is not unknown elsewhere. Witness the animal fetishes of the Zuñi. The medicine bundles of the Plains Indians are also practically fetishes. In central Australia, among the Aranda, we find the sacred stone churinga, associated with their totemism. As a modern survival of stone worship may be regarded the belief in the magic powers of precious stones.

Plants and trees are worshiped as totems, or because they are useful or beautiful or fearsome or symbolic of a sacred object or being. They may be holy in themselves or as dwelling places of spirits. The soma plant in India as well as the coca of Peru are worshiped for their intoxicating qualities. In northern Australia and parts of the Torres Strait islands and Melanesia plants often occur as totems. Many varieties of trees are held in veneration in India, such as the karani tree, the fig tree, the sal or sakhu, the yand tree, the mahwa, the cotton tree, coconut, mimosa, etc. The plants of the fields, usually as harboring spirits of fertilization, were worshiped in primitive communities as well as by the peasants of Europe, among whom traces of these cults can still be found.

Primitive mentality draws no sharp line between man and animal. Among North American Indians, e.g., human qualities are constantly attributed to animals. Transmigration of human souls into animals was believed in in India and Egypt and among the South African Bantu and many other peoples. The mythological creatures of central Australian mythology are interchangeably animals and men. On the northwest coast, or among the Eskimo, men are believed to transform themselves into animals by putting on animal skins; similarly, animals become men by throwing off their skins. Animals are worshiped as ancestors in totemic communities and elsewhere. At Bubastis, in Egypt, where the cat-headed Bast was worshiped, vast cemeteries of mummified cats were discovered; similar cemeteries, dedicated to other animals, were found in other parts of Egypt. Animal taboos, involving various degrees of veneration for the tabooed animals, are practically universal in primitive society and survive, without the veneration, in modern culture. Animals as guardian spirits are indigenous in North America as well as in parts of Polynesia.

Of all animals the snake is perhaps the one most frequently adored. The snake appears to have been worshiped in every land, either as a soul receptacle or friendly house snake, in whose body resides the soul of an ancestor (as in Rome and India), or as a healing and mantic power of wisdom (as in the cults of Babylon and Greece), or as an evil spirit, world snake, or dragon. The negroes of Africa, the Dravidians and American Indians, the Mexicans and Peruvians, Egyptians, Greeks, Romans, and Semites regarded the snake in one or another of these forms as a divine animal. The dragon of the Eddas is evil, he is the Midgardswurm that embodies destruction, like the rain-preventing dragon Vritra of the *Rig-Veda;* but beside the latter stands the figure of the Dragon of the Deep, to whom the Vedic Aryan prays as to a beneficent divinity. So Apollo as a healing god is associated with Æsculapius' snake, but destroys the Python. Among the Mongoloid Naga tribes, as among the Chinese, the dragon snake is a world divinity. Snakes are also often associated with phallic worship.

Man, finally, is revered as an ancestor or as a great chief or medicine man. The Romans had their divine emperors, the Egyptians their pharaohs. Priests and kings are divine in modern India, China, and Japan.

Theories of Worship. Max Müller and other writers of the naturalistic school of mythology posit the adoration of nature as a fundamental and primary fact. Nature, with its innumerable wonders, surprises, elemental forces, must even have aroused the respect, the awe, the adoration of primitive man. Taking so much for granted, Max Müller attempted to reconcile this primitive adoration of nature with the worship of personal deities such as he found it among the peoples of classical antiquity. Müller used a linguistic method of proof. A comparative analysis of many words belonging to the Indo-European group of languages, including their Sanskrit originals, led to the establishment of a set of primary words which, in turn, proved to be resolvable into a number of fundamental

primitive roots. These roots seemed to refer to actions such as walking, standing, sleeping, rising. Now, argued Müller, these were the only linguistic tools with which man, in those remote times, could operate. Hence, when the need arose to refer to the objects and powers of nature, which to him was of such great concern, man used these roots, although their meanings were saturated with human values and, in many instances, did not at all fit the processes of nature. In the course of time the use of a vocabulary born of human associations led to the personification of natural phenomena. It also occurred that one phenomenon in its different phases was designated by separate words. As an attempt to reconcile in imaginative tales these often contradictory designations, mythology arose. The most complete formulation of Max Müller's theory is contained in an essay on *Comparative Mythology* (1856), reprinted in his *Chips from a German Workshop*, vol. ii.

A radically different theoretical position was assumed by E. B. Tylor (*Primitive Culture*, 1871) and Herbert Spencer (*Principles of Sociology*, vol. i, 1876). These two writers represent the main exponents of the doctrine of animism (q.v.). Their method of deriving and interpreting the primitive theory of spirits has been explained in another place. Here we shall note only the difference between Tylor's and Spencer's treatment of the subject in so far as the former, having arrived at the human spirit, proceeds to explain the origin of animal, plant, and nature spirits by an analogous argument, whereas the latter ignores the independent existence of all spirits other than human, conceiving the spiritualization of animate and inanimate nature as a process of extension of the idea of a human spirit. Spencer and Tylor agree in regarding the worship of the dead as the earliest religious cult. Further than that, however, Tylor does not go, his concern being with the history of the animistic faith from most primitive times up to the present day, rather than with the evolution of religious beliefs and rites. The latter task is undertaken by Spencer, who, positing ancestor worship (q.v.) as the earliest form of religion, proceeds to derive from it all other forms of cult and worship. He suggests three processes which must have led to animal worship. Animals which haunt houses are readily conceived as possessed by the souls of the departed and will therefore be regarded as sacred. The same is true of animals often seen in the vicinity of graves. But the principal source of animal worship Spencer sees in a process designated by him as the misinterpretation of nicknames. Savages are wont to give each other animal names. Subsequently, when the ancestors of individuals are referred to in conversation by their animal names, a misunderstanding readily arises. The primitive mind does not easily distinguish between a name and the thing named; a crude and indefinite language, moreover, does not permit the savage to avoid or correct errors of understanding. Hence the animal-named ancestors soon come to be conceived as real animals, and as such they are worshiped. Even the ascription of human characteristics to animals, so common in primitive culture, Spencer explains as due to the fact that man and animal are believed to have had a common ancestor. When animal appellations begin to recede before an advancing culture, cases will occur where one of the ancestors will be conceived as human, the other as animal. Thus arises the belief in and the worship of monsters with mixed human and animal traits. Still later, finally, when human names completely replace animal nicknames, ancestors no longer lose their true characters and are worshiped as human. The worship of plants and of inanimate nature Spencer explains on similar lines.

A systematic presentation of W. Wundt's position (*Völkerpsychologie, Mythus und Religion*, vol. ii) cannot be given here, but the main points of his system may be briefly summarized. The lowest layer of religious belief is constituted by a faith in souls, human souls. This, according to Wundt, is the most primitive form of animism. The belief in magic developed from the contact of man with those aspects of nature which strike him as strange, exceptional, frightful, awe inspiring, such as floods, storms, thunder and lightning, etc. While thus the belief in magic has its own psychological sources, it presupposes a preëxisting animism without which it could not develop. The most primitive cult, also based on animism, is fetishism, the belief in particular powers exercised by specific, usually artificial, objects. Wundt regards fetishism as a universal stage in the development of religion through which all mankind must have passed. Another outgrowth of animism is totemism, which Wundt conceives as the most characteristic form of animalism, or animal worship, the totem appearing in two typical varieties, as ancestor and as guardian spirit. The second variety of totemism is a later form, which constitutes a link between animal worship and the worship of human ancestors, or manism. Thus Wundt shares Spencer's opinion that in the ancestral cult the animal preceded man. In Wundt's system, however, the worship of human ancestors constitutes a relatively late phase of religious development.

A recent highly original contribution to the theory of religion and worship we owe to Emile Durkheim (*La vie religieuse*, Paris, 1912). The French sociologist rejects all theories of religion which, in the last analysis, are based on illusions, such as dreams, the echo, etc. There must exist a reality, asserts Durkheim, from which all religion draws its source. The fundamental fact in religion is the division of experience into sacred and profane. The problem then consists in ascertaining the root of this dichotomy of experience. Durkheim bases his argument on an intensive analysis of totemism as found in Australia. He tries to show that totemism embraces all the elements characteristic of the higher religions and is therefore a true religion. Now, in the totemic complex of beliefs and practices, the worship is really directed, not to the totemic animals or the members of the clan or the totemic symbols, but towards a mysterious power, the totemic principle, which pervades all that is sacred, all else being profane. Durkheim identifies the totemic principle with mana, the magic power (see MAGIC), a belief which supersedes the totemic principle among tribes that have passed out of the totemic stage. An analysis, finally, of mana or the totemic principle leads to the discovery of the reality underlying religion. The savage, in Durkheim's case the Australian, is aware of two radically distinct cycles in his experience: on the one hand there is the monotonous round of everyday activities, on the other the exciting

and strange phenomena of ceremonial life. On ceremonial occasions the individual lives on a different plane, his emotions, thoughts, acts altogether transcend the level made familiar by daily routine. The individual feels himself actuated by a superior and irresistible power. Behind that power, although unrealized by the savage, is society, the clan, social pressure. Such, then, is the reality underlying religion, it is society itself; for the power by which the individual feels himself to be actuated becomes the source of the sacred.

Viewpoint of Ethnology. While all of these theories contain thoughts and suggestions of interest to the student of culture, not one can be accepted in its entirety. Recent advances in ethnological knowledge and important modifications in the methods of research have resulted in an attitude of extreme caution in all problems of origins and developments. Our conclusions also are less ambitious, if perhaps more reliable.

Müller's and Spencer's philological arguments have long since been discarded. While the comparative study of word roots is of inestimable value for tracing linguistic relationships and often proves a precious guide in the study of the migrations and contact of peoples, a theory of religion and mythology which represents religious emotion and mythological concepts as secondary developments based on linguistic processes is doomed to failure. Similarly, Spencer's theory of the misrepresentation of nicknames falls to the ground as soon as analyzed in the light of modern linguistic work among primitive peoples. The reconstruction of primitive languages, with their rich vocabularies and often enormously complex grammars, forbids all thought of misapprehension such as Spencer assumed to lie at the root of animal worship. Another tendency shared by Spencer with many writers of his day was one towards monogenetic explanations: all spirits are human in origin and become secondarily associated with animals, plants, inanimate objects; ancestor worship is the one primitive cult to which all later cults are more or less remotely related. Neither historical nor psychological considerations permit us to limit the origin of spirit and the origin of worship to one out of many possible sources. With reference to ancestor worship (q.v.), Wundt is certainly right as against Spencer in regarding it as a relatively late form of worship and rite, although a more primitive cult of the immediate dead seems to be rooted in the remotest antiquity. In Spencer's as well as in Tylor's presentation the process of development of religion appears as a distinctly individualistic and rationalistic one; they overlook the effect of the social setting on individual experience and entirely overestimate the importance of conscious intellectual processes in situations where subconscious and emotional complexes play the leading rôle. In this latter respect Wundt's work stands on a distinctly higher plane than that of his English forerunners. His treatment of the development of religious phases, on the other hand, remains highly schematic and must be rejected. We may not accept his fetishism and totemism as universal stages in the evolution of religion; nor has Wundt given satisfactory proof of his categorical assertion that animal ancestor worship must have preceded the worship of human ancestors. In Durkheim's system, finally, due attention is given to the social setting; unfortunately, however, the author abandons one extreme for another and altogether disregards individual experience and initiative in his account of the origin of religious sentiment. (Consult A. A. Goldenweiser's review of Durkheim in the *American Anthropologist*, 1915.) Durkheim's identification of the totemic principle with *mana* (see MAGIC) runs counter to all ethnological evidence, while his attempt to derive the category of sacredness from the reaction of the individual consciousness to social pressure will scarcely be found to conform to either primitive or modern experience of religious phenomena.

Before closing it will be well to formulate a few general conclusions which seem justifiable at the present stage of our knowledge of the phenomena of worship. We must assume that the various forms of worship and rite have had a variety of historical and psychological origins; hence any attempt to derive all forms of religion from some one source, no matter how plausible logically or even psychologically, must needs fall far off the mark. The same is true of religious developments. In studying these we observe divergent and convergent phenomena: beliefs and rites, although genetically related, develop in different directions, resulting in highly disparate objective and psychological features; on the other hand, originally distinct lines of religious or ritualistic evolution converge towards forms which display considerable, sometimes great, similarities. Amid the maze of convergences and divergences striking parallelisms occasionally occur, although these never refer to phenomena that are highly complex or greatly extended in time. In innumerable instances the religious situation at a given place and time cannot be understood unless the contact of peoples is taken into consideration. While the social and, speaking more generally, the cultural setting is of paramount importance as a codeterminant of religious phenomena, the individual differences as well as the specific experiences of individuals must not be neglected if proper perspective is to be preserved. This applies with especial force to religion, as in this domain the rôle of individual initiative seems ever to have been particularly significant. While the current terms used for the designation of religious phenomena, such as god, magic, totemism, animal worship, etc., probably serve their purpose as well as any, one must ever remember that under any system of nomenclature highly heterogeneous complexes must needs be designated by the same terms; thus, totemism, e.g., is in North America colored by guardian-spirit ideas, whereas among the African Bantu it is related to the taboo concepts current among those peoples.

While modern insight thus tends to discourage sweeping generalizations or undue implications in dealing with the phenomena of religious worship, some forms of belief must certainly be recognized as bearing the marks of great primitiveness or universality or of both. Among these must be noted animism, the belief in souls and spirits, which certainly is as primitive as it is universal; the belief in magic power, which is as universal and probably as primitive as animism; the general human tendency to experience vague and undifferentiated but at least potentially religious emotions when coming in contact with striking phenomena of nature. Other phenomena of worship, on the other hand,

clearly do not belong to the most primitive religious manifestations and are also limited in their distribution. Among these we must include ancestor worship in general and the worship of human ancestors in particular. Here also belongs fetishism, the belief in particular powers associated with specific, usually artificial, objects. Fetishism, it seems, in part fuses with, in part is independent of, animism. Totemism, finally, must also be classed as a form of worship which is neither primitive nor universal, consisting as it does in an association of a particular form, or rather of several forms, of animal worship with a special form of social organization which has itself but a limited distribution and can certainly not be regarded as primitive. Animal worship, on the other hand, which, it will be seen, is by no means coextensive with totemism, is again a practically universal and probably fairly primitive form of belief. Identification of man and animal and transformation of one into the other are most characteristic traits of primitive belief. These identifications and transformations, the primary source of which must lie in the obvious physical and psychic similarities between man and beast, constitute the favorite theme of all mythologies.

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NAUCK, nouk, JOHANN AUGUST (1822–92). A German classical scholar. He was born at Auerstedt and, after studying at the University of Halle, taught at several Gymnasiums at Berlin until about 1859, when he became member extraordinary of the Imperial Academy of Sciences at St. Petersburg. He remained in that city until his death. His best-known works are: *Aristophanis Byzantii Grammatici Alexandrini Fragmenta* (1848); a text edition of the complete works of Euripides, with the fragments (1854; 3d ed., 1871); *Studia Euripidea* (1859–62); an annotated edition of Sophocles (*Sophoclis Tragœdiæ*), based upon Schneidewin (1867); Homer's *Odyssee* (1874) and *Ilias* (1877–79); *Iamblichi de Vita Pythagorica Liber* (1884); select works of Porphyrius, *Porphyrii Philosophi Opuscula Tria* (1860; 2d enlarged ed., *Opuscula Selecta*, 1886); and his greatest work, *Tragicorum Græcorum Fragmenta* (1856; 2d ed., 1889; with the *Tragicæ Dictionis Index*, 1892). The last work is considered the standard edition. Consult J. Zielinski, *August Nauck* (Berlin, 1894), where his writings are enumerated, and J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

NAU'CRATIS (Lat., from Gk. *Naúkratis*). An ancient city of Egypt, situated on the Canopic branch of the Nile, near the modern Nebîreh, 53 miles southeast of Alexandria by rail. The site was discovered in 1884 by Petrie. Under King Amasis II it was the only place in Egypt where Greeks were allowed to settle and trade, and thus became a very flourishing Greek colony. The most prosperous period of the city was from 570 to 525 B.C. The excavations, which centred chiefly about the sites of the temple of Apollo and Aphrodite, brought to light evidences of the other temples mentioned by Herodotus and Athenæus. Of particular interest is the material discovered bearing on the history of ceramics and epigraphy. On the successful excavations of Petrie, consult his *Naucratis* (London, 1886–87). Petrie thinks that the Greek settlements at Naucratis may date from as early a period as 650 B.C. Consult: W. M. Flinders Petrie, "Naukratis I," and E. A. Gardner, "Naukratis II," in *Egyptian Exploration Fund, Publications*, vols. iii, vi (London, 1886–88); D. G. Hogarth, in *British School at Athens, Annual* (ib., 1898–99); id., "Naukratis, 1903," in *Journal of Hellenic Studies*, vol. xxv (ib., 1905).

NAUCY'DES (Lat., from Gk. *Naukydēs*), called OF ARGOS. A Greek sculptor of the fifth century B.C. He was trained in the manner of Polyclitus I and was the master of his brother Polyclitus II. A Discobolus now in the Vatican is believed to be a copy of a work by him. A gold and ivory Hebe and statues of Hecate, Hermes, Erinna the poet, and some groups of athletes are mentioned by writers of his time and a later period as works of this sculptor.

NAUDET, nô'dâ', JOSEPH (1786–1878). A French historian, born in Paris. He was made professor of Latin poetry at the Collège de France in 1821 and was director of the Royal Library from 1840 to 1860. He was also a member of the Academy. His works include: *Histoire de la guerre des esclaves en Sicile* (1807); *Histoire de l'établissement, des progrès et de la décadence de la monarchie des Goths en Italie* (1811); *La conjuration d'Etienne Marcel* (1815); *De l'administration des postes chez les Romains* (1863).

NAUGATUCK, nȧ'ga-tŭk. A town and borough (coextensive) in New Haven Co., Conn., 5 miles south of Waterbury, on the Naugatuck River and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 4). It has the Whittemore Memorial Library, the splendid Whittemore Memorial Bridge, spanning the river here, Salem School, Naugatuck High School, and noteworthy business blocks, and is engaged extensively in manufacturing India-rubber goods, knit underwear, malleable iron, copper goods, gas and electric fixtures, and paper boxes. Naugatuck was first incorporated in 1844 as a town, and in 1893 as a borough; consolidation was effected in 1895. The government, under the charters of 1893 and 1895, is administered by a board of warden and burgesses, annually elected, which has powers of appointment in all borough offices excepting the board of education, chosen by popular vote.

Pop., 1900, 10,541; 1910, 12,722; 1914 (U. S. est.), 13,651; 1920, 15,051.

NAUHEIM, nou'hīm. A noted watering place in the Grand Duchy of Hesse, Germany, on a slope of the Taunus Mountains, at the foot of which flows the Usa, 17 miles north of Frankfort (Map: Germany, C 3). The Kurhaus is surrounded by beautiful grounds. The waters, ranging in temperature from 86° F. to 95° F. and containing salt, iron, and carbonic acid, are used for both drinking and bathing. Considerable quantities of water are exported. Cooking and bathing salt is extracted. The place is visited annually by about 34,000 patients. Pop., 1900, 4501; 1910, 5694.

NAULETTE, nō'lĕt'. A cavern on the Lesse in the Commune of Furfooz, near Dinant, Belgium. Here, in 1866, Dupont found a human lower jaw associated with bones of the elephant and rhinoceros. The Naulette man is now assigned to the Mousterian epoch. See PALEOLITHIC PERIOD.

NAUMACHIA, nạ-mā'kī-ȧ (Lat., from Gk. *ναυμαχία*, naval battle, from *ναῦς*, *naus*, ship + *μάχεσθαι*, *machesthai*, to fight). Among the Romans, a mock naval battle, also the place used for this purpose. Julius Cæsar was the first to introduce a naumachia into Rome (46 B.C.), causing a portion of the Campus Martius to be transformed into a lake. Augustus made an artificial lake (*stagnum*) near the Tiber for the same purpose, which was afterward frequently used for naumachiæ. Claudius also gave an exhibition of the kind on Lake Fucinus, in which 19,000 combatants took part. These naumachiæ were not sham fights, any more than ordinary gladiatorial combats were sham contests. Both sides fought in real earnest until one was utterly overpowered. The crews consisted of gladiators, prisoners, or condemned criminals. Consult the article "Naumachia," in William Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891), and Ludwig Friedländer, *Roman Life and Manners under the Early Empire*, vol. ii (7th rev. ed., New York, 1909).

NAUMANN, nou'mȧn. A family of German musicians. JOHANN GOTTLIEB (1741–1801), the most famous member, was born at Blasewitz, near Dresden. He studied under Tartini, Padre Martini, and others and became court composer at Dresden in 1764. In 1766 he was appointed kapellmeister at Dresden. He produced many operas and in 1777 organized the royal orchestra of Stockholm, Sweden. He made several tours throughout Italy and Prussia and was regarded as one of the most important composers of his time. He wrote over 20 operas, 10 oratorios, 18 symphonies, and numerous smaller works, instrumental and vocal. Consult: Meissner, *Bruchstücke aus Naumanns Lebensgeschichte* (Prague, 1803–04).—His grandson, EMIL (1827–88), studied under Von Wartensee and Mendelssohn and at the Leipzig Conservatory. He was chiefly famous for his valuable and scholarly writings, particularly with reference to Church music, and was also the composer of an oratorio, *Christus der Friedensbote* (1848), and the opera *Judith* (1848). Among his more important works are: *Die Tonkunst in der Kulturgeschichte* (Berlin, 1869–70); *Musikdrama oder Oper* (1876); *Illustrierte Musikgeschichte* (1880–85). He lectured on musical history at the conservatory at Dresden.—KARL ERNST (1832–), another grandson of Johann Gottlieb, became favorably known for his writings and compositions. He was born in Freiberg, Saxony, and received his musical education in Leipzig, completing his musical studies with a two years' period of organ study under Schneider of Dresden. His compositions are principally chamber music, and so far as is known he may be said to have written the first sonata for viola and pianoforte.

NAUMANN, (JOSEPH) FRIEDRICH (1860–1919). A German publicist. He was born at Stormthal, near Leipzig, and was educated at Leipzig and Erlangen universities. In 1883–85 he was assistant at the Hamburg Rauhe Haus (reformatory) and from 1886 to 1890 was pastor at Langenberg. He held other posts as a clergyman, but in the middle nineties gave up the ministry, became a leader of the left wing of the Christian Socialist party, was one of the founders and first president of the National Socialist party, and edited *Die Zeit* (1896–1903; then coalesced with *Die Nation*), the political periodical *Hilfe* (1901–07), and an annual of the party called *Patria*. Heidelberg University gave him an honorary D.D. in 1903. He was elected to the Reichstag in 1907, but failed of reëlection in 1912. Among his many books are: *Der soziale Progress der evangelischen Kirche* (1890); *Was heisst Christlich-sozial?* (1894–96); *National-sozialer Katechismus* (1896); *Weltpolitik und Sozialreform* (1898); *Flotte und Reaktion* (1899); *Demokratie und Kaisertum* (1900); *Kunst und Volk* (1902); *Briefe über Religion* (3d ed., 1904); *Neudeutsche Wirtschaftspolitik* (1906); *Freiheitskämpfe* (1911); *Geist und Glaube* (1911).

NAUMANN, JOHANN FRIEDRICH (1780–1857). An eminent German ornithologist. He was born at Ziebigk, worked with his father, J. A. Naumann, also an ornithologist, and became professor and inspector of the ornithological museum of the Duke of Anhalt-Köthen. He was a clever draftsman and himself engraved the plates for the illustrations of his *Naturgeschichte der Vögel Deutschlands* (12 vols., 1822–44), a standard work. He was also a skillful taxidermist and mounted the best collection (of local birds) of his time. Naumann wrote, besides: *Taxidermie* (1815; 2d ed., 1848); *Ueber den Haushalt der nördlichen Seevögel Europas* (1824); *Die Eier der Vögel Deutschlands* (1819–28), with Buhle. In honor of Naumann and his father the German Ornithological Society named its journal *Naumannia*.

NAUMANN, KARL FRIEDRICH (1797–1873). A German mineralogist and geologist, born in Dresden. He studied at the Freiberg School of Mines and at the universities of Jena and Leipzig and in 1821 made a journey to Norway for scientific purposes. After his return he became an instructor at Jena (1823). A year later he was called to be professor at Leipzig. During the period 1826–42 he held the chair of mineralogy and geognosy at Freiberg, then returned to Leipzig, where the last 30 years of his academic career were spent. Among his writings are: *Anfangsgründe der Kristallographie* (1841; 2d ed., 1854); *Elemente der theoretischen Kristallographie* (1856); *Elemente der Mineralogie* (1846; 14th ed., 1901).

NAUMBURG, noum'bụrk, or NAUMBURG-ON-THE-SAALE. A town in the Province of Saxony, Prussia, situated on the Saale, 30 miles southwest of Leipzig (Map: Germany, E 3). Its

cathedral of Sts. Peter and Paul has four towers and many statues, paintings, monuments, and other specimens of early German art. Other noteworthy old buildings include the town hall and the castle. There are a Gymnasium and a Realschule. The town manufactures woolens, soap, leather, combs, stockings, brushes, toys, and ivory goods. Much sparkling wine and beer are produced. Glass and porcelain painting is also an important industry. In 1029 Naumburg became the seat of the bishopric of Naumburg-Zeitz. Pop., 1910, 26,962.

NAUNTON, nąn'ton, Sir Robert (1563–1635). An English politician, born at Alderton, Suffolk. In 1582 he graduated B.A. from Trinity College, Cambridge, where he became a fellow in 1585 and public orator in 1594. He then traveled on the Continent, furnishing information on the political condition of Europe to the Earl of Essex, but resumed his duties of public orator in 1600. He became a member of Parliament for Helston in 1606, was chosen for Camelford in 1614, and represented the University of Cambridge in the Parliaments of 1621, 1624, and 1625. In 1618–23 Naunton was Secretary of State through the influence of the Duke of Buckingham, and thereafter until shortly before his death was master of the court of awards. His *Fragmenta Regalia*, which gives an account of Queen Elizabeth's courtiers, was left by him in manuscript. First published in 1641, a new edition, edited by Edward Arber, appeared in 1870.

NAUPLIA, nąˊplē-ą. A town of Greece, the capital of the Nomarchy of Argolis, 7 miles southeast of Argos, on the Argolic Gulf (Map: Greece, D 6). It is the seat of an archbishopric and has railroad connection with Corinth. The impregnable situation of its harbor, protected by strong fortresses, renders it of great strategic importance. The principal sights consist of the Museum, the Acronauplia or ancient acropolis, and the Palamidi, a fortification originally constructed by the Turks and later strengthened by the Venetians, which is at present utilized as a prison. Owing to its advantageous situation and spacious harbor, Nauplia is of some prominence commercially. It has ordnance factories and naval yards. From 1829 to 1834 it was the capital of Greece. In mediæval times Nauplia was one of the leading cities of the Peloponnesus. Here in 1831 Capo d' Istria, the President of the Republic, was assassinated. Pop. (commune), 1907, 12,176.

NAU'PLIUS (Lat., sort of shellfish, which sailed in its shell as in a ship, from Gk. *ναῦς, naus*, ship + *πλεῖν, plein*, to sail). A larval stage in the development of certain crustaceans. See Metamorphosis, and Plate of Barnacles.

NAU'SEA (Lat., from Gk. *ναυσία, nausia*, seasickness, disgust, nausea, from *ναῦς, naus*, ship). A distressing sensation always referred to the stomach. It is unattended by pain, but is usually accompanied by a feeling of general languor or weakness, a small and often irregular pulse, a pale, cool, and moist skin, general muscular relaxation, an increased flow of saliva, and a sensation that vomiting will supervene. It is most commonly a *direct* symptom of disease or disorder of the stomach, but sometimes it is a very important *indirect* symptom of disease of some part at a distance from the stomach—as, e.g., the brain or the kidney. The nausea of pregnant women is due to reflex irritation excited by the enlarged uterus. Among the more common causes of nausea (which may or may not be followed by vomiting) may be mentioned fainting spells, the taking of a general anæsthetic, and disturbances of equilibrium affecting the eyes or internal ear, e.g., car sickness and seasickness. It may be provoked by blows upon the head, abdomen, testicles, or ovaries, or by powerful mental impressions such as revolting sights, odors, or sounds, and sudden fright. Other causes are discussed under Vomiting.

NAUSHON, nąˊshŏnˊ. One of the Elizabeth Islands (q.v.).

NAUSICAA, nô-sīkˊă-*ą* (Lat., from Gk. *Ναυσικάα, Nausikaa*). In the *Odyssey*, vi–viii, the daughter of the Phæacian King Alcinoüs. When Odysseus is wrecked on the coast of Scheria, her father's island, she discovers him and conducts him to her father's court.

NAUTCH, nąch (Hindi *nāch*, Prak. *nachcha*, from Skt. *nāṭya*, dance, *nṛitya*, dancing, acting, from *nart, nṛit-*, to dance). The term applied, especially in northern India, to the dancing girls attached to the temples. The corresponding word in the south of India is bayadere (q.v.). The presence of these girls at temples and their double rôle of attendants on the deity and of courtesans is undoubtedly a survival of the custom formerly widespread, especially in the East, of sacred prostitution. The daughters of nautch girls are generally trained as successors of their mothers. As in like religious customs elsewhere, no social odium attaches to these women. The nautch dancers are completely enveloped in winding drapery, and move with slow and rhythmic motions of the body, while the hands are busied in graceful gesturing or management of drapery. The feet are little used. The nautch dance is primarily erotic in character, and now is often regarded by the natives as symbolizing the loves of Krishna (q.v.) and the milkmaids. See Bayadere.

NAU'TICAL AL'MANAC (from Lat. *nauticus*, from Gk. *ναυτικός, nautikos*, pertaining to ships or sailors, from *ναύτης, nautēs*, sailor, from *ναῦς, naus*, Skt. *nāu*, ship). A volume issued annually and containing primarily the astronomical data required by navigators in the computation or reduction of the sextant observations by which the ship's position at sea is ascertained. The preparation and publication of these almanacs is very costly, and is therefore undertaken as a work of public utility by several different governments. Thus, the United States issues the *American Ephemeris and Nautical Almanac;* Germany, the *Berliner astronomisches Jahrbuch;* France, the *Connaissance des temps;* and Great Britain, the *Nautical Almanac*. To the astronomer the *Nautical Almanac* furnishes a great mass of important data: it gives the position of the moon in right ascension and declination for every hour and the sun's latitude and longitude for every day in the year; it shows the obliquity of the ecliptic, the sun's and moon's parallax, aberration, etc., at different times; it supplies the necessary data for the determination of the real or apparent size, position, and motion of the planets and their satellites; it fixes accurately the places of the more important stars; and gives full details concerning eclipses, occultations, transits, and other celestial phenomena occurring during the year. It is generally issued two or three years in advance of its date for the sake of mariners going on long voyages. See Almanac.

NAUTICAL SCHOOLS. See NAVAL SCHOOLS OF INSTRUCTION.

NAUTICAL SURVEYING. See HYDROGRAPHY.

NAUTICUS, nȧ'tĭ-kŭs. See CLOWES, W. L.

NAU'TILOI'DEA (Neo-Lat., from Lat. *nautilus*, from Gk. *ναύτιλος*, sailor, nautilus, from *ναῦς*, *naus*, ship + *εἶδος*, *eidos*, form). An order of fossil Cephalopoda, equal in rank to the Ammonoidea, containing about 2500 species that range from Cambrian to recent time, and are represented at present by only two or three living species of the genus *Nautilus*. The most ancient forms were straight conic shells (*Orthoceras*), which soon became coiled like the modern forms. Many of the extinct genera and species are most important horizon markers or index fossils. See CEPHALOPODA; NAUTILUS; ORTHOCERAS.

NAU'TILUS (Lat., from Gk. *ναύτιλος*, *nautilos*, sailor, from *ναῦς*, *naus*, ship). The pearly nautilus (genus *Nautilus*) is the only living representative of an immense assemblage of shelled cephalopods of the subclass Tetrabranchiata, which flourished during past geological ages. The shell is coiled in one plane, divided into chambers by partitions or septa, the outermost being called the living chamber, as it contains the animal; the septa are perforated by the siphuncle, which is central or nearly so, and the aperture is wide and spacious. The shell consists of two layers, the outer being porcellanous, the inner pearly, or nacreous, whence the name "pearly" nautilus. The initial chamber consists of an obtuse incurved cone, marked on the outer surface of its posterior wall by a small scar called the cicatrix. It is supposed that a perishable embryonic shell (protoconch) was formed, the presence of which is indicated by the cicatrix.

PEARLY NAUTILUS (*Nautilus pompilius*).

Seen in section showing the chambers and siphuncle. (Half natural size.)

The body is short and thick, divided into a large obtusely conical head bearing eyes, tentacles, ears (otocysts), and a rounded saclike trunk. The mouth is surrounded by about 90 external filiform tentacles. The pair of tentacles on the inner or dorsal side are fused so as to form a hoodlike lobe by which the aperture of the shell is closed when the animal is withdrawn into the living chamber. Beneath is the funnel (hyponome), not forming a completely closed tube as in the squids, but a locomotive organ, through which, as in other cephalopods, the water is ejected with sufficient force to throw the animal backward. In swimming forward, says Kent, the tentacles are extended radially from the head.

The mouth is in the centre of the lobes and groups of tentacles, armed with a tongue (radula) and a pair of remarkably powerful horny jaws tipped with carbonate of lime. Olfactory organs and osphradia are present. The animal is attached within the living chamber by two oval muscles. The compartments of the shell are usually said to be filled with air or gas, but according to Verrill they are filled with sea water, which may be taken in or expelled so as to equalize pressure at varying depths.

Until recently the living nautilus was exceedingly rare, though the empty shells are cast ashore in great quantities in the Pacific and Indian oceans. Yet they have been for a long time trapped in baskets like lobster traps by the natives of some of the Melanesian and Fiji islands and used as food. Willey at Ralum, in New Britain, succeeded in trapping the nautilus in 70 fathoms of water. He also succeeded at Lifu, one of the Loyalty Islands, in capturing specimens at a depth of only three fathoms. These he kept in a large submerged cage, feeding them daily until his efforts were rewarded early in December, 1894, by finding that they had spawned in the cage, yielding an abundance of eggs. These are not laid in bunches, as is the case with those of the squid, but are deposited separately by the female. Each egg is as large as a grape. There are said to be three species now living in the Pacific Ocean, while the number has been carried up to even four. The two better-known species are *Nautilus pompilius* and *Nautilus umbilicatus*.

Fossil Nautili. Although the family Nautilidæ dates from the Jurassic period, the genus *Nautilus* is doubtfully referred to the Tertiary. The order Nautiloidea, however, originated as early as the Ordovician; the earlier types were straight and uncoiled, like *Orthoceras*. Very striking, says Hyatt, is the marvelously sudden rise of the Nautiloidea as a group; it reached its maximum in the Silurian, followed by a decline extending from the Devonian to the Triassic period. Then the forces acting unfavorably upon its existence were arrested, or their violence lessened, and the group has been affected by only very slight changes and an exceedingly slow process of retrogression until the present time.

Bibliography. Sir Richard Owen, *Memoir on the Pearly Nautilus* (London, 1832); Cooke, "Mollusks," in *Cambridge Natural History*, vol. iii (New York, 1895); Parker and Haswell, *Text-Book of Zoölogy* (ib., 1898); Hyatt, in Zittel-Eastman, *Text-Book of Paleontology* (ib., 1900); Willey, "Pearly Nautilus," in *Zoölogical Results Based on Material from New Britain, New Guinea, etc.*, vol. vi, *Zoölogy* (Cambridge, 1902).

NAUTILUS, PAPER. See ARGONAUT.

NAUVOO, nȧ-vōō'. A city in Hancock Co., Ill., 12 miles north of Keokuk, Iowa, on the Mississippi River (Map: Illinois, B 4). It is in a highly productive fruit-growing country, where

the leading industries are wine making and the culture and shipment of fruit for market, particularly grapes, and berries. St. Mary Academy and Spalding Institute, conducted by the Benedictine Sisters, are in Nauvoo. The most interesting features in this vicinity are the remains of the old Mormon buildings. The water works are owned by the city. Pop., 1900, 1321; 1910, 1020. Nauvoo was founded by the Mormons in 1839 and rapidly increased in size until in 1846 it had a population of 15,000. In this year the settlement was broken up by the people in the neighborhood. (See MORMONS.) An imposing temple, 128 feet long by 88 feet wide, left unfinished by the Mormons, was destroyed partly by fire in 1848 and partly by a tornado in 1850. In the latter year a company of French communists, called Icarians (q.v.), under the leadership of E. Cabet, occupied Nauvoo, but their experiment proved a failure, and they abandoned it in 1858.

NAVA, nä'vȧ. A seaport of Japan. See NAWA.

NAVAHO, or **NAVAJO**, năv'ȧ-hō. An important tribe of Athapascan stock (q.v.). Their present reservation in northeastern Arizona and extending into New Mexico and Utah comprises nearly 10,000,000 acres, but it is almost entirely an arid desert of sand and rock, unfit for any purpose except scanty grazing. Like other tribes of the same stock, they call themselves simply *Dîně* (people); they are called *Apaches de Navajo* in Spanish records at least as early as 1630. They came originally from the far northern home of their kindred, but have incorporated elements from all the neighboring tribes. They were roving and predatory in their habits and were continually at war with the Ute and the Plains tribes. They were alternately at war or peace with the Spaniards during the early colonization period, but later became so troublesome that in 1705 and again in 1713 it was necessary to bring them to terms by vigorous invasions of their country. In 1744 Franciscan missionaries attempted to civilize them, but in a few years the effort was abandoned. In 1805, in consequence of continued raids, a Spanish force penetrated their stronghold in Tseyi (Chelly) Cañon and inflicted a severe defeat, killing 115 men, women, and children. The lesson, however, was soon forgotten, and between the fall of the Spanish power about 1815 and the American occupation of the country 30 years later they made the stealing of sheep, cattle, and horses from the Mexican settlements a steady and profitable business. With their booty they were enabled to become a pastoral tribe, and they adopted from the more civilized Pueblos a well-developed weaving art. From the Mexicans they learned the simpler forms of metal working, especially in silver. In 1846 a number of prominent chiefs made their first treaty with the American government, but, on account of the unfortunate killing of the principal signer three years later, the tribe again became hostile. Hostilities continued with but short intermissions until 1863, when it was determined to deport the entire tribe to the Bosque Redondo reservation on the Pecos River, near Fort Sumner, in eastern New Mexico. In the ensuing winter a mixed force of whites and Ute Indians under Kit Carson invaded the Navaho country and forced their cañon stronghold. Within a year nearly 8500 had been deported to the Bosque Redondo, and it was supposed that not more than 2000 remained at large in their own country, but later developments proved that not more than half, and these not the most troublesome, had been removed. The experiment proved a failure. The stock of the Navaho died or was stolen, their crops failed, and their numbers decreased from disease, escapes, and attacks by the Plains tribes. In June, 1868, a new treaty was made, under which the captives, then numbering 7300, were returned to a reservation set aside in their old country, and were given sheep and cattle with which to begin life anew. Since then they have remained quiet, steadily increasing in wealth and population. In 1884 the reservation was extended to its present dimensions to accommodate their rapidly increasing herds.

The Navaho have a fully developed clan system, including some 50 clans, with descent in the female line. Their government is democratic and local rather than centralized, since the nature of their country and occupation prevents the formation of large organized bodies, so that each family shifts for itself in the search for temporary pasturage and water supply. They are agricultural to a limited extent. They make some pottery and baskets, but derive their main subsistence from their herds of sheep and goats, together with horses and some cattle. They are well known for the beautiful and durable blankets which they weave from the wool of their flocks and for their artistic silver ornaments. (See colored plate of INDIAN BLANKETS with the article BLANKET.) Although they are nomadic, they build at each regular halting place permanent *hogáns*, or circular houses, of logs covered with earth, with a short covered entrance way and smoke hole at the top. Men and women alike are almost constantly at work caring for their herds, weaving, or laboring at the forge. They have elaborate and spectacular ritual ceremonies and an abundant mythology, with hundreds of sacred songs in the keeping of their priests. Aside from the industries which they have made their own they have adopted but little of the white man's civilization or teaching. They are estimated now at 22,455, less than half of whom are within the reservation limits, the rest ranging on outside pastures or working in the white settlements. Consult: Washington Matthews, *Navaho Legends* (Boston, 1897); id., *The Night Chant* (New York, 1902); The Franciscan Fathers, *An Ethnologic Dictionary of the Navaho Language* (St. Michaels, Arizona, 1910); id., *A Vocabulary of the Navaho Language* (ib., 1912); P. E. Goddard, "Indians of the Southwest," in American Museum of Natural History, *Handbook Series, No. 2* (New York, 1913). See Colored Plate of INDIANS.

NAVAHO BLANKETS. See BLANKET, with Colored Plate.

NAVAL ACADEMY, UNITED STATES. The school at which are educated the executive officers of the United States navy. It was founded as the Naval School in 1845, at Annapolis, Md., with a course fixed at five years, the first and last of which were to be spent at the school; but this plan was not strictly adhered to even at first and was subsequently changed. In 1849 the course was changed to seven years, the first two and last two being spent at the school and the three intervening years at sea, and the name of the institution

was changed to United States Naval Academy. In 1851 the four years of study were made consecutive, and annual practice cruises were commenced. In 1861 the academy was removed to Newport, R. I., on account of the war. It returned to Annapolis in 1865.

In 1873 the course for cadet midshipmen was extended to six years, the last two to be spent at sea. In 1882 the title of cadet midshipman was changed to naval cadet, which in 1902 was replaced by that of midshipman. Appointments to the different corps were made by the Secretary of the Navy upon recommendation of the academic board; but only enough appointments were made to fill vacancies, all other graduates being honorably discharged. In 1889 the law provided that the cadets of the first class (seniors) should be separated at the beginning of the year into two divisions, and those destined for the line and the engineer corps should pursue separate courses of study during the first-class year. In 1889, also, the age of candidates at date of admission, which had been from 14 to 18 years, was changed to 15 to 20 years. In 1899 the Act of March 3 consolidating the engineer corps with the line abolished the separate line and engineer divisions at the academy. The same Act increased slightly the numbers in all grades of the service and very much increased the lower grades. The supply of graduates thus became insufficient, and in 1900 the number of cadets at the academy was increased by an Act authorizing appointments to the academy every four years instead of every six. The number of officers in service subsequent to the Spanish-American War was wholly inadequate to the increasing demands of the fleet, and, as the only means of adding to the number is through the Naval Academy, an increase in the number of midshipmen was proposed. This increase, made by Congress in 1902, provided for the appointment of a midshipman every two years by each Senator, Congressman, and Delegate in Congress, and 11 by the President. By the Act of March 7, 1912, the probationary period of two years at sea was eliminated and the course fixed at four years, at the end of which, upon graduation, the midshipmen are commissioned as ensigns.

The course of study and instruction at the institution is much more advanced than the term "academy" would imply, is beyond that of most colleges, and approximates that of many postgraduate technical schools. The course for the first year (fourth class) includes mechanical drawing, algebra, geometry, descriptive geometry, trigonometry, English studies, French, Spanish, and hygiene, and practical exercises and instruction in seamanship, boats, ordnance, target practice, infantry, artillery, battery drill, fencing, gymnastics, dancing, and swimming. The course for the second year (third class) includes trigonometry, conic sections, differential and integral calculus, mechanical drawing, physics, chemistry, naval history, French and Spanish, and practical exercises and instruction in seamanship, boats, signals, ordnance, target practice, infantry, artillery, battery drill, fencing, and steam engineering. The course for the third year (second class) includes seamanship, principles of mechanism, mechanical processes, mechanical drawing, marine engines and boilers, integral calculus and mechanics, physics, chemistry, and electricity, and practical exercises and instruction in seamanship, boats, steam tactics, signals, ordnance, infantry, artillery, battery drill, target practice, fencing, and steam engineering. The course for the fourth year (first class) includes seamanship and naval tactics, gun and torpedo drills, naval ordnance and gunnery, ballistics, theoretical gun construction, navigation, theory of compass deviations, marine surveying, boilers, naval construction, engineering materials and designing, physics, electricity, and Spanish, and practical exercises and instruction in seamanship, boats, steam tactics, battery drill, target practice, torpedo practice, ordnance, artillery, infantry, fencing, compass correction, navigation, surveying, steam engineering, practical electricity, turret drill, international law, etc.

From about the first of June until the first of September the midshipmen are embarked on war vessels for the summer cruise, when they are instructed practically in the various duties of their profession. For several years since the Spanish-American War the practice vessels have been comparatively modern war vessels temporarily detached from the reserve fleet. Until 1898 most of the buildings of the academy were very old, many of them dating from the early part of the nineteenth century, and the accommodations for the midshipmen inadequate as well as unsuitable. The necessary expansion of the institution was brought to the attention of Congress by the war, and a very liberal plan of rebuilding the academy was adopted. The expenditure authorized was $10,000,000. The work is now completed, and the result is the best-equipped and handsomest naval institution of learning in the world. The headquarters of the postgraduate schools (see NAVAL SCHOOLS OF INSTRUCTION) is at the Naval Academy, though many of the courses are taken elsewhere. Consult: J. R. Soley, *History of the Naval Academy* (Washington, 1876); Park Benjamin, *The United States Naval Academy* (New York, 1900); United States Navy Department, *Courts Martial at the Naval Academy* (Washington, 1906); J. M. Conover, "West Point and Annapolis in Civil Service," in the *Nation*, vol. xcviii (New York, 1914).

NAVAL AËRONAUTICS. The various problems connected with the military use of the dirigible balloon and the aëroplane at sea are much the same as on land. In respect of construction, the dirigible is the same for both services; the aëroplane, however, must be so designed that it may alight on or rise from the water; hence the hydroaëroplane. As in the land, so in the sea service—one has to consider both offensive and reconnoitring applications of the two classes of machines.

If the offensive employment of the dirigible ashore is attended with uncertainty, still greater uncertainty waits on its use against ships. Apart from the probability of missing, increased at sea, by the condition that the target, the ship itself, is in motion, it may be remarked that light projectiles would be practically harmless against turrets and armored decks, and that the number of really destructive projectiles that may be carried is limited. At any useful height a dirigible would be seriously exposed to ship fire, delivered by guns especially designed for this sort of fire. Under this head, as under so many others of military aëronautics, experience is lacking, or, if not experience, then information in respect of achievement. If a conclusion from

negative evidence be permissible, we may take it for granted that the dirigible, in the offensive against ships, has proved a failure. It has been suggested that dirigibles could be effectively used to detect and even to attack submarines and submarine mines and mine fields, for, if the water be clear, these would all be visible from above. An instance was furnished in the War in Europe by the action of the German submarine U–9, which it was said was informed and guided by a Schütte-Lanz airship; on the other hand, this feat could just as well have been performed by an aëroplane.

In reconnaissance dirigibles could be sent out to report on the presence of a hostile fleet, upon its course if under way, and upon the nature and number of its units. Indeed, this sort of work could be more readily performed at sea than the corresponding work ashore: the dirigible becomes assimilable to a lofty observation station in communication with its own fleet or base, and enjoying, when the weather is good, an uninterrupted view in all directions.

If the weather be unfavorable, so as to obstruct the view, scouting could still pick up the hostile fleet, for it must be recollected that a naval enemy is completely revealed as soon as clearly seen, and is much more readily detected than a land enemy. In general, it is asserted that a dirigible accompanied by a mother ship carrying supplies, and equipped to generate hydrogen gas, would be of inestimable value to an admiral.

Recent as is the application of the aëroplane to the land service, still more recent is that of the hydroaëroplane to sea service. This machine has the same functions in respect of naval operations and of coast defense as the ordinary aëroplane of land operations. In a military sense, the problems that arise in its use do not differ in principle from those of the land machine; the special objective is different. Obviously, should the necessity arise, a land machine could be used in naval war, and a water machine in land war; but since a land machine cannot alight on or rise from the surface of the water, the seaplane is both logical and necessary. Accordingly we find great naval powers developing this branch of military aëronautics, other things equal, in the same ratio as that of the land service, with England, France, and Germany leading.

On the whole the reconnaissance problems that present themselves to the hydroaëroplane for solution are somewhat simpler than the corresponding ones in the land service. For example, if an invading fleet purpose an attack upon coast works, the position and nature of these can be accurately determined. If, on the other hand, the coast defense sends out the hydros to reconnoitre an attacking fleet, an accurate report can be made of the number and nature of the elements comprising the fleet. This, of course, is equally true of the reconnaissance made by two fleets operating against each other. In the two latter cases two or three hydroaëroplanes can more quickly, more accurately, and more economically perform the duty involved than a far greater number of destroyers or rapid cruisers. This is a most important consideration. A Cervera to-day would find it impossible to conceal his fleet for over 24 hours.

In purely naval work the chief duty of the hydroaëroplane is that of reconnaissance. The French naval manœuvres of 1913 in the Mediterranean established beyond all possibility of doubt the importance of this sort of craft on this duty to a naval commander.

The service is organized by the establishment of shore stations, naval centres ashore; but just as aëroplanes accompany an army in the field, so must hydroaëroplanes a fleet at sea. We may accordingly expect that warships will carry them in the future. As a matter of fact, in 1914 the U.S.S. *Mississippi* did take five hydros and flying boats to Mexico, and these were used in the American occupation of Vera Cruz. In Germany hydroaëroplanes are so constructed that they can be picked up by a crane and hoisted aboard, and then stowed until needed, when they are similarly put overboard.

On the English ship *Hibernia* a runway was constructed forward for the launching of the hydro, but this system, of course, was inconvenient unless, indeed, in future naval construction the deck shall be so designed as to be in itself a runway. This would seem to be a necessity in order to meet the case of a very rough sea, from the surface of which a seaplane could not possibly rise, although the existing military conditions might imperatively require the machine to take the air. Another method of launching a hydroaëroplane is by the catapult devised by Capt. W. I. Chambers, U.S.N. This consists essentially of a car running on a track and carrying the flying machine; the car is driven forward by the use of compressed air. It is claimed for this apparatus that it is small, may be mounted even on the top of a turret; indeed, may be used anywhere on the ship. When used, both the aëroplane and the car are projected from the track together. The car drops into the water after clearing the track, the aëroplane goes on its way in the air; the car is then hoisted aboard. To supply the needs of its air scouts a fleet may be accompanied by a mother ship or hangar ship, such as the *Foudre* of the French navy, but it will probably be found more economical and efficient to make the ship itself the unit, and so to regard hydroaëroplanes or flying boats as a part of its necessary equipment. The aëroplane will probably prove invaluable in commerce destroying both to the attack and to the defense. It is not inconceivable that commercial ships navigating waters liable to be invaded by hostile cruisers will themselves carry seaplanes, to give warning of the enemy, and so to enable the vessel to shift her course and avoid capture.

On the employment of the hydroaëroplane as an engine of destruction it is not necessary to dwell; the same limitations exist in its case as in that of the aëroplane. But if certain authorities, chief among them Sir Percy Scott, R.N., may be believed, a great future awaits the hydroaëroplane in connection with submarines. That is, if some way can be devised to assure uninterrupted communication between them, the submarine will be regularly accompanied and guided by the seaplane. This would spell revolution in naval warfare and hence in naval types. In the meantime Admiral Fiske, U.S.N., has proposed to use the aëroplane in the torpedo attack of ships; the flying machines would in this case take the place of the submarine.

The aëronautical needs of the United States navy were fully set forth in a formal report submitted in 1914 by a board appointed to consider the matter. This board recommended an equipment of 50 aëroplanes complete; 50 outfits, spare parts, etc., for fleet service, and in addition 6 aëroplanes complete, 6 outfits, 4 knockdown trucks, and 6 hangar tents, as advanced base outfit. It further recommended the purchase of one dirigible for expeditionary service with the fleet, and of a special auxiliary ship for dirigible service in connection with the subject of a special auxiliary for aëroplanes. In its opinion Pensacola afforded the best site for the Naval Aëronautical Centre. This centre should have one commandant with two divisions, aëronautic and operative, each of sufficient *personnel* and various other officials. The aëronautical laboratory should be at the Washington Navy Yard. Further, the office of Naval Aëronautics should be created at the Navy Department, in the Personnel Division, under a director and an assistant director, with representatives from the various bureaus, navigation, ordnance, etc., and from the Marine Corps. The estimated first cost of the plan was $1,297,700, surely a modest sum in comparison with the enormous expenditures of European nations. The Committee on Naval Affairs of the House recommended early in 1915 an appropriation of $1,000,000 for an aërial corps, and special pay and allowances.

As in land operations pure and simple the aëroplane, so in coast defense the hydroaëroplane, can give notice of the nature, strength, and course of an approaching antagonist. The direct effect of this is to allow ample time in which to prepare ammunition, fire trial shots, and even to move troops from points not threatened to those that are. This case presents no difference of principle from the analogous case of one army approaching another. But in coast defense many conditions arise not found in ordinary operations. Other things equal, coast defenses have little to fear from fleets in broad daylight or, more generally, when the fleet and its course can be suitably observed. Hence a fleet commander may determine to run by in a fog or behind a smoke screen. To fire upon an enemy whose position is thus unknown would be an almost criminal waste of ammunition. In such a case the service of a hydro might be invaluable, by circling over the fleet and making a signal when passing over, e.g., the flagship. A series of such signals observed ashore might enable mortar and gun salvos to be fired. In the similar case of a run by night the hydro might be equally called upon to reveal the position of the fleet.

In direct relation with this possibility the hydroaëroplane of the future may be expected to offset the radical defect of the searchlight, viz., shortness of range; it may also compensate the deficiencies of the range-finding system in this same respect. To illustrate, the modern United States army L/15 12″ mortar has, let us assume, a range of 20,000 yards, but the best searchlight will not illuminate beyond 8000; hence mortar fire, so justly dreaded by ships, at night practically ceases to exist for over one-half of its intended range of effect. Theoretically, at least, there is nothing to prevent the hydroaëroplane from taking up the work at 8000 yards and continuing it to the extreme range of the pieces interested. The hydroaëroplane will also be found useful in locating and possibly in attacking submarines and submarine mines, not merely in coast defense, but in naval operations generally; in reconnaissance against landing parties, and in correcting the howitzer and mortar fire directed against these parties.

In regard to the future it is believed by some authorities that if a seaworthy craft is to be had the seaplane must be both large and powerful. In other words, what is contemplated is a true flying boat, of great horse power, having sleeping accommodations, and carrying food and water. Hence the biplane is to be preferred to the monoplane. The seaplane must also be able to withstand a heavy sea. In a German test the machines were required to rise from and land on the sea, when the waves were breaking one meter high, crest to trough, and to float on such a sea for one hour, with the engines stopped, and without damage to any part from leakage. Specifications for the United States navy call for the construction of armored hydroaëroplanes to carry rapid-fire gun and ammunition and two passengers. These machines must have a maximum speed of at least 80 miles an hour, a radius of action at full speed of four hours, adequate climbing power, and be able to glide at an angle of 1 on 6. They must further be able to rise from the water and alight in the open sea under ordinary conditions, to ride at anchor or drift without danger of capsizing, and to fly safely in a 35-mile breeze. For bibliography and illustrations, see under AËRONAUTICS and MILITARY AËRONAUTICS, which can be read with advantage in this connection, but the fact should be emphasized that conditions have changed and are changing so rapidly that the latest information and developments, as well as conclusions derived from experience in the recent European War, can be obtained not from treatises but from the current files of such journals as *The Scientific American* (New York); the magazine *Flying* (New York); *The Journal of the United States Naval Institute* (Annapolis); *The United Service Magazine* (London); various European naval annuals and reports of the United States Navy Department.

NAVAL APPRENTICE. Naval apprentices in the service of the United States, such as are described under the head of APPRENTICE, are no longer enlisted. The title is now *apprentice seaman*, and the method of instruction is radically different. The applicant for enlistment must be 17 years old, of robust frame, intelligent, of perfectly sound and healthy constitution, free from all physical defects or malformations, and not subject to fits. He must also be able to read and write. The instruction at the training stations (Newport, Norfolk, San Francisco, and Lake Michigan) lasts about six months and includes the rudiments of training only. Apprentice seamen are taught the elements of naval discipline and how to take care of their person and their clothes. They are given instruction in rowing, knotting, and splicing, and in English studies; also a little knowledge of gunnery. When the course at the training station is completed, they are rated *ordinary seamen* and transferred to the regular ships of the service. Their instruction is there continued. See NAVAL SCHOOLS OF INSTRUCTION.

NAVAL ARCHITECTS AND MARINE ENGINEERS, THE SOCIETY OF. An association incorporated under the laws of New York State,

with headquarters in New York City. The object of the association is the promotion of the art of shipbuilding. It has a membership of about 900. The society holds annual meetings, and publishes *Proceedings*.

NAVAL ARCHITECTURE. See SHIPBUILDING.

NAVAL CADET. See MIDSHIPMAN.

NAVAL CHEST. See CHEST, NAVAL.

NAVAL CLERK. See CLERK, PAYMASTER'S.

NAVAL COLLEGE, ROYAL. See ROYAL NAVAL COLLEGE.

NAVAL COLLEGE OF CANADA. A school for training naval cadets at Halifax. The course of study is three years, and the age at date of admission is from 14 to 16 years. At present the Department of the Naval Service does not in any way bind itself to issue commissions to graduates of the Royal Naval College nor, on the other hand, does it require cadets to adopt a naval career. Arrangements have, however, been made with the British Admiralty by which they have agreed to accept each year eight cadets who have completed their course at the college, provided these cadets have attained the required standard of efficiency. They will be entered in the Royal Navy as cadets of the same standing as graduates of the Dartmouth Naval College. Arrangements have also been completed with the McGill University and the University of Toronto, by which they will admit graduates of the college to the second year of the course of applied science in these universities. The entry is made through competitive examinations, the number of candidates selected being dependent upon the number of vacancies. Candidates must be British subjects and must have resided, or their parents must have resided, in Canada for two years immediately preceding the examination. A short period of absence abroad for the purposes of education may be considered as residence in Canada.

The entrance examinations take place in May at the examination centres of the Civil Service Commission. Blank application forms for admission and information concerning dates and plans of examination are furnished by the office of the Civil Service Commission, Ottawa. Candidates are examined in arithmetic, algebra, geometry, geography, history, writing and dictation, and either French or German; for the purpose of adding to their marks they may take two of four optional subjects—Latin, elementary science, drawing, or a second modern language. The fee for the examination is $4. The candidate must be physically sound and will be examined to determine this. Cadets receive no pay while in the college. Each cadet is required to pay annually in advance a fee of $100. In addition, he must pay a fee of $350 for the first year and $225 for each of the succeeding years. The college provides, free of expense, the necessary furniture, bedding, mess equipment, and table board. The training at the college extends over a period of three years, with vacations of six weeks at Christmas and six weeks in summer. The course of study at the college includes: mathematics, navigation, mechanics, physics, chemistry, engineering, seamanship, pilotage, French or German, English, geography, and history (including naval history).

NAVAL CONSTRUCTORS. Officers of the United States navy charged with the design, building, and repair of ships. The corps of naval constructors is filled by appointment of graduates of the Naval Academy who are sent (after graduation) to the naval postgraduate school, or to special technical schools, for an additional course in shipbuilding and naval architecture. The general features of new types of ships are prescribed by the Secretary of the Navy upon recommendation of the General Board and Chief of Operations. The design and details are worked out by the chief constructor and his assistants in the Bureau of Construction and Repair of the Navy Department in consultation with the chiefs of bureaus of Steam Engineering and Ordnance. The building of the hulls of all naval vessels in private shipyards is supervised by naval constructors detailed to that duty, and they are in charge of hull construction and repair when the work is carried on in navy yards. In 1915 there were 5 naval constructors of the rank of captain, 5 of the rank of commander, 23 of the rank of lieutenant commander, and 18 of the rank of lieutenant; the assistant constructors are 24 in number, 14 with the rank of lieutenant and 10 with the rank of lieutenant, junior grade.

NAVAL CROWN. In heraldry, a rim of gold around which are placed alternately prows of galleys and square sails, conferred on one who performed some valiant act on the seas.

NAVAL ENGINEER. See ENGINEER, NAVAL.

NAVAL FUEL SHIP. See FUEL SHIP, NAVAL.

NAVAL GUNS. See GUNS, NAVAL.

NAVAL INSTITUTE, UNITED STATES. An organization founded at Annapolis in 1873 by the officers then on duty at the United States Naval Academy. It has for its object the promulgation of knowledge concerning naval affairs among the officers of the naval service. During the first years of its existence it issued occasional numbers of its *Proceedings*, but in a short time the publication was made quarterly, and this was continued until 1914, when it was changed to bimonthly. The publication is one of the largest and most important periodicals of its type in the world, and the character of its articles, which cover the whole range of naval affairs, is unsurpassed. Its bimonthly review of foreign naval activities is the most extensive and most conveniently arranged compilation given in any publication. Each year the institute offers a gold medal, a life membership, and a prize of $200 for the best essay on any subject of interest to the naval service, reserving the right to withhold the offer if no worthy essay is presented. The institute also publishes a large number of books on naval, technical, and allied subjects.

All officers of the navy and persons holding positions under the Navy Department are eligible to membership, and other persons interested in naval affairs may be elected as associate or honorary members. The present membership of the institute includes about half of all the officers in the navy and is steadily increasing.

NAVAL LAW. See MILITARY LAW.

NAVAL LIEUTENANT. See LIEUTENANT.

NAVAL MACHINIST. See MACHINIST, NAVAL.

NAVAL MILITIA. See NAVAL RESERVE.

NAVAL OBSERVATORY, UNITED STATES. A government institution, situated at Washington, D. C., in lat. 38° 55′ 14″ N. and long. $5^h\ 8^m\ 15.78^s$ W., a division of the Bureau of Navi-

gation in the Navy Department. Its functions are to determine the positions of the sun, moon, planets, and stars for use in preparing the *American Ephemeris and Nautical Almanac;* to issue correct standard time by telegraph and radio at noon and at 10 P.M. daily, 75th meridian, for use of navigators and all others requiring accurate time; to test, purchase, distribute, and repair instruments of precision, including chronometers and gyrocompasses, used by the navy in navigation, surveying, and aëronautics; to conduct astronomical investigations of general and special scientific interest; and, since 1894, to publish the *American Ephemeris and Nautical Almanac.* It had its origin in a depot of charts and instruments established by the Navy Department under the charge of Lieut. L. M. Goldsborough, U.S.N., in 1830. In 1833 Lieutenant Wilkes, U.S.N., moved the depot to a site on Capitol Hill, and at his own expense built an observatory containing a transit instrument of 3¾-inch aperture, a Borda's circle, a 3½-foot achromatic portable telescope, a portable transit instrument, and a sidereal clock. In the summer of 1838 the Secretary of the Navy directed the superintendent "to make a constant series of observations in astronomy, magnetism, and meteorology, ordering an additional number of assistants (naval officers), and granting authority for the purchase of all necessary instruments." Under these instructions Lieut. J. M. Gilliss, U.S.N., began systematic observations in astronomy with additional instruments as follows: a sidereal clock and a mean-time clock; a meridian circle of 4½-inch aperture; a portable achromatic telescope of 3¼-inch aperture. The work done under his direction at the Capitol Hill depot between 1838 and 1842 was published in 1846 as *Astronomical Observations Made at the Naval Observatory,* being the first American volume of this nature.

A building for this depot was authorized by Congress in 1842 through the efforts of Lieutenant Gilliss, who, after consulting American and European scientists, prepared plans and erected the Naval Observatory. Soon after the instruments were in place Lieut. M. F. Maury, U.S.N., succeeded to the charge of the observatory, and in addition to astronomical work devoted much of his personal attention to the study of ocean currents and other hydrographic and nautical subjects. Among the earliest of the scientific achievements of the new observatory were the observations of Neptune secured in 1846 immediately after the discovery of that planet, which enabled Sears C. Walker, by identifying two older foreign observations, to determine the elements of the orbit of Neptune. The application by Prof. John Locke of electricity in recording observations resulted in the installation of the first practical chronograph at the observatory in 1849. With the 9.6-inch equatorial Assistant Astronomer James Ferguson discovered several asteroids between 1854 and 1860. The 26-inch lens made by Alvan Clark, at the time the largest refracting telescope in the world, enabled Prof. Asaph Hall to discover the satellites of Mars in 1877. The observatory was removed to Georgetown Heights in 1893, where the necessary buildings for offices, clockhouse, and vault, together with the houses for the following instruments, were erected: the 26-inch equatorial, the 12-inch equatorial, the 10-inch photo-equatorial, the 9-inch transit circle, the 6-inch transit circle, the 5-inch prime vertical, the 5-inch alt-azimuth, the 5-inch transit, the 40-foot photoheliograph of 5-inch aperture, and numerous others. In addition to its routine work, the observatory has, since 1893, participated in such large works of international coöperation as the observation of a zone of stars for the *Katalog der astronomischen Gesellschaft,* the observation of the asteroid Eros and photographic reference stars for the determination of the solar parallax, the observation of an extensive catalogue of zodiacal stars, and the observation of the fundamental and intermediary stars for the Photographic Chart of the Heavens. There have also been made extensive series of observations of the satellites of the planets, of asteroids and of comets with determinations of their orbits, and a series of observations extending over 20 years for the determination of the constant of nutation. In the winter of 1913–14 separate parties from the observatory and from France, in cooperation, made independently the first direct determinations of the difference of longitude between Washington and Europe, by the interchange of radio signals from the naval radio station at Arlington and the Eiffel Tower radio station at Paris. The library contains about 28,000 volumes and is the most complete astronomical collection in the country. The publications of the observatory comprise more than 50 large quarto volumes, which contain full details of the work done, with many valuable scientific memoirs by Hall, Newcomb, and others.

NAVAL ORDER OF THE UNITED STATES. An hereditary patriotic society organized in Boston, Mass., on Nov. 10, 1890, having for its objects the perpetuation of the deeds of the American navy through the encouragement of research in naval arts and science and the preservation of historic memorials relating to the navy of the United States. It includes a Grand Commandery and six State commanderies. There are two classes of companions. The first class includes veteran officers and their male descendants; and the second class, enlisted men who have received the United States naval medal for bravery in the face of the enemy. The badge of the order is a gold Maltese cross coated with blue enamel and edged with gold. In the centre of the obverse is the insignia of the navy of the United States with the motto "Fidelitas et Patria"; on the reverse is the insignia of the Marine Corps. There are State commanderies in Massachusetts, Pennsylvania, New York, California, Illinois, and the District of Columbia. Representatives from these commanderies meet triennially as a general commandery. The total membership is about 500.

NAVAL RESERVE. In all the more important navies, in addition to the regular forces serving continuously with the fleet, there are certain others which are drilled and instructed in order to be able to supplement the *personnel* of the fleet in time of war. In peace these men are largely employed in the merchant marine, in yachts, in auxiliary government services, or are pensioners or have served the requisite length of time for pension or discharge, but are still within the limit of age. In some countries a portion of the naval reserves have not served either in the mercantile marine or the navy, but receive a certain amount of training for such service; while in countries in which

service in the army and navy is compulsory the greater part of the reserve is made up of men who have completed the requisite length of active service with the fleet.

The naval reserve of the United States was established by Act of Congress approved March 3, 1915. It consists of citizens of the United States who have served in the navy for four years or more or an enlistment during their minority. It is organized under the Bureau of Navigation of the Navy Department and is governed by the Articles for the Government of the Navy, and by the Navy Regulations and Instructions. Whenever actively employed with the navy its members, while so employed, are considered to be in all respects in the same status as enlisted men of the navy on active duty, except that they are not to be advanced in rating during times of peace. When not actively employed they are not entitled to pay or emoluments of any kind except the pay expressly provided for members of the naval reserve. Service in the naval reserve does not count for retirement.

Enlistments in the naval reserve are made for four years (unless sooner discharged), and must be made within eight years of final discharge from the navy. Enlistments are in two classes. Class one includes those enlisting in the reserve within four months of discharge from the navy. Class two includes all others. Men may also be transferred to the naval reserve at the expiration of enlistment in the rate in which serving, provided they have served 16 years in the navy. Members of class one and men transferred at expiration of enlistment are required to keep on hand such parts of their uniform as may be prescribed by the Secretary of the Navy, and all members of the naval reserve are issued a distinctive badge which may be worn with civilian dress. Members of class one who have served less than 8 years in the navy are paid at the rate of $30 per annum; 8 to 12 years, $60 per annum; 12 years or more, $100 per annum. All members of class two receive $12 per annum, and when first called into service receive a clothing allowance of $30. Members of the naval reserve who are transferred to the reserve, after 16 years or more of active service, will be paid at the rate of one-third or of one-half their base pay, according to whether they have served 16 to 20 years or over 20 years, plus permanent additions thereto which they were receiving at the close of their last service in the navy. Members of the naval reserve may, in time of peace, be required to perform not less than one month's active service on board a vessel of the navy during each year of service in the naval reserve, and such active service shall not exceed two months in any one year. In time of war they may be required to serve throughout the war or their term of enlistment.

Members of class one and those who have been transferred to the reserve who reënlist in the navy within four months from the date of their discharge from the naval reserve will not receive gratuity pay for reënlistment, but their enlistment for purposes of determining pay will be held to have occurred within four months of discharge from the navy. The period of active service while in the reserve counts towards the time required to secure retirement for those who reënlist in the navy after service in the reserve.

Any enlisted man on the retired list may, in time of war or threatened war, be called upon for such duty as he may be able to perform; while so serving he will receive the same pay and allowances as he had when retired. Enlisted men on the retired list are not eligible for enlistment in or transfer to the naval reserve.

Naval Militia. The naval militia of the United States is supplemental to the naval reserve. It is organized in the District of Columbia and in 22 States, viz., California, Connecticut, Florida, Illinois, Indiana, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Washington, and Wisconsin. The total number of officers and men on Jan. 1, 1915, was 7785, divided as follows: commissioned officers, 589; warrant officers, 29; petty officers, 1573; men, 5594. Members of the naval militia receive no pay and are not required to serve on board ships in active service, but facilities for such service are granted every year. One or more vessels (mostly of small size) have been lent to the different States for the use of their naval militia for purposes of drill and exercise. Many of these are fully manned and equipped and take short cruises each year. All matters pertaining to the naval militia are under the cognizance of the Assistant Secretary of the Navy, who transacts all business concerning them with the various State authorities. A naval officer (usually a commander) has charge of naval-militia matters under the direction of the Assistant Secretary.

Reserve Ships. The ships in reserve are the older types of battleships, armored cruisers, cruisers, and many auxiliaries. The battleships and armored cruisers are commanded and manned by officers and men of the active navy, but only about one-third of the complement is kept on board. The cruisers are either out of commission or in use by the naval militia.

British Naval Reserve. The British naval reserve consists of (*a*) Royal Fleet Reserve, (*b*) Royal Naval Volunteer Reserve, (*c*) Pensioners (long-service men), (*d*) Royal Naval Reserve, (*e*) Coast Guard. The period of enlistment is 10 years, the first part of which is spent with the fleet and the last part in the fleet reserve. At the beginning of the War in 1914 the numbers in the reserve were:

(*a*) Royal Fleet Reserve:	
Immediate reserve	4,070
Class A — pensioners	8,327
Class B — nonpensioners	18,710
Class C — " (artificer ratings)	30
	31,137
(*b*) Royal Naval Volunteer Reserve (officers and men)	4,500
(*c*) Pensioners (long-service men)	8,110
(*d*) Royal Naval Reserve (officers and men)	20,348
	64,095
(*e*) Coast Guard (officers and men)	3,015
Total	67,110

The Royal Naval Reserve was created in 1860 and consists of officers and men employed in the merchant service but trained in the navy. For this purpose they are mustered annually on the drill ships in the different ports. They also serve (practically all the officers) on board the regular vessels of the navy, and when so serving are on the same footing as officers and men of the regular service. In times of peace they are largely called out in the annual manœuvres.

German Naval Reserve. Service in the German navy is compulsory upon the seafaring and semiseafaring population and lasts in theory for seven years. Three years of this are spent in active service with the fleet and four years in the fleet reserve when the annual manœuvres or requirements of the fleet do not call for their services. Each reservist is required to take part in two training courses, not to exceed eight weeks each, during the four years. He then passes into the Seewehr—in its first class for five years and then into its second class, where he remains until he reaches the age of 39 years. There is also an Ersatz Reserve, which serves, on mobilization, for completing the complements of the navy. It is composed of men who have not served in the navy because they were in excess of the number required, or were exempted for domestic reasons, or did not fully satisfy the physical requirements. They are subject to call to attend the training courses before their thirty-second year, but these courses have not been held for a long time, as their services were not needed. At the beginning of the European War which broke out in 1914 the effective reserve consisted of about 90,000 men.

The French, Russian, Italian, and Austrian naval reserves are formed in a manner similar to that of Germany. At the beginning of the War of 1914 the French reserve consisted of about 60,000 effectives, that of Italy of about 30,000, and that of Austria of 15,000. Russian naval reserve probably exists only on paper. It has never been adequate, even to man the fleet for manœuvres. See NAVIES.

NAVAL SCHOOLS OF INSTRUCTION. In the United States naval schools for officers consist of the Naval Academy (q.v.), the Naval War College, and postgraduate schools in ordnance, marine engineering, electrical engineering, aviation, medicine, and the marine school of application. The Naval War College was established at Newport, R. I., in 1881. It performs the double function of instruction and of preparing plans of operations in conjunction with the General Board, the Office of Naval Intelligence, and the Chief of Operations. The president is a naval officer of high rank (captain or rear admiral), and there is a permanent staff of four to eight officers as assistants. Lectures are also given by distinguished authorities on international law, history, and other subjects connected with naval affairs. Officers are ordered for instruction in the long course (about nine months) or the short course (three or four months). Others go there for the study of special professional subjects. The instruction consists in lectures on professional subjects, the study of naval war, and practical exercises in tactics and strategy on the war-game board. The postgraduate schools are for young officers who specialize in shipbuilding and naval architecture, ordnance, marine engineering, electrical engineering, and aviation. These are not schools in the sense of organizations, but more properly courses of study and instruction. The officers studying shipbuilding and naval architecture pursue their studies at the Boston Institute of Technology at present. They were formerly educated abroad. The ordnance school consists of instruction at the gun factory, torpedo station, powder factory, proving ground, and at Washington University, covering all branches of ordnance and allied subjects. The marine engineering school consists in work at the engineering experimental station and postgraduate school at Annapolis and in courses in marine engineering at various universities. The course in electrical engineering is taken at certain universities and includes radio (wireless) work. The aviation school has been divided between Annapolis and Pensacola. All officers pursuing postgraduate courses may be required to take part of their courses at the postgraduate school at Annapolis, Md. The naval medical school (see MEDICAL DEPARTMENT OF THE UNITED STATES NAVY) is at Washington. It gives young surgeons a course in naval medicine and hygiene. The marine school of application is at Annapolis, Md.

The schools for enlisted men are training schools, seaman gunners' school, electrical school, yeoman school, machinist mates' school, artificers' school, musicians' school, and the school for commissary stewards, cooks, and bakers. The training schools are at the training stations in Newport, Norfolk, North Chicago, and San Francisco (Yerba Buena Island). Recruits, upon first enlistment, are sent to those schools for six months' instruction before going aboard ship. (See NAVAL APPRENTICE.) The seaman gunners' school gives instruction (to men who have served one enlistment) in ordnance and machine work (Washington gun factory) and torpedoes (Newport torpedo station). The electrical schools are at the New York and Mare Island navy yards. Instruction is given in all kinds of electrical work, including radiotelegraphy. The machinists' mates' school, which trains men in all kinds of machine work and in the operation of boilers and machinery, is located at the Charlestown Navy Yard. The yeoman schools are at New York Navy Yard and at the Yerba Buena training station, and train men for naval clerical duties, including typewriting and stenography. The schools for artificers (carpenter, shipwright, plumber, coppersmith, blacksmith, etc.) are at the Charlestown and Norfolk yards. The musicians' schools are at the Newport and Norfolk training stations. The schools for commissary stewards, cooks, and bakers are at the Newport and Yerba Buena training stations. At all training stations and on board all ships in commission the enlisted men are given instruction in English studies, mathematics, and the theoretical and practical parts of their work, the amount of instruction above a fixed minimum being based upon the man's aptitude and desire to acquire knowledge.

In several States there are public marine schools which are maintained by the States, but the training ships and officers are furnished by the Navy Department. These schools are for the education of young officers for the merchant marine.

Argentina. The naval school of Argentina is at Buenos Aires. The age at date of admission is 14 to 17 years, and the course is four years. This includes cruises on the training ship *Sarmiento*. The torpedo school is on the old cruiser *Maipú*. See NAVIES, *Argentina*.

Austria-Hungary. The greater part of the executive officers of the Austro-Hungarian navy are graduates of the naval academy at Fiume; the others are appointed provisionally, and serve in the fleet until able to pass a satisfactory examination. The age at date of admission to the academy is 14 to 16 years. The course is four years, three months of every year being

spent on board a practice ship. There are also a gunnery school, torpedo school, mining and telegraph school, and a training school for boys and recruits. These schools are either on board vessels or have vessels attached to them. The training school is on board an old line-of-battle ship and has sailing and steam practice ships as tenders.

Brazil. The executive officers of the Brazilian navy are drawn from the graduates of the naval academy on the island of Enxadas in the harbor of Rio de Janeiro. The limits of age at entrance are 13 and 17 years. The graduates are transferred to the naval college (also at Rio de Janeiro) for an additional course of four years.

Chile. The Chilean naval academy is at Valparaiso. The course is six years, previous to which the cadet must have completed three years at the military academy at Santiago. The course includes cruises on a training ship. The engineering school is at Talcahuano. Chile also has a naval war college, somewhat similar in character to that of the United States. It is reported that the course of instruction for Chilean officers is to be radically changed. Early in 1915 the Chilean government requested the detail of two officers of the United States navy, presumably to assist in this work.

China. Though China had practically no navy in 1915, the government was preparing for its enlargement by reopening its naval schools at Chifu, Nanking, Foochow, Canton, and Wusung. The most important of these is the one at Chifu, which has a director, 16 instructors, and 192 pupils. The budget for 1914 provided for the use of three vessels (1900 to 2200 tons) as school ships. See NAVIES, *China*.

Denmark. The Danish naval school for executive officers is at Copenhagen. There are 10 admissions each year, the candidates for which must be from 15 to 20 years of age and have served 9 months in the navy or 18 months in the merchant marine. After a preliminary cruise of three months they are reëxamined; 6 of the 10 are selected and the others discharged. The course of instruction is four years. See NAVIES, *Denmark*.

France. The French naval school for the training of officers is at Brest. It was established by Napoleon in 1810 and comprised two sections—one at Brest, the other at Toulon. Both were on board vessels—the *Tourville* at Brest, the *Duquesne* at Toulon. After several changes the school was, in 1830, installed on a vessel anchored in the roadstead of Brest. Various ships have been assigned to this duty, but since 1841 they have borne or have been given the name of *Borda*. In 1911 the present buildings were commenced, and in 1914 the school was moved on shore to its new quarters. The requirements at entrance are high and approximate those of the Ecole Polytechnique. The age at entrance is from 14 to 18 years, and the course is two years. After completing the course at the naval school the cadets are promoted to the grade of *aspirant* (midshipman) second class, and sent on board a cruising training ship for one year for further instruction, especially in practical work. They are then promoted to *aspirants* first class, and their training ceases. The school for engineers is one of engine design and construction. Special courses are taken at the Ecole Polytechnique. The medical schools are three in number and are located at Brest, Rochefort, and Toulon. The course of study is two years. There are also the superior training school for officers of the executive branch, and torpedo, gunnery, navigation, and ordnance schools for the practical training of officers who incline to become specialists. Following the lead of the United States and British navies there is a certain unification of the instruction for executive and engineering officers and a tendency towards consolidation, as in the United States service. The school for apprentices of the enlisted force is on board three or more training ships. The schools for machinists, artificers, and stokers are also on board old vessels in the harbors of Toulon and Brest.

Germany. The German naval academy in 1913–14 was transferred to its new quarters at Mürwik, near Flensburg. The enrollment of cadets takes place in April of each year. Candidates are ordinarily from 17 to 20 years of age. Those with "maturity" certificates from a royal high school (Realgymnasium) have certain advantages, and may receive commissions a year earlier than the men who pass less rigid examinations. After about five weeks' preliminary instruction cadets are sent on board practice ships (old cruisers of the *Hertha* class, 5600 tons) for the remainder of the year, during which the vessels cruise in home waters and abroad. At the end of the year they are examined and, if qualified, are promoted to the grade of midshipman (*Fähnrich zur See*). The next year is spent in theoretical work in the professional sciences. After passing an examination concerning this work they spend six months in courses at the gunnery school, on the torpedo training ship, and with the marine infantry, each course ending with an examination. They are then sent on board ships of the regular service for one year's practical training. At the end of this year those who obtain favorable certificates are promoted to the grade of ensign (*Leutenant zur See*), but remain another year on board, though their education is supposed to be completed when they are promoted. Candidates for naval engineers must be not over 21 years of age, of good character, have means sufficient to eke out the service pay during four years ($10 per month, decreasing to $5 at the end), and have two years' practical experience at machine works. They enter with enlisted men's ratings, but are kept separate from all others of their branch and wear a special uniform. On enrollment (in the autumn) they receive three months' training in military matters, then nine months' practical instruction on vessels of the high-sea fleet. After passing an examination they are promoted to petty officers. Then follow two years of practical experience in petty officers' duties on ships or torpedo vessels and one year's attendance at the engineers' school (one at Kiel, one at Wilhelmshaven). This is intended to provide the necessary theoretical groundwork for understanding what has been learned in practice. The rank of warrant officer is now obtained. Four years' experience in this rank is followed by a second school year, ending in promotion to the rank of commissioned engineer. Of the enlisted force of the German navy 73 per cent are derived from ship's boys. These are enlisted between the ages of 15 and 18 years. They serve two years as boys, three years in fulfillment of their service liability, and four years in return for the training they

have received. They are enrolled in October, are instructed on a stationary training ship at Mürwik for six months, then have one year in a cruising training ship, and complete their instruction by six months on a stationary ship. They are then sworn in as seamen, being allotted, as far as possible, to the branch of the service they prefer—seaman, torpedo, mining, or submarine. The engine and fire room ratings are derived from the seafaring population possessing the required qualifications.

Great Britain. The British naval school for the instruction of officers is divided into two parts. One is at Osborne on the Isle of Wight and the other at Dartmouth. The age at entrance is from 13½ to 14½ years (though this has been frequently changed). The first two years of the course are given at Osborne, the last two years at Dartmouth. Then come eight months in a cruiser; after this, two years and four months' service as a midshipman, followed by promotion to sublieutenant. After promotion to lieutenant all officers must specialize as lieutenants of engineering, gunnery, torpedoes, navigation, instruction, or marines, or remain as general-service officers. Officers specializing in engineering go to Keyham for one year and to Greenwich naval college for six months. Nearly all who finish this course go to sea as engineers, but a few are selected for an advanced course of two years, and will eventually qualify as designing engineers. Junior engineers are given sufficient executive duty to render them familiar with it. Upon promotion all lieutenants become commanders in the general list of the executive branch, except engineer officers, navigating officers, and marine officers, who are commissioned in their own branch; but these revert to the general list on reaching the grade of captain, except the designing engineers and the greater part of the marine officers. The naval college at Greenwich is a postgraduate school in all the naval sciences and branches. The course varies, but the full term is usually two years. The naval war college (very similar in character to that of the United States) is located at Portsmouth, but it was reported that it would be moved to Greenwich. There were several aviation schools in 1915, owing to war conditions. There are also torpedo schools and gunnery schools located on board ship. The headquarters of the gunnery school is on the gunboat *Excellent* at Portsmouth. The torpedo schools are at Portsmouth and Devonport. These schools also instruct enlisted men. The other schools for the enlisted force include training ships for boys, for boy artificers, and for mechanicians; also a cooking-school ship. The drill ships for the Royal Naval Reserve and for the Royal Naval Volunteer Reserve are large vessels of old type located at ports convenient for the purpose. Canada and Australia have established naval forces and naval academies and training schools. The Canadian academy (see NAVAL COLLEGE OF CANADA) is at Halifax, and the Australian is at Sydney.

Italy. The Italian naval academy is located at Leghorn (Livorno). The instruction is in two parts: (*a*) the normal course and (*b*) the superior course. These courses have recently been considerably changed and the age of admission lowered. It is now 12 to 15 years. The normal course is five years in length, eight months of each year being spent at the academy and three months on practice ships. At the end of the course all cadets who pass the required examinations are appointed midshipmen and sent to sea for at least a year. They are then commissioned as sublieutenants and sent to the academy for the superior course, which comprises two sessions. The first is obligatory for all sublieutenants; the examination at the end of it fixes the rank of the officers in their grade and affects greatly the question of their advancement (one-third are promoted by selection and two-thirds by seniority). To the second session are admitted only those who have attained a certain standard in their examinations, and these more fortunate young men receive a diploma which has an important influence upon their naval career and eventual promotion. The naval constructors, constructing engineers, and commissary officers are also graduates of the academy. The schools for the enlisted men are five in number. There are also training ships for seamen. The question of training officers and men has recently been extensively considered, and it was proposed to follow the British system more closely, particularly in regard to the education and status of engineer officers.

Netherlands. The naval school for the Netherlands navy is located at Willemsoord. The age of entrance is 14 to 17 years, and the course is four years. At the end of the course the cadets who pass the required examinations are appointed as cadets of the first class. After two years in ships of the regular service they are again examined and, if found qualified, are commissioned as second lieutenants. The special engineer school is at Hellevetsluis. There are also torpedo and gunnery school ships and training ships for instructing the enlisted force; also drill ships for the naval militia.

Norway. The Norwegian naval school furnishes not only the officers of the regular service, but also those of the reserve. Candidates for admission to the school must not be over 19 years of age and must have served for 21 months in the merchant marine. The course at the school is in two parts, inferior and superior. The inferior course is three years long, and at the end cadets become ensigns. Those ensigns who are not destined to form part of the regular navy are, after two years of ordinary service, made lieutenants of the reserve. The superior course has two terms of eight months each. After 18 months of additional service the graduates of the superior school are promoted to the rank of lieutenant. There are also gunnery and torpedo schools and training ships for the enlisted force.

Portugal. The naval school of Portugal is a polytechnic institution. The course for officers of the executive branch consists of three months on a training vessel, one year at the naval school, three months on a training vessel again, and lastly another year at the school. The graduates are then appointed midshipmen, and after two years of service are commissioned as ensigns. There are gunnery and torpedo schools for both officers and men and training-school ships for boys.

Rumania. Early in 1914 the Rumanian government decided to establish a naval academy at Kustendje. Eighteen officers, selected for instructors, were sent abroad for special study. See NAVIES, *Rumania*.

Russia. The training of officers in the Russian navy was being changed, and the details had not been fully settled at the time of the

Great War of 1914. The principal source of supply of officers was the Imperial naval academy at Petrograd (St. Petersburg). The course was four years, at the conclusion of which the cadets became midshipmen. The academy had postgraduate courses in strategy, tactics, international law, etc. In 1915 a new academy was under construction at Sebastopol at a cost, including equipment, of $4,000,000. When it is completed the primary course of instruction will be transferred to the new institution, which will have quarters for 500 cadets. The old school will be retained as a naval college with postgraduate and advanced courses only, and will also house the naval war college. At Kronstadt there is a school of navigation and ordnance with a primary course of four years similar to that at Petrograd. Whether this institution is to be retained after the completion of the academy at Sebastopol was not stated, but it is presumed that it will be continued as a station for practical instruction in navigation, ordnance, torpedo, etc. There are also training schools (chiefly on shipboard) for engineers, machinists, gunners, torpedo men, seamen, etc.

Spain. The officers of the executive branch of the Spanish navy are graduates of the royal naval school. The age at entrance is from 13 to 18 years. The course is three years, at the end of which the cadets become midshipmen. They then serve one year on a ship detailed as the school of application, one year on the sailing vessel *Nautilus*, and one year on vessels in regular service. After passing an examination they are then commissioned as sublieutenants. There are also floating gunnery and torpedo schools and vessels for the training of seamen and boys.

Sweden. The Swedish naval academy for the training of officers of the executive branch is at Stockholm. The age at entrance is 13 to 16 years. The course is six years, eight months of each year at the academy and four months on a practice ship. Upon graduation the cadets are made sublieutenants. They are then sent for six months as instructors in a school (*Exercisskolan*) where the enlisted men receive their naval instruction. This is followed by six months' service of various kinds, including some time spent at the dockyard. They are then assigned terms of duty with the mobile defense of the coast and at the gunnery school, and after eight or nine months in cruising ships they are commissioned as ensigns. There are also a school of the mobile defense, a school for enlisted men (*Exercisskolan*, already mentioned), a torpedo school, and a gunnery school.

Turkey. The Turkish naval school was broken up by the Great War of 1914. The course was supposed to last 10 years, but the instruction was very irregular. See NAVIES; MIDSHIPMAN; NAVAL APPRENTICE (recently renamed apprentice seaman).

NAVAL SIGNALS. See SIGNALS, MARINE.

NAVAL STATION. A government establishment usually to provide coal, fuel oil, supplies or other equipment for ships of war: Naval stations vary in size and nature with their location and object. They may even form a base for a fleet and include a dry dock, shops, and various ordnance supplies. On the other hand, naval stations may be arranged for a single purpose, as for example, a base for submarines, training quarters for seamen, a marine garrison, a guard for a cable landing, etc., and often are located in distant places or colonial possessions. In some cases they may be acquired by lease or treaty from the friendly power or secured from an inferior nation or from a conquered foe.

NAVAL STORES. The origin of this term, which commercially is applied to the great turpentine and rosin industry of the southern United States, is uncertain, but it is probably derived from the fact that these and other materials broadly included in this designation were at one time chiefly used by shipping. The list of articles so classed is ill defined. They are all of vegetable origin and include turpentine, rosin, tar, pitch, linseed oil, oakum, and certain varnishes and gums. Though still largely used on shipboard nearly all these substances now have a much wider application in manufacturing and the liberal arts. Many of them have medicinal value, such as tar, turpentine, linseed oil, and gum thus, or ordinary frankincense. The last named, commonly called scrape, is the crude gum which collects on the turpentine pine tree when an incision is made in its bark. It is used by druggists as an ingredient in certain ointments and other pharmacal preparations.

Wood Tar (see TAR) is still used for preserving hemp rope, which is impregnated with it. A mixture of tar and pitch or tar and rosin was used as a protective coating for the bottoms of wooden ships before the practice of coppering wooden vessels became practically universal.

Pitch is of various kinds, differing somewhat in composition, and is derived in several ways. The name is applied to a gluelike substance consisting of resinous hydrocarbons such as asphaltum, rosin, tar, etc. The pitch used in wooden ships was usually that derived from wood tar by the removal of the volatile products. It was also prepared by heating and mixing wood tar and rosin. It has to some extent been replaced by substances of a similar character called naval glue, seam cement, and other patented mixtures. It is used on board ship to fill the seams of wooden decks after they have been calked with oakum. For this purpose it is melted and poured into the seams. After it cools and hardens the surplus pitch is scraped off, leaving the seam level with the deck. The operation is called paying the seam. The seams in the sides and bottoms of wooden ships are similarly treated, though a sort of putty was and is used to a considerable extent, especially on the sides and decks of wooden yachts and on the decks of steel ones.

The other substances mentioned are described in separate articles under their own names—tar, rosin, etc. Many of the materials included under the head of naval stores have been replaced in part by petroleum and coal-tar products. While these substitutes are, as a rule, inferior to the articles they replace, they are cheaper and suffice for many purposes. The standards for naval stores as used by the United States government are prescribed by the Bureau of Chemistry of the Department of Agriculture and the United States Bureau of Standards. For a full discussion of the turpentine and rosin industry, including not only statistics but methods of production, see "Turpentine and Rosin," in *Thirteenth Census of the United States*, vol. x, *Manufactures*, 1910 (Washington, 1913); *Forest Products of the United States*, Appendix on "Naval Stores"; also *Naval Stores*

Review (Savannah, Ga., current) and *Bulletins of United States Forestry Service*, especially Nos. 90, 116, and 119. See LINSEED; OAKUM; ROSIN; TAR; TURPENTINE; VARNISH.

NAVAL SURGEON. See SURGEON, MILITARY AND NAVAL.

NAVAL TACTICS. See TACTICS, NAVAL.

NAVAL TARGET PRACTICE. See TARGET PRACTICE, NAVAL.

NAVAL UNIFORMS. See UNIFORMS, MILITARY AND NAVAL.

NAVAL VETERANS, NATIONAL ASSOCIATION OF. A patriotic society organized in New York City in January, 1887, having for its chief purpose the preservation of the traditions and memories of the United States navy during the Civil War. It is also beneficial to its members. It admits to membership any officer or enlisted man who served in the United States navy, United States marine corps, or United States revenue marine service during any portion of the time between April 12, 1861, and Aug. 25, 1865, and who has been honorably discharged or has honorably resigned. The organization has a membership of about 7000, in 20 associations.

NAVAL WAR COLLEGE. See NAVAL SCHOOLS OF INSTRUCTION.

NAVARINO, nä'vȧ-rē'nō. A town of Greece, in the Morea and in the Nomarchy of Messenia, at the southern extremity of the Bay of Navarino (Map: Greece, C 7). It is officially called Pylos. The ancient Pylos was at the northern extremity of the bay, and is now called Palæokastro and Palæo-Navarino. Pop., 1909, about 2100, according to Baedeker. Along the front of the bay stretches the island of Sphagia, or Sphacteria (q.v.). In 1492 the Turks captured Navarino, and held it, with two or three short periods of interruption, till 1821, when it passed into the hands of the Greeks. In 1825 it was taken by Ibrahim Pasha, and on Oct. 20, 1827, in the Bay of Navarino, the allied British, French, and Russian fleets, numbering 24 ships and commanded by the British admiral Sir Edward Codrington, defeated the combined Turkish and Egyptian fleets, comprising 89 ships of war. In this battle 60 of the Ottoman ships were destroyed outright and the rest were driven ashore in a shattered condition. The Turks lost 6000 men, while less than 200 of the allies were killed. The battle of Navarino is one of the great battles of history, since it brought about the achievement of Greek independence. See GREECE, *History*, paragraph *The War for Independence*. Consult *Memoir of Sir Edward Codrington*, by his daughter (1873), and K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

NAVARRAISE, nȧ'vȧ rȧz', LA. An opera by Massenet (q.v.), first produced in London, June 20, 1894; in the United States, Dec. 11, 1895 (New York).

NAVARRE, nȧ'vär'. A former independent kingdom on both sides of the western Pyrenees, now constituting the Spanish Province of Navarra (capital Pamplona) and part of the French Department of Basses-Pyrénées. The Province of Navarra has an area of about 4055 square miles. A large portion consists of wooded mountains and well-watered valleys. The region about Pamplona is a treeless plateau. In the south, in the valley of the Ebro, is a fruitful district, called the Ribera (shore). In the southeast is a barren salt steppe. The region is drained by the Ebro, its affluents, the Ega and Aragon, the Arga, an affluent of the Aragon, and the Bidassoa. The population of the province was 307,669 in 1900.

History. This territory was occupied in ancient times by the Vascones, the present stock of the Basques and Gascons, and they were never entirely subjugated by the Romans. The Visigoths met with sturdy resistance from the Basques, and had to content themselves with a nominal overlordship. The Basques were enabled to maintain some independence even during the Saracen conquest. Charles the Great, towards the close of the eighth century, conquered their country and made it a part of the Spanish mark. It soon became independent of the Franks, and for a time its history is very imperfectly known. Apparently Sancho Garcia (905–925), who wrested the region of the upper Ebro from the Saracens, was the first to bear the title of King of Navarre. In the form of government the Basque influence and the tribal feelings were strong and the governmental institutions were primitive. The King was elected, and was limited in his power by a council of 12 nobles. The Kingdom developed rapidly by conquests. Sancho III, the Great, who died in 1035, was also King of Castile, and Aragon was under his control as a dependency of Navarre. He divided his Kingdom among his three sons. Sancho IV of Navarre was murdered in 1076, and the nobles chose King Sancho of Aragon as their ruler. Until 1134 Navarre was united with Aragon (q.v.). After the death of Alfonso the Battler the people of Navarre chose the son of Sancho IV as King and recovered their independence. The country continued under this dynasty for 100 years, but Navarre, shut in by Castile and Aragon, was prevented from developing by conquests from the Moors. In 1234 Navarre passed by inheritance to Champagne. Queen Joanna of Navarre married Philip IV of France in 1284, and from that time until the extinction of the Capetian dynasty, in 1328, the history of Navarre was intimately connected with that country. Then the kingdom went, as a dowry, to Philip of Evreux, who married Joanna, daughter of Louis X. Her son was Charles the Bad. (See CHARLES II OF NAVARRE.) His granddaughter Blanche married King John of Aragon, and Navarre was connected with Aragon from 1458 until 1479. John's daughter, Eleanora, who succeeded to the throne of Navarre in 1479, was married to Gaston de Foix, Viscount of Béarn, and thus Béarn was united with Navarre. Eleanora died soon after her accession and was succeeded by Francis Phœbus. His successor, Catharine de Foix, married in 1484 a French noble, Jean d'Albret. In 1512 Ferdinand of Aragon conquered what is now the Spanish portion of Navarre. The Kingdom was thus reduced to a small district to the north of the Pyrenees. Jeanne d'Albret married in 1548 Antoine de Bourbon. Their son, Henry, ascended the throne of Navarre in 1572, and in 1589 became King of France as Henry IV. Navarre was united to France by decree in 1607, but down through Charles X all French kings bore also the title of King of Navarre.

Bibliography. Nicholas de Bordenave, *Histoire de Béarn et Navarre* (Paris, 1873); G. B. de Lagrèze, *La Navarre française* (2 vols., ib., 1881–82); Hermilio de Oloriz, *Resumen historico del antiguo reino de Navarra* (Pamplona,

1887); José de Moret, *Anales del reino de Navarra* (9 vols., Toulouse, 1890–92); Jean de Jaurgain, *Etude historique et critique sur les origines du royaume de Navarre* (Paris, 1897); id., *La Vasconie* (ib., 1898).

NAVARRE, Margaret of. See Margaret of Navarre.

NAVARRETE, nä'vä-rā'tā, Domingo Fernández (1610–89). A Spanish missionary. He was born at Peñafiel, Old Castile, entered the Dominican Order, and, after passing some time in Mexico, went (1647) to the Philippine Islands, where he became professor of theology at Manila. Later he made a missionary journey into the interior of China and resided there for a number of years, becoming in time the head of his order in China. During a persecution he was imprisoned at Canton, but escaped and reached home in 1673. In 1677 he became Archbishop of Santo Domingo. He published the first volume of his work, *Tratados históricos, políticos, éticos y religiosos de la monarquía de China* (1676), but the second volume was suppressed by the Inquisition. A projected third volume was never published. Consult *Churchill's Collection of Voyages and Travels,* vol. i (London, 1744).

NAVARRETE, Francisco Manuel de (1768–1809). A Mexican poet, born at Zamora. He entered the Franciscan Order and ultimately became professor of Latin at the University of Valladolid. He attained some reputation, especially for his bucolic poetry. A collection of some of his works was printed as *Entretenimientos poéticos del P. Navarrete* (Mexico, 1823; 2d ed., Paris, 1835).

NAVARRETE, Juan Fernández de (1526–79), surnamed El Mudo (the mute). A Spanish biblical painter, born at Logroño. He studied in different parts of Italy, especially (so says the usual account) at Venice under Titian, and returned to Spain after 20 years, with his reputation well established. In 1568 he was made painter to the King and was employed on the decorations for the Escorial. Among those still surviving are a "St. Jerome," "Christ at the Pillar," "The Nativity," "The Martyrdom of St. James," and a "Holy Family." In 1576 he painted his most famous picture, "Abraham and the Three Angels," for the Escorial, and in 1577–78 he further painted eight pictures representing the "Apostles," the "Evangelists," "St. Paul," and "St. Barnabas." Navarrete's manner and warm coloring show the influence of his master, Titian, and account for his second surname "the Spanish Titian." He plays an important part in the technical development of the Spanish school.

NAVARRETE, Martín Fernández de (1765–1844). A Spanish navigator and author, born at Avalos, Logroño, Spain. He entered the Spanish navy in 1780, served in the West Indies and in the Mediterranean, and took part in the combined French and Spanish attack on Gibraltar in 1782. He became a lieutenant in 1789, and was commissioned to collect documents relating to the history of the Spanish navy. From 1796 to 1808 he was detailed on special service in the Department of Marine, resigning in the latter year rather than recognize Joseph Bonaparte. He again took office after the restoration, became a recognized authority on naval affairs, and in 1823 was appointed director of the hydrographic office. At 27 he had been elected to the Royal Spanish Academy of the Language; and he was a member of various other learned bodies, including the Royal Academy of History, of which he became permanent director in 1824. He was chosen Senator and made a Councilor of State, and in 1841 became a corresponding member of the Institut de France. His greatest work was his *Colección de los viajes y descubrimientos que hicieron por mar los españoles desde fines del siglo XV* (7 vols., 1825–65). He also wrote a *Life of Cervantes,* published with a new edition of *Don Quixote* (1820), and left material for two posthumous works, *Disertación sobre la historia de la náutica* (1846) and *Biblioteca marítima española* (1851). He helped establish the publication, by the Royal Academy of History, of the *Colección de documentos inéditos para la historia de España,* and saw the first four volumes through the press. The set now contains 112 volumes.

NAVARRO, nä-vä'rō, José Francisco de (1823–1909). An engineer and financier, born in San Sebastian, Spain. He was prepared for the navy, but in 1841 came to the United States, where he received his English education in the Jesuit College at Baltimore. He visited South America and later settled in Cuba, where he took up the study of mechanics and railroading and became a member of a large mercantile firm. In 1855 he came to New York and there founded the first line of steamships between New York and Brazil (1863). He also became interested in a number of commercial projects, and in 1878 was one of the constructors of the Metropolitan Elevated Railway. He built one of the first large modern apartment houses in New York.

NAVAR'RO, Madame de. See Anderson, Mary Antoinette.

NAVARRO, Pedro (c.1460–c.1528). A Spanish general, who greatly developed the use of mines in war. In 1500 he was employed by Gonsalvo de Córdoba in the campaign against Naples. He was very successful in his use of mines against the famous Castello Nuovo in 1503, and was made Count of Alvetto, or Olivetto, by Ferdinand of Aragon. In 1508 he helped materially in the capture of Vélez de Gomera (the Peñón de la Gomera) by inventing a kind of floating battery, and in 1509 he did good service under Cardinal Cisneros in the conquest of Orân. After covering in masterly fashion the orderly retreat of the Spanish forces at Ravenna (1512), he was taken prisoner by the French. The King of Aragon refused to pay his ransom, and after languishing in prison nearly three years, Navarro was enabled to join the French army. He contributed largely to the success of the campaign of Marignano (1515). For a life of Navarro, consult Martín de los Heros, in *Colección de documentos inéditos para la historia de España,* vol. xxv (Madrid, 1854).

NAVAS DE TOLOSA, nä'vàs dā tō-lō'sä, Las. A village of Andalusia, Spain, 37 miles north of Jaén, the scene of a battle (July 16, 1212) between Alfonso VIII of Castile, aided by a large army of Crusaders, chiefly French and English, and an army of Almohades under Mohammed au Nâsir. The Christians were victorious and broke Mohammedan power in Spain.

NAVASOTA, năv'ä-sō'tä. A city in Grimes Co., Tex., 71 miles northwest of Houston, on the Brazos and Navasota rivers and on the Houston and Texas Central, the Gulf, Colorado,

and Santa Fe, and the International and Great Northern railroads (Map: Texas, E 4). Noteworthy features include the city-hall and high-school buildings and Washington Park. It has a cotton gin, compress, two cottonseed-oil mills, a cooperage, silo factory, and a creamery. A lock and dam on the Brazos River has been constructed here. Pop., 1890, 2997; 1900, 3857; 1910, 3284.

NAVASSA, nou-ȧs'sȧ. A small island, measuring about 1⅓ by 2¼ miles, in the West Indies, between Jamaica and Haiti, in lat. 18° 25′ N., long. 75° 5′ W. (Map: West Indies, D 3). It has no permanent population. The island is chiefly noted for the deposits of phosphate rock (presumably formed from bird guano) which cover the greater part of its surface and which have been exploited by an American company. Consult D'Invilliers, "Phosphate Deposits of the Island of Navassa," in *Bulletin of the Geological Society of America*, vol. ii, pp. 75–84 (1891).

NAVE (ML. *navis*, nave of a church, ship, Lat. *navis*, ship). *Primarily*, in church architecture, that portion of a church between the entrance and the choir or chancel; in cruciform churches, between the entrance and the crossing of the transepts. As most churches are oriented (see ORIENTATION), this means generally the long western arm of a cruciform church. *Secondarily*, the main central body of the church; particularly, in a church of several aisles, the central portion between the side aisles, usually much broader and loftier than the side aisles. (See AISLE.) Thus in the first sense the nave includes the side aisles, but extends only up to the crossing; in the second sense it denotes the broad and lofty central longitudinal division of the church, in the eastern as well as the western arm of the cross. These are difficulties to be overcome only by the use of explanatory phrases. The cathedrals of Carcassonne and Poitiers in France, of Erfurt and many "hall churches" in Germany, the cathedral of Perugia in Italy, and that of Vienna in Austria, have naves and aisles of approximately the same height, but the central division remains the widest and is still the nave. In the ordinary form of church the nave may be covered with a ceiling of wood or with vaulting; its elevation internally comprises usually three stories—the piers and pier arches or the columns, which separate it from the side aisles, the triforium (q.v.), and the clear-story (q.v.), whose windows admit light above the roofs of the side aisles.

The same use of the term for the middle and widest and highest division exists in the description of a Roman basilica, or bath establishment (thermæ; see BATH), or any building which is lighted in part by windows in the wall of a higher division rising above the roofs of the lower divisions; thus, it is disputed whether the middle part of the Ulpian basilica at Rome was roofed and was a real nave, or open to the sky like a court.

A considerable number of English churches and a few in France have two equal aisles, divided by a single row of piers and arches and having each its own gabled roof; such churches are said to be double-naved.

NA'VEL. The umbilicus or navel is a round or oval depression in the median line of the abdominal wall, marking the site of attachment of the umbilical cord (q.v.), or funis, in the fœtus. See OBSTETRICS.

NAVERO, EMILIANO GONZÁLEZ. See GONZÁLEZ NAVERO, EMILIANO.

NAVESINK (năv'*e*-sĭnk) **HIGHLANDS.** A chain of hills running nearly northeast and southwest and forming a bold headland west of the south end of Sandy Hook, in Monmouth Co., N. J. (Map: New Jersey, D 3). They are important landmarks for ships approaching New York. On them is installed a first-class lighthouse, which shows a flashing white light, 246 feet above the sea, and visible for 22¼ nautical miles. The adjacent region, which is very beautiful and easily accessible from New York City, attracts many visitors.

NAVES LIBURNÆ. See LIBURNIA.

NAVEZ, nȧ'vȧ', FRANÇOIS (1787–1869). A Belgian portrait, historical, and genre painter. He was born at Charleroi and first studied under Joseph François. He was a pupil of the academies of Brussels and Ghent, and later studied with David, in whose manner his works are executed. From 1817 to 1822 Navez was at Rome, after which he settled permanently in Belgium, being made director of the Brussels Academy in 1839. His severely classic style is relieved by a touch of realism, and his portraits and drawings show considerable warmth of feeling. He is well represented in the Modern Gallery, Brussels, by eight portraits, including one of David, and four historical canvases. In the Rijks-Museum, Amsterdam, are "Elijah Raising the Shunamite's Son" (1821) and the "Meeting of Isaac and Rebecca" (1826). His "Spinning Women of Fondi" (1845) is in the New Pinakothek, Munich.

NAVIC'ULAR DISEASE (Lat. *navicularia*, relating to ships, from *navicula*, dim. of *navis*, ship). A disease of the horse, consisting in an inflammation of the sesamoid sheath, induced by repeated bruising or laceration and complicated in many cases by inflammation and caries of the navicular bone, at the point within the hollow of the fetlock where it passes over the navicular bone. It is most common among the lighter breeds of horses, and especially where the pasterns are upright, toes outturned, and work is early and severe on hard roads. It soon gives rise to a short tripping yet cautious gait, undue wear of the toe of the shoe, wasting of the muscles of the shoulder, and projecting or pointing of the affected limb while standing. But few cases of navicular disease recover. Give rest, remove the shoe, shorten the toe, rasp the heel away, and apply hot poultices, changed every few hours, or a cantharides blister, repeated after three or four days. Laxative medicine and bran mashes may be ordered. After a few days, and when the heat and tenderness abate, cold applications should be given; after another week the animal may be placed for two months in a grass field, where the ground is soft and moist, or, if sufficiently strong, at slow farm work on soft land. Division of the nerve going to the foot removes sensation, and consequently lameness, and hence is useful in relieving animals intended for breeding purposes or for slow work. The operation, however, is not to be recommended where fast work is required, for the animal, being insensible to pain, uses the limb as if nothing were amiss, and the disease rapidly becomes worse. Consult Leonard Pearson and others, *Special Report on Diseases of the Horse*, published by the United States Bureau of Animal Industry (rev. ed., Washington, 1907).

NAVIES (OF. *navie*, from Lat. *navia*, ship, variant of *navis*, Gk. *ναῦς*, *naus*, Skt. *nāu*, OIcel. *nōr*, ship, *naust*, naval station; connected with Gk. *νεῖν*, *nein*, to swim). The term navy is applied to the armed force of a country which operates on the water or in coast and harbor defense. The history of navies goes back to the earliest days of ships, for no sooner were such craft built than their value as weapons of war was at once seen. The Chinese were among the earliest of navigators, but little is known concerning their ancient fighting craft. The most ancient war vessels of which the details are known were those of the Egyptians, and the date assigned to them is 3000 B.C. At the same time it is evident that there were many other peoples that possessed fighting vessels, and that the Egyptians were far from paramount; for they had repeated naval combats with the Mysians, Phocæans, and Phœnicians, and probably also with the Pelasgians, Daunians, Oscans, Cretans, and Sicilians. It is therefore impossible to fix any sort of priority to the possession of naval defense. Herodotus says: "These Phocæans were the first of all the Greeks who undertook long voyages, and they are the people who discovered the Adriatic and Tyrrhenian seas, and Iberia and Tartessus [a part of modern Spain]. They made their voyages in fifty-oared galleys and not in merchant ships." At this time, and for a long time subsequent and anterior, the shapes of merchant and war vessels were quite different, the former being broad and suitable for carrying cargo and the latter narrow and sharp so as to make speed. In addition, war vessels were built with rams and other warlike appurtenances, while merchant vessels made a much greater use of sails.

The greatest seafaring people of antiquity were the Phœnicians. They occupied the coast of Asia Minor, but the coast alone, for their territory was only from 5 to 15 miles wide. Even this comparatively small area did not form a single state, for the Phœnicians were a race, not a compact nation, and usually consisted of several communities independent of each other. The principal cities were Tyre and Sidon, and each had its own government. From the founding of Tyre (about 2730 B.C.) till 1600 the Babylonian influence in Phœnicia was probably paramount. Then the country was conquered by Egypt, which held the suzerainty until the Egyptian power began to decline (about 1200 B.C.). From that time until 870 the Phœnicians were independent of foreign control and had command of the sea, both in a naval and commercial sense. Of their cities, Tyre ultimately took the lead in wealth and power, reaching its zenith about 1000 B.C., when "a Tyrian sea" became "a proverbial expression for a sea whose navigation was prohibited to all but those who claimed the ownership thereof."

In 870 the Assyrian advance to the west reached Phœnicia. From this time until 650 B.C. the Phœnician cities usually paid tribute to Assyria, but there were frequent unsuccessful revolts. Phœnician power was now waning, but so was that of Assyria. In 650 the Tyrians freed themselves from their suzerains, but the devastating wars of the past 200 years had so reduced the male population that, soon after the reassertion of independence, their slaves rose and seized the city. Then the Egyptians made themselves masters of the country, but in 605 the Chaldæans drove them out. Revolts continued, Tyre withstanding a siege of 13 years (587–574); but in 538 the country passed under Persian control without much fighting. Though the parent states were now absorbed into the Persian Empire, many of the colonies were flourishing. In the sixth century Carthage declared its independence, and, though it never attained the naval or commercial supremacy of Tyre, for several centuries it divided with the Greeks the control of the Mediterranean. At the end of the fourth century Alexander the Great conquered Phœnicia, the country lost its last semblance of self-government, and its trade and sea power passed to the Alexandrians, Greeks, and Carthaginians. During the various periods in which the Phœnicians formed suzerain states under great land powers they manned and operated the war vessels of their overlords.

The Greeks were early competitors of the Phœnicians in trade and naval power. Like their rivals, the Greeks of Asia Minor passed through the same vicissitudes of subjection and acted as the naval forces of their conquerors. The European Greeks, equally good sailors, retained their independence and in the battle of Salamis (480 B.C.) overwhelmingly defeated the Persian fleet, which was largely manned by their Asiatic brethren. Internal dissensions prevented the extension of Greek sea power, the naval supremacy of Athens being destroyed in the Peloponnesian War (431–404 B.C.).

The early successes of Rome were on land. When it attempted to extend its conquests to Africa a strong naval force was necessary. In 260 B.C. the newly constructed Roman fleet destroyed the Carthaginian at Mylæ, and the overwhelming defeat of the Egyptian naval forces at Actium (31 B.C.) left Rome undisturbed mistress of the Mediterranean. The lack of opposition on the water caused the Roman naval force to be greatly reduced, and after the transfer of the seat of government to Constantinople, the navy almost disappeared until revived in the war against the Vandals. After the reconquest of Africa the fleet again declined. In the seventh century the rise of the Saracen power and the development of its naval forces compelled the Empire to build and organize an efficient fleet whose power and success were greatly augmented by the discovery of Greek fire (q.v.), the manufacture of which was kept a state secret. The dissensions in the Mohammedan world affected its naval forces, and their decline brought about a similar condition in those of the Empire. But in the ninth century the Saracens again gathered a strong force on the water, and the Imperial fleet was once more strengthened, and remained in this condition until the twelfth century, when the new Mohammedan conquests so reduced the territory of the Empire that its finances could no longer stand the burden of a strong navy.

In the meantime the commercial states of Italy had absorbed the greater part of Mediterranean sea-borne trade, and they built war vessels to protect it and to defend their coasts and colonies. Venice and Genoa were the leaders and rivals, and they, especially the former, were largely engaged in transporting the crusading forces to and from Palestine. They also settled at various places in the islands and on adjacent coasts, the settlement in many cases leading to seizure of the littoral and the formation of colonies. More than 200,000 were in Constantinople, and this indirectly led to the capture of the city in 1204 and the formation of the Latin Empire dominated by Venice. After the Vene-

tians were driven out the Empire again built up its fleet to some extent, but pressure from all sides soon caused the Imperial power on land and sea to sink to insignificance. Neither Venice, Genoa, nor the Mohammedan powers ever became paramount, though at times administering severe defeats to their opponents. The rivalry of Venice and Genoa came to an end in 1380 by the victory of Pisani at Chioggia, in which the Genoese fleet was destroyed and Genoese naval power so severely broken that it never fully recovered. Venice and the Mohammedans then continued their rivalry with varying success until the discovery of the passage around Good Hope caused the decadence of Venetian prosperity and the battle of Lepanto destroyed the Mohammedan sea power.

Early in the Middle Ages the countries about the Baltic and the North Sea, which had for centuries been sending out rovers and freebooters in every direction, began to develop organized naval forces. The early expeditions of the Norsemen showed this, though the actual warfare was mostly upon land. The ancient songs and stories of the Danes and Scandinavians contain many accounts of sea fighting, but these are so intermixed with fable, national boasting, and poetic imagery that it is difficult to separate fact from fiction. It is not until the ninth or tenth century that we begin to reach anything approaching reliable history. The Saxons (British) fought sea battles, in which many vessels were engaged, early in the ninth century, and in the last years of that century King Alfred organized a strong naval force The first great sea fight of which we have any definite knowledge was that of Harald Haarfagr, King of Norway, against the petty kings of the northern part of the country. He spent three years in building ships and gathering men, but achieved a complete victory in 872. One of the greatest of the early sea fights of which we have full information was that between Olaf Trygavesson, great-grandson of Harald, and the allied powers of Denmark and Vendland, which were assisted by the Norwegians of the Province of Viken. Olaf's ships were numerous and some of them were 150 feet in length, but the forces of his opponents were still greater, and, though he made a brave and able defensive fight, he was defeated and killed. In 1014 Olaf the Saint assisted the Saxons to capture London, which was occupied by the Danes. This fight is interesting from the fact that it was made by a fleet fighting against land forces. Under Harald Haardraade, in 1061, the Norwegian fleet destroyed the Danish in a fiercely fought action at Nisaa. Harald then started with a fleet and an army to invade England, ostensibly to place Earl Tostig, the brother of the British King Harold, upon the throne. The enterprise was unsuccessful and Harald was killed at the battle of Stamford Bridge, Sept. 25, 1066, three days before the landing of the Normans and less than three weeks before the battle of Hastings. After the death of Harald Haardraade the Norse sea power declined, though in the next century King Sigurd led an expedition into the Mediterranean, which was successful against the Moors in Spain and against the pirates of the Mediterranean and which, in alliance with Baldwin I of Jerusalem, took and sacked Sidon.

Spain made a strong effort to become a great maritime nation, but ultimately failed, partly from governmental mismanagement, partly from various causes connected with the temperament of her people or with the country's environment. In 1588 she sustained a crushing blow in the defeat of the "Invincible Armada," which was organized to conquer England.

Long before this, however, Neptune's sceptre had definitely passed to northern nations, the English and the Dutch. But good sailors as the Dutch were, they were too few in number and too poor to cope long with their great rival, and Britain became mistress of the waves. Alfred the Great is commonly regarded as the founder of the British navy. A naval force had existed before his time, but it lacked the organization and effectiveness of the fleet developed by Alfred, in which the vessels were especially designed for fighting and were adapted to the country's needs. Alfred's grandson Athelstan fostered the maritime spirit of his people as regards both commerce and naval affairs. He granted the title of thane to any merchant who had made three voyages on the high seas in his own ships freighted at his own expense, though this was a title previously confined to men of noble rank and extensive landed possessions. Edwy the All Fair is said to have had large fleets; and under Canute the Great English maritime commerce assumed large dimensions. After the Normans had firmly established their rule they also encouraged the growth of shipping and provided for its defense. Henry II and Richard Cœur de Lion are both known to have had strong naval forces, and under John it was decreed "that any ships of other nations, though at peace and in amity with England, should be made lawful prizes if they refused to strike to the royal flag." Such an arrogant assumption is not likely to have been made unless the power to enforce it had existed, and we know that John's fleet gained a victory over the French in the harbor of Damme.

During the century which followed a sort of piratical war existed between England and France and the coasts of both were ravaged by the freebooters on either side. At length, in 1340, the English fleet, commanded by Edward III in person, won the great victory of Sluys, the French losing nearly their whole force of 300 vessels besides 20,000 men killed, wounded, and prisoners. According to Charnock this was the first action in which beaked galleys propelled by oars were wholly laid aside and reliance placed upon vessels propelled chiefly by sails. From this time there was no particular improvement in the British navy (except that heavy guns were placed on board ship) until the reign of Henry VIII, who gave great attention to the fleet, improving the ordnance, reorganizing the *personnel*, and building several relatively very large vessels, the most powerful being the *Henri Grace à Dieu*, commonly called the *Great Harry*. She carried 72 guns and 700 men, and her tonnage was between 1000 and 1500, the lack of uniformity in measurement for tonnage making it difficult to ascertain the correct figures.

Henry was the first sovereign in Europe to establish a corps of officers for sea service only, and he did more to improve the navy than any preceding monarch, using improved models for his ships and employing Italian shipwrights (then the best in the world) in their construction. The construction and mounting of the heavy guns were improved to such an extent that the design of both the guns and the gun carriages used in the later ships of his reign remained unchanged for nearly 200 years. He

also greatly increased the number of vessels and established the dockyards at Woolwich, Portsmouth, and Deptford. Edward VI and Mary paid but little attention to the fleet, but Elizabeth recognized its vital importance, again increasing the number of ships and their size besides improving the condition of the officers and gathering vast quantities of naval stores. From her reign until the present day the British navy, though not without rivals, has never been equaled but once or twice, and then the equality was of very short duration.

Modern naval development may be said to have begun with the rapid increase in the size of ships which took place at the end of the fifteenth century and the contemporaneous improvement in ordnance (see GUNS, NAVAL), and mediæval naval history finally closed with the battle of Lepanto, the last great action in which oar-propelled galleys played an important part. From this time the sailing man-of-war was gradually improved in size, speed, and power until near the middle of the nineteenth century, when sails were replaced as a motive power by steam. During the whole of this period the British navy maintained its supremacy, though the temporary rise of the Dutch naval power in the seventeenth century seriously threatened it for a short time, and during a brief interval under Louis XIV the French maintained a fleet which was superior to the British, and with which Admiral Tourville defeated the combined British and Dutch forces off Beachey Head in 1690. Two years later the French fleet was destroyed by the same allies at La Hogue. Thenceforward the superiority of the British navy has been unquestionable. Though it lost many single-ship actions and minor engagements with the French and Americans, no navy could stand before its full strength.

At the close of the Napoleonic wars the great naval powers were Great Britain (far in the lead) and France. In the second rank were Spain, Russia, and the Netherlands. In the third were Turkey, Austria, Denmark, Norway, Sweden, the United States, the Two Sicilies, Portugal, and Prussia. In 1860 the conditions were much the same except that the United States had risen to the second category, the Netherlands had sunk to the third, the Kingdom of Italy was forming and the Two Sicilies tottering to its fall; while Greece, Brazil, Peru, Chile, and Argentina had organized naval forces.

During the period 1860–80 the naval powers of the world underwent many changes. During the Civil War the navy of the United States became enormously expanded, but the greater part of the ships were of no permanent value except for the special and unusual conditions existing in that struggle. At the close of operations all such craft were sold and many of the others laid up. Congress addressed itself to the task of reducing the debt and government expenses; and the naval appropriations were so greatly cut that the navy declined steadily until 1881, when it reached a condition of absolute nullity so far as the ships were concerned. Three new naval powers appeared in this period—Germany, Italy, and Japan—and one, the Two Sicilies, was suppressed. In 1867 the North German Confederation took over the Prussian navy and somewhat enlarged it. Some additions were made during the decade following the establishment of the Empire, but these were so moderate in amount that in 1880 it was still in the second rank of naval powers The early history of the Italian service was different. Sardinia had begun to build a strong fleet before it became the Kingdom of Italy. The navy of the Two Sicilies was absorbed in it, but was no addition, and perhaps its inefficient condition rendered its incorporation detrimental to Italian naval efficiency. The vessels built between 1860 and 1866 were, however, very excellent for their date, and at the opening of the War of 1866 Italy was a naval power of the first rank. The disastrous battle of Lissa then caused a cessation in naval development, which continued until 1871, when Italy resumed building on a scale that brought her up to third or fourth in naval power in 1880. Russia started to reconstruct her fleet soon after the close of the Crimean War, but the vessels built previous to 1880 were not very formidable for seagoing purposes. Japan took a first step towards building up a navy by the purchase of the armored ram *Stonewall*, built for the Confederate government, in 1865. Four other small armor-clads and a few cruisers were acquired previous to 1880, but no hint of her naval ambitions had appeared at that time. The Turkish navy was reorganized in 1863, and from that time until the war with Russia (1877–78) it was being steadily strengthened by the addition of armored ships. The financial difficulties brought about by the war put an end to large naval expenditures for many years. Not only were no new vessels ordered, but the old ones were allowed to deteriorate.

The period of 1880–1900 was one of general naval renaissance. Powerful navies were greatly strengthened, weak navies made powerful. During this period France, Italy, and Russia built quite steadily, Italy and Russia gaining in relative power, France holding her own in 1880–90, but losing in the next decade. In 1889 Great Britain passed her first Naval Defense Act, providing for 70 vessels, 10 of which were battleships of the first class; and in the same year Germany adopted a five-year programme providing for four first-class battleships (the first ones in the German navy) and nine armored coast-defense vessels. The United States began the new navy in 1882, and Spain ordered her first battleship in the same year. In 1888 Greece and Chile ordered second-class battleships. During the second decade of this period the development of the various fleets proceeded rapidly. The United States and Germany made the greatest progress, France, Russia, and Italy retrograded slightly. Japan ordered her first battleships (two in number) and adopted a building policy which by 1920 placed her third in naval power and made her no mean antagonist for Great Britain or the United States. Increase of the navy was so strongly urged by President Roosevelt that by 1904 the American navy (including ships building) had reached second place. The impetus he gave was not sustained by his successors, and in less than two years after Roosevelt's retirement from office, Germany had passed us and France was gaining. This condition existed until 1916, when the early lessons of the war and the imminent danger that the United States would be drawn into the vortex awakened Congress to our naval retrogression and deficiencies. The resulting Naval Act of 1916–17 authorized the construction of 10 battleships and 6 battle cruisers of the most powerful class as well as a large number of light cruisers, destroyers and submarines — thereby more than doubling the effective strength of the fleet (upon completion of

the vessels), rendering it nearly equal to that of Great Britain and far superior to that of any other power. The Japanese adopted a new building programme in 1911–12 and were pushing it to completion when the projected increase in the United States fleet caused it to be greatly enlarged and the speed of construction to be notably accelerated. Including ships under construction, the net result was, on January 1, 1922, that in power of battleships and battle cruisers the United States fleet had become at least equal to that of Great Britain while the navy of Japan was more than half as formidable. At this time the Conference on the Limitation of Armaments (see SUPPLEMENT) was completing its labors whereby all building of battleships, and battle cruisers, except replacements, was interdicted for ten years. The five great powers agreed to reduce the number of their capital ships to tonnages as follows: Great Britain, 525,000 tons; United States, 525,000; Japan, 315,000; France, 175,000; Italy, 175,000. By the terms of the armistice of 1918 and the treaty of Versailles, the Turkish, Austro-Hungarian, and Bulgarian navies were abolished and the German fleet reduced to a nearly negligible quantity.

DIMENSIONS, ARMAMENT, ARMOR, SPEED, ETC., OF THE DREADNOUGHT BATTLESHIPS AND BATTLE CRUISERS TO BE RETAINED BY THE FIVE PRINCIPAL NAVAL POWERS UNDER THE TERMS OF THE CONFERENCE ON THE LIMITATION OF ARMAMENTS.

NATIONS AND SHIPS	Completed	Displacement tons	Length on w. l. feet	Beam feet	Draft feet	Armor		Main battery		Speed knots
						Belt inches	Turret inches			
UNITED STATES:										
Florida, Utah	1911	21,825	510.0	88.2	30.1	11.0	12.0	10	12-in.	21.0
Arkansas, Wyoming	1912	26,000	554.0	93.2	29.7	11.0	12.0	12	12-in.	21.0
New York, Texas	1914	27,000	565.0	95.2	29.7	12.0	14.0	10	14-in.	21.5
Nevada, Oklahoma	1915	27,500	575.0	95.2	29.7	13.5	18.0	10	14-in.	21.0
Arizona, Pennsylvania	1916	31,400	600.0	97.0	29.7	14.0	18.0	12	14-in.	21.5
Mississippi, Idaho, New Mexico	1917–19	32,000	600.0	97.4	30.0	14.0	18.0	12	14-in.	21.0
California, Tennessee	1920–21	32,400	600.0	97.4	30.8	14.0	18.0	12	14-in.	21.0
Maryland, Colorado (bldg.) West Virginia (bldg.)	1922–23	32,600	600.0	97.4	31.3	16.0	18.0	8	16-in.	21.0
GREAT BRITAIN:										
Benbow, Emperor of India, Marlborough, Iron Duke	1914	25,000	580.0	90.0	28.0	13.5	12.0	10	13.5-in.	22.0
Queen Elizabeth, Barham, Malaya, Valiant, Warspite	1915–16	27,500	600.0	90.5	28.8	13.5	13.5	8	15-in.	25.0
Ramillies, Royal Oak, Resolution, Revenge, Royal Sovereign	1916–17	25,750	580.0	88.5	28.5	13.5	13.5	8	15-in.	23.0
Tiger	1914	28,500	700.0	90.5	28.5	9.0	9.0	8	13.5-in.	30.0
Renown, Repulse	1916	26,500	750.0	90.0	25.5	6.0	9.0	6	15-in.	32.0
Hood	1920	41,200	810.0	104.0	28.5	12.0	15.0	8	15-in.	31.0
Two new battle cruisers	....	35,000	....	...	...	to be built				
JAPAN:										
Fuso, Yamashiro	1915–17	30,600	630.0	94.0	28.5	12	12	12	14-in.	23.0
Ise, Hiuga	1917–18	31,260	640.0	94.0	28.5	12	12	12	14-in.	23.0
Nagato, Mutsu (bldg.)	1920–22	33,800	700.0	...	...	...	...	8	16-in.	23.5
Haruna, Hiyei, Kongo, Kirishima	1913–15	27,500	653.0	92.0	27.5	8	10	8	14-in.	27.5
FRANCE:										
Bretagne, Lorraine, Provence	1915–16	23,100	541.0	88.6	29.5	11	17	10	13.4-in.	20.0
Courbet, Jean Bart, Paris, France	1913–16	23,100	541.0	88.6	29.5	11	11	12	12-in.	20.0
ITALY:										
Andrea Doria, Caio Duilio	1915	22,562	575.3	91.8	29.0	10	10	13	12-in.	23.0
Giulio Cesare, Conte di Cavour	1915	22,023	557.0	91.8	29.0	10	10	13	12-in.	23.0
Dante Alighieri	1913	19,400	510.0	85.3	27.2	10	10	12	12-in.	24.0

Names of battle cruisers are in italics. Vessels uncompleted are marked (bldg.).

NAVIES OF THE WORLD IN 1922.

In the following paragraphs the present condition of the various navies of the world is briefly described. In some cases, when the subject is not treated elsewhere, a short historical account is given.

Argentina. After possessing a very weak naval force for many years, Argentina acquired in 1874 her first armored vessels — two river monitors of 1500 tons. In 1878, a small third class battleship (4200 tons) was ordered and this was followed by two larger monitors and several protected cruisers about 1890. In 1895–98, four armored cruisers of about 7000 tons were ordered in Italy; and in 1910 two dreadnought battleships of 30,000 tons were ordered in the United States. The battleships and armored cruisers form the present effective fighting force and are supplemented by three cruisers of 3200 to 4500 tons, several gunboats, seven destroyers, eight torpedo boats, and a few auxiliaries. The average *personnel* is about 325 line or executive officers, 4 naval constructors, 30 medical officers, 95 engineers, 2 torpedo engineers, 21 electrical engineers, 80 paymasters and commissary officers, 8 chaplains, and 9500 petty officers and men. The navy yards are at Puerto Belgrano (Puerto Militar) on Bahia Blanca and at La Plata. The naval station at Tigre is a supply and repair establishment and the headquarters of the torpedo fleet.

Austria. The new Austrian state has no seaport. The navy of Austro-Hungary was abolished by the armistice of 1918 and the Treaty.

Belgium. Belgium has no organized navy but a naval commission has been formed to consider the subject and submit plans. The small existing force consists of a gunboat, 3 torpedo boats, and 2 submarines; and it is reported that 4 small vessels have been ordered in France.

Brazil. The navy of Brazil is the oldest of the South American naval establishments having been organized early in the nineteenth century before the Spanish colonies had achieved their independence. Its development and efficiency have at times been much disturbed by politics and it is one of the few naval services of the world which have taken a leading part in overturning their own existing governments. It played an important part in the overthrow of the Brazilian Empire and has twice since been the leading support of unsuccessful insurrections. Its first two armored vessels, built in 1864–65, were small and weak, but ten years later these were followed by two large monitors and a central battery ship. In 1883–85, the armored cruisers *Aquidaban* (5000 tons) and *Riachuelo* (5700 tons) were launched. Two small turret ships were built in France in 1900–01. In 1906, an extensive building programme provided for the construction of 3 dreadnought battleships of 19,000 tons, 3 scout cruisers of 3100 tons, 15 destroyers of 650 tons, 3 submarines, and a mine layer. Of these, 2 battleships, 2 cruisers, 10 destroyers, and 3 submarines were completed and are now in service. A third battleship of 27,500 tons was, for financial reasons, sold to Turkey. Not being ready for delivery when the Great War broke out, she was commandeered by the British government, completed, and named the *Agincourt*. She was afterwards resold to the Brazilian government her name being changed according to reports to *Rio de Janeiro*. The 19,000-ton battleships were rebuilt in the United States. The effective navy in 1922 consisted of the 3 battleships, the 2 small turret ships (3112 tons) built in France, 2 river monitors built in Brazil, and the cruisers, destroyers, and submarines built pursuant to the 1906 programme. The principal navy yard is at Rio de Janeiro, as are also the naval academy, the naval college, the school for naval apprentices and the torpedo school; but there are naval stations at Para, Pernambuco, Santa Catalina, Ladares (Matto Grosso) and Bahia.

Bulgaria. The navy of Bulgaria was abolished by the armistice of 1918 and the Treaty.

Canada. The active vessels of the Canadian navy are 1 light cruiser of 3500 tons and 30 knots speed, 2 destroyers of 980 tons and 35 knots, 4 submarines, and two tenders for torpedo craft. The naval academy for officers and the training establishment for the enlisted force are at Halifax.

Chile. The navy of Chile is third in strength among the South American navies but it has an excellent reputation for efficiency and its capability in war is probably greater than the relative paper power of its fleet. The available active fleet consists of 1 battleship of 28,000 tons (launched in 1913), 1 armored cruiser of 8500 tons (1897), 1 of 7000 tons (1896), 1 small and old battleship of 6000 tons (1890), 5 cruisers (2000 to 4500 tons — launched 1890–1901), 4 flotilla leaders (1700 to 1850 tons), 8 destroyers (300 to 750 tons), several torpedo boats, and 6 submarines (450–520 tons). The *personnel* consists of 689 officers and 6058 men.

China. The Chinese navy is said to be in a very inefficient condition owing to lack of funds and the political disturbances of the past few years. It possesses no vessels of importance or of very recent construction. There are seven light cruisers of 1900 to 4300 tons (1898–1912), about a dozen gunboats, 3 destroyers of 400 tons (1912), and about 20 small torpedo boats. Two submarines of the *Medusa* type were under construction in Italy in 1921.

Colombia. The Colombian navy has a small cruiser of 1200 tons (1892) and seven gunboats.

Cuba. The vessels of the Cuban navy are a small cruiser of 2055 tons (1911) and four gunboats of 440 to 1300 tons (1895–1911).

Denmark. The Danish navy is the oldest in Europe. Denmark possessed naval forces before France became a kingdom, while England was a collection of petty monarchies and while the Arabs ruled all Spain. It has passed through many wars against superior power, but emerged from all with honor and sometimes with success. It was the first to build a sea-going turret ship, and its constructors were among the first to design practicable submarine boats. Though necessarily small, the present Danish navy has an excellent reputation as regards organization and efficiency. At the head of it is the Minister of Marine who is assisted by an officer of rank (usually a vice-admiral or rear-admiral) with the title of director general. The navy department is divided into four principal sections: (1) Secretariat; (2) Admiralty; (3) Commissariat; (4) Justice. The chief of the Secretariat is the director general; of the Admiralty, a captain in the navy. The two other sections have civilian heads. The only dockyard is the royal arsenal at Copenhagen. The present (1922) fleet consists of 5 small armored coast defence turret ships of 2200 to 4100 tons (1896–1918), 3 small light cruisers of 1280 to 3020 tons (1888–94), 5 mine-layers, several small gunboats, 20 torpedo boats of 108 to 300 tons (1911–19), 14 submarines of 204 to 370 tons, and several training vessels and other auxiliaries. The naval academy and postgraduate schools in torpedos, gunnery, and aviation are at Copenhagen which is also the headquarters of the training vessels for seamen and mechanics. According to the latest reports, the *personnel* consists of 1 vice-admiral, 2 rear-admirals, 17 captains, 45 commanders, 72 ober offiziere, and 7200 junior officers and enlisted men.

Ecuador. The navy of Ecuador was organized in 1908. A cruiser of 3600 tons (1896) and a torpedo gunboat of 858 tons (1896) were purchased from Chile at this time. A composite gunboat was bought from France in 1900. At last accounts, the torpedo gunboat only was fit for active service.

Egypt. Egypt has no organized navy but possesses a small cruiser of 1310 tons (1916), 10 sternwheel gunboats of 100 to 150 tons for service on the Nile, and several coastguard vessels.

Esthonia. The Esthonian government has organized a navy department and desires to maintain its present force which is as follows: 1 flotilla leader of 1600 tons (*ex-Capitan Kingsbergen*), 1 flotilla leader of 1800 tons (*ex-Autroil*), 1 gunboat of 875 tons (*ex-Bobr*), 2 smaller gunboats, 2 mine layers, 2 tugs, and 15 vedette boats. Nearly all of these vessels formerly belonged to the Russian government.

Finland. The Finnish navy consists of 1 gunboat of 875 tons (*ex-Gilyak*), 4 smaller gun-

boats, 6 torpedo boats, 2 mine layers, 2 trawlers. These vessels formerly belonged to the Russian government.

France. The success of the French navy in war has rarely been proportional to its strength in ships, guns, and men. This has been due to disturbing and disorganizing forces from without the service and they have prevented efficiency. From the fourteenth century to the end of the nineteenth, France was the second naval power of the world, and twice, for a few years, it was the most powerful. In 1860 it was nearly on a par with Great Britian but from that time onward it relatively declined, especially between 1885 and 1902. During this period, for financial reasons, a cheap substitute for the battleship was sought — first the torpedo boat, then the cruiser and the *guerre de course*, and lastly the submarine. But in 1902, the disorganizing influences which had existed for several years were eliminated and the construction of battleships was begun in earnest. But before the new building policy had made great headway the navy had fallen behind those of the United States and Germany. The forcible reduction of the German fleet by the armistice of 1918 and the almost simultaneous rise of Japan to third place leaves France fourth in naval power, a position she is likely to maintain for many years. The existing fleet and the vessels authorized or under construction are shown in the table at the end of this article. If the proceedings of the Washington Conference are finally and fully ratified by all of the five governments which are signatories, France will be required to scrap all her battleships except dreadnoughts. As none of these ships are of any serious value in modern war the loss will be trifling. The latest (1922) programme of new construction as approved by the French parliament provides for the building of 3 light cruisers of 8000 tons and 34 knots speed, 6 flotilla leaders of 2500 tons and 35 knots, 12 destroyers of 1400 tons and 32.5 knots, and 12 submarines of 1100 tons. It is understood that the partly completed battleship *Béarn* will be transformed into an airplane carrier.

Germany. Stripped by the terms of the armistice and the treaty of Versailles of every dreadnought battleship, battle cruiser, and submarine, and of all its effective light cruisers and destroyers, the German navy has, in the combined fighting power of its vessels, sunk below the navies of Spain, Brazil, and Argentina. By the terms of the treaty, the German navy is permitted to keep in commission not more than 6 battleships of the *Deutschland* or *Lothringen* type (pre-dreadnought battleships of 13,000 tons, four 11-inch guns, launched 1902–06), 6 light cruisers, 12 destroyers, and 12 torpedo boats. Including commissioned and warrant officers, the total *personnel* must not exceed 15,000. Except under specified conditions for replacement, Germany is by the terms of the treaty forbidden to construct or acquire any warships, and the construction or acquisition of any submarines whatsoever is prohibited. Vessels of war are only to have a fixed allowance of arms, munitions, and war material; and no stocks or reserves are allowed. To prevent the training of a large number of officers and men as reserves, the *personnel* of the navy must be recruited by voluntary engagements for a minimum period of twenty-five consecutive years for officers and of twelve consecutive years for petty officers and men under various restrictions. The existing fleet consists of: — 8 battleships of the *Deutschland* and *Lothringen* types, 6 of which are in active service, the other 2 in reserve and used as barracks; 8 old type light cruisers (2600 to 3200 tons — launched 1899–1905); 15 old destroyers (3 in reserve); and 16 torpedo boats (4 in reserve). These vessels are reported to be kept in good order and maintained in such state of efficiency as their age and character admit. The navy department is properly organized and discipline has been brought back from the chaos which existed in the last months of the war and for some time after its close.

Great Britain. While the British navy as regards capital ships is not much if at all superior to that of the United States, it is greatly superior in light cruisers and fleet auxiliaries which have no power in themselves but are necessary to the fleet to enable it to operate with full efficiency. Moreover, the possession of battle cruisers is an asset of great importance and the lack of such ships in the United States navy might prove disastrous in a war waged under certain conditions. The British fleet is indeed a well balanced force, so designed as to be able to exert its full power under any assignable circumstances without being hampered by lack of the proper means to support every class of operations. It is in fact such a weapon as a great insular power must possess — one that is capable of defending its shores and its lines of communication. England produces but little more than half its foodstuffs and not more than two-thirds the raw materials for its industries. The necessity of maintaining her ocean trade is therefore perfectly apparent and was amply proved during the great war. For years previous to the great war, Great Britain maintained the "two-power" standard. That is, she kept her fleet equal to the combined strength of any two other powers. The present apparent willingness of the government and people to accept parity in naval rank with the United States is doubtless compounded of many reasons — the elimination of Germany as a foe, the fair and even altruistic attitude of the United States in international affairs, present and probable future friendliness with the United States, financial advantages, and various minor reasons. A summary of the existing (1922) fleet is given in the tables at the end of this article. The tables give the number and tonnage of vessels to be scrapped if the agreements of the Conference on the Limitation of Armaments are fully ratified. See SUPPLEMENT.

Greece. The nature of their country, with its extensive seacoast, numerous harbors, and geographical position, has made the Greeks a seafaring race. Modern Greece organized the semblance of a navy soon after the establishment of an independent government. This grew steadily in importance for forty years though still remaining more as an evidence of the national aspirations than a force which could be useful in war against any probable enemies. In 1867–69, two small armorclads of 1700 and 2000 tons were built, but it was not until after the decadence of the Turkish fleet which followed the Turko-Russian War (1877–78) that the Greek government began to seriously consider the possible use of naval power against her hereditary enemy. Between 1880 and 1885 half a dozen torpedo boats were purchased. In 1886, three small battleships were ordered. They were of 4800 tons, 17 knots speed,

strongly armed for their size, and very suitable to operate against the old and ill-cared-for ships of the Turks. In 1908 an armored cruiser of 10,000 tons was ordered in Italy and this was of much service in the Balkan war. A battle cruiser of 19,200 tons was building in Germany in 1914. This was seized by the Germans. A battleship of 24,000 tons was ordered in France early in 1914 but the outbreak of war prevented her construction. In June of that year, Greece purchased from the United States two battleships of 13,000 tons (*Idaho* and *Mississippi*). The existing (1922) navy consists of 2 battleships of 13,000 tons, 1 armored cruiser of 9956 tons, 3 small battleships of 4800 tons (rebuilt 1897–1900), 1 light cruiser of 2600 tons (built at Camden, N. J., 1914), 4 destroyers of 980 tons, 2 of 750 tons, 7 of 350 tons, 1 of 400 tons (ex-Austrian *Ulan*), 6 torpedo boats of 250 tons (ex-Austrian), 2 submarines (1911–12). In the early part of 1921, a British naval commission was assisting to reorganize the Greek navy but no complete report of its labors has been published. The naval budget for 1920–21 amounted to 91,036,201 drachmas (the gold drachma is worth 19.3 cents).

Haiti. The navy of Haiti consists of an old protected cruiser of 2245 tons and 18 knots speed (purchased from Italy), 4 armed steamers of 600 tons, 1 gunboat of 514 tons, 2 of 256 tons, and the president's yacht.

Italy. Italy has the greatest extent of seacoast of any country in Europe; moreover, part of this is on islands and in Africa, separated by water from the mainland of the peninsula. She produces very little fuel and but a small part of the raw material for her manufacturers. She is therefore vitally interested in naval power and has always maintained a naval force as great as her financial condition permitted. It was considerably strengthened after the union of the fleets of Sardinia and the Two Sicilies in 1861 but the new navy met disastrous defeat at Lissa in 1866. The service was reorganized and less than ten years later began a steady development until, about 1890, it was only overmatched by Great Britian and France. The rapid and continuous enlargement of the United States, German, and Japanese fleets, begun in the preceding decade, soon dropped it to sixth place, about on a par with the navy of Russia; but the latter has now sunk to a condition of innocuous inefficiency. The existing (1922) fleet consists of 5 dreadnought battleships with a total tonnage of 108,570, 4 older battleships (49,700 tons), 5 armored cruisers (46,208 tons), 9 fast light cruisers (1912–14 — 34,352 tons), 8 scouts or flotilla leaders (11,812 tons), 48 destroyers (31,625 tons), 93 (about 30 are likely to be condemned) torpedo boats (14,496 tons), 43 new submarines (17,140 tons). Under construction are 3 2158-ton scouts, 6 800-ton destroyers, 8 900-ton destroyers, 7 200-ton gunboats. The new program consists of 8 800-ton mine layers, 1 7000-ton oil transport, 4 600-ton submarines, 1 5000-ton light cruiser, 4 900-ton destroyers, 8 submarine chasers. The old battleships, cruisers, and other vessels are being rapidly sold or otherwise disposed of. The naval estimates for 1921–22 amount to 847,837,767 lire (paper, value fluctuating—the gold lira is worth 19.3 cents).

Japan. Unlike the other Allies, Japan incurred no great war debt. Indeed, at the close of the struggle, her finances were in better shape than they had ever been. She therefore felt able, as she never had before, to enter upon a building competition with the United States. So well did she perfect her plans, so rapidly did she produce ships of great power, that she was actually gaining upon the United States because of the leisurely way in which the latter was carrying out the great building programme of 1916; and it was less than two years ago that the tide began to set the other way. After the tide had definitely turned, Japan was probably glad to accept the American proposals as to limitation of armaments as they were more favorable to her than the probabilities of the easily discernible future. The existing (1922) navy of Japan is enumerated in the table at the end of this article.

Jugo-Slavia. The kingdom of Serbia had no seacoast but the new state of Jugo-Slavia fronts on the Adriatic for many miles and possesses a fine harbor at Cattaro and several of lesser importance. The vessels of the navy include two old Austrian armorclads — the old battleship *Erherzog Ferdinand Max* of 5000 tons, launched in 1865 and wholly unserviceable except as a depot ship; and the old battleship *Kronprinz Rudolf* of 6870 tons, launched in 1887, possibly serviceable, but wholly obsolete. The Allied powers alloted to the new kingdom 12 recently built torpedo boats. The government took possession of several ex-Austrian vessels on the Danube, the only one of importance being the Monitor *Bodrog* of 440 tons, carrying 3 4.7-inch guns. Several gunboats and vesesls of little naval value were seized in the port of Cattaro and elsewhere. The naval estimates for 1921–22 amount to 200 million dinari (about $7,000,000 in U. S. gold).

Latvia. There is as yet no organized naval force and the government possesses no war vessels of any kind but expects to purchase 8 destroyers and 4 submarines and keep on hand 1500 submarine mines.

Mexico. It is reported that the present (1922) government has disposed of all its war vessels except one or two small craft in the Pacific. The vessels reported sold consisted of four fairly efficient gunboats (built 1902–1904) of 980 to 1200 tons, 1 training ship of 1200 tons (1891), 1 torpedo transport of 1880 tons (1908), 5 torpedo boats, and several old gunboats of small size.

Netherlands. As far into antiquity as historical records and traditions extend, the inhabitants of the low countries were a seafaring race. Under Spanish rule their seagoing proclivities were greatly curbed but during the long years of rebellion against Spain the naval forces grew steadily and were of vital assistance to the shore operations. In 1607 the Dutch Admiral Heemskirk destroyed a Spanish fleet at Gibraltar. This led to a truce of a dozen years during which the Dutch navy and merchant marine developed rapidly. In 1639, during the renewed war with Spain, Admiral Martin Tromp annihilated a Spanish squadron off the Flemish coast and seven months later defeated and dispersed the combined Spanish and Portuguese fleets off the coast of England. In the period 1652–76 the Dutch fought many actions with the British and French fleets. In the majority of these they were victorious. In 1665, De Ruyter defeated the British fleet and compelled it to take refuge in the Thames; and,

in 1667, he entered the Medway and destroyed the British fleet as it lay at anchor. After the union with England under a common King (William III) the Dutch navy declined steadily until the Napoleonic wars when the Netherlands lost their independence and their fleet. Since then it has not been a naval force of the first rank. The naval administration under the Minister of Marine, consists of the chief of the general staff, the director of naval construction, the director of *personnel*, director of pilotage, the director of hydrographic service, the inspector of pay, provisions and clothing, and the medical inspector. The naval academy is at Willemsoord and the engineer school at Hellevetsluis. The existing (1922) fleet consists of: — 5 coast defence battleships of about 5000 tons and 1 of 6500 tons; 3 armored gunboats of 520 tons; 2 old protected cruisers of about 4000 tons; 10 mine layers; 8 destroyers of 480 tons; 18 torpedo boats of 130 to 320 tons; 12 submarines of 150 to 800 tons; and many old gunboats. There are under construction: — 2 light cruisers of 7050 tons and 30 knots; 2 mine layers of 750 tons; 1 depot ship for submarines of 2300 tons; 7 submarines. The naval estimates for 1921 were about $21,500,000 (at the par value of the florin). The average *personnel* of the navy is about 12,000.

Norway. In proportion to its population Norway has a larger mercantile marine and a greater seafaring population than any other country in the world, but the cost of modern fighting ships prevents the maintenance of a naval force equal to defending the coast against even ordinary aggression. With the exception of torpedo craft, submarines, and mining vessels (layers and sweepers), there have been no additions to the fleet in more than twenty years. The old vessels are being maintained in as great a state of efficiency as is practicable for their age. The government of the navy is confided to the Minister of Marine and Posts and the commanding officer of the navy. The former is an administrative office and constitutes the ministry proper; both branches have their headquarters at Christiania. The commanding officer of the navy is a rear-admiral who is a councilor of state. The executive officers of the active service and of the reserve are educated at the royal naval school. There is but a single military and naval post which is at Horten near Christiania. The only dockyard is there, but there are four other naval stations for the care and supply of vessels of the fleet. The existing force consists of: — 4 small coast-defence armorclads of 3920 to 4233 tons (completed 1898–1901), 3 gunboats of 387 to 1349 tons (1893–98), 4 destroyers of 380 to 540 tons, 26 torpedo boats of 84 to 220 tons, 4 submarines of 250 to 440 tons, 3 mining vessels of 335 to 755 tons.

Panama. The naval force of Panama consists of three small gunboats (400 to 643 tons) and two or three tugs and patrol boats.

Persia. There are no recent reports. At last accounts the naval force consisted of an armed merchant steamer of 1200 tons, a gunboat of 379 tons, and a royal yacht of 400 tons.

Peru. The Peruvian navy is being reorganized under the direction of officers of the United States navy who will give instruction in modern naval duties to the Peruvian officers. The existing (1922) fleet consists of: — 2 light cruisers (1906) of 3200 tons and 24 knots; 1 old armored cruiser (ex-*Dupuy de Lome* — launched 1890) of 6300 tons; 2 very old cruisers (1877 and 1881) of about 1700 tons; 1 destroyer of 492 tons; 2 submarines. Three submarines of 400 tons are under construction in Italy.

Poland. The law creating the Polish navy was passed in 1819 and a naval school for officers was soon afterwards established at Thorn. The building programme, recently announced, contemplates the acquisition of 4 small cruisers or gunboats and 16 torpedo boats (6 are ex-German and 5 of them are being repaired in England). One new gunboat of 500 tons is in commission and a similar one is building in Finland.

Portugal. The navy department forms part of the Ministry of the Marine and Colonies. It is presided over by a vice-admiral with the title of director general and consists of the divisions of (a) *personnel* and (b) material. The only naval dockyard is at Lisbon where is also located the naval college for officers of all branches of the service. The fleet consists of: — 4 old cruisers (1896–98) of 1635 to 4100 tons, about 20 gunboats of 100 to 729 tons at home and in the colonies, several auxiliary ships of no fighting value, 1 mine layer of 200 tons, 1 destroyer of 525 tons and 4 of 700, 6 small torpedo boats (ex-Austrian), and 4 submarines.

Rumania. The navy department is a branch of the Ministry of War and, until the reorganization of 1914, was completely overshadowed by the army, the officers even bearing army titles, and having a military education. The new plans provided for a naval school and a considerable increase in the fleet. The war interfered with the original plans but it is reported that the reconstructed service is in process of development though much hampered by the severe financial stringency common to all European countries which engaged in the war. The existing (1922) fleet consists of: — 1 old cruiser (1887) of 1320 tons; 9 seagoing gunboats; 5 small river gunboats of 100 tons; 4 river monitors of 600 tons; 3 ex-Austrian river monitors; 2 flotilla leaders of 1460 tons (1917–18 — purchased from Italy); 4 large destroyers of 1350 — 1450 tons recently built in Italy; 2 old destroyers (1888) of 578 tons; and 22 small torpedo boats.

Russia. When the Bolshevik government seized the vessels of the navy they murdered nearly all the officers and leading petty officers and seven or eight thousand of the men who refused to join them. The total number included in the massacre was estimated at about 10,000. This removed nearly all the capable officers and men and left the operation of the vessels to persons too ignorant to keep them even in a low state of efficiency. The only vessels that have been in active service during the past two or three years are submarines and destroyers. The four battle cruisers of 32,000 tons, which were building in 1914, have been launched; but there is neither money nor ability to complete them. The four new battleships of 23,000 tons cannot go to sea without extensive repairs. The older battleships are reduced to hulks; from many of them the guns have been removed to mount them in fortifications. Practically all the fast light cruisers have been destroyed or otherwise disposed of. There remain about 50 destroyers and 15 or 20 submarines in the Baltic and 20 destroyers and 6 or 8 submarines in the Black Sea. These are serviceable

but lack important supplies and are rapidly deteriorating. The only vessels being kept in cruising condition are the ships in which General Baron Wrangel made his flight from the Crimea. These are interned in the Algerian (French) port of Bizerta and are being cared for by the French navy. They consist of 1 dreadnought battleship of 22,795 tons, 1 old battleship of 11,390 tons, 1 light cruiser of 6850 tons, 6 large destroyers of 1120 to 1345 tons, 4 small destroyers, 4 submarines, 1 yacht, 1 transport of 16,250 tons and some other vessels of a size and character not reported.

Santo Domingo. The naval force consists of 3 gunboats of 322 to 1000 tons and some small craft.

NUMBER AND DISPLACEMENT OF VESSELS OF DIFFERENT CLASSES

BUILT AND BUILDING FOR THE PRINCIPAL NAVAL POWERS, JULY 1, 1922

TYPE	UNITED STATES				GREAT BRITAIN			
	Built		Building		Built		Building	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Battleships (dreadnought) to be retained	16	460,650	2	65,200	22	548,190		
Battleships (dreadnought) to be scrapped	4	72,000	7	291,800	8	181,940		
Older battleships, to be scrapped	11	170,740	..	.....	...	(a)		
Battle cruisers to be retained	...	.....	..	.....	4	122,700		
Battle cruisers to be scrapped	...	.....	6	261,000	3	71,500	4	168,000
Fast cruisers and scouts	3	11,250	10	75,000	56	294,490		
Flotilla leaders	...	.....	..	.....	26	43,150		
Destroyers	303	330,000	3	3,645	166	184,300	6	7,468
Submarines	*80	*55,000	41	*35,000	87	76,980	7	9,275
Airplane carriers	...	.....	..	.....	6	79,560	2	34,270
Total	417	1,094,640	69	731,645	381	1,602,810	23	219,013
Total to be scrapped	15	242,740	13	552,800	11	253,440	4	168,000
Remaining	402	851,900	56	178,845	370	1,349,370	19	51,013

Total built and building — United States: Ships, 458; Tons, 1,030,745. Great Britain: Ships, 389; Tons, 1,400,383.

TYPE	JAPAN				FRANCE			
	Built		Building		Built		Building	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Battleships (dreadnought) to be retained	5	157,520	1	33,800	7	163,037		
Battleships (dreadnought) to be scrapped	1	20,800	2	81,200				
Older battleships to be scrapped	6	99,587	..	.....	3	56,507		
Battle cruisers to be retained	4	110,000						
Battle cruisers to be scrapped	3	42,990	4	174,000				
Fast cruisers and scouts	9	42,450	11	61,620	5	21,302	3	24,000
Flotilla leaders	...	.....	8	15,200	...	.....	6	15,000
Destroyers	81	56,158	38	39,985	61	47,376	12	16,800
Submarines	*30	*18,000	*25	*30,000	50	32,000	12	13,200
Airplane carriers	—							
Total	140	547,505	79	435,805	126	320,222	33	69,000
Total to be scrapped	10	163,377	6	255,200	5	56,507		
Remaining	130	384,128	73	180,605	121	263,715	33	69,000

Total remaining built and building — Japan: Ships, 203; Tons, 564,733. France: Ships, 154; Tons, 332,715.

TYPE	ITALY			
	Built		Building	
	No.	Tons	No.	Tons
Battleships (dreadnought)	5	108,570		
Older battleships	4	49,700		
Battle cruisers				
Fast cruisers and scouts	9	34,352	1	5,000
Flotilla leaders	8	11,814	3	6,474
Destroyers	48	31,625	18	15,600
Submarines	43	17,140	4	2,400
Total	117	253,201	26	29,474

Total built and building — Ships, 143; Tons, 282,675.

Being allowed 175,000 tons of capital ships by the Armament Conference, Italy need not scrap any old battleships still in service.

* Approximate. Through the condemnation of old vessels and the completion or laying down of new construction, the figures are changing rapidly and the correct ones are not exactly known.

No vessels are included in these tables except combatant ships less than 20 years old. All armored cruisers, small torpedo boats, or other vessels of types universally regarded as inefficient for modern war are excluded. Such craft are being rapidly scrapped by all powers or relegated to auxiliary service.

Sarawak. Has 2 small gunboats of 118 and 175 tons.

Siam. The naval force consists of 1 old (1892) protected cruiser of 3000 tons; 4 gunboats of about 600 tons; several smaller gunboats; 3 small despatch vessels of 100 to 250 tons; 3 destroyers of 380 tons and 1 of 980 tons; and 3 torpedo boats of 120 tons.

Spain. Began the rebuilding of her old navy in 1884 at about the same time as the United States. The latter built more powerful ships however and built faster. So that in the war with the United States the Spanish fleet was badly defeated and more than half of its effective vessels destroyed. The navy was then reorganized and an ambitious building programme proposed. But it was not until 1908 that any vessels of importance were decided upon. In that year the Cortes approved the construction of the following: — 3 dreadnought battleships of 15,000 tons, 3 destroyers of 350 tons, 3 submarines of 300 tons, 24 torpedo boats of 180 tons, 4 gunboats of 800 tons, and 3 fishguard vessels of 157 tons. All these were completed by the end of 1916. A second programme equally large was approved in 1914 but was not undertaken; probably because of the outbreak of the great war. Since 1914, the new construction has consisted of light cruisers, gunboats, destroyers, submarines, and auxiliaries. The present fleet is: — 3 dreadnought battleships of 15,700 tons; 1 old (1887) battleship of 9744 tons; 3 old (1898–1902) armored cruisers of 6889 to 9089 tons; 2 protected cruisers of 5587 and 5778 tons; 1 small cruiser; 800-ton gunboats and many smaller ones; 7 destroyers of 300 to 400 tons; 4 or 5 submarines; 2 torpedo boats and a number of auxiliary vessels. There are under construction 4 light cruisers of 5500 to 6000 tons; 6 submarines (12 more will be built); 3 destroyers of 1145 tons; 2 to 4 torpedo boats (24 will be built). A submarine salvage vessel of 2100 tons, built in Holland, was added to the auxiliaries in 1921. The naval appropriation for 1921–22 is 119,907,672 pesetas (par value of 1 peseta is $0.193), of which 34,000,000 pesetas are allotted to new construction. The act provides for a naval enlisted force of 13,400 men and a marine enlisted force of 4600.

Sweden. Like Norway, Sweden has a large seafaring population; but the latter is larger, more populous and of greater wealth. It is able therefore to support a larger naval force than its sister kingdom. The navy is under the Minister of Defence with the headquarters at Stockholm. The navy department consists of four bureaus, viz.: (a) cabinet of the Minister (b) bureau of *personnel;* (c) naval staff; (d) bureau of material. The school for executive officers (there are no marine engineer officers in the navy) is located at Stockholm; the full course is six years. There are two dockyards, one at Stockholm and one at Karlskrona. The fleet in 1922 consisted of 3 armored coast defense ships of 7605 tons (1918–12), 1 of 4980 tons (1907), 1 of 4658 tons (1907), 5 of 3620 to 3990 tons (1893–1907), 3 of 3715 tons (1890–99), 2 of 3393 tons (1891–94); 4 torpedo gunboats of 800 tons; 4 gunboats of 200 tons; 10 destroyers of 480 to 500 tons; 32 torpedo boats of 92 to 110 tons; 8 submarines of 120 to 235 tons, 10 of 370 tons. There are in reserve but not yet discarded 6 old coast defence ships and 8 or 10 old monitors. The principal auxiliaries are 1 hospital ship, 4 mine layers, 1 repair ship, 1 ice-breaker, 1 submarine depot vessel, and 1 royal yacht. The naval budget for 1921 amounted to 28,752,254 crowns (1 gold crown = $0.268) of which 1,950,000 was allotted for new construction. For 1922, the sum of 15,000,000 crowns is asked for the purpose of constructing submarines.

Turkey. The Turkish navy was wholly destroyed by the great war.

United States. The Naval Appropriation Act for 1921–22 authorized an expenditure of $413,067,039.23 and provided for a naval *personnel* of 106,000 and a marine *personnel* of 21,000. If the agreements of the Conference for the Limitation of Armaments (see SUPPLEMENT) are ratified by the various governments, it is likely that the appropriations for 1922–23 will provide for a smaller *personnel* and a greatly reduced allotment for new construction. The effective force of the navy on January 1, 1922, including vessels under construction is shown in the table at the end of this article. Those vessels which are to be scrapped, if the agreements of the Conference on the Limitation of Armaments are ratified by the governments concerned, are separately given in the table. The vessels under construction on April 1, 1922 are listed in the following table, which gives the character, tonnage, and percentage of completion. The vessels which will be scrapped or otherwise disposed of are marked with an asterisk.

Vessel	Displacement Tons	Per Cent. Complete
BATTLESHIPS:		
Colorado	32,600	90.7
*Washington	32,600	75.9
West Virginia	32,600	78.0
*South Dakota	43,200	38.5
*Indiana	43,200	34.7
*Montana	43,200	27.6
*North Carolina	43,200	36.7
*Iowa	43,200	31.8
*Massachusetts	43,200	11.0
BATTLE CRUISERS:		
*Lexington	43,500	33.8
*Constellation	43,500	22.7
*Saratoga	43,500	35.4
*Ranger	43,500	4.0
*Constitution	43,500	13.4
*United States	43,500	12.1
LIGHT (SCOUT) CRUISERS:		
Omaha	7,500	99.2
Milwaukee	7,500	94.9
Cincinnati	7,500	88.2
Raleigh	7,500	64.9
Detroit	7,500	82.8
Richmond	7,500	89.0
Concord	7,500	85.0
Trenton	7,500	59.0
Marblehead	7,500	47.0
Memphis	7,500	40.0
AUXILIARIES AND GUNBOATS:		
Repairship Medusa	10,000	79.3
Destr. Tender Dobbin	10,600	69.9
Destr. Tender Whitney	10,600	51.8
Subm. Tender Holland	10,600	21.5
Gunboat Tulsa	1,575	72.7
DESTROYERS:		
Trevor	1,215	99.8
Perry	1,215	95.2
Decatur	1,215	86.1

In addition to the foregoing there are 3 fleet submarines and 38 submarines under construction; 6 fleet submarines and 1 submarine are authorized but not yet under construction.

Uruguay. The naval force consists of 1 light cruiser of 1132 tons (1910); 1 old gunboat

of 274 tons and 1 of 380 tons; 2 transports of 260 and 400 tons; and several small steamers.

Venezuela. Has one gunboat of 1125 tons (*ex-Isla de Cuba*); 1 of 571 tons, 1 of 200 tons; 1 armed transport of 568 tons and 1 of 350 tons.

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See *Navy* under the head of FRANCE, GERMANY, ITALY, JAPAN, RUSSIA, UNITED KINGDOM OF GREAT BRITAIN AND IRELAND, and UNITED STATES. Also, ARMOR PLATE; BATTLESHIP; GALLEY; GUNS, NAVAL; NAVAL ACADEMY; NAVAL APPRENTICE; NAVAL COLLEGE OF CANADA; NAVAL SCHOOLS OF INSTRUCTION; SHIP AND SHIPPING; SHIP, ARMORED; SHIPBUILDING; TORPEDO BOAT (includes submarine boats and destroyers); SIGNALS, MARINE; TACTICS, NAVAL.

NAVIGABLE RIVER. See RIVERS, NAVIGABLE.

NAVIGA'TION (Lat. *navigatio*, a sailing, from *navigare*, to sail, from *navis*, ship + *agere*, to lead). In a broad sense, all means whereby the ship is made to proceed from place to place, but, in a more technical sense, only those means whereby the course of the vessel is directed or ascertained.

HISTORY OF NAVIGATION

The early history of navigation is wrapped in obscurity. The Egyptians had vessels large enough to be called ships about 3000 years B.C. and perhaps long before this. The Chinese also built ships at a very early date. The appliances for navigating these vessels must have been few and rude, and a voyage of a few hundred miles was regarded as a great undertaking. Considering the difficulties under which they labored, the voyages of the Phœnicians must be regarded as daring ventures. They spread their merchant fleets throughout the Mediterranean, navigated Solomon's squadrons to the Persian Gulf and Indian Ocean, and planted colonies everywhere.

Principal among these colonies was Carthage. The Carthaginian fleets passed the Pillars of Hercules and, with no better guide than the stars, are believed to have sailed northward to the British Isles and southward for some distance along the west coast of Africa. In 611 B.C. a Phœnician expedition fitted out by Pharaoh Necho started to circumnavigate Africa, a feat which is said to have been actually accomplished. From the eighth to the fourth century B.C. the Greek states gradually developed the art of navigation, and at the time of the Peloponnesian War the Athenians appear to have been skillful tacticians, capable of concerted manœuvres. In the fourth century B.C. Alexander the Great destroyed the power of Tyre, transferring its commerce to Alexandria, which became the centre of trade for the ancient world. Rome wrested from Carthage its naval power and diverted its vast trade to the Italian sailors.

During all this period the average size of the vessels had been continually increasing. For propelling war vessels and boats in the coasting trade, oars were chiefly used, though nearly all vessels possessed sails; but for long commercial voyages, sails were necessarily the main reliance, and some knowledge was early possessed of beating to windward against adverse breezes. Speed, however, was not ordinarily attained, as a voyage from the Levant to Italy or Carthage was often the work of a season. During the time of the Roman Empire no great progress seems to have been made except in the size of the vessels, but regular fleets were maintained, both in the Mediterranean and on the Atlantic coast of Gaul, for the protection of commerce.

The barbarian nations of the North developed the art of navigation in their own way. The Saxons, Jutes, Danes, and Norsemen began to roam the ocean in every direction; in small vessels they trusted more to the winds than to oars and, sailing singly, gradually acquired that hardihood and daring which ultimately rendered them masters of the sea. The Danes and Norsemen extended their voyages to Iceland, Greenland, and Newfoundland, while they first ravaged and then colonized the coasts of Britain, France, and Sicily.

In the Middle Ages the Venetians, the Genoese, and the Pisans became the carriers of the Mediterranean Sea. Their merchants traded to the farthest Indies, and their markets became the exchanges for the produce of the world. Their constant rivalries gave occasion for the growth of naval tactics. So rich a commerce tempted piracy, and the Mohammedan corsairs spread over the Mediterranean and, passing through the Straits of Gibraltar, ravaged the Atlantic coast.

The mariner's compass (q.v.) came into quite general use in the thirteenth century and rendered the seaman independent of the sun and stars, so far as simple steering was concerned. The variation of the compass from true north seems to have been observed as early as 1269, but it was not until the voyages of Columbus that much attention was paid to it.

The works of Claudius Ptolemy (q.v.), although forgotten in Europe, were known to the Eastern world and were held in high estimation by the Mohammedan scientists and philosophers. As the Arabs, Saracens, and Moors possessed

charts of much value, it is possible that they were based upon Ptolemy's maps or improved by a knowledge of them. Very early in the Middle Ages, perhaps before 1000 A.D., small books of sailing directions (called portolani or pilots) were compiled, and one or more charts included in them. These charts were covered with lines radiating from important seaports, or from other points on land or in the water, and showed the direction of different points from each other. On board ship the courses were at first ascertained from the sun, moon, and stars, but the introduction of the compass caused the portolani charts to be much improved and further developed. One of the oldest existing charts of this kind is the so-called Pisan chart, which belongs probably to the middle of the thirteenth century; it covers the whole of the Mediterranean. The earliest portolani chart of which the exact date is known appears to be that of Pietro Vesconte (1311). These charts are all plane and are chiefly of the Mediterranean, though some which appeared in the fourteenth century show the Azores, the Canaries, and the coast of Africa as far as Cape Bojador.

The translation and dissemination of Ptolemy's works in the fifteenth century caused a great improvement in maps and charts, and the subsequent labors of Mercator (q.v.) and others brought them to a very satisfactory state, considering the lack of exact geographical information. Mercator's projection was a great advance in navigation, for it enabled a ship's course (by compass) to be laid down as a straight line on the chart. Edward Wright, who published in 1599 a work entitled *Certain Errors in Navigation Detected and Corrected*, gives a complete exposition of the proper method of constructing a Mercator's projection (see MAP), together with other information of value.

In the early days of seagoing, vessels followed the coast in good weather and kept away from it in bad. The only navigating instruments were the sounding pole or a weight at the end of a line (see SOUND, SOUNDING), and the moderate depths which could be measured by these means caused the depth of the sea to be greatly exaggerated in the popular mind. After a time some form of sundial was used for steering courses in the daytime, and the coast was not followed so closely. At night a star, especially the polestar, was used when possible. Deep-sea navigation made a great advance in the fifteenth century through the work and assistance of Prince Henry of Portugal (called the Navigator), whose voyages and investigations were carried on between 1415 and 1460. He improved the existing charts, began the development of navigation as a science, and the encouragement he extended caused the invention of many nautical instruments and the compilation of numerous nautical tables.

Means of measuring the altitude of heavenly bodies are very old, but they were not much used at sea until after voyages beyond the limits of the Mediterranean became common. The first practicable instrument for sea observation was the cross-staff. The date of its invention is unknown. It is described in the first edition (1496) of the *Margarita Philosophica*, but it was then an old instrument of which the use by seamen was beginning to be common. Columbus is said to have used a cross-staff on his first voyage. It was employed for the determination of latitude and, after the preparation of suitable tables, for the determination of longitude by measuring the distance between a fixed star and the moon. The astrolabe (q.v.), a more cumbersome instrument, was adapted to nautical uses by suspending it from a small ring, and it became widely used by mariners. Díaz, Vasco da Gama, and Columbus are said to have used it. From the cross-staff and astrolabe were developed the forestaff, backstaff, double quadrant, and sextant (q.v.).

In 1530 Gemma Frisius, of Louvain, suggested the use of watches, in conjunction with instrumental observation, for the determination of longitude; but the lack of good timekeepers greatly hampered the method. The importance of improving them was more and more appreciated as time went on, but it was not until 1765 that Harrison was awarded £10,000 by the British government for his improvement (temperature compensation) of the chronometer. This was found to be so satisfactory that a second award of £10,000 was made to him.

According to Pedro Núñez the captains and navigators of Prince Henry the Navigator were well instructed in mathematics, geometry, and the care of instruments. It is therefore probable that the astronomers and scientists employed as instructors by the Prince prepared works upon navigation, but none are known to exist. In 1530 Gemma Frisius wrote upon astronomy, cosmogony, and the use of the globes. In 1537 Pedro Núñez (Nonius), cosmographer to the King of Portugal, published a work which discussed various problems in astronomy, charts, and in certain fields of navigation. But the earliest treatise devoted specially to navigation was that of Pedro de Medina, published at Valladolid in 1545. This was followed in 1556 by *The Art of Navigation* by Martín Cortés, published at Seville. In 1593 John Davis published *The Seaman's Secrets*, in which he described traverse and great-circle sailings. Early in the seventeenth century arithmetical calculation of navigational problems replaced instrumental solution. About 1620 trigonometry was applied to navigation, and this was closely followed by logarithmic tables. During the next hundred years timekeepers were greatly improved, and navigation tables and formulas considerably improved and extended. The invention of the sextant (q.v.) in 1731 and Harrison's chronometer in 1765 gave to observations an approximation to exactitude they had not previously possessed.

Among the developments of the nineteenth century were the Thomson dry compass, the Ritchie liquid compass, the patent log, compensation for deviation of the magnetic compass, the great-circle chart, Sumner's line of position, improvements in charts, navigation and astronomical tables, and in methods of computation, and a vastly improved knowledge of storms, which has taught how to avoid them when possible and to minimize their danger when avoidance is impossible. The great improvement of the twentieth century is the gyroscopic compass. (See COMPASS.) Steam and other forms of power propulsion have added much to the ease and safety of navigation, while the increased number of vessels has detracted something from the safety. The most serious enemies of the navigator of the present day are fogs and irregular currents.

MODERN ART OF NAVIGATION

In the merchant service vessels are in charge of a pilot when going in or out of port. Naval

vessels take pilots only under special circumstances which require the local knowledge of a pilot. Upon getting under way leadsmen are stationed ready to take soundings. The ship is kept in the channel by observing beacons, buoys, landmarks, ranges, lighthouses, etc. If the water is shoal, soundings are taken at regular intervals. For convenience in navigating certain channels at night lighthouses and lighted beacons or buoys are placed in suitable locations. In some channels ranges are established, i.e., two objects (at night two lights) are located on a prolongation of the axis of the channel so that by steering in a manner to keep them in line the ship is kept in deep water.

Upon reaching the open sea the pilot (if one is taken) is discharged. The position of the vessel is then ascertained by compass bearings or other means, and the place so determined is the point of departure. The course is then laid for the next port or for a point on the most available route.

The further navigation of the vessel is effected by means of: (*a*) compass bearings, or horizontal angles, if proceeding along the coast and the land is in plain sight; (*b*) observations of the heavenly bodies; (*c*) dead reckoning; (*d*) soundings (see SOUND, SOUNDING) so long as the depth is less than 100 fathoms. Dead reckoning is used when land is not in sight and when the sky is so covered with clouds as to make astronomical observations impossible; also to compute the short distances between observations. (See SAILINGS.) To determine the ship's exact position by soundings alone is always difficult and at times impossible, but they usually suffice to keep the vessel out of danger. By taking a large number of soundings and spacing them at the proper intervals on the edge of a slip of paper, a close approximation to the position may be obtained by moving the slip until all soundings on it agree closely with corresponding ones on the chart.

When sailing along a coast, the exact position of the ship may be found by reference to any objects on shore which can be identified and are marked on the chart. If three objects can be seen and the angles between them are over 30°, these are measured, and the position determined by a three-armed protractor or station pointer. If only two are visible, compass bearings of both, if laid down on the chart, determine the position by their intersection; or one bearing and the angle between the two may be taken. With one object, bearings at different times must be taken, and the distance run by log between the times of observation noted. Lines parallel to the course are then drawn across the bearing lines on the chart. The one on which the intercepted distance is correct is that on which the ship has sailed. Its intersections with the bearing lines are the positions of the ship at the times of observation. A very common practice is to note the time and reading of the patent log when an object bears 45° forward of the beam and when abeam. The distance run between the observations is the distance of the ship from the object when it is abeam.

When out of sight of land, positions are determined by observations of heavenly bodies. The sun is more useful, but the moon, planets, and stars are observed when the horizon can be clearly seen. The latitude is most accurately determined when the body is on the meridian (i.e., bears north or south), and the longitude when it bears east or west. The altitude of a heavenly body above the horizon is measured by means of a sextant. In the case of the sun the observed altitude must be corrected for semidiameter (to get the altitude of the sun's centre), for parallax (to reduce the observation to the centre of the earth), for refraction (to allow for bending of the light ray), and for dip of the horizon (to get the correct angle above a horizontal plane). In the case of a star or planet parallax and semidiameter are inappreciable. See LATITUDE AND LONGITUDE.

Observations for Latitude. The simplest method of obtaining the latitude is by observing the meridian altitude. In Fig. 1 $OP'QPM$ is a section of the earth through the plane of the meridian of M, the point of observation; PCP' is the polar axis; OCQ is the plane of the equator; S is the object observed; HH' is the plane of the horizon; $O'M$ is parallel to OCQ; Z is the zenith; AM is parallel to PCP'. Then the angle SMH $(= h)$ is the altitude of the body; SMO' $(= d)$ is its declination from the equator; $O'MZ$ $(= L = OCM)$ is the latitude of M; and $ZMH = 90°$; therefore $L = OCM = O'MZ = 90° - (h - d) = 90° - h + d$.

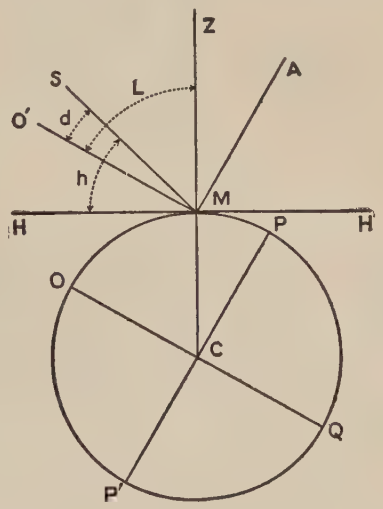

FIG. 1.

Therefore, if we add the declination (taken from the table in the *Nautical Almanac*) of the body to 90° and subtract the corrected altitude from the sum, we get the correct latitude. To make sure that the altitude used is the meridian altitude, the observer begins to measure it a little before noon. It increases steadily to a maximum and then decreases. As soon as the decrease begins the maximum is known to be the meridian altitude. If cloudy about noon and there is danger of not getting the meridian altitude, the times of the other altitudes are observed. The one nearest to apparent noon is taken, and this may be corrected from the tables so as to give the proper meridian altitude. If no altitude within 13 minutes of noon can be obtained, a spherical triangle must be solved, the method being somewhat similar to that used in determining longitude.

Observations for Longitude. The longitude of a place is its angular distance from the prime meridian. In most countries Greenwich is taken as the prime meridian for various reasons. Since

the difference in time (expressed in hours) between two places is one-fifteenth the difference in longitude (expressed in degrees), if we know the local time and the Greenwich time, we can get the longitude of the place of observation. Greenwich time is obtained from the chronometer. It may not show the exact Greenwich time, but its error and rate of gain or loss are known, having been determined in port or by the wireless time signals that are sent out daily. Any heavenly body may be used for longitude observations. In Fig. 2 the projection is made on the plane of the horizon of the place of obser-

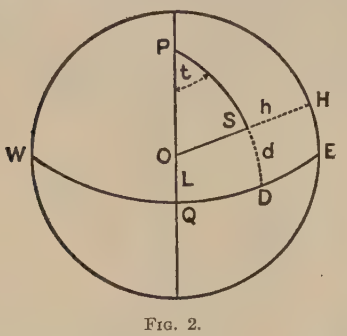

Fig. 2.

vation, O; P is the nearest pole; S is the sun or other body; WQE is the equator; $SH = h$ is the altitude; $SD = d$ is the declination from the equator; t is the hour angle from the meridian; $PS = p$ is the polar distance, and $p = PS = PD - SD = 90° - d$; OS is the zenith distance, and $OS = OH - SH = 90° - h$; OQ is the latitude of O, and $OP = PQ - OQ = 90° - L$. By trigonometry we have

$$\sin^2\tfrac{1}{2}t = \sec L \operatorname{cosec} p \cos s \sin (s - h),$$

in which $s = \tfrac{1}{2}(h + p + L)$.

If the sun is west of the meridian, t is the local apparent time; if east of the meridian, the local apparent time is 12 hours minus t. To the local apparent time apply the equation of time (q.v.), and the result is the local mean time. The difference between this and the Greenwich mean time (derived from the chronometer) gives the longitude in time; multiplying by 15 gives the longitude in arc. If the moon, a planet, or a star is used for observation, t is the hour angle of the body from the meridian. Add to this the right ascension (from the *Nautical Almanac*) to get the local sidereal time and apply the reduction (from the *Nautical Almanac*) to obtain the local mean time. Then proceed as before.

Sumner's Method. When a heavenly body is in the zenith, its altitude is 90°. At points 10° away in all directions the altitude is 80°. Such points are located on a circle with the zenithal point as a centre. So for any given altitude h of a heavenly body there is a circle on the earth at all points of which the altitude is h. If the equation which has been given for the determination of time (and longitude) is solved with two different values of the latitude (L), it will give two points on the circle corresponding to the observed altitude. Since this circle is large (provided the altitude is not near 90°), if the difference in latitude of the two points is 30 miles or less, a line joining them practically forms part of the circle. When the correct latitude is obtained, the point of this line which has the true latitude is the correct position in both latitude and longitude. If two heavenly bodies are observed which bear 30° or more from each other, two Sumner lines are obtained, and their intersection is the correct position. If practicable, the two bodies should bear at right angles from each other in order to reduce the probable error.

Saint-Hilaire Method. In this the position of the ship is estimated and the corresponding altitude computed. The altitude and azimuth of the sun are obtained by observation. The two altitudes are compared, and the assumed position is moved the distance, in the direction of the azimuth, corresponding to the error of the altitude at the assumed position. If a Sumner's line is desired, it is drawn through the corrected position perpendicular to the direction of the sun's bearing.

Laying the Course. In laying the course the navigator must take into consideration the ocean currents, prevailing winds, rocks, shoals, fog, storms, etc. The ocean pilot charts (see Pilot Chart) show the currents, probable direction and force of winds, areas of probable fog, areas in which icebergs may be expected, the most practicable routes for vessels to follow between certain ports or when crossing certain seas or oceans, and the tracks of the cyclonic storms. Further information is obtained from books called *Ocean Pilots* or *Sailing Directions*. Areas of probable ice and fog should be avoided as far as practicable, and the course should be laid to avoid heavy winds and cyclonic storms. This is not always possible, but the study and investigation of these storms (see Meteorology, *Marine Meteorology*) made in the last 75 years have led to the discovery of means of escaping their most serious dangers or of greatly reducing them.

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NAVIGATION, Aërial, Law of. The law governing the use of the air spaces by persons operating balloons and other air craft, and the rights and obligations of such persons with respect to the soil or territory over which they operate. The law of the airship comprehends, therefore, questions of public as well as of private right and rules of municipal or domestic as well as of international law. When aërial navigation was still in its infancy, it had already produced a considerable legal literature.

This was, in the absence of concrete cases, largely abstract and speculative in character, dealing not so much with the actual rights of user of air space and actual liability for injuries sustained as with the principles on which the law of the subject might be expected to develop in the future. Thus, in the field of public law the right of a state to exercise sovereignty in the air space over the national territory was unquestioned; but whether this sovereignty was based on actual ownership of the air space, whether it was unlimited in extent or restricted to a definite or indefinite zone, whether, if restricted, it was limited to a fixed altitude or to the range of a cannon shot, whether it was absolute or subject to an easement of use by foreign aviators—these were questions much debated and as to which no agreement was reached.

The same differences of opinion developed with regard to the rights of owners of the land underlying the air space in private law. It was conceded that such a proprietor owns the air space above his land, but whether, according to the maxim of the Roman and the common law, he owned all the way up, *usque ad cœlum*, or only so far as was necessary to protect him in his use and enjoyment of the surface of his land, was still in dispute. Even in our legal system it was, to say the least, doubtful whether a person flying a kite or operating an aëroplane at a considerable height above my land would be held liable in trespass, though he would certainly be liable as for a nuisance for any injury to my house or trees or garden resulting from his acts. So far as this branch of aërial law was concerned, the following points might be considered settled:

1. The aviator is liable in trespass for landing, whether negligently or by design, on my land.

2. In such a case he is liable not only for the damages directly caused by his trespass, but also for those indirectly resulting therefrom, as through the gathering of a crowd attracted by his descent.

3. He is liable in trespass for sailing close to the ground or to the buildings thereon.

4. He is liable in trespass if he throws anything, such as sandbags, bottles, or other articles, on the land.

5. Apart from any trespass on land he is liable for any injury resulting from his negligence to any one.

6. He is probably liable in England and the United States for any injury caused by him, even though not due to negligence on his part — this because of the danger to the general public which the practice of aviation involves. Several of the European codes have laid down the rule that injury done without fault results in no liability, but the contrary rule was laid down in the draft code prepared by the American Bar Association (1910). This bill (not enacted into law in 1915) also provided for the licensing of air men by the state. No rules having been adopted governing collisions, salvage, etc., in connection with aviation, it was, therefore, a matter of conjecture whether the maritime law or the law governing vehicles on land, which differ on these points, would be applied to air craft. Whether a crime or a tort committed on board an airship was punishable in the state over whose territory the wrong was done or by the state in which the craft was owned was also a question for future determination.

International law has dealt with several aspects of aviation, especially (1) with the status of the aviator scouting or carrying dispatches in time of war; (2) with the discharge of projectiles and explosives from balloons and aëroplanes; and (3) with the question whether the airship of a belligerent may lawfully cross the territory of a neutral power.

As to the first point, it was contended by Bismarck in the Franco-German War in 1870 that balloonists of the enemy who crossed the German lines should be executed as spies. As a matter of fact, however, captured balloonists were treated by the Germans as well as by the French as prisoners of war, and this practice has been adopted as the rule in all cases where the aviator has not acted clandestinely or on false pretenses. (Hague Conference of 1899, Second Convention, Art. 29.)

As to the second point, a determined effort made by several of the Powers, notably by Belgium and Great Britain, wholly to prevent the use of airships as engines of destruction in time of war was defeated by Germany, France, and others of the Great Powers. A convention prohibiting "the discharge of projectiles and explosives from balloons or by other new methods of a similar nature" was adopted by the First Hague Conference (1899) for a term of five years and was renewed by the Second Conference (1907), but as all the great military Powers, with the exception of Great Britain and Austria-Hungary, refused to sign it, it became a dead letter. However, a more restricted proposal of the First Conference forbidding the bombardment of undefended places was adopted by the Second Conference and extended so as to include aërial operations as follows: "The attack or bombardment *by whatever means* of towns, villages, habitations, or buildings which are undefended is prohibited." (Regulations Respecting the Laws and Customs of War on Land, Art. 25.) This convention was ratified by all the Powers and was, therefore, in full force during the European War of 1914. As expressed it lent itself to evasion. There was a question as to the meaning of the term "undefended." It might mean a town or other place unfortified in the old sense of the term, or it might mean a place undefended in any way, even by a gun or guns intended only as a defense against hostile air craft; and in either case it left room for doubt whether an undefended private residence or church in a fortified town was covered by the terms of the convention. On any construction, however, the provision was repeatedly violated in the course of the war; wholly undefended towns and places, as well as private dwellings, railroad stations, and the like in cities like Paris and London, which were in the technical sense fortified, have suffered from aërial bombardment.

As to the third point, it seems to be conceded that for a belligerent airship to use the air space of a neutral state for purposes connected with the conduct of a war was a violation of the neutrality of such state. On the other hand there is no basis for the claim that such use of neutral territory for purposes of observation made before the outbreak of hostilities is a violation of neutrality.

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NAVIGATION, FREEDOM OF. The right which all nations possess of unrestricted passage over the high seas. While the right is now universally admitted, it is only within the past century that the question has become a settled one. Formerly claims of territorial jurisdiction were made over large portions of the ocean, and these claims have led to much controversy and frequent international disputes. But the question of national control in its present phase is reduced to the application of the rule to broad arms or recesses of the sea, narrow seas inclosed within the territory of a single state, straits leading to inland seas, such inland seas and navigable rivers rising in one country and discharging through the territory of another.

Of the first class bays are generally conceded to belong to the states to which the embracing promontories belong, unless the headlands are so far separated as not to permit of effective defense. Thus, Delaware Bay was in 1792 declared to belong exclusively to the United States, and a like claim for Chesapeake Bay would hardly be contested, although the Bay of Fundy is held to be a part of the high seas.

The straits over which international controversy has chiefly arisen are those leading into the Baltic and Black seas. Denmark claimed exclusive control over the former by prescriptive right. As early as 1319 certain prescribed tolls were levied upon the Dutch, an attempt to increase which a century afterward resulted in war. In the seventeenth century England and France contracted to pay the same Sound dues that the Dutch paid. This continued until about 1855, when an arrangement was made whereby Denmark relinquished her claim to tolls and agreed to police properly and protect the passage. Previous to Russia's acquisition of the northern coast of the Black Sea it was Turkish water, but by the Treaty of Adrianople (1829) entrance through the straits into the Black Sea and navigation thereon were permitted to Russia and Powers friendly to her. But according to the ancient custom all foreign vessels of war had been prohibited from entering the Bosporus and the Dardanelles, and this inhibition was continued under the Treaty of London (1841) between Turkey and the five Powers. By the Treaty of Paris of 1856 the Black Sea was neutralized, but in 1871 Russia secured the abrogation of this provision of the treaty and has the right of maintaining her fleets of whatever size in the Black Sea. Turkey might in time of peace lawfully open the straits to her friends, although unfriendly to Russia, whenever it might seem necessary to provide for her own safety.

When a navigable river runs between two states, both are guaranteed its unmolested use, and the line of jurisdiction is held to run along the middle of the stream. But when a river rises in the territory of one state and discharges through the territory of another, international law does not admit the moral claim sometimes asserted by the upper state to right of navigation to the mouth. Yet nearly all such streams flowing through the territory of Christian nations have now beeen opened by international agreement. By the act of the Congress of Vienna (1815) declaring free the use of certain streams separating or traversing the territory of different Powers, the Rhine and Scheldt were opened to navigation. This act also opened most of the other European rivers, excepting the Danube, which by the Treaty of Bucharest and later by that of Adrianople (1829) was made free for common commercial use to Turkey and Russia. Later by the Treaty of Paris (1856) this also came within the application of the concert of the Congress of Vienna. At the close of the Revolutionary War Spain held the territory at the mouth of the Mississippi and refused the United States outlet to the Gulf of Mexico. The Louisiana Territory was subsequently ceded to France, and its purchase by the United States in 1803 disposed of the question. The St. Lawrence was thrown open to the United States by the reciprocity Treaty of 1854 with Great Britain, which also included the reciprocal use of the Upper Lakes and the freedom of Lake Michigan to Canadian subjects. In South America the freedom of the Río de la Plata to commerce was guaranteed by a series of treaties from 1853 to 1859, while the Amazon was in 1867 declared by Brazil to be open to all nations. The Stikine, Yukon, and Porcupine rivers of Alaska, rising in British territory, were opened to the subjects of England and the United States by the Treaty of Washington (1871), while the Congo and Niger in Africa were opened under an agreement for an international commission provided for by the Congo Conference of 1884–85. Consult the authorities referred to under INTERNATIONAL LAW. See also HIGH SEAS; MARE CLAUSUM.

NAVIGATION ACT. The name applied to each of a series of acts, known collectively as the Navigation Acts, passed by the English Parliament, beginning with 1645, for the purpose of protecting the shipping of Great Britain and her colonies, of injuring the shipping of the Dutch, the chief rivals of the English, and of exploiting, for the benefit of England, the commerce of the English colonies. See NAVIGATION LAWS.

NAVIGATION LAWS. The early restriction placed upon commerce was but one phase of the application of the economic doctrines advocated prior to the time of Adam Smith, prohibiting exports, regulating intercourse, and generally obstructing the operation of economic laws. The first recorded British navigation law belongs to the reign of Richard II (1381) and required the shipment of merchandise by the "King's liege people" in "ships of the King's liegance." Subsequently a more liberal policy was pursued. With the discovery of the New World and the consequent growth of colonial dependencies, both the importance of navigation laws as a question of policy and their sphere of influence were greatly extended. England, France, Spain, Portugal, and Holland by their restrictions prohibited all commercial intercourse between their colonies and other nations, and Spain even treated the crews of foreign ships wrecked upon her coasts as pirates. In 1645 the

English Parliament passed an Act prohibiting the importation into England of whale oil and other products of the whale fisheries in any vessels except such as were owned in England and were manned by English seamen. This Act was the first of a long series of Acts which are known collectively in history as the Navigation Acts. The Acts of 1651 and 1660—the latter of which is known officially as the First Navigation Act—served as the basis of the British legislation in this field for almost 200 years. In general, the objects of these Acts, as of the succeeding ones, were to protect the shipping of England and her colonies and to exploit the trade of the colonies in the interest of the mother country. The chief feature of the Acts of 1651 and 1660 was the prohibition of the importation into England of foreign products except in English ships or in the ships of the country of production. In 1663, by what is usually known as the Second Navigation Act, it was ordered that "none of the products of the English plantations or factories . . . in Asia, Africa, or America shall be carried anywhere (except to other plantations) till they be first landed in England, under the forfeiture of ships and cargoes." The English restrictive measures neither destroyed the Dutch commerce of the seventeenth century nor stamped out American shipping interests of the eighteenth. The chief features of the British Navigation Code, which was essentially identical with that of all maritime nations as it existed down to the time of its repeal in 1849, required: That no foreigner could own, wholly or in part, an English ship; the captain and three-fourths of the crew must be British subjects; foreign products must be imported in British ships or in ships of the country of production; products of Asia, Africa, and America could not be imported into Great Britain from any European port in any ship whatsoever, and such products could be imported from any other place only in British ships or those of the country of production. No coastwise trade was permitted in foreign ships to the United Kingdom or between different British possessions, and trade of any kind was permitted only by special authorization. The effort to evade these restrictions involved great waste of capital, while the adoption of a more liberal policy has resulted in a steady enlargement of the prosperity of the British merchant marine.

For the navigation laws of the United States, see MERCHANT MARINE OF THE UNITED STATES.

NAVIGATOR, HENRY THE. See HENRY THE NAVIGATOR.

NAVIGATORS ISLANDS. See SAMOAN ISLANDS.

NAVILLE, nȧ'vêl', EDOUARD HENRI (1844–). A Swiss Egyptologist, born at Geneva, June 14, 1844, and educated at Geneva University, King's College, London (1862), Bonn (1866), and the Faculté des Lettres, Paris, receiving his degree in 1867. During this period, having paid much attention to Egyptology, in 1868 he followed the courses of Lepsius at Berlin, in the following year went to Egypt, and in 1870 published as the result of his investigations there *Textes relatifs au mythe d'Horus recueillis dans le temple d'Edfou.* His *La litanie du soleil* appeared in 1875 and his *Inscription historique de Pinodjem III* in 1883. Commissioned in 1874 by the London Congress of Orientalists to edit the text of the Egyptian *Book of the Dead* (q.v.), Naville spent the next 10 years collecting material in the libraries and museums of Europe. The results of his labors appeared in *Das ägyptische Todtenbuch der 18. bis 20. Dynastie* (1886), one of the most important works in the history of Egyptology. Beginning in 1882, Naville usually spent his winters in Egypt conducting fruitful investigations for the Egyptian Exploration Fund. In 1891 he became professor of Egyptology in the University of Geneva. Among the most important of his works, besides those already mentioned, are: *The Store City of Pithom and the Route of the Exodus,* Egyptian Exploration Fund Memoir, i (1885); *Goshen and the Shrine of Saft el Henneh,* ib., iv (1887); *The Festival Hall of Osorkou II,* ib., x (1892); *Ahnas el Medineh,* ib., xi (1894); *Deir el Bahari,* ib., xii–xiv, xvi, xix (1894–1901); *Les amis de la paix dans l'Afrique du Sud* (1901); *La religion des anciens Egyptiens* (1906; Eng. trans., *The Old Egyptian Faith,* 1909); *Papyrus funéraires de la XXIe dynastie* (1912).

NAVRÁTIL, nȧv'rä-tĕl, CARL (1867–). A Bohemian composer, born at Prague. He studied under Guido Adler and Ondricĕk. His compositions include: two operas, *Hermann* and *Salammbô;* five symphonic poems, *John Hus, Ziska, Zalov, Neklan,* and *Der weisse Berg; String Quartet in D Minor; Symphony in G Minor; Mass in D;* two trios and two quintets for piano and strings; a sonata for violin and piano and one for viola and piano; and much pianoforte music and many songs.

NAVY. See NAVIES.

NAVY, DEPARTMENT OF THE. One of the ten executive departments of the United States government, created by Act of Congress of April 30, 1798, and charged with the general control and administration of the navy. From 1789 to 1798 the management of naval affairs was under the control of the War Department. At the head of the department is a secretary, who is a member of the cabinet, appointed by the President with the advice and consent of the Senate, and receives an annual salary of $12,000. As the President is by the Constitution the commander in chief of the navy, the Secretary is generally subject to his direction. It is his duty to execute such orders as the President may give relative to the administration of naval affairs, including the procurement of naval supplies and the construction, armament, equipment, and employment of vessels of war. A variety of specific duties are imposed upon him by law, in which cases he is not subject to the direction of the President. He makes an annual report to the President of the operations of the Navy Department. His deputy is the Assistant Secretary, who is appointed by the President, and who during the absence or incapacitation of the Secretary acts in his stead, taking the title of acting Secretary. An Act of June 8, 1880, authorized the appointment of a judge-advocate-general of the navy from the marine corps or the navy with the rank of colonel or captain. It is his duty to receive, revise, and record the proceedings of courts-martial, courts of inquiry, boards for the examination of officers for retirement and promotion in the naval service, and to give opinions on such legal questions as arise in the course of the administration of the navy. Another officer of importance attached to the Navy Department is the commandant of the marine corps.

By an Act of July 5, 1862, eight bureaus were established in the Navy Department, at

the head of each being a chief, appointed by the President from among the officers of the navy. These are the bureaus of (1) Yards and Docks; (2) Equipment; (3) Navigation; (4) Ordnance; (5) Construction and Repair; (6) Steam Engineering; (7) Medicine and Surgery; and (8) Supplies and Accounts. See *Navy*, under UNITED STATES.

NAVY LEAGUE OF THE UNITED STATES. An organization incorporated in 1903 whose object is "to acquire and spread before the citizens of the United States through branch organizations and otherwise information as to the condition of the naval affairs and equipment and to awaken public interest and coöperation in all matters tending to aid, improve, and develop their efficiency." The league is strictly nonpartisan, and men, women, and children are eligible to membership. Its badge is a button of silver gilt and blue enamel, with letters in white and an anchor of gold. The membership in 1915 was about 10,000. The president in that year was Gen. Horace Porter. The league's headquarters are in Washington.

NAVY REGISTER. An annual official publication of the United States Navy Department. It gives a list of the officers of the navy and marine corps in order of their rank, a list of retired officers, a statement of resignations, retirements, dismissals, and deaths since the publication of the previous register, the number of stations with the ships on each and the names of officers attached to them, and an enumeration of the ships of the navy, with some details of their character, present condition, and service. Similar lists are issued for other navies. As a rule they contain less information than the United States register. The British navy list is issued monthly.

NAVY YARD. A navy yard is a government establishment for the construction, repair, and equipment of vessels of the navy. The yards at New York, Norfolk, and San Francisco are equipped for the building of large vessels, and the one at Philadelphia in 1915 was being fitted for such work. One of the most important features of a navy yard are the dry docks, because steel vessels must have their bottoms scraped and painted every six months—not for preservation, but in order to keep up their speed and avoid the useless waste of coal entailed by a foul bottom covered with barnacles and seaweed. The commanding officer of a navy yard is called the commandant and is a naval officer of high rank. The manufacturing and repair department is under control of the manager (an officer of the rank of commander or captain). It consists of the hull division and the machinery division, each with its own head. The other departments of the yard are the general storekeeper's department, yards and docks department, accounting department, pay department, and medical department. The general storekeeper purchases and supplies all the material for yard use and for vessels at the yard, including provisions and clothing for the crews. The head of the yards and docks department is responsible for the care of buildings, wharves, streets, and other public works in the yard. The character of the work in the other departments is indicated by their titles. The principal navy yard of the United States is located at Brooklyn, N. Y., on the East River. There are four dry docks at this yard. Here also is located the naval-clothing factory which makes the uniforms for the enlisted men. The other important navy yards of the United States are at Norfolk (Va.), League Island (near Philadelphia), Boston, Mare Island (San Francisco Bay), and Bremerton (Puget Sound); there are less important yards at Portsmouth (N. H.), Pensacola (Fla.), and New Orleans, and a yard of considerable importance is being developed at Charleston, S. C. In England the term "dockyard" (see DOCKYARDS, ROYAL) is equivalent to the American designation "navy yard." The great naval establishments on the continent of Europe are generally termed "arsenals." See ARSENAL.

NAWA, nä'wȧ, or **NABA.** A seaport on the west coast of the island of Okinawa, in the Luchu group, Japan (Map: Japan, G 7). It is the principal seaport of the group and exports sugar, cotton, and silk to Japan. Pop., 1903, 43,132; 1908, 47,562.

NAWANAGAR, *na*-wä'nŭg'*ar*. A seaport of India. See NOWANAGAR.

NAX'OS (Lat., from Gk. *Náxos*). The largest, most beautiful, and most fertile of the Cyclades (q.v.), known in ancient times also as Dia or Strongyle (Map: Greece, G 6). It lies in the Ægean, midway between the coasts of Greece and Asia Minor. Extreme length, about 20 miles; breadth, 15 miles; area, 163 square miles. Pop., 1909, according to Baedeker, 18,603. The principal products and articles of export are wine, corn, oil, cotton, fruits, and emery. The wine of Naxos (the best variety of which is still called in the islands of the Ægean Bacchus wine) was famous in ancient as it is in modern times, and on this account the island was celebrated in the legends of Dionysus and Ariadne. The island also contains good quarries of marble of a rather coarser grain than that of Paros. They were worked in the sixth century B.C., as is proved by the unfinished statues found in them, among which is a famous colossus some 34 feet in length. The most flourishing period in the history of the island seems to have been in the sixth century B.C. under the rule of the tyrant Lygdamis. In 490 B.C. it was ravaged by Persians and later joined the Delian League, from which (469 B.C.) it was the first to revolt. The island now became a dependency of Athens. After the conquest of Constantinople by the Latins, it became in 1207 the seat of a dukedom, founded by the Venetians, and in 1579 was seized by the Turks. It now forms a portion of the Kingdom of Greece (q.v.). Naxos, the capital, with a population of 1760 in 1909, is situated on the northwest coast, contains Greek and Catholic churches and a castle built by the Venetians, and is the seat of a Greek and a Latin bishop. Consult: Ludwig Ross, *Reisen auf den Inseln des aegäischen Meeres*, vol. i (Halle, 1840); E. Curtius, *Naxos* (Berlin, 1846); Ernest Dugit, *De Insula Naxo* (Paris, 1867); H. F. Tozer, *Islands of the Ægean* (Oxford, 1890); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

NAYARS. See NAIRS.

NAY'LER, JAMES (c.1617–60). An English Quaker. He was born at Ardsley in Yorkshire. In 1642 he became an adherent of the Parliament and served for about eight years under Fairfax and Lambert. While in the army he began to preach as an independent, but in 1651 was led by George Fox to become a Quaker, and for three years was Fox's literary coadjutor. But popularity turned his head. His followers

fancied that he resembled the pictures of Christ, and they called him Jesus and the Lamb of God, in spite of the protest of Fox and the leading Quakers. After riding into Bristol accompanied by a few followers, in imitation of Christ's entry into Jerusalem, he was arrested on charges of blasphemy, tried before Parliament, and sentenced to the pillory, whipping, branding, and imprisonment for two years. The whole punishment was inflicted. He was released in 1659, recanted his errors, and was again received by the Society of Quakers. A collection of his writings was published in London in 1716, and his *Memoirs* in 1719 and reprinted in 1800. He is mentioned in George Fox's *Journals*. Consult also Sewel, *History of the Quakers* (1725, often reprinted; New York, 1844).

NAZARÆANS, năz'â-rē'anz, **NAZORÆANS**, or **NAZARENES**, năz'â-rēnz'. A designation of Christians as Galileans. In the Talmud Jesus is called *ha-nozri* and his followers *ha-nozrim*, probably as natives of that part of Galilee which was particularly famous for its luxuriant vegetation; the Galilean lowland is called Genesar or Genosar, the district immediately west of the lake Gennesar, or the Galilean garden. The name continued to attach itself to Jewish Christians in general or a particular sect among them. (See EBIONITES.) Epiphanius refers to Nazoræans as a Jewish Christian sect living in Berœa, about Cœle-Syria, and in Decapolis about the regions of Pella, and in Basanitis, who were formerly called Jessæans. Jerome speaks of Nazaræans in Berœa, referred to by the Jews as Minim, whose Gospel of Matthew, written in the Hebrew dialect (i.e., Aramaic), he had copied. The rejection of the virgin birth and the conception of Jesus as a man seem to have been characteristic of the whole sect, or at least a considerable part of it. The Nazaræans should not be confused with the Nasaræans (q.v.). Consult Hoennicke, *Das Judenchristentum im ersten und zweiten Jahrhundert* (Berlin, 1908), and Schmidtke, *Neue Untersuchungen zu den judenchristlichen Evangelien* (ib., 1913).

NAZARENE, năz'â-rēn' (Gk. Ναζαρηνός, *Nazarēnos*, from Ναζαρά, *Nazara*, Nazareth, Ναζωραῖος, *Nazōraios*, from Aram. *nāẓûrâ*, branch, shoot). A descriptive term applied in the Gospels and Acts—as it is regularly applied in the Talmud—to Jesus and his disciples. The form *Nazarēnos* occurs in Mark i. 24, x. 47, xiv. 67, xvi. 6; Luke iv. 34, xxiv. 19; the form *Nazōraios*, in Matt. ii. 23, xxvi. 71; Luke xviii. 37; John xviii. 5, 7, xix. 19; Acts ii. 22, iii. 6, iv. 10, vi. 14, xxii. 8, xxiv. 5, xxvi. 9. Occurring as it does in the earliest Gospel (Mark) and in the indubitably primary narrative of the visit to Nazareth (Luke iv) as well as in the obviously primary incident of the walk to Emmaus (Luke xxiv), it is clear that *Nazarēnos* is the earlier of the two forms, and was used to designate Jesus as coming from and belonging to Nazareth, as is stated in Matt. xxi. 11 (cf. Acts x. 38; John i. 45). As Nazareth popularly (cf. John i. 46) and Galilee by the religious leaders (cf. John vii. 41, 52) were not held in repute, the term *Nazarēnos* came easily to have a contemptuous meaning when used by those not of Jesus' following (cf. Mark xvi. 67). To offset this, it is quite likely that the early Christians substituted for it the later form, *Nazōraios*, as a distinctively Messianic term, based on the prophecy of Isa. xi. 1, as is evidenced by the specific reference in Matt. ii. 23. This later form came to be the name by which the Christian communities were known within Palestine and by Jews, as Christians was the name given to the disciples in Gentile lands (cf. Acts xi. 26). There was a Jewish-Christian sect of Nazarenes, as we are informed by Jerome and Epiphanius. Very little authentic information about them is obtainable, though they were apparently distinguished from the Ebionites (q.v.), as more loyal to Jesus' teachings. The gospel known as the Gospel of the Nazarenes was in all probability identical with the Gospel of the Hebrews, and was an apocryphal working over of our first canonical gospel.

NAZARENES, or **NAZ'ARITES**. A group of German painters. See PRE-RAPHAELITES.

NAZ'ARETH (Gk. Ναζαρέθ, *Nazareth*, which in all but two passages, Matt. xxi. 11; Acts x. 38, is the less-authenticated text. In place of this the better reading is Ναζαρέτ, *Nazaret*. In Matt. iv. 13 and Luke iv. 16 the best-attested text is Ναζαρά, *Nazara*, to which are doubtless due in other passages the unaccepted variants Ναζαράθ, *Nazarath*, and Ναζαράτ, *Nazarat*. From an Aramaic word of uncertain form and meaning). A town of Galilee, the modern En Nāṣira, famed as the place where Jesus passed the obscure years of his childhood (Map: Palestine, C 2). From the question of Nathanael (John i. 46) it may be inferred that it was of no special importance, and possibly was of poor repute. (Consult Conder, *Tent Work*, p. 74.) It lay on the southern slope of the Jebel el Sikh, probably somewhat higher up than the modern town, as is evident from the position of the old cisterns and tombs. From the summit of the hill (some 1600 feet above sea level) one of the finest views in Palestine is obtained, commanding the great plain of Esdraelon, from the Jordan valley on the east to the Mediterranean on the west, and southward to the hills of ancient Samaria; while northward is seen the beautiful plain of El Baṭṭōf, beyond which rise the snowy heights of Mount Hermon. With this advantaged site, the town stood apart from the main highways of travel, though within easy reach of them. This seclusion may, to a large extent, account for the fact that there is no mention of the place in the Old Testament or by Josephus. At the same time, it never could have been a very large town, as it had but one spring. At all events, we have no knowledge of its early history. The New Testament writings and the Talmud show that Jesus was popularly called, doubtless in contempt by those not in his following, the Nazarene, and his disciples Nazarenes (cf. Mark xvi. 67; Acts xxiv. 5). (See NAZARENE.) No further mention of the place is found until Eusebius, who says in his *Onomasticon* that it was 15 Roman miles eastward from Legeon (the ancient Megiddo), and not far from Mount Tabor. Epiphanius, a century later, says that it had become in his day a mere village. The Christians of the first three centuries appear to have regarded it with no consideration. In later centuries it began to attract pilgrims, and in 600 it had a large basilica. It naturally was reverenced by the Crusaders, who greatly embellished the place and transferred to it the bishopric of Scythopolis. In 1229 it was rebuilt by Frederick II. After the conquest of Palestine by the

Turks in 1517, the Christians were compelled to leave the place. About 1620 the Franciscans established themselves in Nazareth, and the great church and convent of the Annunciation was built. This has become one of the most popular pilgrim shrines in Palestine. The house in which Mary lived is said to have been miraculously transported to Loreto (q.v.), Italy. Of late years Nazareth has materially increased in population, at present containing over 11,000 souls, 4000 Moslems, 4000 Orthodox Greeks, 1000 United Greeks, 1500 Catholics, 200 Maronites, and 250 Protestants. No Jews reside in the town. Of all the traditional sites, perhaps the only reliable one is that of the Virgin's Spring, which must often have been visited by Mary and Jesus, as it is the only spring in the place. The Cliff of Precipitation is more probably the one indicated in Sanday's *Sacred Sites* (p. 59, plate xxiii B).

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NAZARETH. A borough in Northampton Co., Pa., 7 miles northwest of Easton, on the Lehigh and New England and the Delaware, Lackawanna, and Western railroads (Map: Pennsylvania, L 5). It contains the Nazareth Hall Military Academy and several places of historic interest, notably the Whitefield House and an Indian monument, both 175 years old, Gray Cottage, and Greenwood and Indian cemeteries. The borough has also a fire engine imported from England in 1791 and believed to be the oldest in the United States. Among the industrial plants are Portland cement works and manufactories of children's waists, hosiery, and musical instruments. Pop., 1900, 2304; 1910, 3978.

NAZ'ARITE (Heb. *nāzīr*, from *nāzar*, to consecrate). Among the Hebrews, one who had devoted himself in a peculiar sense to Yahwe. The term is used of two classes: (*a*) Nazarites for life and (*b*) Nazarites for a limited period. The law in Num. vi refers to the latter class alone. According to this law one who had taken the vow of Nazariteship was to abstain from wine or any intoxicating drink, not to suffer a razor to touch his head, but to let the locks of his hair grow long, and to avoid all ceremonial defilement. It is evident from these regulations—particularly the first two—that the Nazarite was to lead a life marked by the return to the simpler and rougher fashions of primitive times. The original purpose of such vows among the Hebrews, as among the Arabs, where they are also found (cf. Wellhausen, *Reste arabischen Heidenthums*, p. 143, Berlin, 1897; W. R. Smith, *Religion of the Semites*, pp. 482 et seq., London, 1894), was for war or revenge, but it was natural also to extend the customs involved to sacred seasons of the year when the deity was to be approached. So among the Arabs to this day, during the days spent by the pilgrims in Mecca (see Hajj), it is forbidden to cut the hair, and other restrictions are imposed, most of which emphasize the return in the holy season to more primitive fashions. As for the Nazarite for life, we have only two instances in the Old Testament, Samson and Samuel. The former, in so far as he embodies popular elements, represents the hero of a rude age. It is not said of him that he was to abstain from wine, and, as a matter of fact, he frequently was involved in acts (such as contact with the carcass of a lion) which brought in their wake ceremonial defilement. The long hair in his case may have originally been the natural condition, just as the hero Engidu among the Babylonians is described as hairy. In the case of Samuel the Nazariteship involves, likewise, merely the obligation to let the hair grow, and this may have been customary among the guardians of the sanctuaries, who were in a perpetual state of sanctity. The application, therefore, of the term Nazarite to Samson and Samuel in the postexilic sense of the word is due to the projection into the past of a condition which reached its development centuries after the age of these two personages. Nazariteship in time lost its old significance and became a species of private asceticism. In this sense John the Baptist is a permanent Nazarite (Luke i. 15) and Paul possibly (though not certainly) a temporary one (Acts xxi. 17–26).

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NAZARITES (from Lat. *Nazarita*, from Gk. *Nαζαρίτης*, *Nazaritēs*, from Heb. *nāzar*, to separate one's self). A Christian sect found in Hungary and particularly numerous in the Magyar districts of eastern Hungary. They believe in the Trinity, but reject transubstantiation and infant baptism. They have no priesthood, refuse to take oaths or to perform military service, and profess to go to the New Testament for their principles of life. They are said to number about 80,000.

NAZ'ARITES. See Pre-Raphaelites.

NAZIANZUS, Saint Gregory of. See Gregory of Nazianzus, Saint.

NAZIMOVA, nä-zē'mō-vä, Alla (1879–). An actress, born in Russia and educated in Switzerland. She received her early training for the stage at a dramatic school in Moscow. After playing in various provincial companies she appeared as leading lady at St. Petersburg in 1904. She visited London and New York in 1905 in Paul Orlenev's company, playing in Russian. Having entered into a contract to play in English, she made her English-speaking début in New York in 1906 after only five months' study. She is best known for her work in Ibsen. Her interpretations of Hedda Tesman in *Hedda Gabler*, Nora in *The Doll's House*, and Rita Allmers in *Little Eyolf* placed her at once in the front rank of modern actresses. She was less successful in her attempts to impersonate English and American character. Perhaps the

most notable of her later performances was in 1912, when she played Mrs. Chepstow in *Bella Donna*. In 1915 she appeared for the first time in vaudeville, in a one-act play called *War Brides*.

NAZ'IRITE. The same as NAZARITE (q.v.).

NAZORÆ'ANS. See NAZARÆANS.

NEÆ'RA (Lat., from Gk. *Νέαιρα, Neaira*). The name of several nymphs in Grecian mythology and of a maiden mentioned in the poems of Horace, Vergil, and Tibullus. It is used also in Milton's *Lycidas* to designate an imaginary charmer.

NEAGH, nā, *Ir. pron.* nā'äG, LOUGH. The largest lake of the British Isles, in the northeastern part of Ireland, 13 miles west of Belfast (Map: Ireland, E 2). It is rectangular in shape, 17 miles long by 10 miles wide, and has a mean depth of 40 feet. It is drained northward into the Atlantic Ocean through the Bann River. Canals connect it with Belfast on the east and Lough Erne on the southwest. It abounds in fish, especially trout, char, and freshwater herring.

NEAGLE, nā'g'l, JOHN (1799–1865). An American portrait painter. He was born in Boston, but his parents moved to Philadelphia soon after his birth. Early apprenticed to a coach painter, he also received some instruction from Bass Otis, but was practically self-taught. About 1818 he began painting portraits in Lexington, Ky., New Orleans, and other cities. On his return to Philadelphia he married the daughter of Thomas Sully, the painter, from whom he received instruction and encouragement. He made rapid progress and, rising in public favor, was made director of the Pennsylvania Academy (1830–31) and first president of the Artists' Fund Society of Philadelphia (1835–44). Neagle was a good draftsman, a fair colorist, and attained striking effects of light and shade. He was clever in delineation of character but lacked sincerity and a true feeling for beauty and grace. Most of his important works are in Philadelphia. These include a full-length portrait of Patrick Lyon at the Forge (1829, Pennsylvania Academy), an enlarged replica of the study in the Boston Museum, which first gained him a reputation (1826). The portraits of Clayton and Cornelia Earl are also in the Pennsylvania Academy. Other well-known portraits in Philadelphia are those of Rev. Dr. Joseph Tilmore, St. George's Hall; Henry Clay, Union League Club; Dr. Thomas Parke, City Library; and George Washington, Independence Hall. Neagle's portrait of Gilbert Stuart in the Athenæum, Boston, painted during a visit to that city, is considered the best existing likeness of Stuart.

NEAL, DANIEL (1678–1743). The historian of the Puritans, born in London. He entered Oxford, but left, before completing the course, to study for the dissenting ministry in England and Holland. In 1703 he returned to England, in 1706 became pastor of an independent congregation in Aldersgate Street, London, and remained at its head to the end of his life. His first work, a *History of New England* (1720), won for him the honorary degree of master of arts from Harvard in 1721. Neal's greatest work, however, was the *History of the Puritans* from the Reformation to 1689, originally undertaken by him in conjunction with Dr. John Evans. Dr. Evans died in 1730, and Neal completed the work himself (4 vols., 1732–38). It was, on the whole, very favorably received by the Puritans, but Neal's studied misrepresentation and suppression of facts evoked criticism. Nevertheless the history is for the most part a scholarly piece of work.

NEAL, DAVID DALHOFF (1838–). An American historical and portrait painter. He was born at Lowell, Mass., and after removal in youth to San Francisco was employed in making drawings on wood. In 1862 he went to Munich, where he studied under his father-in-law, the Chevalier Maximilian Ainmüller, and at the Academy under Wagner. From 1869 to 1876 he was a pupil of Piloty. After 1879 he principally practiced portrait painting. In his technique and ideals he belongs to the Munich school and has little that is distinctively American. Among the works in his early style are the "Chapel of the Kings, Westminster"; "Saint Mark's"; and the "Return from the Chase." His first figure composition, "James Watt," was exhibited at the Royal Academy, London (1873). The "First Meeting of Mary Stuart and Rizzio" (1875) received the great medal from the Royal Bavarian Academy. His most noted work, "Oliver Cromwell and John Milton," is now in the Public Library, Cleveland, Ohio. His portraits owe their success to their clever characterization. Good examples are those of Rev. Mark Hopkins for Williams College; D. O. Mills; Whitelaw Reid; and Teackle Wallis (Athenæum Club, Baltimore).

NEAL, JOHN (1793–1876). An American novelist and journalist of English-Quaker descent, born in Portland, Me. Neal was self-educated and studied law at Baltimore, supporting himself by literary work with an energy that characterized him throughout his long and varied life. Between 1817 and 1819 he published *Keep Cool*, a novel in two volumes, two volumes of verse, and a five-act tragedy, *Otho*. Meantime he was admitted to the Maryland bar. In 1823 he paid a visit to England. Here he was a pioneer of American letters, attracting and compelling attention, the first American to contribute to the great quarterlies and to *Blackwood*, and becoming secretary of Jeremy Bentham. Returning to America in 1827, he took up the practice of law in Portland and in 1828 began to edit the *Yankee*, contributing much to various other magazines and newspapers, earnestly opposing capital punishment, and being an early advocate of woman's suffrage. He established a gymnasium, said to have been the first in the United States, and he was himself athletic and a sympathetic teacher and adviser of young men, notable among whom was E. A. Poe. While engaged energetically in journalism, he poured out a steady stream of novels, interspersed with other works. The more noteworthy of his chaotic, Byronic novels are *Randolph* (1823) and *Logan* (1823). *Rachel Dyer* (1828) and *The Down Easters* (1833) are soberer, but not memorable productions. The interesting autobiography, *Wandering Recollections of a Somewhat Busy Life* (1869), was practically the last of his voluminous writings, all of which are characterized by haste, but not less by an ebullient talent and a distinctive flavor of nationality.

NEALE, nēl, EDWARD VANSITTART (1810–92). An English Christian Socialist, born at Bath and educated at Oriel College, Oxford. He became an advocate of social reform and joined the group of Christian Socialists under Frederic

Denison Maurice (q.v.). Neale founded the first coöperative stores in London. In order that the coöperative principle might take firm root and grow, he was especially anxious that associations of producers should be formed to supplement the work of associations of consumers; and he held that the former could only be established by engaging in the wholesale trade. He contended also that coöperators engaged in wholesale production should share profits with their factory operatives. He assisted in forming several industrial societies, was a founder of the North of England Cöoperative Wholesale Society in 1863, of the Cobden Mills in 1866, and of the Agricultural and Horticultural Association in 1867, and general secretary to the Central Coöperative Board from 1875 until 1891. He visited America in 1875 and published the results of his observations in the *Coöperative News*. He was a director of the Coöperative Insurance Company and of the Coöperative Newspaper Society, and a Vansittart Neale scholarship at Oriel College for the sons of coöperatives was founded in his honor in 1890. He had an important influence in procuring coöperative legislation, especially the Consolidation Act of 1862 and the Industrial and Provident Societies Act of 1876. Neale was also a thoughtful student of biblical and religious questions. His writings include: *The Characteristic Features of Some of the Principal Systems of Socialism* (1851); *The Analogy of Thought and Nature Investigated* (1863); *The Mythical Element in Christianity* (1873); *A Manual for Coöperators* (1881), in collaboration with Thomas Hughes (q.v.).

NEALE, John Mason (1818–66). An English author and hymnologist, born in London. He graduated at Trinity College, Cambridge, in 1840 and in 1842 was ordained priest in the Church of England. While chaplain and tutor at Downing College, he came under the influence of the Oxford movement (q.v.), warmly embraced High Church views, and adhered to his principles in spite of severe criticism. By reason of poor health and also on account of opposition to his religious views he failed to receive fitting advancement in the church and was for many years obliged to content himself with the wardenship of Sackville College, East Grinstead, a charitable foundation. While there he became the founder of an Anglican sisterhood of St. Margaret. His extensive writings on theological and ecclesiastical subjects include *A History of the So-Called Jansenist Church in Holland* (1858) and *Mediæval Preachers* (1857). He translated the several parts of Bernard of Cluny's *De Contemptu Mundi*, "Jerusalem the Golden," and in 1863 published *Hymns of the Eastern Church*. He also published, in addition to various collections of hymns: *History of the Jews* (1841); *An Introduction to the History of the Holy Eastern Church* (1850); *Stories for Children from Church History* (1850); *Theodore Phranza, or the Fall of Constantinople* (1857); *History of the Council of Florence* (1861); *Essays on Liturgiology and Church History* (1863).

NEANDER, nā-ān'dĕr, Johann August Wilhelm (1789–1850). One of the most famous of ecclesiastical historians. He was born at Göttingen, Jan. 17, 1789, of Jewish parentage and received his early education at the Johanneum in Hamburg. On Feb. 15, 1806, he publicly renounced Judaism and was baptized in St. Catharine's Church, Hamburg, changing his name from David Mendel to Neander (from Gk. *νεός, neos*, new + *ἀνήρ, anēr*, man, in allusion to the religious change which he had experienced) and taking his Christian names from several of his friends. He now proceeded to Halle, where he studied theology under Schleiermacher and concluded his academic course at his native town of Göttingen. In 1811 he took up his residence at Heidelberg University as a privatdocent, in 1812 he was appointed extraordinary professor of theology, and in the following year was called to the newly established University of Berlin as professor of Church history. Here he labored till his death, July 14, 1850. Neander enjoyed great celebrity as a lecturer. Students flocked to him, not only from all parts of Germany, but from the most distant Protestant countries. His works, in the order of time, are: *Ueber den Kaiser Julianus und sein Zeitalter* (1812); *Der heilige Bernhard, und sein Zeitalter* (1813); *Genetische Entwicklung der vornehmsten gnostischen Systeme* (1818); *Der heilige Johannes Chrysostomus und die Kirche, besonders des Orients, in dessen Zeitalter* (1821–22); *Denkwürdigkeiten aus der Geschichte des Christenthums und des christlichen Lebens* (1822–24); *Antignosticus, Geist des Tertullianus und Einleitung in dessen Schriften* (1826); *Allgemeine Geschichte der christlichen Religion und Kirche* (1825–52); *Kleine Gelegenheitsschriften* (1824); *Geschichte der Pflanzung und Leitung der christlichen Kirche durch die Apostel* (1832–33); *Das Leben Jesu Christi in seinem geschichtlichen Zusammenhange*, written as a reply to Strauss's work (1837); *Wissenschaftliche Abhandlungen*, published by Jacobi (1851); *Geschichte der christlichen Dogmen*, also published by Jacobi (1856); and several other posthumous works. The majority of these works have been translated into English, viz., *General History of the Christian Religion and Church* (trans. by Joseph Torrey, 12th ed., 5 vols., Boston, 1882); *History of the Planting and Training of the Christian Church by the Apostles* (trans. by Ryland, 1842); *Memorials of Christian Life in the Early and Middle Ages* (trans. by Ryland, 1832); *Life and Times of Saint Bernard* (trans. by Miss Matilde Wrench, 1843); *Life of Chrysostom* (trans. by Stapleton, 1845); *Life of Jesus Christ* (trans. by McClintock and Blumenthal, 1848); *Lectures on the History of Christian Dogmas* (trans. by Ryland, 1858); *The Emperor Julian* (trans. by Cox, 1850); and his commentaries on Philippians, James, and First John.

Bibliography. Philip Schaff, in *Germany, its Universities, Theology, and Religion* (Philadelphia, 1857); id., *Saint Augustine, Melancthon, Neander* (New York, 1886); L. Schulze, *August Neander* (Leipzig, 1890); A. Wiegand, *August Neander's Leben* (Erfurt, 1890), containing a bibliography; K. T. Schneider, *August Neander* (Schleswig, 1895); also Adolf Harnack, *Rede auf August Neander* (Berlin, 1889).

NEANDERTHAL (nā-ān'dĕr-tāl') **MAN.** See Man, Science of, *Ancient Types*.

NEAP'OLIS (Lat., from Gk. Νεάπολις, new town). The Neapolis mentioned in the New Testament was an ancient town, the seaport of Philippi in Macedonia. The modern town of Kavalla (Map: Balkan Peninsula, E 4), with about 5000 inhabitants, is on or near its site. Paul landed here when he sailed from Troas to begin his missionary labors in Europe (Acts xvi. 9–11). The town lay on a bay, affording

excellent anchorage, nearly opposite the island of Thasos, and about 9 miles from Philippi.

NEAP'OLIS. The ancient name of Naples (q.v.).

NE'APOL'ITAN FEVER. See MALTA FEVER.

NEAP TIDES. See TIDES.

NEARCHUS, nē-är'kŭs (Lat., from Gk. *Néarchos, Nearchos*). The commander of the fleet of Alexander the Great in his Indian expedition (327–326 B.C.). He was the son of Androtimus and was born in Crete, but settled in Amphipolis in Macedonia, near the Thracian boundary. He was high in favor with Philip, but was banished on account of his adherence to Alexander. When, however, Alexander succeeded to the throne of Macedon, Nearchus was recalled, and when the conquest of the Persian Empire was begun, he was appointed governor of Lycia and other districts in the south of Asia Minor. In 329 B.C. he accompanied Alexander to Bactria, with a body of Greek mercenaries. When his patron ordered a fleet to be built on the Hydaspes, Nearchus received the command of it. He sailed down the Indus and then to the Persian Gulf and arrived at Susa in Persia, Feb. 24, 324 B.C., shortly after Alexander himself, who had marched overland. After the death of Alexander in 323 B.C. Nearchus accepted the decision of the other generals with regard to the position of the Kingdom and retained his own provinces under Antigonus, whom he accompanied against Eumenes. In 314 B.C. Antigonus appointed him a councilor of his son, Demetrius. Fragments of his narrative of his voyage have been preserved in the *Indica* of Arrian, of which the text was edited by Müller (Paris, 1846). Consult J. W. McCrindle, *Invasion of India by Alexander the Great* (new ed., London, 1896).

NEARC'TIC REGION (from Gk. *néos, neos,* new + *árktikos, arktikos,* arctic, northern). A region in zoögeography including the entire continent of North America, except the hot coast lands of Mexico. It is a part of Arctogæa, or the Holarctic region, in the view of those who regard the Northern Hemisphere as a unit in zoögeography; but in the scheme of Sclater and Wallace it is one of the six primary regions, coördinate with the Palæarctic province. (See DISTRIBUTION OF ANIMALS, *Zoögeographical Map.*) Of further interest here are the subdivisions or local faunal areas that have been distinguished. The earliest attempt at this set apart three regions: an Eastern, from the Atlantic to the plains; a Central, including the dry interior plains; and a Western, the Pacific slope. As early as 1854 Louis Agassiz stated that the eastern half of the continent contained three faunas: a northern, which he called Canadian; a middle (Great Lakes to the latitude of Kentucky), which he called Alleghanian; and a southern or Louisianian. Later writers, especially Allen, dealing mainly with birds, made eight zones in succession from north to south: Arctic, Hudsonian, Canadian, Alleghanian, Carolinian, Louisianian, Floridian, and Antillean. Ornithologists still use this classification east of the Mississippi River. Subsequently Merriam announced the opinion that there was no reason for recognizing a Central province, and that too much stress had been laid upon the dissimilarities between Eastern and Western animals. He asserted the view that only two primary subdivisions of the Nearctic region should be made: a Boreal province and a Sonoran province. The former stretches from New England and the Great Lakes northwest across Canada to Alaska and sends down long arms along the heights of the Alleghanies and the Rocky Mountains and along the Pacific coast, whose fauna is a mingled one. Everything south of this is Sonoran, embracing nearly all the United States, a great area of the plains of northwestern Canada, and all of Mexico except the low tropical coast lands. These generalizations, however, have not been universally accepted, most critics objecting that too high rank has been accorded to the Sonoran region, whose boundaries are regarded as too indefinite to entitle it to be differentiated and outlined as Merriam proposed in his "Biological Survey of the San Francisco Mountain Region," in *North American Fauna, No. 3* (Washington, 1890). The question of the subdivision of the Nearctic region therefore remains open.

NEARING, nēr'ing, SCOTT (1883–). An American economist, born at Morris Run, Pa. He studied at the University of Pennsylvania Law School in 1901–02 and took the S.B. degree at Pennsylvania in 1905 and the Ph.D. in 1909. He taught economics at Swarthmore College from 1908 to 1913 and (as instructor and then assistant professor) at the Wharton School of the University of Pennsylvania from 1906 to 1915. His dismissal from the latter institution, without notice, was generally supposed to be due to attacks made by Nearing upon corporations controlled by certain of the university trustees. The action resulted in widespread and vigorous protest. Deeply interested in the social aspects of economics and in social reform, he published, besides periodical articles: *Economics* (1908); *Social Adjustment* (1911); *Solution of the Child Labor Problem* (1911); *Wages in the United States* (1911); *Woman and Social Progress* (1912), with his wife; *Social Religion* (1913); *Financing the Wage Earner's Family* (1914); *The New Education* (1915); *Income* (1915).

NEARSIGHTEDNESS. See SIGHT, DEFECTS OF.

NEATH, nēth. A municipal borough and river port in Glamorganshire, South Wales, on the Neath, 7 miles east-northeast of Swansea (Map: England, C 5). The town, built on the site of the Roman station Nidum, contains the remains of an ancient castle, burned in 1231, and there is also the old parish church of St. Thomas. The town received its first charter from Edward II. It is chiefly notable for refining of iron and copper ore. It also manufactures tin plate, machinery (including steam engines), bricks, chemicals, and textiles. Stone is quarried near by, and there is a large export trade in local products. It owns its gas, water, slaughterhouses, markets, tramways, library, cemetery, the Victoria Gardens pleasure ground, a fair field, and real estate worth $1,000,000. Pop., 1911, 17,586.

NEBENIUS, nā-bā'nē-ŭs, KARL FRIEDRICH (1784–1857). A German statesman and economist, born at Rhodt, near Landau. In 1819 he took a prominent part in working out the Baden constitution and for many years was the principal statesman of the Grand Duchy. In 1833 he was made Privy Councilor of State and soon afterward became Minister of the Interior and President of the Cabinet Council. Owing, however, to reactionary influences, he did not keep this position very long, retiring in 1839. In

1845 he again joined the cabinet, but the revolution of 1849 compelled him to resign, and thereafter he devoted himself entirely to literary pursuits. He published, among many treatises on political economy: *Betrachtungen über den nationalökonomischen Zustand Grossbritanniens in staatswirtschaftlicher Hinsicht* (1818); *Ueber technische Lehranstalten* (1833); *Baden in seiner Stellung zur deutschen Frage* (1850); and wrote a *Geschichte der Pfalz*, which appeared posthumously (1874).

NE'BO (from Bab. *nabû*, to call, name, proclaim). A deity of the Babylonians and Assyrians, mentioned in Isa. xlvi. 1. The name also occurs in the Old Testament as a geographical term. (See NEBO, MOUNT.) In cuneiform literature the form is Nabu or Nabium. It is no doubt Semitic and means "announcer," "proclaimer." He was consequently an oracle giver. He was the local patron deity of Borsippa, opposite the ancient city of Babylon, and it is possible that he was likewise the god of Babylon before the ascendancy of the Sumerian god Marduk, seeing that he maintained his position of importance even after Marduk had become the head of the Babylonian pantheon. (See MARDUK; MERODACH; BABYLON.) There was a shrine to Nebo in Marduk's temple at Babylon to which Nebo was carried in solemn procession on the New Year's Day, while the statue of Marduk was on the return trip carried part way back to E-zida (the true house), Nebo's temple in Borsippa. To express further the relationship to Marduk, Nebo was regarded as the son of Marduk. Nebo was the scribe among the gods (*tupshar*), the "bearer of the destiny tablets of the gods," the "writer of Esagil." As such naturally he became the god of wisdom, and it is in this capacity that he was chiefly worshiped by the Assyrians. To Nebo and his consort Tashmitum Assyrian rulers ascribe the art of writing on stone and tablets, and all learning is eventually traced back to him. In this respect he supplanted an earlier god of wisdom, Ea, whose cult reaches back to a still higher antiquity than that of Nebo or Marduk. He was identified with the planet Mercury. Consult: Morris Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898); id., *Die Religion Babyloniens und Assyriens* (Giessen, 1902–12); Zimmern, in Eberhard Schrader, *Die Keilinschriften und das Alte Testament* (3d ed., Berlin, 1902); Alfred Jeremias, *Das Alte Testament im Lichte des alten Orients* (Leipzig, 1906); Condamin, in Joseph Huby, *Christus: Manuel d'histoire des religions* (Paris, 1912).

NEBO, MOUNT. The mountain from which, according to the Book of Deuteronomy (xxxii. 49, xxxiv. 1), Moses viewed the land of Canaan before his death. It has been identified with the mountain Neba—a ridge 2643 feet above the Mediterranean, situated 5 miles southwest of Heshbon. The name Nebo also occurs as that of a town in Moab (Num. xxxii. 3 and on the Moabite stone) and a town in Judah (Ezra ii. 29). It is identical in form with the name of a well-known Babylonian god Nabu (see NEBO), whose worship appears to have spread far to the west. The tradition associating the death of Moses with Mount Nebo may have had as a starting point the existence of a sanctuary on the top of the mount or, at all events, the sacred character of the mountain.

NEBRAS'KA (North American Indian, meaning flat or broad water). One of the north-central States of the American Union, popularly known as the Tree-Planter State. It lies between lat. 40° and 43° N. and between long. 95° 20′ and 104° W. It is bounded on the north by South Dakota, on the east by Iowa and Missouri, on the south by Kansas and Colorado, and on the west by Wyoming and Colorado. Its shape is that of a rectangle whose eastern end is cut off diagonally by the Missouri River and whose southwestern corner is overlapped by the northeastern corner of Colorado. Its extreme length from east to west is 455 miles, and its breadth from north to south 208 miles. Its area is 77,530 square miles, of which 712 square miles are water. It ranks fifteenth in size among the States.

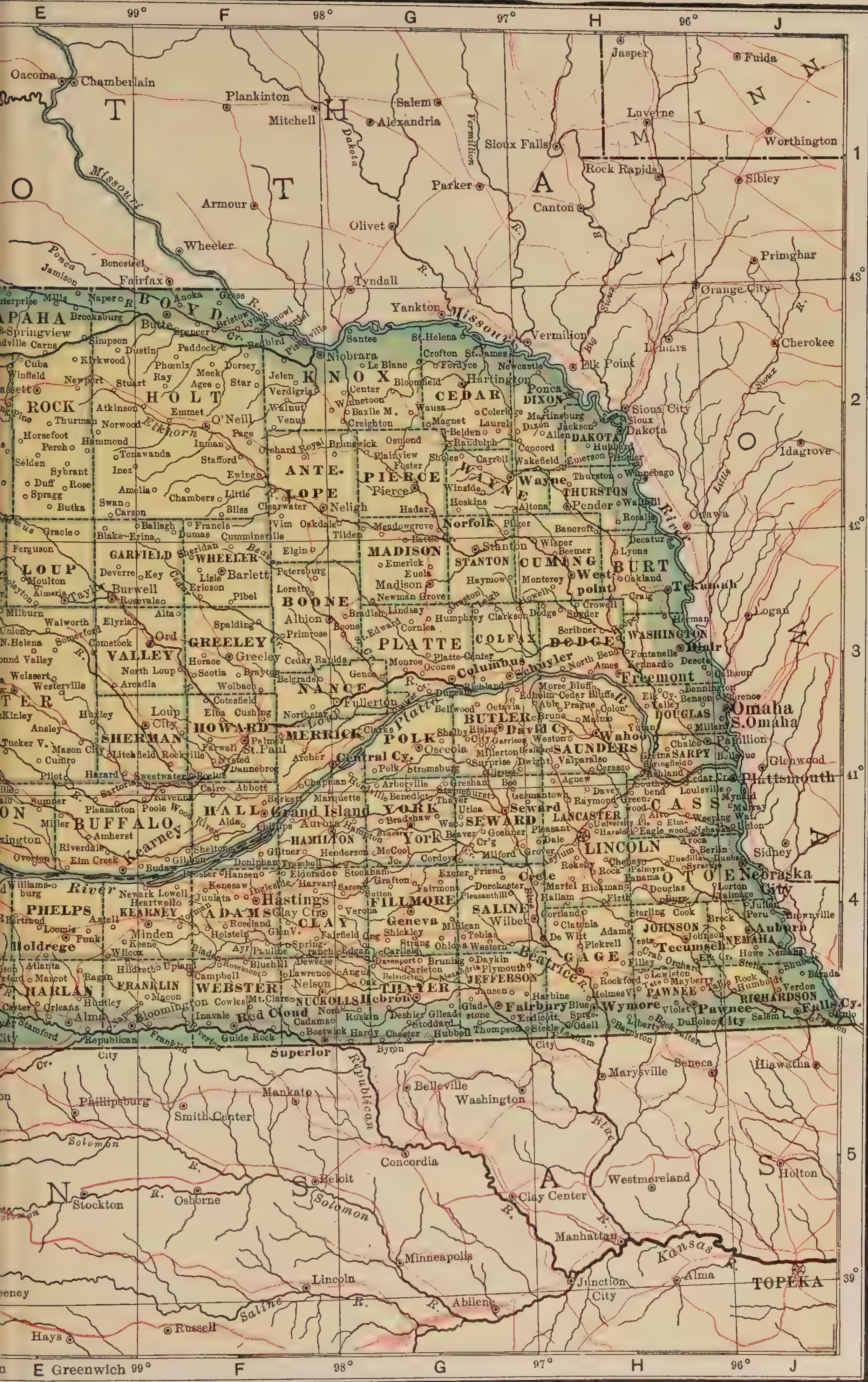
Physiography. Nebraska lies in the region of the Great Plains skirting the east slope of the Rocky Mountains, towards whose foothills it rises in a gentle, undulating incline. Its whole western half lies at an elevation of more than 2500 feet above the sea. Though level in the central portion and along the lines of transcontinental travel, the land is rolling and surprisingly diversified. The physiographic relief varies from 842 feet at Rulo in southeast Nebraska to 5084 feet at Hogback Mountain, near the Wyoming line. The State has five well-defined physiographic regions—loess, drift, sand hills, bad lands, and buttes and plateaus. A line drawn from the southwest to the northeast corner divides the State into its two important physiographic regions, the agricultural loess plain in the southeastern half and the sand hills of the grazing region in the northwestern half. In the western and northwestern counties occur the famous Nebraska Bad Lands, and bordering them to the westward the butte and high plateau region.

Hydrography. The State is drained entirely by the Missouri River and its tributaries. Owing to the gentle and regular slope of the land, most of these rivers flow in nearly straight parallel lines eastward or southeastward, and they are for the most part wide and shallow. The three principal rivers, besides the Missouri (on the boundary), are the Platte in the centre, the Niobrara in the north, both flowing through the whole length of the State, and the Republican in the south, the latter coming from Kansas and returning to that State to form the Kansas River.

Climate. The climate is continental, dry, and exhilarating. The mean temperature for January is 21.7° F. and for July 74.5° F. The extremes are very great, the mercury sometimes falling to — 35° F. and even — 45° F. and at times rising to 114° F. The nights are cool. The climate of the western third of the State is, however, quite arid, and differs considerably from that of the eastern third, where agriculture is very successful. The annual rainfall is 23 inches, but this is very unevenly distributed. Averaging about 32 inches in the east, it is sufficient to support agriculture. In the western half it is below 20, and in the extreme west as low as 12 inches, so that here agriculture depends on irrigation and "dry-farming" culture. The greatest amount of rain falls in May and June, and more than three-fourths of the annual rain falls during the six months of the growing season, April to September. The prevailing winds of winter are from the northwest, while those of the summer are from the south and southeast.

Soils. More than half of the State is covered with glacial drift and loess, the drift being confined to the eastern counties. The loess deposits

NEBRASKA
SCALE OF STATUTE MILES
0 10 20 30 40 50 60 70 80
SCALE OF KILOMETERS
0 10 20 40 60 80 100 120
Places of 100,000 and over Omaha
5,000 to 100,000 S.Omaha
2,000 to 5,000 Norfolk
County Towns
Railroads
SIOUX
DAWES
SHERIDAN
CHERRY
BOXBUTTE
MORRILL
GARDEN
GRANT
HOOKER
THOMAS
SCOTTS BLUFF
BANNER
KIMBALL
CHEYENNE
DEUEL
ARTHUR
MCPHERSON
LOGAN
KEITH
LINCOLN
PERKINS
CHASE
HAYES
FRONTIER
DUNDY
HITCHCOCK
REDWILLOW
COLORADO
Custer
Hot Springs
Chadron
Rushville
Alliance
Hyannis
Thedford
Gering
Bridgeport
Oshkosh
Kimball
Sidney
Chappell
Ogallala
North Platte
Julesburg
Sterling
Holyoke
Fort Morgan
Akron
Yuma
Benkelman
Imperial
Trenton
McCook
Atwood
Oberlin
St. Francis
Goodland
Colby
Hoxie
Russell Sprs.
Gove
Sharon Springs
Longitude West


E
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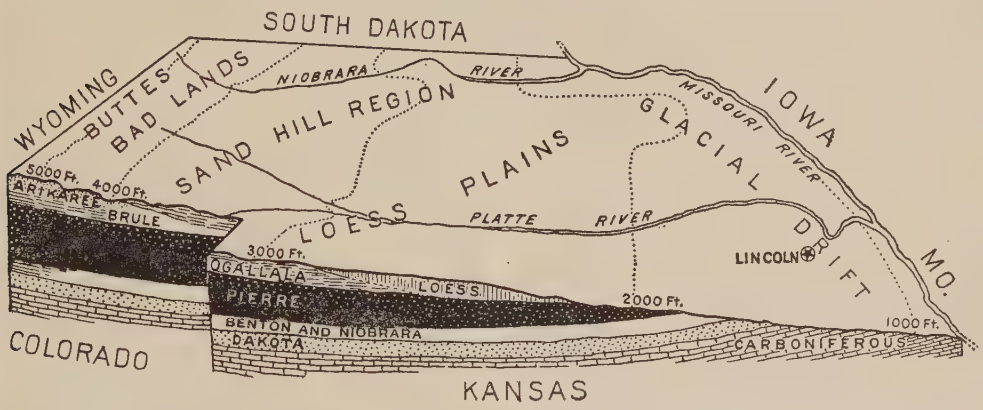
Missouri
Chamberlain
Oacoma
Plankinton
Mitchell
Salem
Alexandria
Sioux Falls
Jasper
Fulda
Luverne
Worthington
Rock Rapids
Sibley
Parker
Canton
Armour
Olivet
Wheeler
Bonesteel
Fairfax
Tyndall
Yankton
Vermilion
Primghar
Orange City
Cherokee
Le Mars
Elk Point
Sioux City
Dakota
Idagrove
Onawa
Logan
Omaha
S.Omaha
Glenwood
Plattsmouth
Sidney
Nebraska City
Auburn
Brownville
BOYD
ROCK
HOLT
KNOX
CEDAR
DIXON
DAKOTA
ANTELOPE
PIERCE
WAYNE
THURSTON
BURT
MADISON
STANTON
CUMING
GARFIELD
WHEELER
LOUP
BOONE
PLATTE
COLFAX
DODGE
WASHINGTON
VALLEY
GREELEY
NANCE
DOUGLAS
SHERMAN
HOWARD
MERRICK
POLK
BUTLER
SAUNDERS
SARPY
BUFFALO
HALL
HAMILTON
YORK
SEWARD
LANCASTER
CASS
OTOE
PHELPS
KEARNEY
ADAMS
CLAY
FILLMORE
SALINE
GAGE
JOHNSON
NEMAHA
HARLAN
FRANKLIN
WEBSTER
NUCKOLLS
THAYER
JEFFERSON
PAWNEE
RICHARDSON
O'Neill
Norfolk
Columbus
Fremont
Wahoo
Grand Island
Hastings
Kearney
Lincoln
Crete
Beatrice
Wymore
Tecumseh
Falls Cy.
Fairbury
Hebron
Red Cloud
Superior
Central Cy.
St.Paul
Seward
Wilber
Geneva
Ord
Albion
Fullerton
West point
Tekamah
Blair
Schuyler
David Cy.
Osceola
Holdrege
Minden
Alma
Marysville
Seneca
Hiawatha
Belleville
Washington
Phillipsburg
Smith Center
Mankato
Concordia
Beloit
Stockton
Osborne
Clay Center
Manhattan
Westmoreland
Holton
Minneapolis
Lincoln
Junction City
Alma
TOPEKA
Abilene
Russell
Hays
Kansas R.
Republican
Solomon
Saline
Blue
Platte
Loup
Elkhorn
E Greenwich 99°

range in thickness from 5 to 150 and even 200 feet, and, though soft and easily excavated, are very compact and retentive of moisture. They form a soil of inexhaustible fertility. The bluffs along the bottom lands are composed of this material. The alluvial lands of the river valleys also afford an excellent soil, though scarcely exceeding the loess in quality. Considerable areas in the west, as much as 20,000 square miles, are covered with sand hills (q.v.). These are found partly in the southwest corner, but chiefly in the large and arid area north of the Platte and west of the one hundredth meridian.

In the extreme west the Tertiary marls, even in the Bad Lands, can be made productive by irrigation or "dry farming."

Geology. The rocks of Nebraska may be described as undisturbed sediment, the older dipping slightly to the west, where they disappear. The outcrops of all the successive formations have a direction slightly east of north, and are found along the narrow valleys of certain streams. The oldest beds are the Pennsylvanian, exposed in the southeastern corner from Lincoln eastward, consisting essentially of about 1200 feet of limestone interspersed with shale. At Lincoln the Carboniferous disappears. Triassic and Jurassic rocks are wanting, but the Cretaceous series is well developed and underlies the entire State west of Lincoln. The Dakota (Cretaceous), composed of coarse ferruginous sand and clay, about 300 feet in thickness, outcrops from Jefferson County, through Lincoln in a general northerly and easterly direction to Dixon County. This is the water-bearing bed of the Great Plains. Twenty miles west of Lincoln some 20 feet of Graneros shales outcrop and are overlain by as many feet of Greenhorn limestone paralleling and overlying the Dakota, from Thayer to Dixon County. Just west of this, parallel to and superimposed upon it, comes 300 feet of Carlisle shale capped by 25 to 50 feet of Niobrara chalk. A line from Webster to Cedar County gives the general direction of the outcrops of these two formations. Next above these, and parallel to them, the Pierre shale outcrops in a general direction from Franklin to Knox County. The Pierre is the most extensive member of the Cretaceous, and attains a thickness of several thousand feet. Overlying the Pierre are many feet of early, middle, and late Tertiary beds, the oldest being the Bad Lands formation (Oligocene). The paleofauna of this well-known collecting ground varies between wide limits, and has attracted paleontologists from all institutions and countries. The Bad Lands have a general elevation of about 3500 feet, and, although the rainfall is scant, the gradient is steep and the wash extensive. The Oligocene covers the western fourth of the State and has a total thickness of 500 to 600 feet. Next above the Bad Lands comes the Butte formation (mostly Arikaree) of Miocene age. Much of this butte region is covered with bull pines, *Pinus ponderosa*, hence the name Pine Ridge. Pliocene merging into Pleistocene covers the northern tier of counties from Brown westward. The glacial drift covers the eastern fifth of the State, and two divisions, the Nebraskan (or Jerseyan) and the overlying Kansan, are distinct. Much of this formation is confounded with the loess, which lies directly above the drift, and which varies in thickness up to 150 feet. It is a light buff deposit consisting essentially of fine silt and fine sand, with varying amounts of lime, clay, and humic matter. It is believed to be partly æolian and partly aqueous in origin. It is retentive of moisture, fertile, and productive, and constitutes an agricultural area of the utmost consequence.

Mineral Products. The minerals produced consist chiefly of clay products, mineral waters, pumice, sand and gravel, sand-lime bricks and stone. The value of clay products in 1913 was $886,166. In the production of pumice Nebraska enjoys almost a complete monopoly. The total value of mineral products in 1913 was $1,433,718.



MAP OF NEBRASKA SHOWING BOUNDARIES, PRINCIPAL RIVERS, ALTITUDES, PHYSIOGRAPHIC DIVISIONS, AND GEOLOGY.

Agriculture. The entire land area is approximately 49,157,100 acres, of which 38,622,021 was in farms in 1910, these numbering 129,678. The average value of land per acre in 1910 was $41.80, and the total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, $2,079,818,647. Of the total number of farms, 80,237 were, in 1910, operated by owners and managers. In that year more than 70 per cent of the farms were from 100 to 500 acres in size.

There were, in 1910, 93,509 native white farmers out of a total of 129,678. The foreign-born white farmers numbered 35,707, and the negro and other nonwhites 462. Of the foreign-born white farmers, the greater number (15,478) were born in Germany.

The following table gives the acreage, produc-

tion, and value of some of the principal crops as estimated by the United States Department of Agriculture in 1914.

CROPS	Acreage	Prod. bu.	Value
Corn	7,100,000	173,950,000	$92,194,000
Wheat	3,668,000	68,116,000	64,710,000
Oats	2,175,000	69,600,000	27,840,000
Barley	113,000	2,656,000	1,248,000
Rye	122,000	1,952,000	1,444,000
Potatoes	118,000	9,440,000	5,098,000
Hay	1,500,000	* 2,535,000	17,492,000
Alfalfa †	1,022,485	* 3,208,055	22,466,385

* Tons. † State Board of Agriculture Report.

The total value of crops in 1909 was $196,125,632, and the combined reported acreage 17,231,205, representing 70.7 per cent of the total improved land in farms. The general character of Nebraska agriculture is indicated by the fact that nearly 80 per cent of the total value of crops was contributed by the cereals and 16.2 per cent by hay and forage. Nebraska is one of the most important corn-producing States. Census figures for 1909 show, in corn, an acreage of 7,266,057, a production of 180,132,807 bushels, valued at $88,234,846; in wheat, an acreage of 2,622,918, a production of 47,685,745 bushels, valued at $44,225,930; in hay and forage, an acreage of 4,520,034, a production of 5,776,475 tons, valued at $31,729,691; in oats, an acreage of 2,365,774, a production of 53,360,185 bushels, valued at $19,443,570. The total acreage of potatoes and other vegetables was 147,594, the production being valued at $5,931,738. Excluding potatoes and sweet potatoes and yams, the acreage of vegetables was 36,164. The production was valued at $2,118,393.

A large quantity of orchard fruits is produced. This amounted in 1909 to 3,572,253 bushels, valued at $1,932,124. Apples contributed more than nine-tenths of this quantity, peaches, nectarines, and cherries most of the remainder. The production of grapes in 1909 amounted to 4,752,217 pounds, valued at $137,295. Strawberries are the most important of the small fruits, with blackberries and dewberries ranking next. The total acreage of small fruits in 1909 was 1411, and the production 1,594,421 quarts, valued at $159,169. The growing of sugar beets has become an important industry. The total acreage of this crop in 1909 was 4191, and the production 39,874 tons, valued at $180,247.

Live Stock and Dairy Products. Stock raising is of great importance. The total value of live stock on farms in 1910, including poultry and bees, was $222,222,000. Cattle are raised in large quantities for market, and dairying is an important industry. The following figures are the estimates of the United States Department of Agriculture for Jan. 1, 1915: dairy cows, 625,000, valued at $39,062,000; cattle, other than dairy cows, 2,034,000, valued at $82,987,000; horses, 1,038,000, valued at $95,496,000; mules, 85,000, valued at $8,925,000; swine, 3,809,000, valued at $41,518,000; sheep, 374,000, valued at $1,795,000. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $10,566,275. The milk sold amounted to 6,500,380 gallons, and the butter sold to 11,652,068 pounds. The total number of fowls of all kinds in 1910 was 9,351,830, valued at $4,219,158.

Irrigation. Irrigation is practiced to a considerable extent in the western part. In 1909, 1852 farms, or 1.4 per cent of the total number, were irrigated. The area of irrigated land in 1912 was 273,018 acres. Enterprises operating in 1914 were capable of supplying water to an area of 684,642 acres, and the total area included under all irrigation projects, completed or under way, was 951,000 acres.

Forest Products. The total forest area in 1908 was 800,000 acres, or less than 2 per cent of the total land area. The total value of the output of lumber in 1909 was $2,021,366. In addition there were produced during the same year on the farms forest products valued at $795,053.

Manufactures. In 1909 Nebraska ranked twenty-fifth among the States in the value of manufactured products, and the value per capita was $167. The table (p. 675) gives the most important figures relative to manufactures for 1909 and 1904.

Owing partly to the natural advantages for feeding cattle, and partly to location in the centre of the corn and cattle-raising sections of the country, the slaughtering and packing of meat is the most important industry. A large amount of live stock is bred in Nebraska, and much is brought from other States to be fattened for market. In 1909 the State ranked fourth in the value of such products.

The centre of the slaughtering and meat-packing industry is South Omaha, which is surpassed in this respect only by Kansas City, Mo., and Chicago. The importance of this industry is best indicated by the fact that in 1909 it gave employment to 24.7 per cent of the total number of wage earners engaged in all manufacturing industries and contributed 46.4 per cent of the aggregate value of products. Beeves slaughtered in 1909 numbered 651,258; sheep, 1,127,962; and hogs, 2,103,602. The total value of the fresh beef produced was $26,914,613, and the pork was valued at $8,624,522. Flour and gristmill products ranked second in point of industrial value. The most important of these products is white flour, of which there were produced, in 1909, 2,252,828 barrels, valued at $11,379,662. Large quantities of graham flour, corn meal, rye flour, and buckwheat flour are also produced. Butter is the chief output of the dairies. Other important industries not mentioned in the table are those in connection with the manufacture of men's clothing, gas, artificial stone, paint and varnish, confectionery, brick and tile, and tobacco.

The total number of wage earners in 1909 was 24,336, of whom 20,941 were males. The wage earners 16 years of age and under numbered 217, of whom 178 were males. For the great majority of wage earners the prevailing hours of labor range from 54 to 60 a week and from 9 to 10 hours a day.

The four cities having a population of over 10,000 in 1910, Omaha, Lincoln, South Omaha, and Grand Island (qq.v.), gave employment to 70.2 per cent of the total number of wage earners and produced 81.5 per cent of the total value of products. South Omaha, engaged almost exclusively in the slaughtering and meat-packing industries, had in 1909 a manufacturing output valued at $95,435,712. Omaha, which in 1909 had 8023 wage earners, manufactured products valued at $60,824,550. The smelting and refining of lead is by far the most important industry of this city.

Transportation. The eastern and more popu-

lous section of the State greatly exceeds in mileage the western, which has but one line running north and south. The State is crossed from east to west by three large railroad systems—the Chicago, Burlington, and Quincy, the Union Pacific, and the Chicago and Northwestern. The total steam-railroad mileage of main track in 1914 was 6148. The most important lines and their mileage are: the Chicago, Burlington, and Quincy, 2850; the Union Pacific, 1184; the Chicago and Northwestern, 1071; the Missouri Pacific, 371; the Chicago, Rock Island, and Pacific, 246; the Chicago, St. Paul, Minneapolis, and Omaha, 308; the St. Joseph and Grand Island, 112. The total mileage of electric railway in 1914 was 220. The steam and electric railways are under the complete jurisdiction of the State Railway Commission.

SUMMARY FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY: Total	PERSONS ENGAGED IN INDUSTRY: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	2,500	31,966	24,336	$99,901	$13,948	$199,019	$47,938
	1904	1,819	25,356	20,260	80,235	11,022	154,918	30,866
Bread and other bakery products	1909	279	1,155	646	1,092	373	3,014	1,342
	1904	138	567	383	654	188	1,351	631
Butter, cheese, and condensed milk	1909	37	602	383	2,975	256	7,681	1,246
	1904	40	390	253	1,861	137	3,326	654
Cars and general shop construction and repairs by steam-road companies.	1909	13	4,021	3,685	6,311	2,271	4,642	2,918
	1904	30	3,626	3,245	5,975	2,109	4,395	2,478
Flour-mill and gristmill products	1909	249	1,455	839	9,472	519	17,836	2,619
	1904	234	1,324	863	6,497	468	12,190	2,037
Foundry and machine-shop products	1909	73	1,346	1,020	2,808	595	2,930	1,414
	1904	46	626	518	920	287	1,092	664
Leather goods	1909	30	365	266	988	197	1,583	605
	1904	22	364	247	906	146	983	447
Liquors, malt	1909	14	547	424	3,999	290	3,335	2,710
	1904	16	338	265	2,558	186	1,664	1,205
Lumber and timber products	1909	48	707	543	1,155	356	2,021	795
	1904	27	416	356	379	234	645	381
Printing and publishing	1909	674	3,884	2,329	4,979	1,397	6,667	4,956
	1904	631	3,326	2,073	3,616	1,093	4,991	3,697
Slaughtering and meat packing	1909	18	7,221	6,015	19,414	3,372	92,305	13,947
	1904	9	6,462	5,590	20,606	3,159	69,329	8,051

Banks. The first session of the Territorial Legislature in 1855 pronounced currency banking a crime, and no banks were chartered. The necessity for currency, however, was such that insurance companies issued a disguised form of paper money. In 1856, under special charters, certain institutions did a banking business, in spite of the laws to the contrary. The general panic of 1857 swept all such institutions out of existence. For almost a decade all the banking business was performed by private banks; then national banks began to be organized.

A considerable increase in the number of banks came about in 1880, when the era of railroad building commenced. An Act regulating banks was passed in 1889, establishing a State Banking Board and providing for reports and examinations. In 1909 Nebraska passed a bank guaranty act, which has proved very successful in operation. In 1893 there were eight savings banks in Omaha, but only one existed in 1900. On Sept. 12, 1914, there were 220 national banks with an aggregate capital of $15,845,000; surplus, $8,012,335; cash, etc., $3,204,023; loans, $96,132,273; deposits, $87,786,114. On April 21, 1915, there were 772 State banks with a capital of $16,420,000; surplus, $3,985,311; cash, $5,297,151; loans, $95,629,881; total individual deposits, $100,952,813.

Government. The present constitution was adopted in 1875. Amendments may originate in either branch of the Legislature or among the people, but to become a part of the constitution must be agreed upon by three-fifths of the members of each House and carried by a majority of the electors.

Legislative.—The Legislature consists of a Senate and a House of Representatives. The House of Representatives, by reapportionment made in 1911, consists of 77 members, and the Senate of 28 members. The number of Representatives must never exceed 100 nor the Senators 33. Sessions of the Legislature are biennial and begin on the first Tuesday in January in the year next following the election of members. After the expiration of 20 days of the session, no bills or joint resolutions of the nature of bills may be introduced, except with regard to matters relative to which the Governor shall, in special message to the Legislature, call its attention to the necessity of legislation. The initiative and referendum have been adopted and are in full force. The term of office for both Senators and members of the House is two years.

Executive.—The executive department of the State consists of a Governor, Lieutenant Governor, Secretary of State, Auditor of Public Accounts, Treasurer, Superintendent of Public Instruction, Attorney-General, and Commissioner of Public Lands and Buildings. Each holds office for the term of two years. The Governor and Lieutenant Governor must have attained the age of 30 years. The Treasurer is ineligible to the office for two years next after

the expiration of two consecutive terms for which he was elected.

Judiciary.—The judicial power is vested in a supreme court, district courts, county courts, justices of the peace, police magistrates, and such other inferior courts as may be created by the Legislature. The State is divided into six judicial districts, in each of which there is elected, for a term of four years, one judge of the district court. In each organized county there is elected for two years a judge of the county court.

Suffrage and Elections.—Every male person of the age of 21 years or upward, who has resided in the State for six months and in the county, precinct, or ward for the term provided by law, may be an elector, provided that he is a citizen of the United States or that he, if a person of foreign birth, shall have declared his intention of becoming a citizen at least 30 days prior to the election. The general election is held every two years, on the Tuesday next succeeding the first Monday in November. All candidates for elective offices, except those expressly excepted, are nominated by primary elections. Provision is made for the preference vote for President and Vice President of the United States and for United States Senator. There is a stringent corrupt-practices act, limiting and regulating the expenditures of candidates for office.

Local and Municipal Government.—The Legislature may form no new county of an area less than 400 square miles nor reduce any county to less than that area. Counties may organize into townships whenever a majority of the legal voters of such county shall so determine. Cities of the first class (between 5000 and 100,000 in population) may frame a charter for their own government.

Miscellaneous Constitutional and Statutory Provisions.—Property acquired by a wife after marriage remains separately her own. Women who own assessed property or who have children of school age may vote in school meetings. The sale of liquor is regulated by local option. Under the State law, however, all saloons are compelled to close at 8 P.M. and remain closed until 7 A.M. There is also a law forbidding the sale of liquor on dining cars and in all territory within 2 miles of an incorporated city or village.

Finance. Nebraska has no bonded or funded debt. The floating debt, composed entirely of outstanding warrants, amounted, on Nov. 30, 1912, to $374,394. The State constitution provides that the revenue from certain sources be set aside for a perpetual common-school fund, the income only being available. The fund in 1912 amounted to $8,482,143. The university fund, amounting to $218,377, was derived from the sale of 45,426 acres of land granted by Congress. Other funds include the agricultural college fund, amounting in 1912 to $545,064, the normal endowment fund, and general and special funds. The debt per capita was 31 cents in 1912. The total receipts for one year ending Nov. 30, 1914, were $6,451,742; the expenditures, $6,346,034. On that day there was a balance of $746,108 in the treasury.

Militia. The males of militia age (18–44) in 1910 numbered 267,497. The organized militia comprises one brigade, including two regiments of infantry, a company of signal troops, and a detachment of sanitary troops. The total strength in 1915 was 1264 privates and 131 officers.

Population. The population by decades is as follows: 1860, 28,841; 1870, 122,993; 1880, 452,402; 1890, 1,058,910; 1900, 1,066,300; 1910, 1,192,214. The est. pop. in 1914 was 1,245,873; 1920, 1,296,372. The population per square mile in 1910 was 15.5, compared with 13.9 in 1900. The larger part of the population is in the southeastern counties, the western half being, on account of its aridity, rather sparsely populated. The urban population, i.e., that of places of 2500 or over, in 1910 was 310,852, and the rural 881,362. The foreign-born population numbered 24,361; native whites of foreign or mixed parentage, 362,353, and negro, 7689. The largest number of foreign-born whites came from Germany. The population was divided in 1910 into 627,782 males and 564,432 females. The males of voting age numbered 353,626. The largest city is Omaha with a population in 1910 of 124,096 and in 1914 (estimated) of 133,274. Some other cities with their populations in 1910 and 1914 (estimated) are as follows: Lincoln, 43,973, 45,643; South Omaha, 26,259, 26,368; Grand Island, 10,326, 11,505; Hastings, 9338, 10,252; Fremont, 8718, 9345.

Education. The general excellence of educational conditions in Nebraska is indicated by the fact that only one other State, Iowa, had a smaller percentage of illiteracy in 1910. Of a population of 10 years of age and over numbering 924,032, there were in that year 18,009 illiterates. The percentage of illiteracy among the native whites of native parentage was 0.6, among foreign-born whites 7.1, and among the negroes 7.2. According to the thirteenth census the total school population, ages 6 to 20 years, was 373,868, and of this number 261,219 were attending school. The report of the State Superintendent of Education for 1914 shows a total school population (ages 5 to 21 years) of 383,882, a total school enrollment of 288,369, and an average daily attendance of 214,152. The total number of teachers employed in that year was 12,018, of whom 10,549 were women and 1449 men. The average monthly salary of men teachers was $84.25 and of women teachers $58.70. The total expenditure for public schools is over $10,000,000 per year. There were 240 accredited high schools in 1913. In addition there were 192 nonaccredited high schools approved by the State Superintendent under the free-high-school law. Special attention has been given in recent years to agricultural training in the high schools, and in 1913 legislation was enacted permitting qualified high schools to give training in agriculture, manual training, and home economics. The State has a free-textbook law. The State normal schools are situated at Peru, Kearney, Wayne, and Chadron. The University of Nebraska, a part of the educational system of the State, is situated at Lincoln. The other institutions of higher education, all coeducational, are Bellevue College at Bellevue, Cotner University at Bethany, Union College at College View, Doane College at Crete, Grand Island College at Grand Island, Hastings College at Hastings, University of Omaha at Omaha, the Nebraska Wesleyan University at University Place, and York College at York. Creighton University at Omaha is a Roman Catholic institution for men. There is also a school of agriculture at Curtis.

Charities and Corrections. The charitable and correctional institutions under control of the State include the Institute for the Blind at Nebraska City, the Institute for the Deaf and Dumb at Omaha, the Institute for the Feeble-Minded at Beatrice, the Industrial School for Juvenile Delinquents at Kearney, a Girls' Industrial School at Geneva, an Industrial Home for Girls at Milford, asylums for the insane at Lincoln, Norfolk, and Hastings, an Orthopedic Hospital for Crippled and Deformed Children at Lincoln, soldiers' and sailors' homes at Grand Island and Milford, the State penitentiary at Lincoln. There are a juvenile-court law and a board of control for dependent and neglected children. Prisoners may be subjected to an indeterminate sentence and have, at the discretion of the State Prison Board, the privilege of parole.

Religion. The Church members or communicants in the State form only about 30 per cent of the total population. The principal denominations in order of their numerical strength are the Roman Catholic, comprising over one-fourth of the Church members, Methodist, Lutheran, Presbyterian, Christian, Baptist, and Congregational.

History. The territory now constituting the State was originally a part of the Louisiana Purchase and afterward a part of Missouri Territory. Coronado (q.v.), setting out from Mexico in search of the seven cities of Cibola and of Quivira, claimed that in 1541 he journeyed on the great plain as far as lat. 40° N., the southern boundary of the State. There are stories of other Spanish explorations, but little is known of them. In 1673 Marquette passed the mouth of the Missouri and marked the Platte from Indian stories. Pierre and August Chouteau, brothers engaged in the fur trade, reached the Platte about 1807. Lewis and Clark, in 1804–06, skirted the eastern boundary of the present State. The *Trudeau Journal* (discovered 1912) shows there were trading posts as early as 1794. The American Fur Company placed one at Bellevue in 1810, and posts were established at Omaha in 1825 and at Nebraska City in 1826. Fort Atkinson was established in 1819, but abandoned in 1827. With the admission of Missouri as a State in 1821, the territory was left practically without government. In 1834 part of the western Indian country was attached to Arkansas, the jurisdiction of the district court at Missouri was extended over another part, and a third portion was joined to Michigan Territory. The next year Col. Henry Dodge, with a force of dragoons from Fort Leavenworth, marched up the Platte valley to the forks and thence up the South Platte to the mountains. Many tribes of the Eastern Indians were then being transferred to this "Indian country."

New Fort Kearney was established on the Oregon trail in 1848.

Thousands of gold seekers passed through the Territory in 1849–50, and some stopped on the way in utter defiance of the law which forbade settlement among the Indians. The partly civilized tribes near Fort Leavenworth, who foresaw the inevitable extension of white settlement, wished for a territorial government in order to sell lands to better advantage. The Wyandots, led by their half and quarter bloods, in 1851–52 petitioned Congress to establish a Territory, with no success. A territorial delegate, Abelard Guthrie, was chosen in October, 1852. A bill to organize Nebraska Territory passed the House Feb. 2, 1853, but did not reach a vote in the Senate. In order to force action, a provisional government was organized by the residents, and William Walker was elected Governor July 25, 1853. Senator Douglas reported a bill in January, 1854, providing for the erection of a Territory, based on his principle of "squatter sovereignty." It was amended to provide for two Territories (see KANSAS-NEBRASKA ACT), passed both Houses, and was signed by the President May 30. By this Act the boundaries of the Territory of Nebraska were defined as the fortieth and forty-ninth parallels of latitude, from the Missouri to the summit of the Rocky Mountains. In 1861 all the region north of the forty-third parallel was constituted part of Dakota Territory, a small part from the southwest corner was added to Colorado, and the western boundary was extended to the one hundred and tenth meridian. With the creation of Idaho Territory from the northwestern portion of Nebraska in 1863, the State was reduced to its present limits except for a slight addition in the northeast in 1882.

Congress passed an enabling Act in 1864, but not until 1866 was a constitution adopted. The act of admission passed by Congress July 18 was not signed by the President. In February, 1867, he again vetoed a similar bill, but it was passed over the veto, and on March 1 the State was admitted.

Nebraska from its establishment as a State to 1896 was Republican in politics. Since that year, however, the Democrats have practically equaled the Republicans in strength. Both Republican and Democratic parties have been split by factional disturbances. Nebraska was more conservative than some of its neighboring States in the adoption of the more radical principles of government favored by insurgent or progressive wings of both parties. The "Progressives," however, attained considerable strength and succeeded for several years in electing their candidate to Congress. In the election of November, 1908, Bryan received 131,099 votes; Taft, 126,997; Chafin, 5179; Debs, 3524. The Democrats elected their candidate, A. C. Shallenberger, for Governor, and a Democratic Legislature. The Republicans elected the remaining State officers. In the State elections held in 1910 the Republicans elected their candidate, Chester H. Aldrich, Governor, and the Democrats a United States Senator, Gilbert M. Hitchcock. In 1912 the Progressive party, indorsing the Republican candidates chosen at the primaries, had no candidates for State offices. They did, however, elect delegates to vote for Mr. Roosevelt at the National Progressive Convention. In 1912 Wilson received 109,008 votes; Roosevelt, 72,678 votes; Taft, 34,216 votes; Debs, 10,185 votes; and Chafin, 3383 votes. The Democrats elected J. H. Morehead Governor by about 10,000 plurality, and Mr. Norris received the popular preferential vote for United States Senator. In this election several amendments to the constitution were carried, among these a provision for the initiative and referendum. Governor Morehead was reëlected Governor by a plurality of about 20,000 votes. The following is a list of the Governors of the State, with their party affiliations.

TERRITORIAL

Francis Burt		1854
T. B. Cuming (acting)		1854–55
Mark W. Izard		1855–57
T. B. Cuming (acting)		1857–58
William A. Richardson		1858
J. S. Morton (acting)		1858–59
S. W. Black		1859–61
A. S. Paddock (acting)		
Alvin Saunders		1861–67

STATE

David Butler	Republican	1867–71
W. H. James (acting)		1871–73
Robert W. Furnas	Republican	1873–75
Silas Garber	"	1875–79
Albinus Nance	"	1879–83
James W. Dawes	"	1883–87
John M. Thayer	"	1887–91
James E. Boyd	Democrat	*1891
John M. Thayer	Republican	1891–92
James E. Boyd	Democrat	1892–93
Lorenzo Crounse	Republican	1893–95
Silas A. Holcomb	Populist	1895–99
William A. Poynter	"	1899–1901
Charles H. Dietrich	Republican	1901
Ezra P. Savage	"	1901–03
John H. Mickey	"	1903–07
George L. Sheldon	"	1907–09
Ashton C. Shallenberger	Democrat	1909–11
Chester H. Aldrich	Republican	1911–13
J. H. Morehead	Democrat	1913–17
Keith Neville	"	1917–19
Samuel R. McKelvie	Republican	1919–

* Ousted by decision of Supreme Court, Nebraska, May, 1891; restored by decision of Supreme Court, United States, February, 1892.

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NEBRASKA. A river of Nebraska. See PLATTE.

NEBRASKA, UNIVERSITY OF. A State university for higher education founded at Lincoln, Neb., in 1869 and opened to students in September, 1871. The university forms a part of the educational system of the State. The governing body is the board of regents, which includes six members who are elected, but was formerly composed of 12 members who were appointed. Included in the university are the following colleges, each of which has its own faculty: arts and sciences, agriculture, engineering, graduate, law, medicine, teachers. A summer session is also maintained. Tuition in the university is free to residents of Nebraska in all of the colleges except the so-called professional colleges; undergraduate students who are nonresidents of the State and resident students in professional colleges pay a moderate tuition. All departments are open to both men and women. The chief sources of support are a tax of one mill per dollar of the grand assessment roll of the State, with interest from endowment land leases on sales and on permanent fund investments. The university also benefits by United States appropriations under the Morrill acts for instruction in agriculture and the mechanic arts, the Hatch-Adams acts aiding agricultural experimentation, and the Smith-Lever Act of 1914 aiding agricultural extension. On the campus in Lincoln are 13 buildings which house all the departments except a medical school, which is located at Omaha, and a school of agriculture and an experiment station conducted on the university farm of 320 acres near the city of Lincoln. The libraries of the various colleges contain 116,000 bound volumes, and the museums contain large and valuable collections. The total enrollment in all departments in 1913–14 was 4133. There were 281 members of the faculty, including 83 professors, 20 associate professors, 46 assistant professors, 63 instructors, and 64 assistants. The Legislature of 1914 provided for a special three-fourths of a mill levy upon the grand assessment of the State, continuing for six years, for securing an extension of grounds in the city of Lincoln and for new buildings and their equipment on both the city campus and the university farm; approximately $2,300,000 will be spent for the new physical plants. The chancellor in 1915 was Samuel Avery, Ph.D.

NEBRASKA CITY. A city and the county seat of Otoe Co., Neb., 53 miles south of Omaha, on the Missouri River, here spanned by a fine steel railroad bridge, and on the Missouri Pacific and the Chicago, Burlington, and Quincy railroads (Map: Nebraska, J 4). It has a United States government building, St. Bernard's Academy (Belgian) for young ladies, a fine monument to J. Sterling Morton, the State Institute for the Blind, and a public library. The city is the centre of a noted fruit belt and of a rich corn region. The principal industrial plants include large stockyards, canneries, grain elevators, flour mills, lumber and planing mills, foundries, press-drill works, a starch factory, packing and provision house, breweries, brickworks, windmill, cigar, vinegar, and pickle factories, and a cold-storage plant. Arbor Lodge, the old homestead of J. Sterling Morton, has been developed into a magnificent estate of 900 acres and contains the finest arboretum in the State. Settled in 1855 on the site of old Fort Kearney, Nebraska City was incorporated as a city of the second class in 1871 and received a charter of the first class in 1891. It has since adopted the commission form of government. Pop., 1900, 7380; 1910, 5488.

NEBRASKA WESLEYAN UNIVERSITY. A coeducational institution for higher education founded at University Place, Neb., in 1886. It is under the control of the Methodist Episcopal denomination. The university includes a college of liberal arts, a teachers' college, a conservatory of music, a school of expression and oratory, a school of art, a teachers' training course, and an academy. The total enrollment in all departments in 1914–15 was 840, and the faculty numbered 34. The university has a productive endowment of about $350,000, and the college grounds and buildings are valued at $305,800. The annual income is about $65,000. The library contains 8000 volumes. The chancellor of the university in 1915 was Clark A. Fulmer.

NEBRIJA, nā-brē'hä, or **LEBRIJA,** lā-brē'hä, ANTONIO DE (1444–1522). An eminent Spanish humanist, whose real name was Antonio Martínez de Jarava. From the city of his birth (Nebrija, or Lebrija) he became known as Antonio Nebrissensis. One of the most important leaders of the revival of learning in Spain, he was tutor to Queen Isabella, collaborator with Cardinal Ximenes on the celebrated Complutensian Polyglot Bible, and professor for

many years at the University of Alcalá. His works may be classified as philological, poetical, historical, juridical, medical, and theological. Aside from his chronicle of the reigns of Ferdinand and Isabella, his most important works are the *Dictionarium Latino Hispanicum et Hispanico Latinum* and the *Gramática sobre la lengua castellana*, both published in 1492, when there were no similar works in any other modern language.

NEBRIS, nĕb′rĭs. See DIONYSUS.

NEBRIS'SA VENE'RIA. See LEBRIJA.

NEBUCHADNEZZAR, nĕb′û-kăd-nĕz′zĕr, or, more correctly, **NEBUCHADREZZAR** (Heb., from Bab. *Nabu-kudŭrri-uṣur*, Nabu [Nebo], protect the boundary). The great King of the Chaldæan Empire, who ruled 605–562 B.C. He was the second of the name, Nebuchadnezzar I having been a distinguished monarch of the fourth dynasty of Babylon, reigning c.1160–1140 B.C. He was the son of Nabopolassar, Viceroy of Assyria in Babylonia, who, after the death of Asurbanipal, gained control of the Babylonian portion of the latter's empire in 625 B.C. The family was Chaldæan, hence the use of this name for the dynasty and for the land in later ages. (See CHALDÆANS.) Nabopolassar entered into alliance with the other great enemy of Assyria, the Medes, marrying his son to a daughter of the Median King Cyaxares, and apparently also with Psammetichus of Egypt. Nineveh was saved in 625 by the appearance of Assyria's ally, the Scythian King Madyas, who drove away the Medes. But a second attack by the Medes, supported no doubt by the Chaldæans, led to the fall of Nineveh in 606 B.C. The Assyrian Empire was forthwith partitioned; the Medes took possession of the upper Tigris valley and the lands to the north and east of the Euphrates; Nabopolassar made firm his control of the Euphrates valley; and from the west Necho, King of Egypt, advanced to the great river to reclaim for his land its ancient dominion in Syria. The division of spoils between Media and Babylon seems to have been prearranged, but Egypt's intrusion could not be suffered, and Nabopolassar sent Nebuchadnezzar against Necho. The latter seems to have been defeated at Carchemish (605 B.C.). But he was recalled by the news of the death of his father. Unfortunately we possess but scanty materials for the study of the continuation of Nebuchadnezzar's military and political career. The sources are, besides a few inscriptions, the partial accounts found in the Bible, Josephus (quoting Berosus; *Ant.*, x, 6–11, c. *Ap.*, i, 21), and Herodotus (containing obscure information concerning Egypt; ii, 151 et seq.) and a fragment of Menander. The books of Kings, Jeremiah, and Ezekiel enable us to follow to some extent Judah's relation to its new lord. At first King Jehoiakim submitted, but about 600 B.C. rebelled. After some delay Nebuchadnezzar sent his army against Jerusalem, which fell in 597, Jehoiakim dying during the siege. His son, Jehoiachin, suffered the Imperial chastisement of exile along with 10,000 citizens, an uncle, Zedekiah, being appointed to the throne by the conqueror. But the new King succumbed at last to the temptations to revolt offered by his neighbors, especially by Hophra (see APRIES), the ambitious King of Egypt, and drew upon himself the wrath of the great King. Jerusalem stood a siege of 16 months, but fell in 586 B.C. Zedekiah was blinded, the city was in part destroyed, almost 4000 Jews were carried away into exile and a smaller number in 581 B.C. (See JEWS.) This campaign broke the refractory spirit of the Syrian states, Tyre alone holding out and suffering a famous siege of 13 years, which ended in a truce and the rather ignominious departure of the Chaldæan army, which had labored in vain outside its walls. In 568 B.C. occurred a campaign which carried Nebuchadnezzar into the heart of Egypt, where, however, he obtained no permanent results. But it is the glory of this King that he prided himself not on the arts of war (he seems to have prosecuted them only at necessity), but on his works of peace. Most of his inscriptions are devoted to his building operations, especially in Babylon, which, destroyed as it had been by Sennacherib and since then racked by civil war, he rebuilt and restored to more than its pristine glory. The excavations of the Germans under Dr. Koldewey have uncovered the extent and grandeur of the fortifications, the palace, the temple of Marduk, and the great Procession Street, which Nebuchadnezzar reared out of patriotism and an eminent devotion to the gods. The sister city Borsippa shared in his benefactions, and he built or repaired temples in Sippara, Cutha, Uruk, Larsa, Ur, and other cities. Nebuchadnezzar's outward successes seem to have been based upon noble kingly qualities. His son Amil Marduk (see EVIL MERODACH) succeeded him, but was assassinated after a reign of two years (562–560). He was followed by his brother-in-law, Nergalsharuṣur (Neriglissor), the son of Belshumishkun (560–556). Labashi Marduk, his son and successor, was murdered after only nine months' reign. He was the last descendant of Nebuchadnezzar who sat upon the throne, Nabonidus (q.v.), the last King of Babylon, being a native Babylonian and not a Chaldæan. For Nebuchadnezzar's inscriptions, consult: Ball, in the *Proceedings of the Society for Biblical Archæology*, vols. x–xi (London, 1888–89); H. Winckler, *Keilinschriftliche Bibliothek*, vol. iii, part ii (Berlin, 1892); Langdon, *Building Inscriptions of the Neo-Babylonian Empire* (Paris, 1905); id., *Neobabylonische Königsinschriften* (Leipzig, 1912). For excavations in Babylon, consult Koldewey, in *Mittheilungen der deutschen Orient-Gesellschaft* (Berlin, 1899–1913), and id., *Das Wiedererstehende Babylon* (Leipzig, 1913). See also BABYLONIA and the literature quoted under that article.

NEB'ULA, IN MEDICINE. See LEUCOMA.

NEB'ULÆ (Lat. nom. pl., clouds, vapors, mists). Patches of luminous matter occurring in considerable numbers in various parts of the sky and differing from the stars in that they do not present simply small definite points of light, but rather large surfaces of widely varying brilliancy. We have acquired much exact knowledge about the nebulæ, especially in recent years, since the application of photographic processes to astronomical observation; and they have also been made the subject of extensive philosophical theories as to the origin, development, and construction of the universe, some of which are based upon too many hypothetical considerations to receive the unqualified assent of astronomers.

Only two nebulæ are visible to the naked eye: that in Andromeda and the great nebula in Orion. The former consists of an oval mass

of light about three times as long as it is broad and surrounded with several more or less distinct disconnected oval rings. There is also a central condensation in the middle of the whole mass. The Orion nebula, on the other hand, is of quite irregular shape, contains a number of stars, and is indented with at least one very large nonluminous break known as the fish mouth. Both these large nebulæ, in the telescopic field of view, cover a space of more than one square degree on the sky's surface. When tested by long-exposure photographs, they are found to be of truly gigantic size. It is now admitted that the entire constellation of Orion is included in the outlying parts of the great nebula. Condensations appear to fasten about the stars of the constellation; and indeed the conclusion seems irresistible that we are looking upon a universe in course of formation out of plastic and gaseous material. Many of the less conspicuous nebulæ are round or oval, often have a stellar central condensation, and sometimes one of a disklike form with uniform surface luminosity. These are the so-called planetary nebulæ. Then there are annular, or ring-shaped, nebulæ and spiral nebulæ. These last look like great whirlpools of matter apparently rotating rapidly and trailing long streamers of light. The very latest results in nebular photography seem to indicate that the spiral form is in fact the most prevalent one. The application of the spectroscope, and especially the spectrograph, to nebular study has proved that many nebulæ are really gaseous in constitution and not simply aggregations of stars too small and close together to be separated even by our most powerful telescopes. It has also been possible to measure with the spectroscope the velocity with which some of the nebulæ are moving through space in the direction of our solar system, and it is found that nebular velocities are of about the same order of magnitude as those observed in the case of ordinary stars. As to the changes of the shape and form of individual nebulæ, we have no decisive evidence. Indeed, the outlines of these objects are so hazy that no reliance can be placed upon ordinary drawings, and even photographs can mislead us, since what we see upon them depends in great measure upon the length of time during which the sensitive plate was exposed to the light of the nebula. The number of the nebulæ at present known is not far from 10,000, and the best catalogue of them is by Dreyer, published in the *Memoirs* of the Royal Astronomical Society of London.

As to their distance, our knowledge is still in the conjectural stage. No one has yet measured a nebular parallax (see PARALLAX) successfully, but it is extremely probable that their distances, like their velocities of motion, are of the same order of magnitude as the corresponding quantities for the fixed stars.

The theory of cosmic evolution known as the nebular hypothesis of Laplace aims to account for the origin and development of our solar system, beginning with a presupposed mass of formless matter. This mass, assuming a rotation under the influence of natural forces, might be expected to take upon itself the form of a flattened sphere; and if a contraction of its bulk should occur after the lapse of ages of time, certain rings of matter might be left behind, as it were, by the contracting mass. Such rings have indeed a certain analogy in the Andromeda nebula, and, their possible formation once granted, there is nothing to prevent the gradual breaking up of a ring under the action of gravitational forces. Its matter might then be gathered into a single ball, and thus would be formed a planet circulating in an orbit around the central condensing mass destined in later ages to form the sun itself. It will be seen that this hypothesis, while plausible, rests upon a basis of imagined possibilities rather than ascertained facts. While, therefore, it is most interesting, it must on no account be reckoned among those astronomical theories (such as gravitation) whose foundation is as strong as that underlying any of the scientific truths coming within the range of human knowledge. See ASTRONOMY; COSMOGONY.

Consult Isaac Roberts, *A Selection of Photographs of Stars, Star Clusters, and Nebulæ* (2 vols., London, 1894–1900), and A. M. Clarke, *The System of the Stars* (2d ed., ib., 1905).

NEBULAR HYPOTHESIS. See COSMOGONY; NEBULÆ.

NEB'ULY, or **NEBULE** (Fr. *nébulé*, from OF. *nebule*, cloud, from Lat. *nebula*, Gk. *νεφέλη, nephelē*, Skt. *nabhas*, OChurch Slav. *nébo*, cloud). One of the partition lines in heraldry (q.v.), which are intended to represent the clouds and hence are drawn horizontally.

NECCI. See CHESTNUT.

NECESSARIES (Lat. *necessarius*, requisite, indispensable, from *necesse*, OLat. *necessum*, indispensable, from *ne*, not + *cessus*, pp. of *cedere*, to yield). In its technical legal sense, such articles as are reasonably suitable or necessary to maintain a person in the condition in life which he occupies at the time they are furnished. The use of the term in this sense resulted from the doctrine of the common law that married women, infants, lunatics, or any incompetent persons cannot be held on their contracts; and in order to obviate the harsh effect of this rule, the courts adopted the policy of holding such persons for any articles furnished them which were actually necessary to sustain life. The courts continued the use of the word "necessary," but have extended its legal meaning until to-day it is a very elastic term. It is not limited only to food and clothing sufficient to sustain life, but may include articles which might be considered luxuries by persons in some stations in life, according to the circumstances of the case. In order to determine whether an article is a necessary, the character of the article itself, the use for which it was designed, the age, social position, wealth, and previous mode of living of the person to whom it was furnished must be considered. These are questions of fact and must, therefore, be submitted to a jury. See BANKRUPTCY; CONTRACT; HUSBAND AND WIFE; INFANT; LUNATIC; and consult authorities referred to under CONTRACT, ETC.

NECHES, nĕch'ĕz. A river of eastern Texas, rising in Van Zandt County and flowing southeast into Sabine Lake, whence its waters, with those of the Sabine River, find their way by Sabine Pass into the Gulf of Mexico (Map: Texas, E 4). It is about 350 miles long and waters a wide and fertile portion of Texas.

NECHO, nē'kō (Egypt. *Nekau*). The second King of the twenty-sixth Egyptian dynasty, called Pharaoh-nechoh in the Bible (2 Kings xxiii. 29 et seq.) and Nechos, Nechaus, etc., by

Greek writers. He succeeded Psammetichus I and reigned from 610 to 594 B.C. On the downfall of the Assyrian Empire, Necho attempted to gain possession of Syria (Breasted, 609) and, at the outset of his campaign, defeated and slew Josiah, King of Judah, who opposed him at Megiddo. Jehoahaz, the son of Josiah, after a brief reign of three months, was deposed by the Egyptians. Eliakim, who changed his name to Jehoiakim, was made King by Necho in place of Jehoahaz, and Judah was subjected to a tribute of 100 talents of silver and one of gold. Necho conquered Syria as far as the Euphrates, but was completely defeated at Carchemish by the Babylonian Crown Prince Nebuchadnezzar (605 B.C.) and lost all his conquests. Although unable to cope with the Babylonian Empire, Necho was an active and energetic ruler. He unsuccessfully attempted to construct a canal from the eastern arm of the Nile to the Red Sea, a precursor of the modern Suez Canal. Necho also built a fleet and sent it, manned by Phœnician sailors, on an exploring expedition around Africa. Consult: Alfred Wiedemann, *Geschichte Aegyptens von Psammetich I. bis auf Alexander den Grossen* (Leipzig, 1880); E. A. T. Wallis Budge, *A History of Egypt* (New York, 1902); J. H. Breasted, *A History of the Ancient Egyptians* (ib., 1908).

NECK (AS. *hnecca*, OHG. *hnac*, *nac*, Ger. *Nacken*, neck; probably connected with OIr. *cnocc*, OBret. *cnoch*, hill, elevation). The portion of the anatomy between the head and the shoulders. In the human being there are several muscles that pass from the skull to the thorax, which, together with the œsophagus and the trachea, form the principal bulk of the neck. Through the neck run very important blood vessels between the brain and the thorax, among these being the carotid arteries and the jugular veins, accidental cutting of either of which usually causes death very promptly. Through the œsophagus the food passes into the stomach, and through the trachea the air passes into the bronchi and thence into the lungs. The principal muscles of the neck are the platysma myoides, the sternocleidomastoid, the infrahyoid and suprahyoid, the muscles of the tongue, the muscles of the palate and of the pharynx, and the prevertebral muscles, as well as certain of the muscles of the back which are inserted into the skull, as the trachelomastoid, complexus, transversalis cervicis, the rectus group, the longus colli, the three scaleni, and the cervicalis ascendens. Several of these muscles form important triangles with the aid of the ramus of the jaw, the clavicle, the hyoid bone, and the imaginary centre line of the body. These triangles are of use to the surgeon in locating and describing important structures. For instance, the digastric triangle is bounded by the jaw, above, and on either side by a belly of the digastric muscle, attached (at the apex of the triangle) to the hyoid bone below. Within this triangle lie portions of the facial and lingual arteries, and it is the site chosen for ligating the last-named artery.

In man there is present at the back of the neck a rudiment of an important elastic ligament which in some of the lower animals serves to sustain the weight of the head. It is called the ligamentum nuchæ and is a yellow elastic ligament which represents in the neck the supraspinous and interspinous ligaments of the vertebræ of the lower part of the spine. It extends from the external occipital protuberance to the spinous process of the seventh cervical vertebra. In front and on either side of the trachea lie the two lobes of the thyroid gland. The accessory thyroid glands are in close relation to it, and below, in children, is found the thymus.

NECK'AM, Alexander (1157–1217). An English Latinist, born at St. Albans, Hertfordshire, foster brother of King Richard I. Neckam studied in Paris and in 1180, or before, became a lecturer at the university there. In 1186 he returned to England and later entered an Augustinian monastery at St. Albans, where he did most of his writing. He wrote, on natural science, a prose essay, *De Naturis Rerum*, and *De Laudibus Divinæ Sapientiæ*, a treatment of the same subject in elegiac verse (both edited by Thomas Wright in the "Rolls Series of Chronicles and Memorials," 1863); also 42 fables. The fables are edited and Neckam's life sketched by Hervieux, *Les fabulistes latins* (3 vols., Paris, 1883–93). The *De Naturis Rerum*, a résumé of the scientific knowledge of the time, deals much with nautical matters; in particular it preserves the earliest European reference to the use of the magnetic needle as a guide to seamen (see page 183 of Wright's edition).

NECKAR, nĕk'kär. One of the principal right affluents of the Rhine. It rises in the Swabian Jura in the southwestern part of Württemberg, near the source of the Danube, flows northward through Württemberg, then west through Baden, and enters the Rhine at Mannheim, 30 miles south of the mouth of the Main (Map: Germany, C 4). It is 247 miles long and flows for the greater part of its course through a series of lake basins surrounded by vine-clad hills. It is navigable for small steamers to Heilbronn, 71 miles; for smaller vessels to Cannstatt, 116 miles; and for rafts to Rottweil. Heidelberg lies on its banks near its mouth, where the river is flanked by picturesque hills crowned by ruined castles. It is greatly used for floating timber.

NECKER, nâ'kâr', Jacques (1732–1804). A French statesman and financier. He was born Sept. 30, 1732, at Geneva, where his father was professor of public law. In 1747 Necker went to Paris and entered a banking house, where he served his apprenticeship in finance. In 1762 he established a banking business of his own in Paris and acquired a large fortune during the Seven Years' War. After retiring from business he became the representative of Geneva at the French court and also a syndic of the French East India Company. He likewise began his career as a writer and in 1773 gained the prize at the French Academy by his *éloge* on Colbert. He acquired a further reputation by his publications on political economy and finance, particularly his *Essai sur la législation et le commerce des grains* (Paris, 1775). On the removal of Turgot from office in June, 1776, Necker was called to assist in financial affairs, and after the brief administration of Clugny he was made Director General of Finances in June, 1777. Necker succeeded in restoring to some degree of order the general financial affairs of the country, though mainly by the perilous expedient of borrowing, which he was enabled to do to an almost unlimited extent, owing to the confidence reposed in his financial dexterity. He reformed and systematized the financial administration, made taxation more

equitable, and restored public confidence in the government. This was the most brilliant period of his life, and the salon of Madame Necker was the rendezvous for all the brilliant literary and political lights of the day. Necker's Protestantism, however, his extraordinary vanity, and some retrenchments which he had made in the royal household, together with his publication on the financial affairs of France, *Compte rendu au roi* (1781), made him an object of great dislike to both Queen and court, and on May 12, 1781, he was suddenly dismissed. He retired to Geneva, and while living in retirement on his estate of Coppet he wrote his famous *Administration des finances*, published in 1784. He returned to Paris in 1787, but was soon banished on account of an attack which he published on the financial policy and management of Calonne. In the financial crises which followed upon the administration of Loménie de Brienne, Louis XVI found himself under the necessity of calling Necker to the office of Director General of Finances and Minister of State. This was in the summer of 1788, and Necker recommended the calling of the States-General and thereby acquired his great popularity. When the court, on June 23, 1789, determined upon nullifying the resolutions of the Third Estate, Necker seemingly objected, and the King dismissed him on July 11 and required him to leave the French dominions. He obeyed, but the disturbances of July 12–14, culminating in the storming of the Bastile, were the result of his dismissal, and the King was under the necessity of recalling him. On the rejection by the Constituent Assembly of his scheme of a loan and the adoption instead of it of Mirabeau's scheme of assignats he resigned his office in September, 1790, and again retired to Coppet, where he died, April 9, 1804. Necker was able and honest, but he was a business man rather than a statesman. His daughter was the celebrated Madame de Staël (q.v.). A complete edition of Necker's writings, edited by his grandson, August de Staël-Holstein, was published in 15 volumes (1820–21). Consult: Madame de Staël, *La vie privée de M. Necker* (Paris, 1804); J. F. Nourrisson, *Trois révolutionnaires: Turgot, Necker et Bailly* (2d ed., ib., 1886); J. Hermann, *Zur Geschichte der Familie Necker* (Berlin, 1886); Charles Gomel, *Les causes financières de la révolution française: les ministères de Turgot et de Necker* (Paris, 1892).

NECKER, Suzanne, *née* Curchod (1739–94). The wife of Jacques Necker (q.v.), born at Crassier in the Swiss Canton of Vaud. Her father, a Protestant minister, gave her an excellent education. She was at one time engaged to Gibbon, the historian, but after her father's death she went to Paris and there met Necker, then a wealthy banker, who married her in 1764. Under her influence Necker entered public life and became the Finance Minister of Louis XVI. She herself founded a hospital in Paris (1778), which still bears her name, and she wrote a number of books, including: *Des inhumations précipitées* (1790); *Réflexions sur le divorce* (1794; new ed., 1881); and five volumes of miscellanies, which appeared after her death (1798, 1802). Consult: G. P. d'Haussonville, *Le salon de Madame Necker* (Paris, 1882; Eng. trans. by H. M. Trollope, 2 vols., London, 1882); D'Arvor, *Madame Necker, 1737–94* (ib., 1897); Mark Gambier-Parry, *Madame Necker, her Family and her Friends* (Edinburgh, 1913).

NECKER DE SAUSSURE, de sō'sür', Albertine Adrienne (1766–1846). A French writer, born in Geneva. She was the daughter of the naturalist Saussure and married Jacques Necker the botanist and nephew of the French statesman of the same name. Her cousin, Madame de Staël, was credited with the translation (1814) of Schlegel's *Vorlesungen über dramatische Kunst und Litteratur* (1809–11), now known to have been written by Madame Necker herself. The book on which her reputation rests is *L'Education progressive, ou étude sur le cours de la vie* (1828–32), for which the Academy gave her the Montyon prize in 1832. It treats of the importance of child training, in the preparation for later life, and of the education of women. Part of the work was translated by Miss Willard and Miss Phelps (Boston, 1835).

NECKING, NECK MOLDING. The molding or astragal (q.v.) at the junction of the capital and shaft of a column is often called the neck molding, while the plain space between the astragal of the shaft and the echinus in capitals of the Doric (and sometimes of the Ionic) type is called the neck or necking. See Column; Orders of Architecture.

NEC'ROMAN'CY (Lat. *necromantia*, from Gk. *νεκρομαντεία, nekromanteia*, from *νεκρός, nekros*, corpse + *μαντεία, manteia*, divination). A method of divination by which the dead were supposed to be conjured up and to answer questions concerning the future. Its practice was certainly extremely ancient. It was condemned in the Old Testament. Among the Greeks it was familiar in Homer's day. In historical days necromancy was practiced by priests or consecrated persons at many shrines in Greece. It was also current among the Romans, although banned by the Church under Constantine. It was also employed by the Northern peoples and in the mediæval and later period passed over into sorcery. See Divination; Spiritualism.

NECROP'OLIS (Neo-Lat., from Gk. *νεκρόπολις, nekropolis*, cemetery, from *νεκρός, nekros*, corpse + *πόλις, polis*, city). A term originally applied to the cemeteries in the vicinity of ancient cities and in particular to a suburb of Alexandria largely devoted to the reception and embalming of the dead. The term "necropolis" is now, however, used in a much more extended sense and applied to any extensive burial region of ancient date. The most remarkable of these are in Egypt, where they extend for miles along the left bank of the Nile. The pyramids are the most conspicuous features of the Ghizeh necropolis. At Thebes the entire west bank of the Nile was a vast necropolis of the pharaohs, with mortuary temples, endless dwellings for the priests, schools, libraries, etc., the tombs proper being in the neighboring Valley of the Kings. Other famous necropolises in Egypt were at El Kab, Beni Hassan, and Abydos. In Africa the extensive necropolis of Cyrene; in Italy the ancient Etruscan tomb groups of Vulci, Tarquinii, and Capua, distinguished for their painted tombs; the remarkable necropolises of Myra and Antiphellus in Lycia, and that of Petra in Syria are among the important examples belonging to classical antiquity. The extraordinary collection of domed and minareted tombs and sepulchral mosques in Cairo, known as the Karafah (tombs of the caliphs) and

dating from the twelfth to the fifteenth century, is often and justly called a necropolis; but the term is seldom applied to either mediæval or modern cemeteries. The burial places of antiquity have been especially important sources of archæological discovery, owing to the universal custom in early ages of burying, with the deceased, utensils, arms, money, and jewelry for his use in the nether world. See BURIAL; CEMETERY.

NECRO'SIS (Lat., from Gk. *νέκρωσις, nekrōsis*, a killing, deadness, from *νεκροῦν, nekroun*, to kill, from *νεκρός, nekros*, corpse). A term employed to denote the absolute death of a circumscribed portion of any tissue. Specifically, in surgery, it is applied to the death of a bone wholly or in part. The dead portion separates from the surrounding healthy tissue by an inflammatory process, the cast-off part being known as the sequestrum and the boundary between the living and dead tissue as the line of demarcation. Bony necrosis is due usually to direct injuries, inflammations, and infections, which attack either the periosteum (the membrane covering the bone) or the marrow, the immediate cause being interference with the circulation and nutrition. Necrosis of the soft parts is termed gangrene, and the dead portion, known as the slough or sphacelus, separates in the same way as in bone, by a line of demarcation. Necrobiosis is the gradual death of the histological tissue elements, due to imperfect nutrition. It is a much slower process than necrosis. See GANGRENE.

NECTAN'EBO, or **NECTAN'EBUS.** The name of two kings of Egypt. NECTANEBO I (Egypt. *Nakht-Hor-hebt*), the Νεκτανέβης (*Nektanebēs*) of Manetho, was the first King of the thirtieth dynasty and reigned from 382 to 364 B.C. The native monuments give little historical information in regard to his reign, but the accounts of Greek writers, especially Diodorus, show that he was a capable and energetic monarch. In the earlier part of his reign he supported Evagoras, King of Cyprus, against the Persians and, when the latter invaded Egypt, succeeded in repelling them, aided by an inundation of the Nile. Nectanebo endeavored to restore the old sanctuaries of the land, and he built or restored temples in many parts of Egypt. His stone sarcophagus, inscribed with religious texts, is in the British Museum. He was succeeded by TEHER or TACHUS, after whom NECTANEBO II (Egypt. *Nakht-nebof*), the Νεκτανεβός (*Nektanebos*) of Manetho, reigned from 361 to 343 B.C. He was a great builder. For a long time he repulsed the attempts of the Persians to conquer Egypt, but they finally made themselves masters of the delta, and Nectanebo fled to Ethiopia. He was the last native King of Egypt. After his flight Egypt was subject to Persian rule until 332 B.C., when it came into the possession of Alexander the Great. Consult Alfred Wiedemann, *Geschichte Aegyptens von Psammetich I. bis auf Alexander den Grossen* (Leipzig, 1880), and E. A. T. Wallis Budge, *A History of Egypt* (New York, 1902).

NEC'TAR (Lat., from Gk. *νέκταρ, nektar*). In Greek mythology, originally identical with ambrosia (q.v.). From Homer's time, however, nectar is usually the drink of the gods, ambrosia their food; in some later writers nectar is the food and ambrosia the drink of the gods. In the *Iliad* only nectar is mentioned as the nourishment of the gods; in the *Iliad*, again, both ambrosia and nectar are used as unguents. Consult Roscher, *Nektar und Ambrosia* (Leipzig, 1883), though his identification of ambrosia and nectar with honey is open to grave doubts.

NECTAR. The sweet secretion formed by glands located on various parts of a plant, but especially in the flower. Sometimes it is called honey, but honey is nectar after partial digestion in the crop of insects, such as bees or wasps. See NECTARY; GLAND.

NECTARINE', -rēn'. A smooth-skinned variety of the peach. See PEACH, and Colored Plate of DRUPES.

NEC'TARY. A surface gland which secretes nectar (q.v.). The name is also applied to

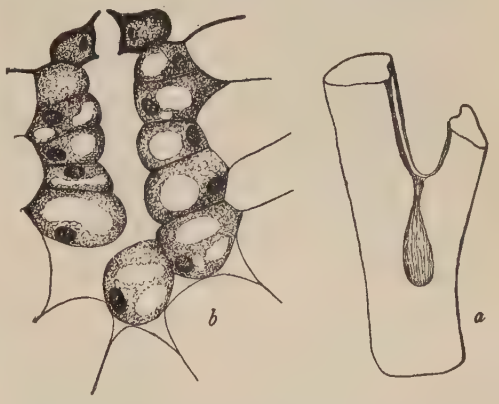


FIG. 1. EXTRAFLORAL NECTARY OF THE BRACKEN FERN.
a, diagram showing location of gland in the axil of a leaflet; *b*, section showing the secreting cells beneath a stoma. (After Lloyd.)

abortive floral organs (see below). Nectaries are most common in the flowers of seed plants, but are found also in regions remote from the flower (Fig. 1). Extrafloral nectaries are found on the leafstalks and at the base of the leaf blade, upon stipules and other portions of the leaf base, and more rarely upon the blade itself.

The forms of nectaries are very various. The secreting surface frequently covers a more or less pronounced swelling or cushion of tissue, which may develop on the base of the flower leaves or on the axis of the flower between them. Sometimes a nectary stands in the place where in other related flowers well-formed and functional floral organs stand. This fact has led to the application of the term "nectary" to abortive floral organs even when they do not secrete nectar. Sometimes the nectar gland forms a continuous ring about the base of the pistil. In other cases the nectar gland lines the concave surface of depressions in the floral organs or the floral axis. When these pits deepen, they con-

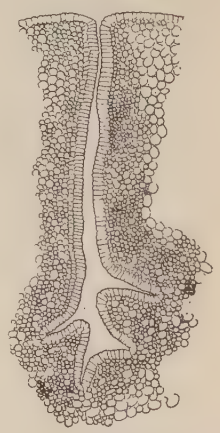


FIG. 2. SEPTAL NECTARY FROM FRUIT OF DAY LILY.
The columnar cells lining the tube are the secreting cells.

stitute efficient receptacles for the secreted nectar. Thus, spurred petals and sepals are often furnished with nectar glands on the inner side or at the base of the spur, and the whole cavity may become filled with their secretion. Nectar glands sometimes line deep and narrow pits of small capacity, opening at the surface by a pore or cleft from which the nectar oozes. These passages may be branches, so that a complex gland is formed, such as is found in the pistils of some lilies (Fig. 2).

Nectar varies greatly in composition in different plants. The greater part of it is water, which is withdrawn from the gland cells by the osmotic action of the sugar. (See SECRETION.) In addition to the sugars glucose and saccharose, various other carbon compounds and small amounts of proteids give the peculiar odor and flavor to the nectar. Nectar is eaten by bees, wasps, butterflies, and other insects, which in their search for it are utilized as unconscious carriers of pollen. See POLLINATION.

NEDBAL, nĕt'bäl, OSKAR (1874–). A Bohemian viola player, born at Tabor. He studied at the Prague Conservatory and became a viola player in the Bohemian String Quartet. He composed a *Scherzo-Caprice for Orchestra* and a *Sonata for Pianoforte and Violin.*

NEDHAM, MARCHAMONT. See NEEDHAM, MARCHAMONT.

NEDJED, nĕj"d. A region of Arabia. See NEJD.

NEED'FIRE. In folk custom, a fire kindled by the friction of two sticks of wood or of a rope on a wooden stake to ward off demons of disease. Among the many customs and beliefs connected with fire one of the most important is that of ritual purification. This idea arose at an early stage of man's acquaintance with fire from a simple observation of the effects of flame, the most mysterious phenomenon which he knew. Later fire was differentiated into a number of varieties partly good and partly evil with regard to position and use, thus implying that all flame was not equal in efficacy. Still further it was thought that by age or contamination fire became ineffective and must be renewed, hence the kindling of new fire, which was an accompaniment of widely diffused cults, as that of Thor in Scandinavia and of nature gods in ancient Mexico. The new fire is supposed to regenerate, as fire sacrifice is designed to sustain, the invisible beings. Needfire is a practice usually of shepherd peoples to ward off disease attacking the flocks. In historic times the sparks for kindling the needfire were sometimes obtained by twirling a wooden peg around in a wooden post. As in the case of new fire, the needfire was almost always accompanied with the extinguishing of the fires of the locality, and the neighbors also rekindled their fires from it as in the new fire ceremony. In practice the people passed or the herds were driven through or between the flames of the needfire for purification. The needfire custom survived well into the nineteenth century, and probably traces of it still exist in parts of Europe.

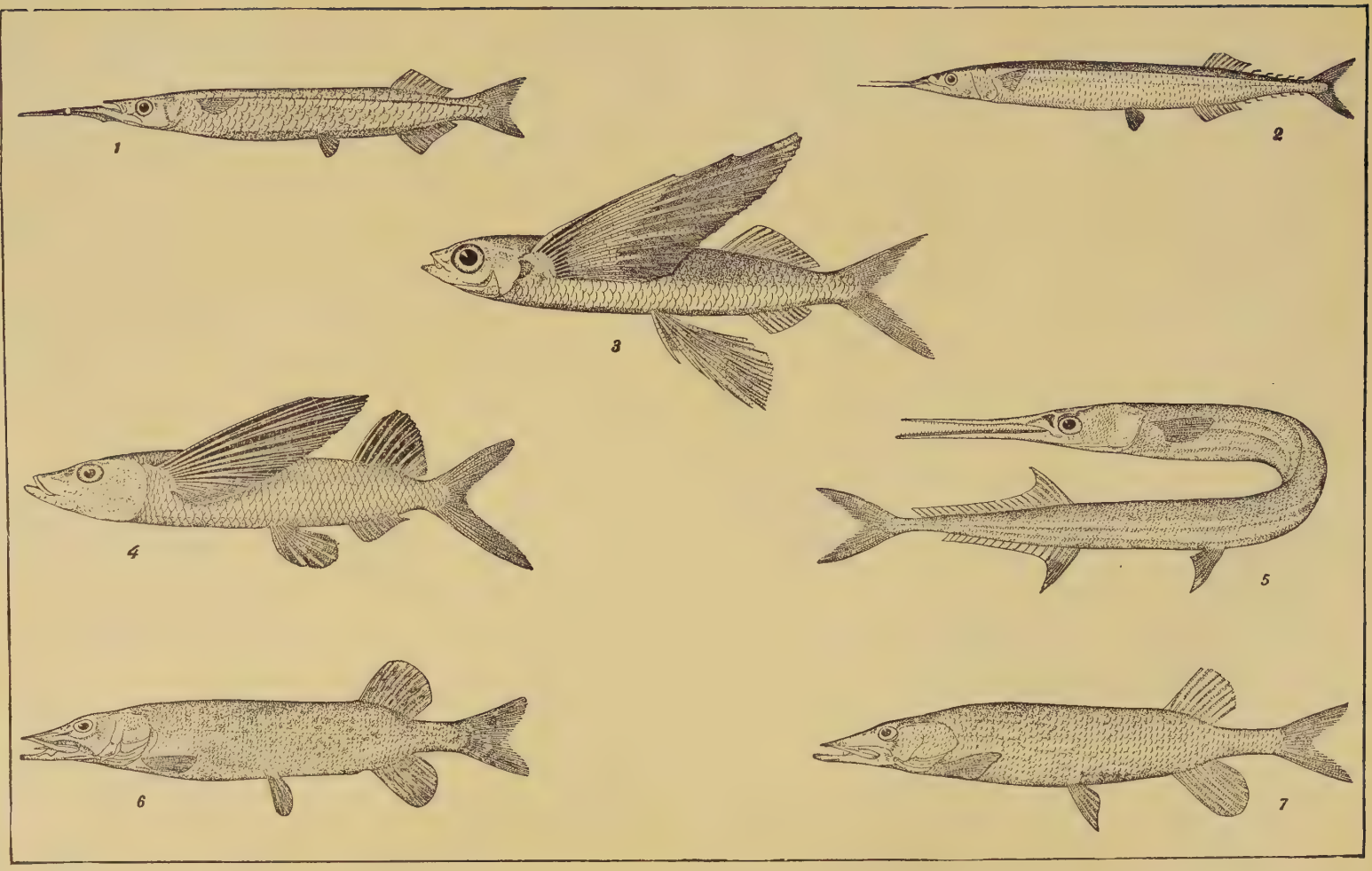
NEEDHAM, nēd'*a*m. A town in Norfolk Co., Mass., 10 miles southwest of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 3). The most prominent buildings are the town hall and public library. The manufacture of knit goods constitutes the town's chief industry. Pop., 1900, 4016; 1910, 5026.

NEEDHAM, JOHN TURBERVILLE (1713–81). An English naturalist, born in London. He studied at Douai and was ordained to the Roman Catholic priesthood in 1738. Later he became director of the Academy of Maria Theresa at Brussels. Much interested in natural history, he contributed to the *Philosophical Transactions* of the Royal Society of London and was the first English Catholic clergyman to be elected a fellow of this society. His scientific work is of interest at the present time only in so far as it bore on the question of the reality of spontaneous generation. He thought that his experiments demonstrated that living beings may arise spontaneously from lifeless materials. These conclusions are published in his most important works, *Observations upon the General Composition and Decomposition of Animal and Vegetable Substances* (1749) and *Nouvelles observations microscopiques* (1750).

NEEDHAM, or **NEDHAM,** MARCHAMONT (1620–78). An English journalist and pamphleteer, born at Burford, Oxfordshire. He was educated at All Souls College, Oxford, and after studying medicine and law turned to journalism and founded in 1643 the *Mercurius Britannicus* (*sic*), to which he was frequently the sole contributor. The boldness of his scurrilous attacks upon Charles I led to his incarceration in the Fleet Prison in 1645 and in 1646, but the following year he became a Royalist himself and began the publication of *Mercurius Pragmaticus,* wherein he defended the King and turned his venomous pen against the Scots and Oliver Cromwell. Afterward he rejoined the popular party, and signalized his conversion by the publication of *The Case of the Commonwealth of England Stated* (1650). He became the editor of *Mercurius Politicus,* a weekly journal in which he again attacked the monarchy. After the Protector's death he went to Holland and continued the publication of his abusive pamphlets, such as *A Short History of the English Rebellion, Completed in Verse* (1661), and *Christianissimus Christianandus; or, Reasons for the Reduction of France to a More Christian State in Europe* (1678).

NEE'DLE (AS. *nædl,* Goth. *nēala,* OHG. *nādela, nādla,* Ger. *Nadel,* from OHG. *nājan,* Ger. *nähen,* to sew; ultimately connected with OIr. *snāthad,* thread, AS. *snear,* Eng. *snare,* Lat. *nere,* Gk. *νέειν, neein,* to sew). An instrument of metal, or other material, used to carry the thread in sewing, embroidering, knitting, netting, and other similar operations. Needles are generally made of metal, but bone, ivory, and wood are also used; for ordinary needlework, called sewing, they are made of fine steel, and are too well known to need description; for other kinds of work they are often much larger and differently formed. The earliest needles were not pierced, but were like awls, and were used for making holes in skins, through which the long roots of plants or leather thongs were passed. Later a hole was bored in one end of the stone or bronze needle, through which the root or thong was passed, and this was dragged through the leather as it was punched. Stone needles with a hole in the end opposite the point are found in the remains of the Stone age. Bone needles with eyes are found in the reindeer caves of France and lake dwellings of central Europe. The needles that have come down to us from ancient Egypt are very coarse, but finer needles must have been made to execute the delicate

NEEDLE-FISH, PIKES, ETC.



1. HALFBEAK (Hyporhamphus unifasciatus).
2. SAURY (Scomberesox saurus).
3. FLYING FISH (Exocœtus volitans).
4. SHARP-NOSED FLYING FISH (Fodiator acutus).
5. NEEDLE-FISH or HOUNDFISH (Tylosurus acus).
6. PIKE (Esox lucius).
7. POND PICKEREL (Esox reticulatus).

embroidery that was produced by that people. The ancient Greeks must have been skilled in needlework, judging from the descriptions of embroidery in Homer. Ordinary needles and surgeons' needles have been found in the ruins of Pompeii.

The Chinese are believed to have been the first to use needles of steel, and these implements gradually found their way westward until they were brought into Europe by the Moors. By 1370 the needle-making industry was established in Nuremberg. In England it was not until the reign of Queen Elizabeth that their manufacture was taken up on any considerable scale in small shops, and after 1650 it gradually developed until the manufacture of hand-sewing needles became an important industry in England, as also later in Germany. Subsequent developments included the introduction of the needle with the eye and the gradual development of machines for their manufacture. In 1785 the first mechanical process for producing the steel rod from which were formed two needles joined together was introduced. The first drill-eyed needles were made in 1826 by using a stamping machine, but it was not until about 1870 that needles were made for the most part mechanically, and not until after 1885 that they were also finished by machine.

The first operation, after the wire has been selected and its thickness accurately gauged, is to cut it into eight-foot lengths; this is done by winding it in a coil of 16 feet circumference and then cutting this coil into exact halves with powerful cutting shears. The coiling of the wire is so managed that there are 100 pieces in each half when cut; the bundles of 100 wires are again cut into the necessary lengths for two needles. The pieces cut from a coil, although now reduced to the length of two small needles, are nevertheless somewhat curved; they are therefore collected into bundles and placed in two iron rings, which hold them loosely together; they are then slightly softened by firing, and are laid on an iron plate or bench, and are pressed with a small curved bar in two or three positions, by which the operator manages to make them all perfectly straight. The blanks after being removed from a hopper in regular succession are next pointed at both ends by a grindstone to whose face they are held by a rubber band.

The eyes are next punched by means of dies. (See Dies and Die Sinking.) The blanks or double needles are now placed on two wires and the two sets broken apart to form separate needles. The roughly formed needles still have to be polished, tempered, and have the heads ground into shape, operations which are mechanically performed.

Besides the ordinary sewing needle already described and other hand needles—such as those used in sailmaking, leather work, upholstery, and surgery—many forms of sewing-machine needles are manufactured. The most familiar of these is the needle used in the domestic sewing machine, with the point in the eye and grooves on each side to protect the thread from being worn or cut in passing through the fabric. The latched needles used in stocking machinery are very delicate pieces of mechanism, as the latch is held by a rivet about $\frac{1}{100}$ inch in diameter between walls which are no thicker. For leather-sewing machines the needles must be adapted for use with waxed thread, and often are made with a hook at the end instead of a hole; while the welting-machine needle, for sewing welts in boots and shoes, is the shape of a segment of a circle.

Needles for use in various machines are made in the United States, especially those for the ordinary domestic sewing machine. At first these needles were made by processes similar to those employed for making ordinary hand-sewing needles, but gradually special machinery has been invented for their manufacture. The process is essentially as follows: The wire is cut into a blank, which is then reduced and pointed, grooved, has its eye punched, is hardened and tempered, hard burr dressed, brass brushed, has its eye polished, undergoes a first inspection, is hard straightened, and then receives the final pointing. In one method of making sewing-machine needles by machinery the crucible-steel wire from which the needle is formed is first straightened and then fed into a machine which makes the large end of the needle and cuts off the blanks of the lengths required. These blanks, after being ground and polished with emery wheels and an emery belt, pass from a hopper on to a grooved endless traveling carrier, where the shank of the needle is formed by the grinding action of an emery wheel. By successive wheels the needles are ground and pointed and then grooves are cut by steel saws and the eyes punched. They are then heated and hardened and cleaned, first by emery and then by wire brushes and burnishing powder applied from a bristle brush. The final pointing is done on a fine emery wheel, and the last polishing is accomplished with crocus and alcohol. A second method differs from that just described in that the steel wire is cut into blanks of about one-third the length of the finished needle. After a thorough cleaning these blanks are fed from a hopper into a machine where they are acted upon by steel dies which compress and extend the blank. This process is known as swaging and produces needles which vary slightly in length. This defect, however, is remedied by the action of a clipping and straightening machine which reduces the needles to a uniform size.

The total value of the various hand-sewing, darning, and shoe-machine needles imported into the United States was as follows: 1903, $442,887; 1904, $455,762; 1905, $406,261; 1906, $418,816; 1907, $492,637; 1908, $414,998; 1909, $431,147; 1910, $476,810; 1911, $445,081; 1912, $501,033; 1913, $49,694; 1914, $481,631. Consult article on "Needles and Pins," in *Twelfth Census of United States*, vol. x, *Manufactures*, part iv (Washington, 1902), and subsequent census bulletins and volumes on manufactures; also articles on the needle industry in *American Machinist*, vol. xxx (New York, 1907).

NEE'DLEFISH (so called from the shape of the snout). A garlike fish of the synentognathous family Esocidæ, and especially of the genus *Tylosurus*. They are slim, long-jawed voracious, carnivorous fishes, found in all warm seas, and sometimes entering rivers. Their habits are ordinarily much like those of a pike. (See Plate of Needlefish, Pikes, etc.) Their flesh is good. Some species are numerous on the South Atlantic and Gulf coasts, where they are confounded with the true gars, under the names garfish and billfish (especially *Tylosurus marinus*), and are also called aguja (q.v.), longjaws, houndfish, and guardfish. Consult Jordan and Fordice, *Proceedings of the United States National Museum* for 1886 (Washington, 1887).

NEEDLE GUN. See SMALL ARMS.

NEEDLEWORK. See EMBROIDERY.

NEEF, nāf, or **NEEFS,** nāfs, PIETER, the Elder (c.1578–c.1661). A Dutch architectural painter. He was born at Antwerp and was there a pupil of Hendrick van Steenwyck. His numerous architectural paintings usually represent church interiors, frequently illuminated with the glow of torches or of candles. His treatment was delicate and refined, his knowledge of perspective extraordinarily accurate. Moreover, he understood the harmonious modulation of colors and the power of chiaroscuro, but he generally intrusted the painting of the figures introduced into his pictures to Teniers, Breughel, Van Thulden, Frans Francken, and others. His works are to be found in the galleries of Dresden, Vienna, Paris, Amsterdam, the Metropolitan Museum and the Historical Society, New York, and elsewhere. His son, Pieter the Younger (1620–75), painted similar subjects, and their works are frequently confounded.

NEELE, nēl, HENRY (1798–1828). An English writer, born in London. He was admitted to the bar and practiced as a solicitor. From the successful appearance of his *Odes and Other Poems* (1817), printed during his clerkship, he was a busy contributor to various journals and the annuals. In 1827 he gave, first at the Russell Institution and later at the Western Literary Institution, his *Lectures on English Poetry,* extending from Chaucer to Cowper. His most important publication was the *Romance of English History* (3 vols., 1827), a collection of stories based on occurrences in each reign from the Conquest to the Reformation, marred by a stilted style and historical inaccuracies. In the same year his poems were gathered in a two-volume edition. His verse has no higher qualities than spontaneity and ease. His stories, at their best, are marked by considerable imaginative skill. His *Literary Remains,* including the *Lectures,* appeared posthumously (1829), with a memoir. The *Winter Nights* (London, 1820) of Nathan Drake contains (no. xiii, vol. ii) "Critical Observations" on the *Odes and Other Poems,* associating Neele with Chatterton and Kirke White. At 30 he cut short his career by suicide.

NEENAH, nē'nȧ. A city in Winnebago Co., Wis., 13 miles north of Oshkosh, the county seat, on the Fox River, at the outlet of Lake Winnebago, and on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, E 4). It is an attractive summer resort, well known for its fishing, and has a public library, the Kimberly High School, Theda Clark Memorial Hospital, a handsome opera house, and several public parks, the most notable being Riverside Park. The river, which affords fine water power, divides, as it leaves the lake, into two streams, inclosing a large island, half of which belongs to Neenah and half to Menasha, the two cities forming practically one industrial community. Manufacturing enterprises are well developed and include paper, lumber, and flour mills, woodworking plants, knitting mills, creameries, stove works, foundries and machine shops, brickworks, a boot and shoe factory, etc. Large quantities of cheese and butter are shipped from Neenah. Settled in 1846, Neenah was incorporated in 1850 as a village, and in 1873 was chartered as a city. The government, under a charter of 1883, is administered by a mayor, chosen every two years, and a unicameral council. The municipality owns and operates the water works. Pop., 1900, 5954; 1910, 5734.

NEER, nār, AART VAN DER (1603–77). A Dutch landscape painter, the father of Eglon Hendrik van der Neer, born at Gorcum. He was a tavern keeper as well as a painter, and is thought to have studied under Camphuysen. His paintings frequently resemble those of his friend Albert Cuyp—for the most part moonlight scenes, depicted with a delicate warm tone. At times he represented the same scenes, usually towns or groups of cottages on the banks of a canal or river, in winter or at sunset in other seasons. Fine specimens of the latter kind are in the National Gallery, London, in the Hermitage, St. Petersburg, and in the Metropolitan Museum, New York, which also possesses a good night scene, "The Farrier." Van der Neer likewise painted remarkable conflagration effects, good examples of which are in the Schwerin Gallery and the Berlin Museum, which, besides a winter and a sunset scene, contains four effective moonlight pieces. Among the best of the latter variety are one in the Arenberg Gallery, Brussels, two in the Dresden Gallery, and several in the Wallace collection, London, which owns, besides, two of his finest winter landscapes. These may also be seen to advantage in the museums of Amsterdam and Brunswick and the collection of Lady Wantage. Van der Neer died at Amsterdam, Nov. 9, 1677.

NEER, EGLON HENDRIK VAN DER (1634–1703). A Dutch genre and landscape painter, born at Amsterdam. He was at first instructed by his father, Aart van der Neer, who, on his showing preference for figure painting, placed him under Jakob van Loo. At the age of 20 he went to France, where he spent about three years, then lived successively in Rotterdam, Amsterdam, and Brussels, and in 1690 became court painter to the Elector Palatine at Düsseldorf, where he died on May 3, 1703. His favorite subjects were interiors, the best being single figures, especially ladies in elegant attire, engaged in domestic occupations, in the manner of Terborch and Metsu. He is, however, inferior to these masters in technique, freedom of composition, and rendering of textures. Good examples of this kind are a "Lady Tuning her Lute" (1678), in the Pinakothek at Munich and similar subjects in the Rotterdam Museum (1669) and in the galleries at Karlsruhe (1677) and Dresden. Eglon van der Neer was also fond of heroic landscapes with biblical or mythological figures modeled after Elsheimer, such as "Tobias with the Angel," in the Amsterdam, Berlin, and Karlsruhe museums. His portraits are frequently mistaken for those of Kaspar Netcher.

NEERWINDEN, nār'wĭn'dĕn. A village of Belgium, in the Province of Liége, 5 miles southeast of Tirlemont, celebrated in history for the great victory gained by the French under the Duke of Luxembourg over the English and Dutch under William III (July 29, 1693). (Map: Belgium, D 4.) It was also the scene of the defeat of the French under Dumouriez by the allies under the Prince of Coburg (March 18, 1793). It was occupied by the Germans in the European War which began in 1914.

NEES VON ESENBECK, nās fŏn ā'zen-bĕk, CHRISTIAN GOTTFRIED (1776–1858). A German botanist and naturalist. He was born at Erbach in the Odenwald, studied medicine at Jena, and in 1818 became professor of botany at the Uni-

versity of Erlangen. He subsequently was professor of botany at Bonn, and in 1830 accepted the posts of professor of botany and director of the botanic garden at Breslau. In 1848 he went to Berlin and took an active interest in the agitations of that and the following year. His deposition from the chair of botany in 1852 was the consequence of his political activity. In his *Handbook of Botany* (1821) he developed the theory advanced by Goethe in his *Metamorphose der Pflanzen*, that all the parts of the flower are only variations of the leaf. This work had been preceded by *Die Algen des süssen Wassers* (1814); by *Das System der Pilze und Schwämme* (1816); and by *Substanz der Pflanzen* (1819), in which he was assisted by Rothe and Bischof. He published, in 1833, *Genera et Species Asterearum;* in 1836, *Systema Laurinarum;* and in 1841, *Florœ Africœ Australiaris Illustrationes Monographicœ.* In 1852 appeared the first volume of *Die allgemeine Formenlehre der Natur.* He was a specialist on cryptogamous plants, and in this branch of botany his chief work is *Naturgeschichte der europäischen Lebermoose* (1833–38).

NE EX'EAT (Lat., let him not go out). A writ or order issued by a court of equity, directed to a sheriff and commanding him to arrest the defendant in an action and detain him until he furnishes a certain bail, on condition that he will not leave the jurisdiction without permission of the court. About the time of Queen Elizabeth this writ came to be employed by the Court of Chancery to restrain a person who was under some equitable obligation to another from leaving the country. This practice became common in England, and was adopted into equity or chancery practice in the United States, where it still obtains in many States.

This equitable remedy of *ne exeat* corresponds in its purposes to the legal process of arrest and bail in civil cases, and has been abolished by some modern codes of procedure, as in New York, and the legal remedy substituted in its stead. See ARREST; BAIL; EQUITY. Consult the authorities referred to under EQUITY; PROCEDURE; WRIT.

NEF, JOHN ULRIC (1862–1915). An American chemist, born at Herisau (Appenzell), Switzerland. He graduated at Harvard University in 1884, held a fellowship there in 1884–87, studied also at Munich (Ph.D., 1886), and in 1887–89 was professor of chemistry in Purdue University (Lafayette, Ind.). In 1889–92 he was assistant professor of chemistry and acting director of the chemical laboratory in Clark University (Worcester, Mass.), in 1892–96 was professor of chemistry in the University of Chicago, and in 1896 became head of the department of chemistry in that institution. He is known internationally as an original worker in organic chemistry. Among his contributions to this science may be mentioned his establishment of the constitution of fulminic acid and his theory that in many compounds and reactions carbon acts as a bivalent element. In 1915 the honorary degree of doctor of laws was conferred upon him by the University of Pittsburgh. His scientific papers were published in the *Annalen der Chemie.*

NEGAPATAM, nĕg'*a*-pa-täm'. A seaport city on the Coromandel coast, in the district of Tanjore, Madras, British India, and the terminus of a branch line from Tanjore, 48 miles east of that town (Map: India, D 7). It has regular steamer communication with Ceylon, Burma, and the Straits Settlements, and carries on an active trade exporting rice, tobacco, cigars, hides, and paddy, and importing cotton goods, betel nuts, and camphor. The extraction of oil from coconuts and oil seeds is an important industry. The extensive construction and repair plant of the South Indian Railway is located here. Negapatam was one of the earliest Portuguese settlements on the Coromandel coast; it was taken by the Dutch in 1660, and was the capital of their Indian possessions until captured by the English in 1781. Pop., 1901, 57,190; 1911, 60,168.

NEG'ATIVE (from Lat. *negativus,* negative, from *negare,* to deny, from *nec,* not + *aierc,* Skt. *ah,* to say, Gk *ἠμί, ēmi,* I say). A photographic picture in which the lights and shades of the object are reversed. A negative is usually produced in a camera by the action of light upon the sensitized surface of a glass plate, celluloid film, or paper. (See PHOTOGRAPHY.) When the plate or film is developed, the portions most affected by the light receive the densest deposits and are rendered nearly if not quite opaque, while the portions corresponding to the shadows appear transparent. A good negative should show the gradations of light and shade and should be distinct in all its detail. The presence of as many tones, or values of light and shade, as possible is desired, while at the same time the high lights and shadows must be marked. The production of a good negative, outside of questions of the preparation of the plate or film, depends chiefly upon a proper length of exposure and successful development. A negative is used for making positives by contact printing or with an enlarging or copying camera. For contact printing the negative is placed film side upward in a printing frame, and on it is laid a sheet of sensitized paper with its coating next to the film. The printing frame is then exposed to the light, and the rays passing through the clear or transparent portions of the negative affect the paper beneath, while those portions beneath the dark or opaque parts of the negative are protected and remain white. In this way a large number of positives or correct reproductions can be obtained from one negative.

NEGATIVE CATALYSIS. See CATALYSIS.

NEGATIVE GEOTROPISM. See APOGEOTROPISM.

NEGATIVE HELIOTROPISM. See APHELIOTROPISM.

NEGATIVE HYDROTROPISM. See APHYDROTROPISM.

NEGATIVE QUANTITY. The inverse operations of mathematics, such as subtraction, division, and evolution, often lead to results which cannot be expressed in terms of the same unit as the numbers entering the operation. The interpretation of these results leads to the so-called artificial numbers and in the particular case of subtraction to the notion of negative number. For example, $2 — $3 is impossible if the result is to be expressed in terms of the positive unit $1, but, since the result of subtraction is the number which added to the subtrahend will produce the minuend, it is easy to see that the number which added to $3 will make $2 must be equivalent to the number which subtracted from $3 will make $2. In other words, instead of subtracting $1 from $3 to reduce it to $2, a number must be added which will produce the same result. Such a number is called

a negative number and is designated by the sign — placed before it. Hence $\$2 - \$3 = -\$1$. This notion of negative number as the opposite of positive number, and apparently growing out of an arbitrary interpretation of a mathematical process, has its counterpart in concrete magnitudes opposed in function or extent. For example, in the above case, if a man's assets are $2 and his debts $3, the number expressing his financial status is $1 of indebtedness, which may be expressed by — $1. Similarly, time A.D. is often expressed by positive numbers and time B.C. by negative numbers. In astronomy north latitude is expressed by positive numbers and south latitude by negative numbers; west longitude may be designated as positive and east longitude as negative, or vice versa. Such extensions of the meaning of signs and modes of operation are the natural outgrowths of a constantly progressive science. The introduction of the negative number doubles the number space of arithmetic by adding an infinite series of numbers opposite in meaning and having a 1 to 1 correspondence (see CORRESPONDENCE) with the series of positive numbers.

The negative quantity enters geometry through the phases of motion and direction. For example, the segments *AB*, *BC*, and *CD* of a horizontal straight line *AD* thought of as extending to the right are considered positive, but the segments *DC*, *CB*, and *BA* thought of as extending to the left are considered negative. Similarly, many writers regard all angles generated by a line revolving counterclockwise about a point as positive and those generated by a clockwise motion as negative. The introduction of negative quantities into geometry, especially in connection with the theory of continuity (see CONTINUITY), has greatly increased the power and scope of the subject.

The meaning of negative quantities as employed in the physical sciences may be illustrated from elementary mechanics. A material point confined to a horizontal straight line may move to the right, remain stationary, or move to the left. The first condition may be expressed by a positive velocity towards the right, the second by a zero velocity, and the third by a negative velocity.

By analogy to mathematical usage the positive and negative notation is sometimes applied to quantities measured by scales like those of the ordinary thermometers, on which an arbitrary point is denoted as the zero point, and all degrees below zero are denoted by negative numbers. Such conventional notations are convenient, but not always well founded. Thus, the temperature — 1° C. is not the physical opposite of + 1° C.; the two temperatures would be the physical opposites of each other only if 0° C. represented a state in which bodies would have no heat at all, and if it were possible that a body should have less than no heat. On the other hand, in the case of physical magnitudes whose character, like that of electricity, may be dual, the positive and negative notation has again a definite natural meaning.

Negative quantities have been thoroughly understood only within recent times. Although Hero of Alexandria in his *Stereometrica* considered the expression $\sqrt{81 - 144}$ as possible, the result is recorded as $8 - 1/16$, which shows that neither negative nor imaginary quantities were understood by the Greeks. Diophantus (c.275), however, recognized the difficulty, for he describes the equation $4 = 4x + 20$ as *ἄτοπος* (absurd), because the root could not be a natural number or a fraction. The Hindus were more successful, for Aryabhatta (c.530) distinguished between *dhana* (assets), positive quantities, and *kshaya* (liabilities), negative numbers. Bhaskara (c.1150) was aware that a square root can be both positive and negative, and that $\sqrt{-a}$ does not exist for the ordinary number system. Al Khuwarizmi (c.830), a celebrated mathematician under the Arab supremacy, obtained two roots for the quadratic equation, but the negative roots were rejected as not valid. Among the early European mathematicians Fibonacci (1202) went no further than the Arabs. Paccioli (1494) definitely stated the rule, *minus times minus always gives plus;* but this fact was known to the Arabs and Hindus—Bhaskara, e.g., having stated that the square of a negative number is always positive. Cardan (1545) recognized negative roots, but called them *œstimationes falsæ* or *fictæ*. Stifel (1544) called negative numbers *numeri absurdi*, and Harriot (1631) was the first to consider such a number capable of forming a member of an equation. Vieta (1591) distinguished between positive and negative numbers, and Descartes (1637) in his geometry used the same letter for both positive and negative quantities.

NEGAUNEE, nē-gą'nē. A city in Marquette Co., Mich., 3 miles east of Ishpeming, on the Chicago and Northwestern, the Duluth, South Shore, and Atlantic, and the Lake Superior and Ishpeming railroads (Map: Michigan, B 2). It is in the great iron region of the State, on a ridge called the Iron Mountain, at an elevation of about 1400 feet, and has several productive iron mines within the municipal limits. It was at Negaunee that the first discovery of iron ore in the Lake Superior region was made. Negaunee's existence as a community dates from 1846; it was incorporated as a village in 1865 and as a city in 1873, the charter of that year, as revised, now operating to provide for a mayor, annually elected, and a unicameral council. The water works and electric-light plant are owned and operated by the city. Pop., 1900, 6935; 1910, 8460; 1914 (U. S. est.), 9108.

NE'GEB (Heb., Egypt. *Ngb*, possibly connected with an Aram. root *negab*, to be dry, hence dry land, steppe). The name of a region in southern Palestine between the Arabah (q.v.) and the Mediterranean littoral and extending approximately from Hebron and Gaza in the north to a line running through Wadi Kades towards El Arish. As "towards Negeb" often is employed to indicate a southerly direction, it is translated "south" or "southland" in the English version; but the term Negeb should be used to avoid confusion. The earliest-known inhabitants of this district seem to have been Horites and Canaanites. The Hyksos movement is likely to have driven many ethnic elements into this territory, among them Hittite clans. The land of Negeb seems to be mentioned in an Egyptian inscription from the time of Thothmes III (1501–1447 B.C.). After the expulsion of the Hyksos from Egypt (c.1575 B.C.) Levi and Simeon appear to have occupied the centre of Negeb. Kadesh Barnea, the home of Moses (q.v.) and Miriam (q.v.), was at one time the chief city of the Levites. Beersheba, Bethuel (modern Halaza), Zephat (modern Meshrife), and Ziklag (modern Asluj) are mentioned as Simeonite cities. Levi and Simeon, however,

were overthrown and scattered, probably by the Idumæan Jerahmeelites first and then, after 1200 B.C., on the west by the Cherethites (Cretans). In the time of David (c. 1033–993) there were five distinct parts of the Negeb, viz., the Negeb of Judah, the Negeb of the Jerahmeelites, the Negeb of the Kenites (1 Sam. xxvii. 10), the Negeb of the Cherethites, and the Negeb of Caleb (1 Sam. xxx. 14). The Kenites dwelt farthest east near the Dead Sea and the Arabah; the Calebites lived in Hebron and its neighborhood; the tribe of Judah evidently held some places in the north; the Jerahmeelites had their cities in the centre; west of them Cretans and Philistines occupied a part of the Negeb; and the Amalekites were in possession of some places in the south and made raids so far as Ziklag. During the period of the Judæan Kingdom the various tribal elements were merged. After the exile the Edomites, driven out of Mount Seir by the Nabatæans, settled in the Negeb. Accustomed to city life, they no doubt developed those towns they took over from the Jews. The most flourishing period in the history of the Negeb seems to have been the time of the great Byzantine cities, whose ruins are still standing at Ruhaibeh, Sebaita, Meshrifeh, Saidiyeh, El Abdeh, El Aujeh, and Halaza. The dated Greek inscriptions found in a cemetery at Ruhaibeh and published by Schmidt and Charles in 1910 come from the fifth, sixth, and seventh centuries A.D. Greek civilization and Roman statecraft had made the desert places blossom like a garden; covered the valleys with grain and the terraced hills with vines; caused cities to grow, with beautiful streets and squares and walls, with temples and theatres, basilicas and churches, baths and aqueducts; and filled the land with a large and thrifty population. After the Arab conquest the cities declined and finally fell into ruins and became again a steppe land. It has been visited in recent times by some explorers, but has not yet been scientifically surveyed.

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NEGELEIN, nā'ge-līn, JULIUS VON (1872–). A German Oriental philologist, born at Königsberg. He was educated at the Gymnasium of Königsberg and at the universities of Greifswald, Berlin, Königsberg, and Marburg. After 1899 he was privatdocent at the University of Königsberg. Besides numerous contributions to learned reviews he published: *Das Verbalsystem des Atharvaveda* (1897); *Germanische Mythologie* (1906; 2d ed., 1912); *The Parāśiṣṭas of the Atharvaveda* (3 parts, 1909–10), with Bolling; *Der Traumschlüssel der Jagaddeva* (1912); *Atharvaprâyaścittâni* (1913–14).

NEG'LIGENCE (Lat. *negligentia*, from *negligens*, pres.p. of *negligere, neglegere*, to neglect, from *nec*, not + *legere*, to gather). The omission to do something which a reasonable man guided by those considerations which ordinarily regulate the conduct of human affairs would do, or the doing something which such a prudent and reasonable man would not do. This definition assumes that the thing omitted or done was in violation of a legal duty, and resulted in legal damage to the one to whom the duty was owed. The three elements of negligence considered, then, are: (1) proper care; (2) legal duty; (3) legal injury.

1. It will be observed that the standard of care required by the definition is such as a reasonable man would exercise in a given situation. Whether such care has in fact been taken or not is generally a question of fact for the jury trying the question. It is true that if the evidence is not conflicting—if the story of the plaintiff is the same as that of the defendant, and if, in the opinion of the court, reasonable men could draw but one inference from the evidence—the question of negligence will be decided by the court. Hence a court often nonsuits a plaintiff on the ground that his own evidence shows that the harm of which he complains was not caused by any negligent act or omission of the defendant. As a rule, however, the jury are to determine whether the defendant's conduct was reasonably prudent or not. At the same time, the court is bound to explain to the jury the legal rules bearing upon the subject, of which the most important are these:

When a person undertakes the performance of a task which requires special skill, the failure to do all that any skillful person could reasonably be expected to do in such a case, considering all the circumstances, will amount to actionable negligence. If an ordinary mechanic undertakes to clean or repair a watch, he is bound to do the work with the skill and care of the ordinary watch cleaner or repairer.

The law does not presume negligence on the part of any one, and throws upon him who alleges that another has been negligent the burden of proving the fact. Accordingly, a person who has been injured by a runaway horse, or whose property has been destroyed by a fire which started on his neighbor's land, must show, not only that the horse ran away or the fire started, but that it was through the owner's fault. At times, however, the situation of the parties when injury occurs is such as to overcome the ordinary presumption of care on the part of the defendant. To such a situation the maxim is applied, *res ipsa loquitur*—"the thing speaks for itself." A railroad train jumps the tracks; a case of goods falls out of a warehouse window; or a peck of live cinders is thrown out of a railroad engine of an elevated road upon a traveler in the street below; in each case we have a situation which would not exist, ordinarily, had the railroad company or the warehouseman exercised ordinary care. Hence the presumption of due care on his part is overcome, and judgment will pass against him unless he can show that, notwithstanding these appearances, he was really without fault.

Another important rule is that the amount of care required varies with the apparent risk. One sets fire to brush or rubbish upon his premises and the fire spreads to his neighbor's land, doing damage and hurting another. Whether he acted negligently will depend upon various circumstances, such as these: Was the weather dry or damp? From what direction and with what velocity was the wind blowing? What

vigilance and effort did he exercise in trying to keep the fire on his own land? Again, without warning, one throws an article from a scaffold to the ground, hitting and hurting another. Whether he acted negligently will depend upon the apparent risk incident to the act. If the scaffold was adjoining a city street and the article was thrown into the thoroughfare, the act would be clearly negligent. On the other hand, if the scaffold overhung private premises, and there was no reason to believe that other persons were present, the act might well have been a reasonable one.

In some cases the courts are disposed to hold persons liable for harm caused by their acts or omissions, whether these are negligent or not. The doctrine was laid down by an eminent English judge as follows: "The person who for his own purpose brings on his land, and collects and keeps there, anything liable to do mischief if it escapes, must keep it at his peril, and, if he does not do so, is *prima facie* answerable for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was owing to the plaintiff's default, or was the consequence of the act of God." This view has not generally been adopted in the United States, the courts preferring the rule that one who brings dangerous agencies upon his land or under his control is not an insurer of the safety of others, but that he is bound to exercise a care over them commensurate with the apparent risk in each case.

The terms "gross negligence," "ordinary negligence," and "slight negligence" are often used, although the modern tendency is to discard them. When employed, the first represents the extreme of negligence—a want of care amounting almost to recklessness; the second is the absence of such care as an ordinarily prudent man exercises; and the third stands for the lack of care required of one who is doing a favor to the injured party, such as keeping his property gratuitously.

2. The legal duty of exercising care is relative, not absolute; when no duty to exercise care exists, there can be no such thing as negligence in the legal sense of the term. In other words, a man may be very careless without being negligent. To illustrate: the owner of a sugar orchard left a bucket of hot maple syrup uncovered in his woods. A neighbor's unruly cow jumped the fence, wandered into the wood lot, and died from drinking the sirup. Leaving the sirup thus was careless so far as protecting it from harm was concerned; but it was not negligence towards the owner of the cow, for the owner of the sirup was under no legal duty to exercise ordinary care towards trespassers, and the act of the cow was a trespass (q.v.). Towards trespassers the duty of a landowner, a common carrier, or the like, is simply to refrain from inflicting willful or wanton injury. Towards a licensee, i.e., one whom a person permits to be upon his premises or in his vehicle, the licensor owes some duty of care; but the amount of care is slight. As a rule, the licensee takes the risk of the situation. There must be something like fraud on the part of the licensor before he can be held answerable for injuries sustained by the licensee in falling into unguarded excavations, or breaking through defective floors, staircases, pavements, or the like, or getting caught by unfenced machinery, or being thrown from a collapsing carriage. The licensor is bound, however, not to open new excavations in or near a path which he knows licensees are accustomed to traverse, or to subject them to anything like mantraps or new and serious dangers without giving them warning. An ordinary guest is generally looked upon by the law as a mere licensee. Towards persons expressly or impliedly invited upon one's property in a matter of common interest, the inviter is under a well-defined duty—the duty of making the property reasonably safe. He is not under an absolute duty to prevent harm, but only to make the place as little dangerous as such a place would reasonably be, having regard to the ordinary exigencies of the business there carried on.

3. Even when it is shown that the defendant has been guilty of negligence towards the plaintiff, the latter may fail in his action because he cannot show that he has sustained legal harm by such negligence. A striking illustration of this rule is afforded where one is made sick by a nervous shock due to another's negligence. Through the fault of a railroad company, e.g., a car takes fire, and several passengers are so badly frightened that they faint and for weeks are confined to their beds by consequent sickness. According to the prevailing doctrine in England and in the United States, they have no cause of action against the company. Various reasons are assigned in its support. One is that such sickness is not the natural and probable consequence of the negligence; that it occurs only when there is an accidental or unusual combination of circumstances which could not have been reasonably anticipated by the defendant, and over which he had no control. Another reason urged is that to hold a defendant liable for mental anguish, or fright, or nervous shock, would cause an alarming increase in the volume of sham litigations. Every passenger in case of a railroad collision could allege fright or nervous shock and thus maintain an action against the company. In a few jurisdictions, however, mental anguish, even without consequent or attendant physical injury, is deemed legal damage. It is generally held that if the defendant's negligence causes injury to one's body, recovery may be had for the pain and suffering incident thereto.

Not only must the harm sustained by the plaintiff be of a character which the law deems it wise to recompense, but it must be, in contemplation of law, the natural and probable consequence of defendant's negligence. When negligence is to be deemed the proximate cause, and when the remote cause, is often a question of great difficulty. When the inquiry is sent to a jury, they are generally instructed that the proper test to be applied by them is: Was there an unbroken connection between the negligence and the injury? Did the facts constitute a continuous succession of events so linked together as to make a natural whole, or was there some new and independent cause intervening between the wrong and the injury? Applying this test, the plaintiff was beaten in the following case: Defendant, a railroad company, received a quantity of wool for transportation from Buffalo to Albany, N. Y., and for delivery there to another company for transportation to Boston, Mass. It was negligent in starting the wool on its journey, so that it

reached Albany 10 days later than it would but for such negligence. While in defendant's warehouse awaiting the call of the second carrier the wool was injured by an extraordinary flood. It was held that the immediate and proximate cause of plaintiff's loss was the flood, and that defendant's negligence was too remote to render it liable. The latter had ceased to operate as an active or efficient cause before the flood came.

It is on this ground (that defendant's negligence is not the proximate and efficient cause of one's injury) that the injured party is denied a recovery when he is shown to have been guilty of contributory negligence. A single example will suffice here: A workman is warned by his employer not to work upon a scaffold at a certain point because it has no railing there. He does work on that part and, forgetting the absence of a rail, steps backward, falls, and is injured. Clearly it is the workman's negligence, not the employer's, that is the decisive cause of his harm. But suppose, being there with knowledge of defendant's negligent omission of a railing, he had been knocked from the scaffold by the fall of an object from the roof, which fall was due to defendant's negligence. The servant's presence at the point in question would have furnished an opportunity for defendant's negligence to operate, but would not have been the cause of his injury, and he would recover.

Negligence which is the proximate and efficient cause of the death of a human being may subject one to a criminal prosecution for manslaughter, but at common law it does not render one liable in tort. The latter rule has been changed by statute both in England and in many of the United States. While this legislation varies in different jurisdictions, its principal object is to grant a cause of action on behalf of those who were dependent upon or financially interested in the life of the deceased against the one wrongfully causing his death. Consult: Shearman and Redfield, *Treatise on the Law of Negligence* (5th ed., New York, 1898); Pollock, *The Law of Torts* (7th ed., ib., 1904); E. B. Thomas, *Negligence* (2d ed., ib., 1904); S. D. Thompson, *Commentaries on Negligence* (7 vols., Indianapolis, 1905–07); Thomas Beven, *Negligence in Law* (3d ed., Toronto, 1908). See CAMPBELL'S (LORD) ACT; TORT.

NEGO'TIABLE IN'STRUMENTS (ML. *negotiabilis*, from Lat. *negotiari*, to negotiate, from *negotium*, business, from *nec*, not + *otium*, leisure). Contracts in writing which are transferable by indorsement or delivery, and which are enforceable by the transferee in his own name, without previous notice to the promisor, as well as without the risk of being met by defenses that would have been good against the transferor. Such contracts were unknown to the early common law of England. By that law a contract, whether written or oral, could not be transferred so as to enable the transferee to sue upon it in his own name. He was obliged to sue in the name of the transferor. Equity modified this rule to the extent of allowing an assignee of a contract to sue in his own name. But, even in equity, the assignment would not bind the promisor until he received notice of it, and after notice he could set up all defenses against the assignee which were available to him against the assignor at the time of notice. In other words, the assignee could get no better title than the assignor had. Modern statutes have made nearly all contracts of action assignable; i.e., they permit the assignee to sue upon them in his own name, but he takes them subject to the defenses available against his assignor.

The negotiability of certain contracts is a characteristic impressed upon them by the usages of merchants. This quality was first recognized and made effective by the law merchant (q.v.), whose rules were later adopted and enforced by the common law. Thus it has come about that for more than three centuries certain contracts in writing have been treated by all English judicial tribunals as negotiable, in contrast with others which are only assignable. The earliest form of negotiable instrument recognized by English law was the foreign bill of exchange (q.v.). Next in order came the domestic or inland bill of exchange, differing from the foreign bill only in the fact that it was drawn and payable within the same state or political jurisdiction. Following this came the promissory note (q.v.), but its negotiable character was not established without a struggle. It is true that the negotiability of this novel mercantile instrument passed unchallenged for a time in England, but after Lord Holt became Chief Justice he set his face against the recognition of new forms of negotiable instruments and decided that promissory notes were not negotiable. Immediately the merchants of London appealed to Parliament, which thereupon enacted a statute upholding the mercantile view and declaring promissory notes negotiable like bills of exchange (3 and 4 Anne, c. 9, 1704). About this time another species of negotiable instruments was devised and came into general use—the goldsmiths' or bankers' notes. These were the promissory notes of bankers, payable to bearer on demand, and originally given for money actually deposited with the maker by the one to whom they were issued. Lord Mansfield had no hesitation in treating them as negotiable by delivery. A little later the use of checks (see CHECK) became general. For some time the legal status of this instrument was doubtful, but it has long been recognized as a species of bill of exchange, and is now authoritatively defined as a bill of exchange drawn on a bank and payable on demand.

The foregoing are the most common forms of negotiable paper, but several other forms have been found useful in mercantile transactions and have received judicial approval, such as the bonds of business and municipal corporations, exchequer bills, and scrip for government bonds. In order that a written contract may possess negotiability, it must be payable to order or to bearer and must be treated in the money market as a security for and representative of money. Accordingly, bills of lading (see BILL OF LADING), warehouse receipts (see WAREHOUSE RECEIPT), and like documents of title are not negotiable instruments, even in jurisdictions where they are declared by statute to be negotiable. They are not representatives of money and cannot perform the functions of currency. They are symbols of goods, and their transferee gets no better title to the goods which they symbolize than he would secure by the delivery of the goods. Hence the thief or the finder of a bill of lading cannot pass a perfect title to a bona fide purchaser thereof, as he can do in case of a bill of exchange or a promissory note,

The right to enforce negotiable paper free from defenses available against the transferor or prior parties is confined to the bona fide holder, i.e., to one who has become the owner of the paper before it is due, for value, and without notice of any defect in the transferor's title. Such a holder can pass his title even after the paper is due, and to one who has notice of defects in the title of one back of such holder.

The law of negotiable instruments has been codified in Great Britain (Bills of Exchange Act, 1882, 45 and 46 Vict., c. 61) and in most of the United States.

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NEGOTIABLE PAPER. See NEGOTIABLE INSTRUMENTS.

NEGRI, nā'grē, ADA (1870–). An Italian poet, born at Lodi of a family of artisans. As a teacher in a village school, she wrote her first verses, which passed almost unnoticed in the columns of a periodical, but they attracted attention to her when published as the volume of lyrics entitled *Fatalità* (1893), which had a wide sale in Italy and was translated into German. A second volume, the *Tempeste*, appeared in 1896. Soon after the publication of the *Fatalità* she received a post in the normal school at Milan, where she married the manufacturer Garlanda. Her third collection of poems, *Maternità*, appeared in 1904. Ada Negri sings the song of the submerged classes. Her earlier verses have a Lombard fierceness of revolt lacking in her later writings. She depicts in vivid colors the abject misery of the workman engaged in a constant struggle against the cruel aristocrat, the ignoble bourgeois, and hostile nature. Although she idealizes the figure of the peasant or the artisan and is careless of form, her verse is characterized by spontaneity and sincere feeling. Consult Guido Mazzoni, in the *Nuova antologia* (Rome, 1893), and Jean Dornis, *La poésie italienne contemporaine* (Paris, 1898).

NEGRI, CRISTOFORO (1809–96). An Italian politician, historian, and geographer, born at Milan. He became professor at Padua in 1843, was the first member of the faculty to side with the Italian cause in 1848, and after Custozza and the success of Austria he was forced to resign his chair. He was almost immediately elected president of the University of Turin, and held a place in Gioberti's ministry until the battle of Novara. He then became chief of the consular service and held this position under Azeglio, Rattazzi, and Cavour. In 1867 Negri founded the Italian Geographical Society, and was its president for five years. He wrote: *La grandezza italiana* (1864); *La storia politica dell' antichità paragonata alla moderna* (1867); *I passati viaggi antartici e l' ideata spedizione italiana* (1880).

NEGRITOS, nā-grē'tōz (Sp., little negro). The term applied by most modern ethnologists to one of the great ethnic groups into which the population of the East Indies is divided. Some anthropologists recognize a Negritic stock consisting of three groups, Negrito, Papuan, and Melanesian, while others regard the Indo-Oceanic Negritos as a separate branch of the *Homo æthiopicus*, distinct from the Indo-Oceanic Negroes, from whom they believe that the Papuans and Melanesians have sprung. It seems best, however, to count the Malays, Indonesians, Negritos, and Papuans as the four ethnic stocks of Malaysia. The term should be used in the restricted sense implied in the principal recent classifications of mankind in this area. The physical characteristics of the Negritos are: small stature (great majority under 5 feet), a brachycephalic or subbrachycephalic head form, a dark-brown or black skin sometimes somewhat yellowish, the hair woolly (scanty on face and body), a flat nose, thickish lips, and other features of physiognomy and body of a negroid character. Many ethnologists assume that the earliest inhabitants of extreme southeastern Asia, the Malay Archipelago, and neighboring regions were of this stock, but evidence for such a view is lacking. No real proof of their presence in Sumatra, Java, Borneo, Celebes, or Formosa has been produced. It is held by some, however, that the Negritos once inhabited Timor, Flores, and the islands near, while it has been reported that the Karons of the Arfak Hills in northwestern New Guinea were Negritos, and an infusion of Negrito blood has been recognized in other parts of the island, such as the Saddle Mountain region. Definite proof of a predominantly Negrito people in New Guinea was supplied by the discovery of the Tapiro, of Netherlands New Guinea, by the Wollaston expedition (1910). The only centres of undoubted Negrito population existing at present are in the Andaman Islands, the Malay Peninsula, certain of the Philippine Islands, and the interior of New Guinea, the pure Negritos being certainly represented only by the Mincopies, Sakai, Aetas, and Tapiro. The Mincopies of the Andaman Islands average 4 feet, 11 inches in height, are brachycephalic, broad-faced, extremely frizzly-haired, and have a skin of a dull leaden hue. The Semangs and Mantras, in the peninsula of Malacca, may be regarded as Negritos, while the Mintra and the Jakuns of Johore are Sakai-Malay half-breeds, with lighter skin and taller stature. Some authorities, however, regard them as Negritos. The Semangs (whose own name is Mendi or Menik) of northern Perak, Kedah, Rahman, Ranga, and Kelantan are described by Martin, who visited the Malay Peninsula in 1897, as representing a dark-brown ulotrichous variety of man, while the Sakai (whose own name is Senoi) of southeastern Perak and northwestern Pahang are a brown cymotrichous variety. Both are distinct alike from the Malayan and the Mongoloid peoples. The Blandas, Ma-meri (or Besesi) of southern Selangor, the Mantra of the territory of Malacca and Rembau, and the Jakuns of Johore he styles mixed peoples. As to head form, the Semangs are mesocephalic (tending to dolichocephalic with an index of 78 to 79), the purest Sakai are dolichocephalic, and the Besesi brachycephalic. The hair of the Semangs is frizzy or thick woolly, while that of the Sakai and of the mixed tribes is for the most part wavy. The Semangs average 5 feet in height and have remarkably convex lips, a typical Pygmy trait. The Sakai are now classed

with the Vedda and some jungle tribes of the Deccan as remnants of a pre-Dravidian race, which is believed to have had a wide distribution. They are thus not Negritos, but belong to the other main stock of Asiatic Pygmies. The Aetas of the Philippines, who number altogether some 10,000, are found in certain parts of the interior of Luzon, Mindoro, Panay, and Negros, and northeastern Mindanao. Their skin is of a dark-chocolate brown, their mean height is 4 feet, 9½ inches, and the cephalic index of 16 males averages 82.2. The culture status of the Negritos is very primitive, though the arts and industries of the Andaman Islanders, the best-studied members of the stock, give more evidence of talent and ingenious adaptation to environment than is commonly attributed to them. The bow and arrow (often poisoned) is a characteristic Negrito weapon.

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NE'GRO (Sp., Portug., It. *negro*, black, from Lat. *niger*, black). The name properly applied to a subspecies of mankind of whom the chief characteristics are a dark skin, woolly or frizzly hair, and a dolichocephalic skull. The negroid type presents many modifications and has obtained a fairly wide dispersion, but is found in its purest state and in greatest numbers in Africa, and that continent must be considered its centre of distribution.

It is commonly held that the type is best represented by the Sudanese tribes of Africa, who are regarded as true negroes. They are distinguished by a very dark-brown or chocolate-colored skin, black crisp hair which is flat on section, a relatively long head, with flat, broad nose and projecting jaws with thick, everted lips. In stature they are tall, with long arms and slender legs.

The most important modification of this type is found in the Bantu group of tribes, which stretches southward in Africa from the Sudan to the Cape of Good Hope. This division is one based largely on linguistic grounds, and, presenting as it does many variations of slight extent, it is impossible to name any single physical character which distinguishes the Bantu negro from the Sudanese. In general, however, the Bantu face is less coarse than the Sudanese, the jaws less projecting, and the lips not so thick. In color of skin the Bantu shows all shades of dark brown, and in stature corresponds to the Sudanese.

A marked variation, and one difficult to account for, is seen in the dwarf races which are found in scattered groups across Central Africa surrounded by Bantu neighbors and extending far to the south, where they are represented by the well-known tribe of Bushmen. The Bushmen have usually been regarded as forming an independent stock not to be classed with the Pygmies of the equatorial region, but recently Kuhn and Von Luschan have argued vigorously for the essential unity of these tribes. On the other hand the Hottentots are surely distinct from both and have even been regarded as of Hamitic stock, though hardly on convincing evidence. See Colored Plate in article AFRICA.

The dwarfs offer striking physical traits which differentiate them from the other negroid peoples of Africa. In stature some of the northern Pygmies do not average much over 4 feet, the Bushmen seldom range over 5 feet, while the Hottentots are distinctly taller. In color the skin is a light yellowish brown and, in the true dwarf groups, said to be covered with a sort of down. The hair is crisp and, in the central dwarfs, of a rusty-brown color, while in the Bushmen group it is black and tufted.

Of the true negroes of the Sudan the most important tribes are, in the west, the Wolof, Mandingan, Felup, Timni, Kru, Sierra Leonese, Liberian, Tshi, Ewe, Yoruba, Ibo, Efik, Borgu, and Mossi; in the central Sudan the Sonrhay, Hausa, Mosgu, Kanembu, Kanuri, Baghirmi, and Yedina; and in the east the Maba, Fur, Nuba, Shilluk, Dinka, Bari, Abaka, Bongo, Mangbattu, Zandeh (Niam Niam), Monfu, and Bari.

Of the Bantu tribes traced southward along the east coast and northward along the west, following their probable course of migration, some of the most important divisions are the Bonjo, Baya, Waganda, Wanyoro, Wapokomo, Wagiryama, Waswhahili, Zulu, Mashona, Bechuana, Ova-Herero, Eshi-Kongo, Bashilange, Balolo, Manyema, Bakalai, Fan, Mpongwe, Dwala, and Batanga.

These peoples include the bulk of the African negroids. The dark-skinned natives of the north, viz., in Abyssinia and in neighboring regions and along the Mediterranean, exhibit such differences and are so allied in other respects with Semitic and Hamitic peoples that they are usually classed with them.

The extra-African distribution of negroid stocks immediately presents difficulties. We can disregard the negroes of the two Americas, who are almost invariably of West African descent and differ from their parent stocks only in the modifications due to mixture with Europeans and Indians.

The Australians must be considered an independent race presenting physical characteristics which differentiate them from the true negro, notwithstanding their dark skins.

There are, however, in the East Indian Archipelago, in New Guinea and Melanesia, and in Madagascar negroid tribes whose classification and relationships present difficulties at present insurmountable. Of these stocks the Papuans of New Guinea and the Melanesians are the most numerous and important. They are a dark-skinned, dolichocephalic race and differ physically from the African negro chiefly in the hair, which is longer and moplike, and in facial features, which latter, however, are variable. There are no safe grounds for considering them as a branch of the true negro stock other than the striking resemblance in skin color.

At different points in the northern portion of this region are found scattered groups of an undersized negroid stock commonly called Negritos (q.v.). They are usually compared with the dwarf races of Africa and undoubtedly do offer striking similarities in physical charac-

ters, but in other respects seem to correspond rather to the Australian and Papuan.

The parentage of the negroids of Madagascar is also in dispute. The proximity of Africa would indicate an origin from that continent, and there are both physical and cultural facts to support the view, but there are also unmistakable signs of Melanesian traits which suggest immigration from both regions.

Much has been written as to the mental capacity of the negro, but trustworthy information is scanty. Such few careful observations as have been made upon negro brains indicate a slightly lower type than that of Europeans, but the variability is so high as to forbid drawing any conclusions regarding the accompanying intellectual powers—a statement which holds true of the natives of Melanesia as well as of Africa.

In culture the negro presents almost as many degrees and varieties as there are stocks. A relatively low grade represented by certain of the Sudanese, Bantu, and dwarf tribes is found side by side with a relatively high civilization, as, e.g., that of the Hausa; but it must be admitted that the sporadic examples of marked cultural progress in Africa can almost invariably be traced to Arabic or other foreign influence. Environment has, of course, produced specific types of culture in different parts of the continent, such as the cattle-breeding, pastoral life of the south and west and the strictly hunting life of the dwarfs of the equatorial forests, and this diversity makes general statements dangerous or impossible.

With regard to religion we find an extensive animism which has developed remarkably at different points. For example, the ancestor worship of the Zulus has been carried to a logical extreme, which is unique among savages, and the complex fetishism of west Africa is everywhere regarded as the type of that phase of belief.

Political organization is equally diverse, ranging from hereditary kingship to such loose tribal systems that no chieftainship is ascertainable.

In comparison with other great groups of mankind the negro seems to possess certain temperamental qualities which are more or less characteristic, being lively, excitable, and fond of social life and discussion, and this trait has undoubtedly played an important rôle in the development of certain phases of African culture. Our knowledge of the majority of the negro tribes of Africa is still lamentably slight, but, with the extension of European interests in that continent, much valuable information is coming to light.

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NEGRO, nā'grō, Río. 1. A tributary of the Amazon. 2. A river of Argentina. 3. A territory of Argentina. See Río Negro.

NEGRO BUG. A plant bug of the family Corimelænidæ. These bugs are usually of very small size and are intensely black in color, sometimes having a bluish or greenish tinge. They are convex in form, the scutellum covering nearly the whole upper side of the body, and are often mistaken for small beetles. They are fond of laying their eggs on small fruits, like blackberry and raspberry, giving them a very disagreeable taste. A common species in the United States, the flealike negro bug (*Corimelæna puticaria*), is frequently mistaken for the chinch bug.

NEGRO EDUCATION. Much of the negro advancement in the United States since the Civil War is to be credited to the regular habits of industry and to the knowledge of the white man's religion, language, and ways of life gained in slavery days. To one connected with negro schools nothing is clearer than the value of the influence of good Southern white families upon their slaves. Some of the plantations were really large trade schools where habits of industry were formed. Carpenters, coopers, sawyers, blacksmiths, tanners, curriers, shoemakers, spinners, weavers, knitters, and distillers were all to be found among plantation slaves, and the negro mechanic was an important man in the community. Thus the race was being gradually trained in the ways of civilization, was contracting the habit of labor, acquiring a superior language and religion, and developing a character capable of further advancement.

Credit should also be given to the training which the colored man received during the Civil War. In the Northern armies there were thousands of colored troops who received discipline of the most valuable sort. In the South the homes and farms of the white Confederate soldiers were largely in the hands of negro men and women. Most valuable to the slaves was the gain in power and executive ability that came out of that experience. While their masters were fighting to keep them in slavery, they were receiving in the absence of those masters the education which was to fit them to be freemen.

Upon the heels of the Northern armies came an army of devoted women, eager to teach the freedmen. In September, 1861, the American Missionary Association opened its first school for contrabands at Hampton, Va., the outcome

of which is the Hampton Normal and Agricultural Institute (q.v.). In the following January schools were started at Hilton Head and Beaufort, S. C., and in 1862 and 1863 teachers were sent to Tennessee. The Rev. John Eaton, an army chaplain from Ohio, afterward United States Commissioner of Education, was placed by General Grant in charge of the instruction of the colored people, of whom it is estimated that more than 1,000,000 learned to read and write; of the 80,000 colored troops in the Northern army, 20,000 learned to read and write. The churches of the North vied with one another in their endeavors to bring education to the black man. In 1865 the Freedmen's Bureau (q.v.) was established, and, in addition to other work, it superintended the education given to the freedmen by the government and the churches of the North. Between 1865 and 1870 more than $5,000,000 were expended by this organization for educational purposes. In some cases government buildings and land were granted.

The proved capacity of the negroes for education suggested the wisdom and economy of providing their schools with teachers of their own race, and during the years from 1868 to 1878 there were founded 25 normal and collegiate institutions under the control of different religious denominations, the Congregationalists and Baptists leading in the number and size of their schools. They extended from Hampton in Virginia to Tillotson in Texas. At Atlanta, Nashville, Chattanooga, and other centres institutions were built costing from $200,000 to $500,000 and having a yearly attendance of from 300 to 500 students. They have trained many of the teachers of the negro race.

The work of these schools has often been criticized and sometimes, perhaps, justly; but it is nevertheless true that they have had much to do with the uplifting of the negro race. From them have gone forth many of the best teachers of the negro public schools. Most of these institutions had as their model the New England high school or college. Latin and Greek had often a prominent place. The practical side of education, which was largely provided for in the New England home, was not supplied in the one-room cabin of the South. Too great emphasis was sometimes placed upon the literary and academic side of education and too little upon the gaining of a knowledge of the common things of life and of the forming of habits of intelligent industry. It was natural that the colored man, after years of forced labor, should revolt against any education that gave prominence to the work of the hand. It was natural that his teacher, who heard it continually said that negroes were fit only to be hewers of wood and drawers of water, should wish to prove that they could become successful lawyers, physicians, and clergymen. The wisdom of raising up leaders of a people is unquestioned, but where 80 per cent of a race live on the land, as is the case with the blacks of the South, and where a large majority live, as the masses of the negro race still do, in one-room cabins under the lien system of crops, it has been recognized that there must be a close relation between education and vocation, and that their teachers and clergymen should be taught how to build their own houses and how to cultivate their land properly.

What is called race prejudice has resulted in a system of public schools taught by colored teachers which, while it has its disadvantages, has resulted in good to the race.

Before the year 1870 there were practically no negro public schools, with the exception of those in Memphis, New Orleans, and Nashville. There were, however, in the District of Columbia 10,494 colored children in public and private schools. In 1870, while for the most part there was opposition, certain farseeing Southerners declared in favor of the education of the blacks. In 1871 a little improvement was made. In 1872 Delaware and Kentucky were the only States that had not made provision for negro education. In 1873 and 1874 State normal schools began to be established for the training of negro teachers. In 1877 the total number of negro children reported of school age was 1,513,065 and the number enrolled in the schools 571,506. There were 27 normal schools with 3785 pupils and 23 institutions for secondary instruction with 2087 pupils. In 1882–83 the colored school population in the District of Columbia and the former slave States was 1,944,572 and the enrollment 802,982. Thus, less than 20 years after the war there was built up in the South a public-school system for both whites and blacks, with normal schools for the training of teachers, which, considering the poverty of the States, was admirable. In 1897–98 there was an enrollment in the schools of 1,506,742 colored children, or 52.97 per cent of the colored school population, while in 1900–01 there was an enrollment of 51.46 per cent of the negro children. The enrollment for 1903–04 was 1,577,385 and the percentage 55.14. The average daily attendance in the colored schools is 64.38 per cent of their enrollment. In 1912–13 there was an enrollment of 1,769,859 colored children, or 56.05 per cent of the colored school population, and an average daily attendance of 1,089,354, or 61.55 per cent of their enrollment. In the same year there was a total of 156 public high schools and 270 private schools for colored pupils, giving secondary, normal, collegiate, and industrial courses. The number taking secondary courses was 25,559. In addition 29,481 students were taking collegiate and professional courses.

No account of negro education in America would be complete which did not include an account of the work of Gen. S. C. Armstrong at Hampton Institute. Believing in the moral value of self-help, General Armstrong built up a school in which greater prominence was given to doing than to mere learning, where there was not only the schoolroom, but also the workshop; not only the church, but also the farm; not only the training of the mind, but also that of the heart and hand. An effort was made in this school to fit men and women for definite conditions, to develop a love for intelligent work, and to inspire in its pupils a strong desire to go out and help to uplift their people. The school at Tuskegee, founded by Booker T. Washington, Hampton's most distinguished graduate, was established with similar views. While receiving help from the North, both of these schools have put themselves in the closest touch with the South and its public-school system. Their influence on this system has been marked. As a result of the kind of training given at Hampton and Tuskegee, hundreds of young people have been sent out who, by the establishment of homes, the cultivation of land, and the carrying on of business enterprises,

have reconstructed whole communities. There is reason to believe that this type of school is meeting the pressing need, on the part of the negro people, of knowledge of the common duties of life, while, at the same time, it is providing a kind of training which results in the stability of character so lacking in the masses of this people.

In the establishment and conduct of negro schools two wisely administered funds have had a large share. (See PEABODY EDUCATION FUND; SLATER FUND.) Mention should also be made of the Southern and General Education Boards, which are composed of prominent Northern and Southern men. Both these agencies represent a union of wealth, business sagacity, and educational statesmanship that augurs well for the cause of universal education. The Southern Education Board conducts a campaign of education for the purpose of stimulating public sentiment in favor of more liberal provision for the common schools for both races. Its work is supplemented by that of the General Education Board, which, in addition to collecting information in regard to existing educational conditions among both races, disburses certain funds where they are most needed for the strengthening of the agencies tending to promote the education of all the people. The board, e.g., coöperates with State departments of education by paying the salaries and expenses of State agents for negro rural schools in the South. The function of the agents is not only to educate the public, but to improve school curricula along industrial and domestic lines and encourage farm demonstration and clubs. The board also coöperates with and manages the Anna T. Jeanes Fund for supporting industrial supervisors and teachers. Through the State supervisors, again, the negro teachers are improved by the holding of institutes and summer schools. Finally, the board, through its support of negro colleges, encourages the training of leaders of the race.

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NEGRO EX'ODUS. The name applied to a movement of freedmen from the Southern to the Western and Northern States in 1879 and 1880. The movement began in the early spring of 1879, and before the close of 1880 fully 40,000 negroes had removed to Kansas alone, while a large number had settled in Missouri and Indiana also. Many arrived at their destination poorly clad, generally destitute, and without promise of employment, and for a time there was much want and suffering among them. Large sums of money, however, were contributed for their relief throughout the North, and especially in Kansas, where, soon after the arrival of the first band of immigrants, an efficient Freedmen's Relief Association was organized. The only Southern States from which the blacks emigrated in any considerable numbers seem to have been Mississippi, Louisiana, and Texas. The chief reasons given by the negroes for the abandonment of their homes were that they were forced to pay excessive rents, that the system of land tenure in the South was unjust, that exorbitant prices were charged by credit merchants, and that the freedmen were wholly denied political recognition and were kept down in every way by bulldozing methods. Opponents of the movement asserted that the negroes had been misled by the representations of land speculators, by misguided philanthropists, and by politicians who, in view of the approaching presidential election, wished to import numbers of Republican voters into various parts of the North, where the Republican majority was doubtful. The movement seems to have been considerably furthered by the Nashville Colored Convention, which met in Nashville, Tenn., May 7, 1879, adopted a report setting forth the grievances of the blacks and the many disadvantages, social, economic, and political, under which they labored in the South, and recommending that the negroes should emigrate to those States where their rights were not denied them. For an account of the causes of the movement, consult an article by Runnion, "The Negro Exodus," in the *Atlantic Monthly*, vol. xliv (Boston, 1879); and for arguments justifying and condemning the movement, consult articles by R. T. Greener and Frederick Douglass, respectively, in the *Journal of Social Science*, vol. xi (ib., 1888).

NEGRO IN AMERICA. The first appearance of the negro in the English colonies in America was in 1619, when a cargo of negro slaves was landed at Jamestown. The scarcity of labor, especially in the Southern colonies, created an increasing demand for negro slaves, and by 1714 the number had increased to 58,850 (estimated). The greater part of these were brought direct from Africa, although considerable importations from the West Indies took place, and natural increase contributed an appreciable number. Importation was carried on more extensively in the following half century, the aggregate of negroes in the colonies reaching about 300,000 in 1754. In 1790 the first census found 757,208 in the United States. In the next 100 years this number was multiplied tenfold. This extraordinary growth in numbers has been due chiefly to natural increase, although importations were considerable up to 1808, when they were prohibited by the Constitution. The smuggling in of Africans continued, however, up to the Civil War. Since that time there has been some immigration of negroes from the West Indies, not sufficient, however, to affect the truth of the proposition that recent growth in negro population practically represents a natural increase.

It is a matter of great importance whether or not the negro population is increasing more rapidly than the white. Table I shows the number of negroes in the United States for each decade from 1790 to 1910, together with the percentage of the total population which the negroes represent.

TABLE I

CENSUS	Negroes	Percentage of total population of United States
1790	757,208	19.3
1800	1,002,037	18.9
1810	1,377,808	19.0
1820	1,771,656	18.4
1830	2,328,642	18.1
1840	2,873,648	16.8
1850	3,638,808	15.7
1860	4,441,830	14.1
1870	4,880,009	12.7
1880	6,580,793	13.1
1890	7,488,788	11.9
1900	8,833,994	11.6
1910	9,827,763	10.7

It will be seen that the proportion of negroes to the general population has declined for every decade since 1810 except 1870–80; and it is now generally understood that the apparent increase for that decade was the result of faulty enumeration. It is true that much of the relative increase in white population is to be ascribed to immigration (q.v.). Nevertheless, it appears that the native white population is increasing faster than the negro population. Thus, for the decade 1900–10 the native whites of native parentage increased 20.9 per cent, while the negroes increased only 11.2 per cent.

Distribution of Negro Population. In the Colonial period negroes were found in every Colony, but were most numerous in the South, where their services were in greater demand. The abolition of slavery in the North led to greater concentration in the South; and by 1860, out of 4,441,830 in the United States, only 226,216 lived in the Northern States. Since the war a considerable diffusion has taken place. At times it has been feared that a large proportion of the negroes would flock to the North; but adverse climatic conditions and the difficulty of competing with white labor have forced most of the negroes to remain in the South. See Table II for the distribution of negroes.

Relatively to the general population the negroes increased in the last decade in the States of Vermont, New York, Illinois, Iowa, West Virginia, Arkansas, Wyoming, Utah, Nevada, and California.

Georgia had a negro population in 1910 of 1,176,987; Mississippi, 1,009,487; Alabama, 908,282; South Carolina, 835,843. Virginia, North Carolina, Louisiana, and Texas exceeded 600,000. In Alabama the negroes are 42.5 per cent of the total population; South Carolina, 55.2; Louisiana, 43.1; Georgia, 45.1; Florida, 41.0. A more detailed statistical study would show a tendency of the negroes to concentrate in limited areas in some of the Southern States. Thus, in the three counties, Issequena Co., Miss., Tensas Co., La., and Tunica Co., Miss., negroes represent 94.1, 91.5, and 90.6 per cent of the total population.

Economic Condition of the Negro. As a laborer the negro is capable of the hardest physical toil, and works without difficulty where the humidity and heat render labor intolerable for the white. He is lacking in stability, and is inclined to roam from one district to another without any satisfactory reason; he is wasteful and careless, requiring constant supervision. These characteristics have largely determined his economic position. As an agricultural laborer the negro is indispensable in the South, more especially in the low, swampy districts, where the white laborer readily succumbs to disease. As a domestic servant the negro has proved his usefulness. In manufactures, on the other hand, negro labor is unsatisfactory, since the negro will not remain in a position long enough to develop a high degree of skill. The same deficiency is driving him out of the handicrafts. Under slavery a large number of negroes were trained in handicrafts, and proved to be valuable workmen after emancipation; but the generation which has risen since slavery has manifested an unwillingness to enter upon the long period of training necessary for the exercise of the trades. The tendency towards agricultural labor and personal service is illustrated by the statistics of occupations of the thirteenth census. Out of 5,192,535 engaged in gainful pursuits, 886,736 were engaged in domestic service and 2,857,732 in agriculture. The economic progress of the negro, except as an owner of land, is not susceptible of statistical determination. The amount of property of all kinds held by negroes is conservatively estimated at over half a billion dollars. The annual meetings of the National Negro Business League, organized in 1900, attest a decided advance in the number and magnitude of enterprises conducted by negroes.

The wages of the negro agricultural laborer in the South usually range from $6 to $10 a month, with substantial additions in the shape of food, house room, etc. In the busy season of the year the day laborer usually receives a far higher wage. A good cotton picker in the Yazoo-Mississippi delta often earns $1.50 a day. Whether wages are high or low, the negro laborer is likely at any time to leave his employment, with resulting embarrassment to the employer. Hence it is a common practice to let small holdings to negroes, in order that interest in the crop may diminish their migratory tendencies. According to the census of 1910, 890,141 farms were occupied by negroes, of which 175,290 were owned by their occupants; 43,177

TABLE II

DISTRIBUTION OF NEGROES

DIVISIONS	1880	1890	1900	1910
North Atlantic division	229,417	269,906	385,020	484,176
South Atlantic division	2,941,202	3,262,690	3,729,017	4,112,488
North Central division	385,621	431,112	495,751	543,498
South Central division	3,012,701	3,497,887	4,193,952	4,636,939
Western division	11,852	27,081	30,254	50,652

farms in addition were part owned. The tenant farmers sometimes pay a cash rental, but more frequently farm on shares. The landowner furnishes machinery and draft animals, receiving one-half the crop. Frequently he advances food and other supplies to the tenant, recouping himself out of the tenant's share in the crop. Share tenants represented 43.1 per cent of all negro farmers in 1910.

While the negro farmer still remains handicapped by lack of education, forethought, and technical skill, he is making notable progress in the direction of economic independence. Farms owned by negroes in the South increased in value from $123,754,396 in 1900 to $275,323,227 in 1910, or 122.5 per cent. The corresponding percentage increase for white owners was 99.6. In the North the negro manifests a tendency to concentrate in the cities, where his economic activities are chiefly confined to personal service and unskilled labor.

Social and Moral Conditions. When account is taken of the fact that the ancestors of the American negro were taken from a state of barbarism and were subjected only to comparatively weak moral restraint under slavery, it does not appear surprising that the social and moral condition of the negro is unsatisfactory. The great mass of the negro children receive an inadequate home training, and are therefore left to pursue their own inclinations, with the result that they readily lapse into their ancestral vices. The rules of monogamic marriage are but loosely obeyed—the exchanging of wives, e.g., being not uncommon on Southern plantations. Illegitimacy is common. In the cities adverse social conditions for which the negro is only in a small measure responsible increase the tendency to moral disorder. The negro quarter is usually in close proximity to the quarters given over to professional vice, and often the two are interpenetrating. Whether conditions are improving or deteriorating in this respect it is impossible to prove. It is, however, the testimony of a large number of observers that wherever the negro withdraws from the presence of the white population, moral conditions deteriorate; hence the tendency towards segregation noted above is generally viewed with anxiety by those who are most deeply interested in the improvement of the negro race. Wherever the economic conditions of the negro are improving, on the other hand, family life and morals also show a tendency towards improvement. The poverty of the masses of the negroes at present results in the overcrowding of cabins and tenements, which is destructive of family life and morality. For this reason students of the race problem look to the technical education of the negro as the best method of elevating him morally.

Statistics of crime present another serious problem connected with the presence of the negro in the United States. In 1890 there were in the Southern States 6 white prisoners to every 10,000 whites, and 29 negro prisoners to every 10,000 negroes. In the Northern States there were 12 white prisoners to every 10,000 whites, 69 negro prisoners to every 10,000 negroes. In the South negro prisoners increased 29 per cent per 10,000 between 1880 and 1890, while white prisoners increased 8 per cent per 10,000. In 1910 the enumeration of prisoners and juvenile delinquents for the United States as a whole gives the number of whites as 93,841 and the number of negroes as 42,631, or 45 negro prisoners to every 100 whites, as compared with 10.7 negroes to 100 whites in the general population. While it is no doubt true that a larger percentage of crimes against property committed by negroes is detected and punished, and hence the relative amount of negro criminality may be exaggerated, it is also true that a large number of negro crimes committed against members of their own race are not punished at all, and so do not appear in the statistics of criminality. Crimes of violence appear to be increasingly frequent where the negroes are least in contact with the whites.

The greatest improvement in the position of the negro appears in the statistics of education. At the close of the Civil War it is doubtful whether more than 5 per cent could read and write. In 1900 the percentage of illiteracy had been reduced to 44.5 per cent. A further decrease to 30.4 per cent had taken place by 1910.

Political Condition. After the close of the Civil War, the negroes, under the leadership of a certain class of whites, practically controlled the government of many of the Southern States. (See RECONSTRUCTION.) Their ignorance and lack of political training rendered them incapable of exercising political power wisely, and they were gradually excluded from power by the whites, at first by wholly illegal means, later by State laws and constitutional amendments. In 1890 the constitution of Mississippi was amended so as to exclude from the suffrage any person unable to read any section of the constitution or to understand it when read to him and give a reasonable interpretation of it. Payment of a poll tax was also required. The effect of this amendment was the exclusion of the greater part of the negro vote. In 1895 South Carolina amended its constitution so as to exclude the vote of any one unable to read or write any section of the constitution, or to show that he owned and paid taxes on property assessed at $300 or more. In 1898 Louisiana passed a similar amendment, with the addition of the so-called grandfather clause excusing from the limitations of the amendment all descendants of men who voted previous to the war, thus admitting to the suffrage illiterate, propertyless whites. North Carolina took similar action in 1900, though no property qualification was required. In 1901 a constitutional amendment was adopted in Alabama practically disfranchising the negro. Georgia took similar action in 1908 and Oklahoma in 1910. In 1915 the grandfather clause of the Oklahoma law was held unconstitutional by the United States Supreme Court.

For the solution of the various negro problems, social, economic, and political, several plans have been brought to public attention. Repatriation of the negro in Africa was widely advocated, especially in the first two decades after the Civil War; but the plan has been generally abandoned as impracticable, since the negro manifests no desire to return to Africa, and could not be forced to emigrate against his will. From a moral point of view, the plan has been condemned on the ground that it would mean a reversion to barbarism of the greater part of the race. Economically its effects would be grave, since the Southern States must for a long time rely upon the negro for unskilled labor.

The plan which finds greatest favor at present is the industrial education of the negro, the encouragement of landownership by those who are now tenants, and the general extension of

education. (See NEGRO EDUCATION.) The plan has already produced valuable results. Graduates of institutions like Tuskegee (q.v.) and Hampton Institute have proved that under the leadership of members of their own race negro communities are capable of rapid improvement, economically and morally. See NEGRO; NEGRO EDUCATION; SLAVERY.

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NEGRO LETH'ARGY. See SLEEPING SICKNESS.

NEGRO MELODIES. The music of the American negroes is essentially vocal. Their few musical instruments are of importance only for furnishing accompaniments to songs or for accenting the rhythm of the dance. Negro music has been steadily losing its distinctive features, owing to the tendency among the younger generation to discard everything which harks back to the days of slavery. The old plaintive melodies have been replaced largely by more modern comic and erotic songs which are cast in a nondescript Afric-European mode.

Negro songs may be divided into two general groups—those which show evidences of foreign origin, but which have been added to and changed until they are undeniably negro in character; and those which are the spontaneous expression of the negro's own feelings. The first group may be subdivided into (*a*) those derived from European songs and dances and (*b*) those adapted from Baptist and Methodist hymns. The original negro songs, whose most typical element is a weird recitative, have undoubtedly an affinity with the musical forms used in Africa, but they have been greatly expanded both rhythmically and melodically. Though it is possible to make some such analysis of negro melodies, the most important feature, their interpretation, cannot be adequately described. Impromptu chords, notes, and accents are introduced, the whole blending into unusual forms with strikingly original melodies and motives. Strange to say, the time structure is excellent, and the tempo is universally exact. The tunes have as a rule a range of few notes, and, as in Africa, the major key predominates. In some songs both the major and minor keys are used. The weird effect produced by many of their cadences is not as a rule due to the use of the minor key so much as to the employment of the pentatonic scale and the major scale with the flat seventh. A distinctive character of negro melodies is the rhythmical snap, which became such an overworked feature in "ragtime." See FOLK MUSIC; RAGTIME. Consult: F. L. Ritter, *Music in America* (new ed., New York, 1900); C. L. Edwards, *Bahama Songs and Stories* (ib., 1895); J. B. T. Marsh, *The Story of the Jubilee Singers and their Songs* (Boston, 1880); H. E. Krehbiel, *Afro-American Folk-Songs* (New York, 1913).

NEGRO MONKEY. 1. A sooty black langur (*Semnopithecus maurus*, or *Pygathrix aurata*), about 24 inches long, plus a still longer tail. The animal is well known in Java. Its young are reddish in color and grow black with advancing age. 2. A marmoset (*Midas*, or *Cercopithecus, ursulus*) of Brazil, also called negro tamarin, and often tamed. It is black, with a reddish dorsal stripe. See LANGUR.

NEGROS, nā'grōs. One of the Philippine Islands, belonging to the Visayas group. It lies between the islands of Panay and Cebú. It is separated from Panay and the small island of Guimarás on the northwest by the Strait of Guimarás, 8 miles wide at the narrowest, and from Cebú on the east by the Strait of Tañón, from 6 to 22 miles wide (Map: Philippine Islands, D 6). On the north the island borders on the Visayan Sea, and on the southwest and south it is washed by the Sulu Sea, which to the southeast separates Negros by a distance of 30 miles from Mindanao. The island is roughly rectangular, but very elongated in shape. Its length is 134 miles, and its average breadth 26 miles, increased near the southern end to 34 miles by a broad, rounded peninsula extending from the western coast. Its area is given as 4881 square miles. Including a number of small dependent islets, the area is 4994 square miles. It ranks fourth in size among the Philippine Islands.

The coasts are clear and steep, but very little indented, and afford no harbors except a few anchorages sheltered by the small adjacent islands. The whole interior consists of a mountainous plateau with a central ridge containing peaks above 4000 feet, running the entire length of the island and dividing it into two distinct halves, forming its two political divisions. The active volcano of Canlaón, or Malaspina, situated in the north-central part of the island, is 8192 feet high, but the island suffers less from volcanoes than others of the archipelago. The range terminates at the north in the remarkable isolated peak Solitario. The two slopes are eroded into numerous lateral valleys watered by short and generally simple streams, the largest being on the western slope. In the southern part are two remarkable mountain lakes, the larger 6 miles long. The mountains of the interior are covered with vast forests of valuable timber, among which the teak is prominent. The soil is everywhere fertile, and agriculture is the principal occupation. The chief products are sugar, manila hemp, copra, tobacco, rice, cacao, and corn. Negros Occidental is one of the most important sugar-growing regions of the islands. The fisheries are next in importance to agriculture, and cattle raising also receives considerable attention, large numbers of horses, carabaos, and hogs being raised.

There are no manufactured products of importance, the few that there are being outgrowths of the agricultural activities of the inhabitants. The interior, once an impenetrable wilderness, is fast being opened. The population of the island in 1903 was 460,776, of whom 21,217 were wild. The prevailing race is the Visayan, and the Visayan is the language most spoken. The forests of the interior are inhabited by roaming savages. Politically the island is divided into the two provinces of Negros Occidental and Negros Oriental, whose areas, respectively, are 3130 and 1864 square miles, and whose populations are 308,272 and 201,494. The island of Sequijor, which is part of Negros Oriental, has an area of 106 square miles, and in 1903 had a population of 46,023. The capital of the former is Bacólod, and of the latter Dumaguete. The two old provinces were continued under civil government by the Philippine Commission Act of Feb. 6, 1901. Some resistance was offered to the authority of the United States by bands of natives, who kept American troops actively engaged on the island during the campaigns of 1899 and 1900. Consult *Apuntes de la Isla de Negros* (Manila, 1894).

NEGRUZZI, nā-grōōt'sē, Konstantin (1808–68). A Rumanian poet, born at Jassy, the disciple and translator of the poet Pushkin. He also translated some of Hugo's works, and wrote an epic poem, *Aprodul Purice*, and a volume of verse and prose, *The Sins of Youth*. *Alexandru Lăpusneanu*, a historical short story, is one of the masterpieces of Rumanian literature. His *Complete Works* were published in 1873. His son, Jacob (1843–), was born at Jassy and became professor of commercial law at the university there, and afterward at Bucharest (1885). In 1867 he founded the literary journal, *Convorbiri Literare*, of which he was for 28 years the editor. His writings include: *Poesii* (1872); *Miron si Florica*, an idyl; *Mihaiu Vereanu*, a novel; the short stories in *Copii după natură;* and a number of plays. His *Collected Works* were published at Bucharest (6 vols., 1894–96).

NEGUN'DO (Neo-Lat., from the North American Indian name). A group of trees sometimes separated from *Acer* as a genus of the family Aceraceæ (see Maple), differing from the maples chiefly in the apetalous diœcious flowers and in the pinnated ashlike leaves. The common species, *N. aceroides*, known as ash-leaved maple, or box elder (q.v.), is a native of North America, often planted for ornament and extensively cultivated in the western United States. It is now generally referred to as *Acer negundo*. See Plate of Bignonia.

NEHAN'TIC. See Niantic.

NE'HEMI'AH (Heb. *Nĕhemyah*, Yahwe is consolation). A Hebrew leader of the fifth century B.C., whose memoirs are embodied in the Book of Nehemiah of the Old Testament. It is there stated that he was a son of Hachaliah, and cupbearer to Artaxerxes (i.e., Artaxerxes I, Longimanus, 465–425 B.C.), in the palace of Shushan. Having learned the sad condition of the returned colonists in Jerusalem, he prevailed upon the King to send him to his brethren there with full powers "to seek their welfare." He received an appointment as governor, and worked for the safety of the city and its inhabitants. He rebuilt the city walls, notwithstanding many hindrances and dangers; he induced people from the country—priests and laymen—to take up their abode in the city, thus promoting its prosperity; above all he rekindled the flame of ancient piety and enthusiasm for the observance of the law in the hearts of the rough immigrants. He then returned to Persia, trusting to the new vitality which his reforms had, as he thought, infused into the Jewish commonwealth. But not long afterward he had again to obtain leave from the King to return for the purpose of abolishing many abuses that had crept in during his brief absence. He enforced the rigorous observance of feast and Sabbath, and rearranged the temple service, procuring at the same time the means for its proper support by inducing the people to offer the tithes as of old.

Owing to the changes in the memoirs of Nehemiah which have been made in the course of the different editings to which they have been subjected (see Nehemiah, Book of), it is difficult to separate the actual course of events from the traditional view concerning Nehemiah's activity. This much, however, seems certain: that Nehemiah paid two visits to Jerusalem, the one in 445 B.C., the other probably in 433. He came the first time on a special mission to protect Jerusalem from attack by rebuilding the walls, and for this work he was intrusted with full powers by the Persian King. He completed the restoration of the walls in the short space of 52 days, and provided for the proper guarding of the gates; afterward he returned to the Persians. In this visit he appears as the governor. In the second, however, he holds no such office; his purpose is to insure the enforcement of the rules against marriages between Jews and non-Jews. See Ezra.

NEHEMIAH, Book of. One of the historical books of the Old Testament. In some Greek and Latin versions it is called the Second Book of Ezra, and in the Jewish canon the books of Ezra and Nehemiah originally constituted one book. It is the opinion of modern scholars that both books were put into their present form by one and the same editor. (See Ezra, Book of.) The period covered by the Book of Nehemiah is the years 445–432 B.C. It is based upon the genuine memoirs of Nehemiah, but also, according to the critical view, contains much extraneous material, the memoirs having been freely used by compilers whose aim it was to prove that the work of restoration of the temple, the cult, and the general reorganization was performed by Babylonian Jews who returned from the exile; whereas, as a matter of fact, much of the work was due to the section of the Jewish community of Jerusalem which had remained in the country. The contents of the book may be summarized as follows: Nehemiah's sorrow over the desolation of Jerusalem is depicted, and he prays to God for opportunity to rebuild the city (chap. i). Permission is granted him by the King to undertake the work; he arrives at Jerusalem, surveys the ruins, and begins to rebuild the walls (chaps. ii–iii). The opposition of enemies is related and the plans by which their schemes were defeated (chap. iv). The people complain against the oppression of the nobles, and the evil is redressed (chap. v). Enemies form a plot to interrupt the work, which is frustrated by Nehemiah's boldness (chap. vi). A record of the families that returned first from Babylon is given, followed by an account of the offerings made by rich and poor for the work (chap. vii). The law is read by Ezra the Scribe, accompanied with a joyful celebration of the

Feast of Tabernacles (chap. viii). The people mourn, fast, and repent, a full confession of sin is made and a solemn covenant sealed by princes, priests, and Levites, and confirmed with an oath by the whole multitude to observe the law, sanctify the Sabbath, sustain the services of the temple, and bring in all the tithes (chaps. ix–x). A tenth of the people are selected by lot to dwell in Jerusalem, and the rest are distributed through the other cities of the land (chap. xi). A list of priests and Levites is given, and the joyous dedication of the wall, accompanied with sacrifices, is described (chap. xii). During Nehemiah's absence in Persia heathen strangers were admitted into the temple; they are expelled after his return, and the broken covenant to pay the tithes, to sanctify the Sabbath, and to refrain from mixed marriages is enforced (chap. xiii).

The chronological questions involved in the Book of Nehemiah will be found discussed in the articles EZRA, BOOK OF; NEHEMIAH. As to how much of the book represents Nehemiah's memoirs, scholars are not agreed. The genuine historical basis of the work is probably the account of Nehemiah's first visit, his activity in the rebuilding of the walls, his return to Persia, and his subsequent second visit to Jerusalem. For literature, consult the works mentioned under EZRA, BOOK OF.

NEHLIG, nā'lēg', VICTOR (1830–?1910). An historical painter, who was born in Paris and lived there most of his life. He was a pupil of Cogniet and Abel de Pujol, and came to the United States in 1850. He opened a studio in New York, and in 1870 was made a member of the National Academy of Design. In 1872 he returned to Paris. Nehlig painted chiefly historical scenes, among the best of which are: the "Bravo" (1870); "Armorer of the Olden Time," "Gertrude of Wyoming," the "Artist's Dream," the "Cavalry Charge of Lieutenant Hidden," New York Historical Society; "Battle at Antietam," in possession of William Astor, New York; the "Captive Huguenot," "Pocahontas," "Hiawatha," the "Serenade," and "Waiting for my Enemy."

NEHRING, nā'rĭng, WLADISLAW (1830–1909). A German Polish scholar, born at Kletzko, near Gnesen. He was educated at the University of Breslau, where he was appointed professor of Slavic languages and literature in 1868. Among his publications are: *Kurs literatury polskiéj* (1866); *Studya literackie*, a collection of monographs on the literature of Poland (1884); "Ueber den Einfluss der altčechischen Literatur auf die altpolnische," in *Archiv für slavische Philologie* (1876 et seq.); *Iter Florianense* (1871); a Latin (1856) and a Polish (1860–62) work on the Polish historians of the sixteenth century; *Altpolnische Sprachdenkmäler* (1887); and a revision of Poplinski's *Grammatik der polnischen Sprache* (1901). Consult the obituary notice by Jagić in *Archiv für slavische Philologie* (Berlin, 1909).

NEIDHART VON REUENTHAL, nīt'härt fŏn roi'en-tāl (c.1180–c.1250). A German poet, born in Bavaria. He participated in the crusade against Damietta, Egypt (1218–19), and later resided at the court of Frederick the Quarrelsome in Vienna. From Frederick he received a fief near Melk and other valuable gifts. He was the originator of a new form of the mediæval lyric—the peasant lyric written under the influence of the court. In this he satirizes the wealthy but vulgar peasantry of Bavaria and Austria, with its display of finery, its brawls, and its insolence to betters. For this ridicule he was bitterly disliked by the rustic versifiers and, by the name Neidhart Fuchs, was known as the enemy of the peasants as late as the sixteenth century. Neidhart's work was an important one in the development of the Volkslied, upon which it continued for two centuries to leave a distinct impression. Neidhart is co-hero with the Pfaff Amis of Anastasius Grün's (Count Auersperg's) *Pfaff vom Kahlenberg* (Leipzig, 1850; 3d ed., 1877). A manuscript collection of his poems, dating from the thirteenth century, was edited by Benecke, in volume ii of the *Beiträge zur Kenntnis der altdeutschen Sprache* (Göttingen, 1832). The critical edition by Haupt (Leipzig, 1858; Keinz, 1889) is excellent. Consult: Von Liliencron, "Ueber Neidharts höfische Dorfpoesie," in *Zeitschrift für deutsches Altertum*, vol. vi (Leipzig, 1848); also Wilmanns, in the same journal as above, vol. xxix; Bielschowsky, *Leben und Dichten Neidharts von Reuenthal* (Berlin, 1891); Pfeiffer, *Die dichterische Persönlichkeit Neidharts* (Paderborn, 1903).

NEILE, nēl, RICHARD (1562–1640). An English ecclesiastic, born at Westminster and educated at St. John's College, Cambridge. In 1605–08 he was dean of Westminster, and he held the bishoprics of Rochester (1608–10), Lichfield (1610–14), Lincoln (1614–17), Durham (1617–28), and Winchester (1628–31). In 1631 he was appointed Archbishop of York. In 1608 he made William Laud his chaplain and subsequently promoted Laud's advancement. Very active politically, he was made Privy Councilor in 1627 and participated regularly in the Star Chamber and High Commission sessions. His correspondence with Laud and others is considered a valuable historical source.

NEILGHERRY (nēl'gē-rĭ) **HILLS.** Mountains in India. See NILGIRI HILLS.

NEILGHERRY (or **NILGIRI**) **NETTLE** (*Girardinia palmata*). A plant of the family Urticaceæ, nearly allied to the true nettles and possessing the stinging power common in them. It is frequent on all the higher ranges of the Nilgiri Hills. The natives obtain the fibre by first boiling the plant, to destroy its stinging properties, and then peeling the stalks. There are said to be two or three distinct forms or varieties of Neilgherry nettle fibre, and different specific names have been given the plants producing them. Its bark yields a long, soft, and silky fibre, which is said to be one of the best produced in India.

NEILL, nēl, CHARLES PATRICK (1865–). An American commissioner of labor, born at Rock Island, Ill. He studied at the universities of Notre Dame (Indiana) and Texas and graduated from Georgetown (A.B., 1891) and Johns Hopkins (Ph.D., 1897). He was an instructor at Notre Dame in 1891–94 and instructor and associate professor of political economy at the Catholic University (Washington, D. C.) from 1897 to 1905. Thereafter until 1913 he was United States Commissioner of Labor, served as Commissioner of Labor Statistics from March to May, 1913, and then became connected with the American Smelting and Refining Company at New York. He served also as vice president of the District of Columbia Board of Charities (1900–08), as assistant recorder of the Anthracite Strike Commission (1902), as recorder of the Birmingham (Ala.) Arbitration Board

(1903), and as member of the United States Immigration Commission (1907–10).

NEILL, Edward Duffield (1823–93). An American author and educator, born at Philadelphia. He attended the University of Pennsylvania for a time, but graduated at Amherst in 1842 and afterward studied theology at Andover. After ordination as a Presbyterian minister he removed to St. Paul, Minn., in 1848 and became pastor of the first Protestant church. In 1851–53 he was Superintendent of Public Instruction for the Territory and from 1858 to 1861 chancellor of the State university. In 1861–64 he was an army and hospital chaplain in the Civil War. From that time until 1869 he was one of the secretaries of Presidents Lincoln and Johnson. President Grant appointed him Consul to Dublin in 1869, but he returned the next year. In 1873–84 he was president of Macalester College in St. Paul and from that time until his death professor of history and literature. He published many historical works, chiefly concerning the Colonial period. They are drawn entirely from original documents and contain much valuable material, arranged, however, with little sense of proportion. The most important are: *History of Minnesota* (1858; 5th ed., 1883); *Terra Mariæ* (1867), a history of early Maryland; *History of the Virginia Company of London* (1869); *English Colonization of America during the Seventeenth Century* (1871); *Minnesota Explorers and Pioneers* (1881); *Virginia Vetusta* (1885); *Virginia Carolorum* (1886).

NEILL, James George Smith (1810–57). A British soldier, born near Ayr, Scotland. He studied at Glasgow University, became a cadet in the service of the East India Company in 1827, and from 1828 to 1852 served with the First Madras European Regiment. When the Second Burmese War broke out in 1852, he was appointed deputy assistant adjutant general on the staff of Sir Scudamore Steele. During the Crimean War in 1855–56 Neill was second in command of the Turkish contingent. Returning to India in 1857, he occupied Benares and Allahabad when the Indian Mutiny broke out, suppressing the mutineers at those places with the utmost severity. During the operations of Havelock's column about Cawnpore Neill failed to support loyally his superior officer, but in the final advance to Lucknow he commanded the right wing of Havelock's army. While leading a successful assault on the rebellious sepoys besieging Lucknow, he was killed.

NEILSON, nēl'son, (Lilian) Adelaide (1846–80). The assumed name of an English actress, Elizabeth Ann Brown. She was born in Leeds of poor parents, who moved to Guiseley. When 14 years old she ran away from home and, going to London, was educated for the stage through the kindness of a chance acquaintance, making her début in 1865 in the part of Juliet. She played for a few years in various theatres of London and the provinces till 1870–71, when she met great success as Amy Robsart in an adaptation of *Kenilworth* and as Rebecca in *Ivanhoe.* At once she became one of the favorites of the English stage and was equally popular in America, where she appeared nearly every year from 1872 to her death. Her great characters, besides those mentioned, were the Shakespearean Rosalind, Beatrice, and Imogen, and also Julia in *The Hunchback.* Early in her career she was married to Philip Lee, from whom she was divorced in 1877. She died suddenly in Paris when at the height of her career. Consult: Marston, *Our Recent Actors* (London, 1890); Scott, *The Drama of Yesterday and To-Day* (ib., 1899); William Winter, in *Other Days* (New York, 1908) and *The Wallet of Time,* vol. i (ib., 1913).

NEILSON, James Beaumont (1792–1865). A Scottish inventor, born at Shettleston, near Glasgow. He had little education in school and at 14 was set to work. He was first employed by his brother near Glasgow, later as engineer of a colliery near Irvine, and in 1817 as foreman of the Glasgow gas works, with which he remained for 30 years. There he made many improvements in gas manufacture, including the use of clay retorts and of sulphate of iron as a purifier, and founded an institute for the education of employees. His great invention, that of the hot blast in manufacturing iron, was directly opposed to the belief of contemporary foundrymen that the colder the blast the better the quality and the greater the quantity of iron produced, and his experiments were long blocked by the impossibility of a fair test. Neilson's patents, taken out in 1828, were very successful. With equal fuel his method produced three times the iron of the cold blast. But the validity of the patents was attacked with some success, and many firms refused to pay the license for the blast. Neilson won the great suit against the Bairds of Gartsherrie in 1843 and four years afterward retired to the Isle of Bute. His last years were spent at Queenshill, Kirkcudbright, where he established a workingman's institute. See Iron and Steel, Metallurgy of.

NEILSON, John (1776–1848). A Canadian journalist and statesman. He was born in Kirkcudbrightshire, Scotland, went to Lower Canada in 1790, and seven years afterward became editor of the Quebec *Gazette,* the first newspaper ever published in Canada. It was printed both in French and in English and under his direction became an influential organ of public opinion. Neilson was elected a Liberal member of the Lower Canada Assembly in 1818 and identified himself strongly with the cause of the French Canadians, not in encouraging separation or rebellion, but in contending by constitutional means against any encroachment upon their rights and privileges. In 1822, along with Louis Joseph Papineau (q.v.), he was a delegate to England to oppose the contemplated union of Upper and Lower Canada, and in 1828 and 1834 he went again to England on the same mission. After the Act of Union was passed in 1841 he still remained opposed to it, and its subsequent history largely vindicated his course. He was elected a member of the Canada Legislative Assembly in 1840 and later was offered, but declined, the speakership of the Legislative Council. In 1844, however, he became a member of that body. During the latter part of his life he was the real leader of the French Canadians, and though for many years the friend of Papineau, the latter's extreme course severed the ties that had long united the two men. Consult J. C. Dent, *The Last Forty Years* (Toronto, 1881).

NEILSON, Julia (1869–). An English actress, born in London. She studied music at Wiesbaden, Germany, and (1884–86) at the Royal Academy of Music, London. Her first appearance was as Cynisca in *Pygmalion and Galatea* in 1888. She married the actor Fred Terry (q.v.) and was joint manager with him

after 1900. She had played with Lewis Waller, Beerbohm Tree, John Hare, George Alexander, and others, at the Haymarket, Savoy, Adelphi, and St. James's in London, making a particular success as Rosalind in the phenomenal run of *As You Like It*, and toured Canada and the United States (1895, 1910). For her daughter, see TERRY, PHYLLIS NEILSON-.

NEILSON, SAMUEL (1761–1803). An Irish politician, founder of the United Irish Society. He was born at Ballyroney, County Down, the son of a Presbyterian clergyman, and established himself in Belfast as a woolen merchant, but his interest in politics soon forced him out of business. In 1792 he became editor of the *Northern Star*, an organ founded under the auspices of the United Irishmen. The formation of this society had been suggested by Neilson in the previous year and was carried out by Wolf Tone. The *Star* was suppressed in 1797 after the editor, who aimed at the establishment of a republican government and complete separation from England, had several times suffered arrest and imprisonment. Rearrested in 1798, Neilson either bargained with the government in behalf of all political prisoners that they were to be exiled to some country friendly to Great Britain, and in return would disclose the secrets of the United Irish Society, or in some other way managed to escape trial. In 1802 he was set free at Cuxhaven, soon afterward came to the United States, and died at Poughkeepsie, N. Y.

NEILSON-TERRY, PHYLLIS. See TERRY, PHYLLIS NEILSON-.

NEIRA (nā'ĕ-rȧ) **BANDA.** One of the Banda Islands (q.v.).

NEISSE, nī'sĕ. A fortified town in the Province of Silesia, Prussia, on the Glatzer Neisse, 46 miles south-southeast of Breslau (Map: Prussia, G 3). The town proper on the right bank of the river is well built, with the interesting Gothic church of St. Jacob, dating from the fifteenth century, the Jesuit church, the church of the Cross, the Rathaus with its high tower, the bishop's residence, now used for municipal offices, and the Catholic Gymnasium, formerly a Jesuit college. The town has a Gymnasium, an archiepiscopal seminary, and a military academy, manufactures tapestry, furniture, machinery, cutlery, lace, and wire screens, and carries on a trade in sugar, wood, marble, and vegetables. Pop., 1900, 24,271; 1910, 25,938. Neisse was formerly the capital of the Principality of Neisse, which belonged to the bishopric of Breslau.

NEISSER, nīs'ĕr, ALBERT LUDWIG SIEGMUND (1855–1916). A German syphilologist. Born in Schweidnitz, German Silesia, he studied at the universities of Erlangen and Breslau (M.D., 1877). From 1878 to 1880 he was assistant at the university clinic at Breslau, in 1880 he was admitted to the medical faculty of the University of Leipzig as privatdocent, and two years later he returned to Breslau as assistant professor, where, in 1907, he was appointed professor of dermatology and syphilis. He traveled through the Scandinavian peninsula and Spain, studying leprosy, and through Java and Batavia. Neisser paid special attention to leprosy, gonorrhœa, and syphilis. Upon his discovery of the gonococcus (1879) he based the local treatment of gonorrhœa, which is now universally used. His writings treat the fields of leprosy, gonorrhœa, and syphilis and amount to more than 100 essays. Among them may be mentioned: "Weitere Beiträge zur Aetiologie der Lepra" (1881); "Ueber Iodoform Exantheme" (1884); "Ueber die Ansteckungsfähigkeit der chronischen Gonorrhoe" (1886); "Ueber Therapie der Syphilis" (1886); "Ueber die Mängel der zur Zeit üblichen Prostituirtenuntersuchung" (1890); "Wann und wie sollen wir die Gonorrhoe behandeln?" (1890); *Die Einreibungskur* (1897); "Ist die Syphilis heilbar?" (1903); *Atlas seltener . . . Hautkrankheiten* (1906–07), with E. Jacobi; "Ueber das neue Ehrlichsche Mittel" (1910); "Bemerkungen zur Lupus Bekämpfung" (1913).

NEITH, nē'ĭth. One of the most ancient of the Egyptian goddesses, worshiped especially at Sais in the delta. She is mentioned in some of the most ancient inscriptions, but did not attain any special prominence until the time of the twenty-sixth dynasty, which originated in Sais. Neith is represented as a woman wearing the crown of Lower Egypt and holding in her hand a bow and arrows, together with the sceptre of a goddess. In late times it seems certain that she was regarded as a form of Hathor. In earlier times, says Budge, "she was certainly a personification of a form of the great, inert, primeval watery mass out of which sprang the sun god Ra." It is probable that she was originally a Libyan divinity. Consult: Mallet, *Le culte de Neit à Sais* (Paris, 1889); W. M. Flinders Petrie, *Nagada and Ballas* (London, 1896); Alfred Wiedemann, *Religion of the Ancient Egyptians* (Eng. trans., New York, 1897); E. A. T. Wallis Budge, *The Gods of the Egyptians* (2 vols., London, 1904).

NEITHARDT VON GNEISENAU, nīt'härt fŏn gnī'ze-nou. See GNEISENAU, AUGUST.

NEITZEL, nīt'sĕl, OTTO (1852–). A German music teacher and composer, born at Falkenburg, Pomerania. He studied in Kullak's Academy in Berlin and also at the university there (Ph.D., 1875). He became pianist for Pauline Lucca and Sarasate; served as conductor of the Musikverein at Strassburg in 1878–81 and also conducted in the City Theatre there in 1879–81; and taught at the Moscow Conservatory in 1881–85 and thereafter at the Cologne Conservatory. In 1887 he became musical critic of the *Kölnische Zeitung*. His operas, *Angela* (1887), *Dido* (1888), and *Der alte Dessauer* (1889), were fairly successful, and he published *Führer durch die Oper des Theaters der Gegenwart, Text, Musik, und Scene erläuternd* (3 vols., 1890–98); *Beethovens Symphonien nach ihrem Stimmungsgehalt erläutert* (1891); *Camille Saint-Saëns* (1899); *Musikästhetische Betrachtungen* (1909), with Ludwig Riemann.

NEIVA, nā'ĕ-vȧ. The capital of the Department of Huila, Colombia, on the right bank of the river Magdalena, at the head of navigation for light craft, and 112 miles southwest of Bogotá (Map: Colombia, B 3). It is the chief centre for commerce for south Colombia, is celebrated for its cacao, and has an export trade in cattle. There are minor industries in silk weaving and in the manufacture of hats. Its former trade in cinchona has largely disappeared through the destruction of the trees. Neiva was founded in 1550 and 19 years later destroyed by the Indians. It was rebuilt in 1612 on its present site. Pop., 1912, 21,852.

NEJD, or **NEDJED,** nĕj"d. A region of Arabia, lying between lat. 24° and 27° N. and bounded by El Hasa on the east and Hedjaz on the west (Map: Asia, F 6). It has a hilly

surface, 2500 to 5000 feet, intersected by many streams, which dry up during the summer. The climate is healthful. Politically Nejd is a dependency of Jebel Shammar. The inhabitants are Wahabis and are estimated at 1,000,000.

NEJIN. See NEZHIN.

NEKHBET, nĕk'bĕt. An Egyptian deity, the local divinity of the city of Eileithyia (q.v.).

NEKRASOV, nyĕ-krä'sôf, NIKOLAI ALEXEIEVITCH (1821–78). A Russian poet, born in the Government of Podolia. At 16 he left the Yaroslav Gymnasium and was sent to St. Petersburg to enter the Regiment of Nobles. He matriculated at the university in 1839, whereupon his father cast him off. For three years he suffered fearful privations, until a tutorship in a preparatory school and some hack work for periodicals improved his material circumstances. In 1840 he produced a volume of verse which was not well received. He was more fortunate with two prose volumes, published in 1845 and 1846, which met with Belinski's praise. In 1847 he bought the *Contemporary* (*Sovremennik*), which soon became the most popular monthly in Russia. The years between 1856 and 1866 were the most brilliant period in his literary activity. Until then despondent and doubting, he now shared the hopes aroused by the great reform movement. When the *Contemporary* was suspended, Nekrasov edited the *Annals of the Fatherland.* His works depict the downtrodden and oppressed of all classes of Russian society. The racy, idiomatic language of the poet, the vividness of his imagery, and the caustic power of his satire are tremendously impressive. On the other hand Nekrasov is not wholly free from artificiality and exaggeration and is deficient in form. His *Red-Nosed Frost, Fatherland, Peasants' Children,* and *Last Songs* are among the most touching of his poems. The long poem (5000 verses) *Who Lives Happily in Russia?* written in an unusual metre, is sometimes diffuse in the treatment of the whole life of the whole nation, but the greater part of it is admirable. He died Jan. 8, 1878. His works have been published at St. Petersburg in two volumes (10th ed., 1909). Wiener, *Anthology of Russian Literature,* vol. ii (New York, 1903), contains a list of English translations of Nekrasov's poems. Consult Rosa Newmarch, *Poetry and Progress in Russia* (New York, 1907; with translations), and the monographs of Pypin (St. Petersburg, 1905) and Pokrovski (Moscow, 1906).

NEKTON, nĕk'tŏn. See PALEONTOLOGY.

NÉLATON, nā'lä-tôN', AUGUSTE (1807–73). A French surgeon, born in Paris. He received his doctor's degree in 1836, from 1839 until 1851 was adjunct professor in the Faculty of Paris, and from the latter year until 1867 was professor of clinical surgery. In 1866 he became physician to the Emperor and in 1868 a Senator. He was elected a member of the Institute in 1869. Nélaton was one of the most skillful operators of his time, especially in lithotomy, and made several important improvements in surgery, one of which, a probe, having an unpolished porcelain knob at its end, much used in military surgery in searching for bullets, is called Nélaton's probe. His principal work is *Eléments de pathologie chirurgicale* (1844–49; 2d ed., 1868–85). Among his other works may be mentioned *Recherches sur l'affection tuberculeuse des os* (1837).

NE'LEUS (Lat., from Gk. Νηλεύς). A son of Poseidon and brother of Pelias. Having been exposed by their mother, the brothers were found and brought up by a herdsman and when grown up were recognized by their mother, Tyro, who had married Cretheus of Iolcus in Thessaly. After Cretheus's death they quarreled over the possession of Iolcus, and Neleus withdrew to Pylos in Messenia. Because Neleus refused to purify Heracles after the murder of Iphitus, Heracles killed all Neleus's sons except Nestor. According to one account Neleus perished with his sons. He is also said to have reëstablished the Olympic Games and to have died at Corinth. See also MELAMPUS.

NELIDOV, nĕl'ĭ-dôf, ALEXANDER IVANOVITCH (1838–1910). A Russian diplomat, member of an old aristocratic family. He was born in the Kishinev District and studied law and Oriental languages at the University of St. Petersburg. Entering the diplomatic service (1855), he was secretary successively to the Russian Ambassadors at Athens, Munich, and Vienna and in 1872 was appointed counselor to the Embassy at Constantinople. During the Russo-Turkish War of 1877–78 he directed the diplomatic office at the headquarters of the Russian army and took an active part in the negotiations which led to the Peace of San Stefano and later to the Treaty of Berlin. Nelidov was appointed Ambassador to Saxony (1879). Between 1883 and 1897, while Ambassador to Turkey, he took a prominent part in the settlement of the Armenian question and in the adjustment of the Balkan difficulties and did a great deal to strengthen the influence of Russia at Constantinople. From 1897 to 1903 he was the Russian Ambassador at Rome and from 1903 to his death Ambassador to France. He played a considerable part in settling the famous Hull incident during the Russo-Japanese War.

NELIGH, nē'lĭg. A city and the county seat of Antelope Co., Neb., 153 miles northwest of Omaha, on the Elkhorn River and on the Chicago and Northwestern Railroad (Map: Nebraska, G 2). It has a Carnegie library and a beautiful park with a fine bathing beach. The city is the commercial centre of a large agricultural and stock-raising region. Alfalfa, corn, and fruit are extensively cultivated in this vicinity. The industrial establishments include alfalfa and flour mills, a grain elevator, a creamery, cement-block, brick, and chicken-food factories, and marble and granite works. Pop., 1900, 1135; 1910, 1566.

NELLORE, nĕl-lōr', or **NELLUR,** nĕl-lo͝or'. The capital of a district, Madras, British India, situated on an elevation on the right bank of the Pennair River, 8 miles from its mouth and 96 miles north-northwest of Madras (Map: India, D 6). It is an irregularly built town, is the seat of several European missions, and has dyeing and rice-husking establishments. One of the features of the vicinity is the anicut, 677 yards long, the chief irrigation work on the Pennair. The town has a good water supply. The ancient Sinhapur (lion city) was formerly an important fortress. The discovery in the ruins of a Hindu temple, at the end of the eighteenth century, of a pot filled with second-century Roman gold coins and medals, chiefly of Trajan, Adrian, and Faustina, would point to a remote origin. Pop., 1901, 32,040; 1911, 33,246.

NEL'SON. A municipal borough and manufacturing town in Lancashire, England, 3½ miles north-northeast of Burnley. Besides coal mining it has considerable manufactures of cotton,

worsted, and silk. It contains a handsome town hall, a market hall, a library, and a technical school. In 1850 it was a small village named after a roadside inn; its manufactures inaugurated its prosperity, and it was incorporated in 1890. It owns its water, gas, and electric-lighting plants, market, and cemetery. Pop., 1901, 32,816; 1911, 39,479.

NELSON. The capital of a province of the same name in New Zealand, situated at the north end of South Island (Map: New Zealand, S. I., D 2). The harbor has a depth on bar of from 15 to 19 feet. The railway wharf can be reached only by vessels drawing 18 feet and under. Steamers periodically ply to Sydney and Melbourne. The manufactures of the town comprise cloth and leather goods. The centre of the town is a hill rising 40 feet above the surrounding streets and laid out as a square with an Episcopal cathedral in its centre. The city possesses a town hall, art gallery, museum, and several educational institutions of high grade and is the centre of a fruit and hop growing district. The city was founded in 1842. Pop., 1901, 7000; 1911, 9023. The provincial district of the same name contained, in 1911, 48,463 inhabitants.

NELSON. A city and the capital of Kootenay electoral district, British Columbia, situated on the Kootenay River, about 270 miles east (direct) of the city of Vancouver and on the Canadian Pacific and Great Northern railways (Map: British Columbia, E 5). It possesses a business college, an armory, and county buildings. It is the centre for the East and West Kootenay mining district, producing silver, gold, copper, lead, zinc, and coal. It is a divisional point on the Canadian Pacific Railway, which has railway repair shops and shipyards here. Industrial establishments include ironworks, cigar, box, jam, and mattress factories, saw and shingle mills, and manufactories of boats and launches. The city owns its hydroelectric light and power plant, gas and water works, and street railway. Pop., 1911, 4476; 1915, with suburb (local est.), 7500.

NELSON, Aven (1859–). An American botanist, born in Lee Co., Iowa, and educated at the State Normal School at Kirksville, Mo., at Harvard (A.M., 1892), and at the University of Denver (Ph.D., 1904). He served as an instructor at Drury College, Springfield, Mo., in 1883–85, as principal of public schools at Ferguson, Mo., in 1885–87, and as professor of botany at the University of Wyoming after 1887. Nelson had charge of laboratories at the Columbian Exposition in 1893 and at the Louisiana Purchase Exposition in 1904. His publications include: *Report on the Flora of Wyoming* (1896); *The Trees of Wyoming and how to Know them* (1899); *Key to Rocky Mountain Flora* (1902); *Spring Flora of the Intermountain States* (1910; new ed., 1912).

NELSON, Henry Loomis (1846–1908). An American economist and journalist, born in New York City. He was educated at Williams College, graduated from the Columbia Law School, and, admitted to the bar in 1869, practiced until 1878. From the latter year until 1885 he was Washington correspondent of the Boston *Post*, of which he was editor in 1885–86, was an editorial writer for the New York *World* in 1889, and served as editor in chief of *Harper's Weekly* in 1894–98. From 1902 until his death he was professor of political science at Williams. He is author of *John Rantoul* (1885), a novel; *Our Unjust Tariff Law* (1884); *The Money we Need* (1895); *The United States and its Trade* (1902).

NELSON, Horatio, Viscount (1758–1805). The most famous of English admirals. He was born at Burnham-Thorpe, Norfolk, England, on Sept. 29, 1758. His father was the rector of his native place, while his mother was a grandniece of Sir Robert Walpole. Nelson received only a meagre education, and at the age of 12 he entered the navy under the care of his maternal uncle, Captain Maurice Suckling. To this uncle he owed his early rapid promotion and the advice which led to his careful training in seamanship. During his first period of service he made voyages to the Arctic regions and to both the West and East Indies, and suffered considerably from ill health, for throughout life Nelson was very weak physically, and often was maintained only by sheer force of will. In 1777 Nelson was made second lieutenant, and again went to the West Indies. In 1779 he became captain, and henceforth promotion came to him only in due order, since the regulations did not allow any promotion other than according to seniority after the rank of captain.

In 1783, after the war with France and the American Colonies had closed, Nelson was for a short time put on half pay, but after a few months, part of which time was spent in France, he was appointed to the *Boreas*, on which he served in the West Indies until 1787. Here he performed his first notable service, which, however, brought him into conflict with his commander, Sir Richard Hughes, a well-meaning but timid man. Contrary to the latter's orders and in opposition to powerful interests in the West Indies, Nelson insisted upon enforcing the Navigation Acts against the United States and other foreign nations. He was ultimately upheld by the British government, but for the time it involved him in vexatious lawsuits and caused him much anxiety. While on this station Nelson first met at Nevis the widow of Dr. Josiah Nisbet, by birth a Miss Frances Woolward, whom he ultimately married on March 11, 1787, Prince William, afterward William IV, giving the bride away.

Soon after his marriage Nelson started for home, and on Nov. 30, 1787, he was relieved from active service. For some obscure reasons a coolness had sprung up between Nelson and the Admiralty, with the result that he remained in retirement until the threatened outbreak of the war with France in 1792 caused all officers to be recalled into active service. On Jan. 30, 1793, Nelson received command of the 64-gun ship *Agamemnon*, which, together with his last ship, the *Victory*, is most closely associated with his career. He served on it for over three years. He was assigned to the Mediterranean fleet, serving first under Admiral Hood, then under Hotham, and finally under Sir John Jervis (later the Earl of St. Vincent). Several times he was sent on diplomatic missions, and on the occasion of one to Naples in September, 1793, Nelson for the first time met Sir William Hamilton and his wife Emma, the Lady Hamilton who was to have later so great an influence over him. Nelson took an active part in Hood's conquest of Corsica, commanding the marines at Bastia and Calvi, where gravel driven by a cannonball destroyed the sight of his right eye. This period of his life Nelson always considered the happiest part of his career, and it prepared

him for the great events to come. In 1796 he was made a commodore and received a new ship.

At this time Napoleon was winning his great victories over the Austrians in Italy. The position of the British fleet in the Mediterranean was becoming precarious, as Spain was about to join France, in which case the English fleet would be greatly outnumbered. The hold of the British on Corsica was loosening, since, under the influence of the great French victories, the Republicans were becoming very active on the island. Taking all these things into consideration, the British government ordered Sir John Jervis to abandon Corsica, to withdraw from the Mediterranean, and return to England. These orders were received on Sept. 25, 1796, and Nelson had to superintend the work, though he considered it best for Great Britain to retain everything, since he believed the British fleet sufficiently powerful to cope with the enemy.

In December, 1796, Jervis sent Nelson back to the Mediterranean to aid in the removal of the naval stores from the island of Elba, which the British had retained at the time they had abandoned the other posts in that sea. As he was returning he had to pass through the whole Spanish fleet, and on Feb. 13, 1797, he had rejoined Jervis. The following day took place the great battle off Cape St. Vincent (q.v.). Here by his rapid and independent manœuvres Nelson did much to carry the day, and Jervis was magnanimous enough to give him due credit. The Spanish fleet of 27 ships was totally defeated by 15 vessels, and one of the chief naval resources of France had disappeared. As a reward for his share in this great event Nelson received a knighthood of the Bath, and before this he had become in due order of promotion a rear admiral of the blue. His next duty was to bring the troops away from Elba, a task which he promptly accomplished. It is interesting to note that though at this time the serious mutinies in the fleet at Spithead and the Nore took place, Nelson had no difficulty with his men, who assured him of their loyalty. For a few weeks Nelson served off Cadiz, and then, at his own suggestion, he was detached to make an attack on the town of Santa Cruz, on the island of Teneriffe, believing that large Mexican treasure ships had taken refuge there, whose capture would deal a severe blow to Spain. The expedition arrived at its destination on July 20, 1797, and the following day an attack was made. This assault and some later ones were all repulsed. The plan had never anything to recommend it but its boldness and a belief that the place was not strongly defended. Nelson himself fought with great heroism and lost his right arm, and, as the wound did not heal well, he was compelled to return to England, where he arrived Sept. 3, 1797. On September 27 he was invested with the Order of the Bath by George III in person, and at the same time a pension of £1000 a year was awarded him. At this time, on account of his ill health and a fear that he would never again be able to enter active service, his spirits were greatly depressed, but he revived at once when on March 29, 1798, his flag was again hoisted over a ship. On April 29 he rejoined the Earl of St. Vincent off Cadiz.

From this time a new period in Nelson's life begins. He soon becomes the great man of his service, instead of merely one of many distinguished naval officers. It is the period which opens with Abukir Bay and closes with Trafalgar. It is necessary to consider now the state of Europe at the time when Nelson rejoined the fleet. Austria had been compelled by Napoleon's victories in Italy to sign the Preliminaries of Leoben on April 18, 1797, which were ratified soon after by the Treaty of Campo-Formio (q.v.). This left England with only one weak ally, Portugal, while it set Napoleon free to attack England itself. He thought the best place to injure England would be in the East, and for this purpose prepared his great Egyptian expedition. (See NAPOLEON I.) The news of Napoleon's intentions soon reached St. Vincent, and in spite of the jealousy of some older officers, he detached Nelson to watch the French fleet and to check it. Nelson was unable to prevent it from getting to Egypt, and for months there was a weary hunt to find the French ships and compel them to fight. Finally, on Aug. 1, 1798, Nelson discovered them in the Bay of Abukir, and in the battle of the Nile that ensued the French fleet was completely defeated, and only two vessels escaped. Nelson received a wound on the head from which he suffered ever after. The brilliant victory practically insured the failure of Napoleon's expedition, since it cut him off from his base of supplies. Nelson was created Baron Nelson of the Nile, and received a pension of £2000 a year, besides other numerous gifts and compliments both from England and abroad. On August 19 he sailed from Alexandria and on September 22 he finally arrived at Naples.

The Neapolitan period of Nelson's life, which covered the ensuing two years, was the principal blemish on his career. Here began his criminal relations with the wife of the English Minister at Naples, Sir William Hamilton, which led to a complete separation of Nelson and his wife early in 1801. Moreover, Lady Hamilton influenced Nelson's public acts, so that for a time he behaved rather as commander in chief of the Neapolitan navy than as an English admiral. He induced Naples, however, to make war upon France, but the Neapolitan army was soon decisively defeated, and the royal family was compelled in December, 1798, to leave Naples, where the French proclaimed the Parthenopean Republic. After residing for a while with the Hamiltons at Palermo, and vexed for a time on account of the appointment of a junior officer, Sir Sidney Smith, to an important command in the Levant, Nelson was finally roused again to action on May 12, 1799, by the news that Admiral Bruix with the French Brest fleet had escaped from that harbor and was about to enter the Mediterranean. The danger was imminent that the French would recover the naval supremacy in the Mediterranean, which had been destroyed by the victory at Abukir Bay. Nelson prepared for the emergency with his usual ability, when, to his disgust, Jervis resigned his command and was succeeded by Keith, an honest but by no means brilliant officer. Friction between him and Nelson existed from the start. On June 24, 1799, Nelson appeared before Naples, intent upon securing that city before the French fleet should appear. He found that the Republicans had complete control and were aided by a Neapolitan squadron under Commodore Caraccioli. The Neapolitan admiral was captured on June 29, and Nelson, as commander in chief of the Neapolitan navy, immediately ordered a court-martial,

which sentenced the Commodore to death, and he was executed at once. Nelson has often been blamed for this action—for not keeping within his proper jurisdiction as the representative of Great Britain, and for not proceeding with more deliberation. The forts of the city had surrendered on June 26. At this time Nelson was created Duke of Bronte by the despicable Ferdinand IV of Naples. To the influence of Lady Hamilton, who was the intimate of the Queen of Naples, must be charged the serious disobedience of orders by Nelson shortly after. He had been ordered to join Lord Keith and to assist him to meet a large French fleet, but he preferred to remain at Naples. The danger, it is true, was averted; for on Aug. 13, 1799, the French fleet reëntered Brest, but had Nelson come up in time it is just possible that another great victory might have been won. For a short time Nelson was commander in the Mediterranean, but he displayed no enthusiasm for his work. On Jan. 20, 1800, he united his command with that of Keith, and after several quarrels Nelson was finally recalled by orders which reached him in June. He traveled overland with the Hamiltons, and, though he was received everywhere with great enthusiasm, his conduct gave great cause of scandal to his friends. On Nov. 6, 1800, the party arrived in England, and soon after Nelson's final breach with his wife took place.

On Jan. 1, 1801, Nelson became vice admiral by seniority and was assigned to the command of Sir Hyde Parker, who was to coerce the Northern Confederation. This league, composed of the states on the Baltic, had been maintaining an armed neutrality, which in truth was only a veiled attempt to aid Napoleon. Nelson advised an attack on the strongest member of the confederacy, Russia; but his daring plan was not followed, and instead the whole fleet sailed for Denmark. In a bold assault on the Danish fleet at Copenhagen, Nelson was victorious (April 2, 1801), and the Danes were compelled on April 9 to sign an armistice, which tied their hands, but left the English free. It was during the engagement of April 2 that Nelson, having received an order early in the day to cease action, placed his telescope to his blind eye and said, "I really do not see the signal." On May 5, 1801, Nelson was appointed commander in chief in place of Parker. He immediately proceeded to carry out his plan of attacking Russia, but found, when he arrived at Revel, that the Czar Paul had been murdered on March 24, and his son and successor, Alexander I, was preparing to follow another policy. For his services in this campaign Nelson was created Viscount. He returned to England and lived with the Hamiltons. After some slight service in the Channel, the Peace of Amiens closed the war, and on Oct. 22, 1801, Nelson left his ship.

Peace, however, proved of short duration, and on May 18, 1803, Nelson raised his flag on the *Victory* as commander in chief of the Mediterranean fleet. For two years he blockaded Toulon and kept a watchful eye on affairs, but Villeneuve escaped from Toulon with the French fleet on March 30, 1805. Napoleon was preparing at Boulogne to invade England, and for this purpose the different French fleets were to unite and cover the expedition. A most exciting chase followed, in which Nelson pursued Villeneuve to the West Indies and back to the coast of Spain, but the French admiral was unable to elude Nelson and the other English admirals long enough to give Napoleon any opportunity of crossing the Channel. Villeneuve finally put in at Cadiz, and Napoleon marched against Austria, which had declared war against him. Thus England was saved.

Nelson now blockaded Villeneuve at Cadiz, but Napoleon was threatening to disgrace his admiral for not fighting, and consequently, when Nelson had to send six vessels to Gibraltar for water, Villeneuve seized the opportunity and started to leave his shelter on Oct. 19, 1805, and on October 21 took place the famous battle off Cape Trafalgar (q.v.). Before beginning battle Nelson gave his now famous signal, "England expects that every man will do his duty." The victory was complete, but Nelson was mortally wounded, and died on the afternoon of Oct. 21, 1805, with the words "Thank God, I have done my duty." By his final great victory he had destroyed the combined French and Spanish fleets, and Napoleon's hope of creating a naval power vanished forever. Nelson thus contributed immensely to the final destruction of the Napoleonic ambitions, for without the control of the sea England would have been unable to wage her long contest. Nelson was buried in St. Paul's Cathedral, London, on Jan. 9, 1806, amid extraordinary public demonstrations, and in 1849 an imposing monument to his memory was completed in Trafalgar Square.

Bibliography. For many years the standard biography of Nelson was that by Robert Southey, popular and unreliable, first published in 1813, with many later editions, a good one being in Everyman's Library (New York, 1908), which contains a bibliography; this has been superseded by the sympathetic and reliable work by A. T. Mahan, *The Life of Nelson, the Embodiment of the Sea Power of Great Britain* (Boston, 1899). Consult also: J. K. Laughton, *Letters and Despatches of Horatio, Viscount Nelson* (London, 1886); J. C. Jeaffreson, *Lady Hamilton and Lord Nelson* (ib., 1888); id., *The Queen of Naples and Lord Nelson* (ib., 1889); G. L. Browne, *The Public and Private Life of Horatio, Viscount Nelson, as Told by himself, his Comrades, and his Friends* (ib., 1891); W. H. Fitchett, *Nelson and his Captains* (ib., 1902); J. K. Laughton, *Nelson* (ib., 1904); id., *Nelson and his Companions in Arms* (ib., 1905); White and Moorhouse, *Nelson and the Twentieth Century* (ib., 1905); M. E. Matcham, *The Nelsons of Burnham Thorpe . . . Compiled from Unpublished Letters and Notebooks* (ib., 1911); E. H. Moorhouse, *Nelson in England: A Domestic Chronicle* (New York, 1913).

NELSON, KNUTE (1843–). An American lawyer and legislator, born near Bergen, Parish of Voss, Norway. After his father's death he was brought by his mother to the United States in 1849. The family settled first in Chicago, the next year moving to Wisconsin. Nelson attended the Albion Academy; fought in the Civil War, being wounded and taken prisoner at Fort Hudson, La.; was admitted to the bar in 1867. During the next two years he was a member of the Wisconsin Legislature. After removal to Alexandria, Minn. (1871), he was for three years attorney for Douglas County, State Senator (1875–78), and presidential elector (1880). Elected to the Federal House of Representatives in 1882 and twice reëlected, Nelson showed his independence of party control by voting for both the Mills and

the Morrison tariff bills, although they were Democratic measures. On his retirement and resumption of practice, he became interested and employed in numerous complicated land cases, and he later prepared exhaustive treatises on the law governing public lands. In 1892 he was elected Governor of Minnesota, and in 1894 he was reëlected with increased plurality, having had a conspicuously successful administration. Before the end of his second term he was selected to succeed W. D. Washburn as United States Senator; and he was reëlected in 1900, 1906, and 1912. As Senator, Nelson soon took standing as one of the foremost Republican leaders. Probably his most important contribution to legislation was the act creating the Department of Commerce and Labor.

NELSON, Reuben (1818–79). An American Methodist Episcopal clergyman, educator, and publisher, born at Andes, N. Y. He entered the ministry in 1842. From 1840 to 1844 he was principal of Otsego Academy at Cooperstown, N. Y., and then, except for a year when he was presiding elder, for 28 years was the first principal of Wyoming Seminary, at Kingston, Pa. In 1872 he was elected one of the agents of the Methodist Book Concern in New York, and treasurer of the missionary society of his church, continuing to serve in both positions until his death. He was secretary of the Wyoming (Pa.) Conference for 10 years and a member of several General Conferences.

NELSON, Samuel (1792–1873). An American jurist, born at Hebron, Washington Co., N. Y. He graduated at Middlebury College, Vermont, in 1813. He then read law, removed to New York State, where in 1817 he was admitted to the bar, and began practice at Cortland. In 1820 he was a presidential elector on the Democratic ticket. His long judicial career of half a century began in 1823, when he was appointed by Governor Yates a judge of the State Circuit Court. In 1831 he was promoted to be an associate justice of the New York State Supreme Court, and in 1837, by appointment of Governor Marcy, he became Chief Justice of the court in succession to Judge Savage. In 1845 he was nominated by President Tyler as an associate justice of the Supreme Court of the United States. Although he concurred with Chief Justice Taney in the "Dred Scott" decision in 1857, and disapproved of the President's exercise of "war powers" during the Civil War, his loyalty was never questioned, and he was frequently consulted by Lincoln in judicial matters. He ranks as one of the greatest American authorities on admiralty and maritime law, and his prize-court decisions during the Civil War are of the utmost importance. In 1871 he was appointed by President Grant as one of the Joint High Commission for the settlement of the Alabama claims (q.v.).

NELSON, Thomas (1738–89). An American patriot, one of the signers of the Declaration of Independence. He was born at Yorktown, Va., and was the son of William Nelson, Governor of Virginia in 1770–71. He went to England in 1753, was educated at Eton and at Trinity College, Cambridge, and returned to his home at Yorktown in 1761. He was a delegate for several terms to the House of Burgesses, and served in the Provincial Conventions of 1774, 1775, and 1776, introducing in the last the resolution by which Virginia's delegates to Congress were instructed (May 15) to propose a declaration of independence. From August, 1775, until May, 1777, when he was forced by ill health to resign, he was a delegate to the Continental Congress, and signed the Declaration of Independence. In 1775 he was for a time colonel of the Second Virginia Regiment, and from August, 1777, until late in 1782, he commanded the Virginia State forces, rendering valuable service at the siege of Yorktown (1781), where he showed his patriotism by ordering the gunners to fire upon his own mansion, supposed to be the headquarters of Cornwallis. In 1779 he again sat for a time in Congress, and was again forced by ill health to resign; in 1780 he raised a large sum of money, on his own security, for the State, and paid out of his own pocket the arrearages of two Virginia regiments ordered South; and in the spring of 1781 he succeeded Jefferson as Governor of Virginia, though he resigned in November. Impoverished by his liberal advances to the State during the war, he passed his last years in very straitened circumstances, and much of his property was sold to pay public debts, for which he was security.

NELSON, William (1825–62). An American naval officer and soldier, born in Maysville, Ky. He entered the United States navy in 1840, and in 1847 commanded a battery at the siege of Vera Cruz. He subsequently served in the Mediterranean and South Pacific, was promoted to the rank of master in 1854 and to that of lieutenant in 1855, and in 1858, as commander of the *Niagara*, transported to Africa the negroes who had been rescued from the slave ship *Echo*. In 1861 he was on ordnance duty at Washington, and at the outbreak of the Civil War he was placed in command of the gunboats on the Ohio, with the rank of lieutenant commander. He left the navy soon afterward, entered the military service, was ordered to Kentucky, and there established recruiting stations, and organized camp Dick Robinson, near Danville, and a similar rendezvous at Washington, in Mason County. In September, 1861, he became a brigadier general of volunteers, and at the battle of Shiloh (April 6–7, 1862) he commanded the second division under General Buell. (See Shiloh, Battle of.) He was wounded in the engagement at Richmond, Ky.; was in command at Louisville, Ky., in 1862, when the Confederate general Bragg threatened that city, and in July of this year was commissioned major general of volunteers. On September 29 he was fatally shot at the Galt House, Louisville, by the Federal general Jefferson C. Davis, in a personal quarrel.

NELSON, William Rockhill (1841–1915). An American newspaper proprietor and editor, born at Fort Wayne, Ind. He was educated at Notre Dame University, Indiana, studied law, and was admitted to the bar. In 1876 he was campaign manager of Samuel J. Tilden in Indiana. He accumulated a fortune of $200,000 as a contractor, but lost most of it in an unfortunate cotton-growing enterprise in Georgia. An interest which he had acquired in the Fort Wayne *Sentinel* in 1876 he sold four years later, and then founded with S. E. Morss, who retired a few months later, an evening daily, the Kansas City *Star*. In 10 years the *Star* had a daily circulation of 50,000, and under Nelson's personal direction and editorship it came to have considerable influence throughout the country. When the Kansas City *Times* failed in 1901,

Nelson bought that paper and continued it as a morning edition of the *Star*. The two papers soon reached a combined circulation of 200,000, under a policy which Nelson himself described as "independent, but never neutral."

NELSON, WOLFRED (1792–1863). A Canadian physician and political leader. The son of an English officer, he was born at Montreal. In 1811 he began the practice of medicine in St. Denis. In the war with the United States (1812–14) he served as surgeon. In 1827 he was elected Reform member for the Borough of William Henry in the Legislative Assembly of Lower Canada, where he labored faithfully to secure constitutional redress of the political grievances under which the people of that province suffered. Yielding later to the influence of L. J. Papineau (q.v.), he took a leading part in the rebellion of 1837, and was in command at the victory obtained by the insurgents at St. Denis, on the Richelieu River, but was captured and banished to Bermuda by Lord Durham (q.v.). Released in October, 1838, after the British government had declared Durham's decree of banishment illegal, Nelson settled at Plattsburg, N. Y., in the same year, and in 1842, after the declaration of a general amnesty, returned to Montreal. He was elected for Richelieu County to the Legislative Assembly of Canada in 1844 and 1845, and in 1851 was made inspector of prisons, a position which he held for several years. He served as mayor of Montreal two terms, and was at the head of the Lower Canada College of Physicians and Surgeons. Nelson was for many years a contributor to the medical press of Canada and the United States. He died in Montreal. Consult J. C. Dent, *Canadian Portrait Gallery* (1880), and *Canada since the Union of 1841* (Toronto, 1881).

NELSON RIVER. The principal river in the Province of Manitoba, Canada, forming the lower course of the Saskatchewan (q.v.) (Map: Canada, L 5, M 5). It flows from the north end of Lake Winnipeg at Norway House, first northward, through a series of lakes, then northeastward, into Hudson Bay at Port Nelson and York Factory, emptying through the estuary of Port Nelson after a course of about 400 miles. It is deep, wide, and swift, discharging an enormous volume of water; rapids and falls in its upper reaches limit its navigation by steamers to from 80 to 90 miles, though boats can ascend 127 miles from its mouth.

NELSON'S FARM, BATTLE OF. See FRAZIER'S FARM, BATTLE OF.

NELSON'S MONUMENT. A granite column in the centre of Trafalgar Square, London, copied from a Corinthian column of the temple of Mars Ultor, in Rome, and crowned with a statue of Nelson, 17 feet in height, by Edward H. Baily (q.v.). The shaft, 145 feet high, was erected in 1843 by voluntary subscriptions. The pedestal bears bronze reliefs, cast from French cannon, depicting scenes from Nelson's life. At the foot of the column are four colossal bronze lions, by Sir Edwin Landseer.

NEL'SONVILLE. A city in Athens Co., Ohio, 62 miles by rail southeast of the State capital, Columbus, on the Hocking River and on the Hocking Valley Railroad (Map: Ohio, F 7). There is an important trade in coal, which is mined extensively in the vicinity, this being one of the most productive coal fields of the State. Nelsonville has brick, sewer-pipe, and clay works, and a large establishment which manufactures mining implements, car wheels, etc., and carries on a large repair business. The water works and electric-light plant are owned by the city. Pop., 1900, 5421; 1910, 6082.

NELUM'BO (Ceylonese name). A genus of aquatic plants similar to water lilies, belonging to the family Nymphæaceæ. The few species are found in the warm parts of Asia, North America, and the north of Africa. *Nelumbo nucifera*, with rose-colored flowers, is the Egyptian bean of Pythagoras, the lotus (q.v.) held sacred by the Hindus and by the people of Tibet, has been used as a food by the Egyptians from remote antiquity, and is much esteemed where it is cultivated, especially in China, for its edible seeds, roots, leafstalks, and flower stalks. The seeds resemble acorns in size and shape and have more delicate flavor than almonds. The root contains much starch, and Chinese arrowroot is said to be obtained from it. Great quantities are pickled with salt and vinegar and eaten with rice. When powdered, it makes excellent soup with water or milk. The ancient Egyptian mode of sowing this plant, by inclosing each seed in a ball of clay and throwing it into the water, is practiced at the present day in India. *Nelumbo lutea* is a North American species, with yellow flowers, which extends as far north as Ontario. The edible seeds, called water chinquapins, are sought for by children and others, and the farinaceous roots are agreeable when boiled. See Plate of AQUATIC PLANTS.

NEMAGRAPTUS, nĕm'ă-grăp'tŭs (Gk. *νῆμα, nēma*, thread, from Gk. *νεῖν*, to spin + Gk. *γραπτος, graptos*, written on, marked). A genus of graptolites, including the forms earlier known as *Cœnograptus* and *Stephanograptus*, found in fossil condition in the early Ordovician shales, especially the Normanskill, and of world-wide distribution. It possesses a sigmoidal curved main stem from which numerous branches diverge, a form very graceful in outline. Its principal species is *Nemagraptus gracilis*.

NEMA'LION (Gk. *νῆμα, nēma*, thread, from Gk. *νεῖν, nein*, to spin + -lion). A genus of the red algæ (Rhodophyceæ, q.v.), including marine forms, usually branching filaments, much simpler in structure and in life history than most of the red algæ. For this reason it is a very common form described in textbooks and used in laboratories.

NEM'ATHELMIN'THES (Neo-Lat. nom. pl., from Gk. *νῆμα, nēma*, thread + *ἕλμινς, helmins*, worm). A large and important phylum of the unsegmented worms, of a more or less elongated cylindrical form and known as roundworms. Their skin is thick and strong and is usually wrinkled, giving the body a slightly annulated appearance, which, however, disappears if the animal is placed in water. The nervous system in the higher forms consists of two lateral ganglia at the anterior extremity, which are united by a nervous ring, and from which two nervous trunks, one dorsal and one ventral, proceed to the posterior part of the body. In the lower forms the dorsal cord is wanting, or else the ventral cord is wanting and there are two lateral cords. Special organs of sense are rarely met with; but a general sense of touch exists, and a few of the free-living species have two simple eyespots. The digestive organs are extremely simple. No blood system

nor distinct respiratory or excretory organs can be detected. These worms are unisexual; but the males are comparatively rarely found and are always smaller than the females. With the exception of the two families—the Enoplidæ, which are mostly marine forms, and the Anguillulidæ, or paste and vinegar eels—all the animals of this class are parasitic.

This phylum is divisible into three very distinct classes, viz., Acanthocephala, which have a protrusile proboscis armed with continuous hooks and are destitute of an intestinal canal; the Gordiacea, which possess an intestinal canal, but no anus; and the Nematoda, which usually possess a perfect intestinal canal, provided with two orifices. See ASCARIS; ENTOZOA; FILARIA; GUINEA WORM; PINWORM; ROUNDWORM; THREADWORMS; TRICHINA.

NEM'ATOCYST (from Gk. *νῆμα, nēma,* thread + *κύστις, kystis,* bladder). One of the lasso cells, thread cells, or nettling organs (*cnidæ*) of jellyfishes and other Cœlenterata, acting as organs of offense and defense. These bodies are embedded in the outer cellular layer or ectoderm of cœlenterates. A nematocyst is an oval, tough capsule, filled with a clear fluid, and invaginated at one end in the form of a hollow process which is prolonged into a long, coiled, hollow thread. The entire structure is developed in an interstitial cell called a cnidoblast, which, as it approaches maturity, migrates towards the surface and becomes embedded in one of the large ectoderm cells. At one point on its surface the cnidoblast is produced into a delicate protoplasmic process, the cnidocil or trigger hair. Any small animal on coming in contact with the lasso cells of a jellyfish is stung, benumbed, or poisoned by them. Upon contact with one or many of these lasso cells in the tentacles of a jellyfish or hydra, or a physalia, the cnidoblast suddenly contracts, and the pressure upon the stinging capsule causes an instantaneous eversion of the thread, at the base of which are minute sharp barbs. The threads also convey a poisonous fluid, which benumbs the victim. In this way sea anemones and coral polyps obtain their food, paralyzing and thus capturing quite large animals, even young fishes. These poison lasso cells also occur in certain Protozoa, mollusks, and in sponges, and in a modified form exist in the skin of certain worms, both terrestrial and aquatic. In these worms they are minute stiff rods, either coiled up in an irregularly spiral manner, or short and straight, contained in oval cells. They are shot out in great numbers when the animal is irritated, but are not retractile, being projected clear from the skin. That they are true nettling organs is proved by the fact that on touching the worms with the tongue they cause a tingling sensation. See illustration under CŒLENTERATA.

NEM'ATO'DA. A class of the phylum Nemathelminthes (q.v.), mostly parasites, but many others are extremely abundant in both fresh and salt water. They are the roundworms (q.v.), and a familiar example is found in *Ascaris* (q.v.). They are ranked in two orders—Nematoidea, in which the cœlom is not lined by epithelium, and Gordioidea, in which it is so lined. See HAIRWORM; NEMATHELMINTHES.

NEM'ATOG'NATHI (Neo-Lat. nom. pl., from Gk. *νῆμα, nēma,* thread + *γνάθος, gnathos,* jaw). An order of fishes. See CATFISH. Cf. PLECTOSPONDYLI.

NEMATOPHYTON, nĕm'ă-tŏf'ĭ-ton (Neo-Lat., from Gk. *νῆμα, nēma,* thread + *φυτόν, phyton,* plant). A gigantic fossil alga found in rocks of Devonian age in the eastern United States and Canada. The stem is of great size, often 40 feet long by 2 to 3 feet in diameter, and resembles the trunk of a tree to such extent that it was originally supposed to be the trunk of a conifer. This resemblance led Dawson to name it Prototaxites, or ancestral yew tree. The cellular structure is that of an alga. Several large trunks were uncovered near Monroe, Orange Co., N. Y., during 1897 to 1899. The type species is *Nematophyton logani.*

NEMAU'SUS. An ancient town of Gallia Narbonensis, now Nîmes (q.v.).

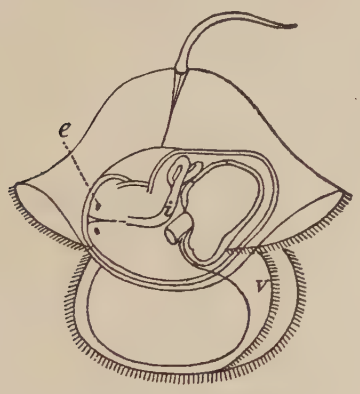
NĚMCOVÁ, nyĕm'tsŏ-vä, BOŽENA (1820–62). A Czech novelist, born in Vienna. She lived in Bohemia for many years, making a study of the life in its villages. The privations she had to endure for the last 10 years of her life do not seem to have dimmed her optimism or benevolence. *Babička* (Little Grandmother, 1855) is especially well known. It has frequently been translated into foreign languages, and was translated into English by Gregor in 1891. Her other works include: *Chydi lide* (Poor Folks, 1857); *Karla* (Charlotte, 1856); *Pohorská vesnice* (The Village in the Mountains, 1856). Her contributions to the study of Bohemian and Hungarian folklore in the volumes *Národní báchorky a pověsti* (1845–46) and *Slovenské pohádky a pověsti* (Slovak Folk Tales, 1858) are valuable. Her complete works, *Sebrané spisy,* were published in 1862–63. Consult Jakubec, *Geschichte der čechischen Litteratur* (Leipzig, 1907).

NE'MEA (Lat., from Gk. Νεμέα). The ancient name of a well-wooded valley of Argolis, in the Peloponnesus, between Cleonæ and Phlius. It lies north and south and is from 2 to 3 miles long and more than ½ mile broad. In it there was no town, but a sacred inclosure and temple of Zeus, of which three columns are still standing, while the others lie where they have been thrown by earthquakes. The valley was the seat of one of the four great national festivals of the Greeks—the Nemean Games, which were celebrated in midsummer every two years, at the beginning of the second and fourth years of each Olympiad. The first set of games in the historical period seems to have been held in 573 B.C., though legend ascribed the foundation of the games to the seven heroes on their march against Thebes, or to Hercules. The games consisted of the usual athletic contests, horse racing, and a competition for players on the cithara. The prize was a palm branch and crown of parsley. Consult E. N. Gardiner, *Greek Athletic Sports and Festivals* (London, 1910).

NEMEAN GAMES. See NEMEA.

NEM'ERTIN'EA (Neo-Lat., from Gk. Νημέρτης, *Nēmertēs,* name of a Nereid, from *νημερτής, nēmertēs,* unerring, from *νη-, nē-,* not + *ἁμαρτάνειν, hamartanein,* to miss). A class of flatworms easily distinguished from the Platodes by the proboscis and the presence of an anus. They are also remarkable for the prodigious length attained by some of the species, which, in the most extended state, is 10 or 12 feet, and one (*Linus longissimus*) reaches 90 feet. But the animal which so stretches itself out is capable of suddenly contracting itself to a quarter of that length. The nemertineans are

unsegmented worms, with a ciliated body epithelium, and are more or less dorsoventrally flattened. There is no distinct body cavity; the intestine is straight, with lateral diverticula; the anus is at the posterior end of the body. The blood, nervous, and excretory systems are all present and are usually very well developed. The only sense organs are little ciliated pits, possibly olfactory, and pigment eyes. The sexes are separate, and the larva goes through a complicated metamorphosis in most cases. One of the characteristic features of the nemertineans is the proboscis, lying above the œsophagus and opening from its cavity, just over the mouth. This proboscis may be used in the capture of food, which consists, to a large extent, of other sorts of worms. These worms twine themselves into knots and rolls, apparently inextricable, but without any real entanglement. A large number of species are known from all parts of the world. The great majority are marine, but a few are fresh-water, and land forms are known. The latter are all small and dull-colored, but the marine forms, besides being oftentimes very large, are frequently very gaudy, red and green being common colors. These worms usually pass through a metamorphosis; the prelarva is called a pilidium,



PILIDIUM OF NEMERTES.

The worm is shown growing within the larva: *v*, velum; *e*, eyes; *i*, intestine of the nemertinean worm.

which is helmet-shaped, with side lobes or lappets. A reduced form of the pilidium is called Desor's larva. The body of the pilidium is not entirely absorbed by the growing worm, but the worm develops within the larva, and finally frees itself, when the remnant of the pilidium dies. Certain forms have a direct development. Multiplication by transverse fission is frequent. Consult Shedson, in *Cambridge Natural History*, vol. ii (London, 1901).

NE'MESIA'NUS, Marcus Aurelius Olympius. A Carthaginian Latinist of the latter half of the third Christian century. He wrote poems called *Halieutica* (on fishing), *Nautica* (on aquatics), and *Cynegetica* (on hunting), of which the 325 lines preserved constitute what is apparently an introduction to the main work (edited by Baehrens in his *Poetæ Latini Minores*, vol. iii, 1881, and by Stern, together with Grattius Falicus, q.v., 1832), and four *Eclogæ*, reminiscent of Vergil, of Manilius, and most of all of Calpurnius Siculus, with whose poems they are so constantly found in manuscript that they long passed as his work (edited by Baehrens, as above, and by Schenkl, 1885; translated into English verse by Scott, 1891). The fondness of the author for the refrain and other points of similarity in style have suggested the attribution to Nemesianus of the *Pervigilium Veneris;* but this is entirely problematical. Consult W. S. Teuffel, *Geschichte der römischen Litteratur*, vol. iii (6th ed., Leipzig, 1913).

NEM'ESIS (Lat., from Gk. *Νέμεσις*, from *νέμειν, nemein*, to distribute. Others connect with Gk. *νεμεσίζεσθαι, nemesizesthai*, to feel just anger). A goddess of fate, who apportions to men their deserts. In Homer Nemesis does not appear as a person, though the word is used as a common noun in the sense of 'righteous anger,' a sort of personification of justice divine. In another early epic, the *Cypria* (q.v.), Nemesis was a goddess beloved by Zeus, whom she sought to escape by transforming herself into various animals. Finally the god approached her as a swan, and she brought forth an egg, which was found and kept by Leda, till in fullness of time Helen, the cause of the Trojan War, was born. Nemesis was worshiped at Smyrna in Ionia, where there seem to have been two goddesses of the same name, and especially at Rhamnus in Attica, where were two temples, an old one and a large new one erected in the period following the Persian wars. It contained a famous statue of the goddess by Agoracritos, the pupil of Phidias, of which the head is in the British Museum. According to Hesiod, Nemesis was the daughter of destructive night. She is the avenger of wrong, punishing especially vaunting pride, and in general any overstepping of the bounds of due moderation. Those who forget to humble themselves before the gods or who offend against the eternal laws are likely to fall under her power. In Alexandrian poetry Nemesis is frequently invoked to punish a cold or fickle loved one. At Rome, too, Nemesis was worshiped, e.g., by victorious generals and by gladiators. In art Nemesis appears as a dignified youthful figure, bearing frequently a measuring rod or an apple branch in one hand, and commonly drawing forward the upper seam of her tunic. In later art she is frequently winged, with a wheel at her feet, or a griffin at her side, or holding a bridle or a sword or a scourge. Consult: H. Posnansky, "Nemesis und Adrasteia," in *Breslauer philologische Abhandlungen*, vol. v (Breslau, 1890); L. R. Farnell, *The Cults of the Greek States*, vol. ii (Oxford, 1896); the article "Nemesis," in W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. iii (Leipzig, 1897–1909); P. E. More, "Nemesis, or the Divine Envy," in *The New World* (New York, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

NEME'SIUS (Lat., from Gk. *Νεμέσιος, Nemesios*). A Greek philosopher of the latter half of the fourth century A.D. He was Bishop of Emesa in Syria and wrote in Greek a treatise on *The Nature of Man*, an anthropological work combining Christian views with ideas gained from the Greek philosophers, especially Plato, in which he expressed his belief in the pre-eminence of the soul, the freedom of the will, and the indestructibility of matter. There is a passage in the book which has been interpreted as showing some understanding of the circulation of the blood. In Latin translation the work was much read during the Middle

Ages, and since then it has been translated into several of the languages of modern Europe. There is an edition by Matthaei (Halle, 1802). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

NÉMETI, Szatmár-. See Szatmár-Németi.

NEMI, nā'mē. A beautiful lake in Italy, about 17 miles southeast of Rome, having on its margin a famous grove of Diana, east of the Alban Lake. It was anciently called Lacus Nemorensis and also Speculum Dianæ (Mirror of Diana). The grove of Diana was celebrated on account of its priest, who won his place by slaying his predecessor and held it till he was himself slain. The grove seems to have been situated on the northeast shore, near the modern village of Nemi. In the grove was a splendid temple (98 feet by 52); excavations made in the seventeenth and nineteenth centuries, and especially in 1905, have laid bare the temple and yielded many coins, ex-voto statuettes, inscriptions, etc. The lake fills the crater of an extinct volcano, is about 1100 feet above the sea, 4 miles in circumference, and has no outlet except a passage, 2 miles long, of unknown antiquity, which still serves its original purpose. It had long been known that there were remains of vessels sunk near the shore, but it was not till 1895 that these were satisfactorily examined. One seems to have been about 210 feet in length and 65 feet beam; the other measured 233 feet by 80. The decks were paved with thin slabs of porphyry and serpentine, and the railings were of gilded bronze. Lead water pipes with the name of Caligula furnished a clew to the date and seemed to imply fountains on board. Bronze beam heads and heads of lions, wolves, and a Medusa, with rings in their mouths for hawsers, have been recovered from these structures and removed to Rome. Though commonly called ships, it is far more probable that they were great rafts or boathouses used in some spectacle connected with the worship of Diana. Consult, for the antiquities, *Notizie degli Scavi* (Rome, 1895–96) and *Rivista Marittima* (1896–97). On the ritual of the grove, consult J. G. Frazer, *The Golden Bough*, parts i–iii (3d ed., New York, 1911).

NEM'OREN'SIS LA'CUS. See Nemi.

NEMOURS, ne-mōōr', Duke of. See family article Foix.

NEMOURS, Louis Charles Philippe Raphael d'Orléans, Duke de (1814–96). Second son of Louis Philippe. He was born in Paris and educated at the College of Henry IV. In 1831 he was elected King of the Belgians, but declined the offer. He served in the two Belgian campaigns and in Algeria and was in 1837 made lieutenant general. After the death of his elder brother, the Duke of Orléans (July 13, 1842), it was proposed to confer the regency upon the Duke de Nemours; but this was not sanctioned by public opinion, and he left France on the outbreak of the revolution in 1848 and did not return till 1871. After the adoption of the antiroyalist bill of 1886 his name was struck off the army list.

NENADOVITCH, nĕn'ä-dō'vĭch, Mateya (1777–1854). A Servian patriot. In 1793 he became a priest and later archpriest, or prota, of Valyevo, and hence is called Prota Mateya by Servians. When the Dahis, or leaders of the Janizaries, murdered Alexa Nenadovitch, the father of Prota Mateya, and other Servian leaders to prevent an uprising among the Serbs, Prota Mateya became one of the leaders of the resulting insurrection in 1804. In the following year Kara George sent him to St. Petersburg (now Petrograd) on a special mission, and thereafter he represented Servia diplomatically in Russia, Austria, Rumania, and Turkey. He defended his country's interests at the Congress of Vienna in 1814–15. His memoirs, *Memoari Prote Mateye Nenadovicha* (Belgrade, 1893), are a valuable source for the history of the Servian insurrections against the Turks.

NENANA (nä-nä'nä) **VALLEY.** A valley in the watershed of the Nenana River, a southwestern affluent of the Tanana River, Alaska, its principal fork—Jack River—rising in Broad Pass, about 2500 feet in height. The Nenana, formerly called the Cantwell, is a rapid stream which flows for miles through cañons walled in by cliffs several hundred feet high. Forage plants are good and abundant, game fairly plentiful, and considerable areas of spruce are found. The valley has become of special interest, owing to its forming part of the route of the government railroad, designated by President Wilson in April, 1915, between Seward, Kenai Peninsula (q.v.), and Fairbanks, via Broad Pass and Susitna valley (q.v.). Nenana valley possesses resources of great economic importance in its coal—lignite of somewhat inferior quality. The coal-bearing strata, stretching from the upper Nenana to the Delta River, exceeds 600 square miles in area, the largest field of interior Alaska. From outcroppings it is known that at least 66 square miles are underlaid by coal, with veins of considerable thickness. The rapid devastation, for mining purposes, of the forestal sections of the Tanana valley make it certain that the Nenana coal will become an important element in the industrial development of adjacent regions. Tentative plans have been advanced for the generation locally of electric power for transmission to Fairbanks, 75 miles distant. Gold placers have been discovered, but their exploitation has progressed slowly, owing to scarcity of water and cost of transportation.

NENA SAHIB, nā'nä sä'hĕb. Leader in the Sepoy Mutiny in India. See Nana Sahib.

NENCIONI, nän-chō'nē, Enrico (1836–96). An Italian poet and critic, born at Florence. He was one of that literary company called the *amici pedanti*, of which Carducci was the leader. He wrote for the *Italia Nuova* and translated much French and English poetry into his language. Especially remarkable are his papers on English literature. Towards the end of his life he held a professorship at the Woman's Normal School in Florence. His works include: *Versi* (1880); *Medaglioni* (1883, 1897); *Studi di letterature straniere* (1897–98). Consult Croce, "E. Nencioni," in *La Critica* (Bari, January, 1906).

NENCKI, nĕn'kä, Marcel von (1847–1901). A Russian physician, born in Boczki in the Government of Kalish. He studied philosophy at Cracow, Jena, and Berlin and medicine at Berlin (M.D., 1870). In 1872 he joined the medical faculty at the University of Bern, becoming professor of physiological chemistry, and from 1891 was chief of the bacteriological institute in St. Petersburg. He introduced into medicine the use of salol (1886). Among his writings are *Zur Kenntniss der Skatolbildung* (1880), *Beiträge zur Biologie der Spaltpilze* (1880);

and the following contributions to medical journals, later reprinted—"Ueber die Zersetzung der Gelatine und des Eiweisses bei der Fäulniss mit Pankreas" (1876); "Untersuchungen über den Blutfarbstoff" (1885); "Ueber die chemische Zusammensetzung des russischen Nadelholztheers, etc." (1894), with N. Sieber; "Ueber die Rinderpest" (1897).

NENEBOJO. See MANABOZHO.

NEN'NIUS. An historian who lived in Wales at the end of the eighth and the beginning of the ninth century and who is believed by some to be the author of the *Historia Britonum*. Little is definitely known about him. The *Historia Britonum* contains a description of Britain and deals briefly with the period of the Roman occupation and the subsequent events, as the incursions of the Picts and Scots and the Saxon conquest. As an historical source it has little value, but it is of some importance for the study of early British mythology, especially for the study of the legend of Arthur and because it contains the genealogies of English kings to 796. The best edition is by Mommsen, in *Monumenta Germaniæ Historica: Auctores Antiquissimi*, vol. xiii (Berlin, 1898). For secondary works, consult Heinrich Zimmer, *Nennius Vindicatus* (Berlin, 1893), and Charles Gross, *Sources and Literature of English History* (New York, 1900).

NE'O-CELT'IC MOVEMENT. This phrase is loosely used to describe generically a variety of recent literary and scholarly activities—in Ireland, Scotland, Wales, Brittany, and elsewhere—concerned with the Celtic past or regarded as expressions of the Celtic spirit. It is also specifically applied, as, e.g., to the Celtic movement in late nineteenth-century Ireland, otherwise known as the Irish Literary Revival, which included scholars in and translators of Gaelic literature as well as Anglo-Celtic poets, dramatists, and story-tellers in whose brains and imaginations something of the distinctive old Celtic spirit seemed born again. It was sometimes used as a label, too, for the attempt at the revival of Irish as a spoken tongue organized as the Gaelic League and in full swing towards the end of the nineteenth century. Various applications of the phrase here in question are exemplified in William Sharp's introduction to *Lyra Celtica* (edited by Elizabeth A. Sharp, Edinburgh, 1896), and from the same anthology, with the introduction to it, some idea of the *personnel* of the Neo-Celtic Renaissance as a whole may be obtained. Conspicuous among those associated with the Neo-Celtic movement as it expresses itself in English are the Irish poet William Butler Yeats, the Irish dramatist J. M. Synge, the Scottish poet Fiona McLeod (William Sharp), and such translators or scholars as Kuno Meyer, Whitley Stokes, Alfred Nutt, Douglas Hyde, and Lady Gregory. See IRISH LITERATURE, *Irish Literature in English*.

NE'OCENE (from Gk. *νέος, neos*, new + *καινός, kainos*, recent). A geologic term employed by the United States Geological Survey to designate the middle portion of American Cenozoic time and corresponding to the combined Miocene and Pliocene periods of the Lyellian classification. The latter is most generally followed at present, even in the United States. See TERTIARY SYSTEM.

NEO-DARWINISM. Although Darwin, in his *Animals and Plants under Domestication*, gave more weight to changes in the conditions of life, conceding that natural selection was not an exclusive factor in organic evolution, Wallace and others, notably Weismann, have insisted on the all-sufficiency of natural selection, pushing, as many think, Darwinism far beyond its legitimate bounds. See WEISMANNISM.

NEODESHA, nē'ō-dē-shä'. A city in Wilson Co., Kans., 13 miles by rail northwest of Independence, at the confluence of the Verdigris and Fall rivers and on the St. Louis and San Francisco and the Missouri Pacific railroads (Map: Kansas, G 8). The chief industrial plants are a zinc smelter, oil refinery, and brickworks. Neodesha has adopted the commission form of government. It owns its water works, sewage system, and electric-light plant. Pop., 1900, 1172; 1910, 2872.

NEODYMIUM, nē'ō-dĭm'ĭ-ŭm. A metallic chemical element isolated by Auer von Welsbach, in 1885, from a mixture of neodymium and praseodymium that had been regarded as an element and called *didymium*. Neodymium occurs in a number of rare minerals, including cerite, monazite, and orthite. It is separated from the concomitant elements either by fractional precipitation or by fractional crystallization of the nitrates. Neodymium (symbol, Nd; atomic weight, 144.3) is a pale-yellow metal that melts at 840° C. (1544° F.); it may be obtained by the electrolysis of fused neodymium chloride. Among the compounds of neodymium may be mentioned: the *oxide*, Nd_2O_3, which may be obtained by heating the nitrate or the oxalate; the *chloride*, $NdCl_3$, which may be obtained in the form of pink crystals by the action of hydrochloric-acid gas upon neodymium hydroxide; and the *nitrate*, $Nd(NO_3)_3.6H_2O$, which forms double salts with the nitrates of magnesium, rubidium, and ammonium.

NE'OGÆ'A (Neo-Lat., from Gk. *νέος, neos*, new + *γαῖα, gaia*, earth). An alternative name in zoögeography for the continent of South America, or Neotropical region, in conformity with Arctogæa, Notogæa, and so on.

NEO-HEGELIANISM, nē'ō-hā-gā'lĭ-an-ĭz'm. A term often applied by opponents to the doctrine of those English, Scottish, and American thinkers who, more or less under the influence of Hegel, hold that consciousness and object are mutually implicated, and who, believing in the historical priority of the physical universe to the finite consciousnesses which are in some way correlated with physiological organisms, feel themselves forced to the conclusion that there is an eternal consciousness, of which the universe is the object. T. H. Green, J. and E. Caird, J. Watson, H. Jones, D. G. Ritchie, and Josiah Royce may be mentioned as prominent among those to whom the epithet is often applied. See especially GREEN, THOMAS HILL; ROYCE, JOSIAH. Consult Seth Pringle-Pattison, *Hegelianism and Personality* (Edinburgh, 1893), and the histories of philosophy by Falckenberg, Höffding, Thilly, Ueberweg-Heinze, and Windelband. See HEGEL.

NEO-KANTIANISM, nē'ō-kăn'tĭ-an-ĭz'm. A term applied to the doctrine of those followers of Kant who accept the general result of Kant's philosophy so far as the theory of knowledge goes, but do not follow Kant in his endeavor by practical reason to work out a metaphysics. F. A. Lange, H. Cohen, P. Natorp, J. Volkelt, and O. Liebmann may be mentioned as representatives of this tendency. Consult the his-

tories of philosophy by Höffding, Thilly, Ueberweg-Heinze, and Windelband. See KANT.

NEO-LAMARCK'ISM. The modified doctrine held by those naturalists who accept in the main the teachings of Lamarck (q.v.). Lamarck was the first truly scientific thinker to state in a detailed way the causes not only of the origin of species, but of certain types of animal life, such as some orders of birds, of the groups represented by the ai, lemur, the kangaroo, and so on. The chief Lamarckian factors of organic evolution (see LAMARCKISM) are changes in the environment, direct in plants and the lowest animals, indirect in the higher animals; also, the use and disuse of organs, and the transmission of characters acquired during the lifetime of the individual, or what is called use inheritance. The first writer after Lamarck, on the lines laid out by the great French zoölogist, was Herbert Spencer. In 1866–71, in his *Principles of Biology*, Haeckel claimed (1868) that we should have to adopt Lamarck's theory of descent for the explanation of biological phenomena, "even if we did not possess Darwin's theory of selection," adding: "The one is so completely and *directly proved* by the other, and established by mechanical causes, that there remains nothing to be desired."

In America, Cope (1866–71) and Hyatt (1866–74) independently advocated Lamarckian views. Cope first (1871) furnished what he considered as "an actual demonstration of the reality of the Lamarckian factor of use, or motion, as friction, impact, and strain, as an efficient cause of evolution." A. S. Packard (1871), by his studies of the embryology of *Limulus* and of cave animals, was led to adopt Lamarckian views in preference to the theory of natural selection, which never seemed to him adequate or sufficiently comprehensive to explain the origin of variations and the rise of new types; and it was he who originated the term *Neo-Lamarckism*. "Neo-Lamarckism," he explained, "gathers up and makes use of the factors both of the Saint-Hilaire and Lamarckian schools, as containing the more fundamental causes of variation, and adds those of geographical isolation or segregation (Wagner and Gulick), the effects of gravity, the effects of currents of air and of water, of fixed or sedentary as opposed to active modes of life, the results of strains and impacts (Ryder, Cope, and Osborn), the principle of change of function as inducing the formation of new structures (Dohrn), the effects of parasitism, commensalism, and of symbiosis—in short, the biological environment; together with geological extinction, natural and sexual selection, and hybridity."

Among American zoölogists who have advocated Lamarckian views are W. H. Dall, J. A. Allen, R. T. Jackson, C. H. Eigenmann, and others; in England, Spencer, Henslow, Cunningham, Gadow, and others; in France, Giard, Perrier; and in Germany and Holland, Haeckel, Wagner, Eimer, Standfuss, Fischer, Plate, Pfeffer, O. Hertwig, Emery, Roux, and others. Consult A. S. Lamarck, *Zoölogical Philosophy*, translated and with an introduction by Hugh Eaton (New York, 1914).

NE'OLITH'IC MAN (from Gk. *néos, neos*, new + *líthos, lithos*, stone). The term applied by European archæologists to the races in the period when the polishing of stone, agriculture, pottery, weaving, domestication of animals, and the construction of pile dwellings on lakesides in Switzerland, France, Italy, and Ireland, the burying of the dead in dolmens, and the rearing of megalithic monuments, were practiced. See NEOLITHIC PERIOD.

NEOLITHIC PERIOD. The first step towards placing prehistoric archæology on a scientific basis was taken in Scandinavia. Thomsen, of Copenhagen, was the first archæologist to employ the methods of geology and paleontology. Seconded by Forchhammer, Worsaäe, Steenstrup, and Nilsson, he succeeded in establishing a relative chronology for prehistoric times. His system, based on the development of human industry, was published in 1836 and has served as a foundation for all later classification. Thomsen divided prehistoric times into the ages of Stone, Bronze, and Iron. His system, applied to the collections of the Copenhagen Museum, was immediately accepted throughout Scandinavia and later by the entire civilized world. In time the three ages were subdivided into periods and epochs. The discoveries in valley deposits and caves of industrial remains older than any known in Denmark led to a subdivision of the Stone age. That portion of the Stone age corresponding roughly in time to the geologic past or Pleistocene was called the *paleolithic* period (q.v.), and that portion dating from the geologic present was called the *neolithic* period. These terms were first employed by Sir John Lubbock. They are preferable to the terms "age of chipped stone" and "age of polished stone." Many of the stone implements belonging to the neolithic period were never polished. On the other hand, although the polishing of stone was never resorted to as a shaping process during the paleolithic period, stones polished by use, such as grinding and polishing stones, do occur.

The dividing line between neolithic and paleolithic was quite naturally placed where the break seemed greatest. In any succession of cultures certain elements are carried to the succeeding phase, while certain elements are lost. The life of some industrial types is short, while that of others is long. The apparent failure of the neolithic to inherit largely from the paleolithic led for a while to the quite general belief in a hiatus between the two periods of the Stone age, a belief that at first seemed to be supported not only by a cultural gap, but by geologic and faunal changes as well. The ice sheet of the last (Würm) glacial epoch was followed in its retreat to the north by cold-loving animals, such as the mammoth, the woolly rhinoceros, and the reindeer. Cave art, inseparably linked with these forms, likewise disappeared. The stag superseded the reindeer. These changes, however, took place before the close, rather than at the close, of the paleolithic period. The Azilian epoch is, properly speaking, the closing phase of the paleolithic, yet it has tended almost to bridge the gap between the latter and the neolithic period, so that the hiatus is evidently more apparent than real.

An important discovery bearing on the transition was recently made by G. F. L. Sarauw on the island of Zeeland, Denmark. The station is in the Maglemose (great peat bog). This was apparently a lake station, and, since there are no remains of piles, the dwellings are supposed to have been on rafts. The cul-

tural remains are suggestive of the Azilian. There are no pottery and no polished flint implements; likewise no domestic animals with the exception of the dog. According to Sarauw (and Brögger agrees with him), the Maglemose culture belongs to about the middle of the *Ancylus** period, when the land, somewhat higher than at present, was covered by pine forests (*Pinus sylvestris*) and the Baltic was a fresh-water lake. The Maglemose, then, is the oldest known culture in Denmark. It is also found in regions of northern Germany and southern Sweden.

A change of land level and climate brought on a new epoch, that of the shell heaps. The southern Baltic area sank, converting the great Baltic lake into a sea once more. The oak tree supplanted the pine. As the temperature rose and the sea became more salt, the oyster and *Littorina littoria* took the place of *Ancylus*. The presence of *Tapes decussatus* in the waters of western Sweden, Denmark, and southern Norway indicates that the climate of that region during the *Littorina* or shell-heap epoch was even milder than at present.

The shells of oyster, *Cardinum edule*, *Mytilus edulis*, *Littorina*, and *Tapes* make up the great mass of the shell-heap deposits, which often attain large dimensions. Shellfish thus formed the chief nourishment of the people of that time; for, if not the dwelling sites, the shell heaps were at least the great outdoor restaurants of the masses. Mingled with the shells are fish bones and the broken bones of water birds. Less plentiful are the bones of mammals. The elk, common in the Maglemose epoch, has almost disappeared. The dog is the only domesticated animal. Associated with shells and bones are hearthstones, rude chipped-flint implements, bone and horn tools, and potsherds. Among the flint implements the two most characteristic are the pick and the paring knife. (See KITCHEN MIDDEN.) Before the close of the shell-heap epoch the land began to rise and the movement continued till the early Middle Ages.

Outside of southern Scandinavia shell heaps are comparatively rare in Europe; but a culture supposed to be synchronous is found in western Europe, particularly in northern France. It has received the name Campignian, from the station of Campigny in the commune of Blangy-sur-Bresle (Seine-Inférieure). At Campigny are numerous cabin sites, one of which was carefully excavated by Salmon, D'Ault du Mesnil, and Capitan. It proved to be a pit sunk in the gravel bed. At the bottom of the pit was a black mass of charcoal and ashes, with numerous flint implements; also the bones of *Bos*, the stag, and the horse. An analysis of the charcoal proved the presence of the oak. Above the black hearth deposit was a filling of yellow sandy clay, with nodules of clay and industrial remains similar to those of the layer beneath. These two deposits are of Campignian age. While the scrapers, perforators, and gravers are suggestive of the upper paleolithic, the two new and dominant forms are the pick and paring knife, so characteristic of the shell-heap industry. The presence of potsherds and the absence of polished flint implements are notable features of the Campignian culture. In the vegetal earth that formed a surface covering over the pit were found polished and other flint implements. Practically the same stage of culture is to be found at the great camp of Catenoy, near Clermont (Oise). While the superficial layer contained polished flint implements and remains of the Bronze age and Roman times, the industry found at a depth of 30 centimeters and more was confined to forms that first appeared in the paleolithic, and the pick and paring knife (the two new types), as well as pottery. The same phenomenon is repeated at many village sites of western Europe, Italy, and even as far east as Russia. If, then, the Azilian and Maglemose cultures represent the last term in the paleolithic series, the Campignian and the epoch of the shell heaps represent the initial term of the neolithic series.

Chronologic Subdivisions. Archæologists of the North took the lead in establishing a definite chronology for prehistoric times; since Thomsen's time they have kept pace with the general progress made, especially in the domain of the neolithic and subsequent periods. Stratigraphy is the potent guide to a chronology of the paleolithic period. In the neolithic, on the contrary, stratigraphy is for the most part lacking. Recourse is thus had to the typologic method, with results that do not always carry universal conviction. There is thus as yet no unified neolithic school of thought and practice. In Denmark Worsaæ early recognized two neolithic epochs. His successor, Sophus Müller, has gone further by subdividing the second of Worsaæ's epochs. Müller's system comprises (1) epoch of the shell heaps, (2) epoch of the pointed-poled and the flat-poled axe, and (3) epoch of the dolmens. (See MEGALITHIC MONUMENTS.) The latter epoch is subdivided into three successive stages: that of the (*a*) simple dolmens, (*b*) many-chambered (giant) dolmens, and (*c*) stone cists and individual graves. The pointed-poled and the flat-poled axes of the intermediate epoch are apparently derived from the Campignian pick and paring knife of the shell-heap period. Beginning with the second epoch, one begins to find polished flint implements.

During the closing stage of the third epoch, burials were in cists, the walls and coverings of which are comparatively thin flat stones split for the purpose. They were small and covered by insignificant mounds that were never marked by stone inclosures. A cist contains from 1 to 11 skeletons. Closely related to the stone cists and belonging to the very close of the Stone age are the individual graves. These are even less conspicuous than the cists, and, as their name suggests, never contain more than one skeleton, which rests on a floor of loam or stone, is surrounded by a number of stones, and is simply covered with earth. Such burials are in or under low flat mounds.

The characteristic implement of the third period is the thick-poled axe, which is especially abundant in the small and giant dolmens. A large dolmen will contain 20 or 30 axes and chisels and as many arrowheads. Pottery and objects of bone and horn also abound. The perforated battle axe, pecked and ground into shape, is the usual accompaniment of the stone cists and individual graves. Spearheads and poniards are abundant. They are always of flint and belong to a limited number of well-defined types. The hilt or shaft end varies so that one cannot always distinguish between the spear and the poniard. Those with beautifully chipped handles were without doubt poniards. These

* *Ancylus fluviatilis*, a small mollusk that lived in the Baltic fresh-water lake.

are so numerous that it must have been the custom to carry one always in the belt.

It is worth while to trace the evolution of the poniard during the third epoch. In the oldest type there is practically no differentiation between blade and hilt; both are very thin. The margins curve with perfect regularity from the point to the end of the handle. The chipping is done with admirable regularity, often appearing as oblique parallel grooves. In the second stage of development the hilt becomes more and more differentiated from the blade, and is thicker. These two types are found in the dolmens. In the stone cists one finds the third type. The hilt has become quadrangular in section; its breadth is about the same at all points, and the corners are carefully chipped. With the fourth type, also found in the cist graves, the hilt becomes heavier and widens at the pommel, presenting a rhomboidal cross section.

The foregoing classification is practically the same as that worked out by Montelius of Stockholm and, broadly speaking, applies also to northern Germany. In Switzerland the problem is different, and yet even there both Heierli and Gross make a triple division of the neolithic period, the last witnessing the introduction of objects made of copper and hence marking the transition to the age of metals. The three divisions are based principally on the finds made at three lake dwellings. These in the order of age are: Schafis, near Neuville; Moosseedorf, at Münchenbuchsee; and Vinelz, in the Lake of Bienne.

The stone axes of the oldest epoch are small, rude, and made of local material. The pottery is crude and undecorated. Woven fabrics are found. Wild animals were used for food in greater quantities than domestic animals. With the second epoch the lithic culture is influenced by the importation of nephrites. Stone implements are finely polished and often perforated. There is an improvement in the potter's art, many of the vessels being ornamented in a simple but effective manner. Wild and domestic animals were about equally employed for food. The population was in a large measure brachycephalic. The characteristic features of the third epoch are the string ornament in pottery, the increasing presence of domestic animals, and the appearance of copper.

It will thus be seen that, if much still remains to be done in the way of relative chronology, one is safe in assuming that there were three more or less distinct phases of the neolithic period—an initial stage, marked by the complete absence of polished flint implements and the appearance of pottery represented by the kitchen middens and the so-called Campignian culture; a middle stage, marked by the introduction of polished flint tools and weapons; and a closing phase, characterized by the occasional appearance of copper objects.

It would be difficult to apply anything like an exact time scale to the neolithic period. If there was no hiatus, then the neolithic begins where the paleolithic left off, say from 10,000 to 20,000 years ago. A very moderate estimate would place the beginning of the kitchen-midden or Campignian epoch at 8000 B.C. and the middle epoch at 6000 to 2500 B.C. It should be recalled that the neolithic period persisted longer in the north than in the south of Europe and Egypt. The figures mentioned are intended to be valid only for central Europe.

Inhumation was the dominant mode of disposing of the dead, but incineration was also practiced to some extent in certain parts of Germany, France, and Switzerland. Neolithic sepultures belong to five classes: (1) simple burial in the earth without protective envelope of an enduring nature, (2) burial in natural caverns or shelters, (3) in dolmens, (4) in artificial caves, and (5) in stone cists.

Neolithic Contributions to Civilization. European neolithic culture is the resultant of a gradual regional evolution regulated in a measure by forces from without. An analysis of all the elements is impossible in the present state of our knowledge. This much we know, that there was a swing of the culture pendulum towards more serviceable, if less artistic, lines of activity. Magic finally failed to give to an increasing hunter (paleolithic) population a regular and adequate food supply. Neolithic man solved the problem by the domestication of both animals and plants, thus registering one of man's greatest conquests over nature. The dog was the first animal to be domesticated; after that came the horse, ox, sheep, goat, and pig. Among cereals, wheat was the most common; barley, oats, and rye were also cultivated. Flax was the principal textile plant. It is probable that the grape was also cultivated. Other fruits as well as nuts appreciably augmented the neolithic food supply. Thanks to the habit of living in pile dwellings, such delicate products as woven fabrics, cereals, and fruits have been preserved to our day.

Of prime importance was the potter's art, which appeared at the beginning of the neolithic and which ever since has contributed so much to human comfort and well-being, aside from its purely artistic possibilities. The potter's wheel was unknown and the firing was done in the open. Neolithic pottery is divisible into three great groups based on form and decoration. To the first group the Germans have given the name Schnurkeramik, because the ornamentation consists of string imprints. The geographic distribution of the Schnurkeramik embraces central and eastern Europe. The second or caliciform group was at one time combined with the first; but it differs not only in form and ornament but also in respect to geographic distribution. The decoration on caliciform vases consists of horizontal zones that cover the whole surface of the vessel instead of being confined to the upper third. This group is found widespread in southwestern Europe (Italy, Sardinia, Sicily, France, Spain, and Portugal), also the British Isles, Holland, Denmark, parts of Germany, and Austria. The third group, or Bandkeramik, is decorated by bands consisting of continuous incised or punctate lines disposed in chevrons, undulations, spirals, and otherwise. It is spread over even a vaster territory than the two preceding groups, since it occurs throughout practically the whole of Europe with the possible exception of the British Isles.

Neolithic constructive ability is seen not only in the megalithic monuments and pile dwellings but also in the numerous fortified camps. A good example is the Camp de Chassey (Saône-et-Loire), on the summit of a narrow rock promontory, whose escarpments not only protect but command in all directions. At each extremity are formidable earthworks, that even yet reach a maximum outside height of 14 meters.

Concerted activity and commerce on a considerable scale are indicated by great workshops suitably located for the fabrication of flint implements. One of the greatest workshops is that at Grand Pressigny (Indre-et-Loire), which extends over a zone 12 kilometers in length. The wide distribution of the Grand Pressigny product through commerce is easily traceable on account of the peculiar beeswax color of the flint. M. de Saint-Venant in a special study has traced the dissemination of these flints over a large area, including Brittany, northern France, western Switzerland, and even into Belgium, where local flint of another variety is by no means rare.

Only in the neolithic period did man first begin to realize that the earth and the fullness thereof was his. He regulated the food supply by domesticating animals and plants. The ceramic and textile arts were made to minister to his comfort. In the matter of tools and weapons his choice of materials was still limited to stone, wood, bone, and horn. Flint was his chief reliance, and this he had learned not only to chip with much dexterity but also to polish. He also observed that dry, weathered-surface flints were more difficult to manipulate than those *in situ*. As a result the mining for flint became an important industry. The mining was done not only by open cast but also by shafts and galleries. At the well-known neolithic flint mines of Spiennes, near Mons, Belgium, discovered in 1866, two methods of mining were employed: galleries were driven in from the valley slope and shafts were sunk from the surface of the plateau above. Here the mining operations occur over an area of 60 acres, some of the shafts being sunk through flint veins of poor quality to a depth of 10 meters before reaching the kind of flint desired. At the bottoms of the shafts are chambers of considerable size from which galleries radiate in various directions. After extracting the flint the galleries were filled with rubble as a precautionary measure. At Obourg, Belgium, the open-cast system was employed. This is thought to antedate mining by shafts and galleries. Some of the trenches at Obourg reached a depth of 4 meters. Here the skeleton of a miner with his tools was recently unearthed. He had evidently been accidentally buried while engaged in driving a crosscut between two trenches.

The mining tools were picks of staghorn and flint. The scapula of *Bos longifrons* was also employed, probably as a shovel. Much workshop débris is found about the shafts of flint mines. The great flint mines of Grimes' Graves and Cissbury in England are well known. Flint-mining operations are traceable all the way from Norfolk to Sicily. With the introduction of metals, the mining of flint for implements gradually fell into disuse. It persists, however, even to-day at Brandon (Suffolk), where the product is converted into gun flints. Since the introduction of the automobile the exploitation of flints for road metal is no longer so popular as it once was. Thus it is that new inventions and the discovery of utilizable elements hitherto unknown have ever been powerful factors in the conservation of natural resources.

Neolithic Races. The principal European races of the present time are: (1) the Northern blond dolichocephalic race; (2) Mediterranean, dark-haired, dark-eyed, dolichocephalic; and (3) Alpine brachycephalic race. Skulls representing these three types are found in neolithic graves and in approximately the same geographic distribution. Of the dolichocephalic races one has a high forehead and long face, the other a low forehead and a broad face.

Remains of a pygmy race dating from the beginning of the neolithic and even earlier have been encountered in central Europe, especially in Switzerland, parts of Germany, and France. The pygmy skeletons are always associated with those of normal size in the same graves and cemeteries.

The elements that go to make up the neolithic population of Europe are not foreign to those seen in the last paleolithic races. To a certain extent, therefore, somatology is not inconsistent with archæology. Both seem to point to a gradual diffusion of new blood and new ideas rather than to changes due to invading and conquering hosts. Combined cultural, physical, and linguistic studies may yet succeed in throwing new and much-needed light on the nature and number of the elements that entered into the make-up of the European neolithic population. See BRONZE AGE; EUROPE, PEOPLES OF; MAN, SCIENCE OF, *Ancient Types*.

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NE'ON (Gk. *néon*, neut. sing. of *néos*, *neos*, new). A gaseous element obtained from the atmosphere by Ramsay and Travers in 1898. It resembles helium and the other members of its group in being chemically inert, no compound of helium with any other element being known. Neon is separated from the air in the same way as krypton. Neon (symbol, Ne; atomic weight, 20.2) is a colorless and odorless gas which can only be liquefied below —210° C. Its molecules, like those of argon, helium, and the other rare gases of the atmosphere, are made up of single atoms. One million volumes of air have been shown to contain about 15 volumes of neon.

NE'OPHYTE (Fr. *néophyte*, from Lat. *neophytus*, from Gk. *νεόφυτος*, from *νέος*, *neos*, new + *φυτός*, *phytos*, grown, from *φύειν*, *phyein*, to grow). The name given in early ecclesiastical language to persons recently converted to Christianity. The word is used in this sense in 1 Tim. iii. 6, and is explained by St. Gregory the Great as an allusion to "their being newly planted in the faith." It differed from catechumen (see CATECHUMENS), in supposing the person to have not only embraced the doctrines of the Church, but also to have received baptism. The passage referred to directs Timothy not to promote a neophyte to the episcopate; and this prohibition was generally maintained, although occasionally disregarded in extraordinary circumstances, such as those of St. Ambrose (q.v.). In the modern Roman Catholic church the same discipline is observed, and extends to persons converted not alone from heathenism, but from

any sect of Christians separated from the communion of Rome. The time, however, is left to be determined by circumstances.

NEO-PLA'TONISM. The name applied to the teachings, primarily of the Græco-Alexandrian school of philosophy, and later of a number of Italian humanists, as well as some Englishmen. The extension of the Roman Empire and the growing intercourse between different parts of the world gave rise to an eclectic tendency which combined features of various systems. The process of amalgamation showed itself most prominently at Alexandria, whose central position made it a meeting place for the chief religions and philosophies of the ancient world. Such a philosophy, therefore, as that promulgated by the Neo-Platonists, combining the peculiar mental characteristics of the East and the West, naturally originated there, though it soon ceased to have any local connection. The term Neo-Platonism is sometimes loosely used to signify the whole new intellectual movement proceeding from Alexandria, and attempts have been made to include among its exponents some of the Christian Fathers, such as Clement of Alexandria and Origen; but the name is more properly applied to the school of Ammonius Saccas (q.v.) and his followers. Plotinus (q.v.), a pupil of Ammonius, was its most important champion. Porphyrius, Iamblichus, and Proclus (qq.v.) represent a continuous decline in philosophic interest and a greater and greater tendency to wild and fantastic religious syncretism. In common with Neo-Pythagoreanism and the Judæo-Alexandrian philosophy represented by Philo, the teaching of this school is characterized by an opposition of the divine and the earthly, an abstract conception of God which excludes all knowledge of the divine essence, a contempt for the world of sense which rests on the Platonic doctrines of matter and of the descent of souls into bodies, the supposition of mediating forms which carry over the divine operations into the world of phenomena, the demand for an ascetic liberation from a life of sense, and a faith in a higher revelation obtained in ecstasy. The basis of the divine nature for this philosophy is unity, the one; from this as the primordial source of all things emanates pure intelligence; and from this, in turn, emanates the soul of the world, whose creative activity produces other lesser souls, of men and animals. The doctrine of the divine immanence in this *anima mundi* was one of the most marked points in later Neo-Platonism, and led very close to pantheism. One of the last Neo-Platonists of antiquity was Boëthius (q.v.), who by his continued popularity became the most influential medium for the transmission, during the early Middle Ages, of Greek philosophy to western Europe.

The fifteenth century witnessed a strong revival of interest in these speculations. Nikolas of Cusa (see CUSA) and other mystics sought to overcome the doubt arising from the inadequacy of human conceptions by the theory of man's immediate knowledge or intuition of God—a theory distinctly akin to the Neo-Platonic doctrine that the soul in a state of ecstasy has the power to transcend all finite limitations. The Italian humanists, in their reaction against the previously dominant Aristotelianism, paid great devotion to anything that seemed to derive from Plato. Marsilio Ficino, especially, by his translations of Plotinus, Porphyrius, and Iamblichus, contributed to the spread of these doctrinés. The Cambridge Platonists (q.v.) were not without their affinities to the Alexandrian teaching; and Wordsworth's prevalent idea of the existence of a soul in nature which holds converse with the soul of man might be traced to the same source.

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NE'OPTOL'EMUS (Lat., from Gk. *Νεοπτόλεμος, Neoptolemos*). The son of Achilles and Deidamia, also called Pyrrhus. After the death of his father he was taken by Odysseus to Troy, where he was distinguished by his courage, and was one of the band who entered Troy inclosed in the wooden horse. He was the slayer of the aged Priam. (Consult Vergil, *Æneid*, ii, 469–558.) He returned with rich spoils to Phthia and married Hermione, the daughter of Menelaus. According to later legend he brought back with him as part of his booty Andromache, the wife of Hector, and settled in Epirus (*Æneid*, iii, 293 ff.), to become there the ancestor of the Molossian kings. Later he married Hermione when he had gone to Phthia to restore Peleus to his throne. He was killed at the altar at Delphi by Orestes, the former lover of Hermione, or by the Delphians. He was buried within the precincts of the temple, where he was afterward worshiped as a hero.

NE'O-PYTHAG'ORE'ANISM. The name of one of the two Græco-Alexandrian schools of philosophy, the other school being the Neo-Platonic. (See NEO-PLATONISM.) Pythagoreanism was revived in the first century B.C. by P. Nigidius Figulus, a Roman prætor, but Apollonius of Tyana (q.v.) was the most prominent representative of this attempt to blend Pythagorean philosophy with Oriental theosophy. The Neo-Pythagoreans regarded it as the greatest task of the philosopher to purify himself from connection with matter by the suppression of desire and by the observance of certain ceremonial rules which were adopted from the earlier Pythagorean brotherhood. In their theoretical system, numbers had symbolic significance. Consult: Zeller, *Die Philosophie der Griechen*, part iii; *Die nacharistotelische Philosophie* (3d ed., Leipzig, 1880–81); Vacherot, *Histoire critique de l'école d'Alexandrie* (Paris, 1846–51); also the histories of philosophy by Ueberweg-Heinze, Windelband, Erdmann, and Bergmann.

NEO-REALISM. See REALISM.

NEORNITHES, nê-ôr'nĭ-thēz (Neo-Lat. nom. pl., from Gk. *νέος, neos*, new + *ὄρνις, ornis*, bird). Modern birds, as distinguished from those of Jurassic times, which are called *Archornithes*. They are characterized by fused metacarpals, the second finger longest, and the caudal vertebræ not more than 13 in number. The group

comprises not only existing groups, but all fossil birds except *Archæopteryx*.

NEOSALVARSAN. See SALVARSAN.

NEOSHO, nē-ō′shō. A city and the county seat of Newton Co., Mo., 19 miles southeast of Joplin, on the Kansas City Southern, the Missouri and Northern Arkansas, and the St. Louis and San Francisco railroads (Map: Missouri, B 5). It has a public-school library. The United States government fish hatchery here includes 34 ponds, well stocked with various species of fish. The city is on the edge of the zinc and lead mining district of southwestern Missouri, has a canning factory and planing mill, and manufactures foundry and machine-shop products, agricultural and mining implements, flour, etc. Settled in 1839, Neosho was incorporated as a town in 1868, and in 1878 was chartered as a city. The water works are owned by the municipality. Pop., 1900, 2725; 1910, 3661.

NEOSHO. A river rising in Morris County, east-central Kansas (Map: Kansas, G 6). It flows east and then southeast, draining eastern and southeastern Kansas, and then southward, emptying into the Arkansas River, just below Fort Gibson, Okla. It is about 400 miles long, and its drainage basin has an area of about 12,600 square miles. The chief towns on its banks are Oswego, Burlington, and Emporia. Its principal tributary is the Spring River.

NEOTROP'ICAL REGION. In zoögeography, a primary division embracing South America and its islands, Central America, and the hot lowlands of Mexico and the West Indies. Other names proposed for it have been Austro-Columbian, Dendrogæa, and Notogæa. Its characteristics are more distinctly marked than those of some of the other regions, and indicate a remote antiquity for the mainland areas and a long period of isolation from North America. It also has some curious resemblances to the Australian region, especially in the presence of marsupials and ratite birds. It is naturally divided into four subregions by physiographic features. The first, or Brazilian, subregion comprises the great forested equatorial area from the Caribbean coast to the pampas of southern Brazil. The second, or Chilean, subregion stretches along the Andean plateaus and the dry coast strip between the Andes and the Pacific, from Peru to about lat. 4° N. The third, or Mexican, subregion (q.v.) consists of Central America and tropical Mexico. The fourth, or Antillean, subregion embraces all the West Indies except Trinidad and Tobago, which are continental in their characteristics. The region as a whole is characterized by great richness of life, as well as by marks of isolation. Wallace found that it had eight families of mammals absolutely confined to it, including the distinct group (Cebidæ and Hapalidæ) of New World monkeys, the bloodsucking bats (Phyllostomidæ); the chinchillas, cavies, and three other families of rodents. Nearly all the edentates of the world are collected here—sloths, armadillos, anteaters, and the like. It has also many important lesser groups, as the llamas, the opossums (save two species), the hutias, the solenodons, and many peculiar carnivores. The absence of certain groups is notable; it has no civets, no insectivores (save a shrew or two from the North), no wild cattle or sheep, no ruminants except the llamas and a few deer, and no other hoofed mammals except the tapir (elsewhere known only in Malaya) and the peccary. In birds the case is even more extraordinary. About 25 of its families are not known elsewhere, including such large or peculiar groups as the plant cutters, manakins, cotinga, ant thrushes, tree creepers (Dendrocolaptidæ), toucans, todies, motmots, curassows, tinamous, sun bitterns, and many others; while it possesses the great majority of several groups, such as the humming birds, only scantily present in North America, and not known at all in the Old World. A similar account might be given of regional peculiarities in the departments of reptiles, amphibians, fishes, and the many branches of invertebrate life. The West Indies, as a part of this region, present some extraordinary peculiarities. Though so near to the shores of North America, their zoölogical affinities are distinctly Neotropical, and they present curious resemblances to the island fauna of Madagascar. See AMERICA, *Fauna;* Zoögeographical Map under DISTRIBUTION OF ANIMALS; and consult the authorities there cited.

NE'OZO'IC (from Gk. *νέος, neos,* new + *ζωή, zōē,* life). A term introduced by Edward Forbes to include all the strata from the Trias to the most recent deposits. It has been occasionally used as a substitute for Cenozoic (see CENOZOIC ERA) and for the Tertiary system (q.v.).

NEPAL, nē-pȧl′, or **NIPAL.** An independent state on the south slope of the Himalaya, bordering on British India (Map: India, E 3). It is bounded by Tibet on the north, by the native State of Sikim and Bengal on the east, and by Behar and the United Provinces of Agra and Oudh on the south and west. Its area is estimated at 54,000 square miles.

The southern portion, known as the terai, is a level strip of land, partly covered with forests and well cultivated. The rest of the country belongs to the region of the Himalaya (q.v.) and contains some of the highest mountains in the world, such as Mount Everest (29,002 feet), Kinchinjunga (28,156 feet), and Dhaulagiri (26,826 feet), which are covered with perpetual snow. There are a number of minor ranges intersecting each other and inclosing numerous valleys. The country belongs to the basin of the Ganges, its chief rivers being the Karnali and the Sarda in the west, the Gandak in the centre, and the Kosi in the east. The rain which occurs under the onblowing monsoons, June to October, is not heavy. The temperature varies considerably in accordance with the configuration of the surface. In the mountainous part it is naturally cold, while in the flat region along the south boundary and in some of the valleys of the interior it is hot and humid between April and June. The average temperature at Katmandu (over 4300 feet) is about 62° F. Deposits of iron, lignite, copper, lead, and zinc are found and exploited to some extent by the natives. There are also many mineral springs and some deposits of gold and silver. The chief occupation of the inhabitants is agriculture and grazing; the former, carried on in a primitive way, is highly intensive, owing to the scarcity of agricultural land. The slopes of the hills and ledges even, difficult of access, are utilized for agricultural purposes, and the methods employed for diverting mountain torrents for irrigational needs exhibit noticeable and varying degrees of ingenuity. See NAIPALI LANGUAGE.

The chief crops in the central valleys are several varieties of rice, wheat, pulse, corn, sugar

cane, potatoes, and various vegetables. In the terai region are cultivated tea, cotton, tobacco, etc. Many European fruits are successfully cultivated. Famine is unknown, and the people in general are prosperous. The chief manufactures are coarse cotton cloth, paper, brass bells, utensils, and ornaments. Excellent pottery is produced in some parts of the country, and the wonderful wood carving found in the temples testifies to the skill of the natives. Wood carving, however, as well as artistic working in brass, has declined. The commerce of Nepal is chiefly with British India and Tibet. From British India are imported cotton piece goods, cotton yarn, woolen goods, silver, spices, salt, brass, copper, sugar, iron, leather goods, etc. These are partly reëxported to Tibet, which sends in return drugs, shawl wool, coarse woolen cloth, salt, paper plant, domestic animals, honey, wax, quicksilver, gold, etc. The chief exports to British India are rice, oil seeds, cattle, tobacco, hides, timber, spices, and ghee. The exports to and imports from British India amounted in 1912–13 to Rs. 45,498,493 and Rs. 22,243,544 respectively. Goods are usually transported by human carriers or pack animals.

Nepal is a monarchy. The actual ruler is the Prime Minister, who is nominally assisted by a council of his own choosing. There are civil and criminal courts. The savage native code has been humanized by British influence. Foreign relations are controlled by the government of India, which is represented at Katmandu, the capital, by a Resident. The revenue of the government is derived chiefly from land tax, customs, mines, forests, and monopolies. There is an efficient army of about 45,000, including 2500 artillery, which can be greatly enlarged in case of necessity in view of the fact that the Gurkhas (q.v.) are able fighters.

No reliable figures as to the population of Nepal are available. Native statistics place it at 5,000,000, but these figures are probably exaggerated by at least a million. The great mass of the population of Nepal are by some considered to be Mongolic with large infusions of Dravidian and Aryan blood, while others regard them as a mixed race of Indo-Afghan and Mongolic descent. The Gurkhas (q.v.), the ruling class, are the typical representatives of the Nepalese; they include the military tribes of the Khas, Gurungs, Magars, and Thakurs and are descended from aboriginals who intermarried with Rajput and other Hindu refugees from the Mohammedan invasion of the twelfth century. The Gurkhas are spread throughout the country. The Newars, who inhabit the valley of Nepal, constitute the largest division of the population. The Bhotias, who dwell in the east, include several tribes of Tibetan stock—the Kirantis, the Murmis, and the Limbus. Other tribes are the Lepchas, the Tharus, and the Bokras. The languages spoken in Nepal belong to the Tibeto-Himalayan branch of the Tibeto-Burman family of the Indo-Chinese languages. The lingua franca is Parbatya, i.e., hill speech, which resembles Hindi and is written in the Nagari character. The religion of the ruling dynasty and of the majority of the Gurkhas, Tharus, and Boksas, and of a part of the Newars, is Hinduism; the other inhabitants profess Buddhism and are accorded complete religious liberty. The two religions are supposed to be about equal numerically. Education is entirely in the hands of the priests, and the bulk of the population are illiterate. The children of the wealthy classes are sent to the educational establishments of British India.

History. Various ruling dynasties from a remote period are given in the native literature, but the first authentic mention of a ruler—Ançuvarma of the Thakuri dynasty—is made by Hiuen Tsang, the Chinese Buddhist pilgrim, who visited Nepal in the seventh century. In 1324 the country was invaded and occupied by Harisinha-deva, Rajah of Simraungarh. Modern history begins in 1768 with its conquest by the Gurkhas, who originally were driven from Rajputana by the Mohammedan invasion. Gurkha aggressions on Tibetan territory in 1790 led to their defeat by China and the limitation of their northern boundary. In 1814, by way of reprisals, the British invaded the country, but were defeated; the following year, however, advancing on Katmandu, they obtained favorable conditions of peace and the establishment of a British Residency at the capital. By the assassination of his uncle in 1845 and by the Kot massacre of his opponents in the following year, Jung Bahadur, a colonel in the army, became Prime Minister and nominal ruler. Having firmly established himself in power, he visited England in 1850, and after his return the fruits of his journey were exhibited in the wise reforms that he introduced. During the Indian Mutiny of 1857 he rendered valuable assistance to the British and was handsomely rewarded. He died in 1877 and was succeeded by his brother, who also resorted to wholesale executions to maintain his ascendancy and ruled until 1885, when he was murdered at the instigation of Bir Shamsher Jang. The latter became Prime Minister and father-in-law, by two daughters, of the reigning Maharajah, Pirthivi Bir Bikram, who was born in 1875 and ascended the throne in 1881. The Maharajah died in 1911 and was succeeded by his son, Tribhubana Bir Bikram. In 1901 Sir Chandra Shamsher Jang succeeded Bir Shamsher Jang as Prime Minister.

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NEPALI LANGUAGE. See NAIPALI LANGUAGE.

NEPAUL. See NEPAL.

NEPEN'SIS COLO'NIA. See NEPI.

NEPENTHE, nē-pĕn'thē, or **NEPENTHES,** nē-pĕn'thēz (Gk. *νηπενθής, nēpenthēs*, from *νη-, nē-*, negative prefix + *πένθος, penthos*, grief). In the *Odyssey*, iv, 221, an epithet of a drug given

to Helen in Egypt, possessing the power to bring forgetfulness of every pain or grief. Later writers identified the drug with opium or some preparation of hemp.

NEPENTHES. A genus of herbs or half-shrubby plants of the family Nepenthaceæ. The species are natives of swampy ground in India, Indo-China, Malaysia, Madagascar, etc., and are chiefly remarkable for the leaves of some species, which consist of a dilated foliaceous petiole, prolonged beyond its foliaceous part, as if it were the prolongation of the midrib of a leaf, and terminating in a pitcher (ascidium), from which the name "pitcher plant" has been derived. The pitcher is terminated by a lid, which is regarded as the true blade of the leaf. The fluid found in these pitchers is a secretion of the plant itself. Insects often enter the pitcher and, according to investigations of Vines, are dissolved by a ferment secreted by the leaves and absorbed, so that the nepenthes rank among insectivorous plants. Many of the species are epiphytes, being attached to trees and other plants, and are rather commonly grown in hothouses for their strange leaves. The name "pitcher plant" is applied to many other plants, as *Sarracenia* spp., *Arisæma triphyllum*, etc.

A CULTIVATED VARIETY OF NEPENTHES.

NEPH'ELITE (from Gk. *νεφέλη, nephelē*, cloud). A mineral sodium-aluminium silicate that crystallizes in the hexagonal system, has a vitreous or greasy lustre, and is generally colorless or light yellow, though sometimes when found massive it is green or red. It occurs in both ancient and modern volcanic rocks and in crystalline rocks, such as syenite. It is found in the lavas of the volcanoes of Italy, also in Bohemia, France, Brazil, and Canada; in the United States the massive and crystallized varieties are found in Maine, New Jersey, the Ozark Mountains (Arkansas), and Montana.

NEPHELITE, or **NEPH'ELENE, SY'ENITE,** *Laurvigite.* An igneous rock of granitic texture, of which the essential mineral constituents are nephelene and alkali feldspar. Nephelene syenites usually contain also an alkaline variety of pyroxene (acmite or ægirine) and frequently also nosean or haüyne, sodalite, sphene, and peculiar varieties of mica (lepidomelane) and garnet (melanite). These minerals are so generally found together, and so rarely occur except when in association with nephelene or the allied mineral leucite, that the nephelene syenites and a few rare families of rocks (leucite syenites, theralites) are quite marked in their peculiarities. Nephelene syenites are very rich in the alkalies and alumina. They are quite subject to alteration by weathering processes. They occur in rather small bodies as a rule and are not so common as the ordinary class of syenites. (See SYENITE.) There are outcrops at Litchfield, Me.; Salem, Mass.; Beemerville, N. J.; Magnet Cove, Ark.; and in other places in the United States and in Canada.

NEPHE'LIUM. A genus of plants. See LITCHI.

NEPHI, nē'fī. A city and the county seat of Juab Co., Utah, 87 miles south of Salt Lake City, on the San Pedro, Los Angeles, and Salt Lake and the San Pete Valley railroads (Map: Utah, C 3). It is the distributing point for a district interested chiefly in farming, lumbering, and cattle raising and in the mining of salt and gypsum. The water works and electric-light plant are owned and operated by the city. Pop., 1900, 2208; 1910, 2759.

NEPH'OSCOPE (from Gk. *νέφος, nephos*, cloud + *σκοπεῖν, skopein*, to view). An instrument used by meteorologists for observing the clouds, and especially for determining the amount and direction of the horizontal component of the apparent motion of a cloud. The modern nephoscope is the development of an idea embodied by Aimé in 1846 in his so-called reflecting anemometer, and in its best form it has a wide range of usefulness. The simplest form is merely a horizontal mirror having a circular graduated edge. The observer brings one eye to such a position that the reflected image of the cloud is seen to pass from the centre of the mirror to the circumference, and he merely records the direction in which the image appears to pass off. The Marvin nephoscope, an instrument of high precision, is used by the United States Weather Bureau observers, and has been extensively employed in cloud observations. A form of nephoscope for use on vessels at sea was devised by Professor Finemann and used by him about 1888. About the same time Professor Abbe devised his marine nephoscope and a method of using it for determining absolute altitudes and movements of clouds at sea. It consists essentially of a light bronze circle fitting rather loosely on top of the ordinary ship's compass; it therefore replaces the nearly horizontal circle of the apparatus ordinarily used by the navigator to sight upon the sun when measuring azimuths. The bronze circle is graduated, and at its zero point carries a hinge and an adjustable arm having at its end a knob which serves to define the line of sight. The circle also carries a glass mirror from which the quicksilver backing has been removed, leaving a transparent circle, through which the graduation of the compass needle can be read. As this marine nephoscope enables one to locate a storm centre by the motions of the lower clouds better than can be done by the wind, and as it gives the direction of the pennant at masthead much more accurately than it can be observed by the unaided eye, it is strongly recommended for use by navigators at sea. To ordinary meteorological observers it has the special advantage of being the only instrument by means of which observers at sea can easily determine the absolute altitude and movements of clouds.

In 1897 Louis Besson of Paris devised the nephoscope now generally known by his name, also sometimes called a cloud rake from its general resemblance to that garden implement. Besson's device consists essentially of a horizontal rod provided with seven short upright points or teeth, three on each side of, and evenly spaced from, the middle tooth, which is in the axis of a vertical staff rigidly attached to the horizontal rod at its middle.

To observe cloud direction and velocity with this nephoscope (it is of course not a portable device), the observer takes position so that a selected cloud point falls immediately behind the central or axial tooth of the rake. Remaining in this position, he then turns the rake until

the line of teeth is in perspective agreement with the path of the moving cloud point observed. When thus adjusted, the direction of the assumed horizontal cloud path may be read off directly by the appropriate indicator on a graduated disk. The velocity of the cloud is determined by observing the time interval elapsing between the moment when it was on the middle tooth and the time at which it reached any other given tooth. Appropriate formulas, examples, and certain interesting problems which the use of this nephoscope developed will be found in the *Meteorologische Zeitschrift*, September, 1903, pp. 404 ff.

Bibliography. A full account of various forms of nephoscopes is given in Cleveland Abbe, *Treatise on Meteorological Apparatus and Methods* (Washington, 1888), published as part ii of the *Annual Report, Chief Signal Officer* for 1887. The Marvin nephoscope is described in the *Monthly Weather Review*, vol. xxiv (Washington, 1896), and also in separate pamphlets. The description of Abbe's marine nephoscope was first published in 1893 in the *Report of the International Meteorological Congress* held in Chicago (*Weather Bureau Bulletin No. 2*). A general description of work done with it is contained in the *American Meteorological Journal* for October, 1891.

NEPHREC'TOMY (from Gk. *νεφρός, nephros*, kidney + *ἐκτομή, ektomē*, excision, from *ἐκ, ek* + *τομή, tomē*, a cutting, from *τέμνειν, temnein*, to cut). The total removal of a kidney in rare cases of acute or chronic infection, either because the kidney is useless or because it is a source of infection owing to abscesses in its substance. Other conditions demanding removal are congenital malformation, hydronephrosis (destruction of the kidney from blocking of the ureter), and tumors. A kidney may be approached through an abdominal incision, but an oblique extraperitoneal lumbar incision is the route generally preferred. Cutting through the lumbar muscles obliquely, beginning an inch below the twelfth rib, making his incision downward and forward, the surgeon reaches the kidney. Blunt dissection frees it from its site and divests it of its capsule. Its pedicle is then tied, and it is separated and removed. Shock, severe hemorrhage, suppression of urine, peritonitis, or injury of neighboring structures may be unavoidable and add considerably to the risk of the operation. Consult Kelly and Burnham, *Diseases of the Kidneys, Ureters, and Bladder* (New York, 1914).

NEPH'RITE (from Gk. *νεφρός, nephros*, kidney). A variety of amphibole that varies from white to dark green in color, according to the amount of ferrous oxide that it contains. It is known chiefly through the carved ornaments and utensils that are found among the remains of primitive man in various parts of the world, especially in China and Mexico, and known under the collective name of *jade* (q.v.). Many imaginary virtues were ascribed to it, and it was especially sought after as a cure for epilepsy and diseases of the kidneys.

NEPHRI'TIS. See Bright's Disease; Cirrhosis.

NEPHROT'OMY (from Gk. *νεφρός, nephros*, kidney + *τομή, tomē*, a cutting). The operation of cutting open a kidney for the purpose of removing a stone (nephrolithotomy) or evacuating pus. An incision is made in the lumbar region, obliquely, from the outer border of the sacrolumbalis muscle, an inch below the twelfth rib, parallel to the rib and forward and downward. The organ being grasped and drawn into the wound, the surgeon bisects it through its convex edge, removes the calculi, or evacuates the pus. The viscus is sutured and replaced when uninfected, as after the removal of a stone; when an abscess is present, the cavity must be drained. Consult Warren-Gould, *International Text-Book of Surgery* (Philadelphia and London, 1902).

NEPH'THYS (Lat., from Gk. *Νέφθυς, Nephthus*, Egypt. *Nebt-hat*). An Egyptian goddess, the daughter of Seb and Nût, and the sister and wife of Set (q.v.). By her brother Osiris, or Set, she was the mother of Anubis (q.v.). Though in the earliest period she was regarded as a female counterpart of Set and always associated with him, still in the legend she joins with her sister Isis, in mourning over and guarding the body of Osiris, and therefore in funerary scenes the two goddesses are often depicted protecting the mummy of the deceased. The lamentations of Isis and Nephthys over the body of Osiris form the subject of a poem of which several copies have been preserved. Nephthys is usually represented as a woman wearing upon her head the ideogram of her name. As a protector of the dead from evil influences she was worshiped throughout Egypt. Consult: Horrack, *Lamentations d'Isis et de Nephthys* (Paris, 1866); Alfred Wiedemann, *Religion of the Ancient Egyptians* (Eng. trans., New York, 1897); E. A. T. Wallis Budge, *The Gods of the Egyptians*, vol. ii (London, 1904).

NEPI, nā'pē. An episcopal city in the Province of Rome, Italy, 17 miles southeast of Viterbo. It is the Etruscan Nepete and the Roman Colonia Nepensis. The town is encircled by its ancient walls and towers and has a Roman aqueduct, an eleventh-century cathedral, a ruined castle, built for Pope Alexander VI and used as the residence of Lucretia Borgia in 1500; also a handsome Renaissance municipal palace. Pop., 1901, 3036; 1911, 3063.

NEP'IGON, Lake. A lake of Canada. See Nipigon, Lake.

NEP'ISSING, Lake. A lake of Canada. See Nipissing, Lake.

NEPOMUK, nā'pō-mụk, John of. See John Nepomuk Salvator.

NE'POS, Cornelius. A Roman historian. The place and precise time of his birth are unknown. He was the friend of Cicero and Catullus. The only work of his which has survived is a series of 25 biographies, generally brief, of warriors and statesmen, mostly Greeks; this series is part of a work in 16 books, *De Viris Illustribus*. These biographies are distinguished by the simplicity and purity of their Latinity, the conciseness of their style, and their admirable delineation of character; but sufficient care has not been exercised in the examination of authorities, nor is the relative importance of things duly regarded. But in many matters they supplement, in important ways, other sources of information. Until the middle of the sixteenth century these biographies, on the strength of the titles given in the various manuscripts, were generally ascribed to Æmilius Probus, a writer who lived in the latter part of the fourth century; but in 1569 an edition was put out by the famous Dionysius Lambinus, who pronounced the so-called *Lives* of Æmilius Probus to be in reality the lost work of Cornelius

Nepos, *De Viris Illustribus*. This view is now generally accepted. The mistaken ascription to Probus arose from the presence in the manuscripts, after the "Vita Hannibalis," of a dedicatory epigram, by Probus, to Theodosius. There are many editions, among which may be mentioned those of Van Staveren (Leyden, 1773), of Tzschucke (Göttingen, 1804), of Fleckeisen (Leipzig, 1884), of Nipperdey (10th ed., ib., 1896), of Rolfe (Boston, 1894), of Lindsay (New York, 1895), of Flagg (ib., 1895), and of Winstedt (text, Oxford, 1904). Nepos wrote also *Chronica*, an epitome of the world's history; *Exempla*, a series of anecdotes; and letters. Consult Martin Schanz, *Geschichte der römischen Litteratur*, vol. i, part ii (3d ed., Munich, 1909).

NEPOS, Julius. A Roman emperor (474–475). He succeeded his uncle Marcellinus as Prince of Dalmatia. After the death of Olybrius, Nepos was selected by Leo I, Emperor of the East, his kinsman by marriage, to occupy the Western throne. As Emperor he ceded to the Visigoths the Province of Auvergne. In 475 Orestes, father of Augustulus, marched against Nepos at Ravenna. Nepos fled to Salona, where he was assassinated in 480 by two of his own officers. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

NEP'TUNE (Lat. *Neptunus*), or Poseidon (Gk. Ποσειδῶν, *Poseidōn*, Doric Ποτειδάϝων, *Poteidavōn*, Ποτειδᾶν *Poteidan;* of uncertain etymology. Many connect the Greek name with Gk. πόντος, *pontos*, the open sea, and ποταμός, *potamos*, a river). In classical mythology, a brother of Zeus and lord of the sea. In legend he is the son of Cronus and Rhea. His home is a splendid palace in the depths of the sea near Ægæ, though which town of this name was meant caused much dispute. His wife in Hesiod is Amphitrite, and she shared his cult on the isthmus. As a lover he rivals his brother Zeus, and many legends traced local heroes to Poseidon and some nymph or daughter of an early king. So Neleus and Pelias were sons of Poseidon and Tyro. In his nature Poseidon is always wild and implacable, never becoming a guardian of higher virtues. He is the shaker of the earth, a natural conclusion from the frequency with which disturbances of the sea accompany the shocks on land; but he is, above all, the master of the sea, who sends the dreaded storms and at his will controls the waves, which are called his swift horses. His attribute is the trident, or three-pronged harpoon of the Ægean fisherman, with which he controls the waves or brings springs from rocks. Closely associated with him is the horse. He was the horse tamer and was honored with horse races at many points; horses were frequently sacrificed to him, and there are traces of a belief that he was in the form of a horse. His worship was chiefly confined to the coast, though he had temples even in the inland country of Arcadia, and it is not at all improbable that he was originally a god of water and moisture in general. There is some evidence for a decline in Poseidon worship, which seems reflected in the legends of his contest with Athena for Attica and with Hera for Argos. At Athens he was worshiped in the Erechtheum, and some have held that Erechtheus was in essence identical with Poseidon, or a form of Poseidon, and that this deity Poseidon-Erechtheus, overpowered by Athena, was converted into an agricultural deity. From him was also named the Attic month Poseideon (about December). He was a great Ionian divinity, and the Panionia were celebrated by the 12 Ionic cities at his sanctuary at Mycale. His temple on the island of Calauria, where Demosthenes died, was in very early times the centre of an amphictyony or league of maritime states. His most famous cult, however, was on the Isthmus of Corinth, where the Isthmian Games (see Isthmus) were celebrated in his honor. In art Poseidon has much the same type as Zeus, but without the dignity and benignity of the latter. Statues of him are by no means common. Two of the best are the Poseidon of Melos, now in Athens, and the fine statue in the Lateran, which many regard as derived from the famous bronze on the isthmus, by Lysippus.

At Rome the old Italian or Roman water god, who appears dimly in religious tradition, seems to have been early identified with Poseidon, and during the historical period Neptune is scarcely distinguishable from the Greek god of the sea. A temple to Neptune stood near the Circus Flaminius; his festival, the Neptunalia, was held on July 23. Consult: W. W. Fowler, *Roman Festivals* (London, 1899); O. Grupple, *Griechische Mythologie und Religionsgeschichte* (2 vols., Munich, 1906); L. R. Farnell, *The Cults of the Greek States*, vol. iv (Oxford, 1907); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

NEPTUNE. The outermost member of the solar system. Its mean distance from the sun is 2,792,000,000 miles; its diameter 34,800 miles; period of revolution about 165 years; mass 17 times that of the earth; density one-fifth of the earth's. Thus, it is about 85 times larger than the earth, but from its extreme remoteness is of almost inappreciable magnitude when seen through an ordinary telescope.

The discovery of Neptune was an event unique in scientific history. It was the disturbance in the motion of Uranus, caused by the attractive force of Neptune, which led to its discovery. From 1690 to its discovery as a planet by Herschel, Uranus (q.v.) had been repeatedly recorded as a fixed star. Earlier observations were found not to agree with later observations, and hence it became evident that either the earlier observations were erroneous or that Uranus was wandering from its ancient track. On Oct. 21, 1845, John Couch Adams (q.v.) communicated to the Royal Astronomer estimates of the elements and position in the heavens of a planet whose mass would account for the orbital irregularities of Uranus. This did not, however, lead to any search for the planet in the heavens, and the matter remained buried in obscurity. In the same year the attention of Urbain Jean Joseph Leverrier (q.v.), a teacher of astronomy in the Ecole Polytechnique, was brought to the Uranian difficulty. In two papers communicated to the French Academy, Leverrier proved that only an exterior body could produce the irregularities in the Uranian orbit. In a third paper, submitted Aug. 31, 1846, he had computed the orbit of the supposed planet, the visibility of which he described as that of a star of the eighth magnitude. These results were communicated to Galle of the Berlin Observatory, with a request to look for the planet in the place assigned to it. This Galle did in the evening of September 23 and perceived a small body with a disk nearly 3 inches in diameter. The place where it was found was within

less than 1° of the spot indicated. Before the news of the discovery reached England, it had already been duplicated. Under the direction of Airy, director of the Greenwich Observatory, Challis of the Cambridge Observatory had commenced a search for the planet July 29 and recorded 3150 stars, three of which were different positions of the planet, recorded on August 4, August 12, and September 29. Challis proceeded to map them, but as he had no good star map this required considerable time, and before this was accomplished news of the discovery arrived from Berlin on Oct. 1, 1846. Neptune had already been seen by Lalande on the eighth and again on the tenth of May, 1795, but was taken to be a fixed star and repeatedly entered in the catalogues as such till its discovery as a planet.

Neptune is attended by one satellite, which was discovered Oct. 10, 1846, by Lassell. This satellite, like the eighth and ninth satellites of Jupiter, Phœbe, the ninth satellite of Saturn, and those of Uranus, differs from the satellites of other planets in the direction of its motion, which is retrograde, i.e., from east to west, in a plane inclined at an angle of 35° to that of the ecliptic. Its period of revolution is 5 days, 21 hours, and its distance from the planet somewhat less than that of our moon from the earth. For an account of Neptune's discovery, consult A. M. Clerke, *History of Astronomy during the Nineteenth Century* (London, 1908). See Astronomy; Planets; Solar System.

NEPTUNE, Temple of. 1. A remarkably preserved and majestic Doric temple at Pæstum, originally called Posidonia, in Lucania. The temple is a peripteral hexastyle and measures 120 by 85 feet. Within the peristyle the cella has porches, each of two columns *in antis*, at front and rear. The temple stands on a platform of three steps and dates from the latter part of the sixth century B.C.

2. A temple forming part of a group of buildings erected on the Campus Martius at Rome, 26 B.C., by Agrippa in commemoration of the victories at Mysæ, Naulochus, and Actium. It stood in the midst of a great square surrounded by a colonnade, the Portico of the Argonauts, which was decorated with naval paintings. The whole group was called the Neptunium and was the seat of the Admiralty. It was destroyed in the great fire of 80 A.D. and was restored by Hadrian. Eleven columns of the temple, with a part of the cella and decorated ceiling, are still preserved. See Plate of Pæstum.

NEPTU'NIAN (from Lat. *Neptunius*, relating to Neptune, marine, from Lat. *Neptunus*, name of the Roman sea god). A term formerly applied to the geologists who maintained the aqueous as against the igneous theory of the origin of rocks. The discussions between the two schools were long and bitter. The most prominent advocate of the aqueous theory was the German geologist Werner, who taught at the famous Freiberg School of Mines in the latter part of the eighteenth and the early years of the nineteenth centuries. The theory has long since been superseded by the view that there are two types or classes of rocks—the one originating from igneous agencies and called the massive rocks, and the other resulting from aqueous deposition and known as the sedimentary class.

NEQUI'NUM. See Narni.

NÉRAC, nā'räk'. A town in the Department of Lot-et-Garonne, France, on the Baise, 15 miles southwest of Agen (Map: France, S., E 4). The old town, Petit Nérac, on the right bank of the river is united by bridges to Grand Nérac, the modern industrial quarter on the left bank. The ruins of the imposing royal castle of Henry IV, now numbered among French historical monuments, and the park and promenade of La Garenne along the river bank, are the chief objects of interest, and there is a small museum with remains of a Roman city which once occupied the site of Nérac. Corks, machines, coaches, cloth, brandy, and beer are manufactured, and there is a general trade in wine, grain, and hemp. Here Henry IV, to whom there is a monument, spent his youth. Pop. (commune), 1901, 6435; 1911, 6279.

NERBUDDA, nĕr-bŭd'ä, more correctly **NARBADA,** nŭr-bŭd'ä (Skt. *Narmada*). A river of India, ordinarily considered the boundary between Hindustan proper and the Deccan. It rises in the Maikal Range in the northern part of the Central Provinces and flows southwestward for 800 miles, emptying into the Gulf of Cambay through an estuary beginning at Broach, 200 miles north of Bombay (Map: India, C 4). In the upper half of its course, below Jabalpur, it flows through a great depression between the Vindhya Mountains on the north and the Satpura Range on the south and is broken by numerous falls and rapids. In this valley, near Hoshangabad, are important deposits of coal and iron ore. In its lower course the river is broad and becomes a tidal stream 50 miles from its mouth. Seagoing vessels ascend the estuary to Broach on favorable tides, and the river is navigable 82 miles for large boats, while smaller ones can ascend 28 miles farther. The Nerbudda is to the Hindus one of the most sacred streams of India.

NEREID (nē'rĕ-ĭd) **MONUMENT.** The name given to a sculptured heroön at Xanthus in Lycia, dating from the end of the fifth century B.C. and discovered in 1838 by Sir Charles Fellows. The sculptures from the monument, preserved in the British Museum, show 10 female figures with dripping garments (the daughters of Nereus), which, with the shells and seaweed represented, gave the monument its name.

NEREIDS (Gk. Νηρηίδες, Νηρεΐδες, *Nēreïdes*). Sea nymphs, daughters of Nereus (q.v.) and Doris, daughter of Oceanus. Their number is variously given, though 50 seems to have been the popular belief. We have, however, in the various lists some 77 different names. Few of them appear as individuals, and of these Thetis, mother of Achilles, Amphitrite, the wife of Poseidon, and Galatea, beloved by the Cyclops Polyphemus, are alone conspicuous. In art they appear frequently as spectators in scenes involving sea deities, as at the contest between Nereus and Hercules or the capture of Thetis by Peleus, while a favorite scene represents them as bringing to Achilles the armor made by Hephæstus. In the later art they appear riding on various sea monsters, sporting with Tritons, or attending on Poseidon and Amphitrite. The name has continued in the popular belief of the Greeks of to-day, but the Nereids are no longer sea maidens, but have become nymphs of the land. The old belief that one who saw a nymph might be smitten with madness reappears in the modern popular superstition, and it is thought dangerous to haunt their caves, and still more to be caught in the whirlwinds of dust raised in their dances. See Nymph.

NEREIS, nē'rē-ĭs. A genus of annelids

(family Nereidæ) having a long slender body, a distinct head, with tentacles and eyes. Flat lobes (parapodia) on either side in each somite carry leaflike gills. They are all marine and generally hide under rocks or in the sand. They swim actively by rapid and undulating inflections of the body and by the aid of numerous parapodia arranged along the sides. The proboscis is thick, strong, and armed with two jaws.

NEREITES, nē′rē-ī′tēz (Neo-Lat., from Lat. *Nereis,* Nereid). A peculiar fossil trail found in many of the Cambrian rocks of America and Europe and supposed to have been made by a crawling worm.

NEREOCYSTIS, nē′rē-ō-sīs′tĭs, or BLADDER KELP. A genus of the giant kelps of the Pacific coast of North and South America. It has a long flexible stem (stipe) that swells at the end into a large globular float (the bladder), to which are attached large blades.

NERE'TUM. See NARDO.

NEREUS, nē′rē-ŭs *or* nē′rōōs (Gk. Νηρεύς). In Greek legend, an ancient sea divinity, son of Pontus (sea) and Gæa (earth) and father, by Doris, of the Nereids. He seems to have been worshiped at Gythium and probably elsewhere; but his cult was never prominent, and in legend he plays scarcely any other part than father of the Nereids, among whom was included Thetis, mother of Achilles. In the myths he is usually friendly and helpful, and his only contest is with Hercules, who, in order to learn the way to the Garden of the Hesperides, was obliged to wrestle with and hold Nereus, in spite of his manifold changes of shape.

NER'GAL. A prominent deity in the Babylonian and Assyrian pantheons. The name (probably better Nerigal) is assured by Hebrew, Aramaic, and Greek transliterations; it is unquestionably Sumerian; its meaning was given by Babylonian scholars as "lord of the great dwelling place," i.e., the nether world, though probably the original significance was "the rager." His original aspect seems to have been that of a solar deity, representing especially the blazing heat of the sun at noon or the summer solstice; thus, he is referred to as "the hero of the gods, the lofty meridian sun." As a destructive deity he became the god of war and the god of pestilence. He shares the former characteristic with Ninib, along with whom he also appears as the god of the chase. But he appears more uniquely as the god of pestilence, and so he became by an easy transition of thought the god of those whom he destroyed, and thus the deity of the lower world. Accordingly in the later mythology he stood for the declining sun, and the month of Chislev (December) is dedicated to him. This development in the character of Nergal is presented in a story preserved in an Amarna tablet, to the effect that the gods of the upper world became engaged in war with Eresh-kigal, the goddess of the nether world; Nergal as their leader makes his way into her presence, but is induced by her supplications to save her life and to marry her, so becoming the god of the lower world. With this may be compared the classic myth of Pluto and Proserpine. Nergal had also as wife Laz, probably an upper-world goddess. As god of war and destruction, Nergal was identified with the planet Mars, while the lion was his symbol, and the colossal winged lions with human heads at the entrance to the Assyrian palaces seem to have been called *Nirgallu.* Nergal's ancient sanctuary, with which he was always associated from earliest to latest times, was Cutha, the name of which even became a synonym of the nether world. Accordingly, the Cuthæan colony which was settled in Samaria after the deportation of Israel brought thither the cult of Nergal. (2 Kings xvii. 30.) His cult, however, was widespread, and is found in Syria, as recent excavations show, as early as in the first dynasty of Babylon (2232–1932 B.C.). Consult: Morris Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898); id., *Die Religion Babyloniens und Assyriens* (Giessen, 1902–12), Zimmern, in Eberhard Schrader, *Die Keilinschriften und das alte Testament* (3d ed., Berlin, 1902); Eduard Meyer, *Geschichte des Altertums,* vol. i, part ii (3d ed., Stuttgart, 1913).

NERI, nā′rē, PHILIP. See PHILIP NERI, SAINT.

NERIN'EA (Neo-Lat., from Lat. *Nerine,* variant of *Nereis,* Nereid). A genus of siphonostomate gastropods allied to the Cerithiidæ and exclusively restricted to the Mesozoic formations, where it is especially abundant in and characteristic of the Jurassic coral beds of Europe. The shell is long and turreted, with many whorls, and the columella always, and usually also the inner lip of the aperture, are ornamented with strong ridges. Longitudinal sections of the shell show that these ridges increase in size and complexity from the apex to the aperture of the shell, in other words, as the shell increases in growth from its young to its adult stage.

NERIS'SA. In Shakespeare's *Merchant of Venice,* the companion of Portia.

NE'RIUM. A subtropical plant. See OLEANDER.

NERNST, nĕrnst, WALTER (1864–). A German physicist, born at Briesen (West Prussia). He studied at the universities of Zurich, Berlin, Graz, and Würzburg; in 1887 was appointed assistant to Ostwald at Leipzig, and in 1889 lecturer in physical chemistry in the university. In 1891 he became professor at Göttingen, where in 1895 he also organized and became director of the institute for physical chemistry. In 1905 he was called to Berlin to occupy a similar position. In 1906 he delivered a series of lectures at Yale University, which were printed under the title *Experimental and Theoretical Applications of Thermodynamics to Chemistry* (1907). He is the inventor of the Nernst incandescent electric lamp, in which were employed one or more rods or glowers of rare earth oxides, such as zirconia or yttria. These, heated by an auxiliary coil, emit light when incandescent by the passage of the current. Considerable economy was promised for the Nernst lamp in comparison with those with carbon filaments, but the tungsten lamp proved more advantageous. Nernst's publications include: *Siede- und Schmelzpunkt, etc.* (1893); *Die Ziele der physikalischen Chemie* (1896); *Ueber die Bedeutung elektrischer Methoden und Theorieen für die Chemie* (1901); *Einführung in die mathematische Behandlung der Naturwissenschaften,* with Schoenflies (6th ed., 1910); *Physico-chemical Investigations of the Processes of Combustion in Gas Machines,* Russian text (1913); *Untersuchungen über die spezifische Wärme* (1914). See ELECTRIC LIGHTING.

NERNST LAMP. See ELECTRIC LIGHTING.

NERNST'S HEAT THEOREM. An interesting thermodynamic principle introduced by Walter Nernst and elaborated by Nernst, Planck, and others. The basal idea of the theorem is that a material body cannot possibly be cooled down to the absolute zero of temperature. A number of important consequences follow from Nernst's heat theorem, and among other things it permits of calculating the equilibrium constants of chemical reactions, and therefore the so-called affinities of the reactions, on the basis of certain physical properties of the reacting substances. (See REACTION, CHEMICAL.) Nernst believes his theorem to constitute a third principle of thermodynamics (q.v.).

NE'RO (37–68 A.D.). A Roman emperor (54–68 A.D.). He was born at Antium, on the coast of Latium, Dec. 15, 37 A.D., and was the son of Cn. Domitius Ahenobarbus and of Agrippina the younger, the daughter of Germanicus Cæsar, and sister of Caligula; his name was thus originally L. Domitius Ahenobarbus. His mother afterward became the wife of the Emperor Claudius, who adopted him (50 A.D.), and his name was changed to Nero Claudius Cæsar Drusus Germanicus. After the death of Claudius (54 A.D.), the Prætorian Guards, at the instigation of Afranius Burrus, their prefect, declared him Emperor, instead of Claudius' son Britannicus, and their choice was acknowledged both by the Senate and the provinces. His reign began under the guidance of Burrus and his tutor, Seneca, the philosopher. For a time all went well, but the influence of his mother, together with his own moral weakness and sensuality, frustrated their efforts, and he soon plunged into debauchery, extravagance, and tyranny. He caused Britannicus, the son of Claudius, to be poisoned at the age of 14, because he dreaded him as a rival, and afterward (59 A.D.) procured the death of his own mother, Agrippina, to please his mistress, Poppæa Sabina. She was the wife of his principal boon companion, Otho, afterward Emperor, and in order to marry her he divorced and afterward put to death his wife Octavia, the sister of Britannicus (62 A.D.). The affairs of the Empire were at this time far from tranquil. In 61 A.D. an insurrection broke out in Britain among the Iceni under their Queen, Boadicea (q.v.), which was, however, suppressed by Suetonius Paulinus. The following year saw an unsuccessful war against the Parthians in Armenia. At home matters were not much better. The Emperor was lampooned in verse; the Senate and priesthood, alike venal, were also satirized by audacious malcontents; Burrus died, and even Seneca removed from court. In July, 64, occurred a great conflagration in Rome, by which two-thirds of the city were reduced to ashes. Nero himself was charged in ancient times with having been the incendiary (Tacitus, *Annales*, xv, 44); the charge has been often believed in modern days. It is said that he admired the spectacle from a distance, reciting verses about the burning of Troy, but many scholars are doubtful whether he really had any hand in it. At all events, to offset the charge in his own day, and to minimize the popular disfavor caused by this grievous calamity, he laid the blame on the Christians, and persecuted them with great fury. He rebuilt the city with great magnificence, and reared for himself a splendid palace extending from the Palatine Hill over the intervening valley to the slopes of the Esquiline, called, from the immense profusion of its golden ornaments, the *Domus Aurea* (Golden House). To provide for this expenditure, and for the gratification of the Roman populace by spectacles and distributions of grain, Italy and the provinces were unsparingly plundered. A conspiracy against him failed in the year 65, and Seneca and the poet Lucan fell victims to his vengeance. In a fit of passion he killed his wife Poppæa. He then proposed marriage to Antonia, the daughter of Claudius, but was refused, whereupon he caused her to be put to death, and married Statilia Messalina, after killing her husband. His vanity led him to seek distinction as a poet, a philosopher, an actor, and a musician, and he received applause, not only in Italy, but also in Greece, which, upon invitation of the Greek cities, he visited in 67. In 68 the Gallic and Spanish legions, and after them the Prætorian Guards, rose against him, proclaimed Galba Emperor, and Nero fled from Rome to Phaon. The Senate, hitherto subservient, declared him an enemy of his country, and the tyrant committed suicide. Consult: Tacitus, *Annales*, xiii–xvi; Suetonius, *Nero;* Schiller, *Nero* (Berlin, 1872); B. W. Henderson, *Life and Principate of the Emperor Nero* (Philadelphia, 1903); the article "Claudius, 28," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. i (8th ed., Leipzig, 1914).

NER'OLI, OIL OF. See ORANGE OIL.

NERTCHINSK, nyĕr'chĭnsk. A district town in the Territory of Transbaikalia, Siberia, situated on the Nertcha and the Trans-Siberian Railway, 184 miles east of Tchita, the capital of the territory (Map: Asia, N 3). It is poorly built. It has a small museum and a library. The inhabitants are engaged chiefly in the cultivation of tobacco and vegetables, and in the fur trade, of which Nertchinsk is still an important centre. The town was founded in 1656 over a mile from its present site. It soon rose to great importance as the centre of the trade with China. With the rise of Kiakhta (q.v.) Nertchinsk lost in commercial importance, but it soon became the centre of an extensive mining region and received many immigrants, a considerable proportion being convicts. By the Treaty of Nertchinsk, concluded in 1689, the two rivers of Argun and Gorbitsa and the Stanovoi mountain chain were fixed upon as the boundary lines between Siberia and Manchuria. The mining industry in the vicinity of Nertchinsk is now of secondary importance. Pop., 1897, 6713, including about 1200 exiles; in 1914 it had increased to about 11,300 inhabitants.

NER'THUS. In Northern mythology, a goddess worshiped by the tribes of northern Germany, among whom she journeyed at intervals, bringing peace and fertility. Her shrine was an island, sometimes identified with Rügen. She is also called Hertha, from a former reading of the passage in Tacitus in which she is mentioned.

NERUDA, nĕ'rụ-dȧ, JAN (1834–91). A Bohemian poet, journalist, and novelist, born at Prague. He was educated at the university in his native city, and began to write under the pseudonym of Janko Hovora. His early poetical works belong to the Romantic school, new in Bohemia in his time, and he was influenced by the contemporary movement in the same direction in Germany. His volumes of verse include: *Hřbitovní kvĭtí* (Flowers from the Cemetery, 1858); *Knihy vešů* (Book of Verse, 1868);

Písně kosmické (Cosmic Songs, 1878), of philosophic character; *Ballady, a romance* (Ballads and Romances, 1883), written in the spirit of the Czech folk songs; *Prosté motify* (Plain Motives, 1883), his lyric masterpiece; and the posthumous *Friday Songs* (1896), whose mystic and patriotic ideas are wholly at variance with the beliefs of Neruda's youth. He also wrote several plays of lesser importance. Neruda was connected with various newspapers as editor and contributor; in conjunction with Hálek (q.v.) he founded the review *Květy* in 1866, and much of his best work appeared in the *Národní Listy*, for which he was feuilletonist and literary and dramatic critic from 1865 to 1891. His prose masterpiece, the studies of middle-class life in Prague called *Malostranské povídky*, was published in 1878. Others of his sketches and novels are: *Arabesky* (1864); *Různí lidé* (All Sorts of People, 1871); *Obrazy z ciziny* (Pictures from Abroad, 1872); and *Feuilletony* (1876 et seq.), all remarkable for humor, observation, and a style full of charm. His complete works were edited by Herrmann in 1891–99 (Prague).

NERUDA (NORMANN-NERUDA), WILMA MARIA FRANCISCA (1839–1911). A European violinist, born at Brünn in Moravia, where her father was organist of the cathedral. She became a pupil of Jansa, and made her first appearance at Vienna, in 1846. In 1849 she went to London to play at the Philharmonic in one of De Bériot's concerts. She then returned to the Continent and passed several years traveling as a soloist, chiefly in Russia. In 1864 she visited Paris and played with great success at the Pasdeloup concerts, the Conservatory, and elsewhere. In the same year she was married to Ludwig Normann, a Swedish musician. She returned to London in 1869, again taking part in the Philharmonic; in the winter following she played the first violin at the Monday Popular Concerts; and in 1888 married Sir Charles Hallé, with whom she toured Australia in 1890–91. She visited the United States in 1899. Her tours were a succession of triumphs. She died in Berlin.

NER'VA, FORUM OF, or FORUM TRANSITORIUM. The fourth of the Imperial fora at Rome, formed from the highway which separated the Forum of Peace from the Forum of Augustus. As the main thoroughfare between the Subura and the Forum Romanum and between the various Imperial fora (see FORUM), it was called Forum Transitorium or Forum Pervium. It was also called Forum Palladium, from the temple of Minerva (Pallas), of which two Corinthian columns remain, the temple having been destroyed in 1606 to build the chapel of St. Paul in the church of Santa Maria Maggiore. Consult S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

NERVA, MARCUS COCCEIUS. A Roman emperor (96–98 A.D.). He was born 35 A.D., of a family belonging to Narnia in Umbria, and twice held the consulship before his election by the Senate, at the bidding of the people and the soldiers, to the dignity of Emperor, after the murder of Domitian. He displayed great wisdom and moderation, rectified the administration of justice, and diminished the taxes; he provided also for the maintenance, at public expense, of the children of poor parents in the towns of Italy; but finding himself, on account of his advanced age, not vigorous enough to repress the Prætorian Guards, he adopted M. Ulpius Trajanus, then at the head of the Army of Germany, who succeeded him on his death, Jan. 25, 98. After his decease he was deified. (See APOTHEOSIS.) Consult the article "Cocceius, 6," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. i (8th ed., Leipzig, 1914).

NERVA COCCEIUS, or NERVA MARCUS. See COCCEIUS, NERVA.

NERVAL, nâr'vàl', GÉRARD DE. A French writer. See GÉRARD DE NERVAL.

NERVE. See NERVOUS SYSTEM AND BRAIN.

NERVE STRETCHING. A treatment of forcibly extending a nerve (neurotomy). It is used in severe, chronic neuralgia of certain nerve trunks (sciatic nerve, trigeminal nerve, etc.). The treatment consists in massage and in certain movements of the affected area or in a surgical operation, by which the nerve is exposed, raised, and stretched for several minutes. See NEURALGIA; SCIATICA.

NERVI, nĕr'vē. A town in the Province of Genoa, Italy, situated on the seacoast, 6 miles east of Genoa. It is a favorite winter health resort of the eastern Riviera, with a fine park and promenades. In the vicinity are groves of lemons, oranges, and olives. Pop. (commune), 1901, 6766; 1911, 6745.

NERVII, nĕr'vĭ-ī. An ancient tribe in Gallia Belgica, north of the Ambiani. In the time of Cæsar, who first mentions them (*De Bello Gallico*, i, 1; ii, 4–28), they were a warlike people who prohibited trade with their neighbors, forbade the introduction of luxuries, and attempted to make an alliance of the surrounding tribes against the Romans. Cæsar subdued them in 57 B.C.

NER'VOUS DISEASE. An affection of any part of the nervous system, either of the brain, spinal cord, sympathetic nerves, or peripheral nerves. Diseases of the nervous system are divided into functional and organic. In the latter local anatomical alteration of nerve structure is apparent. There are in reality no such things as functional diseases. While not seen or described, undoubtedly anatomical changes are present in many cases; and in others there are lesions at a distance which constitute the real disease, while the symptoms which occupy the attention are the result of reflex action. It cannot be affirmed that there are no structural changes in nerve fibres in so-called functional diseases of the nervous system, which constitute the bulk of nervous diseases. There are a large number of special nervous diseases, which may be functional or be associated with lesions in the brain, spinal cord, or peripheral nerves.

Nervous diseases are, first, morbid manifestations of demonstrably disturbed nerve elements, and, second, so-called functional disorders in which actual changes in the physical properties of the nervous system have not yet been discovered. The latter are commonly called neuroses and are steadily tending to enter the former category under improved methods of research. In many nervous diseases heredity is a marked feature, and in the acquired diseases of the nervous system heredity may play a predisposing part.

There is a general belief that nervous diseases are increasing in frequency. Absolute statements, however, are impossible, as many causa-

tive conditions are changing and other newly recognized nervous diseases are being added to the known list. For instance, the infectious diseases, such as smallpox, typhoid, diphtheria, and malaria, are all capable of producing organic and functional nervous diseases. Their control by preventive medicine and hygiene correspondingly reduces that liability. Civilization, on the other hand, by conserving the unfit and prolonging the life of the feeble and neurotic, entails additional nervous disturbances and susceptibilities. There can be no doubt that modern urban conditions favor the development of nervous instability and at the same time bring to bear the additional highly competent noxious influences of vice, particularly through alcoholic and drug habits and venereal diseases. Yet statistics collected in 1914 by the National Education Association apparently show that in early life at least, mental defectiveness is considerably higher in the country than in large cities. Figures gathered from 25 cities and rural districts gave an average of 0.8 per cent of mental defect in rural children as compared with 0.2 per cent in city children. Inbreeding, together with bad hygienic surroundings, probably accounts for the poor showing, both mental and physical, made by rural school children. The monotony and hardships of farm life, however, are also a factor of morbidity and are particularly active among the women so situated. Some occupations bear either a direct or predisposing relation to nervous ailments. Writer's cramp and the entire group of occupation neuroses of which it is a type show this feature. Workers in metal, especially lead, phosphorus, mercury, arsenic, those subjected to inhalation of various gases, and those whose occupation tempts them to indulge in liquors, are liable to nervous disorders. Work entailing exposure to cold or wet or increased atmospheric pressure, and that attended by great mental strain or monotony, furnish predisposing factors.

In their proper place are found articles on the following nervous diseases or conditions: APOPLEXY; CAISSON DISEASE; CATALEPSY; CHOREA; EMBOLISM; EPILEPSY; FACIAL NEURALGIA; HYSTERIA; INSOMNIA; LOCOMOTOR ATAXIA; MENINGITIS; MYELITIS; NEURASTHENIA; NEURALGIA; NEURITIS; NEUROSIS (including occupation neuroses); NEUROTIC; PARALYSIS; THROMBOSIS; ETC. There is also an article on NEUROLOGY. In addition there are articles in the domain of psychiatry, on DIPSOMANIA; INSANITY; KLEPTOMANIA; MANIA; MELANCHOLIA; MONOMANIA; PARANOIA; PARESIS; PYROMANIA; PUERPERAL INSANITY, ETC., as well as on IDIOCY and IMBECILITY.

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NERVOUSNESS. A condition of unstable nervous equilibrium, which is largely temperamental. A person afflicted with nervousness startles easily at sudden sounds, is unduly emotional, lacks poise and self-possession. If the condition go beyond these limits, actual disease is present and the person is a neurasthenic, i.e., a sufferer from nerve exhaustion. This state is characterized by unfounded feelings of apprehension, tremor, headache, disordered digestion, insomnia, loss of power of application, and irritability. Overwork, excesses, and disease may cause nervousness in normally stable people, which disappears when the cause, often obscure, is removed. See NEURASTHENIA.

NERVOUS SYSTEM, EVOLUTION OF THE. The nervous system comprises those tissues that have the property of irritability or of sensitiveness to external influences, and whose function it is to mediate between the outer world and the inner and to convey to the muscles and other organs motor impulses so as to bring about movements harmonious and advantageous to the organism. In the nervous system also are centred those phenomena which we designate as thought, reason, will, etc. The origin of the nervous system is apparently independent of that of the muscular system, but the development of nervous tissue accompanies that of the contractile organs. In the most primitive organisms, such as the amœba, the whole protoplasm of the animal body is sensitive to external influences; there is a diffuse irritability. Thus, the whole body of the amœba moves away from strong light. Moreover, it has the ability to move with reference to objects that stimulate it in some physical or chemical way.

Lower Invertebrates. In the Metazoa the nervous system develops in the ectoderm or outer layer of the body wall, which is the region that comes in contact with the outside world and hence is the one in which we should expect sensitiveness to become first developed and localized. Some of the cœlenterates have in the ectoderm superficial sensory cells with which the nerve cells are in contact. Fibres from the nerve cells connect in turn with the fibrillar part of the muscle cells. In the flatworms the nervous system is almost completely separated from the epithelium and lies in or close under the dermal musculature, and a brain is best developed in some of the Polycladida and some trematodes. The nervous system of echinoderms has a development unknown in other animals. It is composed of three independent systems: (1) the superficial oral, (2) the apical oral, and (3) the deeper oral. The superficial oral consists of a ring around the œsophagus and of radial nerves which branch out from this ring to the arms and radii. This system innervates the intestine, ambulacral feet, and integument. The nervous system of Mollusca is of a complex type of its own, but shows some affinities to that of annelids and arthropods. In its simplest form (chitons) it consists of a cerebral part, from which four pairs of commissures are sent off. Passing ventrally from it there is a ring with ganglia, and passing backward two pairs of commissures, one called pedal and the other pallial. All of these contain ganglion cells along their whole length and send off various branches and commissures. The pallial commissures are united posteriorly. In the Pelecypoda the nervous system is somewhat more complex, but it is always symmetrical and consists of two ganglia, the cerebropleural, one on each side of the gullet and united above by a commissure. Each ganglion gives off a nerve

cord, which passes downward and backward to the bilobed pedal ganglion of the foot. Directly backward from the cerebral ganglia also proceed two other cords to the bilobed, fused, visceral ganglion, situated on the ventral side of the posterior adductor muscle; this ganglion sends out branches to the palps and mantle. The pedal ganglion innervates the foot, the viscera, the enteric canal, the heart, the gills, and a part of the mantle. The nervous system of gastropods varies in the different groups both in regard to the arrangement of the ganglia and the commissures. There is usually a pair of ganglia near together or some distance apart, which lie above the gullet and produce the visceral nerve cords behind. The visceral cords pass eventually into a pair of ganglia, but only after they have passed through the pleural ganglia. Pedal and buccal ganglia with their commissures also exist.

The nervous system of annelids is well developed and has a bilateral and metameric arrangement. It consists of the bilobed cerebral ganglion or brain and of a double ventral chain of ganglia and commissures. The brain lies in the prostomium or a little farther back, as in the case of the earthworm. Branches are given off from it to the eyes, tentacles, and sensory epithelium. Two lateral commissures from it pass ventrally around the alimentary canal and unite below it into the double ventral nerve chain. One ganglion occurs in this nerve chain for each segment. In some forms the halves of the chain are widely separated and are united by transverse commissures. The arrangement of the nervous system of arthropods is essentially like that of annelids. There is a supraœsophageal ganglion or brain that gives off commissures which pass downward and backward to unite with the first ganglion of the ventral nerve chain. Various degrees of concentration of the nervous system occur throughout the Crustacea and the insects. The higher Crustacea, as well as the insects, have a visceral nervous system. The brain of insects is relatively large and is lobed.

Vertebrates. The nervous system of the higher vertebrates consists of a double chain of ganglia lying in the median line on the dorsal side of the body, which consists of the spinal cord and the brain. The segmental origin of the spinal cord is shown by the regular repetition of the spinal nerves that branch out from it in pairs, one on each side. The visceral or sympathetic system of vertebrates consists of a series of ganglia on each side of the vertebral column. Fibres connect this system with the spinal and cranial nerves. Nerves from the neural axis pass to all the various sense organs, muscles, and glands. The spinal cord is made up of two kinds of nervous matter, a superficial white layer and an internal H-shaped rod of gray matter. The cord merges gradually into the brain, which has a bilateral form and consists, in its simplest form, of three parts, the forebrain, midbrain, and hindbrain. The two lobes of the cerebrum comprise the most anterior part of the brain. The midbrain connects the fore and hind brain. The hindbrain includes the bilobed cerebellum on its dorsal side and the pons Varolii and medulla oblongata on the ventral side. The brain is made up of two kinds of nervous matter, the white and the gray. Its surface is much convoluted, so as to give a greater surface for the gray matter which forms the outer coating. The cranial nerves arise from the lower surface of the brain.

The brain of the Acrania (*Amphioxus*) is the enlarged anterior end of the neural axis, and in it the central canal enlarges to form the ventricle. The ventricle opens dorsally to the exterior of the brain. Anterior to the opening there is a pocket known as the olfactory lobe. The brains of cyclostomes and teleosts represent a low stage of development in that they possess an unpaired prosencephalon whose dorsal wall, the cortex cerebri, consists of a single layer of cells covered by the pia mater. In the larva of cyclostomes (*Ammocetes*) the metencephalon is the largest part of the brain. Selachians possess a more complicated brain. They lead an active, predatory life, and correspondingly the prosencephalon is relatively large and shows a slight furrow or division into two lateral parts or lobes. A prominent pair of bulbi olfactorii pass from in front to the nose. The thalamencephalon gives rise to two small optic thalami, and there are other modifications in the rest of the brain which render it a more complex organ. There is a bundle of fibres from each side of the prosencephalon that probably corresponds to the crus cerebri of mammals. The brains of ganoids and dipnoans resemble those of amphibians in the absence of the lobi inferiores. In all three the cerebral hemispheres show a marked development. The cerebellum exists only as a small fold at the anterior end of the medulla. In the Anura the optic lobes are well developed.

In Reptilia, as in Amphibia, the cerebellum is small. A well-developed median eyelike structure, the pineal eye, is present on the root of the midbrain. The prosencephalon is the largest part of the brain. It is paired, and its surface is smooth. There is a large olfactory lobe and a well-developed corpus striatum. The avian brain is characterized by a considerable cranial flexure, by large cerebral lobes, by a cerebellum. In sagittal section the latter shows the arbor-vitæ structure so evident in the brain of man. Externally the brain is folded transversely or convoluted. The mammalian brain exhibits in the different groups a steady growth in complexity from the reptilian to the human condition. The cranial flexure is most pronounced in the mammalian brain.

That the degree of development of the different organs within the group of mammals is dependent upon their functional activity can hardly be doubted. Thus, the pyramids are the motor nerves coming from the coördinating centres of movement. These are relatively small in the dolphins, which possess no hinder extremities. The frontal lobe of the cerebrum, upon which probably many of the higher functions, such as speech, depend, are best developed in man; so, too, the olfactory lobes are reduced in man in correspondence with the rudimentary condition of their function in man. While the midbrain is more or less exposed in some of the lower mammals (e.g., marsupials, rodents, and insectivores), the hemispheres come gradually to cover the entire brain. The mammalian brain is characterized by the presence of large commissures, the corpus callosum and fornix, which connect the hemispheres. The pons Varolii is another large commissure and connects the two lateral lobes of the cerebellum, and a number of other bands serve as connectives. In mammals the midbrain is relatively smaller than in other vertebrates. The brain of Tertiary mammals was relatively small. The reduction was especially evident in the hemispheres. In many points of

structure their brain, too, was reptilian in character, although the possessors were related to groups as high as ungulates.

Three main and well-defined types of nervous system may be determined in the animal kingdom. There is first the radial type, such as has been described for the starfish. This consists of a ring of nervous tissue in the disk which surrounds the œsophagus and sends out a branch to each arm. This is the echinoderm type. Another type is the symmetrical, bilateral type of annelids and arthropods, to which the nervous system of mollusks may also be relegated. This type consists of a brain ganglion above the œsophagus, with commissures that pass around and below the digestive tract, where they unite ventrally with a chain of ganglia extending posteriorly. The pedal ganglion of mollusks represents the subœsophageal ganglion. The rest of the ventral chain is absent in unsegmented mollusks. The third type of nervous system is the bilateral type of vertebrates. Here the double nerve cord, segmental in origin, as is shown by the repetition of paired spinal nerves, lies on the dorsal side of the alimentary tract. Except in *Amphioxus* the vertebrate nerve cord widens anteriorly into a large and complex ganglion mass, the brain. The sympathetic system, which appears first in leeches and arthropods, is an almost independent nervous system, for while it is in direct union with the other nervous system, it is not at all under its control.

Sense Organs. As soon as sense organs appear the nervous elements of animals consist of three parts: (1) the so-called terminal, end, or sense organ, (2) the ganglia, and (3) the nerves. End organs appear first clearly defined in the Cœlenterata, although the pigment spots of *Euglena* are in a particularly sensitive region in that infusorian. The sense organs of the Cœlenterates are most developed in the medusæ and consist of the tentaculocysts with calcareous lithites, pigment spots or ocelli, and sensory pits known as olfactory pits. Pigment cells or eyespots are found in many of the flatworms, some of the polyclads possessing several hundred. These eyes, in many forms, are grouped in pairs at the anterior end of the body or are scattered along the anterior margin or even along the entire margin of the body. In many forms the eyes are simple pigment spots. In others a refractive body occurs. In triclads and polyclads the eye consists of a pigmented apparatus with retinal or light-perceiving cells within a cup-shaped organ. These cells connect with the optic nerve. Auditory organs also occur in the flatworms, each consisting of a fluid-filled sphere lying close to the brain in which is an otolith. The skin is everywhere very sensitive, owing to tactile hairs, especially on the tentacles. The proboscis of certain forms contains an invagination which is capable of extrusion and is believed to be a touching organ. The suckers of trematodes, too, are especially sensitive. There are ciliated pits in the epithelium of triclads and other forms to which an olfactory function has been ascribed.

Sense organs occur over the whole integument of mollusks. These cells, when in exposed positions, may have a tactile function. The pallial sensory organs and the ospharadium, which occur near the gills, are probably olfactory organs to test the condition of the water. The optic tentacles of pulmonates and the dorsal tentacles of opisthobranchs are stated by some authorities to be olfactory organs. Ciliated ridges in the mantle furrows of certain chitons are supposed to have an olfactory function. Auditory organs are absent in the Amphineura alone among mollusks. The auditory organ consists of a closed, fluid-filled vesicle, or otocyst, in which a varying number of otoliths are inclosed. Sensory cells occur on the wall of the otocyst, which bear sensory hairs. The otocysts of cephalopods have been shown to have a statical function also. The simplest visual organs of mollusks are optic pits. The retina lies at the base of the pit, and along this base the optic nerve spreads out. The retina consists of cells with and without pigment. External to the retina is a gelatinous cuticle or even a lens. By the approach and fusion of the edges of the pit the vesicular eye is formed. That part of the epithelium which is free from pigment constitutes the cornea. This type of eye occurs on the tentacles of gastropods. By a further development the simple cuplike eye is differentiated into the complex, highly developed organ of cephalopods. The mantle eyes of the scallop resemble vertebrate eyes in that the visual rods are turned away from the light, that is to say, they are directed towards the body.

The sense organs of echinoderms comprise the auditory organs and eyes. The auditory organs are of two types. The first type is represented in holothurians and consists of an otocyst which is lined with ciliated epithelium, container and otolith, and filled with fluid. In echinoids is found the second type of auditory or orienting organs, which are believed to be transformed spines. Organs of this type are known as sphæridia and are developed only on the oral side; they are spherical, stalked bodies and may be inclosed in a pit of the test. The organs of special sense in the annelids are the eyes, tentacles, cirri, and otocysts. The structure of the eye, when that organ is present, is very simple. The eyes are confined to the prostomium, but there are eyelike organs on many or all the body segments or on the branchial filaments of many species. Eyes are lacking in nearly all Oligochæta and some of the Polychæta. The eye is usually a capsule with a layer of elongated cells on the side towards the brain. A thickening of the cuticle may form a lens. Otocysts with otoliths are not common. Tactile cells occur generally all over the body and especially on the prostomium.

The organs of special sense in arthropods are eyes, olfactory setæ, auditory organs, and organs of touch. The eyes are of two sorts, median eyes and a pair of faceted, compound eyes. The median or nauplius eyes sometimes occur in the larvæ only and are composed of a cuticular lens and a group of specially modified epidermal cells. The paired, compound eyes are covered by a transparent cuticle. A single visual element of the compound eye is called an ommatidium. Each element is composed of two parts, an outer vitreous and an inner sensory group of cells. The latter is known as the rhabdome and is made up of the retinule and a refracting rod. Each ommatidium is in a state of optical isolation. Fibres pass from the optic ganglia to the retinule. The organs of touch are bristled cells on the appendages, especially on the antennæ, the palpi, and on other parts of the body. The olfactory organs of the crayfish consist of a number of delicate setæ borne on the antennules. The auditory organ is a pit upon the exterior and is lined with auditory setæ. Grains of sand

military life and devoted himself while in garrison in the fortress of Bard to the study of economics and English politics. In 1831 he resigned his commission and undertook the management of his father's estate at Leri, in Piedmont. Without any previous knowledge of farming, Cavour soon mastered agriculture in all its details, restored the estate, which had been much neglected, and became a leader in the introduction of progressive methods of agriculture into Piedmont. He ever afterward loved the work and found at Leri throughout his life rest from the cares of state. In this occupation and in travel Cavour spent 15 busy and profitable years. The democratic monarchy of England was always his ideal, and he was a great admirer of Anglo-Saxon liberty. In England he made a thorough study of the political, social, and industrial institutions. In 1847, when the censorship of the press had been abolished in Piedmont, Cavour, realizing the power that this agency might have in the great struggle for which Italy was preparing, established in Turin, with Cesare Balbo and others, a journal, *Il Risorgimento*, which declared for independence, unity, and reform. A moderate Conservative in his views, a stanch supporter of the monarchy, but a constitutionalist, he satisfied the extremists of neither party and was far from being a popular leader; but his ability, independence, and courage commanded respect. His greatness was in nothing more marked than in the impersonality of his work. In 1848, when Genoa was about to send a deputation to Turin to ask for a civic guard and the expulsion of the Jesuits, Cavour, at a meeting of journalists held to decide on a course of action, declared that the demands of the Genoese were too moderate, and that a constitution was the only remedy for existing evils. This was, for the times, a revolutionary declaration, and especially startling as coming from a Conservative. Cavour had, indeed, been regarded as almost a reactionary, so little was his moderation understood in the passionate politics of the time. Events justified Cavour; in February Charles Albert (q.v.) set his signature to the famous *Statuto*, the constitution of Piedmont around which, under Cavour's leadership, all the advocates of Italian liberty and unity gradually rallied. He entered Parliament in 1848, a pronounced advocate of a free and united Italy. This platform was sufficient for him during his whole career. He never separated the two ideals, and he decided at the outset that they could be attained only under the royal house of Savoy. He never sympathized with Mazzini and the Republicans, whose theories he believed ill adapted to Italian conditions. On March 7, 1850, Cavour, speaking on the proposition to abolish the special jurisdiction of the ecclesiastical courts, declared that by persevering in her reform policy Piedmont would be "gathering to herself all the living forces in Italy and would be in a position to lead the mother country to those high destinies whereunto she is called." This expression of an aggressive national Italian policy brought Cavour into still greater prominence, and upon the death of the Count of Santa Rosa he was called into the cabinet, then headed by Massimo d'Azeglio (q.v.), at first as Minister of Agriculture, then as Minister of Commerce and of the Marine. He now gave up his journalistic connections and entered upon his great career as a state builder. He also disposed of all his holdings in agricultural and industrial companies. In April, 1851, he was made Minister of Finance, and in the same year, having already become the dominating force in the ministry, he made the famous alliance with Urbano Rattazzi (q.v.), leader of the Left Centre, by which the two parties of the Centre united in support of the ministry, in opposition to the Extreme Right and the Extreme Left. It was through this union of moderate parties that Cavour proposed to foster the new Italy. He was never a party man and looked only to the good of the state. The compact with Rattazzi, known as the *connubio*, was discountenanced by D'Azeglio and led to a rupture in the cabinet (April 15, 1852). Cavour retired temporarily from office and went to France and England, to find out how the *connubio* was regarded among those whose aid he hoped to obtain in realizing Italian aspirations. He was reassured by his reception in both countries; but he made up his mind that, of the two, it was France that must be looked to for active support in establishing the new Italy as against Austria. He therefore devoted his energy to winning the man who was then directing the destinies of France—the new Emperor Napoleon. A ministerial crisis occurred on his return to Piedmont, and Cavour became the head of the government, holding the posts of Minister of Finance and President of the Council. He gave his immediate attention to the material development of the kingdom, the rehabilitation of its finances, and to various reforms, such as the legalization of civil marriage, the suppression of the mendicant orders, and the encouragement of secular education. In 1854 he saw, in an alliance with France and England against Russia, an opportunity to bring Sardinia into the councils of Europe. He brought about the alliance, in spite of the opposition of every one in the country excepting the King and the ministers. Ten thousand troops of the reorganized Sardinian army were dispatched to the Crimea. It was a dangerous game and might have failed but for the fatuous policy of Austria, upon which Cavour had counted. The Sardinian contingent won the respect of their allies, Austria's weak course destroyed her primacy in continental affairs, and at the Congress of Paris (see PARIS, CONGRESS OF), in 1856, Cavour accomplished his great object in compelling the representatives of the Powers to admit Sardinia to their councils and to take up the condition of Italy for international consideration. At the congress Cavour stood for the aspirations of Italy, and while he gained nothing directly for Sardinia, he secured recognition as an Italian leader, which he desired more. It was Italy, rather than Sardinia or Piedmont, of which he always spoke and thought. While these events were passing he was also engaged in a struggle with the Church over the disestablishment of the religious orders.

The Congress of Paris left the issue between Austria and Sardinia very sharply defined and made war almost inevitable. Cavour's energies were devoted to preparing for the struggle. He increased taxation, but developed the resources of the country to meet the new burdens. In 1858 he severed political relations with Rattazzi, who supported the King in the affair of the Countess Mirafiori. (See VICTOR EMMANUEL I.) After the unsuccessful attempt of the Italian fanatic Orsini upon the life of Napoleon III, the secret meeting at Plombières was held

between the French Emperor and Cavour (July, 1858), at which the agreement was made which was to bring France to the side of Italy in the contest with Austria. Cavour's masterful diplomacy is well illustrated in connection with the Austrian War. To the Englishman, Mr. Odo Russell, who did not believe Austria would be so unwise as to declare war, Cavour said, in the spring of 1859, that he would force her to do so, and named the first week in May as the time. A few days before that time Austria had actually committed the desired indiscretion. The royal speech to Parliament, Jan. 10, 1859, prepared by the King, but revised by Cavour and Napoleon III, voiced the spirit of united Italy against the foreign oppressor. Napoleon hesitated on the verge of war and sought to have a congress held, and England proposed that all the Italian States should be admitted; but Austria lost its chance of retaining its hold on Italy by refusing to accede to the English proposal, and demanding the unconditional disarmament of Sardinia. Austria's offensive ultimatum to Sardinia left no alternative for Napoleon but to support his ally. In the campaign of 1859 (see ITALY) the War Minister, La Marmora (q.v.), took command of the Sardinian forces, and Cavour assumed the onerous duties of Minister of War. When Napoleon, who had declared that Italy should be free "from the Alps to the Adriatic," made with Austria the Peace of Villafranca without consulting his ally, and thus abandoned the Italian cause at a time when the expulsion of Austria from the peninsula seemed certain, Cavour was frantic with rage and grief. He resigned his office and went into retirement at Leri, feeling that this betrayal of Italy had disgraced him; but in reality he had become the idol of an Italy which now learned to know the depth of his patriotism and the farsightedness of his policy. The new ministry under Rattazzi proved unequal to the situation; in England, the return of the Whigs to power under Lord Palmerston enlisted that country more actively in the Italian interest; and in January, 1860, Cavour returned to his post at the head of the government. The cession of Savoy and Nice to France, in return for the union of northern Italy, had been agreed upon at Plombières, and Cavour now took his stand upon the execution of the pledge. It was one of the hardest tasks of his life, and the act for which he has been most criticized.

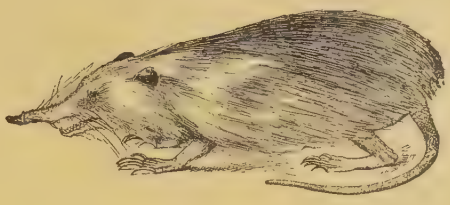
The next move in the campaign for the union of Italy came from southern Italy, in the form of an insurrection in Sicily against the Bourbon government. This, and Garibaldi's violation of international comity in conducting an expedition in aid of the Sicilian revolutionists, were not planned or promoted by Cavour; but when they had become facts he characteristically winked at their irregularity and prepared to check excesses and to make the most of any opportunity they might offer. When Garibaldi crossed the Straits of Messina and entered the Neapolitan mainland, Cavour sent a Sardinian army into Umbria and the Marches, and another great step towards Italian unity was taken in the contest for southern Italy and the papal domains. Garibaldi's arbitrary methods made him Cavour's antagonist at this time, though the two men always respected and appreciated each other. (See GARIBALDI.) On Oct. 11, 1860, true to his lifelong principles, Cavour secured the passage of a bill by the Piedmontese Parliament authorizing the government to incorporate such provinces in central and southern Italy as should express their desire therefor by a plébiscite. At the beginning of 1861 all Italy, except Venetia and Rome, was united, and on February 18 the first Italian Parliament met in Turin. Cavour now sought to complete the historic Italy by having Rome made the capital, and in May a vote of Parliament to that effect was passed; but Cavour did not live to see this consummation brought about, nor to see the annexation of Venetia. He died in Turin, June 6, 1861, worn out by the excessive labors and cares of his public life.

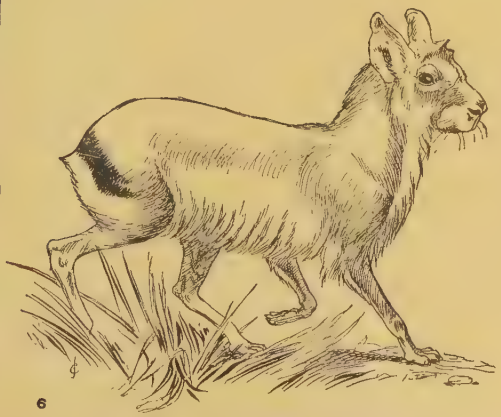
Count Cavour never married. The one brief romance of his youth brought color and inspiration into his life through a woman's devoted and unselfish love, but not even her name is known, and the attachment was far greater on her part than on his. He was beloved by the peasants on his estates and trusted by the common people generally. His King, whom he served so faithfully, never felt quite comfortable when his masterful subject was in power, but he had implicit confidence in him and believed in his success; and it was so with all his associates—his power lay in the assurance of success. He was admired by European statesmen. Napoleon said at Plombières: "There are only three men in Europe—we two and then a third whom I will not name." And the veteran Metternich is reported to have remarked: "There is only one diplomatist in Europe; but unfortunately he is against us—it is M. de Cavour." With all his determination, and his frequent disregard of the nature of the means used to attain his ends, Cavour held firmly to the principles of civil liberty and constitutional government. He was equally distrustful of the doctrinaire republicanism of Mazzini, whom he never liked, and of autocracy in any guise. It is a fine testimonial to his patriotism that he enjoyed the confidence of the exiled Venetian patriot and devoted republican, Manin, in spite of his distrust of Manin's political doctrines. From their first meeting in Paris Manin saw in Cavour the regenerator of Italy. Cavour's writings and speeches on political subjects have been published as *Opere politico-economiche del conte Camillo di Cavour* (Coneo, 1855), and *Discorsi parlementari del conte Camillo di Cavour*, published by order of the Chamber of Deputies (Turin, 1863–80).

Consult: Thayer, *The Life and Times of Cavour* (Cambridge, 1911); Mazade, *Le comte de Cavour* (Paris, 1877); Massari, *Il conte di Cavour* (Turin, 1873); Countess Cesaresco, *Cavour* (New York, 1898); Tivaroni, *Storia critica del risorgimento d'Italia* (Turin, 1888–97); Artom and Blanc, *Il conte di Cavour in parlamento* (Florence, 1868); Cadogan, *Makers of Modern History* (New York, 1905); Orsini, *Cavour and the Making of Modern Italy, 1810–61* (New York, 1914); also the memoirs and correspondence of Kossuth, D'Azeglio, Ricasoli, La Farina, and others. A full bibliography will be found in Stillman, *The Union of Italy* (Cambridge, 1898).

CAVY, kā'vĭ (Neo-Lat., Port. *cavia*, from native Indian word). A small South American rodent of the family Caviidæ, allied to the capybara and the agoutis, exclusively neotropical, and represented familiarly by the guinea pig. The cavies are restless, seminocturnal, herbage-eating creatures, dwelling in burrows or crevices, increasing rapidly, and furnishing

CAVIES, ETC.





1. JAMAICAN SHORT-TAILED HUTIA (Capromys brachyurus).
2. SOLENODON (Solenodon cubanas).
3. CHINCHILLA (Chinchilla lanigera).
4. CARPINCHO or CAPYBARA (Hydrochœrus capybara).
5. VIZCACHA (Lagostomus trichodactylus).
6. PATAGONIAN CAVY (Dolichotis patachonica).
7. AGOUTI (Dasyprocta aguti).

food for both man and beast throughout the plains and unforested highlands of that continent. The largest species (*Cavia patchonica*), sometimes called "agouti," formerly spread throughout the plains of all Argentina, but now nearly extinct, resembles a hare standing upon terrier-like legs; it is a foot in height, and rusty red in general color. It digs deep burrows of its own and also occupies those of the viscacha. The restless cavy (*Cavia porcellus*), or "aperea," and Cutler's cavy (*Cavia cutleri*) are common in burrowing colonies in the La Plata valley and seem to be the ancestors of the guinea pig, though uniformly colored—the former grayish brown, the latter nearly black. Other species inhabit rocky places to a considerable altitude in Brazil and Bolivia. Consult Hudson, *Naturalist in La Plata* (London, 1892). See GUINEA PIG, and Plate of CAVIES, ETC.

CAWDOR, ką'dẽr. A parish in county Nairn, Scotland, 10 miles east by north of Inverness, noted as the site of Cawdor Castle, in which Shakespeare places the murder of Duncan by Macbeth. Pop., 1901, 925; 1911, 847. During the rebellion of 1745 Lord Lovat was, according to tradition, for a time concealed in this castle. It is in an excellent state of preservation and presents a fine specimen of a true baronial stronghold of feudal times.

CAWDOR, THANE OF. A character in Shakespeare's *Macbeth*, who does not appear on the stage, but whose title is coveted by Macbeth and secured by his causing him to be executed for treason. The description of the character, especially as to his bearing at the hour of death, has led Shakespearean editors to find here a reference on the part of the author to the unfortunate Earl of Essex.

CAWEIN, kā-wīn', MADISON JULIUS (1865–1914). A prolific American poet, born and educated in Louisville, Ky. He is the author of, among other books, *Blooms of the Berry* (1887); *The Triumph of Music* (1888); *Lyrics and Idyls* (1890); *Moods and Memories* (1892); *Poems of Nature and Love* (1893); *The Garden of Dreams* (1896); *Shapes and Shadows* (1898); *One Day and Another* (1901); *Kentucky Poems* (1902); *Complete Poetical Works* (5 vols., 1907); *New Poems* (1909); *The Shadow Garden*, etc. (plays, 1910); *Poems* (1911); *The Republic* (1913). A selection of his poems has been made by him, with a brief introduction by W. D. Howells.

CAWNPORE, kąn-pōr', or **CAWNPUR,** kąn-pōōr', or **KANPUR** (Hind. *Kanhpur*, city of Krishna, from *kanh*, Skt. *krsna, krishna*, black + *pur*, Skt. *pura*, city). A city, capital of a district of the same name in the Allahabad division of the United Provinces, British India, on the right bank of the Ganges, 140 miles above Allahabad (Map: India, D 3). Cawnpore's modern importance is due to its commercial facilities and partly to military and political considerations. Since 1888 it has been brought into direct communication with Bombay, through the opening of the railway to Jhansi, and, at the junction of four lines, it is one of the chief railway stations in India. It has an extensive trade in grain and agricultural produce, and important manufactures of home commodities, such as cotton, leather, harness, woodenware, sugar, jute, iron products, chemicals, and cabinetwork. The town contains mission churches, schools, zenanas, a club, and good hotels. It owns municipal water works. It has belonged to the English since 1801. The name of Cawnpore is associated with the events of the Sepoy Mutiny, one of the most terrible episodes of which was enacted here in July, 1857, the massacre of the European women and children by Nana Sahib. A prominent feature of Cawnpore is the memorial garden, covering the scene of the massacre. Marochetti's angel in white marble, under the Gothic monument over the well in which the dead and dying were cast, is a superb piece of sculpture. Though Cawnpore is only 379 feet above the sea, yet during winter considerable quantities of ice are made for preservation, by exposing water in shallow vessels at night. Pop., 1891, 163,800; 1901, 202,797; 1911, 175,557. Area of district, 12,384 square miles. Pop., 1891, 1,209,695; 1901, 1,258,868; 1911, 1,142,286. Consult Trevelyan, *Cawnpore* (London, 1865).

CAXAMARCA, kä'hä-mär'kâ. See CAJAMARCA.

CAXIAS, kä'shē-äsh'. A town in Brazil, situated in the State of Maranhão (Map: Brazil, J 5), on the river Itapicurú, about 200 miles southeast of Maranhão. It has a large trade in cattle, rice, and cotton, the river being navigable. It is the birthplace of the poet Luis Gonçalvez Dias. Pop., about 10,000.

CAXIAS, LUIZ ALVES DE LIMA E SILVA, DUKE OF (1803–80). A Brazilian general and statesman. He was born in Rio de Janeiro and entered the army at the age of 12. After a brilliant military experience, he was in 1850 appointed Minister of War and President of the Council, and afterward, as commander in chief of the Brazilian army, he conducted the war against Argentina, 1851–52. In this war he earned his title as Marquis. In 1867–69 he stood in the forefront of the war against Paraguay and captured its capital, Asunción. The state of his health after this laborious undertaking was such that he had to retire at once to Montevideo. The Emperor Dom Pedro I, as a reward for his services as Minister and general, created him Duke (the only title of this nature that was ever conferred upon a Brazilian) and presented him with the Grand Cross of the Order of Pedro I. From 1875 to 1878 he was again President of the Council and Minister of War.

CAXIAS, MARQUES AND DUKE OF. See LIMA E SILVA, LUIZ ALVES DE.

CAX'TON, WILLIAM (c.1422–91). The first English printer. He was born in the Weald of Kent, and the particulars of his life are scanty. He was apprenticed in 1438 to Robert Large, a wealthy London mercer. At the death of the latter, in 1441, he went to Bruges, where from 1462 to 1470 he was governor of a chartered association of English adventurers trading in foreign lands. In 1471 Caxton entered the service of Margaret, Duchess of Burgundy, formerly an English princess; and, apparently towards the end of 1476, he set up his wooden printing press at the Sign of the Red Pale, in the Almonry, at Westminster. The art of printing he had acquired while abroad, either at Cologne or at Bruges, more likely at the latter place, from Colard Mansion, a well-known printer of that city; and in 1474 he put through the press (without much doubt Mansion's) the first book printed in English, the *Recuyell of the Historyes of Troye*, a translation of Raoul de Fèvre's work. The *Game and Playe of the Chesse* (probably 1475) was another of Caxton's earliest publications; but the *Dictes and No-*

table Wise Sayings of the Philosophers (published Nov. 18, 1477) is the first book which can with certainty be maintained to have been printed in England. All the six fonts of type from which Caxton printed may be called black letter. Of the 99 known distinct productions of Caxton's press, no fewer than 38 survive in single copies or in fragments only. Caxton, who was an accomplished linguist and translated many of the works that issued from his press, was diligent in the exercise of his craft or in translation until within a few hours of his death, which occurred in 1491. By his numerous translations he helped fix the English speech and his many books prepared the way for the literary efflorescence of the Elizabethan era. In 1877 the great printer and his work were fittingly commemorated by a typographical exhibition in London. Consult: Knight, *The Old Printer and Modern Press* (London, 1861); Blades, *Life and Typography of William Caxton* (London, 1861–63), *A Catalogue of Books Printed by or Ascribed to . . . William Caxton* (London, 1865); *Biography and Typography of Caxton* (London, 1882). See, too, in *Cambridge History of English Literature* (Cambridge and New York, 1907–13), two excellent studies in vol. ii: Duff, "Introduction of Printing into England and the Early Work of the Press"; and Greenwood, "English Prose in the Fifteenth Century." The publications of the Caxton Club may be consulted to advantage.

CAXTON MEMORIAL BIBLE. See BIBLE, CURIOUS EDITIONS OF.

CAXTONS, THE. A novel by Bulwer Lytton, published in 1850 (3 vols. octavo). It was originally published in *Blackwood's Magazine*. The scene is chiefly laid in the midst of English country life, and the interest consists largely in the conversations which are held between the members of the Caxton family. Pisistratus Caxton, the *ego* of the story, also appears in *My Novel* and other later works of the author.

CAXTON SOCIETY. An association formed in London, in 1845, for the purpose of publishing mediæval chronicles and other works. Of these it issued 16 vols. before its dissolution in 1854.

CAYAMBÉ, kä'yäm-bā', or **CAYAMBÉ-URCU,** -o͝or'ko͞o. A volcanic peak of the Andes, in Ecuador, about 60 miles east-northeast of Quito and almost directly under the equator (Map: Ecuador, B 3). It has an altitude of about 19,200 feet and is covered with perpetual snow.

CAYAPAS, kä'ya-päs. A tribe of the Barbacoan stock, residing on the coast, near Tola, in Ecuador. Von Buchwald has sought to identify them with the ancient Caras (q.v.). Consult Barrett, "The Cayapo Numeral System" in *Putnam Anniv. Vol.*, pp. 395–404 (New York, 1909), and Beuchat and Rivet, *Affinitiés des langues du sud de la Colombie et du nord de l'Equateur* (Louvain, 1910).

CAYAPÓS, kä'yä-pōs. A tribe of Tapuyan stock, situated north of the Rio Pardo. See TAPUYAN.

CAYCOS, kī'kōs. See CAICOS.

CAYENNE, kā-ĕn' *or* kī-ĕn'. The capital of French Guiana (Map: Guiana, G 3). It is situated on an island of the same name in the Atlantic, in lat. 4° 56′ N. and long. 52° 20′ W. It has a well-protected though shallow harbor, several fine churches, two hospitals, a bank, and an ecclesiastical college. Cayenne is the only outlet for the products of French Guiana and has direct steamer communication with France. The climate is moist, but not very unhealthful. There are about 13,000 inhabitants. Cayenne was founded in 1604 and became a French possession in 1675. It was formerly used as a penal settlement.

CAYENNE PEPPER. See CAPSICUM.

CAYES, kā. See AUX CAYES.

CAYEY, kī-ā'. A town of Porto Rico in the municipality of the same name, 37 miles south of San Juan (Map: Porto Rico, E 3). Situated at an altitude of 2300 feet, its cool climate and sanitary conditions make it a popular local summer resort. There are schools, a church, a hospital, and old Spanish barracks. The chief industry is the manufacture of excellent cigars. The tobacco raised in the surrounding country is of the best cultivated on the island. Pop., 1899, 3763; 1910, 4498.

CAYLEY, kā'lĭ, ARTHUR (1821–95). An English mathematician. He was born at Richmond, Surrey, and was educated at King's College, London, and at Trinity College, Cambridge. In early life he devoted much time to the study and practice of law, being admitted to the bar in 1849, and some of his most brilliant mathematical discoveries were made during this period. Finally, in 1863, he left the legal profession to accept the Sadlerian professorship of mathematics at Cambridge. Cayley's most important contribution to mathematics is the theory of invariants. (See FORMS.) He also discovered an interesting higher curve, known as the Cayleyan, and the principal proposition of matrices, known as Cayley's Theorem. Many of his numerous memoirs were published in the Cambridge *Mathematical Journal*. His collected mathematical papers have been published in book form (13 vols. and supplement, Cambridge, 1889–98).

CAYLUS, kā'lŭs', ANNE CLAUDE PHILIPPE DE TUBIÈRES, COUNT DE (1692–1765). A French archæologist. He entered the army, served in the Spanish War of Succession, and after 1714 traveled in Italy, Greece, England, Germany, and the East, making collections of antiquities on which he published several learned works in French and Latin, the most important being the *Recueil d'antiquités egyptiennes, étrusques, grecques, romaines, et gauloises* (7 vols., Paris, 1752–67). He was a patron of art, and especially of engraving, which he himself practiced. In this field he wrote *Nouveaux sujets de peinture et de sculpture* (1755) and *Tableaux tirés de l'Iliade, de l'Odyssée et de l'Enéide* (1757). He claimed to have rediscovered the method of encaustic painting on wax mentioned by Pliny. He also wrote fiction, which has the kindly humor and attractive simplicity that characterized his own personality. His stories of Parisian life were collected together under the title *Œuvres badines complètes* (Amsterdam, 1787). Some of his stories were translated into English under the title "Oriental Tales" in Gueulette's *Chinese Tales* (1817). Consult: Rocheblave, *Essai sur le comte de Caylus* (Paris, 1889); Nisard's ed. of the *Correspondance du comte de Caylus avec le père Paciaudi* (1877); "Notice" of Uzanne in his *Facéties* (1879); and the preface of Jamet to the *Nocrion: conte allobroge d'après l'édition originale de 1747*, attributed to Caylus (Brussels, 1881).

CAYLUS, MARIE MARGUERITE LE VALOIS DE VILLETTE DE MURCAY, MARQUISE DE (1673–1729). A French court lady and author, mother of the

preceding. She was a descendant of the Protestant family of D'Aubigné, but was converted by her aunt, Madame Maintenon, to the Roman Catholic faith. She was one of the leaders of court society. Racine so admired her abilities that he wrote the prologue to his tragedy of *Esther* as a compliment to her. Her *Souvenirs*, full of interesting anecdotes of the court of Louis XIV, were edited by Voltaire (1770), and often since—notably by Raunié (1881).

CAYMAN, kā′man, or **CAIMAN** (Sp. *caiman*, from the Caribbean name). A native name applied loosely to various alligators, especially the South American, also called jacarés (q.v.). Most systematists now put *Alligator palpebrosus* and *Alligator trigonatus* into the genus *Cayman*, on account of the three thick bony plates which make their eye orbits stand out prominently, so that the former is called the eyebrowed cayman. Their habits are substantially the same as those of the common alligator (q.v.).

CAYMANS, kī-mānz′. A group of three low islets in the British West Indies 150 miles northwest of Jamaica, of which they are an administrative dependency governed by a commissioner (Map: Cuba, D 7). It consists of Grand Cayman (17 miles long and 4 to 7 miles broad), Little Cayman, and Cayman Brac, with a total area of 225 square miles. The chief town is Boddentown. The pasturage is good and the chief exports are coconuts, turtles, mahogany logs, and dyewood. Pop., 1901, 5287; 1911, 5564.

CAYUBABA, kā′yo͞o-bā′bȧ. A tribe constituting a distinct linguistic stock, now gathered into the mission of Exaltación, on Mamoré River, Bolivia. They are of good physique and are fine boatmen. In spite of Christianity, they have retained some of their strange primitive customs. A man does no work during his wife's menstrual period, neither will a widower undertake any important enterprise until he remarries. Consult Chamberlain in *Journal de la Société des Américanistes de Paris*, N. S., vol. vii, p. 182 (1910).

CAYUGA, kȧ-yo͞o′gȧ (N. Amer. Indian *Gwé-u-qweh-o-nó*, people of the mucky land). The smallest of the five tribes of the original Iroquois Confederacy. They formerly dwelt on Cayuga Lake, New York, but on the outbreak of the Revolution most of them, together with the Mohawks, joined the British side and removed to Canada, whence they never returned. They may number perhaps 1000 souls, of whom about 170 are living with the Senecas in New York, a few are with the Senecas in Indian Territory and the Oneidas in Wisconsin, while the main body is on the Six Nations Reserve on Grand River, Ontario. The name seems to refer to a cranberry swamp.

CAYUGA DUCK. See Duck.

CAYUGA LAKE. A beautiful sheet of water in west central New York (Map: New York, D 3). It is 38 miles long, from 1 to 3½ miles wide, and enters Tompkins County, but lies between portions of Tompkins and Cayuga counties on the east and Seneca County on the west. It is 381 feet above tidewater, and 140 feet higher than Lake Ontario, into which it empties through the Seneca and Oswego rivers. At the north end the lake is shallow, but in other places reaches a depth of 400 feet. It is navigable for 30 miles. Along its clifflike banks are several thriving towns. Ithaca, near the south end of the lake, Aurora, near the middle of the east shore, and Cayuga, near the north end, are the chief cities. The lake is much frequented by tourists and pleasure seekers.

CAYUSE, kī-ūs′. A warlike tribe formerly occupying the Blue Mountain region, adjoining the Columbia River, in northwestern Oregon, and now gathered upon the Umatilla Reservation in the same country. In 1847 the smallpox, before unknown among them, carried off a large portion of the tribe, and, believing that it had been introduced by the missionaries, they attacked and destroyed Waiilatpu Mission, which had been established among them a few years before. They are now officially reported to number 298, most of them intermarried with other tribes, and only some half dozen individuals speak their own old language, which belongs to the Waiilatpuan stock. They acquired the horse at an early day, probably through Mexico and California, and were instrumental in its distribution among other tribes, whence the application of their name to the Indian pony of the northwest United States.

CAYVAN′, Georgia (1858–1906). An American actress, born at Bath, Me. She was educated in Boston and was for a time a professional reader. As an actress she first appeared as Hebe in *Pinafore* at the Boston Theatre, 1879. In 1880 she began playing the part of Dolly Dutton in *Hazel Kirke* at the Madison Square Theatre, New York. The next year, at the Globe Theatre, Boston, she made a considerable sensation as Iocasta in *Œdipus Tyrannus* with George Riddle. In 1882 she was Lisa in the melodrama *The White Slave*, at the Fourteenth Street Theatre, New York, and Luxa in *The Romany Rye*, at Booth's Theatre. From 1887 to 1894 she was leading lady of the Lyceum Theatre stock company, winning successes in *The Wife*, *The Charity Ball*, *Squire Kate*, and numerous other plays. An illness obliged her to leave the stage in 1894, and though in the season of 1896–97 she returned and starred for a time, the failure of her health compelled her final retirement. Consult Clapp and Edgett, *Players of the Present* (Dunlap Society, New York, 1899), and Edmunds, in *Famous American Actors of To-Day*, edited by McKay and Wingate (New York, 1896).

CAZAL, Manuel A. See Casal, Manuel A.

CAZALÈS, kȧ′zȧ′lĕs′, Edmond de (1804–76). A French political writer, son of Jacques Antoine Marie de Cazalès. He studied law and received a legal appointment, but soon gave his chief attention to political affairs, and was largely occupied with the question of the reconciliation of the Roman Catholic church with the principles of the Revolution. In 1843 he took holy orders and two years later became director of the ecclesiastical seminary of Nîmes and later of that at Montauban. He was active during the revolution of 1848 and in the events of 1871–72. During the first Republic he served in the Constituent Assembly. He contributed to the *Revue des Deux Mondes* and other periodicals, and published *Etudes historiques et critiques sur l'Allemagne contemporaine* (1853), and *Nos maux et leur remèdes* (1874).

CAZALÈS, Jacques Antoine Marie de (1758–1805). A French politician. He was captain of dragoons at the assembling of the States General, in which he was an eloquent defender of royal and clerical authority. In the Constituent Assembly he argued for a government intermediate between an absolute and constitutional

monarchy, and with Mirabeau tried to organize a conservative liberal party. He was among the first to formulate the principles of the legitimists. In August, 1790, he fought a duel with Barnave (q.v.). After the arrest of Louis XVI he left France, fled to Italy, and thence went to Spain and England. He returned to Paris in 1803. Consult Chare's introduction to his *Discours de Cazalès* (Paris, 1821), and Aulard, *Les Orateurs de la Constituante* (2d ed., 1905).

CAZALLA DE LA SIERRA, kȧ-thäl'yȧ dȧ lȧ syâr'rȧ. A mining town of Spain, in the Province of Seville, 53 miles by rail from Seville (Map: Spain, C 4). It is in a rich mineral region which yields silver, copper, iron, and sulphur and has also quarries of marble and jasper, as well as iron foundries and distilleries. Pop., 1900, 7782; 1910, 8044.

CAZEMBE, kȧ-zĕm'be, or **KAZEMBE.** A country in Central Africa, north of Lake Bangweolo, divided in 1894 between Great Britain and Belgian Congo (Map: Central Africa, E 4). The name is the hereditary title of an African chief, to whose territory it was applied. The British half is now included in Rhodesia, and Cazembe is its chief town. Livingstone visited the Cazembe in 1868. Copper mines are being exploited in the territory under Congo rule. Consult *The Lands of the Cazembe,* published by the Royal Geographical Society (1873).

CAZIN, kȧ'zăn', Jean Charles (1841–1901). A French landscape painter and designer of ceramics. He was born at Samer, Pas-de-Calais, and studied under Lecoq de Boisbaudran and Trélat. In 1868 he was appointed director of the Ecole des Beaux-Arts and conservator of the Museum at Tours. In 1871 he removed to England, devoting himself to designing ceramics for the Fulham pottery. These were of charming decorative effect, especially in their plant decorations. Returning to France, he exhibited for the first time in the Salon of 1876. His subjects are chiefly landscapes—moonlight, twilight, and dusk effects, invested with chastened melancholy and a tender charm. In such subjects he has few, if any, superiors in modern landscape painting. The figures introduced are subordinated to the landscape that environs them, forming with it a harmonious whole. Through such works as "Judith" (1883), "La terre" (Adam and Eve), "Tobit" (1878, Lille), and "Hagar and Ishmael" (1880, Luxembourg), Cazin became the exponent of the landscape of religious sentiment. In his later landscapes the figures are even more incidental. Excellent examples are "Souvenir de fête" (1881, Petit Palais, Paris), "The Journey's End" (1888, Lyons), and a series of river scenes like "The Marne" and "The Bathers." In 1898 he was commissioned to complete the decorations of Puvis de Chavannes in the Pantheon. He received numerous medals and distinctions and was an officer of the Legion of Honor. Besides the paintings above mentioned, the Luxembourg possesses two others and a select collection of his ceramics. He is also represented in the National Gallery, Berlin, the Metropolitan Museum, New York, and the Art Institute, Chicago. He was an ardent champion of encaustic painting, which, especially in his early works, like the "Flight into Egypt," he sought to revive. Consult his biography by Bénédite (Paris, 1901), and Marcel, *La Peinture française au XIXe siècle* (ib., 1905).

CAZORLA, kȧ-thōr'lȧ. A town of Andalusia, Spain, 40 miles east-northeast of Jaén. It is a place of considerable antiquity and figured in many incidents of considerable historic interest and importance in the Frontier Wars, the War of Independence, and the Carlist Wars. It is pleasantly situated on a declivity and watered by the Vega. It has two old castles—one an Arab structure. Manufactures of leather, earthenware, soap, and bricks, and a trade in agricultural produce are carried on. Pop., 1900, 7936; 1910, 8866.

CAZOT, kȧ'zō', Théodore Joseph Jules (1821–1912). A French politician and jurist, born at Alais (Gard). He was elected to the National Assembly in 1871 and in 1875 became a permanent member of the Senate. In 1879–82 he served as Minister of Justice, and in that capacity he was prominent in the execution of the decrees against the Jesuits and unauthorized congregations. He became president of the Court of Cassation in 1883, but resigned in the following year.

CAZOTTE, kȧ'zŏt', Jacques (1719–92). A French writer of humorous tales. He wrote a romance, *Ollivier* (1762), in prose and in verse; the tales, *Le lord impromptu* (1771) and *Le diable amoureux* (1771); coarse popular songs; and some philosophical works. He joined the fanatic Illuminati about 1775. He opposed the Revolution and was guillotined as a Royalist by the Revolutionary Tribunal. Consult De Nerval, *Illuminés* (Paris, 1852).

CEADDA, kĕäd'dȧ, or **CHAD,** Saint (?672). An English prelate, Bishop of York, and afterward of Lichfield. His boyhood was spent in Ireland in the monastery of Rathmelsige, now Melfont. In 664 he succeeded his brother Cedd in the office of Bishop of the East Saxons in the monastery of Lastingham. Subsequently he was called by Theodore to the South Humbrian diocese and spent his last years in the Mercian see, which he himself fixed. Bede, in the *Historia Ecclesiastica Gentis Anglorum,* gives many beautiful examples of this holy man's simplicity and "zealous love of pious toil."

CEAN-BERMUDEZ, thȧ-än' bĕr-mōō'dȧth, Juan Agustin (1749–1829). A Spanish art historian and painter. He was born at Gijón, Asturias, and studied in Seville under Juan Espinals and in Madrid with Mengs. He painted portraits and decorative compositions, but is best known for his valuable works on art: *Diccionario histórico de los mas ilustres profesores de las bellas artes en España* (1800); *Descripción artistica de Sevilla* (1804); *Diálogo sobre el arte de la pintura* (1819); *Noticias de los arquitectos y arquitectura de España* (1829).

CE'ANO'THUS (Neo-Lat., from Gk. κεάνωθος, *keanōthos,* thistle). A genus of American shrubs or small trees, belonging to the family Rhamnaceæ. There are about 40 species, most of which are found in the Pacific Coast States. Many are in cultivation as ornaments, but the most desirable species are only semihardy in the eastern and northern United States. New Jersey tea, or redroot (*Ceanothus americanus*), is a hardy shrub attaining a height of about 3 feet, with ovate, irregularly serrate, bright-green leaves and abundant white flowers in large panicles. The flowers are short-lived, but from their abundance are very ornamental. This species is found in dry woods from Canada to Texas. The leaves are said to have been used as a substitute for tea during the war of the American Revolution and are still so used by poor farmers of the Southern States. Some of the Pacific

species have pink or blue flowers which are very attractive.

CEARÁ, sā'ā-rä'. A state of Brazil, on the north coast, bounded by the states of Rio Grande do Norte and Parahyba on the east, Pernambuco on the south, and Piauhy and Maranhão on the west (Map: Brazil, K 4). It has an area of 40,250 square miles. The coast regions are sandy and unproductive; the centre is occupied by an elevated plateau, sparsely watered and fit only for pasture. In the mountainous regions the slopes are well adapted for coffee cultivation. The climate is hot and dry. The chief products are corn, rice, sugar, coffee, watermelons, and pineapples. Pop., 1890, 805,687; 1900, 849,127; 1908 (est.), 886,000. Capital, Fortaleza (q.v.). Consult Fontenelle, *The State of Ceará* (Chicago, 1893).

CEARÁ. See FORTALEZA.

CEARÁ MIRIM, sā'ā-rä' mê-rēN'. A town of Brazil, in the State of Rio Grande do Norte, on the Ceará Mirim River. It has sugar and cotton manufactures and is in a cattle-grazing district. Pop., 18,000.

CEB'ADIL'LA. See SABADILLA.

CEBALLOS, sā-bā'lyōs, JOSÉ (1831–93). A Mexican soldier. He was born in the city of Durango, defended the plaza of Nazatlán against the French, and was appointed brigadier general in 1870, in which capacity he commanded the First Division of the federal troops of Mexico in the campaign against the bandit Losada, who had placed himself at the head of a force of 10,000 Indians. Upon the installation of Lerdo de Tejada as President of Mexico, Ceballos had Camarena, the Governor of Jalisco, deposed after a long and sanguinary engagement between the federal and state troops. Ceballos remained as Governor of Jalisco until 1876, when Lerdo's government was superseded by that of Diaz. He later went to California and then to Guatemala, where he was appointed director of the Military School. After plotting a revolution against Diaz, he suddenly espoused the cause of the latter, went to Mexico, and was appointed Governor of the Federal District, the highest office after the presidency. He frequently antagonized the press, and in 1885 a number of journalists and students were imprisoned by him.

CEBALLOS, JUAN BAUTISTA (1811–c.1854). A Mexican jurist, born at Durango. He was made president of the Supreme Court in 1852. Upon the resignation of Arista, in 1853, he became President of Mexico *ad interim*, with extraordinary powers for three months. A month later he resigned. His failure was chiefly due to conditions beyond his control. Still his administration of one month produced two important measures. The first concerned a new Tehuantepec interoceanic contract that brought money into the treasury; and the second gave official recognition to civil marriages with foreigners, against which the Church fought as an infringement of its rights.

CEBALLOS, PEDRO. See CEVALLOS.

CEBENNA. See CEVENNES.

CE'BES (Gk. Κέβης). A Greek philosopher, born at Thebes in Bœotia. He was a disciple of Socrates, at whose death he was present, and also of Philolaus. He is represented by Plato as a serious-minded thinker eager for philosophical knowledge. He is reported to have written three dialogues in the Socratic style—the *Phrynichus*, the *Hebdome*, and the *Pinax*, or *Tabula*. A work named *Pinax*, now extant, was probably written, however, in the first century A.D. by a Stoic or a Cynic. It professes to be the explanation of an allegorical picture in a temple of Cronus representing human life and the condition of the soul before its union with the body. It inculcates the Socratic doctrine that only education of the mind and consciousness of virtue can lead to happiness. Edited by Prächter (Marburg, 1893).

CEBETIS TABULA. See CEBES.

CEB'IDÆ (Neo-Lat. nom. pl., from *Cebus*, from Gk. *κῆβος, kēbos*, long-tailed monkey). A family of Primates embracing all the American monkeys (formerly designated as platyrhine) except the marmosets. The features in which they differ from the monkeys of the Old World are stated under MONKEY. The family includes several genera described under DOUROUCOLI; HOWLER; SAKI MONKEY; SAPAJOU; SPIDER MONKEY; SQUIRREL MONKEY; TITI MONKEY; UAKARI.

CEBU. See HUMPED CATTLE.

CEBÚ, sē-bo͞o', *Sp. pron.* thā-bo͞o', or **ZEBU.** One of the Philippine Islands, situated between the islands of Bohol and Leyte on the east and Negros on the west, and lying between lat. 9° 25′ and 11° 20′ N. and long. 123° 10′ and 124° 5′ E. (Map: Philippine Islands, D 5). It is of an oblong form and has a length of about 130 miles, but does not exceed 20 miles in breadth. Area, 1782 square miles. Its surface is very mountainous, but only moderate altitudes are reached. The soil is fertile and produces tobacco, cotton, sugar, vegetables, rice, and hemp. The reported minerals are coal, gold, lead, silver, and iron. Some petroleum is found on the west coast. Manufactures include native wine, sugar, cloth, pottery, and cheeses. Fishing, especially for sponges, is an important industry. The population of the island is (1903) 592,242, and of the province, which includes the neighboring islands of Camotes, Mactan, Bantayan, and others, is 653,727, consisting of Visayas, Mundos, and some Negritos. Capital, Cebú (q.v.).

CEBÚ. The capital of the island Province of Cebú, Philippines, formerly the seat of government of the entire Visayan group (Map: Philippine Islands, D 5). The town, which is situated on the east coast of the island and fortified by a triangular fort, is well built and contains an episcopal palace, a post office, and the cathedral of San Nicolás. It is the chief commercial centre of the Visayan Islands. Cebú is regarded as the oldest city in the Philippines, and was the capital of the archipelago from 1565 to 1571. Magellan is said to have died on the island of Mactán, to the east of the city, and in the Rizál, a small building in the plaza, is a cross which, according to tradition, was planted in Cebú by Magellan when he took possession. Pop., 1903, 31,079.

CECCHI, chĕk'kē, ANTONIO (1849–96). An Italian explorer. He was born in Pesaro and was educated in Pesaro, Triest, and Venice. In 1877 he joined the Italian geographical expedition to Abyssinia, and in 1885 he accompanied the first Italian military expedition to Massowah and later concluded a naval and commercial treaty with the Sultan of Zanzibar. In 1894 he became Consul General in Zanzibar. He was murdered by the Somalis. He wrote *Da Zeila alle frontiere del Caffa* (1887) and *L'Abissinia settentrionale* (1887).

CECCO D' ASCOLI, chĕk'kô däs'kô-lē (c.1257–1327). The popular name of Francesco degli Stabili, a learned Italian astrologer and poet. He studied mathematics and astrology and was professor in the University of Bologna. Having published a commentary on Sacrobosco's *Sphæra Mundi,* in which he propounded bold theories concerning the employment and agency of demons, the Clerical party caused him to be condemned to certain fasts, prayers, and fines; but he eluded punishment by going to Florence. His freethinking and plain speaking, however, procured him many enemies. They took advantage of the fact that he had attacked Dante's *Commedia.* He was again tried for heresy, sentenced, and burned at the stake in Florence, in the seventieth year of his age. Consult W. S. C. Baddely, *Charles III . . . also Cecco d' Ascoli, Poet, Astrologer, Physician* (London, 1894).

CECH, chĕk, Svatopluk (1846–). A Czech poet. He was born at Ostredek and was educated at Prague. As a poet, Cech is the foremost representative of the distinctively national Czech poetry. He excels more particularly in the epic genre, while his numerous tales, sketches, personal reminiscences, satires, and novels constitute the finest prose productions in the national literature of Bohemia. In 1895 he was elected to the Austrian Reichsrat. The following are a few of his principal works: *Poems* (1874), containing, among others, the epics entitled "The Angels" and "The Dreams"; *New Collection* (4th ed., 1896); *The Circassian* (1883); *The Candidate for Immortality* (1884). Consult J. Sutnar, *S. Cechs Leben und Werke* (1898).

CECIDIUM. See Gall; Malformation.

CECIDOMYIIDÆ, sĕs'ĭ-dô-mī'yĭ-dē (Neo-Lat. nom. pl., from Gk. *κηκίς, kēkis,* gallnut, from *κηκίειν, kēkiein,* to gush forth + *μυῖα, myia,* fly). A family of minute flies, with hairy bodies, sparsely veined wings, and many-jointed antennæ, furnished with whorls of hair. Most of the larvæ make galls. See Gall Insects.

CECIL, sĕs'ĭl *or* sĭs'ĭl, Richard (1748–1810). An English evangelical divine of the Established church, born in London. He originally professed skeptical views, but in 1772 was converted, and from 1773 studied at Queen's College, Oxford. In 1777 he was ordained priest, and in 1780 he became rector of St. John's, Bedford Row, London. He was distinguished for his eloquence, and was considered the most prominent evangelist of his time. His collected works (4 vols., 1811) have been often reprinted (e.g., in New York in 1845, 3 vols.), and contain, particularly in vol. iv, valuable contributions to the discussion of various religious questions. Consult Pratt, "A Memoir of the Character of the Rev. R. Cecil," vol. i of the *Works* (London, 1811).

CECIL, Robert, Earl of Salisbury (c. 1563–1612). An English statesman and son of William Cecil, Lord Burghley (q.v.). He was born probably about 1563, although both the exact date and place of his birth are unknown. A sickly child, he was educated at home, but spent some years at Cambridge and in travel on the Continent. In 1588 he went with Lord Derby in his unsuccessful attempt to arrange a treaty of peace with the Duke of Parma. In 1589 he entered Parliament and was a member of the succeeding Parliaments of the reign of Elizabeth. At about the same time he took up the duties of Secretary of State, although he was not actually appointed to this post until 1596. In 1591 he was knighted, and a few months later he entered the Privy Council. The main direction of foreign affairs was in his hands, and in 1598 he headed an embassy to France to negotiate against peace between France and Spain. On August 4 of that year his father died, and Cecil inherited much of his father's influence, which, however, he had to defend against the Earl of Essex (q.v.). The mistakes of the latter, culminating in his trial and execution in 1601, freed Cecil from danger on this side, and during the last two years of the Queen's life he engaged in secret negotiations with James VI of Scotland, which greatly facilitated the latter's accession to the English throne in 1603 as James I. The grateful King showered honors on him, culminating in his creation as Earl of Salisbury in 1605, and he remained until his death the leading minister of the crown. The old Elizabethan, however, was out of his element. Cold, methodical, and versed in business, he made few friends, and with the people he was distinctly unpopular. Worst of all, he utterly failed to perceive, as did Bacon, the change of atmosphere that had come over England since the death of Elizabeth. Intent on securing revenue, he urged James on in his attempt to secure money without parliamentary grant, thus raising the storm that was to ruin the Stuart dynasty. In 1608 he became Lord Treasurer, and his management of the finances was extremely able, but all his ability was thrown away in the face of James's stupid prodigality. An attempt to come to terms with Parliament in 1610 failed, although Salisbury was willing to make vital concessions. His many labors broke down his never rugged health, and he died, worn out, May 24, 1612.

Bibliography. There is no life of Cecil. Many of his letters are in the *Cecil Papers* published in 8 vols. by the Historical Manuscripts Commission. The best account of Cecil's career (1603–12) is in Gardner, *History of England,* vols. i, ii (London, 1883–84).

CECIL, William, Lord Burleigh or Burghley (1520–98). One of England's foremost statesmen, the son of Richard Cecil, Master of the Robes to Henry VIII. He was born at Bourne, Sept. 13, 1520. He was educated at Grantham and Stamford grammar schools, and at St. John's College, Cambridge, where he distinguished himself, especially in Greek. Before he could take his degree he was removed by his father, and entered as a law student at Gray's Inn, to prevent his marriage with Mary, the sister of Cheke, the Greek professor. William, however, married her two months after his advent in London; but his happiness was short-lived, for she died on Feb. 22, 1544. The following year (Dec. 21, 1545) he married Mildred, daughter of Sir Anthony Cooke, a union which increased his political influence. In 1547 he became *Custos Brevium* in the Court of Common Pleas, the reversion of which Henry VIII had previously given him, and in 1548 his friend, the Lord Protector Somerset, appointed him his secretary. He shared in Somerset's downfall and imprisonment; but two years later, by his wisdom and prudence, was appointed Secretary of State by the Duke of Northumberland, Somerset's enemy. When Queen Mary ascended the throne, Cecil, as a Protestant, resigned office, but maintained good relations with the Roman Catholic party, and was one of the few eminent Protestants who escaped in purse and person

during her reign. Owing to his freedom from persecution, he has been unjustly accused of being a "trimmer." Cecil was cautious and politic, and averse to extremes in religion, and his essentially Erastian frame of mind inclined him to support the religion of the state. The rejection of the bill which the Roman Catholics introduced into Parliament, to confiscate the estates of Protestants, was mainly due to him. Cecil was merciful and tolerant, as compared with the narrow Whitgift or the bigoted Aylmer; but he was not guiltless of the cruel religious persecutions which disgraced Elizabeth's reign. The use of the torture and the employment of spies are a dishonor to his memory. Prior to Mary's death, Cecil corresponded with Elizabeth, who recognized his capacity for government and appointed him Secretary of State on her accession to the throne (Nov. 16, 1558). For 40 years he was the originator and director of that policy which made Elizabeth's reign memorable, and although Elizabeth occasionally favored other courtiers, Cecil was the statesman whose judgment she relied on in all matters of importance. His policy at home and abroad was shrewd, cautious, liberal, and comprehensive, and the quality of prompt decision was also his. As a statesman he was above animosities and favoritism; his enemies never suffered and his friends profited nothing by his power. He was a man of classical attainments and a voluminous writer. In 1564 Cambridge created him M.A., and Oxford conferred the same honor in 1566. The Queen created him Baron Burleigh, Knight of the Garter, and Lord High Treasurer. He died Aug. 15, 1598. Consult: Nares, *Memoirs of Lord Burghley* (3 vols., London, 1828–31), and Macaulay's famous review of it (*Burleigh and his Times*); Hume, *Great Lord Burleigh* (London, 1898). Much of his correspondence is to be found in the *Cecil Correspondence at Hatfield House* (published by the Historical Manuscripts Commission, 8 vols., London, 1883–99). Consult also the *Calendar of State Papers Foreign*, which had in 1913 published the documents down to 1582.

CECIL, or **GASCOYNE-CECIL**, gās-koin′, Robert Arthur Talbot Gascoyne. See Salisbury, Marquis of.

CECIL'IA. The second of Frances Burney D'Arblay's novels, dealing with domestic life. See D'Arblay, Madame.

CECILIA, Saint. The patroness of music, who is said to have suffered martyrdom in 230 A.D. Her heathen parents, as we are told, belonged to a noble Roman family and betrothed their daughter, who had been converted to Christianity, to a heathen youth named Valerian. This youth and his brother, Tiberius, became Christian converts and suffered martyrdom. Cecilia, when commanded to sacrifice to idols, firmly refused and was condemned to death. Her persecutors, it is said, first threw her into a boiling bath, but on the following day they found her unhurt. The executioner next attempted to cut off her head, but when he did not succeed in three strokes he was obliged by the law to abandon the attempt. She lived three days longer. As early as the fifth century there is mention of a church dedicated to her at Rome; and in 821, by order of Pope Paschal, her bones were deposited there. Since her story speaks of her singing to God in her heart, she came to be regarded as the patroness of Church music, and even as the inventor of the organ. Her festival is celebrated on November 22. Chaucer, Dryden, and Pope have celebrated St. Cecilia, and the painters Raphael, Domenichino, Carlo Dolci, and others have represented her in art. Consult Guéranger, *Sainte Cécile et la société romaine* (Paris, 1873).—Another St. Cecilia was born in Africa and suffered martyrdom by starvation under Diocletian. The Roman Catholic church celebrates her festival on February 11.

CECILIA, Saint. A favorite subject with religious painters. She is represented as a young woman, either at the organ or with some musical instrument, attended by saints or angels. The finest and most famous painting of the subject is by Raphael, in the Gallery of Bologna, in which St. Cecilia, standing in the midst of four saints and holding in her hands a small organ, listens enraptured to the angels above. Well known also is the painting by Rubens in the Berlin Gallery, in which his second wife is represented as St. Cecilia, singing and playing the harpsichord and attended by four angels. Other well-known pictures of her are by Guercino and Domenichino, both in the Louvre, and, among moderns, by Ary Scheffer, Sir Joshua Reynolds, John Singleton Copley, and F. S. Church. Above her tomb in Santa Cecilia-in-Trastevere, Rome, is a beautiful recumbent marble figure by Stefano Maderna, representing the saint after her martyrdom, with head partially severed.

CECILIA, The Story of Saint. A series of frescoes (1588–89), five in number, by Domenichino (q.v.), representing the charity, fervor, martyrdom, and final rewards of St. Cecilia. They are in the church of San Luigi dei Francesi, Rome.

CECRO'PIA (Neo-Lat., from Gk. Κέκροψ, *Kekrops*, according to Greek myth founder of Athens). A genus of trees of the family Artocarpaceæ. *Cecropia peltata*, a native of the West Indies and of South America, sometimes called trumpetwood and snakewood, is remarkable for its hollow stem and branches, exhibiting merely membranous partitions at the nodes. The small branches, these partitions being removed, are made into wind instruments. The wood is very light, readily ignites by friction against a harder piece of wood, and is much used by the Indians for procuring fire in this way. The fruit is agreeable and resembles a raspberry. Both the trunk and branches yield a large quantity of saline matter, which is employed by the French planters in the purification of sugar. The bark is strong and fibrous and is much used for cordage. It is also astringent and is applied in diarrhœa and other diseases. This species is an example of myrmecophily in which ants dwell in the hollow stems. In return for the service of the tree in affording them shelter and food, they protect the tree from attacks of leaf-cutting ants, which abound in the tropics.

CECROPIA MOTH. The largest of the silkworm moths (*Samia cecropia*), with wings expanding 5 to 6 inches, brown, marked by white, red, and buff. The caterpillar has coral-red tubercles on the second and third thoracic segments, and other tubercles, yellow and blue; it feeds on a great variety of forest and fruit trees. The cocoon is elongated, brown, papery, and unprotected by leaves. See Silkworm.

CE'CROPS (Lat., Gk. Κέκροψ, *Kekrops*).

The first King of Attica, who figures in Greek mythology as an autochthon, half man and half serpent. At first probably the eponymous hero and ancestor of the people, he seems to have been crowded aside later by the figure of Erechtheus, though whether we have here the heroes of separate tribes may well be doubted. Later legend attributed to him, as the first King of Attica, the formation of a confederacy of 12 cities, the introduction of marriage, burial of the dead, writing, and other arts. Made umpire in the contest of Athena and Poseidon over Attica, he decided for Athena. See PARTHENON.

CE'DAR (OF. *cedre*, Lat. *cedrus*, from Gk. *κέδρος*, *kedros*, cedar tree). A name applied to several species of coniferous evergreen trees, as well as to the wood of a number of trees in no way related to the conifers. The name properly belongs to the genus *Cedrus*, of which there are three species generally recognized—*Cedrus libani*, the cedar of Lebanon; *Cedrus deodara*, the deodar tree of India; and *Cedrus atlantica*, of the mountains of northern Africa. By some botanists the first and last are considered as one species. All are characterized by their fragrant, light-red, durable wood. The cedars of Lebanon have been famous from early times, being frequently mentioned in sacred and profane writings. The original groves mentioned in the Bible have become greatly reduced through various causes, and the largest grove now known contains only about 400 trees, some of which are evidently of great age. The trees are noted for the size of their trunks rather than for their height. They differ from most conifers in that their branches are widespreading. The cones and leaves resemble those of the larch more than any other tree, except that the leaves are persistent. The cedar of Lebanon was introduced into England in the seventeenth century, and a number of noble specimens are now growing in that country. (For detailed illustration, see Plate of CALABASH.) It is hardy in the United States only in the South and in California. In its natural home the cedar of Lebanon is found at elevations of 6000 feet or less, but it thrives best in sandy loam, where the roots can reach water. A white resin, called cedar resin, is exuded by the trunks and was formerly employed in embalming. A sort of oil or turpentine was also prepared from it, but neither the oil nor the resin is much known now. The deodar, or God tree, and the *Cedrus atlantica* resemble *Cedrus libani* in appearance and have similar uses. They are more abundant, and their timber is very valuable. The deodar forms extensive forests in the Himalayas at elevations of from 7000 to 10,000 feet. The trees often attain a height of 150 feet and a diameter of 8 feet. The wood takes a high polish and is in demand for cabinetwork. *Cedrus atlantica* is most abundant in the Atlas Mountains and is used for the same purposes. Many other coniferous trees are given the name "cedar." The Siberian cedar is *Pinus cembra;* Goa cedar, a species of cypress; red cedar, species of *Juniperus* (see JUNIPER), etc.

The white cedar of the United States is *Chamæcyparis thyoides*, a tree 30 to 90 feet high, found growing in swampy situations from Maine to Mississippi. The trees are evergreen, with small, scalelike leaves. The wood is exceedingly durable, especially when in contact with moisture. The tree resembles the arbor vitæ, which is also sometimes called white cedar. The yellow cedar of the Pacific coast is *Chamæcyparis nootkatensis*. It is found from northern California to Alaska. The wood when seasoned is a beautiful light yellow and takes a high polish, on which account it is highly esteemed for finishing lumber and cabinetwork. The Port Orford cedar (*Chamæcyparis lawsoniana*) is quite similar and is found in Oregon and California. There are many horticultural varieties of these cedars in cultivation, that vary in their habit of growth and color of foliage. Among trees not allied to the conifers to which the name "cedar" is given are species of *Cedrela*, which furnish the wood from which cigar boxes are so extensively made. The Australian cedar is of the same genus, the species being *Cedrela toona* or *Cedrela australis*. This is an important timber tree which is put to many uses. It yields gum, a resin, and tanbark, in addition to timber. This or a similar species is found in India. The cedar wood of Guiana is from *Protium altissimum*. In Australia *Melia composita* is called white cedar.

CEDAR, BARBADOS (*Cedrela odorata*). A tree of the family Cedrelaceæ, and of the same genus with the toona, a native of the West Indies and warm parts of America. It is called "cedar" in the West Indies. It is often upward of 80 feet high, with a trunk remarkable for thickness. It has panicles of flowers resembling those of the hyacinth. The fruit, bark, and leaves have the smell of asafœtida, but the wood has an agreeable fragrance. Being soft and light, it is used for canoes and for shingles. Cigar boxes are very generally made of it, and it supplies some of the wood used in the manufacture of lead pencils.

CEDAR APPLES. Outgrowths of frequent occurrence upon the red cedar or juniper. They are caused by fungi, *Gymnosporangium macropus* and other species. (For illustration, see FUNGI.) During most of the season they may be seen as warts or knots of greater or less size on the twigs. At first they have about the same color as the branch, but later become brown. In the spring of the year they undergo a marked transformation and appear as horn-shaped masses of orange or yellow colored jelly. These contain the spores of the fungus, and upon drying they are blown about. Lighting upon an apple tree, they cause apple rust. See also *Apple Diseases*, under APPLE.

CEDAR BIRD, or CHERRY BIRD. See WAXWING.

CEDAR CREEK. A stream in Shenandoah Co., Va., falling into the Shenandoah River. On its banks, on Oct. 19, 1864, during the Civil War, a Confederate force under General Early completely surprised Sheridan's army at daybreak, during its leader's absence, and forced it to retreat in considerable disorder back through Middletown; but about 10 o'clock the cavalry and part of Wright's corps (the Sixth) succeeded in checking the advance of the Confederates. General Sheridan, who was just returning from Washington, was at Winchester when the firing began, but hastened to the front and, rallying his troops, ordered a countercharge at about three o'clock in the afternoon. Many of the Confederates had left their ranks to plunder the Federal camp, and in turn they broke and fled and were pursued as far as Fisher's Hill. Next day the retreat was continued to New Market. Sheridan's forces then returned to Kernstown for winter quarters.

Sheridan had about 31,000 troops, and Early 18,500. The Federal loss was 644 killed, 3430 wounded, 1590 missing; the Confederate, 320 killed, 1540 wounded, 1050 missing. Sheridan recaptured his lost guns and 23 of Early's. This battle ended the last attempt on the part of the Confederates to strike the North through the Shenandoah valley. Sheridan's famous ride from Winchester, his enthusiastic reception at the hands of his troops, and his remarkable success in turning a disastrous rout into a brilliant victory, form, perhaps, the most dramatic episode of the Civil War. They furnished the theme of a stirring poem by T. Buchanan Read, "Sheridan's Ride." Consult Pond, *The Shenandoah Valley in 1864* (New York, 1883), and Sheridan, *Personal Memoirs* (3 vols., New York, 1888).

CEDAR FALLS. A city in Black Hawk Co., Iowa, 100 miles west of Dubuque, on the Illinois Central, the Chicago, Rock Island, and Pacific, Chicago Great Western, and the Waterloo, Cedar Falls, and Northern railroads, and on Cedar River (Map: Iowa, E 2). The city has a Carnegie library, State normal library, a hospital, and two parks, and is the seat of the Iowa State Teachers' College. It is a manufacturing place of importance, having good water power, and possesses flour, feed, oatmeal, and planing mills, clothing, wagon, and gate factories, corn-canning works, foundry, house-furnishing factory, feeder and stacker works, etc. Settled in 1845, Cedar Falls was first incorporated as a village in 1853. At present it is governed under the charter of 1865, which provides for a mayor, elected every two years, and a city council. The water works and electric light plant are owned by the city. Pop., 1900, 5319; 1910, 5012.

CEDAR KEY. A town and seaport in Levy Co., Fla., on a small island just off the coast in the Gulf of Mexico, and on the Seaboard Air Line Railroad (Map: Florida, C 2). The harbor, which admits vessels of light draft, is formed by several small keys, on one of which is a tall lighthouse with a fixed white light, varied by a white flash every minute. The town has several saw mills, most of which cut red cedar wood for pencils, which is a leading export. It has a considerable trade also in fish, oysters, sponges, palmetto fibre, and lumber. Pop., 1910, 864.

CEDAR MOUNTAIN. A hill in Culpeper Co., Va., near which on Aug. 9, 1862, a sharp battle was fought between 8000 Federals of Pope's army, under General Banks, and about 24,000 Confederates, under General Jackson. Banks gained a slight advantage at first, but was swept from the field by the spirited attack of Jackson's reserves. Pope's whole force advancing, Jackson fell back towards Gordonsville to join General Lee. The reported losses were, for the Federals, 1661 killed and wounded and 723 missing; for the Confederates, 1283 killed and wounded and 31 missing. It was the first serious engagement fought by the Army of Virginia under Pope. Consult Ropes, *The Army under Pope* (New York, 1881).

CEDAR MOUNTAINS. A mountain range of southwest Cape Colony, South Africa, lying parallel with the Atlantic, and separating the valley of the Olifante River on the west from its tributary the Doorn on the east. The highest summit is Sneeuwkop, about 6300 feet altitude.

CEDAR OF GO'A. See CYPRESS.

CEDAR RAPIDS. A city of Linn Co., Iowa, 79 miles (direct) southwest of Dubuque, on the Cedar River, and on the Chicago, Rock Island, and Pacific, the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads (Map: Iowa, F 2). Several bridges, including four railroad bridges, cross the river at this point. Cedar Rapids is the seat of the Coe College (Presbyterian), founded 1881, and has Carnegie and Masonic libraries, a government building, an auditorium, two theatres, several parks, and the Holly system of water works, owned municipally. It is the headquarters of the Order of Railway Conductors. The city, which lies in a rich agricultural country, has extensive wholesale houses and pork-packing establishments, and large railroad machine shops. The manufacturing plants include two large cereal mills, barley and flour mills, starch factory, machine shops, planing mills, agricultural-implement works, carriage factories, windmill and pump factories, tanneries, cement brick and block plants, etc. The rapids furnish water power for many factories. Settled in 1845, Cedar Rapids was incorporated in 1856. It has adopted the commission form of government. Pop., 1900, 25,656; 1910, 32,811; 1920, 45,566.

CEDAR, or RED CEDAR, RIVER. A river rising in Freeborn and Mower counties, southern Minnesota (Map: Minnesota, F 7). It flows southeast across Iowa from the northern to the southeastern boundary, emptying into the Iowa River at Columbus Junction, Louisa County, about 30 miles above where the latter stream joins the Mississippi. It is about 275 miles long and drains a beautiful and fertile region. The chief cities along its course are Waterloo, Vinton, and Cedar Rapids.

CE'DARTOWN. A city and the county seat of Polk Co., Ga., 60 miles northwest of Atlanta, on the Seaboard Air Line, the Central of Georgia, and the Louisville and Nashville railroads (Map: Georgia, A 1). Cedar and pine timber and valuable mineral deposits are found in the vicinity, and the city has a box factory, marble works, planing, cotton-yarn, and knitting mills, charcoal iron furnaces, foundries, iron mines, oil and fertilizer works, and railroad repair shops. The water works and lighting plant are owned by the municipality. Pop., 1900, 2823; 1910, 3551.

CEDD, kĕd, or **CEDDA,** kĕd'dȧ, SAINT (?–664). A brother of St. Chad or Ceadda, with whom he is often confused. He was born in Northumbria, brought up by Bishop Aidan, Christianized Essex and other parts of England, was made Bishop of the East Saxons (654), founded two monasteries, and was famed for learning and sanctity. He died in the monastery at Laestingaen, now Lastingham, a village about 25 miles northeast of York. His day is January 7.

CEDIL'LA. See DIACRITICAL MARKS.

CEDROS, sā'THrōs, or **CERROS,** sĕr'rōs. An island of Mexico, situated in the Pacific off the west coast of Lower California, where it forms part of the western boundary of San Sebastián Viscaino Bay (Map: Mexico, A 3). It lies between lat. 28° 5′ and 28° 35′ N. Its total area is estimated at 120 square miles. The surface is mountainous and partly barren. The climate is dry. Mineral deposits of importance are supposed to exist.

CÉDULA, thā'DOO̅-lȧ (obsolete Eng. *cedule*,

Fr. *cédule*, It. *cedola, cedula*, whence Ger. *Zettel*, slip of paper; variant of *schedule*, OF. *schedule, scedule, cedule*, from Lat. *schedula*, small sheet of paper, from *scheda*, sheet of paper, from *scindere*, to split). In Spanish, a written or printed paper of any sort, including blank forms. In Spanish law, any kind of a legal document, public or private, the exact nature of the document being indicated by supplementary words; e.g., *cédula real*, a royal order promulgating a law or decree; *cédula hipotecaria*, a mortgage loan certificate; *cédula ante diem*, a summons to a meeting of a society.

Cédula personal is a certificate of identification. Under the Spanish régime every inhabitant or resident of the Philippine Islands was required to take out, annually, such a certificate, and (unless legally exempt) to pay for it at a rate varying, according to his resources, from 2 pesos to 37.50 pesos. The graduated poll tax thus established yielded an annual revenue of 7,000,000 pesos. The American military government found it necessary, for administrative purposes, to retain the *cédula personal*, but decided to issue it at the nominal and uniform rate of 1 peseta.

CEFALÚ, chā'fâ-lōō' (ancient Lat. *Cephalœdium*). An episcopal city and seaport in the Province of Palermo, north Sicily, 42 miles east by south of Palermo (Map: Italy, J 9). It is grouped around the cathedral begun by Roger II in the twelfth century. Its mosaics are the most ancient and perfect in Sicily and resemble those of Mount Athos. The town lies at the base of the steep limestone promontory which towers to the height of over 1200 feet, and which bears the ruins of the ancient town. Fisheries and commerce are engaged in by the inhabitants. Pop., 1901, 13,273; 1911, 14,341.

CEGLIE MESSAPICA, chā'lyâ mĕs'sâ-pē'kâ. A city in the Province of Lecce, south Italy, 18 miles northeast of Taranto, and 27 miles from Brindisi (Map: Italy, M 7). It markets large quantities of wine, fruit, and oil, and quarries stone. Pop., 1901, 16,867; 1911, 17,844.

CEHEGÍN, thā'â-hĕn'. A town of Spain, in the Province of Murcia, 37 miles west-northwest of the city of that name (Map: Spain, E 3). It has some spacious streets, with handsome buildings. The town is in a fertile region, has a trade in grain, oil, wine, fruits, etc., and has manufactures of paper, cloth, and pottery. Pop., 1900, 11,523; 1910, 13,313.

CEIBA, sā'bâ. A small and growing port on the Atlantic coast of Honduras, 60 miles southwest of Trujillo. The chief trade is in bananas, Ceiba being in the midst of a large plantation district. Other exports are coconuts, soap, rubber, sarsaparilla, hides, tropical fruits, and mahogany logs. There are several experimental plantations of cotton and cacao.

CEILING (OF., Fr. *ciel*, Lat. *cœlum*, sky). The inner lining of an inclosed structure when distinct from the structural walls and roof; and by extension and restriction, the top covering of a room or hall. In the first sense, however, it is not used of plastering, tiling, or flooring. A ceiling in this sense may be partial, like a wainscot, or a complete sheathing internally with wood or metal (e.g., Solomon's Temple: consult 1 Kings vi. 9, 15). In the second sense it may be either the underside of the floor or roof immediately above the room; or, as is more often the case, a wholly independent decorative construction, merely suspended from or attached to the roof or floor above it. Vaulted and domed ceilings are more often termed "vaults" and "domes" than "ceilings."

In Egyptian temples the underside of the flat stone roofs formed the ceiling and was generally painted blue, with yellow stars, bands of hieroglyphs, and emblems of the heavens. The ceilings of Babylon and Assyria were stuccoed and painted, and apparently gilding was used in the sanctuaries. The horizontal ceilings of Greek art were deeply paneled (coffered), and the flat surfaces of the panels were painted, but with ornaments, not figures. Roman ceiling decoration combined to perfection both types—the flat and the curved surfaces. The pictorial sense of Græco-Roman artists seized on the decorative possibilities of the ceiling. From the great domes, tunnel vaults, and groin vaults of the Imperial baths and the flat ceilings of the temples and basilicas, down to the minor ceilings of tombs and private houses, all were covered according to one of three systems: (1) coffering or paneling, or combinations of them used both on flat and curved surfaces; (2) stucco reliefs, mainly on curved surfaces; (3) decoration by simple painting, also on curved surfaces. The stuccoed ceilings of the Pompeian baths, of the tombs on the Via Latina, and of the "House of Livia" in Rome show the exquisite taste and dash of these facile works. The elaborate painted ceilings of the substructions of the baths of Titus, discovered in the sixteenth century, furnished the models for the arabesques and grotesques which Raphael made so popular in his Vatican *Loggie* and which have been ever since in continual use. With the fall of Roman art, ceiling decoration disappeared entirely in the West, to be revived only after six centuries in the Romanesque period. But in the Orient there was no such intermission. On the contrary, Byzantine art, with its discovery of marble, glass, and mosaic incrustation as a covering for the surfaces of vaults, added a previously unknown element of deep and rich color, which gave a mysteriously impressive effect to the ceilings; and this was helped by its use of curved ceilings, wherever possible, even in civil structures. Such are the domes of the Ravenna baptisteries, of St. Mark's in Venice, and the churches of Salonica and Constantinople. This mosaic decoration strikes a note of seriousness in contrast to the playfulness of Roman decoration. One important fact is that Byzantine ceilings always present an unbroken surface. This same ideal—of curves and of deep surface coloring—was developed by Mohammedan art; but in the buildings erected in the Mohammedan style there were few unbroken lines and surfaces, and flat ceilings on carved beams were often used. Stalactite corbeling and geometric surface decoration were combined with coloring even more brilliant than that of the Byzantines. When, in the West, mediæval art gave up its severe simplicity of unconcealed beams and rafters, ceiling design followed two different lines of development—that of the stone vault and that of the wooden ceiling. Both of these reached their highest development in England, where the simpler forms of groined vaulting with molded ribs, which the French always preferred, were exchanged for an increasingly elaborate system of multiple ribs that finally developed into the superb fan vaulting of

the sixteenth century (see VAULTING); while the wooden ceiling, with the trusses and entire framework of the roof supports, were made richly decorative in the splendid hammer-beam types of English churches and halls—a type which lasted well into the seventeenth century. The Renaissance abandoned the ribbed vault and in Italy developed three principal types of ceiling: the smooth vaulted ceiling with or without "penetrations" plastered and painted in fresco or tempera, as in the Sistine Chapel at Rome; the coved ceiling with penetrations, having a flat central field and curves (coving) along the sides and ends penetrated by lunettes, the whole richly painted; and the flat paneled ceiling of wood or plaster, in endless variety of decoration, which reached its highest splendor in Venice (Doge's Palace), with sumptuously carved panels framing paintings by Titian, Tintoretto, and Veronese. Plaster and stucco came into general use throughout Europe, and in England a very charming type of flat ceiling was developed with all-over decorations modeled in low relief in the plaster. See PAINTING; STUCCO.

CEILLIER, sā'yā', RÉMY (1688–1761). A French Benedictine scholar. He was born in Bar-le-Duc, France, became titular prior of the Benedictine monastery of Flavigny, near Nancy, and there died. His enduring fame rests upon his laborious and exhaustive analysis of ecclesiastical literature down to the middle of the thirteenth century, *Histoire générale des auteurs sacrés et ecclésiastiques* (23 vols., 1729–63; new ed., 14 vols., 1858–65).

CELAE'NAE (Gk. Κελαιναί, *Kelainai*). A flourishing commercial city of ancient Phrygia, at the sources of the Marsyas and the Mæander, with a citadel and a royal palace. Cyrus the Younger had a park there. The city passed into the power of Alexander the Great in 333 B.C. His successors occupied it till Antiochus Soter refounded it as the Phrygian Apamea.

CELÆ'NO. See HARPY.

ČELAKOVSKÝ, chĕ'lă-kŏf'skē, FRANTIŠEK LADISLAV (1799–1852). A Czech poet and Panslavist. He was born in Strakonitz and was educated at the University of Prague. In 1842 he held the chair of Slavonic philology at Breslau. He exercised a considerable influence upon the development of Czech literature, made numerous translations from the German, Russian, and English, and published a large number of poetic and other works, among which are the following: *Echoes of Russian Folksongs* (1829); *Echoes of Bohemian Folksongs* (1840); *The Centifolious Rose* (1840), a cycle of didactic, political, and love poems. Besides, he edited a collection of Slavonic proverbs, *The Wisdom of Slavonic Peoples in Proverb* (1852).

ČELAKOVSKÝ, LADISLAV (1834–1902). An Austrian botanist, son of the preceding. He was born and educated in Prague and in 1860 was appointed custodian of the botanical department in the Bohemian Museum in that city. In 1882 he became professor of botany at the Czech University of Prague. Among his numerous and valuable works are the following: *Prodromus der Flora von Böhmen* (1867–81); *Ueber die morphologische Bedeutung der Samenknospen* (1874); *Vergleichende Darstellung der Placenten in den Fruchtknoten der Phanerogamen* (1876); *Die Gymnospermen* (1890); *Das Reduktionsgesetz der Blüten* (1895).

CEL'ANDINE (OF. *celidoine*, Fr. *chélidoine*, Lat. *chelidonia*, from Gk. χελιδόνιον, *chelidonion*, swallowwort, from χελιδών, *chelidōn*, swallow), *Chelidonium*. A genus of plants of the family Papaveraceæ (the poppy family), having a corolla of four petals and a podlike capsule. The common celandine (*Chelidonium majus*) is a perennial, with pinnate leaves, lobed leaflets, and yellow flowers in simple umbels, frequent under hedges, in waste places, etc., in Great Britain and most parts of Europe. It is also introduced in various places in the United States. It flowers from May to September. The root, stem, and leaves, when fresh, have a disagreeable smell and are full of a yellow juice, which is very acrid, causing inflammation when applied to the skin. Celandine is sometimes used in medicine; it is a drastic purgative, and in large doses an active poison; in small doses it is said to act beneficially on the lymphatic system and on the organs of secretion, and to be useful in jaundice, scrofulous diseases, disease of the mesenteric glands, etc. The most prominent constituents of the plant are sanguinarin, chelerythrin, chelidonin, protopin, chelidoxanthin, and chelidonic acid.

CELANO, chā-lä'nō. A town in the Province of Aquila degli Abruzzi, south Italy, 25 miles south-southeast of Aquila (Map: Italy, H 5). It is situated on a hill at the north end of Lake Fucino (q.v.), the ancient *Lacus Fucinus*. It was the seat of a count and a place of importance prior to 1223, when it was devastated by Frederick II. The castle, founded in 1450, was the prison of Countess Covella, who was there immured by her son Rugierotto. The author of *Dies iræ, dies illa*, Beato Tommaso, was born in Celano. Pop. (commune), 1901, 9904; 1911, 1065.

CELAS'TRUS. See WAXWORK.

CELAYA, sā-lä'yā. A city in the State of Guanajuato, Mexico, 34 miles south of San Miguel de Allende, on the Río Grande de San Jago, at the junction of the Mexican Central and Mexican National railroads (Map: Mexico, J 7). It has a fine public square and the splendid church of Our Lady of Carmen, completed in 1798, which has a portico with handsome Corinthian columns and a spacious interior in the form of a Latin cross. The city manufactures soap, woolen goods, and saddles, and is noted for its candies. Near the city are thermal springs. Celaya was founded in 1570 and in 1655 was raised to the dignity of a city by Philip IV. It was sacked by the Revolutionists in 1810. Pop., 1895, 21,245; 1900, 25,565.

CEL'EBES (the name of a native tribe). One of the larger islands of the Dutch East Indies, situated east of Borneo between lat. 1° 45′ N. and 5° 45′ S. and between long. 118° 49′ and 125° 5′ E. (Map: East Indies, F 5). It is surrounded by the Celebes Sea on the north, the Molucca Sea on the east, the Flores Sea on the south, and the Strait of Macassar on the west. Its area is 69,273 square miles; including the dependent islands, 77,750 square miles.

In its shape Celebes is not unlike a starfish, the same general form being found also in the adjacent island of Gilolo. It consists of four mountainous peninsulas, of which the northern, Menado, has a length of about 400 miles. Its extraordinary conformation gives it a coast line of 3500 miles, which is longer than that of France and the Iberian Peninsula together. The surface is largely mountainous and reaches

one of its highest elevations in Mount Bonthain, an extinct volcano, situated in the southern part of the island, 10,088 feet high. There are also a number of active volcanoes in the eastern end of the peninsula of Menado, ranging in altitude from 5000 to over 8000 feet. Most of the volcanoes, however, have reached the solfataric stage. The largest river is the Sadang, which rises in the central part of the island and flows through the southern peninsula. It is navigable by small boats, but most of the streams are mere mountain torrents. Lakes are abundant, and hot springs also are found. The west coast is without any very deep indentations, while the eastern and southern coasts have the three spacious inlets of the gulfs of Tomini, Tomori, and Boni.

The climate is tropical, but somewhat modified by the elevation of the surface and the influence of the sea. The rainfall is more abundant in the north than in the rest of the island. Lying in the centre of the East Indies Archipelago, Celebes has great tropical variety and wealth of both fauna and flora. Among the animals peculiar to the island are the tailless baboon, the babirussa, with upper canines curved backward and nearly touching the forehead, and shorter, curving lower canines, the marsupial cuscus, and the sapi-utan, or wild cow, besides several species of small birds. Deer, wild and tame buffaloes, wild swine, sheep, goats, etc., abound, and monkeys are innumerable. The forests include oak, teak, palm, cedar, and upas trees, while the bamboo, which furnishes material for habitations and every sort of implement, and even articles of dress, is everywhere found. Cloves, nutmeg, spices, the tropical fruits, maize, rice, tobacco, sugar, and indigo are easily raised. The coffee crop is not large, but of superior quality. The geological composition of Celebes is only slightly known. The larger part is probably composed of sandstone and limestone resting upon igneous rocks. The minerals of Celebes are gold, iron, salt, copper, zinc, and coal. The coal, however, is of poor quality. The gold is in quartz veins and occurs in deposits of sufficient richness moderately to reward the mining companies, of which there are several. The largest port, Macassar (pop., 26,000), at the south end of the island, commands most of the trade. The second port in importance is Menado (pop., 9000), on the north side of the northern peninsula.

For administrative purposes the northern arm, Menado (and Minahassa), is organized, with the Sangir and Talaut islands, into Residency No. XII, while the west, centre, and south of Celebes, with Sumbawa and other islands, are included in Residency No. XI or Insulinde, or Island India. Residency No. XIII includes eastern Celebes, Gilolo, and the Moluccas and other islands between Celebes and New Guinea. The princes of Celebes have pretty much their own way, being little interfered with by their Dutch residents as long as they pay tribute or bring forward the crops or forest products. Dutch missionary operations have been very successful in this island. The coffee plantations established on the mountain slopes by the Dutch about 80 years ago, together with the revival of cacao culture, have brought much wealth to the natives and their masters. No part of Insulinde has shown better the results of peace, good government, and missionary operations than certain portions of Celebes, especially Minahassa. Of late years, apart from the business of the government, the imports in the ports, not including Macassar, have averaged over $3,000,000 and the exports over $3,580,000, the commerce of the port of Macassar reaching an annual total of $6,400,000. The chief towns of the island are Macassar, Menado, and Gorontalo.

The population of the island is estimated at 2,000,000, including about 2400 Europeans.

All the natives of Celebes speak languages belonging to the Malay stock. That of the Minahassans in the northeast, however, differs notably from the tongues found in other parts of the island and shows considerable proximity to Philippine dialects, as proved by Professor Brandstetter in the Sarasins' monograph (see below). Culturally the northeast is likewise separated from the rest of the island taken as a unit. This linguistic and ethnographic result is confirmed by somatological study, according to which the Minahassans appear to be related to the Tagalog and other Philippine tribes and even suggest Japanese features. At all events, they may safely be regarded as alien immigrants from the north. So far as the remainder of the population is concerned, it may be positively stated that nowadays there are no traces of any Negroid or Papuan race. On the other hand, the Sarasin cousins distinguish the predominant Toradja type from the Toala, whom they regard as survivors of a very ancient migration from Asia. The Toradja are very closely related to the Dyak of Borneo, the Battak of Sumatra, and the Philippine Igorrotes. They include the Bugi and Macassar of the southern peninsula of Celebes, who have indeed founded feudal monarchies and become affected by Mohammedan influence, but are nevertheless physically of the same stock with the pagan Toradja of the central region. The Toala are perhaps the most interesting of all the tribes of Celebes. They are of very short stature (males, 156.1; females, 145.4 cm.), have wavy hair, and present other traits proving kinship with the Veddahs of Ceylon and the Senoi of Malacca. Although somewhat Islamized, they preserve several cultural traits shared with these tribes, such as cave dwellings, ignorance of pottery and metallurgy, while an examination of their old caves by the Sarasins indicates, as further proof of connection, that the Toala were once economically dependent only on the chase and the collection of wild vegetables, and lacked all domestic animals save the dog. The Macassars practice Mohammedanism, much degraded by local superstitions and beast worship, and the abject fear of a local deity. Many are skillful craftsmen and excel in native manufactures, especially rich personal adornments. They have a literature, chiefly romance and drama, besides works of religion and law, translated from the Arabic and originally brought to them by the missionaries of Islam. In Menado 36 tribes were confederated, under Dutch direction, against an aggressive chief, and it is among these people, especially the Minahassans, that Dutch civilization has accomplished valuable results. The Javanese appear to have exerted not a little influence upon the southern portions of Celebes, and certain Hindu traces are also due to them as intermediaries. The women of Celebes are celebrated for the fine bark cloth made by them. Celebes has furnished many settlers for other regions of the Malay Archipelago, the Bugis, in particular, being great travelers

and colonizers, merchants, and seamen. The island was first discovered and named by the Portuguese in 1512, but from about 1607 the Dutch gradually obtained the supremacy, though it was not until well into the nineteenth century that every district was under their control. Consult: Lahure, *L'Île de Célèbes* (Paris, 1879); Wallace, *The Malay Archipelago* (London, 1880); Van der Lith, *Nederlandsch Oost-Indie*, vol. i; Hickson, *A Naturalist in North Celebes* (London, 1889); Staden der Brink, *Zuid-Celebes* (Utrecht, 1884); Fritz and Paul Sarasin, *Versuch einer Anthropologie der Insel Celebes* (2 vols., Wiesbaden, 1905, 1906); id., *Reisen in Celebes* (2 vols., 1905).

CE'LER. One of the two architects—the other one is Severus—mentioned by Tacitus as employed by the Emperor Nero in his great constructive works. They undoubtedly carried out Nero's scheme for a general reconstruction of Rome on a regular plan after the great fire, and were the architects of his colossal "Golden House," the most immense of all Imperial palaces, which swallowed up a large quarter of the city.

CEL'ER'ES. See LEGION.

CELER'IPEDE. See BICYCLE.

CEL'ERY (Fr. *céleri*, Lat. *selinon*, parsley, from Gk. σέλινον, *selinon*, parsley) (*Apium graveolens*). A biennial plant of the family Umbelliferæ, a native of Europe, now widely cultivated for its leafstalks, which are blanched and eaten raw with salt. One form, celeriac, is extensively grown on the continent of Europe for its turnip-like root. The whole plant has an aromatic flavor.

The celery industry has had a rapid development in the United States during recent years, owing largely to improved methods of culture and transportation. Florida and California now contribute a large supply of late celery to the leading markets. The method of culture now in general use is to sow the seed in a hotbed, or for the late crop, in the open, transplant once or twice, and set in the field in level rows 3 or 4 feet apart and 6 inches distant in the row. Celery intended for summer or fall use is blanched when the plants are well grown by setting up boards about a foot wide against the row on either side; that grown for winter use is blanched by heaping earth against the plants. It is taken up when cold weather comes on and set in pits or a cool cellar, the roots being packed in moist earth so that the plants may continue a slow growth while blanching. In the so-called "new celery culture" the rows are only 6 to 12 inches apart. The plants thus thickly grown are self-blanched and only the outside rows need protection from the light. Celery is generally grown on a moist, rich, peaty soil, well drained and heavily fertilized; but good crops have been grown on fertile clayey and sandy uplands. The crop requires an abundance of moisture and fertilizer. *Celeriac*, or the root form of celery, is handled about like celery, except that it does not require blanching. It is little grown in America except where there is a German settlement. It is cooked and eaten with sauce, used in salads, and pickled. For illustration, see Plate of SALAD PLANTS.

Some 60 varieties of celery are cultivated in the United States. Some are dwarf varieties, scarce 1 foot high, while others grow nearly 3 feet high. The leaves may be green, white, or yellow. Paris Golden or Golden Self-Blanching, White Plume, Giant Pascal, and Boston Market are among the varieties that are most extensively grown.

Celery Diseases. Celery is subject to a number of destructive parasitic diseases. The rust or sun scald, due to *Cercospora apii*, is recognized by the gray or yellow spots upon the leaves. The spots enlarge, run together, and finally destroy the leaf. The disease is more prevalent in dry situations than in moist ones, and where celery is grown in very dry soils it should be given some shade to prevent this disease. A leaf blight, caused by *Septoria petroselina apii*, attacks all parts of the plant above the ground, causing watery spots on stems and leaves. Black dots soon appear in these areas and the spores are widely scattered. Attention should be given to plants when setting them out that no diseased ones are used. If the plants are sound when planted, any good fungicide will prevent the spread of either of the above diseases. Damping off is especially troublesome in the South and in seed beds elsewhere. It is due to soil fungi and is favored by too much moisture, overcrowding, etc. A bacterial disease is said to attack some varieties, causing their stalks to become watery and worthless. It also spreads in market, quickly causing the hearts to melt away into a slimy, worthless mass. In the market celery should be kept very dry or else completely submerged in water to prevent this loss.

Consult: Duggar and Bailey, "Notes upon Celery," in *Cornell University Agricultural Experiment Station Bulletin 132* (Ithaca, 1897); Massey, "Growing Celery in the South," in *North Carolina Agricultural Experiment Station Bulletin 83* (Raleigh, 1892); Beattie, *Celery Culture* (New York, 1907).

CELES'TA. A musical instrument invented by August Mustel, of Paris, in 1886. Upon wooden resonators are fastened steel plates struck by hammers manipulated by means of a regular keyboard like that of a piano. The tones are of crystalline purity and have an ethereal quality. The range of the instrument is five octaves, from c^4 to c^9. In order to avoid the use of many leger lines the music is always written an octave lower than the actual sound. R. Strauss, Tschaikowsky, Puccini, Mahler, and other composers have employed the celesta in some of their scores with much success.

CELES'TIAL CITY. In Bunyan's *Pilgrim's Progress*, the goal of the pilgrim's journey, which was reached by passing through the River of Death.

CELESTIAL EMPIRE, THE. An appellation for China, suggested by the title "Tien Chao" (Heavenly Dynasty), which the Chinese give to their country; whence, also, the term *Celestials*, often popularly applied to the population. See CHINA.

CELESTIAL MOUNTAINS. See TIAN-SHAN.

CELESTINA, thā'lĕs-tē'nȧ. A Spanish prose drama in 21 acts, originally entitled *The Tragi-Comedy of Calisto and Melibœa*, probably begun by Rodrigo Cota, of Toledo, about the middle of the fifteenth century. It was finished by Fernando de Rojas and appeared about 1480. Consult Ticknor, *Spanish Literature* (Boston, 1863).

CEL'ESTINE. The name of five popes. 1. CELESTINE I, Pope 422–32, is supposed to have been a near relative of the Emperor Valentinian. Tradition attributes to him the addition to the

Angelical Salutation: *Sancta Maria, Mater Dei, ora pro nobis.* He sent Palladius to Ireland as the first bishop of that country. 2. CELESTINE II (Guido di Castello), Pope 1143–44. He gave absolution to Louis VII of France, on the King's humble subjection, and removed the papal interdict from that country. 3. CELESTINE III (Giacinto Bobone Orsini), Pope 1191–98. He is supposed to have been 85 years old when chosen. He crowned the Emperor Henry VI of Germany and subsequently excommunicated him for keeping Richard I of England in prison. In 1192 he confirmed the statutes of the Teutonic Order of Knights. 4. CELESTINE IV (Goffredo Castiglione of Milan). A nephew of Urban III. He was elected Pope by only seven cardinals, Oct. 25, 1241, and died November 10 of the same year. He was the author of a history of Scotland, in which country he was once a monk. 5. CELESTINE V (Pietro di Morone), Pope in 1294. He was the son of a peasant of Naples, became a Benedictine monk, and lived many years in caves, after the manner of John the Baptist. Terrible stories are told of the severity of his penitential discipline. During his hermit life he founded the order that bears his name. (See CELESTINES.) After the death of Nicholas IV he was elected Pope, but refused to accept until persuaded by a deputation of cardinals, reënforced by the Kings of Naples and Hungary. He was chosen July 7, 1294, and was crowned August 29. He issued two decrees, one confirming that of Gregory X ordering the shutting up of the cardinals when in conclave, and one declaring the right of any Pope to abdicate at pleasure—a right which, after ruling five months and eight days, he exercised himself, Dec. 13, 1294. In his document of renunciation he assigned as the moving causes "the desire for humility, for a purer life, for a stainless conscience; the deficiencies of his own physical strength; his ignorance; the perverseness of the people, and his longing for the tranquillity of his former life." Having divested himself of every outward symbol of dignity, he returned to his old solitude; but he was not permitted to remain. His successor, Boniface VIII, sent for him, and, fearing a schism on his behalf, confined him, though with great respect, in the castle of Fumone, where after 10 months he died, May 19, 1296. He was canonized in 1313. Some hold that Dante places him in hell, in the famous passage: "I looked, and I beheld the shade of him who made through cowardice the great refusal" (*Inferno*, iii; and cf. xxvii); but it is not certain that the reference is to Celestine.

CELESTINES. A congregation within the Benedictine Order, founded by Pietro di Morone about 1254, and confirmed by Urban IV in 1264 and 1274. They were known at first as Hermits of St. Damian, but called themselves Celestines when their founder ascended the papal chair under the name of Celestine V. They wore a white garment with black hood and scapular and lived a purely contemplative life. In the thirteenth and fourteenth centuries the order rapidly spread through France, Italy, and Germany, but subsequently decayed. The German convents were mostly destroyed by the Reformation, and the French by the Revolution.

CEL'ESTITE (Lat. *cœlestis*, of the sky, then blue, from *cœlum*, sky). A strontium sulphate that crystallizes in the orthorhombic system. It is of a white color, though usually with a faint blue tinge (from which it derives its name) and rarely reddish. The finest crystals are those from Girgenti in Sicily, where it is found with sulphur and gypsum, and from the Put-in-Bay Islands in Lake Erie. It has considerable commercial value as a source of strontium, many of whose salts are used for producing a red light in fireworks. *Barytocelestite* is a variety containing barium, and *calciocelestite* is a variety containing calcium.

CE'LIA. 1. Mother of Faith, Hope, and Charity in Spenser's *Faerie Queene.* 2. Daughter of the usurper Frederick, and devoted cousin of Rosalind, in Shakespeare's *As You Like It.*

CEL'IBACY (from *celibate*, Fr. *célibat*, Lat. *cœlibatus*, celibacy, from *cœlebs*, bachelor). In ecclesiastical history, the abstention from the married state by the clergy and those who have entered upon the monastic life. The Roman Catholic church requires celibacy on the part of its clergy as a part of its ecclesiastical discipline. It holds that this practice is sanctioned, though not required, by the New Testament, basing this claim upon what it avers to have been the constant tradition of the Church and upon several biblical texts. Catholic writers make a careful distinction between the principles upon which the law of celibacy is founded and the changes which have taken place in its application. These principles are: (1) that the clergy may serve God with more freedom and with undivided heart, and (2) that, being called to the altar, they may embrace the holier life of continence. This does not imply, it is declared, that matrimony is not a holy state, but simply that celibacy is a state of greater perfection. Matt. xix. 12, 1 Cor. vii. 32–40, and Rev. xiv. 4 are cited in support of this contention: while the reference in 1 Tim. iv. 3 is taken as clearly directed against Manichæan reprobation of marriage in general. It does not follow, however, that the Church is absolutely bound to impose a law of celibacy upon its clergy.

In Apostolic times there seems to have been no legislation in regard to clerical celibacy. In the second century the veneration for the virginal life had become widespread, and a continent life for the clergy was regarded as proper to the ecclesiastical office, at least in its major orders. The rule for clerics not to marry after ordination seems to have been in force from very early times, for we find Paphnutius, an Egyptian bishop at the Council of Nicæa (325), while resisting the imposition of a law of continence upon all clerics, declaring the ancient traditional law forbidding clerics to marry after ordination to be sufficient. That this was the recognized practice of the early Church seems well established. The Apostolic Constitutions forbid bishops, priests, and deacons to marry, and the twenty-seventh Apostolic canon contains the same prohibition. The Council of Neo-Cæsarea (between 314 and 325) decreed that a priest who married after ordination should be degraded to the lay state. A deacon could marry only if he had stipulated for such liberty at the time of his ordination, as provided for by the Council of Ancyra in 314. The Council of Elvira (305) legislated against the marriage of all those who served the altar in any way, requiring of bishops, priests, and minor clerics a life of continence, even if they had been already married. It was the application of this law throughout the entire Church against which Paphnutius protested at the Council of Nicæa. Nevertheless, it soon

afterward prevailed in the West. We find it so declared in a letter of Pope Siricius (384), addressed to Himerius, Bishop of Tarragona. The Third Synod of Carthage (397) embodied it in its canons. Pope Innocent I laid it down in his letter to Exuperius, Bishop of Toulouse, who had consulted him in regard to it. St. Jerome (*against Jovinian*) declares that a priest who has "always to offer sacrifice for the people must pray, and therefore always abstain from marriage." Leo, and Gregory the Great, and the Eighth Council of Toledo renewed the prohibitions against the marriage of subdeacons.

The strict enforcement of the law of celibacy in the pontificate of Gregory VII has occasioned much dispute. Protestant writers generally, such as Mosheim, Potter, and Ranke, condemn the action of Gregory as an innovation upon ancient discipline. Catholic writers defend this pontiff, and hold that Gregory's legislation was but the application of the ancient discipline with renewed vigor. There is no doubt that in Gregory's time concubinage was largely prevalent. His immediate predecessors, Leo IX, Nicholas II, and Alexander II, issued stringent decrees against it. But it was Gregory who most vigorously and successfully enforced this legislation. Priests living in concubinage were forbidden to say mass or even to serve at the altar; the faithful were warned not to hear their mass, and deposition was to be the punishment of priests who refused to obey. A series of synods from the beginning of the twelfth century declared the marriage of persons in holy orders to be not only unlawful, but invalid. It was now laid down that if persons in minor orders married they forfeited the privileges of the clerical state. However, Boniface VIII (1300) permitted them to act as clerics, if they had been married only once and then to a virgin, had episcopal permission, and wore the habit of clerics. The Council of Trent renewed this law and again decreed the marriage of clerks in holy orders null and void. In the Western church at the present time holy orders can be conferred on a married man only on the condition that his wife voluntarily and fully consents to a separation, and herself makes a vow of chastity.

The law of celibacy has never been so stringently applied in the East as in the West. Socrates (450) states that the same law of celibacy which prevailed among the Latins also obtained in Thessaly, Macedonia, and Achaia. In 620 the Trullan Synod enacted a decree which required married bishops to separate from their wives and forbade all clerics to marry after entering upon the subdiaconate. In the ninth century a law of Leo the Wise permitted subdeacons, deacons, and priests who had married after receiving orders to remain in the ranks of the clergy, but not to exercise any functions pertaining to their office save in matters of administration. The Russian church has modified the ancient Greek canons prohibiting priests and deacons from marrying after ordination. Up to the time of Peter the Great a priestly widower was obliged to enter a monastery, but this monarch allowed a second marriage, and permitted the man to be employed in a seminary or episcopal chancery. The common custom in the Greek church demands that the secular clergy shall be married once, but, if the wife dies, not a second time. The bishops are usually taken from the celibate monks. Among the United Greeks, Ruthenians, Maronites, and such other followers of the Oriental rites, in communion with Rome, the following is the discipline: 1. A bishop cannot, after his consecration, either marry again or cohabit with the wife married before ordination. If he has a wife living, she must retire to a distant nunnery, and there be supported by her late husband. 2. Priests and deacons may, in accordance with the Trullan canon, keep the wives taken before their ordination, but they must abstain from marital intercourse for some time before officiating at the altar. Pope Clement VIII (1592–1605) ordered this abstinence to be if possible for seven, or at least for three days. 3. Priests and deacons cannot marry after ordination. Such was the decree of Benedict XIV issued May 6, 1742. Any such attempt at marriage was pronounced null and void. But in the case of converts from schism who were already in holy orders, the same pontiff decreed that the Holy See might permit the retention of a wife taken after ordination.

Celibacy has no doctrinal bearing in the Roman Catholic church, and is regarded as purely a disciplinary law, though as of prime importance in maintaining the character and dignity of the priesthood. Often a dispensation (q.v.) from the obligation of celibacy has been accorded to ecclesiastics under exceptional circumstances, which seemed to warrant a departure from the general law. These circumstances were very often connected with the necessity of providing heirs for noble families which were in danger of becoming extinct. Among others, the following may be mentioned: In 1040 Benedict IX dispensed Casimir, a monk of Cluny, for the sake of the Polish succession. Constance, daughter of King Roger of Sicily, was dispensed from her vows as a nun by Celestine III in 1191 in order to marry the Emperor Henry VI. In 1648 Innocent X dispensed a Jesuit father, John Casimir, who had been elected King of Poland, from the obligation of celibacy in order again to preserve the succession. In modern days the only instance of a validation of priestly marriages is that by Pius VII in the case of the French *Constitutionnels* (the priests who had accepted the civil constitution of the clergy and for a time had been practically separated from Rome), receiving back into regularity, on their submission, those who had married during the Revolution. Dispensations are quite numerous in cases of persons belonging to the military religious orders.

The celibacy of the clergy was rejected by the Protestant reformers. Luther set the example to his followers by marrying a former nun; and both the marriage of ministers and the abolition of monastic vows became a common feature of those bodies which threw off their allegiance to Rome. The Church of England in its articles of religion laid down the proposition that "bishops, priests, and deacons are not commanded by God's law, either to vow the estate of single life, or to abstain from marriage; therefore it is lawful for them, as for all other Christian men, to marry at their own discretion, as they shall judge the same to serve better to godliness." Consult: Schmitt, *Der Priestercölibat* (Münster, 1870); Lea, *Historical Sketch of Sacerdotal Celibacy* (Philadelphia, 1886); Carry, *Le Célibat ecclesiastique devant l'Histoire et devant la Conscience* (Paris, 1905).

CELI'NA. A village and the county seat of Mercer Co., Ohio, 118 miles north of Cincinnati,

on the Cincinnati Northern, the Lake Erie and Western, the Western Ohio, and the Cincinnati, Hamilton, and Dayton railroads, and on the Grand Reservoir (Map: Ohio, A 4). It has a Carnegie library and manufactories of carriages, furniture, etc. The water works and electric light plant are owned by the village. Pop., 1890, 2702; 1900, 2815; 1910, 3493.

CELL (Fr. *celle*, Lat. *cella*). The general meaning, with the Romans as with us, was that of a storeroom or small apartment where objects of any kind were stowed away; the Latin *cella*, however, does not denote a subterranean storeroom, as does the English cellar. *Cella* was also used to denote the inner room of an ancient temple (Greek *vaós*), where the image of the god was placed. In modern architecture, the term "vaulting cell" signifies the hollow space between the principal ribs of a vaulted roof.

CELL. In early Christian usage, (1) a chapel erected over a tomb; or (2) a monastic dwelling either of a single monk or of a community subordinate to an abbey and compelled to pay tithes to it. Its occupants were obliged to present themselves at the abbey at stated times.

CELL (in animals). The morphological and physiological visible unit of the body of organisms. It is essentially the same in plants and animals and is usually of microscopic size. The yolk, or yellow, of a hen's egg is, however, one cell. The name "cell" is something of a misnomer, for it implies a wall-inclosed chamber. But though many cells, especially among plants, are provided with thick walls, these may be entirely absent, and, when present, are usually, in animals at least, exceedingly delicate. Consequently, we regard the cell wall as of less importance than the cell contents, which constitute the more active parts. The cell content is known as protoplasm. The protoplasm consists of two main parts—a centrally placed, usually more or less spherical or ellipsoidal body called the nucleus, and the rest of the protoplasm, called cytoplasm. Nucleus and cytoplasm are each dependent on the other, and both are necessary to cell life. The nucleus is easily distinguished by the circumstance that it contains much substance which is easily stained by various dyes. This stainable substance is known as chromatin. The cytoplasm usually contains relatively large water-filled spaces, called vacuoles, and small particles of food substance and other substances that are easily "stained," i.e., seize upon the coloring matter of dyestuffs when placed in them. In its general structure protoplasm consists typically of water and the truly vital substance called plasma. The plasma exists in a great variety of forms. Frequently it occurs in films surrounding little vesicles of water, as the films of foam surround air spaces, or as the wax of the honeycomb surrounds the honey. Sometimes it seems to extend in fine threads through the water spaces. Still, again, the water spaces may be almost entirely absent. The living, "active" protoplasm seems to be constantly in motion, as can be judged by the motion of the particles which flow in the transparent current. Besides these particles, larger masses, such as drops of oil, pigment bodies, food granules, and excretory bodies, may be seen in the plasma or lodged in the water spaces between the plasma walls.

The cell wall, or cell membrane, is produced by the cell itself, usually by a transformation of its own substance. It is frequently, at least, to be regarded as still made up of living matter. In many cases, when the cell wall is thick, it can be seen to be perforated to permit of the passage of films of protoplasm by which the adjacent cells are organically connected. In plants where a great weight has to be borne and great rigidity given, the cell wall often gains a great thickness and constitutes the wood of the dead plant.

The *nucleus* is essential to the processes of assimilation and growth and probably controls in these operations. While its general form is subspherical, it may become greatly elongated, lobed, branched, form a series like a string of beads, or appear as two bodies or even as a mass of chromatin, scattered throughout the cell. In the chromatin network lie the chromatic particles and certain larger bodies called nucleoli. There may be many nucleoli, or only one large one. The typical nucleolus is regarded as an excretion product which is eventually cast out of the nucleus. The plasm films separating the nucleus from the cytoplasm are usually very evident, and, taken together, constitute the so-called nuclear membrane. It is of course a living membrane. Outside of the nuclear membrane is often found a minute particle, the centrosome.

Cell Division. The method by which the multicellular body is produced from the unicellular egg was long misunderstood. It was thought that cells crystallized out of a homogeneous matrix, or that new cells were formed inside of the preëxisting cells. It is now known that there is one process of cell multiplication and one only, viz., division of a cell into two equal parts. This division involves all parts of the cell—cytoplasm, nucleus, and centrosome. The method of cell division varies in different cases; two main types may, however, be distinguished—mitotic division, or "karyokinesis," and amitotic division. The mitotic division seems to be the more usual type; so it may be first considered. For purposes of description, four series of stages or phases may be recognized: (1) the prophases, or preparatory changes; (2) the metaphase, or acme of the division process; (3) the anaphases, or aggregation of nuclear material at the centres; (4) the telophases, or those in which the cytoplasm divides and the two new nuclei are established.

(1) *Prophases.*—In the cytoplasm the centrosome becomes double, if not so already, and the two centres move apart. A set of radiations now make their appearance in the cytoplasm—the asters—having the centrosomes at their centres. Between the centrosomes the asters pass over into each other, making a spindle-shaped figure composed of lines—the karyokinetic spindle. At the same time changes are occurring in the nucleus. The chromatin, which has previously consisted of scattered particles, becomes condensed into a deeply staining thread, which is coiled as a twisted or spiral thread within the nuclear membrane (skein or spireme stage). Eventually this thick thread, from which the mitotic process takes its name (Gk. *μίτος*, a thread), breaks into a number of deeply staining rods (centrosomes). The number of centrosomes is believed to be constant in each species throughout the whole series of cell divisions in the individual, and is always even. In the threadworm (*Ascaris*) there are 2 or 4 chromo-

somes; in certain liverworts, 8; in certain insects, 12, 16, 20, etc.; in the frog and mouse, 24; in the crustacean *Artemia*, 168; in man, probably 16. The nucleoli are either cast out into the cytoplasm or are gradually dissolved in place.

(2) *Metaphase.*—In this phase the spindle has come to lie in the equator of the nucleus, and the nuclear membrane has disappeared. Each chromosome splits lengthwise in equivalent parts, one-half of each going towards each pole. Consequently, each of the daughter nuclei receives exactly equivalent portions of the chromatic substance of the mother nucleus.

(3) *Anaphases.*—The separated parts of the chromosomes move to the two poles of the spindle, and these group themselves closely together. For a time the spindle fibres still persist as fine threads connecting the chromosomes, and in the middle of their course a plate of fine granules often appears lying across the fibres. The asters fade away, and the process of nuclear division is accomplished.

(4) *Telophases.*—The whole cell now divides, the division plane passing through the plate of granules, which plate helps form the new cell wall. The chromatophores seem to absorb water, swell up, press against each other, and form spherical nuclei. Alongside each nucleus is found the centrosome of the new cell. What are the purpose and the mechanism of mitosis? The purpose is quite certainly the exact division of the chromatic material. Concerning the mechanism there is still much difference of opinion. It seems probable that currents in the plasma films convey the chromosomes from each other and towards the opposite poles. The division of the cytoplasmic body may result from a centripetal flowing towards the centres of the two asters. But we are ignorant of the causes which determine the direction of flow.

Amitotic Division. This consists of a constriction of a nucleus without any formation of chromosomes. After two nuceli are formed the cytoplasmic body may divide. The significance of amitosis is very uncertain. It is especially common among cells that are about to perish; it seems to be induced by peculiar conditions of the cytoplasm.

The History of the Cell Theory. The first investigations into the finer structure of organisms were made by Malpighi and by Grew, at the end of the sixteenth century, upon plants. They discovered in them small, fluid-filled spaces with firm walls. But it was not until the early part of the nineteenth century that the general notion that the whole body of the higher organisms was composed of a mass of cells was gained. This generalization became established by Schleiden and by Schwann in 1838. The importance of the cell contents was not at first appreciated, but when they were found in constant motion in the live plant cell (Corti, 1772, and Treviranus, 1807), the idea that they were the essential living substance came to prevail. The name "protoplasm" was first assigned to the cell contents by Mohl (1846). Gradually, as cells without walls were discovered, the idea of cell took on this form—a mass of protoplasm possessing a single nucleus.

The *chemical composition* of protoplasm throws little light on vital action, although vital action is a chemical process. The reason is that the form of the molecules rather than the quantitative analysis or the enumeration of the elements is at the basis of life. Carbon, hydrogen, oxygen, nitrogen, are always present, and sulphur, phosphorus, potassium, and certain other alkalies and metals are usually found in small quantities. The dead protoplasm consists chiefly of albuminous substances, including nuclein, 34 per cent; lecithin and fats, 14 per cent; various albuminoids, 14 per cent; and, for the rest, numerous other substances.

Cell Activity. Cells, apart from the process of division, show active processes in their protoplasm, especially by their capacity for movement and response to stimulus. Cell movement takes on diverse forms according to circumstances. In naked, free cells, like the amœba, the most evident movements are the throwing out of blunt, finger-like processes (pseudopodia). If one of these takes the lead, it determines the direction of locomotion of the whole cell, for the rest of the body flows into the pseudopod. Often the pseudopodia are numerous and extremely fine; under these circumstances minute particles may be seen streaming in the current of the protoplasm which moves along the thread. In the case of cells with a firm wall, the protoplasm often streams in fine threads through the fluid-filled cell space, or in other cases a marvelous rotatory movement is seen. The causes of protoplasmic movement are not altogether clear. Recently, however, attention has been called to the fact that other foamy masses—especially a drop of oil filled with vesicles of water—will send out pseudopodium-like processes. So that the constant movement of the protoplasm may be the physiological concomitant of its unstable structure. Other forms of cell movement are the lashing of whips (flagella) or little hairs (cilia) covering the free swimming cell (Protozoa and Protophyta).

Response to Stimulus. Irritability is a fundamental property of protoplasm, so we find it present in unicellular organisms and in the tissue cells. Protoplasm is active only within certain limits of temperature, beyond which quiescence—heat rigor or cold rigor—occurs. Protoplasm (of Myxomycetes) will flow with reference to a source of heat—towards that temperature to which it is most "attuned." The direction of light rays may also determine the direction of locomotion. When a ray of white light passes obliquely through an amœba, the latter moves from the source of light. Also, the chlorophyl bodies of a leaf will move away from the surface which is too intensely illuminated. Likewise the electric current, gravity, contact, and chemical agents may awaken definite responses in cell protoplasm.

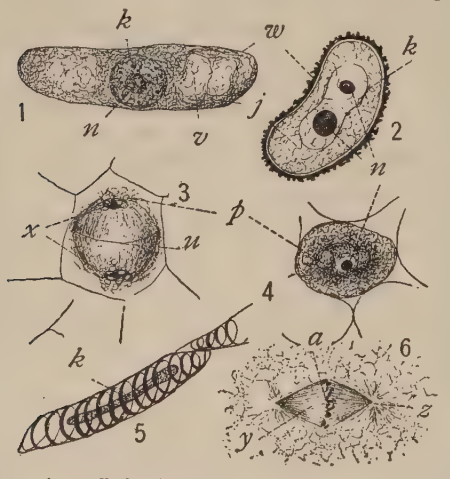
The forms assumed by cells are most diverse. In the animal's body they are united to form tissues, and the cells of each kind of tissue have their peculiar form. The cells of the skin are flattened or cuboidal; those lining the food canal are columnar; muscles are composed of elongated compound cells, and nerves give rise to processes that may be 2 feet or more in length. These kinds of cells will be considered under HISTOLOGY.

The Germ Cell. The egg and the spermatozoön, the union of which is the initial act in sexual reproduction, are each single cells, derived, like the other cells of the body, by the division of preëxisting cells. The two kinds of germ cells are, however, very different in appearance and function. The egg cell (ovum) is of great size, due to the fact that it is stuffed full

of food material, the so-called yolk. The nucleus is large, and is commonly called the germinative vesicle, and in its open-meshed films the chromatic material is lodged. The entire egg is often inclosed in one or more envelopes for its protection. The spermatozoön is of extremely small size. It is typically a threadlike cell, enlarged at one end to form the head. Behind the head is the middle piece, followed by the lash or tail. The head contains the nucleus, which is here dense, without water, but consisting almost wholly of chromatin. The middle piece seems to contain the centrosome. The outer envelope of head and middle piece and the whole of the tail are cytoplasmic, and play only an incidental part in the fertilization of the cell. See FERTILIZATION.

Consult: E. B. Wilson, *The Cell in Development and Inheritance* (2d ed., New York, 1900); O. Hertwig, *Die Zelle und die Gewebe* (Jena, i, 1893; ii, 1899; Eng. trans., New York, 1900); Calkins, *The Protozoa* (New York, 1901); Farmer, in Lankester's *Treatise on Zoölogy*, Protozoa, part i, fasc. 2 (London, 1903); Gurmitsch, *Morphologie und Biologie der Zelle* (Jena, 1904); Hertwig, "Ueber neue Probleme der Zellenlehre," in *Proc. Seventh Inter. Zool. Congress* (Boston, 1912).

CELL (in plants). In its most fundamental characters the plant cell closely resembles the animal cell. Like that, it possesses a nucleus and cytoplasm, and may or may not be surrounded by a cell wall. Nearly all cells are microscopic in size, a fair average being about 0.004 to 0.002 inch in diameter. Some cells, however, become much elongated, bast cells over 0.2 inch in length having been reported, and the internodal cells of *Chara* sometimes reaching a



CELL: 1, a cell showing wall (*w*), cytoplasm (*j*), vacuoles (*v*), nucleus (*k*), and nucleolus (*n*); 2, cell with heavy wall (*w*), and an elongated nucleus (*k*) with two nucleoli (*n*); 3, cell in late stage of division, paranucleus (*p*), chromosomes (*x*), equatorial plate (*u*); 4–5, same lettering; 6, a spindle showing centrospheres (*z*), spindle fibres (*y*), and chromosomes (*a*).

length of 2 inches. On the other hand, the cells of the yeast plant are only 0.00032 inch in diameter, and the bacteria are much smaller. When cells are free, there is a tendency to assume the spherical form, and this is the most usual shape in one-celled plants; but where the cells are aggregated into tissues various modifications are met, the cells becoming compressed, elongated, flattened, star-shaped, etc. In all except a few of the lowest plants the cell has a wall of cellulose, a substance derived from the protoplasm. As growth proceeds, the original wall of cellulose may become modified, the various changes being called lignification, suberization, etc. In spores the outer portion of the wall usually develops spines, furrows, and various sculpturings, that are sufficiently constant to be of value in classification. The internal modifications of the cell wall are no less numerous and striking. Sometimes there is a uniform thickening, but more commonly the thickening is irregular and results in the appearance of striations, spirals, rings, reticulations, and different forms of pits.

Contents. The most important contents of the cell are the nucleus and the cytoplasm, but besides these various other things may be present, such as plastids, starch grains, crystals, oil drops, sap, etc. *Plastids* are differentiated portions of the cytoplasm, and it has been believed by many that they are permanent organs of the cell, passed on from one cell generation to another, and it is undoubtedly true that they divide and may persist throughout the greater part of the life history of a plant; but whether they are present in the initial cell of the plant or not is a serious question, and if not, it must be admitted that they may be formed *de novo* from the cytoplasm. Colorless plastids are called "leucoplasts," and colored ones "chromatophores." If a chromatophore contains chlorophyll (the green pigment) it is called a "chloroplast," but if it contains any other coloring matter it is a "chromoplast." The function of the leucoplast is to produce starch, but if light conditions are favorable the leucoplast may be converted into a chloroplast. Chloroplasts vary greatly in form, in size, and in the number found in a single cell. In the higher plants they are small flattened or discoid bodies, and many are usually found in a single cell. However, in *Anthoceros* (a liverwort) and *Selaginella* (little club mosses), there is only one in a cell. The greatest variety of forms is found among the seaweeds (*Algæ*), where there are not only the small discoid forms, but also flattened plates, coiled bands, etc. The chloroplasts, like the leucoplasts, produce starch, but they are also able to manufacture carbohydrates in the presence of light (photosynthesis, q.v.). *Starch grains* vary in form and size. While the size may vary greatly with age, the form is usually characteristic of a given plant. The starch formed by the chloroplasts is in the form of very small granules, which do not become large grains, but disappear when light is removed, and are probably carried to other portions of the plant. The ordinary starch grains are developed in plastids. *Crystals* composed of calcium oxalate are widely distributed. In form they are prismatic, cubical, octohedral, acicular, etc. Those which are needle-like in form are called "raphides." Cystoliths composed of calcium carbonate are much less common.

Cytoplasm and Nucleus. These are the living portions of the cell. So far as known, there is no difference in the structure of the cytoplasm of animal and plant cells. The nutritive portion of the cytoplasm has been termed the "trophoplasm," and the threadlike portions which are particularly concerned in cell division and other phenomena of motion are called "kinoplasm." The bounding ("limiting") layer of the cytoplasm is called the "Hautschicht." While

cells are young, the cytoplasm fills the entire space between the nucleus and the cell wall, but as the cells increase in size vacuoles (apparently empty spaces) appear, and the cytoplasm merely forms a wall layer connected with the nucleus by constantly shifting strands.

Nucleus. The nucleus is an exceedingly complex structure. An undoubted nucleus has been demonstrated in all groups of plants except in the bacteria, and even here nuclei are being reported. From the seed plants down to the algæ a single nucleus in a cell is the rule, but there are many exceptions. The absolute size of nuclei is exceedingly variable. As a rule, it may be said that large cells have large nuclei. The nuclei of reproductive cells are generally larger than those of the vegetative cells of the same plant. The nuclei of the lilies, orchids, and conifers are usually large, while those of mosses and dicotyledons are small. For example, the nucleus of the egg of the common Austrian pine (*Pinus laricio*) can be seen with the naked eye, being 0.006 inch in diameter, and the nucleus of the egg in some cycads reaches a diameter of 0.02 of an inch; while the nuclei of some of the fungi are scarcely 0.00008 inch in diameter. The nuclei of the lilies, which are seldom more than 0.002 inch in diameter, may be regarded as unusually large, and they have been studied more than any other plant nuclei.

Form of Nucleus. The nucleus in young cells is usually spherical, but as cells grow older its form may change in innumerable ways. When cells become elongated, as in the development of vascular tissue, the nuclei may also elongate, the length becoming 100 times as great as the breadth. In the mucilaginous sap of some amaryllises nuclei have been observed in which the length had become more than 5000 times as great as the breadth. In the endosperm of Indian corn the nuclei acquire remarkable reticular forms, while in some of the stonecrops (*Sedum*) they become variously lobed. In some pollen grains one of the nuclei becomes so amœboid in form that it is easy to believe that it may be capable of amœboid movements, and in one of the slime molds such movements have actually been observed.

Division of Nucleus. It is accepted that a nucleus never arises *de novo*, but only by the division of a preëxisting nucleus. The principal structures concerned in division are the chromosomes, the spindle (achromatic figure), and, in some plants, the centrosome. The last structure, however, is not so constantly present as in animals, and many believe that it does not exist at all in the fern plants (pteridophytes) and seed plants (spermatophytes). In the cells which produce pollen grains the spindle first appears as a weft of fibres surrounding the nucleus, which become grouped into cones forming a multipolar spindle, that gradually becomes bipolar. In ordinary vegetative cells the spindle is bipolar from the start, making its appearance as a pair of dome-shaped caps at opposite poles of the nucleus. The chromatin is generally regarded as the most important part of the nucleus, as it is believed to be the morphological basis of heredity. During division the chromatin assumes the form of a narrow band which divides into a definite number of more or less elongated pieces, the chromosomes. The number of chromosomes is constant in a given species, and the number in the sexless generation (sporophyte) is always double the number found in the sexual generation (gametophyte). The reduction in number takes place during the formation of spores. When the nucleus of the sperm fuses with that of the egg, the double number is restored. The splitting of the chromosomes in the vegetative divisions, and perhaps also in the divisions concerned in the reduction of chromosomes, is longitudinal. Some of the fibres of the spindle become attached to the chromosomes, half the number being drawn to one pole and half to the other, while a series of granules, the beginning of a new cell wall, appears on the fibres which stretch between the young nuclei. The wall becomes completed as the fibres disappear. In the formation of the endosperm of seeds, and in some other cases, nuclear division may take place without being followed by the formation of a cell wall—a phenomenon called free nuclear division. See FERTILIZATION; CYTOLOGY.

CEL'LA (Lat., cell). The name applied to the central chamber, or *naos*, of a Greek or Græco-Roman temple. See CELL; TEMPLE.

CELLAMARE, thā'lyä-mä'rā, ANTONIO DEL GIUDICE, DUKE OF GIOVENAZZO, PRINCE OF (1657–1733). A Spanish diplomat, born in Naples, a grandee of Spain, son of the Duke of Giovenazzo, and nephew of the Cardinal del Giudice. He was trained at the Spanish court and during the War of the Spanish Succession was an active partisan of Philip V. In 1715 he was appointed Ambassador to France, where he was the leading figure in the conspiracy to effect the overthrow of the Duke of Orleans and obtain the French regency for Philip V. Although the plot was discovered in time to prevent its being carried out, the discovery brought to light such high offenses against the government of the regent that the latter was obliged to declare war on Spain, Jan. 9, 1719; a war which was disastrous for Philip V. When arrested, Cellamare appealed to the Corps of Diplomats to save his house from being examined by the authorities, but the Diplomats declined to interfere, as they recognized that the French government was acting well within its rights, and even generously, since, instead of keeping Cellamare in prison it conducted him to the frontier and set him at liberty. Consult Martens, *Causes célèbres du droit des gens* (2d ed., Leipzig, 1861).

CELLA'RIUS, CHRISTOPH (1638–1707). A German classical scholar, born in Schmalkalden (Hesse-Nassau). He was educated at the universities of Jena and Giessen and, after holding posts as instructor or rector in various gymnasia, was appointed professor of history and eloquence at Halle in 1693. By his manuals he promoted the knowledge of ancient grammar, style, geography, and history, and by his editions of Latin authors greatly encouraged classical studies in Germany. Among his works are *Orthographia Latina* (new ed. by Harles, 2 vols., 1768) and *Notitia Orbis Antiqui* (new ed. by Schwarz, 2 vols., 1773). Consult Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

CELLE, tsĕl'le. A town in the Prussian Province of Hanover, situated on the left bank of the navigable Aller, 23 miles northeast of Hanover (Map: Prussia, D 2). It consists of the old town and of a number of suburbs annexed to it during the second half of the nineteenth century. Among the notable buildings are the castle, formerly (1369–1705) the residence of the dukes of Brunswick-Lüneburg; a

number of old churches with monuments of royal personages; the Rathaus, dating from the sixteenth century; and a museum with a complete collection of old army uniforms. A Catholic church contains the vault of the dukes of Brunswick-Lüneburg. The chief products of the town are woolen yarn, printer's ink, soap, tobacco, honey, and wax. It has a considerable trade in lumber and salt. Celle is the seat of the supreme court of the province, and has a forestry school, a gymnasium, a library of over 50,000 volumes, including a number of manuscripts. Pop., 1890, 18,901; 1900, 19,872; 1910, 23,300.

CEL'LIER, ALFRED (1844–91). An English musician, born at Hackney. He was appointed organist of All Saints', Blackheath, in 1862, and of St. Albans, London, in 1868. From 1877 to 1879 he was the conductor of the Opera Comique, London. His works include some popular songs and part songs, compositions for pianoforte and orchestra, and several operettas and operas, including *The Tower of London* (1875), *The Sultan of Mocha* (1876), *The Spectre Knight* (1876), *In the Sulks* (1880), and *The Mountebanks* (with book by W. S. Gilbert; presented in 1892). He also set to music (1881) Longfellow's *Masque of Pandora* and (1883) Gray's *Elegy*.

CELLINI, chĕl-lē'nē, BENVENUTO (1500–71). The most eminent Italian goldsmith of the high Renaissance; also one of its most important sculptors. He was born in Florence, Nov. 1, 1500. In compliance with the wishes of his father, Cellini devoted himself to music until his fifteenth year, but his desire to learn designing prevailed, and he became a pupil of the goldsmith Michelangelo Bandinelli, the father of his lifelong rival, and then of Marconi. He studied also after Michelangelo, copying his famous cartoon of the "Bathing Soldiers." After various adventures and further study, in 1523, as the result of a duel, he was forced to leave Florence, and after wandering from town to town finally went to Rome. Local goldsmiths gave him occupation, and he finally secured the patronage of Pope Clement VII. He soon became recognized as the greatest worker in precious metals of his time. From his autobiography we learn that he was also initiated in "the mysteries of the brass foundry, the methods of hammering iron, the secrets of chiseling steel for medals, and casting dies. . . . Enameling and niello formed special branches of his craft; nor could architecture be neglected." He was employed to fashion silver vases, to design medals and settings for jewels, to enamel bookbindings, cast portraits in bronze, and decorate sword blades—in fact, to exercise his perfect art on court trappings, palace decorations, and the personal adornment of those who figured in the splendid society that existed in the halcyon days of the Renaissance. Nor did his commissions prevent further artistic studies after Michelangelo, Raphael, and the antique. Cellini was in Rome when it was besieged by the Constable de Bourbon, and, according to his own account, it was he who killed both the constable and the Prince of Orange. After the sack of the city he went to Florence, where he was chiefly engaged in designing medals, to Mantua, and then returned to Rome. There he worked under Michelangelo and was again employed by the Pope, especially in designing coins. The murder of a rival in 1534 compelled him to flee from Rome. But after a brief visit to France he again returned, only to be thrown, on a false accusation of defalcation, into the castle of St. Angelo, from which he escaped with great peril. Subsequently, in 1540, Francis I invited him to his court, and Cellini stayed in France five years, the recipient of a pension and title from the King. Aided by numerous assistants, he executed many commissions for the King, such as the bronze relief of the "Nymph of Fontainebleau" (now in the Louvre), a fine specimen of his work, and the celebrated saltcellar mentioned below.

Upon his return from France, where he had alienated himself from every one at the court by his quarrels and eccentricities, Cellini went to Florence, and found a friend there in Duke Cosimo de' Medici. The remainder of his life was spent in Florence, in constant rivalry with the sculptor Bandinelli and in various affrays and adventures. In his fifty-eighth year he began to write his autobiography, and during this time he shaved his unsanctimonious head and retired to a monastery. But two years afterward he returned to the reckless life of his youth. He died in Florence, Feb. 25, 1571, and was buried in the church of the Annunziata.

Most of his surviving sculptures were executed during this last Florentine period. The principal of these is the bronze statue of "Perseus with the Head of Medusa" (1445–54), which is still standing in the Loggia dei Lanzi, Florence. Although a marvel of technical excellence and beautiful in conception, the statue lacks in simplicity of modeling and breadth of treatment and is overwrought in detail. In the four niches of its highly decorative base are small figures of gods unexcelled by anything of the kind in Italian art—and a relief of "Perseus rescuing Andromeda," the original of which is now in the Bargello. The account in his *Autobiography* of the casting of this statue is a classic. Other important statues are the colossal bronze bust of Duke Cosimo I (1545–48, Museo Nazionale, Florence); the bronze bust of Bindo Aldoviti (1566, Gardner collection, Boston); the life-size "Crucifixion" intended for his own tomb, with the figure of Christ in white marble and the cross in black (1562), now in the Escorial. Of the many bronze statuettes ascribed to him we mention only the smaller version of the Perseus (Davilier collection, Paris), and "Ganymede with the Eagle" (Museo Nazionale, Florence).

As a goldsmith Cellini stands unrivaled among the sculptors of the Renaissance. Here his rich decoration and elaborate detail are in place. Unfortunately nearly all of his masterpieces have been melted down. The saltcellar of Francis I (now in the Museum of Vienna) is regarded as his greatest production. It is of embossed gold and enamel, ornamented with figures of Neptune and Cybele in high relief. It was in such examples of decorative work that Cellini excelled. That which required the skill of a perfect craftsman appealed most readily to his imagination. Many beautiful works of the goldsmith's art have been attributed to him with greater or less likelihood, among which are two exquisite cups in the J. P. Morgan and the Altman collections—both now in the Metropolitan Museum of Art, New York. Among his masterpieces, which through stress of time were melted down, was the gold cope button for Clement VII set with precious stones, including the second largest diamond in the world. Cellini

BENVENUTO CELLINI

"PERSEUS"

FROM THE STATUE IN THE LOGGIA DEI LANZI, FLORENCE

was also the first medalist of his day, in such works as "Hercules and the Nemean Lion," in gold repoussé; "Atlas supporting the Sphere," in chased gold; and medals of Clement VII and Francis I. But Cellini's greatest fame is due not to his art but to his well-known *Autobiography*—an invaluable narrative, not only as an account of his own turbulent, brilliant career, but as a vivid picture of the life and civilization of the Renaissance. The *Autobiography* is, moreover, a highly important monument of literature. Cellini lived in a time when the passions of men were uncontrolled, and Cellini himself embodied them all. His acts of hatred, theft, murder, and sensuality are all set forth in writing, and he also portrays in strong phraseology the scenes, political, social, and ecclesiastical, that made up the history of his contemporaries. Besides the *Autobiography* he wrote a valuable treatise on the goldsmith's craft and on sculpture (1568), with wood engraving after his own designs; modern edition by Milanesi (Florence, 1857).

Bibliography. The best Italian edition of his *Autobiography* is by Bacci (Florence, 1900); Eng. trans., *The Life of Benvenuto Cellini*, by Symonds (London, 1896), and by Cust (2 vols., ib., 1910). The classic monograph on Cellini with illustrations of all his works is by Plon (Paris, 1882; supplement, 1884). Others are by Molinier in *Les artistes célèbres;* Focillon, in *Les grands artistes;* Supino (Florence, 1904); Torelli (1903); De Bouchard (Paris, 1903); Gailly de Taurines (ib., 1908), and Darvai (Budapest, 1907). See also the monographs on Italian medals and medalists by Heiss (Paris, 1887), Friedländer (Berlin, 1880–82), and Supino (Florence, 1899).

'CELLO. See VIOLONCELLO.

CELL OF PEAUCELLIER, pō's'-lyā'. See LINKAGES.

CELLULAR TISSUE. See CONNECTIVE TISSUE; HISTOLOGY.

CEL'LULI'TIS (Neo-Lat., from Lat. *cellula*, dim. of *cella*, cell). Inflammation of the subcutaneous areolar and connective tissue, presenting successively œdema, swelling, hardness, bogginess, fluctuation, suppuration, and sometimes sloughing. It is caused by pus germs, which find their way into the tissues through a wound, or septic matter as from snake bite. Cellulitis is peculiarly liable to follow scalp wounds and may complicate operative wounds, or injuries incident to parturition. The pain is severe, and there are generally somewhat grave constitutional symptoms, as fever, severe headache, nausea, prostration, loss of appetite, and general weakness. Salines, iron, and sometimes stimulants are useful, with incisions to relieve tension or let out pus. Disinfection of all small wounds is a valuable preventive. See PHLEGMASIA.

CELLULOID, sĕl'ū-loid (Lat. *cellula*, little cell, dim. of *cella*, cell). A substance of modern invention widely used in the arts as a substitute for ivory, leather, and for many other purposes. It consists of a mixture of nitrocellulose in the form of pyroxylin and camphor. A substance derived from pyroxylin and intended to replace India rubber, gutta-percha, was first made in England by Alexander Parkes, of Burry Port, Wales, in 1855, and was given the name *parkesine*. The modern celluloid was invented and patented in America (U. S. Letters Patent No. 88,634) in 1869 by the Brothers Hyatt of Newark, N. J., and works conducted by them under the name of the Celluloid Manufacturing Company were the first to manufacture the product on a large scale. Celluloid is obtained by mixing gum camphor with pyroxylin (guncotton pulp) in the proportion of about two parts of pyroxylin to one of camphor. There are two methods: the dry method, where the pyroxylin, after being well washed and dried, is ground fine under water, and after the removal of the water is subjected to great pressure. It is then well mixed with 40 to 50 per cent of camphor, while the coloring material is added. The mass is subjected again to very great pressure and heated by steam to about 130° C. The melted camphor dissolves the nitrocellulose, and celluloid is produced, which remains in the press for a while and is then dried. The second, or wet, process is to dissolve the finely admixed pyroxylin and camphor in methyl alcohol or in ether and then add alcohol, after which an antacid such as urea is added. The mass is then worked in a masticating machine until it becomes plastic, when it is worked for an hour between cold rollers, and then between rollers which are slightly heated. The mass is next subjected to hydraulic pressure for 24 hours in a room kept at a temperature of 70° F. It is then cut into sheets of the desired thickness and allowed to dry for 14 days. It is also applied to other materials, such as cotton, linen, or paper. Celluloid varnishes for lacquering on metal are also extensively manufactured. These are solutions of pyroxylin in mixtures of wood naphtha, acetone, and amyl acetate. Any color can be given to celluloid by the use of coloring matter during the process of manufacture. Some of the advantages of celluloid, besides its cheapness and durability, are that it takes a high polish, does not warp or discolor, and is impervious to moisture. As ordinarily manufactured, it is highly inflammable; but various modifications of the original processes of manufacture have been made, largely by the use of mineral fillers or other esters of cellulose in place of the very inflammable nitrate.

Bibliography. See Martin, *Industrial and Manufacturing Chemistry—Organic* (New York, 1913); Worden, *Nitrocellulose Industry* (London, 1911); Masselon, Roberts, Cellard, *Le celluloid* (Paris, 1910; Eng. trans. by Hodgson, London, 1912); Ertet, *Die Celluloid Industrie* (1909); Bockman, *Celluloid* (London, 1907); Lehner, *Imitationen* (Vienna and Leipzig, 1907).

CELLULOSE, sĕl'ū-lōs (from Lat. *cellula*, dim. of *cella*, cell). The chief constituent of the cell wall of all vegetable cells. These walls constitute the plant skeleton and also form a protective covering for the sensitive, living protoplasm. The term "cellulose" covers a number of bodies of similar chemical nature, the relative composition of which may be represented by the empirical formula $C_6H_{10}O_5$; their molecular structures are, however, exceedingly complex, probably much more so than that of starch, to which the celluloses are chemically allied. In nature cellulose is normally combined with woody, fatty, or gummy substances. A typical form, from which pure cellulose can be easily isolated by chemical methods, exists in cotton and flax fibres. Certain plants, such as peas and beans, the *Coffea arabica* and the *Cocos nucifera*, store reserve food in their seed walls as a pseudocellulose, which in this form undergoes hydrolysis more readily than other cellu-

loses. With some exceptions in the insect world, true cellulose is not found in animal tissues. Although considerable quantities of it are digested and absorbed by the herbivora, the amount which man assimilates is usually relatively small. No digestive enzyme has been observed in the animal body having a specific action upon cellulose; it is considered probable that for its disintegration a coöperation of the living cell wall of the intestine and bacteria of the alimentary tract are necessary. The chief value of its digestion by the animal organism has been assumed to consist in this: that the true foodstuff of the plant cells is liberated and rendered available.

Cellulose makes up more than one-third of the entire vegetable matter in the world. Its stability is so great that considerable quantities are preserved unaltered through the process of formation of coal, in which its presence may be demonstrated by means of suitable reagents. It is manufactured on a large scale from wood, cotton, linen rags, hemp, flax, and similar materials of vegetable origin. Being insoluble in all ordinary solvents, it may be readily separated from the other constituents, which are soluble in water, alcohol, ether, dilute alkalies, or acids. It is soluble in an ammoniacal solution of cupric oxide (Schweitzer's reagent), from which it separates out in a pure state on addition of acid; the precipitate is washed with alcohol, and the cellulose is thus obtained in the form of a white, amorphous powder.

The action of sulphuric acid on cellulose depends largely on the concentration of the acid. Moderately dilute sulphuric acid transforms it in the cold into "hydrocellulose," a friable substance soluble in water. This fact is applied in a process called "carbonization," by which cotton fibres are removed from cast-off cotton-woolen material, the wool of which is to be rewoven. If cellulose is dissolved in strong sulphuric acid and the solution is diluted with water, a gelatinous mass separates out, known as *amyloid*, which, like starch, is colored blue by a solution of iodine. In the preparation of vegetable parchment unsized paper is immersed for a few seconds in concentrated sulphuric acid, and then immediately washed with water. A film of amyloid forms over the surface, which on pressing and drying gives a tough, durable paper, less permeable by liquids. Another transformation of cellulose, effected by sulphuric acid, may be mentioned here: if digested with strong acid, it is converted into glucose.

When cellulose has been treated with an alkali, as in the *mercerizing* process, and then exposed to the fumes of carbon disulphide, it goes into solution as cellulose xanthate. By further treatment this solution yields *viscose* films and threads, the latter known as "viscose silk." Viscose is used also for sizing, waterproofing, in textile printing, and mixed with metallic dust and coloring matter furnishes an artificial leather. *Viscoid*, which is a hard mass obtained by mixing viscose with various substances, is used for moldings, cornices, etc. *Cellulose acetates* are also obtained by the action of acetic anhydrides on cellulose in the presence of sulphuric acid. These acetates find numerous applications as films and insulating coatings.

With strong nitric acid cellulose forms explosive nitrates known as nitrocelluloses, the composition of which depends on the strength of the acid employed and the duration of the reaction. *Collodion* is a solution mainly of the trinitrate and the tetranitrate of cellulose in a mixture of alcohol and ether. Besides its importance in medicine, photography, and in many other ways, collodion forms the basis for a well-known form of artificial silk, that of Chardonnet or Lehner. By dissolving in molten camphor the nitrates employed for collodion, *celluloid* is produced. *Guncotton* is a hexanitrate of cellulose, obtained by the prolonged action of a mixture of concentrated nitric and sulphuric acids. *Blasting gelatin* is guncotton mixed with nitroglycerin; mixed with other substances, guncotton enters into the composition of many smokeless powders.

If distilled in retorts, out of contact with air, cellulose is decomposed with formation of methyl alcohol, formic acid, acetic acid, acetone, and various hydrocarbons. All of these products are obtained also in the destructive distillation of wood. The most important use of cellulose, by far, is in the manufacture of paper. For cheaper grades of paper, the impure cellulose of wood pulp is employed; better grades are manufactured from cotton and linen rags. Consult Bersch, *Cellulose* (Philadelphia, 1904); Cross and Bevan, *Researches on Cellulose* (London, 1895, 1901, 1906, 1912); Cross, Bevan, and Sindall, *Woodpulp and its Uses* (London, 1911); Worden, *Nitrocellulose Industry* (London, 1911); Schwalbe, *Die Chemie der Cellulose* (Berlin, 1912).

CELMAN, sāl'mȧn, MIGUEL JUAREZ. See JUAREZ CELMAN, MIGUEL.

CELSIUS, sĕl'sĭ-ŭs *or* sĕl'shĭ-ŭs, ANDERS (1701–44). A Swedish astronomer, born at Upsala. From 1730 to 1744 he was professor of astronomy in Upsala University. He undertook a journey to prominent observatories of Europe in 1732 and in 1740 built the observatory at Upsala and was appointed its director. In 1733 he published a collection of 316 observations, most of which he had made himself, of the Aurora Borealis. In 1737 he took part in the French expedition sent to measure one degree of meridian in the polar regions. He was one of the first to call attention to the subsidence of the sea level off the northern coast of Sweden and urged the introduction of the Gregorian calendar to supersede the Julian. In his monograph *On the Measurement of Heat* (1742) he presented the first idea of the centigrade, also known as the Celsius, thermometer. He published, among other scientific treatises, *De observationibus pro figura Telluris determinanda in Gallia habitis disquisitio* (Upsala, 1738).

CELSIUS, OLOF VON (1716–94). A Swedish historian. He was born in Upsala, where he became professor of history in 1747. He was appointed Bishop of Lund in 1777. In 1742 he founded the first literary journal in Sweden. His works on Gustavus I and Eric XIV are characterized by careful investigation and strict truthfulness. He died while engaged upon his celebrated work, *Svea rikes kyrkohistoria*, which is the first attempt at a compilation of Swedish church history. Two of his best-known histories are *Konung Gustaf I's historia* (1746–53) and *Konung Erick XIV's historia* (1774).

CEL'SUS (Gk. Κέλσος, *Kelsos*). A Greek philosopher of the second century, the earliest literary opponent of Christianity. He wrote, in 177 or 178, an attack on Christianity, called Λόγος Ἀληθής, or *A True Discourse*. This work

has been lost, but by means of Origen's reply, the *Contra Celsum*, it has been ingeniously reconstructed by Keim (*Celsus wahres Wort wiederhergestellt*, 1873). See ORIGEN.

CELSUS. One of the adventurers, fancifully styled by Trebellius Pollio the "Thirty Tyrants," who, between 260 and 267 A.D., rose to usurp the Imperial throne of Rome. A military tribune, resident in Africa, he was proclaimed Emperor by Vibius Passienus, proconsul of the province, and others; but on the seventh day of his ill-starred reign he was murdered in Sicca.

CELSUS, AULUS CORNELIUS. A Latin physician and writer, who flourished probably in the reign of Tiberius. He was called the Roman Hippocrates (q.v.), because he generally followed the great "father of medicine," and introduced the Hippocratic system among the Romans. Celsus wrote not only on medicine, but also on rhetoric, history, philosophy, the art of war, and agriculture. His style is succinct and clear, but full of Græcisms. Only part of his encyclopædic work survives, the *De Medicina*, which is divided into eight books. The portions relating to surgery are exceedingly interesting and valuable, because Celsus has there given an account of the opinions and observations of the Alexandrian school of medicine. The standard edition is that of Daremberg (Leipzig, 1859). It has been translated into English by J. Grieve (3d ed., Edinburgh, 1837).

CELT. An implement used among the primitive peoples of every part of the world. The term is from the Welsh *cellt*, which signifies a flint, or flintstone—a typical form of the implement. In developed form it is a chisel or grooveless axe of any hard stone, used either with or without a haft, in the former case hafted either in line with or transverse to its length and edge. In its nascent form it is an elongated pebble or other stone of convenient size, used in the hand with centripetal (i.e., inward and downward) strokes. Next to the hammerstone it is the most primitive implement used by man. For illustration, see ARCHÆOLOGY, AMERICAN.

CEL'TIBE'RI (Lat. nom. pl., from *Celtus*, Celt + *Iberus*, Iberian, Gk. Κελτίβηρες, *Keltibēres*). A powerful people of ancient Spain, supposed to have sprung from a blending of the Iberians or Spanish aborigines with Celtic invaders from Gaul. They inhabited a large inland district, corresponding to the southwest half of Aragon and the northern and eastern parts of Castile, but the name "Celtiberia" had often a wider signification, including the country as far south as the sources of the Guadalquivir. The Celtiberi were divided into four tribes, and were unquestionably one of the bravest and noblest peoples in the peninsula. Their cavalry and infantry were equally excellent. They were finally conquered by the destruction of Numantia, one of their chief towns, by Scipio Africanus Minor in 133 B.C. They later joined Sertorius, but after his death became quite Romanized in customs, language, and dress.

CELTIC, sĕl'tĭk, or **KELTIC,** kĕl'tĭk, **CHURCH** (Lat. *Celticus*, from *Celtæ*, Gk. Κέλται, *Keltai*, or Κελτοί, *Keltoi;* originally meaning 'high' and probably connected with Lith. *kéltas*, high, *kálnas*, hill, Lat. *celsus*, high, Gk. κολωνός, *kolōnos*, hill, less plausibly connected with OIr. *Goidel*, Gael. *Gaidheal*, *Gael*, Gael). The earliest Christian church in Great Britain and Ireland. It is not definitely known when Christianity was there introduced. Roman tradition puts it in the second century as the result of a request from King Lucius of Eleutherius, Bishop of Rome from 177 to 193; others argue for the same period, only they connect it with the fierce persecution at Lyons, which drove Christians across the English Channel. These fugitives carried with them the Eastern form of Christianity which the Lyons church had. In the third century Christianity existed in Britain; and in the fourth, bishops from that country signed conciliar rolls. In the fifth century the British Province of Britain was essentially Christian. In the sixth century the invading Saxons drove the Celts into the mountains of Wales, and there four bishoprics existed. Augustine was sent to England by Gregory I in 596, and so the Roman form of Christianity, which in some details differed from the Celtic form, especially as to the date of observing Easter, which the Celts in common with the Eastern church observed on the 14th of Nisan, on whatever day of the week it came, first found lodgment on British soil. In 603 a conference was held by Augustine with some Celtic bishops, but his haughty bearing alienated them. Gradually, however, the Roman form encroached upon the Celtic, and in 777 the last station in South Wales had conformed to Rome. Still the Celtic church was not extinct farther north, but it was declining; and in 1172 it was reformed upon the model of Rome.

Christianity existed in Ireland before the landing of St. Patrick on its shores (c.433), but he was the means of winning the greater part of the island to the Christian faith. The Scottish church was strengthened by Irish monks, who, coming with St. Columba about 563, carried on missionary operations from Iona as a centre, and especially in Northumbria. In 664 the Celtic church in Northumbria conformed to the Roman model, and so its separate history ended, as was the case in Scotland in 1153. In Ireland, the merging of the Celtic into the Roman rite was completed in the same year, and henceforth England, Scotland, and Ireland were Christian without variant rites and ceremonies. See CULDEES.

CELTIC LANGUAGES. A group of languages, both ancient and modern, belonging to the Indo-European family, and now comprising Welsh, Breton (Armoric), Irish, Scottish, Gaelic, and Manx. The connection of the Celtic languages with the Indo-European family has been recognized since the publications of Pictet (1837) and Bopp (1838), but the scientific study of them dates principally from Johann Caspar Zeuss, whose *Grammatica Celtica* (1853) laid the foundations of modern Celtic philology. His work has been continued by a series of distinguished scholars both in the British Isles and on the Continent, and rapid progress has been made in all departments of the subject. But in spite of the large number of contributions to this field of research made in recent years, Celtic studies may yet be called new, and it will be some time before these languages are as fully understood or the literatures as thoroughly analyzed as those, e.g., of the Germanic and Romance peoples. The main characteristic of the Celtic group, as distinguished from the other groups of the Indo-European family, is that, before it was separated into dialects, the letter *p*, which was preserved everywhere else, had

disappeared from it without leaving any trace whatever. Thus, a Latin, Greek, or Sanskrit word containing an initial or medial *p* will appear in that family without that consonant (e.g., Latin *porcus*, Old Irish *orc;* Latin *plenus*, Breton *leûn*). With regard to the other members of the Indo-European family, the Celtic group stands linguistically, as it does geographically, in closest relation with the Italic and Germanic. Certain common characteristics of the Celtic and Italic (e.g., the formation of the passive and deponent in *r*, as well as of the *b*-future and other tense stems) have led to the assumption of a common Italo-Celtic language. The Celtic languages themselves fall into two main divisions, the Continental and the Insular. Of the Continental Celtic, or Gaulish, we shall know very little beyond what is now known, because no literary monuments of them have been preserved. While, as late as the second century of the Christian era, Gaulish was still the universal language of ancient Gaul, it was so rapidly driven out by Latin that by the fourth century no more vestiges of it were left. The Armorican peninsula, however, was won back to the Celtic domain by invasions of Brythonic tribes from the British Isles. Inasmuch as the Druidical tradition was purely oral, the only remains of Gaulish that we possess consist of inscriptions and coins, which yield little besides proper names. Additional material of the same sort is found in the Greek and Latin historians, but at times so corrupted by the forms of these languages that it is difficult to determine the original Gaulish word. The Insular Celtic consists of two groups of languages—the Gaelic, or Goidelic (comprising Irish, Scottish Gaelic, and Manx), and the British, or Brythonic (comprising Welsh, Cornish, and Breton). The criterion according to which this classification is made is that an Indo-European *q* (preserved in Sanskrit and Slavic as *k*, in Greek as π or τ, in Latin *qu*, Gothic *hw*, etc.) appears in the Goidelic group as *k* (written *c*) and in the Brythonic group as *p*. Thus, to the Latin *quinque* corresponds in Old Irish *cóic*, but in Welsh *pump*, in Cornish *pymp*, and in Breton *pemp*. Furthermore, an Indo-European initial *s* persists in the Goidelic group, but becomes *h* in the Brythonic. Thus, Latin *serus*, primitive Celtic *sē-ro-*, becomes *sír* in Old Irish, but *hír* in Welsh, Cornish, and Breton. The Gaulish, or Continental Celtic, approaches the Brythonic in changing the *qu* to *p*, but at the same time it preserves the initial *s*. Hence it cannot be classified with either group. Pictish has sometimes been classed with the Celtic languages, but most scholars incline to regard it as not Indo-European. Of the six Insular Celtic languages, five are still living. Cornish died out towards the end of the eighteenth century. Welsh and Breton are each spoken to-day by more than a million of people; Irish by more than half a million; and Scottish Gaelic by somewhat fewer. These languages, however, do not constitute the sole vernacular of the people, most of whom speak also either English or French, according to their nationality. Manx seems likely to die out in the near future, unless it is rescued by the earnest agitation now going on in all the Celtic countries for the preservation of their national tongues. See NEO-CELTIC MOVEMENT.

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CELTIC LITERATURE. See BRETON LITERATURE; CELTIC LANGUAGES; CORNISH LANGUAGE AND LITERATURE; IRISH (GAELIC) LITERATURE; MANX LITERATURE; SCOTTISH (GAELIC) LITERATURE; WELSH LANGUAGE AND LITERATURE; and the bibliography appended to each of these articles.

CELTIC MUSIC. Welsh and Irish music are inseparably connected, for although each country developed its music in accordance with its own traditions and local forms, the bard was the dominant influence which shaped its general character alike in both Wales and Ireland. Poetry was universally identified with music, and musical instruments were used independently only to furnish dance or march music. In the course of time these conditions were changed, but it was not until the decline of the bards that instrumental soloists became a factor in the development of Celtic music. From the earliest historical times, when in the eleventh century a Welsh chieftain summoned Welsh and Irish bards to a great music conference, down to the seventeenth century, when distinctive Celtic music ceased to be written, the musical histories of Ireland and of Wales follow much the same general plan; and, to a certain extent, early Scotch music (q.v.) may be associated with them.

Welsh music was founded by, and for centuries identified with, Druidism. Its influence is apparent even in the modified form of those old songs which still exist. The cadences are savage, weird, yet sad, and far superior artistically to their Irish parallels. The direct reason for this superiority is the fact that the Welsh harp had a perfect diatonic scale, while in Ireland the early scale had but five tones. This diatonic scale made possible the full cadences and great range of melody which is noteworthy in the early pastoral music of Wales, and which distinguished it from both the Scotch, with its abrupt changes from major to minor, and the less complete Irish. Traditionally Celtic musical instruments were introduced into Britain by the Phœnicians, but there is no historic basis for such a belief. The principal Welsh musical instruments were the *telyn*, or harp; the *crwth*, or sort of a violin; the *pîbgorn*, or hornpipe; the *pîb-braich*, or bagpipe; the *tadwrdd*, a drum; and the *cornbuelin*, or bugle horn.

Irish Music.—The exact number and position of the tones in the original Irish scale have been long a subject of discussion. All that we can be sure of is that at first only five notes were used, and that later a sixth and a seventh were added. The melodies were very similar to the Scotch, with the important exception that the Irish avoided the abrupt and violent modulations so much used by the former. Dance music, of which there is a great variety, was mostly written in six-eight time. The seventeenth century marked the appearance of foreign musicians in Ireland and the rapid decline and final disappearance of a national music. The early Irish musical instruments were the harp; the bagpipe, distinguished from the Scotch pipe by being blown upon by bellows, instead of from the lips; the *ben-baubhill*, a horn of a wild ox or buffalo; the *buinne*, a metal trumpet; the *corn*, a long, curved tube; the *stoc* and the *sturgan*, small trumpets; the *musical branch*, an instrument adorned with single bells; and the *tympan*, a stringed instrument played with a bow. Of these, by far the most important was the harp, with its large number of strings and its scale of fixed semitones. In the latest period of Irish music (towards the end of the eighteenth century) there was great uniformity in the compass, the scale, and the method of playing the harp. The ordinary compass was from C below the bass staff to D above the treble staff; and the scale was generally that of G, though sometimes C was used. Almost certainly, however, this uniformity was of comparatively recent date. Some of the oldest harps are the so-called harp of Brian Boru, preserved at Trinity College, Dublin, and having 30 strings; that of Robin Adair at Hollybrooke, with 37 strings; and the Dallway harp, dating from 1621, and having 52 strings. Among the many famous harpists were: Turlogh O'Carolan; Carroll O'Daly, the author of "Eileen Aroon," appropriated by the Scotch as "Robin Adair"; Myles Reilly; and Thomas and William Conallon. Consult: Grove, *Dictionary of Music and Musicians* (London, 1906); D. MacDonald, *Irish Music and Irish Scales* (London, 1910); collections of Irish music by Bunting (1796, 1809, 1840), and by Petrie, in connection with the Society for the Preservation of Irish Music (1855); also collections of Welsh melodies by Parry and by J. Thompson.

CELTIC PEOPLES. A general designation applied to an ensemble of ethnic groups constituting the predominant element in central and western Europe before the rise of the Roman power and the influx of the German tribes, and speaking a language known to us as Celtic. See CELTIC LANGUAGES.

By various early writers the users of Celtic dialects or languages were treated as a distinct ethnic stock or race, known as the Celts or Kelts; but this view is now generally abandoned.

Thus, Keane (1899) observes that the languages are spoken by peoples of so many types that the word "Celt" "has long ceased to have any ethnical significance"; Ripley (1899) says of the term that "a very grave objection to its use pertains"; and Deniker (1900) declares "there is no 'Celtic' type or race."

The Celtic-speaking peoples occupied in antiquity a very wide territory. Radiating from central Europe, which is their earliest ascertainable seat, they spread far into the west, the south, and even the southeast. The date of their settlement in Gaul is doubtful, being variously estimated from 1200 to 700 B.C. They invaded Italy in the fourth century B.C., and in the third century made their way into Greece and as far as Asia Minor. It is inferred from a statement of St. Jerome that a Celtic language continued to be spoken in Galatia until the fourth century of our era. The height of the power of the Celtic peoples was probably about 400 B.C. Before that time they had begun to feel the pressure of the Germanic tribes to the north and east of them, and in the centuries that followed the Roman Empire succeeded in subjugating a large part of the Celtic territory. In the British Isles they continued for centuries to maintain their independence.

Beyond these few general facts our knowledge of the history of the Celtic-speaking peoples is obscure, as is indicated by the diverse views concerning their relations to other Eurasian groups. Their mythology embraced earth gods and various sylvan genii, together with sun or fire deities, and was peculiarly rich in elfin demons and tutelaries, which still pervade the lore of peoples of Celtic ancestry. There were traces also of zoic tutelaries, or beast gods, though this phase of mythologic development appears to have been practically past before the records began; and, as among other branches of the Aryan stock, tradition ran back into the haze of half-deified culture heroes. The social mechanism was dominated by fiducial or ecclesiastical factors, as illustrated by the hierarchic power of the Druids (see DRUID), an order of priests or shamans who performed sylvan rites and practiced magical ceremonies surviving long in the form of ordeal and augury, exorcism and obsession; and the clan system was so deep-rooted as still to survive with vestiges of maternal organization clearly traceable, not only in the avuncular descent of authority in the Highland clans, but in the witchcraft so vividly depicted by Shakespeare. The germ of literature appeared in the Oghams and Oghamic inscriptions of Ireland, i.e., in semiarbitrary characters incised in stone or wood or used in other ways in simple records of men and events. According to Logan (*The Scottish Gael*, 1855) and others, there was a definite Gaelic alphabet of 18 letters, each symbolizing a tree or shrub, and in still earlier times there was a widespread symbolic system embracing the cross, the fylfot or swastika, the trefoil or trivet, and other figures; while in some degree the symbolism ran into colors and weaves, as illustrated by the Highland tartans. In most of the Celtic groups the musical and poetic elements essential to literary and dramatic development were fostered by classes of popular entertainers—bards, pipers, minstrels—who chanted tribal traditions or played and sang patriotic airs, and at a later period sang folk ballads or recited folk tales, and thus prepared the way for that dramatic and oratorical talent for which the Celtic peoples and their descendants are still distinguished. As summarized by Brinton, "The Irish possessed a sparse literature, going back to the eighth century, and the Welsh to the twelfth, while the oldest Scotch or Breton songs date at the farthest from the fourteenth century" (*Races and Peoples*, 1890, p. 155).

Briefly, then, the Celtic tongues flourished before the beginning of written history and contributed in important measure to the character and vigor of the Aryan tongues, as the vernacular of several of the most distinctive and diverse of the vigorous peoples of central and western Europe, up to a time well within the historical period. They give a stamp to early and even modern literature written in the English. Some of them survive as oral rather than literary languages, but all of them are gradually disappearing.

Consult: Brinton, *Races and Peoples* (New York, 1890); Rhys and Jones, *The Welsh People* (London, 1900); Thébaud, *The Irish Race* (Philadelphia, 1873); Beddoe, *The Races of Britain* (London, 1885); Logan, *The Scottish Gael* (London, 1855); Prichard, *The Eastern Origin of the Celtic Nations*, ed. by Latham (London, 1857); Roemer, *Origins of the English People* (New York, 1887); Keane, *Man, Past and Present* (Cambridge, Eng., 1899); Ripley, *Races of Europe* (New York, 1899); Deniker, *The Races of Man* (London, 1900); Nicholson, *Keltic Researches* (London, 1904); Dottin, *Manual pour servir à l'étude de l'antiquité celtique* (Paris, 1906); Rolleston, *Myths and Legends of the Celtic Race* (London, 1911); Dinan, *Monumenta Historica Celtica* (London, 1911); MacCulloch, *The Religion of the Ancient Celts* (London, 1911); Henderson, *Survivals in Belief Among the Celts* (Glasgow, 1911).

CELTIC VERSION. See BIBLE.

CEL'TIS. See HACKBERRY.

CEMBAL D'AMOUR, sän'bäl' dä'mōōr' (Fr., clavichord of love). A musical instrument belonging to the clavichord family, invented by Gottfried Silbermann early in the eighteenth century. Its form was that of an English spinet. The strings were twice as long as those of the ordinary clavichord; and when touched, the keys struck the central node of the string, both halves of which vibrated simultaneously, thus producing a double volume of sound. There were two bridges instead of one, as in the clavichord, and two sound boards, of unequal forms and dimensions. The cembal d'amour stands between the clavichord and the pianoforte.

CEM'BRA NUT. See PINE.

CEMENT, sē-mĕnt' *or* sĕm'ent (OF. *cement, ciment*, Sp., Portug., It., *cimento*, from Lat. *cæmentum*, rubble, from *cædere*, to cut). Any composition which at one temperature or degree of moisture is plastic and at another temperature and degree of moisture is tenacious, and which, because of these qualities, is employed for uniting metals, stone, glass, wood, or other materials. Solder, gums, putty, mucilage, glue, plaster of Paris, limes, and hydraulic cements are all comprehended in this definition. The most important class of cements, structurally and commercially, is that comprising lime, hydraulic lime, and hydraulic cement. The cements of this class will be described first. In engineering, the term "cement," when not qualified, is generally understood to signify Portland cement.

Lime. Lime, common lime, quicklime, or caustic lime, as it is variously named, is produced by burning limestone, generally in upright kilns, until the carbonic acid has been driven off. The clinker resulting from this burning possesses the property of disintegration or slaking upon being treated with a sufficient quantity of water. The slaking of lime is due to its rapid hydration when in contact with water, and the process is accompanied by a material increase in volume and a considerable evolution of heat. If the quantity of water be just sufficient to cause the hydration of the lime, it is reduced to a dry powder, while if the water be in excess it becomes a paste. The slaked lime thus formed, when mixed to a paste with water and allowed to stand in the air, has the property of hardening and firmly adhering to any surface with which it may be in contact. This hardening of common limes will take place only in air. When lime is very pure and its activity very great, it is known as rich, or fat, lime; if lime contains, either mixed with it or in combination, considerable amounts of inert impurities which lessen the activity of the lime, cause a partial loss of the property of slaking, and diminish its power of hardening, it is known as poor, or meagre, lime. The common method of slaking lime consists in covering it with from two to three times its volume of water, and allowing it to stand until all the lumps are reduced and the mixture is in the condition of a thick paste. Where mechanically hydrated, lump lime is first crushed or ground and to the granulated lime is added a definite quantity of water, sufficient to combine chemically with the lime. One type of hydrator (the Clyde) operates intermittently on separate batches of lime, and another (the Kritzer) operates continuously. The product of the mechanical hydrator is a fine, dry powder which may be shipped in paper bags. For use in construction, lime paste is mixed with from two to three times its volume of sand, when it is called lime mortar. The process of hardening of lime mortar consists in the gradual formation of carbonate of lime through the absorption of carbon dioxide from the air, accompanied by the crystallization of the mass of hydrated lime as it gradually dries out. The hardening process is a slow one at best, and the lime mortar used in the interior of thick masses of masonry, where the air cannot get at it, will take years to become hard. Lime mortar should be used only in masonry exposed to the air.

Hydraulic Lime. Hydraulic lime is obtained by burning limestone containing enough silica and alumina to impart to it the ability to harden under water. In calcination the silica and alumina combine with a portion of the lime to form silicates and aluminates of lime, leaving the remainder of the lime as free lime in an uncombined state. When treated with water, the free lime is slaked. The manufacture of hydraulic lime is practically confined to Europe, and consists, after the quarrying of the rock, of burning, slaking, and bolting the material. The burning is accomplished in kilns, and is a process requiring considerable skill and careful attention. To slake the clinker it is spread in layers from 4 inches to 8 inches deep and sprinkled with water. The object is to slake the free lime without hydrating the silicates and aluminates. After the lime has been reduced to powder by slaking, it is passed through sieves and packed for shipment. Hydraulic lime is used in the same manner as common lime, being mixed with water and sand to a paste. When in the air hydraulic lime acts like common lime, slowly absorbing carbon dioxide, drying, and hardening. In water the action of hydraulic lime is altogether different from that of common lime, since, owing to the presence of the silicates and aluminates of lime, the hydraulic lime hardens under water, while the common lime does not.

Hydraulic Cements. Hydraulic cements are classified as natural cements, Portland cements, and puzzolanic cements. *Natural cement* is the product obtained by calcining at a low temperature a natural limestone without pulverization or admixture of other materials, and finely grinding the clinker. In Europe these cements are called Roman cements, and they were first manufactured in England in 1796, by James Parker. Natural cements began to be manufactured in France about 1825; in the United States natural-cement rock was discovered while building the Erie Canal in New York, in 1818, and cement manufactured from it was used in the construction of the locks and walls of the canal. France and the United States are the principal producers of natural cement, their respective outputs having been 2,000,000 barrels and 8,800,000 barrels in 1900. In 1910 the production in the United States had decreased to about 1,000,000 barrels, and in 1912 it was even less, but a large proportion of the cement made in France is still of the natural type. The principal centres of natural-cement manufacture in the United States are: Ulster County, N. Y.; the Lehigh valley, Pennsylvania; Mankato, Minn.; Louisville, Ky.; and Utica, Ill. The rock employed is an argillaceous limestone. The process of manufacture consists in mining and quarrying this limestone, breaking it into lumps about the size of one's hand, calcining these lumps with coal in kilns, and finally crushing and grinding the clinker. Natural cements are characterized by a very rapid set and slowness in gaining strength subsequently; they have less initial strength than Portland cement, but in some instances they have attained, after long periods, equal or even greater tensile strength than Portland cements.

Portland cement was made first by Joseph Aspdin, of Leeds, Eng., and was thus named from its resemblance, when set, to the then well-known building limestone quarried at Portland Isle, England. Portland cement is the product obtained by calcining to incipient vitrifaction an intimate artificial admixture of properly proportioned calcareous and argillaceous raw materials, and finely grinding the clinker. Chemically Portland cement is a combination consisting principally of silicates and aluminates of lime, and the raw materials must necessarily contain silica, alumina, and lime. Within these limitations a great variety of raw materials are capable of being utilized for cement making; in England chalk and clay are used principally; in Germany and France marl and clay and limestone and slate are employed. In the United States limestone and clay or shale, marl and clay, argillaceous limestone and purer limestone, as well as blast-furnace slag with limestone, are used. The first process in the manufacture of Portland cement is the grinding and mixing of the raw materials. This mixture must be uniform and homogeneous, and the respective ingredients properly proportioned, which requires that

they be reduced to a fine powder. The method of reduction practiced depends to some extent, although less now than formerly, upon the character of the raw materials; when readily disintegrable in water, they are usually reduced by one of the wet processes. The wet process proper, formerly extensively used in England, consists in applying an excess of water to the clay and chalk, mixing them in a sort of pug mill to a thin paste, which is run into settling basins, where the water is decanted off as the solid matter settles until the mixture is dry enough to be cut into blocks or bricks. In the semiwet process only enough water is added to reduce the mixture to a plastic condition in the pug mill.

When hard materials incapable of dissolution by water are employed, they are ground dry in grinding mills, the powder being then either slightly moistened and made into bricks, or, where the rotary kiln is used, stored in powdered form. In the wet and semiwet processes the bricks or blocks are dried and then burned in kilns, of which there are several varieties. (See KILN.) In the dry process, drying preliminary to burning is usually unnecessary. In the United States, where the rotary kiln is used most extensively, the dry powder or the wet paste is run into the kiln without previous brick making or drying. Powdered coal is the kiln fuel at more than 80 per cent of the Portland-cement mills in the United States, and crude petroleum is used at nearly all the others. The powdered coal is blown through a tube into the lower end of the inclined rotating kiln, and the incandescent particles of coal constitute a long flame which heats the raw mixture as it travels slowly through the kiln against the flame. The burning or calcination is continued until incipient vitrification of the raw mixture occurs, the resulting clinker being dark green or black in color. To the clinker is usually added less than 3 per cent by weight of gypsum to serve as a retarder, after which the clinker is ground to an impalpable powder, when, after a period of curing, it is ready for use. (See CRUSHING AND GRINDING MACHINERY.) Extreme fineness of grinding is a prime essential of good Portland cement, many brands of which are ground so fine that from 92 to 96 per cent of the powder will pass through a sieve having 10,000 meshes per square inch, and 75 per cent will pass through a sieve having 40,000 meshes per square inch. Portland cement sets slower than natural cement, but attains its maximum strength more quickly.

Puzzolanic cement, or puzzolana, is a term applied to a combination of silica and alumina, which, when mixed with common lime and made into mortar, has the property of hardening under water. Natural puzzolanic cements have been used in Italy from very early times, and are made by grinding certain volcanic tuffs and mixing the powder with slaked lime. These cements are still made and used in Italy and some other parts of Europe. The most commonly employed artificial puzzolanic cement is made from blast-furnace slag and lime. The hot slag, as it comes from the furnace, is run into cold water and becomes granulated. It is ground to fine powder, and then this powder is ground with lime.

The general range in chemical composition of three principal classes of cement is about as follows:

INGREDIENT	Portland	Natural	Puzzolana
Silica (SiO_2) per cent	19. to 25.	19. to 35.5	19.5 to 30.
Alumina (Al_2O_3) " "	5. to 9.	4. to 14.5	9. to 15.
Iron oxide (Fe_2O_3, FeO) " "	2. to 4.	1.5 to 5.1	0.33 to 3.5
Lime (CaO) " "	60. to 64.	30. to 60.	45. to 52.
Magnesia (MgO) " "	0.35 to 4.	1.44 to 25.	0.5 to 4.
Sulphur trioxide (SO_3) " "	1. to 1.75	.....	0.18 to 2.7

Other Cements. In addition to the three principal classes of hydraulic cements just described, there are several other classes of minor importance. *Mixed*, or *blended, cements* include a considerable number of cements which are formed of admixtures of different grades of other cement; of the overburned or underburned portions of the clinker, or of foreign material added to the cement. *Grappier cements* are made by grinding to powder the grappiers left from the slaking and bolting of hydraulic lime. Mixed cements and grappier cements are principally European products. *Sand cement* is the name given to the material formed by grinding together Portland cement and sand to an extremely fine powder and a very intimate mixture. *Surki*, a cement much used in India, is made of one part slaked lime and one-half to one part of finely ground brick dust.

When hydraulic cement powder is mixed with water to a plastic condition and allowed to stand, it gradually combines into a solid mass, and this process of combination is known as the *setting* of the cement. Cements of different characters differ very widely in their rate and manner of setting; some occupy but a few minutes in the operation, while others require several hours; some begin setting immediately, and take considerable time to complete the set, while others stand for a considerable time with no apparent action, and then set very quickly. After the completion of the setting of the cement, the mixture continues to increase in cohesive strength for a considerable period of time, and this subsequent development of strength is called the *hardening* of the cement. The properties of setting and hardening of cement by which a plastic paste is transformed into a hard stone are those upon which the value of cement as a structural material depends. Setting and hardening proceed under water as effectively as in air.

Testing. Previous to its use in structural work, cement is usually tested. The usual tests made are for specific gravity, fineness, rapidity of setting, tensile strength, and soundness. Other tests sometimes made are for chemical composition, compressive and transverse strength, adhesive strength, resistance to abrasion, and permeability to water. The test for fineness consists in determining the proportion of the cement powder which will pass standard sieves. The sieves commonly employed have 2500, 10,000, and 40,000 meshes per square inch. The standard test for rate of setting consists in making cakes of neat

cement about 2 or 3 inches in diameter and ½ inch thick to a stiff paste with water, observing the time when they will bear a needle $\frac{1}{12}$ inch in diameter, sustaining a weight of ¼ of a pound, and noting this as the beginning of setting (initial set); then continuing the observations with a needle $\frac{1}{24}$ inch in diameter, carrying a weight of 1 pound until the material is sufficiently firm to bear this, when it may be said to have attained its final set.

Tests for tensile strength are made by breaking test pieces, briquettes, whose smallest section is 1 inch square, in special tensile testing machines. The cement paste, or mortar, is made into briquettes in small molds and is allowed to remain in the molds until set; the briquettes are then removed and kept in a moist atmosphere for 24 hours and then immersed in water, where they remain until tested. Tests are usually made when the briquettes are 7 and 28 days old, and they consist in pulling the briquette in two and noting the pounds of pull required. The test for soundness consists in placing in air and in water cakes similar to those used in the test for setting, and noting, after a few days, whether checks or cracks have developed, which indicate a tendency to disintegration. This is called the normal test for soundness; accelerated tests for soundness are sometimes made, and consist in immersing the cement cake in either hot or boiling water, or heating it in a hot kiln or in flame, and observing whether cracks develop. Considerable doubt exists as to the value of accelerated tests. Chemical analyses of a cement are of value chiefly to determine uniformity in composition and as a check when the other tests indicate a doubtful cement.

The minimum tensile strengths required by specifications in the United States, based upon the recommendations of the American Society for Testing Materials, are the following values per square inch:

AGE OF BRIQUETTE	24 hours	7 days	28 days
Natural cement (neat)	75 lbs.	150 lbs.	250 lbs.
Portland " "	175 lbs.	500 lbs.	600 lbs.

United States Government Standard Specification. A standard specification agreed upon by United States government engineers, representative consumers and manufacturers of cement, and special committees of several engineering societies, was officially adopted as the United States Government Specification for Portland Cement by executive order, signed by President William H. Taft, April 30, 1912.

The important requirements of this specification are as follows:

Definition.—The cement shall be the product obtained by finely pulverizing clinker produced by calcining to incipient fusion, an intimate mixture of properly proportioned argillaceous and calcareous substances, with only such additions subsequent to calcining as may be necessary to control certain properties. Such additions shall not exceed 3 per cent by weight of the calcined product.

Composition.—In the finished cement the following limits shall not be exceeded:

	Per cent
Loss on ignition for 15 minutes	4
Insoluble residue	1
Sulphuric anhydride (SO_3)	1.75
Magnesia (MgO)	4

Specific Gravity.—The specific gravity of the cement shall be not less than 3.10. Should the cement as received fall below this requirement, a second test may be made upon a sample heated for 30 minutes at a very dull red heat.

Fineness.—Ninety-two per cent of the cement, by weight, shall pass through the No. 100 sieve, and 75 per cent shall pass through the No. 200 sieve.

Soundness.—Pats of neat cement shall remain firm and hard and show no sign of distortion, checking, cracking, or disintegrating, after standing in air or in water for 28 days, and also after exposure to steam for 5 hours.

Time of Setting.—The cement shall not acquire its initial set in less than 45 minutes and must have acquired its final set within 10 hours.

Tensile Strength.—Briquettes made of neat cement, after being kept in moist air for 24 hours and the rest of the time in water, shall develop tensile strength per square inch as follows:

	Pounds
After 7 days	500
After 28 days	600

Briquettes made up of 1 part of cement and 3 parts standard Ottawa sand, by weight, shall develop tensile strength per square inch as follows:

	Pounds
After 7 days	200
After 28 days	275

The average of the tensile strengths developed at each age by the briquettes in any set made from one sample is to be considered the strength of the sample at that age, excluding any results that are manifestly faulty. The average strength of the sand-mortar briquettes at 28 days shall show an increase over the average strength at 7 days.

Brand.—Bids for furnishing cement or for doing work in which cement is to be used shall state the brand of cement proposed to be furnished and the mill at which it is made. The right is reserved to reject any cement which has not established itself as a high-grade Portland cement and has not been made by the same mill for two years and given satisfaction in use for at least one year under climatic and other conditions at least equal in severity to those of the work proposed.

Packages.—The cement shall be delivered in sacks, barrels, or other suitable packages (to be specified by the engineer), and shall be dry and free from lumps. Each package shall be plainly labeled with the name of the brand and of the manufacturer. A sack of cement shall contain 94 pounds net. A barrel shall contain 376 pounds net. Any package that is short weight or broken or that contains damaged cement may be rejected, or accepted as a fractional package, at the option of the engineer.

Inspection.—The cement shall be tested in accordance with the standard methods prescribed in connection with the specification. In general the cement will be inspected and tested after delivery, but partial or complete inspection at the mill may be called for in the specifications

or contract. Tests may be made to determine the chemical composition, specific gravity, fineness, soundness, time of setting, and tensile strength, and a cement may be rejected in case it fails to meet any of the specified requirements.

Statistics. For use in structural work, cements are usually mixed with sand, to form mortar, or with sand and gravel or broken stone, to form concrete. The chief hydraulic-cement-producing countries of the world are the United States, Germany, England, and France, although it is manufactured to a greater or less extent by nearly all civilized countries. In 1900 the United States manufactured about 8,400,000 barrels of natural cement, 8,500,000 barrels of Portland cement, and 450,000 barrels of puzzolanic cement, valued at about $17,000,000. In 1912 the quantities manufactured were approximately 820,000 barrels of natural cement, 82,440,000 barrels of Portland cement, and 92,000 barrels of puzzolanic cement, having a total value of $67,500,000. Germany produces over 30,000,000 barrels of cement yearly, and England about 17,000,000 barrels. France makes annually about 8,000,000 barrels of cement. The principal uses of hydraulic cement are described in the articles on MORTAR and CONCRETE.

Compounds. Besides hydraulic cements, there are many cementing compounds used for various purposes and derived from animal, vegetable, and mineral substances. Animal cements have gelatin and albumin as their basis, while the binding materials of vegetable cements are gums, resins, and wax. Some of these different cements are the following: A cement used for uniting slabs of marble, alabaster, and for many similar purposes consists of plaster of Paris mixed with water to the consistency of thick cream and then applied. The plaster of Paris may be mixed with thin glue, with diluted white of egg, or a solution of gum, instead of with water, and is strengthened thereby. A cement for pipe joints is made of iron borings mixed with sal ammoniac and sulphur. This compound is mixed with enough water to moisten it and then rammed tightly into the joint. The proportions recommended are 1 pound of borings, 2 ounces of sal ammoniac, and 1 ounce of sulphur. For mending earthenware and china, etc., a variety of cements are recommended. For ornamental glass or china which is not subjected to heat or rough usage, Canada balsam that has evaporated until rather hard is a very useful cement; from its transparency it makes an almost invisible joint. The surfaces should be slightly warmed and the balsam brushed over them, after which they should be kept pressed together for a short time. Thick copal or mastic varnish may be used in the same manner. Gum shellac, dissolved in alcohol in sufficient quantity to form a treacly liquid, forms a stronger cement than the above, but its color is objectionable for some purposes. The shellac may be dissolved in naphtha, but the cement thus produced is not equal to that in alcohol. The liquid glue sold in the shops is usually prepared in this manner; another kind is made of a mixture of the solutions of shellac and India rubber. A cement which is sold in sticks consists of shellac or gum mastic fused and molded into a convenient form. It is applied by heating the surfaces to be joined just sufficiently to fuse the shellac and then smearing them thinly with it and pressing them together. If shellac is heated much above its fusing point it becomes carbonized and rotten, and therefore great care must be used in fusing any composition of which it is an ingredient. *Marine glue*, a mixture of shellac and India rubber, is an excellent cement and, when applied with the precautions just alluded to, is so strong that glass or china cemented with it, and then allowed to fall or otherwise broken again, will give way in any part rather than that cemented. Ordinary glue, so much used by joiners and cabinetmakers, is common or impure gelatin (q.v.), obtained by boiling animal substances, as skins, hoofs, etc., in water. As glue dissolves in water, it is an efficient cement only in dry places. A cement which can be used for many purposes is made as follows: Curdle skim milk with rennet or vinegar, press out the whey, and dry the curd at a very gentle heat, but as quickly as possible. When it has become quite dry, grind it in a coffee or pepper mill and next triturate it in a mortar until reduced to a very fine powder. Mix this powder with one-tenth of its weight of new, dry quicklime, also in very fine powder, and to every ounce of the mixture add five or six grains of powdered camphor; triturate the whole well together and keep it in small, wide-mouthed vials, well corked. When required for use, make it into a paste with a little water and apply it immediately. *Cheese cement* is similar in composition and uses. Take two parts of grated cheese and one of quicklime, in fine powder; beat these together with white of egg to form a paste, and use immediately. *Cutler's cement*, used for fixing knives and forks in handles, is made of equal weights of rosin and brick dust melted together; or, for a superior quality, four parts of rosin, one of beeswax, and one of brick dust. *Mahogany cement*, used for stopping cracks and holes in mahogany, may be prepared by melting four parts of beeswax with one of Indian red, and as much yellow ochre as is found requisite to give the color. If shellac be substituted for the beeswax, and less red used, a much better cement is made. *Mucilage* is a name applied to a great variety of sticky or gummy preparations used for fastening paper and other light materials together. It is sometimes a thickened aqueous solution of gum, and sometimes a preparation of dextrin, glue, or other adhesive materials generally containing some preservative substance or compound, as creosote or salicylic acid.

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CEM'ENTA'TION. In geology, the process by which loose materials, such as sands, gravels, and fossil casts, are consolidated into firm rocks. Cementation is caused by the deposition of mineral matter from solutions which have penetrated the loose materials. By this process sands and gravels become quartzites and conglomerates, while the shells of fossils, if calcareous, yield limestones. The most common cementing substances are quartz, calcite, and iron ores. See SANDSTONE; LIMESTONE; CONGLOMERATE.

manifest, as by the payment of a direct tax, certain evidences of capacity and business ability. In 1913 the electoral body comprised about 68 per cent of the male subjects of voting age.

The members of the Second Chamber serve for a term of four years and retire in a body. Any Netherlander who has attained the age of 30 years and who is in the full enjoyment of his civil and political rights is eligible to membership in the Second Chamber. The members receive an annual salary of 2000 guilders, besides traveling expenses. The sessions of the chambers are public, although each by a majority vote may hold secret sessions. Either may be dissolved by the sovereign without the sitting of the other chamber being disturbed, but in case of dissolution new elections must be held within 40 days and the chambers convoked within two months. Ordinarily both chambers meet at least once a year and may be summoned in extraordinary session by the sovereign. The presiding officer of each chamber is appointed by the sovereign, but minor officers are elected by the chambers respectively. The First Chamber has no power of initiating legislative measures, its authority being confined to the simple approval or rejection in toto of bills sent to it from the Second Chamber. The Second Chamber has the special power of appointing commissions of inquiry; it shares with the sovereign the right of initiating legislative measures and may amend the bills presented by the government; to it the government must submit the annual budget; and it alone has the right to impeach the ministers before the High Court at The Hague.

The sovereign, who is declared to be inviolable and irresponsible, is required to take an oath to maintain the constitution, the independence of the country, and the liberties and rights of the citizens, and to execute the laws. The powers of the sovereign include the dissolution of the chambers, either jointly or separately; the declaration of war; the superior direction of foreign affairs; the negotiation of treaties with foreign Powers subject to the approval of the chambers, when the cession or exchange of territory is involved or when rights established by law are affected; the command of the army and navy and the appointment of military officers; the superior direction of the colonies; the general administration of the finances; the granting of pardons (but not amnesties); the fixing of salaries of public officers except in case of the judges; and the decision of administrative conflicts between the provinces. The executive powers of the sovereign are exercised through ministers, one of whom must countersign every official act of the sovereign and who thereby assumes the responsibility for it. The political responsibility of the ministers is to the States-General, to each house of which they are entitled to have access, whether members or not, and to speak, although not to vote unless they be members. At present (1915) there are, besides three ministers without portfolio, nine ministers presiding over departments, viz.: Foreign Affairs; Interior; Finance; Justice; Colonies; Marine; War; Communications; Agriculture, Industry, and Commerce. Each minister with portfolio receives an annual salary of 12,000 guilders. Besides the ministry there is a Council of State, presided over by the sovereign and consulted on a variety of important matters of state administration.

For the purpose of local government the Kingdom is divided into 11 provinces, and these are again subdivided into 1121 communes (*gemeenten*). The chief executive authority in each province is a commissioner of the sovereign. In each province is also a representative assembly (Provincial States) consisting of members elected for six years, one-half of the members retiring every three years. The number of members constituting an assembly varies from 35 to 80, according to the population of the province. The powers of the provincial assemblies are in general those of a local legislative body and include such duties as the enactment of ordinances and the levy of taxes. All ordinances to be valid must be approved by the sovereign. The assemblies exercise a supervisory control over the municipalities and elect the members of the First Chamber of the States-General. Ordinarily they hold sessions twice a year and are presided over by the commissioner of the sovereign. For the conduct of the provincial administration a deputation of six members is chosen from the body of the provincial assembly and is known as the Deputed States. In each commune is a local council elected for six years by the same electorate as that which chooses the members of the provincial assembly. The number of members varies from 7 to 45, according to the population of the commune, and one-third of the members retire every two years. The powers and duties of the communal council include the enactment of by-laws and ordinances relating to matters of purely local concern. These are all subject to the veto of the sovereign, while the budget and ordinances for the alienation of municipal property require the approval of the Deputed States of the province. The council is presided over by a mayor or burgomaster appointed by the sovereign for six years. He is the chief executive officer in the commune and is assisted by from two to six aldermen (the number depending upon the population of the commune) elected by the council from its own membership. The mayor exercises a supervisory power over the actions of the council and may suspend its resolutions for a period of 30 days. He also has charge of the municipal police.

The judicial system consists of the High Court of the Netherlands (Court of Cassation), which sits at The Hague, five courts of appeal, 23 district courts, and 106 cantonal tribunals. The High Court has original jurisdiction in matters concerning the state and the royal family, in the impeachment of ministers, and in offenses committed by the higher officials. It has appellate jurisdiction in cases appealed from the provincial courts and the courts in the colonies. All judges are appointed by the sovereign for life, except the cantonal judges, whose tenure is limited to five years, and they are irremovable except by resolution of the High Court. Trial by jury does not exist in the Netherlands. For navy, see NAVIES.

Army. *Higher Organization.*—The system provides for an initial mobilization of four divisions and one cavalry brigade. A division consists of three brigades of infantry, each of two regiments of three battalions; one field-artillery regiment consisting of 12 three-gun batteries, or a total of 36 guns to the division; a company of cyclists, eight machine guns, and one company of engineers. Total strength of a division about 19,000 officers and men. The cavalry brigade of four regiments of four squadrons each has attached to it four three-gun batteries of horse artillery. The total strength of this field army

when mobilized for war is about 125,000 men and 152 guns. The permanent peace strength maintained as the skeleton upon which the field army is mobilized in war consists of about 1500 officers and 22,000 men. *Service.*—Liability to service in time of war is universal and compulsory from the age of 19 to 40. In time of peace, under the Law of 1912, service is partly voluntary and partly compulsory, the larger number of men being from the latter class. The annual contingent is limited to 23,000 men, the selection being by lot and substitution not being permitted. Volunteers enlist for 10 years, of which period only two or three years are with the colors. Reenlistment of noncommissioned officers is authorized and encouraged. The service of the conscripted militiaman, assigned for training to the permanent units, is divided as follows: (*a*) active army, six years (eight for mounted troops), of which period two years only are continuous service for mounted troops, 8½ months for infantry. Subsequently during this period the mounted troops may be called out once for a period of one month, the dismounted troops twice for four and three weeks respectively. (*b*) Landwehr service: seven or five years, during which period the men may be turned out for training twice for six days only. (*c*) Landsturm service: period eight years. This class includes all men, those who have had active training and those who have not. This completes the liability of 21 years ending at the age of 40.

For each dismounted unit of the active army there is a corresponding unit of Landwehr troops, the necessary skeleton organization being maintained in time of peace.

The fortresses normally are garrisoned by 57 artillery companies organized into battalions of suitable strength for the armament to be manned. In war these troops are supplemented by Landwehr companies. Extensive seacoast and land fortifications are maintained with effective provision for utilizing inundation as a defensive measure. The defensive scheme includes concentration of all the forces in what is called the Holland Fortress, a large area partly surrounded by the sea, and permanent works, the approaches to which may be controlled by inundation. *Arms.*—Infantry, the Mannlicher magazine rifle; cavalry, the carbine; field artillery, a late model rapid-fire Krupp gun, 75 millimeters' caliber. *Normal Military Budget.*—Home defense about $14,000,000; colonial defense about $16,000,000. Surrounded by the sea, Germany, and Belgium, the Netherlands were in a critical political and military situation during the European War which began in 1914 and were forced to expend sums, greatly in excess of the normal annual budget, in military preparations, reorganizations, and increase, and to maintain mobilized large forces. See CAVALRY.

Defense. There are few fortresses protecting the national boundaries. The chief, most effective defense lies in the ability to open the dikes and flood the region between the Lek and the Zuider Zee.

Colonies. The Netherlands are one of the important colonial powers. The Dutch colonies form two groups: the Dutch East Indies (q.v.) and the Dutch West Indies. The statistics—totals—are approximately: estimated area in square miles, Dutch East Indies, 736,400; Dutch West Indies, 46,460; total, 782,860; estimated population of Dutch East Indies in 1905, 37,979,000; Dutch West Indies in 1912, 149,800. The Dutch West Indies comprise the colony of Dutch Guiana, or Surinam (see under GUIANA), area 46,060 square miles, population 86,134; and the colony of Curaçao (q.v.), including the islands of Aruba (q.v.), Buen Ayre (q.v.), Eustatius (q.v.), Saba (q.v.), and half of St. Martin (q.v.), total area 403 square miles, population 55,200.

History. The name Netherlands or Low Countries originally covered the territory included in the kingdoms of the Netherlands and Belgium, with Luxemburg. This region was inhabited in Roman times by the Frisii in the north, the Batavi in the central portion, and the Belgæ in the south. These tribes were successively subjugated by the Romans—the Belgæ by Cæsar; the Batavi after Claudius Civilis, a Batavian leader, whose native name is unknown, had broken the Roman alliance and attempted to form a united Batavian kingdom (69–70 A.D.); and the Frisii still later after an obstinate resistance. The Low Countries were incorporated in the empire of Charles the Great and Christianized. Upon the breaking up of the Carolingian Empire the new Frankish kingdom acquired the southern portion, Lotharingia (Lorraine) the central, and the new Germany the northern part. Coincidentally with this division came the rise of feudalism, and duchies like Brabant (originally Lower Lorraine), counties like Artois, Flanders, Holland, and Hainault, and bishoprics like Utrecht and Liége developed a semi-independent authority in this remote district, where the weakened royal authority of the period reached with difficulty. (See BELGIUM.) It resulted also from the division of the country that, while the people as a whole retained certain traits due to their environment, the Dutch or northern provinces were distinctly Germanic in language and customs, the Flemings of central Netherlands showed in both respects a mingling of French and German elements, while the Walloons on the south were as markedly French as the Dutch were German. In the latter part of the Middle Ages the cities of the Netherlands rose through their commerce and manufactures to an extraordinary state of prosperity, and some of them were for a time virtually independent republics. Next to the Italian states they figured most prominently in the revival of art. The cities of Flanders and Brabant were especially flourishing. Bruges, Ghent, and Antwerp had the largest share in this prosperity—Antwerp, at the beginning of the sixteenth century, eclipsing all other cities of Europe in the volume of its trade and its financial transactions. A marriage alliance between the house of Flanders and that of Burgundy (1369) gave the Burgundian dukes, with their unbridled ambition for empire, a foothold in the Netherlands which they used to such purpose as to bring the whole country under their sway.

The Hapsburg-Burgundian alliance (the marriage of Maximilian of Austria and Mary of Burgundy) in 1477 made the Low Countries an appanage of the house of Hapsburg. Charles V, the grandson of Maximilian, in 1549 formally united this rich inheritance with the Spanish crown. In 1555 he resigned the sovereignty over the Netherlands to his son Philip II. At this time they comprised the four duchies of Brabant, Gelderland, Limburg, and Luxemburg; the seven counties of Artois, Flanders, Hainault, Holland, Namur, Zutphen, and Zeeland; the

margraviate of Antwerp; and the seigniories of Friesland, Groningen, Mechlin, Overijssel, and Utrecht. These provinces were very largely independent of each other and prized this independence. The States-General, to which each sent deputies, served to unify them to some extent, and a supreme tribunal had jurisdiction over all; but the States-General was, like similar bodies in that age, politically weak, without power of legislation or taxation. The acquisition of the country by Spain brought into close political conjunction two bitterly antagonistic forces, for all save the provinces of southern Netherlands was becoming strongly Protestant, while Spain was the most Catholic country in Europe. Under Charles V the Netherlands, which were included in the Burgundian Circle of the Holy Roman Empire, had been declared indivisible and not subject to the Imperial courts. He had subjected the Protestants to severe persecution and had established the Inquisition, but it was reserved for Philip II to show to what lengths bigotry, cruelty, and bad faith could be carried in the oppression of a people. The government during the regency of Margaret of Parma was carried on by Cardinal Granvelle (q.v.), who began at once to break the royal pledges and to trample upon the liberties of the people. Spanish troops were kept in the country, and time-honored privileges and rights were ignored. Protests and resistance soon began under the leadership of William of Orange, Stadholder of Holland, Zeeland, and Utrecht, Count Egmont, and the Count of Hoorne, which brought about the dismissal of the hated Minister (1564), but effected no change in Philip's policy towards the Netherlands. The league of the Beggars (see GUEUX) arose in 1566, and field preaching by proscribed Protestant ministers was carried on under the protection of armed multitudes. Mob violence broke out in many parts of the country, and the resentment of the people showed itself in the plundering and desecration of churches and the destruction of images and relics. Philip II proceeded to summary measures, strengthened by the support of a large peaceful element among the population who viewed with alarm the proceedings of the Beggars. In August, 1567, the Duke of Alva (q.v.) arrived with an army of Spanish veterans and authority to deal with the country as rebellious and conquered territory. Alva's Bloody Council, an irresponsible tribunal, condemned by wholesale Netherlanders guilty of no offense save their religion and love of country, and in February, 1568, the Holy Office of the Inquisition pronounced a death sentence against all the inhabitants of the Netherlands as heretics, with a few named exceptions. Among the notable victims of the tribunal were Counts Egmont and Horne. In the spring the Prince of Orange, who had fled the country, raised a small army and with his brother, Count Louis of Nassau, took the field for the liberties of the Netherlands, thus opening a desperate struggle lasting for 40 years, during which most of the principal towns endured sieges by the Spaniards and suffered wholesale massacres when taken. In May, Louis of Nassau defeated Count Aremberg, the Spanish Governor of Groningen, but he was driven from the field by Alva and fled to Germany with only a remnant of his troops. The first decisive triumph for the national cause was the capture of the fortified seaport of Briel by the Beggars of the Sea under Count de la Marck in April, 1572. This was followed by the revolt of the principal cities of Holland, Zeeland, and Friesland and many cities in Gelderland, and Overijssel. The Prince of Orange was proclaimed as lawful Stadholder of the King of Spain. The fortress of Mons, in the south, was taken by Count Louis of Nassau, but the expected reënforcements from France did not arrive, and the Massacre of St. Bartholomew was a severe blow to the Protestant cause in the Netherlands. Mons was retaken by the Spaniards in September, and in rapid succession other places (Mechlin, Zutphen, and Naarden) fell into their hands, their course everywhere being marked by ruthless cruelty. Haarlem was defended by a garrison of 4000 men against an army of 30,000 men under Don Frederick, a son of the Duke of Alva, and after enduring a siege of seven months surrendered only when reduced to the very verge of starvation. The little town of Alkmaar repelled all assaults by the Spanish soldiery and drove off an army of 16,000 men by cutting the dikes and flooding the country. In 1573 Alva was recalled by Philip II and succeeded by Requesens.

On sea the Dutch repeatedly defeated the Spanish fleets, but on land they suffered a severe reverse in the battle on the moor of Mook, near Nimeguen (April 15, 1574), in which Louis of Nassau and his brother Henry were slain and their entire army destroyed. Leyden, besieged by an army of 8000 Spaniards under Valdéz, held out for five months and was saved by the cutting of the dikes, which enabled the vessels of the Gueux to bring relief to the town. The death of Requesens in March, 1576, was followed by a mutiny of the Spanish troops (the so-called Spanish Fury). Freed from all discipline and clamorous for their pay, which had long been withheld, they brought a reign of terror on the country. Ghent, Utrecht, Valenciennes, Maastricht, and Antwerp were taken and plundered, and in the last-named city 8000 citizens are reported to have been put to death. The southern provinces turned in terror to William of Orange for aid and, with the exception of Luxemburg, entered into an alliance with the northern provinces, known as the Pacification of Ghent (Nov. 8, 1576). The authority of Philip was still nominally recognized. The pacification was completed by the Union of Brussels, January, 1577, the object of which was primarily the expulsion of the mutinous Spanish soldiers. The new viceroy, Don John of Austria, the half brother of Philip II, in order to gain time, was compelled on his arrival to grant the demands of the estates and issued the Perpetual Edict, confirming the terms of the Pacification of Ghent. He won a great victory at Gembloux on Jan. 31, 1578, but died in the same year and was succeeded by Alexander Farnese, Duke of Parma, one of the ablest men of his day as well as one of the most unscrupulous, who administered affairs with energy until 1592. A shrewd judge of men, he used bribery as well as force to divide and weaken the resistance, and he succeeded in fomenting dissensions between the northern and southern provinces, which had little sympathy save that arising from resistance to common oppression. The southern provinces were in great part won back for Spain, but at Utrecht in January, 1579, the seven northern provinces—Holland, Zeeland, Gelderland, Utrecht, Groningen, Overijssel, and Friesland—entered into a union that was virtually the founding

of the Dutch Republic, and on July 26, 1581, at The Hague, the seven provinces constituting the modern kingdom of the Netherlands declared their independence. William of Orange became the ruler of Holland and Zeeland, while the sovereignty over the other provinces was offered to the Duke of Anjou, brother of Henry III of France. The latter, however, aroused the enmity of the people by his attempt to seize Antwerp and left the country in 1583. On July 10, 1584, William of Orange was assassinated at Delft by an emissary of the Duke of Parma, but the United Provinces were saved from the full effects of the blow by affairs in France, where the struggle between the monarchy and the Catholic League diverted the attention of the Spanish King and led for a time to the withdrawal of the greater part of the Spanish troops from the Low Countries. In 1585 Antwerp, after a memorable siege of 14 months, was forced to surrender to the Duke of Parma. In 1585 an English army under the Earl of Leicester was sent by Elizabeth to the aid of the Dutch, but the incapacity of their commander made their assistance of little use, and in 1587 Leicester returned to England. The United Provinces nevertheless continued the struggle, guided by the statesmanship of Barneveldt (q.v.) and under the leadership of Maurice of Nassau, the eldest son of William of Orange. Maurice concluded a series of triumphant campaigns with the decisive victory of Nieuport, over the Archduke Albert of Austria, July 2, 1600. On sea the Dutch navies overwhelmed the Spanish forces and made themselves masters of the Spanish-Portuguese possessions in the East Indies. These years of warfare completed the desolation of the Spanish Netherlands. A respite came in 1609 with a 12 years' truce, which was a virtual acknowledgment of the independence of the Dutch Republic. For additional details of the struggle with Spain up to the truce of 1609, see ALVA; EGMONT; FARNESE; GUEUX; JOHN OF AUSTRIA; PHILIP II; MAURICE (of Nassau); WILLIAM I.

Political and religious dissensions now arose in the Republic. The Arminian controversy in the Church mingled itself unhappily with the political differences between Prince Maurice of Nassau and Barneveldt. Finally Barneveldt was seized, condemned without fair trial, and executed May 13, 1619. See BARNEVELDT; DORT, SYNOD OF; GROTIUS.

In the course of the struggle with Spain the foreign trade of the provinces had undergone a rapid expansion. The Dutch East India Company was organized in 1602. After the discovery of the Hudson River by Henry Hudson, sailing for the Dutch East India Company in 1609, the Dutch established by degrees a trading colony in New Netherland, later New York. The New Netherland Company was given a trading charter in 1615, and in 1621 the Dutch West India Company came into existence and began to people the new colony, which remained a Dutch possession until 1664, when it was taken by the English, to be recovered in 1673 for 15 months and then finally lost to the Republic.

In 1621 the 12 years' truce having expired and the Dutch refusing to acknowledge allegiance to Spain, the war was renewed by Philip IV. The Dutch, led by Prince Maurice until his death in 1625 and then by his brother Frederick Henry, with the French as allies, carried on a struggle for the possession of Flanders, the incidents of which served to increase the hostile feeling between the Catholic and Protestant parts of the country. In the meantime the religious dissensions in the United Provinces themselves died out, and a spirit of toleration arose which made the country the asylum for European Protestant refugees. In 1646 Spain began negotiations for peace with the Republic, and the Dutch, already suspicious of the growing French influence and themselves weary of the long struggle, made terms which became a part of the general Peace of Westphalia in 1648. The United Provinces were now fully recognized as free and sovereign states. The Scheldt was closed to commerce, and the right of the Dutch to a share in the trade of the Indies was acknowledged. William II, who succeeded Frederick Henry as Stadholder of the Republic, attempted to become a sovereign with the aid of France, but died at the age of 24, and the danger his ill-advised attempt had shown led the states to hold the stadholdership in abeyance. Holland, the wealthiest of the provinces, now became the real controlling force, and the executive power in Holland was vested in the Grand Pensionary, an office which from 1650 to 1672 was held by Jan de Witt (q.v.). This was the golden age of the Republic, when its fleets fought successfully against the English (1652–54, 1665–67) and made it the leading sea power of Europe. The prosperity, wealth, and power of the Republic brought it new enemies in the place of decadent Spain. Having united in 1668 with England and Sweden to hold Louis XIV in check, the Republic found itself in 1672 facing both France and England, the former attacking by land, the latter by sea. In this struggle William III, the young Prince of Orange, posthumous son of William II, by his generalship and patriotism won the approval of a large party of the nobles and common people, who demanded the restoration of the stadholdership. France had demanded the restoration of the house of Orange to its authority, but William had declined to receive a gift forced by the enemies of his country. Jan and Cornelius de Witt, who opposed vesting any further powers in the house of Orange, were murdered by a mob (1672), and the Prince of Orange became once more Stadholder and the central figure in the United Netherlands. In the shifting European policies of the succeeding years the Republic found itself sometimes with one ally, sometimes with another, sometimes single-handed, but with the calling of the Stadholder William to the English throne (1688) it was brought into the large scheme of the Grand Alliance against Louis XIV. William of Orange and Heinsius (q.v.), the Grand Pensionary of Holland, were the soul of the resistance to the schemes of the French King. (See LOUIS XIV.) By the Peace of Utrecht in 1713, closing the War of the Spanish Succession (see SUCCESSION WARS), the Spanish Netherlands were handed over to Austria. By the Barrier Treaty, concluded with England and Austria in 1715, the Dutch acquired the right of maintaining garrisons in the fortified towns of the Austrian (Belgian) Netherlands.

There was a decline in the prosperity of Holland in the first half of the eighteenth century. The stadholdership had been again set aside, but it was restored in 1747 and made hereditary in William IV of Nassau-Dietz. There were 40 years of peace, with the exception of a brief naval war with England which broke out at the close of 1780. In 1782 the States-General for-

mally recognized the United States of America as a sovereign and independent nation, being the second government in Europe to do so. The Stadholder's government was essentially aristocratic, and in 1786 the rising democratic tide drove out William V, who, however, was restored in the following year through the intervention of Prussia. The revolutionary movement in France found an echo in the United Provinces, where the democratic party welcomed the conquest of Pichegru (q.v.). The stadholdership was again overthrown, and the Batavian Republic was organized under French sympathizers and in close alliance with France in 1795. Napoleon made the Batavian Republic into the Kingdom of Holland, with his brother Louis as King (1806), but the latter was too faithful to the country to suit his Imperial brother and master, and he was compelled to abdicate (1810), and the country was annexed to the French Empire. In 1813 the French were expelled and the house of Orange was restored, and the Congress of Vienna (1815) annexed Belgium to Holland and created the new Kingdom of the Netherlands under the sovereignty of William I, the son of the last Stadholder. Luxemburg (q.v.) was at the same time erected into a grand duchy for the King of the Netherlands. In the course of the Napoleonic wars England seized the Dutch colonial possessions and at their close was allowed to retain Cape Colony, Ceylon, and a great part of Surinam. The Catholics of the Belgian provinces were not content with the union with Holland and revolted in 1830, and, after fruitless attempts by the King to suppress the revolt, the Powers intervened and created the independent Kingdom of Belgium, under a guarantee of neutrality. (See BELGIUM.) A final settlement with Belgium was not effected until 1839, when Limburg and Luxemburg were divided between the countries. William I abdicated in 1840 in favor of his son, William II, who was better able to enter upon harmonious relations with Belgium.

William II was succeeded by William III in 1849. The country for more than half a century has enjoyed a peaceful and prosperous development, untroubled by other problems than those of national finance, internal politics, and colonial administration.

The last is a question of much magnitude, as the Dutch colonial empire has a population of about 38,000,000 as compared with some 6,000,000 in the home country. The colonial possessions consist, in the Western Hemisphere, of Dutch Guiana and Curaçoa; and, in the Eastern, of Java, part of Borneo, Timor, the Moluccas, Celebes, and the western half of New Guinea. Slavery existed in the Western colonies until 1862 and, until recently, the so-called "culture system," by which the natives were forced to labor for their employers. The more liberal policy which has been adopted has opened the door to private enterprise, substituted more modern forms of taxation, developed an educational system, and established railways. Of all the Dutch colonies, Java is still the most important, containing about three-fourths of the Dutch in the East. The progress of Sumatra is one of the most noteworthy phenomena of recent European colonial history. Celebes and Dutch Borneo are not well developed, the majority of the natives being in a semibarbarous state. In 1902 and 1904 rebellions of a very serious nature occurred in Achin. The conduct of the Dutch troops was very severely arraigned in the home Parliament, because of their severity in suppressing the rebellion.

The government of Holland maintains colonies for vagrants. The chief institution is at Veernhingen and occupies 3000 acres, where some 4000 men are maintained from periods of six months to not more than three years. A similar institution for women has been established at Leyden.

The constitution, which had been much liberalized under the revolutionary influences of 1848, became fully democratized by the reforms of 1887 and 1896. In 1905 a royal commission recommended the adoption of proportional representation and woman suffrage. It is very probable that the former will be adopted; regarding the latter, progressive advance has been made. Women already possess the right to vote in the proceedings of the dike associations; in 1908 the Lutheran synod gave women the right to vote in ecclesiastical matters.

The two chief political parties in Holland until recently have been the Liberals and the Conservatives, the former composed largely of the representatives in the commercial towns and the latter of Orthodox Protestants and of the Roman Catholic peasantry, and supported generally by the Roman Catholics. Between 1871 and 1888 the Liberals were continuously in power; excepting a short break by the Roman Catholic Conservatives, they held office from 1891 to 1901. A coalition ministry of Conservative Protestants and Roman Catholics came into power and lasted until 1903. During the period from 1905 to 1907 the Liberals regained control. The Conservatives won in the election of 1908, and in 1909 the most remarkable of recent elections was held. This resulted in the election of 60 Conservatives, 40 Liberals, and 7 Socialists. It was believed in some quarters at the time that the election marked the downfall of Dutch liberalism; however, in the election of 1913 the Conservative cabinet was obliged to resign, and the Liberals were able to form a ministry under the leadership of Dr. Cort van der Linden, gaining the support of the Socialists by guaranteeing electoral reform and old-age pensions.

King William III died Nov. 23, 1890, and was succeeded by his daughter Wilhelmina, who was born Aug. 31, 1880. She married Prince Henry of Mecklenberg-Schwerin, Feb. 7, 1901; an heir was born April 30, 1909, amid great national rejoicing. In 1909 the Regency Bill was passed, by which the Dowager Queen Emma becomes Regent in case of the death of Queen Wilhelmina, and, on the death of the former, the Prince Consort during the heir's minority.

Although Holland has not progressed as fast as some of the other European states in the direction of social and political reform, yet it enacted an important social-insurance law. As early as 1894 a royal commission introduced a plan for obligatory accident insurance at the expense of the employers. A bill based on these recommendations became a law in 1901, and this has been amended several times since. By means of this law compulsory accident insurance is established in virtually all the Dutch industries. Sickness insurance is in the hands of some 700 mutual societies. State provisions for insurance against unemployment has been agitated, yet the Ghent system, by which such insurance is administered through the trade-

unions subsidized by the municipalities, still prevails. Recent elections make probable the adoption of old-age and widows' pensions.

The Coast Defense Bill, which was passed in May, 1913, and which provided for the fortification of Flushing and the expenditure of some 12,000,000 guilders, caused much comment in the European press. It was rumored that it was done at the behest of the German government as a protection against a possible English invasion.

Since 1890 the Dutch government has rendered a great deal of aid to the development of agriculture, which is still the greatest industry, the total value of the yearly production of which is some 600,000,000 guilders. Agricultural and horticultural schools have been organized, experimental stations have been established, and coöperative societies for buying and selling have spread all over the country, and everywhere coöperative creameries and credit banks have met the needs of the local farming communities.

In 1908 trouble broke out with Venezuela over the Dutch colony of Curaçoa. On June 23 of that year the Dutch Minister was given his passports; later four Dutch vessels were seized. A protocol was signed in 1909 by which the government of Venezuela agreed to pay an indemnity of 20,000 bolivars and the Netherlands to restore the coast guards captured in 1908.

During the war which broke out in Europe in 1914 Holland and her people played a very memorable part. On Oct. 19, 1914, after the fall of Antwerp, over 400,000 Belgian refugees fled to the Netherlands. In January, 1915, it was estimated that 1,200,000 Belgians had been quartered upon this small country, the burden being extremely severe, as the Dutch had to maintain, in addition to the Belgian refugees, an army of 300,000 men to prevent violations of their neutrality. Besides caring for the refugees, the Dutch government granted free use of its railways for the transportation of relief supplies to Belgium and gave to the American Belgian Relief Commission free transmission of letters and telegrams. After the fall of Antwerp, Holland greatly strengthened her barriers by placing barbed wire on all roads leading from Belgium and by guarding especially the territory south of the Scheldt. The preservation of that river's neutrality was a question of much magnitude. Authorities on international law maintained that the Dutch could not permit its navigation by any belligerent Power. The Dutch were in a precarious position in regard to the shipment of goods within their borders by neutral countries intended for belligerent Powers. On Feb. 15, 1915, the government of the Netherlands addressed a note to the British and German governments. The former was informed that the Dutch were opposed to the wholesale use of its flag by belligerents, and the latter that the destruction of neutral vessels without search was a contravention of international law and would not be tolerated. During the month of March the destruction of two Dutch merchantmen by a German submarine caused a great deal of feeling among the people. See WAR IN EUROPE; NATIONAL FLAGS, Plate.

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NETHERLANDS SCHOOLS OF PAINTING. Under this title may best be grouped Flemish and Dutch schools which sprung from the same source, possess in common certain

distinctive qualities, and have had a similar development. The Flemish school may be said to begin with Huybecht and Jan van Eyck (died 1440), whose remarkable improvement of oil painting revolutionized the art. The chief characteristics of the early Flemish school are a pronounced realism, highly detailed finish, and the use of landscape background; its best painters had a good sense of color, perspective, atmosphere, light and shade. Jan van Eyck founded the school of Bruges, the chief centre in Flanders; Rogier van der Weyden (died 1464) the school of Brabant, with a centre at Brussels, which was more emotional and dramatic in character; and Dierick Bouts, a Dutchman, the school of Louvain, distinguished by its treatment of light and shadow and of the landscape. The chief master of the second generation was Hugo van der Goes (died 1482) at Ghent. The two most important masters of the later fifteenth century headed the school of Bruges: Hans Memling (died 1494), of German extraction, whose works show a gentle spirituality, and Gerard David (died 1523), a Dutchman, in whose art both Dutch and Flemish art of the fifteenth century culminated. In the sixteenth century the chief seat of the Flemish school was at Antwerp, where Quinten Matsys (died 1530) founded a school, which in the seventeenth century found its culmination in Rubens (1577–1640) and his pupils Van Dyck and Jordaens. The productions of the later Flemish school are characterized by brilliant line and color, though they are materialistic and lack beauty of form and tenderness of feeling. Although Flemish as regards its characteristic realism, it was much influenced by Italian painting, especially in color. Contemporary with Rubens and his followers were a number of important genre painters, who were thoroughly Flemish, untouched by Italian influence. The chief representatives were Teniers the Younger, Brouwer, and Gonzales Coques. In the eighteenth century Flemish painting declined and was of little importance.

The painting of the early Dutch school resembles that of the Flemish and was much influenced by the Van Eycks. Haarlem is recorded as being the chief centre, but none of the works of the reputed founder of the school, Aelbert Ouwater (fifteenth century), survive. Its chief masters were Dierick Bouts (died 1475) and Lucas van Leyden (1494–1533). The sixteenth century was a period of Italian influence and unimportant productions, but the seventeenth was the golden age of Dutch painting. Haarlem remained the chief centre, and there was an important school at Amsterdam. With an entire absence of Italian influence there arose an art more realistic, more distinctly national than the Flemish. The overthrow of Spain and Catholicism did away with the demand for religious paintings, and the more specialized modern forms—portrait, genre, landscape, animal, and still life—arose. In these the Dutch achieved a high degree of perfection alike in color and design, but they seldom attempted larger compositions, in which they were indifferently successful. Among the Dutch painters of the seventeenth century the chief masters in portraiture are Frans Hals and Rembrandt; the latter was equally great in landscape and introduced light effects which have not yet ceased to influence painting. In genre painting the most important were Adriaen van Ostade for peasant scenes and Gerard Terburg for more refined subjects, besides Gerard Dou, Jan Steen, Pieter de Hooghe, and Jan van der Meer. The Dutch were the first to practice landscape and animal painting for its own sake; their greatest landscapists were Jacob van Ruysdael and Hobbema, while in animal painting Wouverman, Paul Potter, Adriaen van de Velde, and Albert Cuyp are preëminent. In marines the greatest names are Willem van de Velde the Younger and Backhuisen, and in all the branches of still-life painting the Dutch excelled predecessors and contemporaries. In the nineteenth century a new school, distinctly Dutch, arose, including important artists like Israels, the peasant painter, the brothers Maris in landscape, Mesdag in marines, and Mauve in animal subjects.

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of the Nineteenth Century (Philadelphia, 1908); C. H. Caffin, *Story of Dutch Painting* (New York, 1911).

NETHERSOLE, Olga (1870–). An English actress and manager, born in London. She made her London début in 1888 and during the nineties was manager of several London theatres. In 1894 she came to America, where she soon became well known in *Camille, Carmen, Sapho,* and especially for her Paula in A. W. Pinero's *The Second Mrs. Tanqueray* (1899). In 1902 her performance in New York in *Sapho* provoked such bitter criticism upon the grounds of its impropriety that she canceled her engagements and returned to London, where she appeared in *The Flute of Pan* in 1904 and in *The Labyrinth* in 1905. Two years later, under her own management, she starred in a repertoire of her successes at the Théâtre Sarah Bernhardt in Paris. She returned to the United States again in 1910 and appeared at the New Theatre, New York, in Maeterlinck's *Mary Magdalene.* In 1911 she played the title rôle in *Sister Beatrice* (San Francisco) and in 1912 Helena in *The Awakening of Helena Ritchie* (Birmingham, England). Consult Strang, *Famous Actresses of the Day in America* (Boston, 1899).

NETHINIM, nĕ'thē-nĕm' (Heb., given [to God], from *nāthan,* to give, a late Aramaicizing form of the passive participle *nethunim*). The lowest order of ministers of the temple at Jerusalem, mentioned only in Chronicles and Ezra-Nehemiah. They are distinguished from the Levites, but were of sufficient importance to make Ezra solicitous for a large following of them with his mission to Jerusalem (Ezra viii. 17–20). They enjoyed the immunities of the priesthood (vii. 24), possessed a distinct quarter on the temple hill, along with allotments in the towns (Neh. iii. 31; Ezra ii. 70), and shared in the civic life of Israel (Neh. x. 28). Their name, along with their subordinate position, shows that the caste originally consisted of slaves piously devoted to the sanctuary, like the Greek hierodules, to perform its menial duties. The tradition is preserved that David and his princes "gave" these servants (Ezra viii. 20), one division of them being associated with Solomon (ii. 55). The large number of foreign names among the Nethinim suggests that they were largely drafted from prisoners of war (cf. Josh. ix. 23). Such foreign slaves seem to have been employed in the temple down to the time of the exile at least (Ezek. xliv. 6 f.). After a time they were so completely established as a sacred official class that various privileges were accorded to them. They shared with priests, Levites, singers, and porters immunity from taxation (Ezra vii. 24), lived in a special quarter near the water gate (Neh. iii. 26), and joined as full members of the community in the oath not to allow their children to marry foreigners (Neh. x. 28 ff.). But time broke down the racial distinction. The Talmud, with its often abstract view of history, outlaws them as heathen, but this view is contradicted by the Bible. Consult: Baudissin, *Die Geschichte des alttestamentlichen Priesterthums untersucht* (Leipzig, 1899); H. E. Ryle, "Nehemiah," in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1893); Joseph Jacobs, *Studies in Biblical Archæology* (London, 1894); A. H. McNeile, in Hastings and Selbie, *Dictionary of the Bible* (New York, 1909).

NÉTHOU, nā'tōō', Pic de. The highest peak of the Pyrenees. It is situated in the Spanish Province of Huesca, immediately south of the French boundary, 40 miles west of Andorra (Map: Spain, F 1). Its height is 11,169 feet, and it forms with the neighboring Pic de la Maladetta (10,867 feet) and Pic du Milieu (11,010 feet) the Maladetta group, a steep and jagged granite mass. On its north slope lies an extensive glacier. The summit is often ascended for the splendid view which it affords.

NETLEY MEDICAL SCHOOL. See Medical School, Netley.

NETS (AS. *net,* Goth. *nati,* OHG. *nezzi,* Ger. *Netz*). Openwork fabrics, with regular mesh, made by knotting, plaiting, twisting, or weaving, out of linen, cotton, hemp, silk, wire, and other materials. Net making is one of the primitive arts. In the South Sea islands, the natives when first discovered by Europeans, though entirely ignorant of weaving, were skillful in the knotting of nets for catching fish, birds, and animals. In ancient Assyria, Egypt, Greece, and Rome hunting nets were in common use, as is shown by sculptural reliefs and paintings and by literary evidence. The finest and most delicate of nets are those made by hand with needle or bobbin and by lace machines in imitation of them. These are lace nets. (See Lace.) They are sometimes used plain, often with inserted or appliqué motifs and edgings of hand or machine lace. The meshes of hair nets and veils are particularly large and open. The principal use for coarse and heavy fabric nets to-day is to catch fish, the stationary nets being called seines, the dragged ones trawls. Wire net (or netting, as it is often called) is frequently employed to fence in domestic fowls and small animals and has almost superseded cotton as a material for mosquito net. See Trapping.

NETSCHER, nĕt'shĕr, Kaspar (1639–84). A Dutch genre and portrait painter, born at Heidelberg. He studied under Herman Koster at Arnheim and later under Gerard ter Borch at Deventer. After a visit to France he took up his residence at The Hague in 1662. His best work is in portraiture on a small scale and in small genre subjects. Netscher belongs to the commencement of the period of decadence in Dutch art and is lacking in intellectuality, but in his best period is distinguished for the elegance and grace of his figures, especially of women and children, his mellow, golden tone, and his skill in painting textures, particularly white satin. The Dresden Gallery is rich in good pictures by him. They include: "Man Writing a Letter" (1665); "Lady with a Spaniel"; "Lady at the Piano"; two portraits of Madame de Montespan. The National Gallery, London, has his "Lady at a Spinning Wheel" and "Children Blowing Bubbles"; the Louvre, his "Singing Lesson" and "Violoncello Lesson"; the Metropolitan Museum, New York, the "Portrait of a Dutch Lady" and "A Card Party"; and the Boston Museum, his "Boy and Girl Blowing Bubbles." The Rijks-Museum, Amsterdam, possesses 16 portraits, and several of his best works are in private collections in England. He also painted historical subjects, but with less success. His two sons, Constantyn (1668–1723) and Theodorus (1660–1732), were also portrait and genre painters.

NETSUKE, nĕt's'-kā' (from Jap. *ne,* wood, root + *tsuké,* to suspend). A button of wood, crystal, or porcelain, but usually of ivory, by which the Japanese smoker suspends his outfit

of tobacco, flint and steel, pipe, etc., from his girdle. Often the netsuké is elaborately carved and is among the most characteristic products of native skill. The best specimens are valued by both native and foreign collectors. Consult: M. B. Huish, "The Evolution of a Netsuke," in *Transactions and Proceedings of Japan Society of London*, vol. iii (London, 1897); R. Graul, "Netsuke," in *Kunstgewerbeblatt*, vol. xvii (N. S., Leipzig, 1905); A. Brockhaus, *Netsuké: Versuch einer Geschichte der japanischen Schnitzkunst* (ib., 1905).

NETTEMENT, nĕt'mäN', Alfred François (1805–69). A French journalist and historian, born in Paris. He early began to contribute to the magazines and was a consistent Catholic in religion and a legitimist in politics. In 1848 he founded the review *L'Opinion Publique* and in it expressed his own opinions so forcibly that, after the coup d'état of 1851, the paper was suppressed and Nettement imprisoned. Among his works are: *Histoire de la Révolution de juillet* (1833); *Histoire de la littérature française sous la Restauration* (1852); *Histoire de la littérature française sous la royauté de juillet* (1854); *Histoire de la Restauration* (1860–68); *Etudes critiques sur le feuilleton roman* (1845–46); *Vie de madame la marquise de la Roche-jacquelin* (1858).

NET'TER, Thomas, also called Waldensis, from his birthplace, Saffron Walden, Essex (c.1375–1430). An English Carmelite monk. He studied at Oxford and rose to eminence as a man of learning and business capacity. He was elected provincial prior of the English Carmelites in 1414 and was confessor to Henry V and to Henry VI. He was the King's representative at the Council of Constance and was sent on an embassy to Poland, Lithuania, and Prussia. He died at Rouen, France, whence he had accompanied the King, Nov. 2, 1430. He threw himself with great ardor into the lists against the Lollards and so won the sobriquet of Prince of Controversialists. His chief writings against them are *Doctrinale Fidei Ecclesiæ Catholicæ contra Wiclevistas et Hussitas* and, especially valuable for its documents, *Fasciculi Zizaniorum Johannis Wyclif* (ed. by Shirley, London, 1858).

NET'TLE (AS. *netele, netle*, OHG. *nezzila, nezila*, dim. of *nazza*, nettle, Ger. *Nessel*, Ir. *nenaid*, nettle, probably connected with OPrus. *noatis*, Lith. *noterē*, Lett. *nâtres*, Gk. *ἀδίκη, adikē*, nettle). A common name of *Urtica*, a genus of plants of the family Urticaceæ having unisexual flowers. The species are annual or perennial herbs with occasionally shrubby bases, many of them covered with stinging hairs, which emit an acrid juice and pierce the skin when touched, often causing much inflammation and pain; when grasped in such a way as to press the hairs to the stem, no stinging ensues. The species of a number of distinct genera were formerly included in the genus, especially those having stinging hairs, as *Laportea, Pipturus*, and *Pouzolzia*. Some of these are shrubs or even trees, the giant nettle tree of Australia attaining great size. The sting of East Indian species is much more severe than that of European and American species. *Urtica crenulata*, or *Laportea crenulata*, is said to produce a sensation similar to the continual application of a hot iron. The roots of nettles, boiled in alum, afford a yellow dye, and the juice of the stalk and leaves has been used to dye woolen stuffs a beautiful and permanent green. The small nettle (*Urtica urens*) and the great nettle (*Urtica dioica*), introduced European species, are abundant in America. Whatever gives nettles their stinging power is dissipated by boiling. Their high value as food for swine, poultry, and particularly for turkeys, is well known to the peasantry of many countries; the great nettle is cultivated in Sweden for fodder. The seeds are fed to poultry. The stalks and leaves of nettles are employed in some parts of England for the manufacture of a light kind of beer, called nettle beer. The bast fibre of nettles is used for textile purposes. Yarn and cloth, both of the coarsest and finest descriptions, can be made of it. The fibre of *Urtica dioica*, used by the ancient Egyptians, is still employed in Piedmont and other countries. When wanted for fibre, the plant is cut in midsummer and treated like hemp. The names "nettle yarn" and "nettle cloth" are, however, now commonly given in most parts of Europe to particular linen and cotton fabrics. The fibre of *Urtica cannabina*, a native of the south of Siberia and other middle parts of Asia, is much used, and from other species both fine lace and strong ropes can be manufactured. The fibre of *Urtica japonica*, or *Pouzolzia viminea*, is much used in Japan, and also that of *Urtica argentea*, or *Pipturus argenteus*, in the South Sea islands, and of *Urtica gracilis* in Canada. *Urtica tuberosa*, or *Pouzolzia tuberosa*, produces nutritious tubers, which are eaten in India raw, boiled, or roasted. Australia produces a magnificent tree nettle, *Laportea gigas*, abundant in some parts of New South Wales, which sometimes reaches a height of 140 feet, with a trunk of great thickness and very large green leaves which, when young, sting violently. In some places it forms scrub forests, and its stinging leaves form a great impediment to the traveler. The common nettle tree of the United States is a species of *Celtis* (see Hackberry); the name "dead nettle" is given to certain species of *Lamium*, a genus of the family Labiatæ. *Bœhmeria nivea*, often called false nettle, supplies China grass or ramie (q.v.).

NETTLE BUTTERFLY. Any of several species of butterflies whose eggs are laid upon the leaves of nettles, viz., *Pyrameis atalanta, Pyrameis cardui*, and *Vanessa urticæ*, the last, as its scientific name shows, being an especial frequenter of these plants. The two former are cosmopolitan, while the *Vanessa* is European.

NETTLE FAMILY. A family of plants. See Urticaceæ.

NETTLE RASH. See Hives; Urticaria.

NET'TLESHIP, Henry (1839–93). An English classical scholar, born in Kettering, Northamptonshire. He was educated at the Cathedral School, Durham, Charterhouse, and Oxford, where he was elected fellow of Lincoln and gained the Chancellor's Latin Essay prize. From 1868 to 1873 he was assistant master at Harrow. In 1870 he married the eldest daughter of Rev. T. H. Steel, his colleague at Harrow. In 1873 he was appointed fellow and tutor of Corpus Christi College and classical lecturer at Christ Church, Oxford, which appointments he resigned on being made Corpus professor of Latin literature in the University of Oxford in 1878. He published and edited many classical works, among them a commentary on *Æneid*, x, xii, a revised edition of Conington's *Vergil* (1883), and revisions of Conington's edition and translation, in prose, of Persius (1874, 1893);

Lectures and Essays on Subjects Connected with Latin Literature and Scholarship, two series (1885, 1895); *Contributions to Latin Lexicography* (1889). With J. E. Sandys he revised and edited, in translation, O. Seyffert's *A Dictionary of Classical Antiquities, Mythology, Religion, Literature and Art* (London, 1891). For a memoir by his wife and a bibliography, consult his *Lectures and Essays, Second Series* (Oxford, 1895).

NETTLESHIP, Richard Lewis (1846–92). An English philosopher. He was born at Kettering and was educated at Uppingham and at Balliol College, Oxford, where he won many university distinctions. There he became a fellow in 1869, and later as tutor he took the place of Thomas Hill Green in the teaching of philosophy at Balliol. He edited the works of Green with a valuable memoir in 1880. Though he made a lasting impression in his own circle at Oxford, he published only a single essay, *The Theory of Education in Plato's Republic* (1880; new ed., 1906). After his death there appeared *Philosophical Lectures and Remains of Richard Lewis Nettleship*, with a biographical sketch (2 vols., 1897; 2d ed., 1901), edited by A. C. Bradley and G. R. Benson.

NET'TLETON, Alfred Bayard (1838–1911). An American soldier, journalist, and public official, born at Berlin, Delaware Co., Ohio. He studied at Oberlin College, but at the outbreak of the Civil War enlisted as a private in the Federal army and before the conclusion of peace rose to the rank of colonel of the Second Ohio Cavalry (volunteers) and brevet brigadier general. He then studied law, but afterward did newspaper work in Sandusky, Ohio, Chicago, Philadelphia, and Minneapolis. From 1870 to 1875 he was actively interested in the construction of the Northern Pacific Railroad and for the next five years in various mining and manufacturing enterprises. He was Assistant Secretary of the United States Treasury from 1890 to 1893 and for a short time after Secretary Windom's death served as Secretary.

NETTLETON, Walter (1861–). An American landscape painter. He was born at New Haven, Conn., and graduated from Yale in 1883. His professional training was acquired at the Yale School of Fine Arts, the Art Students' League, New York, and in Paris under Carolus Duran, Alexander Harrison, and others. After 1889 he exhibited frequently at the Salon and also at the important American exhibitions, including those of the Pennsylvania Academy of Fine Arts, Philadelphia, and the National Academy of Design, New York. In 1905 he was elected an associate of the Academy. He received a gold medal at the Society of American Artists, Philadelphia, in 1907. Nettleton is especially known for his Brittany scenes, and for his later work in winter landscapes of the country about Stockbridge, Mass., where he made his home. They display a sure technique, rich harmonious color, and a sincere if somewhat solid treatment. The snow scenes are particularly fine. Some of his works in public collections are: "December Sunshine," Yale Art Museum, and "The Beloved Physician," Jackson Library, Stockbridge, Mass.

NETTLE TREE. American ornamental trees and shrubs of the family Urticaceæ, known by sundry popular names, as hackberry (q.v.).

NEUBAUER, noi'bou-ër, Adolf (1832–1907). An English Semitic scholar, born in Hungary and educated at Prague, Munich, and Paris. In 1868 he went to Oxford, where he catalogued the Hebrew manuscripts in the Bodleian Library, of which he was subsequently sublibrarian (1873–99). He was reader of Rabbinical literature to the university in 1886–1900. Neubauer published: *Mediæval Jewish Chronicles and Chronological Notes*, in the Semitic Series of the "Anecdota Oxoniensia"; *Histoire de la lexicographie hébraïque* (1861–62); *Géographie du Talmud* (1868); *The Book of Hebrew Roots* (1875); *The Book of Tobit* (1878); *Catalogue of Hebrew Manuscripts in the Bodleian Library* (1886); *On the Dialects Spoken in Palestine at the Time of Christ* (1888).

NEUBER, noi'bër, Friederike Karoline (1697–1760). A German actress. She was born in Reichenbach, and her maiden name was Weissenborn. From the undue restraint of her father's house she fled in 1718 with her lover, Neuber, to Weissenfels, where they joined some strolling comedians. Seven years afterward, with another company which she had entirely reorganized, she appeared at Leipzig. Meeting Gottsched, she became a convert to his gospel of French classical methods. In 1737 she presented the play *Vertreibung und Tod des Hanswurst*. A short tour to St. Petersburg (1740) seems to have been the turning point in her career. She quarreled with Gottsched on her return, lost her company twice, and failed in her attempt to rehabilitate her fortunes as an actress in Vienna, Dresden, and elsewhere. Consult the biography by Von Reden-Esbeck (Leipzig, 1881).

NEUBRANDENBURG, noi-brän'den-burk. A town in the Grand Duchy of Mecklenburg-Strelitz, Germany, near the head of Lake Tollense, 16 miles northeast of Neustrelitz (Map: Germany, E 2). Its old walls, still standing, and its four handsome Gothic gates give the town a mediæval appearance. The Gothic church of St. Mary dates from the thirteenth century. Near by is the grand ducal palace of Belvedere. It has a museum of antiquities, a Gymnasium, a Realschule, and an art gallery. There are manufactures of machines, pianos, paper, lumber, dairy produce, and brandy, as well as an important trade in grain and horses. Pop., 1910, 12,348. Neubrandenburg was founded in 1248 by Margrave John I of Brandenburg.

NEU'BURGER, Max (1868–). An Austrian neurologist and historian of medicine, born at Vienna and educated there (M.D., 1893), especially under Puschmann. He settled in the Austrian capital and after 1898 was connected with the university as lecturer on the history of medicine and as assistant professor (after 1904). Neuburger wrote on neurology, but his chief work (written with Pagel, q.v.) is the standard *Handbuch der Geschichte der Medizin* (3 vols., 1903–05). Under the direction of Sir William Osler it was translated into English by Ernest Playfair as *History of Medicine* (1910 et seq.).

NEUCHÂTEL, nē'shâ'tĕl', or **NEUFCHÂTEL.** The capital of the canton of the same name in Switzerland, situated on the Lake of Neuchâtel, 25 miles west of Bern (Map: Switzerland, A 2). It is a well-built town, with a picturesque location on a slope 1425–1900 feet above the sea. It has fine public buildings. A beautiful avenue extends along the water front, and one of the squares is adorned with a statue of the Neuchâtel merchant, David de Purry, to

whose generosity the town owes many of its institutions. The twelfth-century abbey church contains a fine monument, erected in 1372, to the counts of Neuchâtel. The old château is now the seat of the cantonal government. Neuchâtel's institutions include the University of Neuchâtel with faculties of letters, science, theology, and law, a valuable natural-history collection, a commercial school, a Gymnasium, an observatory, a museum of natural history, an historical and ethnographical museum, a museum of fine arts, and a public library of 100,000 volumes. There are a number of private boarding schools, attended mostly by foreigners. The industries of Neuchâtel include the manufacturing of watches, electrical apparatus, and jewelry. The trade is of some importance. Pop., 1900, 20,843; 1910, 23,505, chiefly French Protestants. For history, see the article on the Canton of Neuchâtel. Consult August Bachelin, "Neuchâtel and its Environs," in *Europe Illustrated* (Zurich, 1883), and E. Quartier-La-Tente, *Les rues et les édifices de la ville de Neuchâtel* (Neuchâtel, 1897).

NEUCHÂTEL, or **NEUFCHÂTEL** (Ger. *Neuenburg*). A western canton of Switzerland, bounded on the north by the Canton of Bern, on the east by the Canton of Bern and the Lake of Neuchâtel, on the south by the Canton of Vaud, and on the west by the French Department of Doubs. Area, 312 square miles (Map: Switzerland, A 1). The whole country belongs to the region of the Jura and is generally divided into three parts: the region along the lake, ranging in altitude from about 1400 to over 2000 feet and famous for its vineyards; the central portion, traversed by two valleys with an average altitude of 3200 feet and producing principally cereals; and the forest region of the west, devoted chiefly to pastoral purposes. The highest point is the Creud du Van (4800 feet). Hydrographically the canton belongs partly to the Aare and partly to the Doubs. The principal minerals are asphalt, cement, and building stones. Besides agriculture and stock raising, the fundamental industries of the canton, the inhabitants are engaged in watchmaking, distilling, and in manufacturing cables, electrical apparatus, paper, and chocolate. The canton is well known for its sparkling wine and absinthe. The constitution originally adopted in 1858 provides for a grand council elected directly for three years at the rate of one member to every 1200 inhabitants. The five members of the executive council have been elected triennially since 1906. The referendum was adopted in 1879, and the initiative in 1882. For the administration of justice there are a number of justices of the peace, several industrial arbitration courts, and a court of appeals at Neuchâtel. The canton is represented by six members in the National Council. For administrative purposes Neuchâtel is divided into six districts. Pop., 1900, 126,279; 1910, 132,184, mostly French Protestants. Capital, Neuchâtel (q.v.).

The mediæval countship of Neuchâtel passed in 1504 to the house of Orléans-Longueville. In 1707, on the extinction of the Neuchâtel branch of the latter family, 15 claimants came forward, among them Frederick I, of Prussia, whose mother was a princess of the house of Orange, which was connected by descent with the house of Châlons, to whose overlordship Rudolph of Hapsburg had subjected Neuchâtel in 1288. Frederick I was the successful candidate; and from his time Neuchâtel continued associated with Prussia till 1806, when Napoleon bestowed it upon General Berthier. In 1814 it was restored to the house of Brandenburg and in the same year became a member of the Swiss Confederacy. It became a Republic in 1848. Its connection with the Prussian monarchy has been dissolved since 1857.

Consult: L. Grandpierre, *Histoire du canton de Neuchâtel sous les rois de Prusse* (Leipzig, 1889); E. Quartier-la-Tente, *Le canton de Neuchâtel: revue historique et monographique* (Neuchâtel, 1895); Numa Droz, *La république neuchâteloise, ses origines et son développement* (Paris, 1899); Diacon and Rousselot, *Guide du canton de Neuchâtel* (2d ed., ib., 1902); A. Pfleg, *Die schweizerische Uhrindustrie* (Leipzig, 1908).

NEUCHÂTEL, Lake of (Ger. *Neuenburger See*). A lake in the western part of Switzerland lying along the east base of the Jura Range, 19 miles north of the Lake of Geneva (Map: Switzerland, A 2). It is 24 miles long and from 2 to 5 miles wide, being the third largest lake of Switzerland. Its shores, which are very little indented, are partly low and marshy, partly hilly, and covered with forests or vineyards. Successive drainage has brought to light the remains of many lake dwellers. The lake may be considered as an expansion of the river Thièle, which enters at the south end, and leaves it at the north on its way to the Aare. It was an important commercial route until railroads were built along its banks, and is traversed by regular lines of steamers between the towns of Neuchâtel and Estavayer.

NEUDÖRFER, noi'dĕr-fĕr, Johann Georg (1497–1563). A German writing master and calligrapher, born at Nuremberg. He became the foremost representative of his profession, which, despite the invention of printing, was still widely and skillfully practiced and highly esteemed. His manuscripts were beautifully decorated with gold and other colors, but his chief attention was directed towards an elegant formation of the letters of the German alphabet. He thus developed the German Gothic characters to their perfection and secured their general use. Of his autographs there are known to exist only the signatures to the Gärtner copies of Dürer's two paintings, "The Temperaments" (in the Germanic Museum, Nuremberg), and a letter of June 7, 1556 (in the municipal archives of Nuremberg). He also wrote in 1547 the *Nachrichten von nürnbergischen Künstlern und Werkleuten daselbst* (new ed. by Lochner, Vienna, 1875), whose 79 brief notices are important sources regarding the history of Nuremberg of the early sixteenth century.

NEUENDORFF, noi'en-dôrf, Adolf (1843–97). A German-American musician, conductor, and operatic impresario. He was born in Hamburg, Germany, but at the age of 12 came to America, where he completed his musical education. He first came before the public in 1859 as a concert pianist, and in 1860 became the solo violin in the Stadt Theater orchestra of New York. The following year he toured Brazil, and on his return was appointed musical director of the German Theatre in Milwaukee, Wis. To him is due the credit of introducing Wagner's *Lohengrin* into the United States, at the Stadt Theater, New York (1871). He also introduced

Wachtel (the famous tenor), and the following year (1872) conducted the season of grand opera at the Academy of Music (New York). *Die Walküre* also received its first presentation in this country at his hands (1877), and in 1878 he was appointed conductor of the New York Philharmonic Society. From 1884 to 1889 he was a concert director in Boston, after which he became associated with the management of several successful opera companies. His wife, Georgine von Januschowsky (1859–1914), was prima donna of the Imperial Opera, Vienna, in which city he spent two years (1893–95), returning in 1896 to become musical director of the Hebrew Temple Emanu-El. In 1897 he conducted the Metropolitan Orchestra. He composed operas, symphonies, overtures, and many songs.

NEUENKIRCHEN, noi'en-kêrĸ'en. A town of Austria. See NEUNKIRCHEN.

NEUFCHÂTEAU, nē'shà'tō', COUNT FRANÇOIS DE. See FRANÇOIS DE NEUFCHÂTEAU.

NEUFCHÂTEL, nē'shà'tĕl'. See NEUCHÂTEL.

NEUFVILLE, FRANÇOIS DE. See VILLEROI, DUKE DE.

NEUHAUS, noi'hous. A town of Bohemia situated 70 miles south-southeast of Prague (Map: Austria, D 2). It contains a mediæval castle with a fine gallery of paintings, a thirteenth-century Gothic parish church, a Franciscan monastery, a museum, and a college. Manufactures include silk, cotton and woolen goods, embroidery, lace, starch, sirup, lumber, beer, and brandy. Pop. (district), 1910, 52,409.

NEUHÄUSEL, noi'hoi-zel (Hung. *Ersekújvár*). A town in the County of Neutra, Hungary, situated on the Neutra, 55 miles northwest of Budapest (Map: Hungary, F 2). It has a fine church, a Franciscan monastery, and a Gymnasium. There are manufactures of textiles and shoes, and the town is a good grain and horse market. Prior to 1724 it was a strong fortress and played a prominent part in the Turkish wars. Pop. (district), 1910, 34,442, mostly Catholic Magyars.

NEUHOF, noi'hŏf, THEODOR STEPHAN VON, BARON (c.1686–1756). A German adventurer and King of Corsica. He was born in Metz, the son of a Westphalian nobleman in the French service, and became page to the Duchess of Orléans. He then enlisted in the French army and later in the army of Sweden, where the Minister Goertz discovered him and employed him on secret diplomatic missions. In Spain he married a daughter of Lord Kilmallock and ran away with her diamonds to France. Beggared by Law's financial schemes, he lived in misery till 1732, when the Emperor Charles VI made him chargé d'affaires at Florence. In Florence Neuhof rendered some service to several Corsican patriots, who in return invited him to become King of Corsica. He landed in Corsica in March, 1736, was proclaimed King as Theodore I, and with help obtained from the Dey of Algiers defeated the Genoese. He left the island soon to seek assistance abroad, and came back in 1738 with reënforcements from Holland. But the French had come to the aid of the Genoese, and Neuhof fled. He made one more attempt on Corsica in 1743, but failed, and after long wandering went to England in 1749. There he was thrown into prison by his creditors and was released through the intercessions of Horace Walpole. Neuhof's son published his life in *Mémoires pour servir à l'histoire de Corse* (1768). Consult Fitzgerald, *King Theodore of Corsica* (London, 1890).

NEUHUYS, nē'hois, ALBERT (1844–1914). A Dutch genre painter, born in Utrecht. He studied under Craeyvanger and at the Antwerp Academy, and started as an historical and portrait painter, but after 1870 turned to interiors. When Israels had ceased to paint, Neuhuys became the most distinguished of the Dutch artists devoted to the portrayal of peasant life. His cottage pictures possess much the same characteristics as those of Israels, but in their rich, refined color scheme and admirable handling of lights and shadows bear more resemblance to Jacob Maris. They are to be found in many galleries and private collections in Europe and America. The Metropolitan Museum, New York, has one of his typical Dutch interiors, the Rijks-Museum two, the Dordrecht Museum one. He was awarded gold medals at Munich, Vienna, Paris, and Chicago. His home was in Amsterdam.

NEUILLY, nē'yĕ'. A northwest suburban municipality of Paris, in the Department of Seine, on the right bank of the river Seine (Map: Paris and vicinity). It is a favorite residential section of Parisian merchants and has sanatoriums, hospitals, and five parks, and, in connection with Parisian houses, establishments manufacturing patent leather, carpets, chemicals, perfumery, dyes, chocolate, varnish, starch, and automobiles. In a large and beautiful park along the Seine formerly stood the Château de Neuilly, built by Louis XV, and the favorite residence of Louis Philippe, who after his deposition assumed the title of Count of Neuilly. The château was destroyed in the revolution of 1848. Pop., 1901, 37,493; 1911, 44,616.

NEUKOMM, noi'kŏm, SIGISMUND VON (1778–1858). An Austrian composer and orchestra leader, born at Salzburg. He studied under Weissauer the organist and Michael and Joseph Haydn, the latter of whom was mainly instrumental (in 1804) in securing for Neukomm the leadership of the German opera at St. Petersburg. In 1809 he went to Paris, where he gained the friendship of Grétry, Cherubini, and Talleyrand, and in 1815 received the cross of the Legion of Honor. In 1816 he went to Rio de Janeiro and was appointed music teacher to the Crown Prince Dom Pedro. He returned in 1821. He was a prolific composer and has nearly 300 compositions to his credit. Of these his sacred works continued to enjoy great popularity for some time after his death, which occurred in Paris.

NEUMANN, noi'mân, ANGELO (1838–1910). An Austrian operatic impresario, born in Vienna. After 1859 he sang tenor parts in the opera at Cracow, Odenburg, and Pressburg; was a member of the Vienna Royal Opera in 1862–76; and in the latter year became director of the opera at Leipzig. The success of his presentation of Wagner's *Der Ring des Nibelungen* in Berlin and in London led him to establish in 1882 a traveling Wagnerian company, with which he toured Europe. At the end of 1882 he assumed direction of the Stadttheater at Bremen, and after 1885 was director of the German Landestheater at Prague. Neumann is author of *Erinnerungen an Richard Wagner* (1907; 4th ed., 1908; Eng. trans. by E. Livermore, *Personal Recollections of Wagner*, 1909).

NEUMANN, FRANZ ERNST (1798–1895). A

German physicist, born at Joachimsthal, near Berlin. He took part in the War of 1815 and afterward studied at the universities of Jena and Berlin. Neumann received his doctor's degree in 1826, and in 1828 he was made professor of physics and mineralogy in the University of Königsberg. He contributed to the theories of the reflection and refraction of light and of double refraction, to the study of crystals of double axes, and to the methods of determining the specific heat of bodies. From his work on specific heat he established (1831) Neumann's law, that the molecular heat of a compound is equal to the sum of the atomic heats of its constituents. Neumann's chief publications are: *Vorlesungen über die Theorie des Magnetismus* (1881); *Einleitung in die theoretische Physik* (1883); *Vorlesungen über elektrische Ströme* (1884); *Vorlesungen über theoretische Optik* (1885); *Vorlesungen über Theorie des Potentials* (1887); *Ueber ein allgemeines Princip der mathematischen Theorie inducirter elektrischer Ströme* (1892). About 100 of his memoirs appeared in the *Annalen, Crelle's Journal*, and the *Astronomische Nachrichten*. Consult Volkmann, *Franz Neumann* (Leipzig, 1896).

NEUMANN, Karl Friedrich (1793–1870). A German Orientalist and historian, born at Reichmannsdorf, Bavaria. He was educated at the universities of Heidelberg, Munich, and Göttingen, in 1821–25 was an instructor in the Gymnasium at Speyer; and later, at the Mechitarist cloister and academy on the island of San Lazzaro, Venice, made a study of the Armenian language and literature, some results of which appeared in his *Geschichte der armenischen Litteratur* (1836). He also made several translations into English of Armenian chronicles for the Oriental Translation Fund of London. During a visit to China he acquired an extensive knowledge of the Chinese tongue and a library of 12,000 printed books, which he presented to the Bavarian government. In 1833 he was appointed at Munich professor of the Armenian and Chinese languages, but in 1852 was retired because of his expression of liberal political views. He further wrote several works on the history of the Far East, a *Geschichte des englischen Reichs in Asien* (1857), and a *Geschichte der Vereinigten Staaten von Amerika* (1863–66).

NEUMANN, Karl Gottfried (1832–). A German mathematician, son of Franz Ernst Neumann, the physicist. He was born and educated in Königsberg, was professor at Halle, Basel, and Tübingen, and in 1868 became professor at Leipzig, founding in the same year the *Mathematische Annalen*. He retired in 1911. Neumann devoted himself mainly to the theory of functions and to mathematical physics, and may be considered the founder of the theory of logarithmic potential. Neumann edited various papers written by his father and published: *Theorie der Besselschen Funktionen* (1867); *Ueber die elektrischen Kräfte* (1873, 1898); *Vorlesungen über die mechanische Theorie der Wärme* (1875); *Untersuchungen über das logarithmische und Newtonsche Potential* (1877); *Hydrodynamische Untersuchungen* (1883); *Vorlesungen über Riemanns Theorie der Abelschen Integrale* (1884); *Allgemeine Untersuchungen über das Newtonsche Princip der Fernwirkungen* (1896).

NEUMANN, Karl Johannes (1857–). A German classical scholar, born at Glogowo and educated at Strassburg, where he later became professor of ancient history. His numerous publications include: *Juliani Imperatoris Librorum contra Christianos quæ Supersunt* (1880); *Strabons Landeskunde von Kaukasien* (1883); *Julians Abfall von Christentum* (1884); *Der römische Staat und die allgemeine Kirche bis auf Diocletian* (1890); *L. Junius Brutus der erste Konsul* (1901); *Die hellenistischen Staaten und die römische Republik* (1909); *Römische Staatsaltertümer* (1911; 2d ed., 1913).

NEUMANN-SPALLART, späl'lärt, Franz Xaver von (1837–88). An Austrian economist, born and educated in Vienna. He was professor of economics there in the commercial academy (1864–68), at the military academy (1868–71), and at the university and the agricultural college (1872). With Bodio he was one of those most influential in forming the International Statistical Institute, and he was long connected with the Austrian Central Commission on Statistics. As an economist he was a zealous worker in the interest of free trade in Austria and founded the Association for Economic Progress. Neumann published: *Oesterreichs Handelspolitik* (1864); *Volkswirtschaftslehre mit besonderer Anwendung auf Heerwesen und Militärverwaltung* (1873); and the valuable yearbook *Uebersichten in der Weltwirtschaft* (1878–87), continued by Juraschek.

NEUMARK, noi'märk, Georg (1621–81). A German poet. He was born at Langensalza and studied at Königsberg. At Kiel, where, after wandering about in poverty, he was engaged as a tutor, he wrote his famous song "Wer nur den lieben Gott lässt walten." Neumark was a member of the poetical guild called the Palmenorden, and he wrote its history, *Der neusprossende deutsche Palmbaum* (1668). Consult the selected poems in M. Müller, *Bibliothek deutscher Dichter des 17. Jahrhunderts*, vol. ii (Leipzig, 1828, and Knauth, *Georg Neumark nach Leben und Dichten* (Langensalza, 1881).

NEUMAYER, noi'mī-ĕr, Georg von (1826–1909). A German meteorologist and hydrographer, born at Kirchheimbolanden, Bavaria. He was educated at the Polytechnic and the University of Munich and at the nautical school at Hamburg, and in 1857 was sent by Maximilian II to Australia to make magnetic observations. At Melbourne Neumayer founded the Flagstaff Observatory. He returned to Germany in 1864, interested himself in the formation of expeditions to the north and south poles and in founding the German African Company, and, after a long connection with the hydrographic bureau at Berlin, in 1876 became director of the German Marine Observatory at Hamburg. He held this position until 1903, when he retired. Neumayer wrote: *Results of the Observations at the Flagstaff Observatory* (1858–63) and *Results of the Magnetic Survey of Victoria* (1869); *Anleitung zu wissenschaftlichen Beobachtungen auf Reisen* (1875; 3d ed., 1905); *Beobachtungsergebnisse der deutschen Stationen im Systeme der internationalen Polarforschung* (1886), with Börgen; *Die deutsche Expedition und ihre Ergebnisse* (1890–91); *Atlas des Erdmagnetismus* (1891); *Anemometer-Studien* (1897); *Auf zum Südpol!* (1901).

NEUMAYR, noi'mīr, Melchior (1845–90). An Austrian geologist. He was born in Munich, studied there and at Heidelberg, where, after four years in the Imperial Geological Institute at Vienna, he became docent in 1872. He soon re-

turned to Vienna and became full professor of geology and paleontology in 1880. Neumayr traveled widely in southern Europe and Asia Minor, making an especial study of the life and coördination of the Jurassic formations, the results of which appeared in the German geological magazines. He coöperated on *Geologische Studien in den Küstenländern des griechischen Archipels* (1880), and wrote *Die Stämme des Tierreichs: Wirbellose Tiere* (1890) and a general work on geology entitled *Erdgeschichte* (1885–87; 2d ed., 1895). The last-named work, while written in a popular style, may be commended for its comprehensiveness and scientific accuracy.

NEUMEISTER, noi'mīs-tẽr, ERDMANN (1671–1756). A German clergyman and hymn writer, born at Uechteritz, near Weissenfels, and educated at the University of Leipzig, where he was later professor of poetry. He is chiefly remembered for his hymns, some of which are of great merit and are still in use, such as "Jesus nimmt die Sünder an," "Will ich sagen," and "Lass irdische Geschäfte stehn," which have been translated into English. He wrote the text to Bach's cantatas. He also published a *Specimen Dissertationis Historico-Criticæ de Poetis Germanicis* (1695). His poetical works include *Fortgesetzte Fünffache Kirchenandachten* (1716–17) and *Zugang zum Gnadenstuhle* (1705). Consult the *Allgemeine deutsche Biographie,* vol. xxiii, p. 543; vol. xxviii, p. 808 (Leipzig, 1886, 1889).

NEUMES, nūmz (OF. *neume,* from ML. *neuma, pneuma,* song, musical sign, from Gk. *πνεῦμα,* pneuma, breath, from *πνεῖν, pnein,* to breathe). In Gregorian music, melodic ornaments, especially series of notes sung to one syllable. Also characters in a peculiar system of musical notation which was in use from the eighth or ninth to the eleventh century. The oldest preserved manuscript written in this notation is the Antiphonary of St. Gall (ninth century). No staff was used. The notes were represented by a system of dots and hooks and their respective pitch by the height at which they were placed above the syllables of the text. A single long note was indicated by the *virga* ( ) , two notes on one syllable by the *bivirga* ( )) , three by the *trivirga* ( ))) , etc. A shorter note was indicated by the *punctus* (•) , two by the *bipunctus* (••) , etc. The rising and falling of the voice was marked by a corresponding higher or lower position of the signs. In order to obviate the difficulty of determining the exact pitch of the various tones, a red line was drawn horizontally across the parchment (tenth century), and the signs were written above and below this line. Any sign upon the line denoted F. Before another century a second line was drawn above the red one. This was yellow and the note upon it was C. But in the plainer manuscripts the distinction of color was soon abandoned, and two black lines were drawn with the letters F and C placed at the beginning. In the course of time these letters underwent a series of conventional modifications, until they finally assumed the shape in which they are used to-day as clef signatures ( ). The G clef, which was added later, underwent a similar change . See MENSURABLE MUSIC; MUSICAL NOTATION; PLAIN CHANT. Consult: M. G. Houdard, *Le rythme du chant dit Grégorien après la notation neumatique* (Paris, 1897); O. Fleischer, *Neumen-Studien* (3 vols., Berlin, 1904); P. Wagner, *Neumenkunde,* part ii of *Einführung in die gregorianischen Melodien* (Freiburg, 1905).

NEUMÜNSTER, noi'mụn'stẽr. A manufacturing town in the Province of Schleswig-Holstein, Prussia, on the Schwale, 38 miles north of Hamburg (Map: Prussia, C 1). The principal products are leather, paper, cartons, cloth, enamel ware, machinery, and ironwork. It has railway shops. Pop., 1900, 27,335; 1910, 34,555.

NEUNKIRCHEN, noin'kẽrĸ-*e*n, or **NEUENKIRCHEN.** A market town in the Austrian Crownland of Lower Austria, on the Schwarza, a branch of the Danube, 39 miles south-southwest of Vienna (Map: Austria-Hungary, E 3). It lies in an important coal-mining district, has a large iron foundry, and manufactures textiles, metal work, screws, paper, ultramarine, and boilers. Pop. (district), 1910, 70,543.

NEUQUÉN, nā'o͞o-kān'. A territory of Argentina, situated on the west frontier of the Republic, and bounded by Chile on the west, the Province of Mendoza on the north, and the Territory of Río Negro on the east and south (Map: Argentina, F 5). Its area is about 42,345 square miles. The western part of the territory is covered by ramifications of the Andes, with intervening fertile valleys. The eastern portion is an elevated plain, lacking in rainfall and with meagre vegetation. A large part of the territory is watered by the headwaters of the Río Negro. There are numerous lakes, the principal one being Lake Nahuel-Haupi (q.v.) on the south boundary. The climate is dry, cool, and healthful. Agriculture and stock raising are the chief industries. Gold, silver, copper, coal, and petroleum are found, but mining is undeveloped. The territory is connected with Bahía Blanca and Buenos Aires by the Great Southern Railway. Pop., 1895, 14,517; 1912 (official estimate), 29,746, mostly Indians, though many Chileans have settled in the territory since the Indians were subjugated in 1884. The capital is Neuquén (pop., 1500).

NEURAL'GIA (Neo-Lat., from Gk. *νεῦρον, neuron,* nerve + *ἄλγος, algos,* pain). A sensory neurosis classed as functional and characterized by pain in the course of a nerve or nerves. The causes for neuralgia are legion, and more than one factor may be operative in a given case. It is not a disease of late life, but arteriosclerosis, a phenomenon of old age, is not an infrequent cause. Children rarely suffer from it. Neuralgias are divided into classes named from their underlying causes, as gouty, traumatic, hysterical, etc., as well as from their anatomical location, as trigeminal, lumbar, crural, sciatic, gastric, renal, visceral, cervico-occipital, brachial, and intercostal. The trigeminal, or facial, neuralgia is the most frequent, and the sciatic ranks next in frequency.

The most prominent symptom is pain, which is of a sharp, lancinating character or of a dull aching variety. Generally it appears in twinges of short duration, though of great intensity. Though principally following the course of the nerves, neuralgic pain pervades adjacent structures. Heat as well as cold generally increases it, as well as a light touch. Firm pressure sometimes relieves. In many cases painful points, generally corresponding to the places of exit of nerves from a bony structure, are found by testing with pressure. Numbness may accompany the pain, as well as muscular spasm in rare cases. The pain of neuralgia is usually increased

at night. It may return at regular intervals during the day, especially if dependent upon neuritis.

The treatment of neuralgia includes the use of rest, catharsis, the analgesics, hypodermic exhibition of morphine, as well as the local use of menthol, camphor, mustard, chloride of ethyl, chloroform, etc. Stretching of the nerve trunk as in sciatica (see NERVE STRETCHING; SCIATICA), excision of a part of the affected nerve, or removal of a ganglion of the sympathetic, may effect a cure. Permanent cure or temporary relief may be had from injection into or about the affected nerve or its ganglion of alcohol, normal saline solution, or cocaine. In all cases hygiene, diet, regimen, and tissue building are necessary, as well as the discovery and removal of any peripheral irritant, thereby stopping all nerve leaks. Refractive errors, decayed or impacted teeth, intranasal pressure, and accessory nasal sinus disease must always be sought for. See NEURITIS.

NEURALGIA, FACIAL. See FACIAL NEURALGIA.

NEU'RASTHE'NIA (Neo-Lat., from Gk. *νεῦρον, neuron,* nerve + *ἀσθένεια, astheneia,* weakness), nerve weakness. Perhaps the most frequent of the acquired neuroses. The symptom group making up this clinical entity was first familiarized by Beard of New York in 1869, and it is sometimes called the American disease, though now recognized as a world-wide malady. As a rule all forms of nervous energy are reduced and fatigue quickly appears upon the exercise of any motor, mental, or organic activity. It is essentially a disorder of the productive period of life, but does occur in neurotic children and in nervous adults of advanced years. The sexes are about equally affected. Hebrews, Scandinavians, and Slavs show a special susceptibility, and those of neuropathic heredity and the offspring of the physically defective are prone to be attacked by it.

Great altitudes, extremes of climatic conditions, wasting diseases, vicious habits, physical illness, injury, shock, and fright, or protracted anxiety, grief, worry, and excitement are competent causes. Excesses of all varieties and, finally and most important of all, overwork must be added to the list. The only essential element in the causation of neurasthenia is overstrain, and this is a quantity relative to the inherent capacities of the individual and often correlated with hereditary tendencies or defects.

The major symptoms of the disorder are headache, backache, gastrointestinal disturbances, neuromuscular weakness, mental depression, irritability, and insomnia. To these in varying number and of inconstant appearance are added tremor, twitchings, startings, sensations of general fatigue, pressure headaches, drawing feelings in the back of the neck and spine, tenderness at various points along the spine, particularly at its two extremities and at the waist, neuralgic pains, and various paræsthesiæ described as prickling, tightness, burning, numbness, stiffness, heat, cold, heaviness, soreness, and vague discomforts referred to the body viscera. Use of the eyes commonly intensifies the headache and causes prompt fatigue with increase in all the subjective complaints. Sometimes patients shun the light continuously. Nervous indigestion, gaseous fermentation, alternating diarrhœa and constipation, cardiac palpitation, feebleness of the circulation, and vascular storms are commonly presented. The activity of the functions of the genitourinary tract is reduced. On the mental side there is loss of concentration and consequently memory is enfeebled. Continuous application is impossible. Courage fails, introspection becomes habitual, and many apprehensions and distinct phobias of a hypochondriacal cast add to the patient's misery. The natural affections are diminished and depressed emotions are continuous. The sleep, disturbed by troubled dreams, is broken and unrefreshing. The early morning hours are particularly gloomy. The patient's general bodily condition is unsatisfactory. Anæmia and loss of flesh are commonly encountered, though exceptionally the general nutrition is excellent. The great majority of these symptoms it will be noticed are subjective, not demonstrable physically and capable of misrepresentation. For this reason such patients are misunderstood by their friends, who either foster the condition by misguided solicitude or give it scant sympathy. A careful examination proves that the nerve force is actually diminished and strength exhausted with undue ease. This is demonstrated by the contraction of the visual fields under appropriate tests, the initial exaggeration and progressive reduction of the tendon reflexes, the inability to maintain dynamographic records, the tendency to rapid heart, the digestive inadequacy, etc. Any one or even very many of the enumerated symptoms may be found in other ailments, but it is their systematic grouping and the exclusion of other definite morbid states that enables a diagnosis of neurasthenia to be made.

When the brain functions are principally disordered, the term "cerebral neurasthenia" is sometimes employed. In the same way spinal and sexual neurasthenia are mentioned, but in neurasthenia no function escapes, though there may be a varying preponderance of certain classes of symptoms. All functions are marked by an irritable weakness. Often this nervous disorder is associated with hysteria, particularly in the traumatic cases. Not seldom it is secondary to an initial bodily disease, which may or may not be present at the same time.

Neurasthenia is essentially chronic. Its causation is commonly of long standing, its onset insidious, its course protracted, its recession halting and marked by relapses, its tendency to recurrence pronounced. It is often associated with organic and inorganic diseases, and is encountered as an initial stage in the development of hypochondriasis, melancholia, mania, and general paresis. When uncomplicated by organic diseases, its prognosis is usually fairly good, provided the causal conditions can be removed and sufficient adequate rest and upbuilding secured. As it often arises out of the necessities of human existence and social conditions, its proper treatment is frequently impossible. The keynote is rest, and in proportion as this can be made complete both mentally and physically success results. The full rest-cure plan of Mitchell, especially with women, often secures brilliant results. In a modified form in mild cases it is also efficient. It implies the expenditure of much time and money. When this is not possible, change of scene, of occupation, of preëxisting influences, must otherwise be obtained. The burden of work, the fretting, and carking cares must be minimized, and the physical health and stamina raised to the highest possible level. If such patients can be fattened, success is almost

assured. Drugs play an entirely secondary part in the treatment of neurasthenia, merely meeting incidental physical requirements. Any underlying physical disease of which neurasthenia may be the superficial manifestation must of course receive major care. To the mental perturbation, however, constant attention must be directed. The patient's fears must be allayed, his hopefulness encouraged, his introspection diverted, and refreshing sleep secured. In proportion as the physician grasps the mental side of the disease, secures the patient's confidence, and meets the requirements of his biased views, is he successful and helpful in managing the neurosis.

A number of more or less speculative theories regarding the essence of neurasthenia are current, but nothing definite is known. Consult Church and Peterson, *Nervous and Mental Diseases* (8th ed., Philadelphia, 1914). See CLIMATE AND DISEASE.

NEUREUTHER, noi'roi-tĕr, EUGEN NAPOLEON (1806–82). A German painter, etcher, and illustrator, born in Munich, son and pupil of the painter Ludwig Neureuther (1775–1830). He also studied at the Munich Academy under Wilhelm von Kobell. His talent developed, however, chiefly under the influence of Cornelius, who employed him on the frescoes in the Glyptothek and in the Königsbau. His illustrations for Goethe's romances and ballads with marginal drawings, published in 1829–39, made his reputation. In 1830 Neureuther visited Paris, where his illustrations of the scenes of the July revolution appeared under the title "Souvenir du 27, 28, 29 juillet" (1831). After his return he published "Marginal Drawings to Bavarian Poets" (1832–35), and in 1838 completed his illustrations to Herder's *Cid*. His best etching, in which line he produced his most pleasing and valuable compositions, is perhaps the large plate of "Dornröschen" (1839). As a painter, he may be judged by "The Pastor's Daughter of Taubenhain," in the Pinakothek, Munich, and six canvases in the Schack Gallery at Munich. All his work is distinguished by great decorative charm and by purity and nobility of line.

NEURI'TIS (Neo-Lat., from Gk. *νεῦρον, neuron,* nerve). A disease of a nerve or nerves, accompanied by inflammation. Neuritis may be single or multiple, interstitial or diffuse, toxic or infective. It is caused by injury to the nerve involved by infection such as from typhoid fever, tuberculosis, or leprosy, or by the toxic action of alcohol, arsenic, lead, etc.

The symptoms of localized neuritis are severe pain, somewhat relieved when the part is at rest and kept warm, some numbness, reduction of the sense of touch, loss of power in the muscles, and eventual atrophy. There may be contraction of the muscles, with rosy color of the skin and a peculiar glossiness.

Multiple neuritis is very frequent. It is caused by the toxins of several infectious diseases, as diphtheria, typhoid fever, smallpox, and scarlet fever, as well as by mercury and lead, gout, diabetes, cancer, and tuberculosis, but most often by alcohol. In this form of neuritis the invasion is usually acute, with pain in head, back, and legs, loss of power in arms and legs so that the patient can scarcely climb the stairs, drop wrist and drop foot, muscular wasting, tenderness in the muscles, tremor, and sensory disturbances. Fever is rare, and the invasion of the disease is slow. When alcohol is the cause, delirium and convulsions may occur, with hallucinations, somewhat resembling delirium tremens. Multiple neuritis is frequent in various countries, under various names. It is called kakké in Japan, and beriberi in China, New Zealand, India, Brazil, and the West Indies, in which countries it is endemic. Its course is similar to that of alcoholic multiple neuritis. Its mortality varies from 3 to 50 per cent. The mortality of alcoholic neuritis is not much smaller. Of those who continue the use of alcohol, 50 per cent die of alcoholism, pneumonia, or tuberculosis. Treatment is symptomatic, with removal of the cause. See BERIBERI.

NEUROG'LIA. See NERVOUS SYSTEM AND BRAIN.

NEUROL'OGY (from Gk. *νεῦρον, neuron,* nerve + *-λογία, -logia,* account, from *λέγειν, legein,* to say). The branch of science concerned with the anatomy, physiology, disorders, and diseases of the nervous system. Brain functions associated with mentality are somewhat arbitrarily placed in the field of psychology, and their disorders furnish the topics grouped under the head of psychiatry. Neurological conditions are also studied in the lower animals, giving a subdivision of the subject, comparative neurology, which with embryology furnishes important facts which aid in understanding the human nervous apparatus. In the more limited medical sense, neurology embraces a study of the human nervous system, its diseases (except insanities) and their treatment. See NERVOUS DISEASE.

NEUROMA, nû-rō'mȧ (from Gk. *νεῦρον, neuron,* nerve + *ωμα*). A tumor, composed chiefly of sympathetic ganglion cells (true neuroma) or of fibrous tissue (false neuroma). See TUMOR.

NEURON, nū'rŏn (Gk. *νεῦρον, neuron,* nerve). See NERVOUS SYSTEM AND BRAIN.

NEUROP'TERA (Neo-Lat. nom. pl., from Gk. *νεῦρον,* neuron, nerve + *πτερόν, pteron,* wing). A Linnæan order of insects which has recently been restricted by separating out the orders Mecoptera, Corrodentia, Isoptera, Odonata, Ephemeridæ, Plecoptera, and Trichoptera, which together for a time were known as the Pseudoneuroptera. At present the Neuroptera include those forms belonging to the old group of net-winged insects which possess a complete metamorphosis. The mouth parts are formed for biting. The wings are four in number, membranous, and furnished with numerous veins, usually with many cross veins. Practically all forms are carnivorous and feed upon other insects. Some of them are aquatic, but the majority live on land and wherever their prey abounds. The order is divided into seven large families:

1. The Sialidæ, including the dobson or hellgramite fly (see CORYDALIS), the alder flies (*Sialis*), and the fish flies (*Chauliodes*).

2. The Raphidiidæ, or snake flies (q.v.).

3. The Mantispidæ, including the false rear-horses, or mantis-like Neuroptera. These insects, rare in the United States, have a long neck and grasping front legs, and are predatory in habits. Their transformations are especially interesting.

4. The Conopterygidæ, including the dusty-wings, which are the smallest of the Neuroptera and have wings covered with whitish powder. They are very few in number, and prey, in the larval stage, upon scale insects, plant lice, and red spiders.

5. The Myrmeleonidæ, or ant lions (see ANT LION).

6. The Hemerobiidæ, or aphis lions (see APHIS LION).

7. The Chrysopidæ, or golden-eyed lace-winged flies. See LACEWING.

Nearly all the families of Neuropteran insects are represented by fossil remains in the Tertiary rocks; and some, such as the dragon flies, caddis flies, May flies, and white ants, appear in the still earlier Mesozoic formations.

Consult: David Sharp, *Cambridge Natural History*, vol. v (London, 1895); V. L. Kellogg, *The Insect Book* (New York, 1908); J. H. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, 1909); L. O. Howard, *The Insect Book* (New York, 1914).

NEUROP'TERIS (Neo-Lat., from Gk. *νεῦρον, neuron*, nerve + *πτερίς, pteris*, fern). An important genus of fossil ferns common in the coal-measure shales and sandstones of Carboniferous age in North America and Europe. See CARBONIFEROUS SYSTEM; FERN.

NEURO'SIS (Neo-Lat., from Gk. *νεῦρον, neuron*, nerve). A morbid nervous state, either functional (due to reflex disturbance from a lesion or a condition in another part of the body) or organic (due to local conditions). Neuroses are classed as *kinesioneuroses*, or disorders of motion; *œsthesioneuroses*, or sensory disorders; *trophoneuroses*, or disorders of nutrition; *thermoneuroses*, or disorders of heat perception; *vasomotor neuroses* or *angioneuroses*, or disorders of circulation; *secretory neuroses;* and *mixed neuroses*. Among the latter are the *acroneuroses*, certain disorders affecting the extremities, such as acroparæsthesia and erythromelalgia; *sexual neuroses*, affecting the functions of the sexual organs; and *psychoneuroses*, in which there is a combination of mental and physical symptoms due to a complex condition. Many of these functional neuroses are considered under their proper titles.

The occupation neuroses are functional disorders consisting of numbness, tingling, partial loss of muscular power, involuntary contractions or spasms, tremor and disability, which combine to prevent the use of certain groups of muscles which have been used habitually by the patient in his occupation or professional labors. An occupation neurosis and atrophy is really a condition of muscle fatigue occurring in a neurasthenic, with subsequent neuritis in a few cases. The most common neurosis of this class is *writers' cramp*, or *scriveners' palsy*. This disease has been known since about 1820, when the steel pen superseded the quill. Worry, intemperance, and other undermining influences are predisposing causes, as well as preëxisting neurasthenia, as already noted. Excessive writing, under mental pressure, is the exciting cause, especially if the writing is done with the hand in a cramped position. It is a chronic disease. Many sufferers learn to write with the left hand, but this also may become affected. The use of gold pens has brought some relief and has controlled the increase of the affection among writers. But the great refuge and preventive is the typewriter, although this instrument itself may engender a neurosis. Those who write much should use large cork penholders and gold pens. Writing under cerebral strain should be avoided.

Telegraphers' cramp is common among the manipulators of the Morse instrument. About one in 200 operators suffer from "loss of the grip." The symptoms are much the same as in writers' cramp. Among the other occupation neuroses are *musicians' cramp*, seen in pianists, violinists, flutists, and others; *sewing spasm*, among tailors, seamstresses, and shoemakers; *milkers' spasm*, which is very rare; *ballet-dancers' cramp*, and many others. The *glass arm* of the ball player and the *tennis elbow* are really forms of occupation neurosis.

In the treatment of occupation neuroses, rest or change of occupation, massage of nerve and muscle, electricity, douches, and the cautery have proved useful. Drugs are generally useless, except such as relieve the neurasthenia of the patient. Consult Church and Peterson, *Nervous and Mental Diseases* (8th ed., Philadelphia, 1914). See OCCUPATIONAL DISEASES.

NEUROT'IC (Neo-Lat. *neuroticum*, from *neurosis*). A word partly synonymous with nervous, now commonly used to describe an individual who suffers from nervous disease, such as neurasthenia or hysteria, or who is of pronounced nervous temperament. The term "neurotic" was formerly used in medicine to specify such a drug as tends to affect principally and specifically the brain centres that govern intellect, sensibility, and motor activity. Alcohol, ether, chloral, opium, potassium bromide, amyl nitrite, and strychnine are examples of drugs to which this name may be applied.

NEURUPPIN, noi'ṛụp-pēn'. A town of the Province of Brandenburg, Prussia, on the small lake of Ruppin, connected with the Elbe, 36 miles northwest of Berlin (Map: Prussia, E 2). It has a thirteenth-century church, a Gymnasium, and a seminary for teachers. Its industries are brewing, spinning, and the manufacture of linen and woolen cloths, starch, brushes, fire extinguishers, lithographed work, machinery, and lumber. There is also considerable trade in cattle and cereals. Neuruppin became a town in 1256. Pop., 1900, 17,100; 1910, 18,720.

NEUSALZ, noi-zälts'. A town in the Province of Silesia, Prussia, on the Oder, 75 miles northwest of Breslau (Map: Prussia, F 3). The principal manufactures are linen thread (employing 2200 hands), cartons, machinery, lumber, cartridges, and enamel. It has iron mines and a shipbuilding trade. Pop., 1900, 12,586; 1910, 13,474.

NEU-SANDEC, noi-zän'dĕts. A town of the Crownland of Galicia, Austria, on the Dunajec, about 45 miles southeast of Cracow (Map: Austria, G 2). It has a Roman Catholic church of the fifteenth century, an Evangelical church of the seventeenth century, an old castle, a new town hall, a Gymnasium, a girls' convent school, a Jesuit college, and a hospital. The chief industrial establishments are the extensive railway shops. Machinery and flour are produced, there are fisheries, and in the vicinity of the town petroleum wells. Pop., 1910, 25,404; (district) 136,366, mostly Poles and Jews.

NEUSATZ, noi'zäts (Hung. *Ujvidék*). A royal free town in the County of Bács-Bodrog, Hungary, situated on the left bank of the Danube, opposite the town of Peterwardein and at the mouth of the Franz-Josefs Canal, 163 miles south-southeast of Budapest (Map: Hungary, F 4). It is a town of recent origin, having been practically rebuilt since its destruction in 1849. It is the seat of the Greek Oriental Bishop of Bács and has a new cathedral, a higher Gymnasium, an industrial and a commercial school. Its products include millstones, silk, conserves, and spirits, with good fruit, vegetables, and wines. The river trade is large. Neusatz is the

seat of the Matica Srpska, the chief literary and scientific organization of the Serbs in south Hungary. Pop., 1900, 29,296; 1910, 33,089, mostly Serbs and Magyars.

NEUSE, nūs. A river of North Carolina, rising in Person County in the northern part of the State and flowing southeast into the west end of Pamlico Sound (Map: North Carolina, F 3). It is about 300 miles long and navigable for light-draft steamers for about 70 miles from its mouth. At Newbern, 34 miles from its mouth, it widens into a broad estuary. The stream is from 1¾ to 5 miles wide and has a channel depth of more than 13 feet for 25 miles above its mouth; for the next 9 miles (to Newbern) the channel depth is 11 feet.

NEUSIEDLER SEE, noi'zēd-lēr zā (Hung. *Fertö-Tava*). A lake in northwest Hungary, 30 miles southeast of Vienna (Map: Hungary, E 3). It is about 23 miles long, from 4 to 9 miles wide, and covers an area of 126 square miles, but its surface is not permanent. On the east shore is the large swamp of Hanság, but the land on the west shore consists of vine-clad hills, with several thriving towns. The water is salty and unfit to drink. The lake has dried up on several occasions, notably in 1865, when farms were laid out in its bed; but in 1870 it filled up again, destroying all improvements. It is now connected with the Rabnitz River by a canal which, in case of a flood, drains off the surplus water.

NEUSOHL, noi'zōl (Hung. *Beszterczebanya*). The capital of the Province of Sohl, Hungary, at the confluence of the Gran and Bistritz, 75 miles north of Budapest (Map: Austria-Hungary, F 2). It has a cathedral noted for its fine fourteenth-century altar, other ecclesiastical structures, and an old castle, now used as barracks. There are manufactures of hardware, firearms, paper, cloth, matches, and spirits, and a silver foundry. Four and a half miles to the north are the Herrengrund silver, iron, and copper mines. Pop., 1910, about 12,000; (district) 33,268.

NEUSS, nois. A town in the Rhine Province, Prussia, near the Rhine, with which it is connected by a canal, 4 miles west of Düsseldorf (Map: Prussia, B 3). The Roman Catholic church of St. Quirinus, a beautiful edifice of the transition from the round to the pointed style, was begun in 1209. The late Gothic Rathaus is interesting for its collection of paintings by Janssen. Neuss produces a large amount of rape oil. There are manufactures of paper, machinery, ironware, screws, hats, soap, starch, oleomargarine, chicory, chemicals, bricks, lumber, meal, cravats, leather, and woolens; there is a trade in grain, cattle, and coal. Pop., 1900, 28,484; 1910, 37,224. The town is supposed to be the Novesium of the Romans. It came under the Archbishop of Cologne in 1074. In 1474 it suffered a long siege by Charles the Bold, and a century later was almost totally destroyed by Alexander of Parma.

NEUSSER, noi'sēr, Edmund von (1852–1912). An Austrian physician. He was born in Swozowice, Galicia, studied medicine in Vienna (M.D., 1877), was admitted as lecturer to the medical faculty of the University at Vienna in 1888, and was appointed professor of medicine and director of the second medical clinic in 1903; from this position he resigned in 1912. He made reports to the Austrian government on pellagra as observed in Friaul and Rumania and described in *Die Pellagra in Oesterreich und Rumänien* (1887), and is the author, among other writings, of *Ausgewählte Kapitel der klinischen Symptomatologie* (1904) and *Clinical Treatises on the Symptomatology and Diagnosis of Disorders of Respiration and Circulation,* English translation by Andrew MacFarlane (New York, 1901–09). He wrote for Nothnagel's *Specielle Pathologie und Therapy,* "Die Erkrankungen der Nebennieren" (1897; English translation, "Diseases of the Suprarenal Capsules," in *Nothnagel's Practical Diseases of the Liver, etc.,* 1903).

NEUSTADT, noi'stât. A city in Upper Silesia, Prussia, on the river Prudnik, 29 miles southwest of Oppeln (Map: Prussia, G 3). It has two monasteries, a Gymnasium, and a school to teach the weaving of Persian rugs. There are manufactures of woolen and linen fabrics, damask, carpets, shoes, dyes, and yeast. Pop., 1900, 20,139; 1910, 18,856.

NEUSTADT, Heinrich von. See Heinrich von Neustadt.

NEUSTADT, Wiener. A town of Austria. See Wiener-Neustadt.

NEUSTADT-ON-THE-HARDT, härt. A town in the Rhine-Palatinate, Bavaria, situated in the Hardt Mountains, 14 miles west-northwest of Speyer (Map: Bavaria, D 4). The abbey church (1356) contains many tombs of the Counts Palatine. The educational institutions include a Gymnasium, a Realschule, a Latin school founded in 1579, and a vintner's school. Neustadt manufactures cloth, paper, tobacco, machinery, boilers, cement, starch, wire cloth, and furniture. In the vicinity are extensive vineyards, from which a good grade of sparkling wine is produced. Pop., 1900, 17,800; 1910, 19,288, chiefly Protestants.

NEUSTETTIN, noi'stĕt-tēn'. A town in the Province of Pomerania, Prussia, 80 miles southwest of Danzig (Map: Prussia, G 2). There are manufactures of machinery, ironware, dyes, soap, and matches, and trade in grain and cattle. Pop., 1905, 10,785; 1910, 11,833.

NEUSTRELITZ, noi-strā'lĭts. The capital of the Grand Duchy of Mecklenburg-Strelitz, Germany, 60 miles north by west of Berlin (Map: Germany, E 2). It is laid out with remarkable regularity, its wide, straight streets radiating in eight directions from the market place, which is adorned with a statue of the Grand Duke George. The principal buildings are the grand ducal palace, situated in a beautiful park and containing a fine library of 130,000 volumes and collections of coins and antiquities, the theatre, the royal stables built in Byzantine style, and the Rathaus. There are also a Gymnasium, a Realschule, and a fine hospital. The principal manufactures are machinery, stoves, woolens, lumber, cloth, vinegar, flour, conserves, and dairy products. Neustrelitz was built in 1726 on the site of the old fortress of Lunkin. Pop., 1900, 11,344; 1910, 11,993.

NEUSTRIA, nūs'trĭ-â (Lat. *Francia occidentalis,* west France). The name given in the times of the Merovingians to the western portion of the Frankish Empire, in contrast to Austrasia (q.v.). Later it was used for various territorial divisions; in the eleventh century and later it was often used as synonymous with Normandy. Consult Longnon, *Atlas historique de la France* (Paris, 1889). See Franks.

NEUTITSCHEIN, noi'tĭt-shīn. A town in the Crownland of Moravia, Austria, on the

Titsch, 70 miles northeast of Brünn (Map: Austria, F 2). It has a Byzantine church and an old castle, a higher Realschule, and schools of agriculture, forestry, and textiles. There are manufactures of tobacco, vehicles, organs, spirits, hats, and cloth. Pop., 1910, about 15,000; (district) 85,245, chiefly of German descent. Near by is the sulphur bath of Sommerau.

NEUTRAL AXIS (Lat. *neutralis*, from *neuter*, neuter, from *ne-*, not + *uter*, either). An imaginary line of a body which is subjected to a transverse strain and is so situated as to separate the forces of extension from those of compression. If the ratio of the resistance to extension and compression were the same for all substances and depended merely upon the form of the body, then in all bodies of the same shape the neutral axis would have a definite geometric position. But this ratio has a separate value for every substance. In a rectangular wooden beam supported at both ends, the neutral axis passes longitudinally through the centre of the beam, while in cast iron, in which the resistance to compression is greater than that to extension, it is a little above the centre, and in wrought iron, in which the contrary is the case, it is a little below the centre.

NEUTRAL IDIOM. See UNIVERSAL LANGUAGE.

NEUTRAL'ITY. Neutrality is the situation of states which do not enter a war. It is *temporary* when assumed with respect to a specific war, by virtue of a voluntary act; *perpetual* when it is assumed in advance for all wars to come, by virtue of a formal obligation. The conception of neutrality is of relatively recent origin and as yet is only imperfectly developed.

Temporary Neutrality. Temporary or optional neutrality is as old as war itself, but the recognition of a right of neutrality and the determination of the rights and duties of neutrals are recent. A law of neutrality, amounting as it does to a limitation of belligerency, is only possible at a time in history when neutral nations become strong and numerous. It was not till the eighteenth century (Vattel, 1758) that an attempt was made to present a complete theory of neutrality under that name. Grotius in the seventeenth century suggested that neutrals should form an opinion upon the justice or injustice of the hostilities, and then he bade them "do nothing which would further the cause of the one in the wrong, or hamper the movements of the one in the right." However, in doubtful cases he demanded that neutrals should treat both parties equally. (*De Jure Belli ac Pacis*, book iii, chap. xvii, 3, 7.) According to Vattel, on the other hand, the neutral is not, on principle, to constitute himself a judge of the justice or injustice of the cause of the war. For the principle of unequal treatment of belligerents in accordance with the justice or injustice of the war is substituted the principle of impartiality, i.e., of equal treatment for both belligerent parties. But there was an exception to that equality of treatment in cases where, by a treaty concluded before the war, the neutral had engaged to furnish assistance, either in subsidies or troops. Regard for treaties thus limited the law of neutrality, which was the more imperfect in that it was not until somewhat later that it found its basic principle. This basic principle is respect for neutral sovereignty. To make war is an act of sovereignty, but the sovereignty of a state does not extend beyond the limits of its jurisdiction. The neutral, therefore, cannot be obliged to allow the belligerent to commit an act of war within its territory. Not only should a belligerent never enter neutral territory, despite the numerous territorial violations of the seventeenth and eighteenth centuries, nor even follow an enemy ship into neutral waters, despite the contrary opinion of Bynkershoek (*Quæstiones Juris Publici*, book i, chap. viii, 1737), but by the end of the eighteenth century it had been settled that the fitting out of privateers and the adjudication of prizes, acts of belligerent sovereignty, could not be effected within the jurisdiction of a neutral without violating its sovereignty. The American Secretary of State, Jefferson, wrote to citizen Genet, Minister from France, that it is "the right of every nation to prohibit acts of sovereignty from being exercised by any other within its limits." Furthermore, the raising of troops and the granting of military commissions were sovereign rights which, as they pertained exclusively to the nation itself, could not be exercised within its territory by a foreign power without its consent. In June, 1794, the first Neutrality Act was passed, forbidding within the United States the acceptance and exercise of commissions, the enlistment of men, the fitting out and arming of vessels, and the setting on foot of military expeditions, in the service of any prince or state with which the government was at peace. (John Bassett Moore, *American Diplomacy*, 1905, pp. 43–46.) In 1818 was passed the Foreign Enlistment Act, which, subsequently amended and developed, is still in force. It prohibits all citizens of the United States from serving in a war against a state with which the United States is at peace and forbids the equipping and arming, within the limits of American jurisdiction, of a vessel destined to be used as a cruiser in a war during which the United States remains neutral, or the increase or the armament of such a vessel in a port of the United States, or the organizing within the territory of the Republic or its waters of an expeditionary force directed against a country with which the United States is at peace. It is out of respect for its own sovereignty that a neutral state places limitations on the activity of belligerents and thus makes war recede before neutrality.

The moment that a neutral is conscious of its right to prevent a belligerent from using its territory for battle, for the passage of troops that would surely lead to battle, for the arming of vessels and the adjudication of maritime prizes, it is equally conscious that it ought to abstain from all acts which, in favoring one of the belligerents, would give the other a motive to enter its territory in order to put a stop to such acts. Reason requires that a neutral, in order to keep its sovereignty intact during the course of a war, shall refrain from taking part in the operations of that war. Accordingly a neutral is not permitted to give or sell arms or munitions drawn from the arsenals of the state or government manufactures, or condemned ships of the fleet, still less subsidies from the public funds; but it is not contrary to the obligations of neutrality for a state to permit its citizens, in the free exercise of industry and commerce, to manufacture for and sell to belligerents arms, munitions, and detached parts of vessels. Neutrality is the duty of the state;

it is not the duty of the individual citizen. This distinction is clearly laid down in Conventions V and XIII of The Hague Conference of 1907: A neutral Power must not allow belligerents "to move troops or convoys of either munitions of war or supplies across" its "territory." Likewise a neutral Power must not allow belligerents to form corps of combatants, or recruiting agencies to be opened to assist the belligerents (Convention V, Arts. II, IV, V), or to establish a prize court on its territory or on a vessel in its waters, or to use its ports and waters as a base of naval operations against its adversaries, or to erect wireless telegraph stations or any apparatus for the purpose of communicating with the belligerent forces on land or sea, or to supply, in any manner, directly or indirectly, warships, ammunition, or war material. (Convention XIII, Arts. IV, V, VI.) But, according to Article VII of Conventions V and XIII (same text for both Conventions), "A neutral Power is not bound to prevent the export or transit, for the use of either belligerent, of arms, munitions of war, or, in general, of anything which could be of use to an army or fleet." The principle, thus established, of the freedom of neutral commerce in military supplies in time of war, is, however, subject to one exception, viz., warships, the equipping, arming, and departure of which for the immediate purpose of cruising on the high seas for war or capture, must be prevented by neutral Powers by every means at their disposal. Such a military unit organized on neutral territory would transform that territory into a base of military operations, in disregard of the principle of territorial inviolability of a neutral state above set forth. The rule governing cases of this kind arose out of the controversy with Great Britain over the cases of the *Alabama* and other Confederate cruisers equipped in England during the American Civil War, and was embodied in the Treaty of Washington of May 8, 1871, and reproduced in Article VIII, Convention XIII, of Oct. 18, 1907, at The Hague. It seems obvious that this rule, framed to cover the case of complete naval units, designed for cruising immediately after leaving neutral waters, could not have any application to detached parts of submarines or even, according to the decision of the American Department of State, March, 1915, to hydro-aëroplanes.

After being based for upwards of 100 years upon the respect for sovereign territory, the legal aspect of neutrality tends, since the close of the nineteenth century, to find its basis elsewhere. This new viewpoint is that, war being contrary to international order, to the common interests of the peoples, which are becoming more and more unified, and to the general good of humanity, which will not permit that anywhere on the globe men shall be insensible to the sufferings of others, it is the right and duty of states not involved in an international controversy to use their efforts to prevent the outbreak of war; then, if hostilities commence, to multiply their efforts to restrict the war zone as much as possible and to hasten the end of the struggle. By virtue of this new conception, embodied in The Hague Conventions of 1899 and 1907, For the Pacific Settlement of International Disputes, Article 3, "Powers, strangers to the dispute, have the right to offer good offices or mediation even during the course of hostilities." "The exercise of this right can never be regarded by either of the parties in dispute as an unfriendly act." But further, by virtue of the same idea it is not the duty of neutral states to circumscribe the area of war and lessen the force of hostilities by preventing their citizens from carrying on commerce in arms and munitions of war or from loaning money to belligerents, and by preventing the coaling and repairing of belligerent warships, even when closing, except on internment, the ports of neutrals to such vessels. The progress of the pacific idea gives more and more force to the principle that neutral states ought, not only by abstention but also by action, to deprive belligerents of any kind of assistance, direct or indirect, within the limits of their jurisdiction. In Conventions V and XIII of Oct. 18, 1907, at The Hague, the solution of these diverse questions has been left in a systematic manner to the discretion of the neutral state. To each individual state, out of the fullness of its sovereignty, it leaves the right to say whether it will prohibit the exportation or transportation to belligerents of arms and munitions of war; whether it will prohibit or restrain the use by belligerents of telegraph or telephone cables or wireless apparatus, whether belonging to companies or to individuals; whether a belligerent war vessel may stay in its ports more than 24 hours (Convention XIII of 1907, Art. XII), excepting in the case of a storm at sea; and each state may fix the maximum number of warships belonging to a belligerent which may be in one of the ports or roadsteads simultaneously. (Art. XV.) Finally, each state may allow warships to coal in its ports or waters, either directly or through dealers, in a quantity even more than sufficient to reach the nearest port in their own country. (Convention XIII of 1907, Art. XIX.) But if it does not prohibit the exportation of arms and munitions at the opening of hostilities, the neutral state cannot change the rule in the course of the struggle, "except in a case where experience has shown the necessity for such change for the protection of the rights of that Power." Further, if at the beginning of hostilities, and subject to the preceding exception, the neutral state has not passed legislation upon the length of stay, the number and restocking of belligerent vessels in neutral waters, Convention XIII of 1907 has supplied a course to be followed. In the absence of special provision to the contrary in the legislation of a neutral Power, belligerent warships are not permitted to remain in the ports, roadsteads, or territorial waters of the said Power for more than 24 hours, except in the cases covered by the present conventions. (Art. XII.) In the absence of special provisions to the contrary in the legislation of a neutral Power, the maximum number of warships belonging to a belligerent which may be in one of the ports or roadsteads of that Power simultaneously shall be three. On principle, belligerent warships may ship only sufficient fuel to enable them to reach the nearest port in their own country, but they may fill up their bunkers built to carry fuel when in neutral countries which have adopted this method of determining the amount of fuel to be supplied.

In the determination of the rights and duties of neutrals it is impossible not to reckon with the difficulties for neutrals which arise from obligations too numerous and too strict. It would

be imprudent to lay down such rules as a neutral could not make a belligerent respect. Not only should the duty of a neutral be limited in principle to abstention from all direct aid, or the prohibition of every act which would transform its territory into a base of operations, but, apart from the matter of direct aid, a neutral state can only be expected to use "due diligence," in accordance with the terms of the Treaty of Washington of May 8, 1871, in the affair of the Alabama claims, or, in accordance with the interpretation by Articles XVIII and XXV of Convention XIII of The Hague of Oct. 18, 1907, to exercise such surveillance as the means at its disposal permit. After having used all its efforts, even to a display of force, to prevent the violation of its neutrality, the neutral should do all in its power, once this violation has been committed, to put an end to its effects. When a ship has been captured in the territorial waters of a neutral Power, this Power must employ, if the prize is still within its jurisdiction, the means at its disposal to release the prize with its officers and crew and to intern the prize crew.

If the prize is not within the jurisdiction of the neutral Power, the captor government, on the demand of that Power, must liberate the prize with its officers and crew. (Convention XIII of 1907, Art. III.) Finally, neutrals have the incontestable right to refuse the access of their ports and waters to warships which would violate their neutrality. (Convention XIII of 1907, Art. IX.) More than that, in the event of an embargo on arms or the refusal of hospitality to belligerent warships, the neutral state assumes an authority over the Powers at war, which permits it to demand of them respect for its commerce in the measure which the legitimate necessities of war permit.

The belligerent whose war halts or menaces commerce profits by its command of the sea in so far as it succeeds in paralyzing rival traffic. As much for defending its commerce against the rivalry of neutrals as for preventing the enemy from sustaining or developing its economic forces, the belligerent has but one aim—to prohibit a neutral from all commerce with its adversary. The neutral resists. The greater it grows the stronger becomes its resistance and the more its commercial liberty extends. After having in the fourteenth century prohibited all neutral commerce with the enemy, belligerents now limit themselves to prohibiting trade in certain articles to some point of the enemy's coast or, on the other hand, to limiting the trade in all articles to a destination at certain designated points of the hostile coast. In the first instance the prohibition of commerce results in the listing of certain articles, called contraband of war, as forbidden to commerce. In the second case the prohibition results in the employment of naval force to cut off all trade with certain enemy ports. A belligerent may arbitrarily increase the list of articles in the catalogue of contraband of war and may announce a blockade without assembling a naval force sufficient to make it effective. Such a multiplication of lists of contraband and such fictitious, or "paper," blockades quickly draw protests from neutrals. These latter strive for two reforms—the limitation of contraband to articles immediately in demand for hostile purposes and the limitation of blockades to such as actually bring to bear a force sufficient to assure respect for them. The rules governing blockades and contraband of war are the result of a compromise between the interest of the belligerent, which is to cut off neutral commerce, and the interest of the neutral, which is to continue it. To impose on neutrals the renunciation of all commerce with blockaded ports, the belligerent on his part must maintain a naval force sufficient to make it impossible for the neutral to engage in commerce with the blockaded ports without grave danger of capture; in other words, the blockade must be effective. To make neutrals renounce dealings with the whole hostile coast, the belligerent should give them the liberty of trading in certain articles designed for the noncombatant population, and even of certain other articles that could neither directly nor indirectly serve military purposes, and this without regard to their final destination. Briefly, then, the belligerent guarantees the prohibition of neutral commerce in absolute contraband (arms, munitions), as distinguished from relative or conditional contraband (foodstuffs, coal), the transport of which is prohibited only when destined for a military or naval base, for the contractor of an enemy state, or, more generally, for any branch of the administration of that state. The progress of the law of neutrality tends to limit the power of blockade by the substitution of real effectiveness for fictitious effectiveness, and to limit contraband by the curtailment of lists of conditional as well as of absolute contraband. At the same time, neutral commerce tends to remove neutral merchandise from the status of enemy private property under an enemy flag, by proclaiming neutral private property under an enemy flag to be exempt from seizure, and to favor neutral navigation by the adoption of the principle that the neutral flag covers enemy merchandise. Three great international acts mark in the commercial field the increasing recognition of neutral rights. By the Declaration of St. Petersburg, Feb. 26, 1780, inspired by the French Minister to Catharine of Russia, Vergennes, and directed by the northern courts against the maritime tyranny of Great Britain, contraband of war was reduced to arms and munitions; enemy private property was unseizable under a neutral flag, although neutral private property was seizable under an enemy flag; blockades were to be constituted by ships constantly on guard and reasonably close at hand. In virtue of the Declaration of Paris, April 16, 1856, the English rule that neutral private property is unseizable under a hostile flag is combined with the French rule that enemy private property is unseizable under a neutral flag; blockades had to be effective, i.e., of a kind that involved evident danger of entry and departure; but, unlike the provisions of the Declaration of 1780, which emanated from neutrals, those of 1856, which followed the Crimean War, emanated from belligerents. These latter reserved the right, in not defining contraband, of withdrawing the concession that had just been made to neutrals by Great Britain in ceasing to seize private enemy property under a neutral flag, France agreeing to refrain from seizing neutral private property under an enemy flag. The progress of the law of neutrality demanded imperiously the precise determination of what articles constituted contraband. In the light of the experience of the Russo-Japanese War, that necessity was, after a vain effort to

suppress contraband, satisfied under English initiative, by the Declaration of London, Feb. 28, 1909. By virtue of this declaration, signed by the Great Powers and by Spain and Holland, but not yet ratified and hence without force in the Great War which began in 1914, blockades had to be effective; absolute contraband of war became limited to arms, munitions, and objects of immediate use in war; objects which could serve peace as well as war (foodstuffs, combustibles, etc.), constitute together with absolute contraband a relative contraband whose transportation is not forbidden unless they are destined to combatants; finally, certain articles such as cotton are declared as never to figure on contraband lists, whether relative or absolute.

The doctrine of continuous voyage which permits delaying merchandise, when merchandise has a destination from an unprohibited port to an ulterior destination at a prohibited port (blockaded or neutral), is not to apply in future in the case of blockades, and, maintained in the case of absolute contraband, does not extend to relative contraband unless the neutral port affords access by sea to a state (e.g., Abyssinia or the Transvaal) devoid of seacoast.

The destruction of neutral prizes admitted by France but repudiated by England and the United States was accepted as permissible only in cases of proved necessity. The convoy of neutral merchant ships by warships of their own nationality protects them from the right of visit and search by enemy cruisers. Like the prior Declaration of Paris of 1856, the Declaration of London is indivisible, i.e., is not open to acceptance in one part and rejection in another. Not originally signed by Spain and Mexico, who were to repair that omission in 1907, the Declaration of Paris was never signed by the United States, which was unable to accept its essential principle, the abolition of privateering, unless enemy private property should be declared unseizable under an enemy flag. But the principles of this declaration have been constantly followed, in what concerns blockade and the unseizability of enemy private property under a neutral flag, by the United States, which sees in these rules customary principles of positive international law.

Perpetual Neutrality. A state perpetually neutral renounces the right of making war and, in consequence, the right of contracting alliances, even purely defensive, because these would lead to war through the duty of sustaining an ally, or, if the ally did not demand aid, would place such neutral state in a situation of political dependence which would put it in danger of annexation. While a state perpetually neutral loses with the right of offensive war the right of annexing territory by force, it acquires, as regards other states, the right of never having to submit to war or annexation. Meanwhile such a state has the right, and may be under an obligation, to defend its neutrality if attacked.

Perpetual neutrality made its first entry into history in 1815 by the neutralization of Switzerland; it developed in 1831 by the neutralization of Belgium; then, in 1867, of Luxemburg; and finally, in 1885, of the Congo Free State. While the neutrality of Switzerland was in accordance with the historic aspirations of the Swiss people, that of Belgium in 1831 was rather in the interest of Europe and its desire to oppose a barrier to the French longing for expansion and conquest, than in accordance with the will of Belgium; Belgium detached from the great Kingdom of the Netherlands seemed to Europe too frail a barrier; it was necessary to strengthen it. Against her inclination she submitted to an enforced and permanent neutrality as the price of her independence. By the Treaty of London, March 11, 1867, Luxemburg was in like manner neutralized. These three instances of permanent neutrality, differing in historical origin, could not have exactly the same juridical status. Belgium was prevented, in 1842, by the opposition of Great Britain from concluding a customs union with France, for a customs union, usually only a preliminary to a political union, seems incompatible with neutrality. On the other hand, in 1867, Luxemburg remained in the German customs union (the Zollverein). Belgium, like Switzerland, could have arms and fortresses; Luxemburg could have neither. Prussia, which kept a garrison there in the name of the North German Confederation, had to withdraw her soldiers, and the fortifications of the capital had, by virtue of the treaty, to be demolished.

These three neutralities, imposed in the interest of those neutralized, but still more in the interest of European peace and equilibrium, sprang from conventions to which they owe their strictly obligatory character. The neutralization of the Congo Free State was otherwise accomplished—under the authority given by the Act of Berlin of Feb. 26, 1885, to the Conventional Powers of the Congo Basin, which permitted the Congo Free State to place itself under a régime of neutrality. While the neutrality of Switzerland, of Belgium, and of Luxemburg is an obligatory neutrality, from which the neutralized state cannot free itself without the consent of the signatories of the neutrality treaty, the neutrality of the Congo is a facultative neutrality, springing from a unilateral declaration of its King, which could at the present hour be withdrawn, had not Belgium been substituted, in 1908, for Leopold II in the sovereignty of the Congo Free State; for Belgium as a perpetually neutral state could not retract the declaration of neutrality of a Belgium colony. The neutrality of the Congo, being thus, owing to its different origins, a facultative neutrality, is not, like that of the other states just mentioned, a guaranteed neutrality.

Convention V of The Hague Conference of 1907, in fixing the rights and duties of temporary neutrality, determined also the juridical content of perpetual neutrality. The inviolability of neutral territory does not permit belligerents to send troops or convoys of munitions of war through the territory of a neutral state. And, in virtue of the same convention (Art. X), "The fact of a neutral Power resisting, even by force, attempts to violate its neutrality cannot be regarded as a hostile act." Cf. "Neutrality of Belgium," in *North American Review* (New York, December, 1914), and E. Waxweiler, *La Belgique neutre et loyal* (Lausanne, 1915).

Respect for the Law of Neutrals. Respect for the law of neutrality can be assured in but two ways: for temporary neutrality, through the joint action of neutral Powers leagued for the defense of their rights; and, for permanent neutrality, through increasing the number of

guarantees of neutrality. Can a neutral protest against the lapse of another neutral from the law of neutrality? France in 1861, on the occurrence of the *Trent* affair between the United States and Great Britain, believed it her duty to address to the United States friendly representations with regard to maintaining "certain principles essential to the security of neutrals." That example might have been remembered, under certain circumstances of some 50 years later, with a view to showing that neutrals have the right, and perhaps the duty, of recalling belligerents to a respect for the laws of neutrality. However, the experience of the Great War would seem to show that truly to assure respect for European neutralities, such neutralities must have guarantees extending from Europe even to America. Without such a world-wide guarantee perpetual neutrality is doomed. See BLOCKADE; CONTRABAND OF WAR; DECLARATION OF PARIS; INTERNATIONAL LAW; LONDON, DECLARATION OF.

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NEUTRALITY, ARMED. See ARMED NEUTRALITY.

NEUTRALIZATION. See NEUTRALITY.

NEUTRAL NATION. An Iroquoian tribe formerly holding the territory along the north shore of Lake Erie in the Province of Ontario, and extending eastward as far as the Genesee River in New York. Their proper name is unknown. They were known to the Huron (see WYANDOT) as *Atiwendaron*, implying a people speaking a language slightly different (from Huron), and to the Seneca as *Gagwage-ono*. The French called them the Neutral Nation on account of their taking a neutral stand during the long wars between the Iroquois and the Huron. This did not save them, however, for on the final conquest and dispersion of the Huron people the Iroquois invaded the Neutral country, with the result that in 1651 the tribe was utterly destroyed, the remnant being incorporated with the conquerors or dispersed in small parties among the Western or Southern tribes. The final battle occurred at a fortified Neutral town about 6 miles south of the present Buffalo. See IROQUOIAN STOCK.

NEUTRALS. See NEUTRALITY.

NEUVILLE, nē'vēl', ALPHONSE DE (1836–85). A French military painter and illustrator. He was born at Saint-Omer (Pas-de-Calais), May 31, 1836, and died in Paris, May 20, 1885. His father, who was wealthy, wished his son to study law in preparation for an official position, but the boy, after attending the naval school at Lorient, and studying law for three years, determined to become a military painter. He went to Paris and took a studio of his own, studying a short time with Picot, but was more influenced by the art of Horace Vernet, Charlet, and Raffet. His first exhibited picture, "Batterie Gervais, Malakov" (1858), an episode from the Crimean War, achieved some success. Not being equally successful with later works, as a means of livelihood De Neuville designed a large number of illustrations for periodicals and books, including Guizot's *Histoire de France* and Claretie's *Histoire du drapeau*. His great success came after the Franco-Prussian War of 1870–71, in which he served as an officer of engineers. He became the most popular painter of that war, his pictures being greeted with great applause. From a purely artistic point of view they are open to criticism. His colors are sometimes dull and ill chosen; indeed, his drawings in black and white are more uniformly good than his paintings. He excels in portraying vividly and vigorously an intensely dramatic incident, and depicts soldiers in the thick of the fight with an accuracy and a sentiment that make the pictures national in spirit. As a draftsman, he is best known by his "Types of French Soldiers," published by Goupil & Co.

His early paintings include: "Capture of Naples by Garibaldi" (1860), "Chasseurs of the Guard" (1861), and "Attack in the Streets at Magenta" (1864), all in the Saint-Omer Museum; "Chasseurs Crossing the Tchernaia" (1868), Lille Museum. Among his later and more famous pictures, many of which are in the United States, are: "Bivouac before Le Bourget" (1872), Dijon Museum; "The Last Cartridge" (1873); "The Cemetery of St. Privat" (1880, Luxembourg); "Le Bourget" (1879) and "The Drummer," both in the Metropolitan Museum, New York; "The Adieu," bought by John Jacob Astor, New York; "Attack at Dawn," "In the Trenches," and "Information," all three in the Walters Gallery, Baltimore; "The Destruction of the Telegraph Line" (1884), David C. Lyall, New York. In 1881 De Neuville, in company with Detaille (q.v.), painted the celebrated cir-

cular panorama, "The Battle of Champigny," which was followed by that of "Rezonville." Consult De Lostalot, in *Gazette des Beaux-Arts,* vol. xxxii (Paris, 1885).

NEUVILLE, JEAN GUILLAUME, BARON HYDE DE (1776–1857). A French statesman, born at La Charité-sur-Loire. He displayed great loyalty to Louis XVI and Marie Antoinette, was one of the most active agents in the "emigration" from France, took part in the Royalist uprising of 1796, and after the 18th Brumaire attempted to persuade Bonaparte to recall the Bourbons. Being accused of having taken a part in the plot of the "infernal machine," he fled to Switzerland, and later went to the United States. Upon the restoration of the Bourbons, he returned to France, was Minister to the United States from 1816 to 1821, and was then Minister to Portugal. He was a member of the Chamber of Deputies from 1822 to 1830, and held the portfolio of the Marine in the ministry of Martignac. After the revolution of July, 1830, he withdrew into private life. His *Mémoires et souvenirs* were published in 1888.

NEUWIED, noi'vĕt. A town in the Rhine Province, Prussia, on the right bank of the Rhine, 7 miles northwest of Coblenz (Map: Prussia, B 3). The castle, residence of the Prince of Wied, stands in a beautiful park and has collections of Roman antiquities. Educational institutions include a Gymnasium and two seminaries for teachers. Sheet tin and iron are the main products, but bridge material, enamel, buttons, brushes, wool and cotton goods, soap, tobacco, starch, and chicory are also manufactured. Pop., 1900, 11,003; 1910, 19,104. Neuwied was founded in 1662 by the Prince of Wied, as a refuge for religious exiles, and many religious denominations are represented.

NEVA, nē'vȧ, *Russ. pron.* nyĕ-vä'. The outlet of Lake Ladoga (q.v.) in northwest Russia. It leaves the lake at its southwest end and flows westward for 45 miles, emptying through several mouths into the Gulf of Finland. The city of St. Petersburg is built on the islands of its delta, 9 miles from its mouth. It is the last link in the great waterway which through the Volga River and the Ladoga Canal system connects the Caspian Sea with the Baltic. Though the volume of water flowing through the Neva is very great, and the river is in places more than half a mile wide, sand banks prevent a passage, and its navigation has been made possible only by extensive engineering works, and an artificial channel, running through the shallow Bay of Neva, connects its mouth with the harbor of Kronstadt. During continued west winds the waters of the bay are piled up in the delta of the river, causing destructive inundations.

NEVADA, nĕ-vä'dȧ (Sp., signifying 'snow clad' or 'snowy land' and referring to the snow-covered mountains along the western border of the State). One of the Pacific coast group of the United States, popularly known as the Sagebrush State. It is separated from Oregon and Idaho on the north by the 42nd parallel of north latitude; from Utah and Arizona on the east by the 37th meridian west of Washington (long. 114° 1′ 34″ W.) and the Colorado River; and from California on the west and southwest by a line from the intersection of the 35th parallel and the Colorado River to the intersection of the 39th parallel and the 120th meridian west of Greenwich, and continuing along this meridian to the 42nd parallel. Nevada ranks sixth in area among the States of the Union and has an extreme length from north to south of 483 miles and an extreme breadth of 320 miles. Its area is 110,690 square miles, of which 869 square miles consist of water.

Topography. Nevada lies almost wholly within the Great Basin, a large area of interior drainage chiefly included between the Sierra Nevada and the Wasatch Mountains. In Nevada numerous mountain ranges from 7000 to 10,000 feet in height and up to 100 miles in length divide the State into a series of elongated parallel valleys running north and south. The valleys are filled to a depth of several hundred feet with the detritus washed from the mountains, and their level floors are from 4000 to 6000 feet above sea level. Most of the valleys are separated from each other by low divides, and with the exception of the Humboldt valley the State is divided into a large number of isolated basins by the mountain ranges. About half of the total area is included in the more level land of the valleys. The highest point in Nevada is Mount Wheeler (elevation 13,058 feet), near the centre of the eastern boundary, while the lowest point is in the Cañon of the Colorado, in the extreme southern point of the State, with an elevation of less than 700 feet.

Hydrography. Since the surface of Nevada is a series of basins surrounded by mountains and low divides, a very small part of it drains to the ocean. A few of the tributaries of the Snake River rise in the extreme northeastern corner and finally reach the Pacific Ocean through the Columbia River, and a portion of the extreme southern part drains into the Colorado River. Over the greater part of Nevada the streams flow only during the wet season, and their waters either are lost in the alluvium of the valleys or evaporate from the transient lakes formed on the level floors, leaving in the dry season hardened mud flats the lower portion of which is frequently covered with a dazzling white coating of salts. In the northern half of Nevada the slow melting of the snow on the mountains maintains more permanent streams. The Humboldt River is the largest of these and flows from east to west across the State into the Humboldt and Carson sinks, where the water evaporates. Several rivers rise in the Sierra Nevadas and flow into lakes and sinks in the west-central part. The chief of these are the Walker River, flowing into Walker Lake; the Carson River, flowing into the Carson Sink; and the Truckee River, flowing into Pyramid and Winnemucca lakes. Pyramid Lake is the largest body of water in Nevada and has a length of 31 miles, a breadth of 7 to 11 miles, and a depth of 380 feet. As none of the lakes have outlets, the water is brackish, containing about one-tenth as much salt as the ocean.

Climate. The dominant features of the climate are the low relative humidity and the large daily range in temperature. The rapid radiation, due to the dry air, cloudless skies, and high altitude, makes the nights cool even after the hottest summer days, and during the winter the temperature usually rises above freezing, even though it was below zero during the night. The average annual temperature is 49.6°, with a difference of six degrees between the northern and southern parts. About one

OREGON
IDAHO
CALIFORNIA
HUMBOLDT
BOLDT
ELKO
LANDER
EUREKA
CHURCHILL
LYON
WHITE PINE
DOUGLAS
CARSON CITY
Winnemucca
Lovelocks
Wadsworth
Reno
Virginia City
Fallon
Austin
Eureka
Ely
Elko
Battle Mountain
Carlin
Lamoille
Halleck
Wells
Tecoma
Lucin
Cobre
Pilot Pk.
Great Salt Lake Desert
Pyramid Lake
Lake Tahoe
Humboldt R.
Carson Sink
Carson R.
Truckee R.
Quinn R.
Owyhee R.
Reese R.
Humboldt Range
Independence Mts.
Ruby Mts.
Toiyabe Range
Toquima Range
Shoshone Mts.
Battle Mtn.
Sonoma Range
Trinity Mts.
Granite Range
Pine Forest Range
Black Rock Desert
Antelope Range
Augusta Mts.
Diamond Mts.
Butte Valley
Steptoe Valley
Spring Valley
Ruby Valley
Huntington Valley
Independence Valley
Goose Lake
Upper Lake
Middle Lake
Lower Lake
Mud Lake
Alkali Lake
Humboldt Lake
Carson Lake
Walker Lake
Honey Lake
Eagle Valley
Dixie Valley
Smoke Creek Desert
Granite Spring Valley
Paradise Valley
Quinn River Valley
Kings River Valley
Pine Nut Mts.
Clan Alpine Mts.
Desatoya Mts.
Simpson Park Mts.
Toiyabe Mts.
Monitor Range
Egan Range
Schell Creek Range
Snake Range
Deep Creek Range
Duck Valley Indian Res.
Hat Mt. Indian Res.
Camp McDermit Military Reservation
Pyramid Lake Indian Reservation
Winnemucca Lake
Humboldt Lake
Lake Lahontan
Twin Pk.
Disaster Pk.
Hot L.
Mud L.
New Year L.
Massacre L.
Summit L.
Central L.
Hot Spring Pk.
Haystack Pk.
Mt. Blitzen
Tuscarora
Monument Pk.
Granite Pk.
Division Pk.
Mt. Fox
Black Butte
Sonoma Pk.
Battle Mt.
Shoshone Pt.
Galena
Unionville
Kennedy
Foltz
Grunite Pk.
Lone Pk.
Mill City
Humboldt House
Stonehouse
Golconda
Willowpoint
Amos
Rebel Creek
Ashdown
Hausen
Madeline
Buffalo Meadows
Deephole
Roop
Amedee
Sheldon Pahrum Pk.
Pyramid
Whiteplains
Dewey
Zelda
Leete
Olinghouse
Sparks
Vista
Verdi
Truckee
Wadsworth
Nixon
Fernley
Hazen
Stillwater
Fallon
Saint Clair
Churchill
Lahontan
Silver Springs
Dayton
Carson L.
Empire
Wabuska
Walker R.
Eagleville
Rawhideo
Yerington
Mason
Smith
Wellington
Topaz L.
Coleville
Genoa
Glenbrook
Tahoe
Frankstown
Washoe
Welsh Steamboat
Silver Cy.
Gold Hill
Virginia City
Saint Clair
Fort Churchill
Carson L.
Alkali L.
Dry L.
Newpass
Mt. Airy
Austin
Reese R.
Dry Valley
Wilson
Miniums Sta.
Potts
Midas
Alkali Flat
Ruby Hill
Prospect
Illipah
Hamilton
Ruth
Kent
Smelter
Cleveland
Osceola
Aurum
Steptoe
Schellbourne
Pleasant Valley
Tippett
Cherry Creek
Coldcreek
Strawberry
Romano
Tonkin
Birch
Hobson
Alkali
Cortez
Mineral Hill
Coyote Creek
Ruby L.
Mt. Taylor
Boone Spr.
Huntington
Hayranch
Crescent Valley
Cortez Mts.
Pine Creek
Palisade
Bullion
Beowawe
Dean
Lewis
O'Hara Pk.
Argenta
Battle Mt. R.
Humboldt R.
Carlin
Lee
Hylton
Schley
Ruby Valley
Franklin L.
Sugarloaf Pk.
Arthur
Clover L.
Snow Water
Flowery L.
Spruce
Spruce Mt.
Goshute Mts.
Toano Range
Wood
Halleck
Ft. Halleck
M.R.
Elko
West Pk.
Monument Pk.
Independence Mts.
Independence Valley
East Humboldt Range
Hammil Spr.
Antelope Spr.
Thousand Spr.
Round Top
White Pks.
Contact
Gold Creek
Mountain City
Owyhee
Rowland
Bear Mt.
Sugar Loaf Pk.
San Jacinto
O'Neil
Morlin
Charleston
North Fork
Anderson
Beaver
Deeth
Wells
Pilot Pk.
Cobre
Tecoma
Lucin
Umbria Jc.
Edgemont
Columbia
Quill Mts.
Jarbidge Mts.
Bruneau R.
Jarbidge R.
Owyhee Mts.
Owyhee Cr.
Lake Cr.
Milligan Cr.
Rock Cr.
Willow Cr.
Whiterock
Duck Valley
Hat Mt.
Disaster Pk.
Kings River Valley
Quinn River Valley
Rebel Creek
Paradise Valley
Amos
Willowpoint
Fairlawn
North Ranch
Hot Spring Pk.
Haystack Pk.
Mt. Blitzen
Tuscarora
Monument Pk.
Granite Pk.
Division Pk.
Mt. Fox
Black Butte
Sonoma Pk.
Battle Mt.
Shoshone Pt.
Galena
Unionville
Kennedy
Foltz
Grunite Pk.
Lone Pk.
Mill City
Humboldt House
Stonehouse
Golconda
Winnemucca
Dry L.
Buffalo Meadows
Deephole
Roop
Amedee
Sheldon Pahrum Pk.
Pyramid
Whiteplains
Dewey
Zelda
Leete
Olinghouse
Sparks
Vista
Verdi
Truckee
Wadsworth
Nixon
Fernley
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Stillwater
Fallon
Saint Clair
Churchill
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Silver Springs
Dayton
Carson L.
Empire
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Eagleville
Rawhideo
Yerington
Mason
Smith
Wellington
Topaz L.
Coleville
Genoa
Glenbrook
Tahoe
Frankstown
Washoe
Welsh Steamboat
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Carson L.
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Alkali Flat
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Prospect
Illipah
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Steptoe
Schellbourne
Pleasant Valley
Tippett
Cherry Creek
Coldcreek
Strawberry
Romano
Tonkin
Birch
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Cortez
Mineral Hill
Coyote Creek
Ruby L.
Mt. Taylor
Boone Spr.
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Crescent Valley
Cortez Mts.
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Palisade
Bullion
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Battle Mt. R.
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Carlin
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Schley
Ruby Valley
Franklin L.
Sugarloaf Pk.
Arthur
Clover L.
Snow Water
Flowery L.
Spruce
Spruce Mt.
Goshute Mts.
Toano Range
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Halleck
Ft. Halleck
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Antelope Spr.
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San Jacinto
O'Neil
Morlin
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North Fork
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Pilot Pk.
Cobre
Tecoma
Lucin
Umbria Jc.
Edgemont
Columbia
Quill Mts.
Jarbidge Mts.
Bruneau R.
Jarbidge R.
Owyhee Mts.
Owyhee Cr.
Lake Cr.
Milligan Cr.
Rock Cr.
Willow Cr.
Whiterock
Duck Valley
Hat Mt.
A
B
C
D
E
F
G
H
120°
119°
118°
117°
116°
115°
114°
42
41
40
39

NEVADA
SCALE OF STATUTE MILES
0 10 20 30 40 50 60 70 80 90 100
SCALE OF KILOMETERS
0 20 40 60 80 100 120 140 160
County Towns
Railroads
Longitude 117° West from 116° Greenwich
120°
119°
118°
115°
114°
Mono Lake
Ashland
Mono Mills
Benton
Bridgeport
Bodie
Mt. Braley
Mariposa
Raymond
Berendo
Pollasky
Collis
Fresno
Visalia
Redlands
Independence
Keeler
Owens Lake
Owens R.
San Joaquin R.
Bishop
Oasis
Palmetto
Lida
Sugar Loaf Pk.
Dyer
Goldfield
Columbia
Klondike Wells
Silverpeak
White Mtn. Pk.
Tonopah
Alpine
McSweeny Jc.
Goldfield Jc.
Columbia Jc.
Belmont
Hotcreek
Shoshone Pk.
Reveille
Sharp
Diamondfield
Mud L.
Dry L.
Death Valley
Amargosa Desert
Johnnie
Rhyolite
Beatty
Gold Center
Bull Frog
Forty Mile Canyon
Gold Mt.
Grapevine Mts.
Sand Hill Pk.
Telescope and Funeral Mts.
Gold Hills
Head of Death Valley
Johannesburg
Mohave Desert
Mohave R.
Barstow
Lookout Pk.
Ripley
Goodsprings
Jean
Roach
Calada
Clarks Pk.
Ivanpah
Leastalk
Manvel
Sugar Loaf Pk.
Searchlight
Newberry Mts.
Eldorado Canyon
South Quartette
Las Vegas
Arden
Bard
Pahrump
Manse
Spring Mts.
Pahrump Valley
Lake Mead
Virgin River
Virgin Canyon
Overton
Logan
Moapa
Moapa Riv. Ind. Res.
Ute
Hoya
Bunkerville
Mesquite
St. Thomas
Garnet
Drylake
Apex
Valley
Vigo
Galt
Carp
St. George
Kyle
Boyd
Cana
Stine
Delamar
Hiko
Timpahute Range
Pioche
Panaca
Yeacham
Caliente
Etna
Minto
Acoma
Barclay
Escalante
Uvada
Crestline
Ursine
Fay
Freiburg
Sunnyside
Patterson
Geyser
Newland
Cedar Ra.
Dock Val.
Ely Ra.
Railroad Valley
Grant Range
Golden Gate Ra.
Pahroc Range
Quinn Canyon Mts.
Reveille Range
Kawich Range
Monitor Range
Hot Creek Range
Pancake Range
Big Smoky Valley
Excelsior Mts.
Montezuma Range
Christo Mts.
Silver Peak Range
Grapevine Mts.
Timpahute Ra.
Silver Canyon Mts.
Arrow Canyon Mts.
Meadow Valley Ra.
Mormon Range
Highland Ra.
Golden Gate Range
Delamar Mts.
Desert Mts.
Muddy Ra.
Colorado Ra.
Eldorado Ra.
Newberry Mts.
Dry Lake Range
Vegas Range
Dry Lake
Lake Cr.
White R.
Railroad Valley
Nevada
Arizona
Utah
California
Death Valley
Lincoln
Esmeralda
Nye
Clark

day in nine has a precipitation of .01 of an inch or more, and the rainfall is chiefly during the winter months. The average annual rainfall is 10 inches and is greatest on the mountains. Stations having different elevations may show a great difference in rainfall, even though a distance of but a few miles separates them. The dry, invigorating air and abundant sunshine make the climate of Nevada very pleasant and healthful.

Geology. East of a central north-and-south line the mountains are chiefly composed of Paleozoic sediments, while west of the line rocks of Mesozoic age are predominant. Throughout the State the lower elevations are remnants of volcanic flows of rhyolite, andesite, and basalts, together with lake sediments of Tertiary age. The valleys are deeply filled with detritus washed in from the surrounding mountains during the late Tertiary and Quaternary. Two periods of mountain building are recognized—the one at the close of the Mesozoic, which was accompanied by the intrusion of granites and diorites and which folded the rocks of pre-Cretaceous age; and the other which gave us the present mountains through the faulting of the crust into great tilted blocks at the close of the Tertiary. The ore deposits were formed at the time of the intrusion of the granites at the close of the Mesozoic and during the period of volcanic flows in the early Tertiary.

Mining. Though Nevada is essentially a metal-producing State, its importance as such is relatively smaller than during the days of the Comstock Lode (q.v.). This lode was developed in 1860, proving immensely rich in gold and silver. Between this year and 1890 its total production was $340,000,000, the year of the greatest output being 1877, when the production was valued at $38,000,000. After 1890 the output declined, the lode becoming apparently exhausted. This affected the industry, which decreased in importance until the remarkable discoveries, in 1906 and the years following, at Tonopah, Goldfield, and other places, when the State again became one of the leaders in the production of gold, silver, and copper. Copper, the most valuable product of the mines, did not assume importance until 1908, although it had been produced since 1873. Nevada, in 1913, ranked fifth among the States in the production of this metal. In that year the copper produced amounted to 90,693,751 pounds, valued at $14,057,531.

Nevada ranked in 1914 first among the States in the production of silver and fourth in that of gold. The production of silver in 1913 amounted to 16,090,088 fine ounces, valued at $9,718,410. In 1914 the value of the product was $9,457,100. In 1913 there were produced 570,589 fine ounces of gold, valued at $11,795,130. In 1914 the gold product was $11,977,400. Lead and zinc are the only other metals produced in considerable quantities. The lead produced in 1913 amounted to 8172 short tons, and was valued at $719,137. The production of zinc was 7210 short tons, valued at $807,502. In addition to the metals mentioned, other minerals produced are clay products, lignite coal, occasional gems, graphite, gypsum, infusorial earth, iron ore, lime, mineral waters, quicksilver, salt, sand, gravel, stone, sulphur, and tungsten. The total production of minerals in 1913 was valued at $37,842,084.

Agriculture. Of a total land area of approximately 70,285,440 acres, there were, in 1910, 2,714,757 acres, or 3.9 per cent, in farms, and in several counties in the southeast this percentage was less than one. The improved land in farms amounted to 752,117 acres. The average size per farm in 1910 was 1009 acres. The total value of property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $60,399,365.

One of the unusual characteristics of Nevada is the great area of arid land utilized, if at all, for grazing purposes only, upon which there are some very large farms or ranches, from 50,000 to 100,000 acres in extent.

Of the total number of farms in 1910, 2356 were operated by owners and managers and 333 by tenants. The foreign-born white farmers, in 1910, numbered 867, and the negro and other nonwhites 161. Of nonwhites, 148 were Indians, the rest Chinese and negroes.

The following table gives the acreage, production, and value of important crops as estimated for 1914 by the United States Department of Agriculture.

CROPS	Acreage	Prod. in bus.	Value
Wheat	45,000	1,322,000	$1,266,000
Oats	13,000	676,000	372,000
Barley	13,000	611,000	397,000
Potatoes	12,000	1,560,000	1,092,000
Hay	247,000	*803,000	6,665,000

* Tons.

Hay and forage is by far the leading crop, and in 1909 had an acreage of 350,538. The production was 521,918 tons, valued at $4,185,071. Potatoes, the next important crop, had an acreage of 4864 in that year, and a production of 766,826 bushels, valued at $396,652. There were produced in that year 396,075 bushels of wheat, valued at $396,285. The acreage was 14,260. In that year there were also harvested 412,149 bushels of barley and 334,973 bushels of oats. The production of barley was valued at $310,394, that of oats at $191,968, and the acreage devoted to each was 12,200 and 7853 respectively.

The total value of crops in 1909 was $5,924,000 and their combined acreage 392,387. The total acreage of potatoes and other vegetables was 6882 and their value $661,803. Excluding potatoes, sweet potatoes, and yams, the acreage of vegetables was 1952 and their value $264,000. The production of orchard fruits in 1909 amounted to 86,576 bushels, valued at $82,695, of which apples composed 74,449 bushels, valued at $66,097. The most important of the small fruits were raspberries, loganberries, gooseberries, and strawberries.

Live Stock and Dairy Products. Grazing is the most important of the agricultural industries. The domestic animals on the farms in 1910 were valued at $19,071,809. On Jan. 1, 1915, the estimated number of cattle other than milch cows was 450,000, valued at $18,315,000; milch cows numbered 24,000, with a value of $1,860,000; horses, 78,000, valued at $5,382,000; mules, 3000, valued at $237,000; sheep, 1,532,000, valued at $7,507,000; swine, 36,000, valued at $418,000. The total number of fowls of all kinds in 1910 was 133,217, valued at $93,668; the total value of milk, cream, and butter fat sold and butter and cheese made,

$518,179; milk sold, 1,192,833 gallons, valued at $219,554; and the butter made, 403,885 pounds, valued at $121,649.

Irrigation. Nevada is the most arid State in the Union. Of the 2689 farms in 1910, 2406, or 89.5 per cent, were irrigated. The acreage irrigated was 701,833 acres, or 93.3 per cent of the improved land in farms. The total length of irrigation ditches completed was 3151 miles. The irrigation plants existing in 1910 were capable of supplying water to 840,962 acres, and the total acreage included in projects completed or under way in 1910 was 1,232,142 acres. The estimated final cost of all enterprises in 1910 was $12,188,756. The most important of the projects undertaken by the United States government is the famous Truckee-Carson project, in which in 1913 there was a net investment of $5,029,519. This project has redeemed over 200,000 acres of land. See GREAT AMERICAN DESERT.

Manufactures. Nevada is the least important of the States as regards manufactures. The following table gives the most important data relative to manufactures for 1909 and 1904.

SUMMARY FOR 1909 AND 1904

THE STATE — LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY: Total	PERSONS ENGAGED IN INDUSTRY: Wage earners (average number)	Capital	Wages	Value of products	Value added by manufacture
					Expressed in thousands			
All industries	1909	177	2,650	2,257	$9,807	$1,982	$11,887	$3,521
	1904	115	1,016	802	2,892	693	3,096	1,468
Bread and other bakery products	1909	29	86	47	147	54	356	142
	1904	11	48	31	39	28	127	63
Butter, cheese, and condensed milk	1909	9	25	16	102	15	15	37
	1904	4	11	10	57	9	197	36
Cars and general shop construction and repairs by steam-railroad companies	1909	9	857	818	607	610	1,033	696
	1904	6	340	315	251	280	532	310
Flour-mill and gristmill products	1909	8	39	24	592	24	598	102
	1904	9	31	17	411	16	521	89
Lumber and timber products	1909	9	224	186	774	143	503	215
	1904	5	162	147	1,072	110	528	271
Printing and publishing	1909	54	276	180	654	193	519	406
	1904	29	121	67	168	64	253	220
All other industries	1909	59	1,143	986	6,931	943	8,552	1,923
	1904	51	303	215	894	186	938	479

Of the total number of wage earners in 1909, 26 were women. The wage earners of 16 years of age and under numbered only 9.

Transportation. Two railroads cross the northern half from east to west, and several lines traverse the southern part. The total mileage in 1914 was 2412. The chief roads and their mileage follow: Central Pacific, 746 (operated by the Southern Pacific); Western Pacific, 427; San Pedro, Los Angeles, and Salt Lake, 267; Las Vegas and Tonopah, 200; Nevada Northern, 165; Tonopah and Goldfield, 110. The water transportation is negligible.

Banks. A national bank was organized in 1866, but soon closed. The First National Bank of Winnemucca, organized in 1886, was the only national bank in 1900. On Sept. 12, 1914, there were 10 national banks with a combined capital of $1,410,000; surplus, $306,000; deposits, $5,743,000; cash, etc., $663,000; loans, $5,190,000. On June 30, 1914, there were 19 State banks with a capital of $1,473,800; surplus, $388,003; cash, etc., $672,221; loans, $5,945,381.

Government. The constitution, adopted in 1864, has been amended in important respects. Amendments may be proposed by either the Senate or Assembly, but must be agreed to by a majority of both Houses of two succeeding Legislatures before being submitted to the people, and if approved by a majority of the voters, become part of the constitution.

Legislative.—The Legislature, consisting of the Senate and an Assembly, meets biennially, the sessions beginning on the third Monday in January next following the election of the members of the Assembly. Senators hold office for four years, the members of the Assembly for two. The initiative and referendum have been adopted and are in full force.

Executive.—The supreme executive power is vested in the Governor, who must have attained the age of 25 years. The other executive officers are Lieutenant Governor, Secretary of State, Treasurer, Comptroller, Inspector of Mines, Superintendent of Public Instruction, Surveyor-General, and Attorney-General. The Governor, Secretary of State, and Attorney-General constitute a Board of State Prison Commissioners and a Board of Examiners with power to examine all claims against the State.

Judiciary.—The judicial power is vested in a supreme court, district courts, and justices of the peace. The supreme court consists of a Chief Justice and two associate justices, who are elected and hold office for a term of six years. The State is divided into nine judicial districts, for each of which a district judge is elected for four years.

Suffrage and Elections.—Every male or female citizen of the United States of the age of 21 years and upward, who has resided in the State six months, and in the district or county 30 days, next preceding any election, is entitled to vote. Voters are required to pay an annual poll tax, to be expended for the maintenance and betterment of public roads. Every public officer in the State is subject to recall from office by the qualified electors of the State or the county, district, or municipality from which he is elected. General elections are held on the Tuesday next after the first Monday of November, beginning with 1916 and every two years thereafter. There are severe penalties for bribery, intimidation, or other crimes against the electorate.

Statutory and Miscellaneous Provisions.—There are a Tax Commission and a Bureau of Industry, Agriculture, and Irrigation. An eight-hour-day law applicable to plaster and cement work is in force. A workman's compensation law has been adopted. There are also a juvenile court, a child labor law, and a compulsory-education law. The State has a food and drugs act and a law forbidding faro and other forms of gambling. A corrupt-practices act limits the campaign expenses to 20 per cent of one year's salary.

Finances. On admission to statehood, in 1864, Nevada had a public debt of $400,000 (offset by State and Government bonds held in excess of this total), which in the following decade grew to $733,528. This debt was in 9 and 10 per cent bonds, the prevailing rate of interest at that time. The income was derived partly from a tax on property, partly from a special tax on the proceeds of the silver mines. The income from this special tax grew rapidly with the output of the mines; in 1874 it amounted to 28 per cent of the total receipts of the State treasury, and in 1878 to 50 per cent, or about $250,000. The output of the mines rapidly declined in the eighties, and with it the income from this source. The funded debt on Dec. 31, 1912, was $614,000. It consisted of $234,000 in bonds and $380,000 in nonnegotiable certificates of indebtedness. All of this indebtedness is due to the State school fund, to which the annual interest is paid. The State also holds in trust for its educational fund bonds of other States or counties amounting to $1,765,000, the interest being paid into this fund. The floating debt, consisting entirely of outstanding warrants, amounted to $56,759. There was in the same year a sinking fund of $63,064. The total per capita debt was $6.70. The bonded debt at the end of the fiscal year 1913 was $680,000. At the beginning of the fiscal year 1914 there was a balance in the treasury of $449,404. The receipts for the year amounted to $881,538, and the disbursements to $1,073,114, leaving a balance on hand of $257,828.

Population. Nevada is the most sparsely settled State of the Union. The following are the figures by decades: 1860, 6857; 1870, 42,491; 1880, 62,266; 1890, 47,355; 1900, 42,335; 1910, 81,875. The est. pop. in 1914 was 98,726; 1920, 77,407. The population per square mile in 1910 was 0.7, and the urban population (places of 2500 or more), 13,367. The native white population in 1910 numbered 56,277; the foreign-born whites, 17,999; Indians, 5240; Chinese, 927; Japanese, 864; and negroes, 513. The greater part of the foreign-born population came from Italy. The males in 1910 numbered 52,551, the females 29,324, the males of voting age 40,026, the males of militia age 29,383. The only city with a population of 8000 or more in 1910 was Reno, with 10,867 in that year and an estimated population in 1914 of 13,579. The other cities with their populations in 1910 are as follows: Virginia City, 2244; Carson City, the capital, 2456; Tonopah, 3900; Goldfield, 4838; Ely, 2055.

Education. The chief educational problem of Nevada is the proper administration of a school system covering a wide and thinly populated area. Of a total school population of 16,132, in 1910, 10,141 attended school. There were in the same year 4702 illiterates of 10 years of age or over—6.7 per cent of the entire population. According to the Superintendent of Public Instruction the children of school age in 1910 numbered 13,523, the total school enrollment was 11,710, the average daily attendance 8552. There were 327 elementary schools, 21 district high schools, and 14 county high schools. Teachers numbered 576, of whom 480 were females and 96 males. The average monthly salary paid to male teachers was $96.81, to female teachers $81.85. The school fund, coming largely from the sale of public lands, amounted in January, 1914, to $2,471,771. The total expenditure from the county funds for the year ending June, 1914, was $659,659.

Manual training was conducted in 1914 in six high schools and nine elementary schools, and some form of industrial art has been introduced into 50 or more rural schools. Agriculture is taught in several high schools and in a few elementary schools. Teachers' institutes are held each year in each of the districts, and a State institution in one of the larger cities. County normal schools are situated at Eureka, Yerington, and Tonopah. The State University at Reno is the only institution of collegiate rank. Virginia City Mining School is at Virginia City. There are several schools where industrial training is given to the Indian students.

Charities and Corrections. The charitable and correction institutions include the Hospital for Mental Diseases at Reno, the Orphans Home and the State Prison at Carson City, and the Nevada School for Industry at Elko. The Crittenton Home for Girls at Reno receives aid from the State, but is not under State control. Convicts in the State prison may be detailed for work on roads, and for each month of such service may be allowed 10 days' extra time off and 25 cents for each working day. The deaf, blind, and feeble-minded are for the most part placed in institutions in California. The training of male juvenile delinquents is carried on at the Nevada School of Industry opened June 15, 1915, while the female juvenile delinquents are sent to institutions of adjoining States.

Religion. The Roman Catholics, including over 20 per cent of the total population, are more than three times as numerous as all of the Protestant bodies combined. The more important Protestant bodies are the Episcopal, the Methodist, the Presbyterian, and the Baptist. In numbers Mormons rank after the Episcopalians.

History. The territory from which Nevada was formed was acquired from Mexico by the Treaty of Guadalupe Hidalgo, Feb. 2, 1848, and later formed part of Utah Territory. The first European known certainly to have entered the

region was Francisco Garcés, a Franciscan friar, on his way to California from Sonora, in 1775. In 1825 Peter S. Ogden, in the employ of the Hudson's Bay Company, worked inland with a small party and came upon the Humboldt River, sometimes called the Ogden River after himself, or the Mary River after his Indian wife. Other trappers came within the next five years, though they suffered from the attacks of Indians. In 1826 Jedediah S. Smith crossed the entire breadth of the present State from west to east. In 1849 the Mormons founded a trading post in the valley of the Carson River, near the present town of Genoa, to supply gold seekers on their way to California. When Utah Territory was formed, Sept. 9, 1850, the western boundary was fixed as the summit of the Sierra Nevada Mountains and so included much of the present State, but the territorial organization did not extend at once to the extreme west, and the inhabitants organized a government of their own. In 1853, and again in 1856, the inhabitants of the Carson valley petitioned to be annexed to California, claiming that the government of Utah did not protect them and had even withdrawn the county government, so tardily given. In 1858 a provisional government was formed at Carson City with Isaac Roop as Governor. The Comstock Lode was discovered in June, 1859, and miners flocked thither from every direction. The new Territory was separated from Utah, March 2, 1861, being bounded on the east, however, by the 116th meridian. Another degree was cut from Utah, July 14, 1862, and on May 5, 1866, the eastern boundary was extended nearly to the 114th meridian and that part of the State below 37° was taken from Arizona. In September, 1863, an election was held for delegates to form a State constitution, but the instrument submitted was defeated in January, 1864. However, the political situation made two additional Republican votes in the United States Senate exceedingly desirable, and Congress, in March, 1864, again passed an enabling Act; in July the constitution was accepted, and the State was admitted on October 31. The State was Republican in national elections until 1892, when it was carried by the People's party. In the 1896, 1900, 1908, and 1912 presidential elections it voted for the Democratic candidates, but was carried by Roosevelt in 1904.

The State was so greatly disturbed in 1906–08 by strikes in the gold mines at Goldfield and other points that it was found necessary to send United States troops to preserve peace. (See STRIKES.) At the presidential election of November, 1908, Bryan received 11,212, Taft 10,777, and Debs 2203 votes. A Democratic Legislature was elected. The Legislature of 1909 passed several measures preventing Japanese from owning land in the State. In January of that year Francis G. Newlands was reëlected to the United States Senate. In 1910 Tasker L. Oddie, Republican, was elected Governor. George D. Nixon, Republican, received the preferential vote for the United States Senate. Senator Nixon died in 1912, and the Governor appointed W. A. Massey, former Chief Justice of the Supreme Court, to fill out his term. In the presidential election of that year Wilson received 20,437, Taft 17,733, Roosevelt 8347, and Debs 2859 votes. A Democratic Legislature was elected. The Legislature of 1913 made more stringent the divorce law, which up to that time had been very lax. This law, becoming effective on Jan. 1, 1914, was practically repealed the next year. In the State elections held in 1914 the Democrats elected E. D. Boyle Governor. Senator Newlands was reëlected United States Senator. An amendment providing for woman suffrage was also adopted at this election.

The Governors of Nevada have been as follows:

TERRITORIAL

James W. Nye		1861–64

STATE

Henry G. Blasdell	Republican	1864–70
Louis R. Bradley	Democrat	1870–79
John H. Kinkead	Republican	1879–83
Jewett W. Adams	Democrat	1883–87
Christopher C. Stevenson	Republican	1887–90
Frank Bell	"	1890–91
Roswell K. Colcord	"	1891–95
John E. Jones	Silver	1895–96
Richard Sadler	"	1896–1903
John Sparks*	Silver-Democrat	1903–06
D. S. Dickerson	Democrat	1907–10
Tasker L. Oddie	Republican	1911–14
E. D. Boyle	Democrat	1915–

* Died in office.

Consult: Angel, *History of Nevada* (Oakland, 1881); Bancroft, *Nevada, Colorado, and Wyoming* (San Francisco, 1890); *Nevada and her Resources* (Carson City, 1894).

NEVADA. A city and the county seat of Story Co., Iowa, 35 miles north by east of Des Moines, on the Chicago, Rock Island, and Pacific and the Chicago and Northwestern railroads (Map: Iowa, D 2). It is the centre of a farming and cattle-raising district, and has a large cold-storage plant for butter and eggs, and some manufactures, the chief products being tile and brick, furnaces, eveners, automobile trucks, plows, candy, cement posts, auto tire gauges, and flour. The city maintains the Iowa Sanitarium, Oak Park Academy, and a public library, and it owns the water system. Pop., 1900, 2472; 1910, 2138; 1915 (State census), 2681.

NEVADA. A city and the county seat of Vernon Co., Mo., 103 miles by rail south of Kansas City, on the Missouri Pacific and the Missouri, Kansas, and Texas railroads (Map: Missouri, B 4). It has a Roman Catholic convent school, a State hospital for the insane, the Weltmer Institute of Suggestive Therapeutics, and Cottey College for Young Ladies (Methodist Episcopal, South), opened in 1884. A prominent feature of the city is Radio Springs Park, containing mineral springs which have medicinal properties. The Spring of Pawhuska is also of interest. Nevada controls considerable trade in the products of the agricultural and stock-raising district of which it is the centre, and has large zinc smelters, iron works, a foundry, and saw, planing, flour, and feed mills. Nevada was incorporated in 1870. It is governed by a mayor and a unicameral council. Pop., 1900, 7461; 1910, 7176.

NEVADA, EMMA (EMMA WIXOM) (1862–). An American dramatic soprano, born in Austin, Nev. She studied under Marchesi in Vienna and afterward in Italy. She first appeared in opera in London (1880) with Marie Van Zandt and subsequently sustained leading parts in Triest, Pesth, Prague, Milan, Rome, Naples, and Paris, making her first professional tour of the United States in 1884–85. She had a wide repertoire, which included almost all the great coloratura parts and many parts demanding pathos.

NEVADA CITY. A city and the county seat of Nevada Co., Cal., 166 miles northeast

of San Francisco; the terminus of the Nevada County Narrow Gauge Railroad (Map: California, D 3). It is a popular health and summer resort, being esteemed for its equable climate and for its fine site, at an elevation of 2500 feet in a mountainous region. The city contains a Carnegie library, county courthouse, high school, and an Elks Home. Near by are valuable gold mines, Nevada County being the leading gold-mining county in California. The leading occupations are gold, quartz, and placer mining, horticulture, farming, truck gardening, and dairying. Under a charter of 1885 the government is vested in a president and board of trustees elected on a general ticket. The city owns and operates the water works. Nevada City was first settled in 1849, and in 1850–51 was the most important mining town in the State. It was incorporated in 1875. Disastrous fires occurred in 1851, 1856, 1858, and 1863. Pop., 1900, 3250; 1910, 2689.

NEVADA STATE UNIVERSITY. A State university for higher education founded at Elko in 1873. In 1875 it was removed to Reno, and was formally reopened in the following year. The university is the head of the educational system of the State and is the only institution of collegiate grade within its borders. It comprises the college of agriculture, including the school of home economics and the division of agricultural extension; the college of arts and sciences; the college of engineering, including the Mackay school of mines, school of mechanical and electrical engineering; the department of education of the summer season for teachers. Military instruction forms part of the curriculum, and a uniform is worn by students in military work. The degrees conferred by the university are A.B., S.B., A.M., S.M., and mining, mechanical, and civil engineer. The total enrollment in all departments in 1915 was 388, and the faculty numbered 56. The library contains about 30,000 volumes. The university covers 53 acres, and its property was valued in 1915 at $523,268. The income from all sources in that year was about $200,000. The president in 1915 was Archer W. Henry.

NEVADITE. See RHYOLITE.

NÉVÉ, nā′vā′. See GLACIER.

NEVERS, *ne*-vâr′. The capital of the Department of Nièvre, France, and formerly of the Province of Nivernais, situated on a hill in the midst of fertile plains at the confluence of the Loire and the Nièvre, 140 miles southeast of Paris (Map: France, N., J 6). The old portion of the town is ill built, with narrow, crooked streets, but the later portion is more modern and has a large park. A gateway, containing a Gallo-Roman museum, and two towers are preserved remains of the mediæval fortifications. The feudal ducal castle is utilized for the Palace of Justice and also contains a ceramic museum. The chief ecclesiastical buildings are the Romanesque eleventh-century church of St. Etienne and the restored cathedral of St. Cyr, built in the thirteenth century on the site of a prior church, the west portion of which is incorporated in the present building. The cathedral is noted for its double apse and fine sculptures and paintings. The town possesses a public library of 30,000 volumes, a teachers' training college, an ecclesiastical seminary, and an art school. It has manufactures of iron and copper ware, chemicals, porcelain, cloth, glue, shoes, fur garments, dyes, rope, and agricultural implements, an engine-fittings factory, formerly a famous naval cannon foundry, and oil mills. Near by are found earths used in faïence. Eight miles northwest is the watering place Pougues-les-Eaux. Nevers is the ancient Noviodunum, an important town of the Ædui. It has been an episcopal see since the sixth century, when it was called Nivernum. The town became the seat of the counts of Nevers in the tenth century and was created a dukedom by Francis I in 1538. The Dukedom of Nevers passed by marriage to a member of the family of Gonzaga, the ducal house of Mantua. On the extinction of the Gonzaga line in Mantua in 1627, Charles, Duke of Nevers, claimed the duchy. He was supported by France and opposed by Spain and Austria. The War of the Mantuan Succession which ensued ended in the recognition of the claim of Charles of Nevers in 1630. Pop., 1901, 27,673; 1911, 27,706.

NEV′ERSINK HIGHLANDS. A range of hills in New Jersey. See NAVESINK HIGHLANDS.

NEVIANSKY-ZAVOD, nĕv-yän′ské-zá-vôt′. A mining settlement in the Government of Perm, Russia, situated on the Neiva, in the Ural Mountains, 62 miles north of Ekaterinburg. It is the centre of an important mining district and contains extensive ironworks, steel mills, and gold washeries. The settlement was founded in 1699. Pop., 1897, 16,066; 1910, 17,500.

NEV′ILLE, GEORGE (c.1432–76). An English divine. He was educated at Balliol College, Oxford. Through the influence of his father, the Earl of Salisbury, then Chancellor of England, and of his brother, the Earl of Warwick (q.v.), his preferment was rapid. From 1453 to 1457 he was Chancellor of Oxford University, he became Bishop of Exeter in 1458, and was appointed Archbishop of York in 1464. Participating in the stormy politics of the time, and one of the Yorkist peers who placed Edward IV on the throne, Neville was rewarded in 1460 with the chancellorship of England. He was deprived of his high office in 1467, and, when Warwick revolted against the King in 1469, the latter was a prisoner in Neville's hands for a short time, but was permitted to escape. During the short reign of Henry VI in 1470–71 he held the chancellorship, but surrendered himself and Henry to Edward after the latter had returned from Holland and defeated Neville's brother, Warwick, at Barnet. He was imprisoned in the Tower for a short time, was pardoned, but was again imprisoned in 1472–75 in France on a charge of treason.

NEVILLE, RICHARD, EARL OF WARWICK. An English political leader known as the Kingmaker. See WARWICK, RICHARD NEVILLE, EARL OF.

NEVILLE'S CROSS, BATTLE OF. A battle between the Scotch and the English, fought on Oct. 17, 1346. During the Hundred Years' War (q.v.) the Scotch were the firm allies of the French, and, when Edward III invaded France, King David II of Scotland prepared to harass England. He was met, however, at Neville's Cross, near Durham, by the English under Henry Percy and Ralph Neville. The English, owing to their archers, were completely victorious, and David himself was captured. See BRUCE, DAVID.

NEV′IN, ARTHUR FINLEY (1871–). An American composer, brother of Ethelbert Nevin. He was born at Vineacre, Edgeworth, Pa., was educated at Sewickley (Pa.) Academy and at Park University (Allegheny, Pa.), and studied

at the New England Conservatory of Music in Boston in 1891–95 and then at Berlin under Klindworth and Boise. His compositions include: a book of four *May Sketches; Pierrot's Guitar;* and the songs *Were I a Tone, In Dreams,* and *Free as the Tossing Sea.* His North American Indian opera, *Poia,* was produced at the Royal Opera of Berlin in 1910.

NEVIN, ETHELBERT (1862–1901). An American composer, brother of A. F. Nevin. He was born at Edgeworth, Pa. After thorough preparation under local music teachers he went to Berlin (1884) and became a pupil of Von Bülow and Karl Klindworth, the former of whom particularly encouraged his natural gift for composition. He returned to Boston in 1887 and settled there, devoting himself largely to composition, but after 1893 he spent much of his time in Europe, mostly in Paris, the south of France, Italy, and Algiers. He returned to America in 1900 and became associated with H. N. Parker in the department of music at Yale University. He was the composer of many songs, instrumental pieces, and waltzes, almost all of which are marked by delicacy. He died at New Haven, Conn. Consult V. Thompson, *The Life of Ethelbert Nevin* (Boston, 1913).

NEVIN, JOHN WILLIAMSON (1803–86). An American clergyman. He was born in Franklin Co., Pa., graduated from Union College in 1821, studied theology at Princeton, and taught Hebrew there from 1826 to 1828. From 1829 to 1840 he was professor of Hebrew and biblical literature in the Western Theological Seminary at Allegheny, Pa. From here he went to the theological seminary of the Reformed (German) church at Mercersburg, where he taught theology until 1851. He was president of Marshall College, Mercersburg, from 1841 to 1853. After this institution had united with Franklin College at Lancaster under the name of Franklin and Marshall, he served as president from 1866 to 1876. He was one of the founders of the Mercersburg theology (q.v.). He was the editor of and principal contributor to the *Mercersburg Review* from 1849 to 1853. He published: *Biblical Antiquities* (2 vols., 1828; rev. ed., 1849); *The Anxious Bench* (1842); *The Mystical Presence* (1846); *History and Genius of the Heidelberg Catechism* (1847); *Anti-Christ; or, the Spirit of Sect and Schism* (1848). Consult his biography by Appel (Philadelphia, 1889).

NEVIS, nē'vĭs. One of the Leeward Islands in the West Indies, belonging to Great Britain. It lies 2 miles southeast of St. Christopher, with which it is administratively connected (Map: West Indies, G 3). Area, 50 square miles. It consists largely of an extinct volcano, 3596 feet high and wooded at the summit. The lower slopes are fertile and well cultivated, producing sugar cane and some limes and oranges. Pop., 1901, 12,774; 1911, 12,945. The chief town is Charlestown (q.v.). The island was discovered by Columbus in 1498 and was colonized by the English in 1628. In 1899 it suffered from a disastrous hurricane. Nevis was the birthplace of Alexander Hamilton.

NEVIS, BEN. See BEN NEVIS.

NEVSKI, ALEXANDER. See ALEXANDER NEVSKI.

NEVSKI (nyĕf'skê) **PROSPEKT'.** The chief street of St. Petersburg, extending for about 3 miles in a straight line and faced by some of the finest shops and public buildings of the city.

NEW, JOHN CHALFANT (1831–1906). An American politician, born at Vernon, Ind. He graduated at Bethany College (West Virginia) in 1851 and settled in Indianapolis, where he was admitted to the bar in 1852. Throughout the Civil War he served as quartermaster-general of Indiana. In 1862 he was also a member of the Indiana State Senate. For some years after 1865 engaged in banking, in 1875 New was appointed Treasurer of the United States by President Grant, and in 1882 President Arthur appointed him Assistant Secretary of the Treasury. He was active in securing the nomination and election of Benjamin Harrison to the presidency in 1888 and the next year was appointed Consul General in London. This office he held until 1892. In later years he was proprietor of the Indianapolis *Journal.*

NEW ACADEMY. A school of Greek philosophers, the successors and expositors of Plato. The various schools classed under the name of the Academy are differently divided by modern historians. The third school, headed by Carneades (q.v.), is sometimes referred to as the New Academy, though it is perhaps more often classed, with the second, under the name of Middle, the New beginning a little later with Philo of Larissa, who founded the fourth school. See ACADEMY.

NEW ALBANY. A city and the county seat of Floyd Co., Ind., on the north bank of the Ohio River, 2 miles below the falls and opposite Louisville, Ky., with which it is connected by a very long steel railroad bridge, and on the Southern, the Chicago, Indianapolis, and Louisville, the Baltimore and Ohio Southwestern, and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads (Map: Indiana, F 8). It has a fine courthouse, post office, and customhouse, Scribner's Park, St. Edward's Hospital, and a public library. In the suburbs there is a national cemetery which contains 2908 graves, 676 of unknown dead. The city controls large commercial interests and is an important manufacturing centre, having tanneries, automobile and furniture factories, engine and boiler works, rolling and planing mills, iron foundries, a rug factory, and pork-packing establishments. Clay is found in the vicinity. New Albany was laid out in 1813 and incorporated as a city in 1839, the charter of that year being still in operation and providing for a mayor, chosen every four years, and a unicameral council, which elects subordinate municipal officers. Pop., 1900, 20,628; 1910, 20,629; 1920, 22,992.

NEW ALBION. See ALBION, NEW.

NEWALL, nū'ăl, HUGH FRANK (1857–). An English astronomer, born at Gatehead-on-Tyne, where his father, Robert Stirling Newall, had a private observatory. The son was educated at Rugby and at Trinity College, Cambridge, from 1886 to 1890 was assistant in physics at Cambridge, and then became professor of astrophysics and director of the solar physics observatory, using the large equatorial telescope given the university by his father in 1891. Besides technical papers he wrote a popular manual, *The Spectroscope and its Work* (1910).

NEW ALMADEN, ăl'mȧ-dĕn'. A village in Santa Clara Co., Cal., 13 miles south of San José. The famous old Almaden mine, with the largest total production to date of all United States quicksilver producers, is located here. The value of its product since 1848 is estimated at $60,000,000. Pop., 1915 (local est.), 140.

NEW AMSTERDAM. The name of New York City (q.v.) under the Dutch.

NEW ARAD. See ARAD.

NEW ARCHAN'GEL. The former name of Sitka (q.v.).

NEWARK, nū'ĕrk, or **NEWARK-UPON-TRENT.** A municipal borough and market town of Nottinghamshire, England, on the Devon, a navigable branch of the Trent, 16 miles southwest of Lincoln (Map: England, F 3). Newark is one of the most important malting towns in England and has flour mills, breweries, manufactories of iron, brass, plaster of Paris, agricultural implements and boilers, gypsum and limestone quarries, and a trade in corn, malt, and flour. The corn market is one of the largest in the Kingdom. The parish church of St. Mary, a large and elegant edifice, though often rebuilt, still shows traces of its original Norman character. The grammar and song school was founded in 1529. There are also the town hall, corn exchange, library, and mechanics' institute. Newark was incorporated in the reign of Edward VI and received further charters from Charles I and Charles II. The town owns the water works and markets and maintains public baths. It dates from the Roman occupation. The castle, now in ruins, was built early in the twelfth century. King John died in it in 1216. From its position and great strength it was called the Key of the North and during the Civil War sustained three sieges for Charles I, finally surrendering at his request to the Scots in 1646. Pop., 1901, 14,992; 1911, 16,408. Consult Cornelius Brown, *Annals of Newark-upon-Trent* (London, 1879).

NEWARK. A town in Newcastle Co., Del., 12 miles west by south of Wilmington, on the Baltimore and Ohio and the Philadelphia, Baltimore, and Washington railroads (Map: Delaware, H 1). It is the seat of Delaware (State) College (q.v.), Delaware Agricultural Experiment Station, the Women's College of Delaware, established in 1914, and State Board of Health Laboratories. There are paper manufactures, wall-paper mills, fibre works, machine shops, etc. The water works and electric-light plant are owned by the municipality. Pop., 1900, 1213; 1910, 1913.

NEWARK. The metropolis of New Jersey, county seat of Essex County, and a port of entry, extending from the Elizabeth city line north 3 miles along the west bank of Newark Bay to the mouth of the Passaic River and 7½ miles up the river to Belleville; located 8 miles west of the Hudson, on the Pennsylvania, Lehigh Valley, Central of New Jersey, Lackawanna, and Erie railroads, in lat. 40° 41′ N. and long. 74° 10′ W. (Map: New Jersey, D 2).

The city's area is 23.4 miles. It is fairly level for about a mile from the water front, when the ground rises in a series of plateaus. Beyond these, north, west, and southwest, are a cluster of smaller municipalities—Belleville, Bloomfield, Montclair, Glen Ridge, East Orange, Orange, West Orange, South Orange, and Irvington—and to the east are East Newark, Harrison, and Kearny, facing Newark from the east bank of the Passaic River. The latter group is strung together as one city and reached from Newark by several bridges, trolley and steam-railway lines. The suburban communities to the west and north surround Newark crescent-like, built so close to the big city as to give no sign where one ends or the other begins. All these municipalities are included in a Greater Newark, the population of which was more than half a million in 1915.

Newark is distinctly a manufacturing centre, is often called the Birmingham of America, is financially one of the strongest municipalities of its size, is the third most important insurance-company home centre, and ranked fourteenth in population in 1910. The census total of Newark's inhabitants in 1910 was 347,469; in 1900, 246,070; in 1890, 181,830; in 1880, 136,508; in 1860, 71,941; in 1830, 10,953; in 1810, 8008. In 1798 the total was 2500 and, in 1713, 300. In 1915 the population, as taken by the State, was 366,744; 1920, 414,216.

Among manufacturing centres Newark is eleventh in total annual value (nearly 300 varieties) of finished products, about $202,000,000, which ranks it ahead of 30 States of the Union in this respect. Fifty of its industries turn out more than $1,000,000 each in value yearly. Among some of the better known products are fine jewelry, cut glass, celluloid, shoes, patent leather, cutlery, chemicals, thread, electric machinery and appliances, hats, paints and varnish, malt liquors, and foundry products. Capital invested in manufacturing is about $154,233,000, number of industrial operatives 60,000, total annual wages paid them $45,000,000, and annual cost of raw material employed $114,000,000. The annual total of freight received and shipped by rail is 5,316,000 tons and by water 3,125,000 tons.

Newark has nine national banks, one State bank, and 10 trust companies (Jan. 1, 1915), with total resources of $127,560,568, capital $11,000,000, surplus, etc., $14,710,000, and deposits of $84,856,000. There are also five savings banks with deposits of $44,585,149. This financial machinery is emphasized by the city's being the home of two of the larger life-insurance and four well-known fire-insurance companies of the country. Newark's total of life-insurance-company assets is $448,489,000 and fire-insurance-company assets $20,519,000. Total resources of its building and loan associations amount to $37,169,000.

The terraces back of the business part of the city form the residential section, supplemented by the closely adjoining municipalities named, all being interwoven by 28 electric trolley lines carrying over 450,000 passengers daily. To these must be added the high-speed electric line which connects Newark and New York via tubes under the Hudson, in addition to commutation and other accommodation by five trunk-line steam railroads. The area of the city's numerous small parks in all is greater per square mile of territory than that of any other city in the United States and is valued at $10,000,000. It has a million-dollar free public library, two law libraries, and one historical society.

In cost and architectural impressiveness the home buildings of life and fire insurance companies, several of the banks, and the municipal and county buildings would distinguish any city. More than 66,000 pupils attend 68 public grammar and high schools, and 19,000 attend 35 or more parochial and private schools. There are 27 public-school playgrounds. Religious life is represented by 150 Protestant churches, 32 Roman Catholic, and 8 Jewish temples and synagogues. Among the first named are 33 Presbyterian churches, 26 Baptist, 22 Methodist, and 16 Episcopalian. Supplementing them all are

5 orphan asylums, 12 hospitals, and 59 charitable organizations. There are 4 dramatic, 3 vaudeville, and 59 moving-picture theatres, the last with a total seating capacity of 43,000.

The city government consists of a mayor, elected every two years, and a unicameral common council, one-half elected each year, which is the legislative branch. Administration of the municipality's affairs rests with boards and commissions. Beyond legislating as to ordinances the main function of the council is to provide funds for carrying on the city's business. The mayor alone names the tax commissioners, city counsel, excise and assessment commissioners, trustees of the public library and police justices, the board of estimate, the playground and shade-tree commissions, and the board of education.

The mayor, with the consent of the council, names the police, fire, and health commissioners and the city auditor; and the council elects the treasurer, tax receiver, city clerk, and comptroller. The board of street and water commissioners is elective. Wide interest has been shown in the question of substituting the modern form of commission government. There are more than 60,000 buildings in the city, and the total municipal revenue is in excess of $12,050,000. The annual expenditure for public schools is about $3,000,000, for fire department $760,000, and for police $1,030,000. The city water works, with 300 miles of mains, cost more than $11,000,000 and have a capacity of 50,000,000 gallons daily, delivered by gravity. The daily consumption is about 41,000,000 gallons and the storage capacity nearly 10,000,000,000 gallons. The gas and electric power and light supply is second to that of no other city. There are 300 miles of sewers, costing $6,000,000, and 240 miles of streets, of which 170 are excellently paved. The net bonded debt is $30,010,000, and the tax rate in 1914 was 2.08 on ratables, totaling $403,199,000.

The city has spent $2,000,000 for highways through the meadows to upper Newark Bay and for docks, where warehouses and railway spurs are to connect with deep-sea shipping, and an industrial and export-import ocean-rail transfer centre is to be established reaching the 300-foot channel of a depth from 20 to 25 feet, according to the tide.

Newark was settled in 1666 by Congregationalists, members of 30 families, Puritans, from Milford, Branford, and Guilford, Conn. They had purchased the land, virtually equal to the present Essex County, from the Lords Proprietors, who held it under grant from Charles II, but, when they arrived by vessel, found the Indian owners objected, and bought their rights for $750 worth of weapons, tools, clothing, lead, etc. The town was originally called Milford, but shortly after, in honor of the home of their first pastor, was renamed Newark (at first New Work), from Newark-upon-Trent. The original settlers planned a community only for those whose religious beliefs were their own, but these views did not long continue. Government of the early settlement and practically until 1836 was by town meetings. Most of the earlier settlers were well to do. The first shoe industry there was started in 1680. The first tanyard was established in 1698 and the first free school in 1792. In 1776 Washington and 3000 troops were quartered at Newark. From 1748 to 1756 the College of New Jersey (now Princeton University) was located at Newark, going thence to Princeton. Jewelry has been manufactured there since 1801, and there Seth Boyden, in 1819, was the first to make patent leather in the United States, he who, in 1828, discovered the process for making malleable iron. The hatting industry, still a Newark feature, took its rise there in 1810. In 1836 Newark was chartered as a city. Plans for the city's celebration of its two hundred and fiftieth anniversary in 1916 were drawn on a scale to attract nation-wide interest.

NEWARK. A village in Wayne Co., N. Y., 30 miles east by south of Rochester, on the Barge Canal and on the New York Central, the West Shore, and the Pennsylvania railroads (Map: New York, C 4). It has a public library and is the seat of the State Custodial Asylum for Feeble-Minded Women. The home of the Fox sisters, in which modern spiritualism (q.v.) originated, is at Hydesville, near Newark. The surrounding country is a productive agricultural region, and the chief industries of the village include fruit preserving, the growing of roses and nursery stock, and the manufacture of paper boxes, tin and enamel wares, wagons, furniture, and automobile wheels. The water works and sewage plant are owned by the municipality. Pop., 1900, 4578; 1910, 6227.

NEWARK. A city and the county seat of Licking Co., Ohio, 33 miles east of the State capital, Columbus, at the junction of the forks of the Licking River, on the Ohio Canal and on the Pittsburgh, Cincinnati, Chicago, and St. Louis, the Ohio Electric, and the Baltimore and Ohio railroads (Map: Ohio, F 5). It has also good interurban electric-railway service. Situated in a plain surrounded by hills, Newark is attractively laid out, 20 miles of its streets being paved with vitrified brick and asphalt. Noteworthy features are the Auditorium, a splendid memorial to the soldiers and sailors who died in the Civil War, the Children's Home, courthouse, Federal building, public library, hospital, and Moundbuilders Park, a summer resort. Two of the most extensive earthworks of the mound builders are here, comprising a circular embankment, one mile in circumference, and a larger series of fortifications, called the Octagon Fort. Tributary to the city are fertile agricultural districts and areas of natural gas, coal, and sandstone. The manufacturing interests are very important, the establishments including electric-car works, table glassware and bottle works, locomotive shops of the Baltimore and Ohio, a large stove foundry, golf-stick works, a rope-halter factory, a hardwood saw mill, cigar, shoe, brick, and motor-truck factories, engine and machine works, an iron foundry, agricultural-implement works, flouring mills, a carriage factory, a chemical laboratory, etc. Newark was settled in 1801 and was laid out as a town in the following year. The water works, costing $800,000, and the electric-light plant are owned by the municipality. Pop., 1890, 14,270; 1900, 18,157; 1910, 25,404; 1914 (U. S. est.), 28,271; 1920, 26,718.

NEWARK, David Leslie, first Lord (1601–82). A Scottish soldier. He rose to the rank of colonel of horse in the service of Gustavus Adolphus. In 1640 he returned to Scotland to aid the Covenanters, became major general in 1643 under Alexander Leslie, Earl of Leven, and gave important aid to Cromwell in the battle of Marston Moor. After his capture of Carlisle in 1645 he was recalled to Scotland and made lieu-

tenant general of horse, and in September he practically annihilated the forces of Montrose in the south of Scotland. In 1650, when all parties in Scotland combined to support Charles II, Leslie was placed in chief command of the army, which was defeated by Cromwell at Dunbar. In 1651 Leslie was captured by the Cromwellian forces and imprisoned in the Tower. On the Restoration in 1661 he was created first Lord Newark.

NEWARK SERIES. The name given to the Triassic system in the eastern part of North America. Along the Atlantic coast from Nova Scotia to South Carolina there are many isolated areas of thick bedded red sandstones, conglomerates, and breccias, which throughout their extent exhibit marked uniformity of characteristics. The sedimentary rocks are accompanied by dikes and sheets of basalt indicating intense volcanic activity at the time of their formation. Fossils are rare and mostly of fresh-water or land types, the commonest being land plants and footprints of animals. The micaceous and feldspathic nature of the sandstone shows that it was derived from the waste of crystalline rocks. In North Carolina and Virginia the series contains workable coal seams; it also yields a good quality of building stone—the brown sandstone of Connecticut and New Jersey—and large quantities of trap for road building and engineering work. See TRIASSIC SYSTEM.

NEW ART. The English equivalent of the French *art nouveau* and the German *moderne Kunst*, designating a movement in the arts of design which marked the close of the nineteenth and beginning of the twentieth century, the counterpart in architecture and decoration of the various secession movements in painting and sculpture. Beginning in sporadic individual efforts in Europe to break away from traditional formulæ, especially in the minor arts, it began to take on the character of a movement by 1893. The posters and *orfèvrerie* of Grasset and Chéret, the pottery, metal work, and jewelry of Delaherche, Gallé, and Chaplet, all in France, the vases and minor sculpture of Wolfers in Belgium, and the highly original if somewhat eccentric houses and furniture of a Darmstadt art colony led by Olbrich and Behrens, produced between 1893 and 1903, made a profound impression in Europe, especially in Belgium, Germany, and Austria. The underlying principle of the movement, baptized with the name of art nouveau in 1893 by Bing, the French art dealer and collector, is that of protest against tradition and formulated style, the assertion of the individual taste and imagination unhampered by rules or fashions. It is thus chiefly a negative movement, with no positive unifying element, and has not resulted in creating a definite style, though it has given rise to many striking and beautiful works, especially in the industrial and decorative arts. It has profoundly modified the style of so great a master of architectural design as Wagner of Vienna, though he was trained in the school of the academic styles. But it has also given birth to many architectural works of so eccentric and extravagant a character as to offend good taste by violating the fundamental principles of structural design, especially in Germany and Austria. Architecture is an art of construction, demanding subservience to basic laws of structural expression. In furniture these laws are less important, and in jewelry and the minor arts the individual fancy may express itself with almost perfect freedom. In these arts, besides the artists already mentioned, the names of Charpentier, Guimard, Génuys, Gaillard, and Moreau-Vautier in France, of Jean Dampt and Hoentschel in France and Belgium, Brangwyn in England, and many others stand conspicuous for excellent work. Rodin (q.v.) has powerfully influenced sculpture, and Meunier, with his powerful, half-tragic naturalism, in Belgium, and Bitter in some recent works in this country, have shown that sculpture can display strong individualism in a new spirit without forsaking fundamental principles of design. In America tradition has been less dominant than in Europe, and, with less occasion for the spirit of protest, many artists have produced highly original designs without having to organize a movement under the label of new art.

NEW ATLAN'TIS, THE. The name given by Lord Bacon, in his allegory bearing the same title, to an island supposed to lie in the southern Atlantic. See ATLANTIS.

NEW BEDFORD. A port of entry and one of the county seats of Bristol Co., Mass., situated near the mouth of the Acushnet River, which expands into a fine spacious harbor that leads into Buzzards Bay (Map: Massachusetts, F 6). Fort Rodman, on Clark's Point, with a garrison of 125 men, defends the harbor entrance. On the opposite side of the harbor is situated the town of Fairhaven, with which New Bedford is connected by three bridges, one of which cost $1,500,000 and is one of the features of the city. The city is 56 miles south of Boston and is the terminus of a division of the New York, New Haven, and Hartford Railroad. New Bedford is connected with Fall River, Taunton, and towns on Cape Cod by both steam railroads and trolley lines, and by passenger steamboat lines with Woods Hole, Marthas Vineyard, and Nantucket. The New England Navigation Company maintains excellent passenger service to New York during the summer months and freight service all the year. The harbor has been much improved by the national government, and the State Legislature of 1914 made an appropriation of $350,000 for the erection of a shipping pier upon the harbor front. The area of the city is 19.39 square miles. It is regularly laid out, with 184 miles of paved or macadamized streets. Among the prominent buildings are the municipal building, the post office, the registry of deeds, the county courthouse, the third district courthouse of Bristol, the high school, the textile school, St. Luke's Hospital, the Masonic building, the Institution for Savings, the Five Cents Savings Bank, the Merchants Bank, the Mechanics Bank, and the State Armory. The public library, completed in 1910, is one of the finest library buildings in New England, contains 150,000 volumes, and had a circulation in 1914 of 400,000. It is rich in genealogical material and has the largest collection of books on the subject of whaling in the country. It has an endowment fund of $314,000 and receives annually from the city $25,000 to $30,000. The Old Dartmouth Historical Society, an institution of the city, also contains much material of interest, especially pertaining to the whaling industry. Public parks, aggregating 219 acres, are the Common, Brooklawn, Buttonwood, Hazelwood, Grove, and Ashley.

New Bedford was for many years the principal whaling port of the world, 59 whaling vessels being registered there in 1804. Arctic whaling, begun in 1848, marked a new era, and in 1857 New Bedford had 329 registered whaling ships. The Civil War, during which many vessels were either destroyed or purchased by the government, and especially the discovery of oil fields in Pennsylvania, caused a decline, and New Bedford is now distinctively a manufacturing city, the largest producer of high-grade cotton yarns and fancy woven fabrics of cotton and silk in the United States. In 1914 capital to the amount of $47,820,575 was invested in the leading industries. The cotton mills in 1914 contained 3,010,195 spindles and 53,699 looms, and the employees numbered 31,820. There are also manufactories of silverware, cut glass, and specialties for textile lines, machine shops, foundries, oil manufactories, cordage works, paint works, lumber mills, etc. The trade of the city is considerable, the leading commodities being coal, cotton, lumber, oil, fish, and general merchandise.

Under the revised charter of 1896 the government is vested in a mayor, chosen annually; a bicameral council, the aldermen being nominated by wards, but elected on a general ticket; and administrative officers as follows: licensing board, city solicitor, chief of police, appointed by the mayor; health board, appointed by the mayor, confirmed by the aldermen; poor board, appointed by the mayor, confirmed by the council in convention; cemetery board, park board, trustees for public library, elected by the city council; school committee, consisting of the mayor ex officio and six members elected by popular vote. Most of the other city officers, as the city clerk, the city treasurer, the city auditor, etc., are elected by the city council in convention. The water works are owned and operated by the municipality. New Bedford spent in 1914, for maintenance and operation, $2,225,831.50, the principal expenditures being, for schools, $520,063.51; interest on debt, $370,059.12; police, $198,234.16; fire department, $158,860.11; highways, $289,909.43; charities and corrections, $132,477.76; health, $193,315.59; street lighting, $105,359.39. The assessed valuation in 1914 was $108,032,232.79; the bonded debt, $9,951,989.05; sinking funds, $1,777,453.51. Pop., 1790, 3313; 1880, 26,845; 1890, 40.733; 1900, 62,442; 1910, 96,652; 1915 (est.), 110,000; 1920, 121,217.

New Bedford originally formed a part of the town of Dartmouth and was set off from it in 1787. In 1812 it was incorporated as a separate township and in 1847 as a city. The town was called Bedford for Joseph Russell, one of the founders, whose family name was the same as the Duke of Bedford; it was later called New Bedford to distinguish it from Bedford in Middlesex County. The site was visited by the English navigator Bartholomew Gosnold in 1652. It was settled in 1652 by John Cook and others from Plymouth, who purchased the land from Massasoit, sachem of the Narragansets, and his son Wamsutta. The famous Wamsutta Mills, the first cotton mills built in the city, and the Wamsutta Club, the leading social club in the city, perpetuate the name of the latter chief. During the Revolution New Bedford sent out many privateers and, from its convenient location, became the storehouse of captured prizes. On Sept. 5, 1778, an English fleet of 32 vessels and an army under General Gray attacked the town, captured it, and reduced the greater part of it to ashes. Consult: Daniel Ricketson, *History of New Bedford* (New Bedford, 1858); L. B. Ellis, *History of New Bedford and its Vicinity, 1602–1892;* Z. W. Pease and G. W. Hough, *History of New Bedford: Industries, Institutions, and Attractions* (1889); *The Old Dartmouth Historical Sketches* (1903 et seq.), published by Old Dartmouth Historical Society.

NEWBERN, nū'bĕrn. A city, port of entry of the Pamlico district, and the county seat of Craven Co., N. C., 87 miles northeast of Wilmington, on the Neuse River at its confluence with the Trent and on the Atlantic Coast Line and the Norfolk Southern railroads (Map: North Carolina, E 2). It exports fish, cotton, lumber, and vegetables. It has ironworks, cottonseed-oil and lumber mills, foundries and machine shops, carriage and fertilizer factories, bottling and lime works, and extensive fish, oyster, lumbering, and truck-gardening interests. The most prominent architectural features of the city are the government building, the county courthouse, and two bridges over the Neuse and Trent rivers, both affording fine views of river scenery. The government, under a charter of 1899, is administered by a mayor, elected every two years, and a board of aldermen. The water works and electric-light plant are owned and operated by the municipality. Newbern was settled by Swiss in 1710, was for a time the capital of the Province of North Carolina, and for many years was its most important seaport. It was strongly fortified during the Civil War, but was captured by General Burnside, March 14, 1862, after a severe engagement 3 miles from the city, the Union loss being about 100 killed and 500 wounded. Pop., 1900, 9090; 1910, 9961; 1914 (U. S. est.), 10,281; 1920, 12,198.

NEW'BERRY. A city and the county seat of Newberry Co., S. C., 43 miles by rail west-northwest of Columbia, on the Columbia, Newberry, and Laurens and the Southern railroads (Map: South Carolina, C 2). It has a fine city hall and courthouse and Newberry College (Lutheran), which was opened in 1858. The centre of a productive cotton-growing region, Newberry carries on a considerable trade and manufactures cotton goods, cottonseed oil, fertilizers, coffins, etc. The government is administered, under a charter of 1894, by a biennially elected mayor and a unicameral council. The water works and electric-light plant are owned by the city. Pop., 1890, 3020; 1900, 4607; 1910, 5028.

NEWBERRY, John Strong (1822–92). An American geologist. He was born at Windsor, Conn., Dec. 22, 1822, and died at New Haven, Dec. 7, 1892. Most of his early life was spent in the Western Reserve of Ohio. He graduated from Western Reserve University at Hudson in 1846 and from the Cleveland Medical School in 1848. After two years at Paris, spent in post-graduate work in medicine and paleontology, he established himself as a physician in Cleveland (1851). In 1855 he joined an exploring expedition under Lieutenant Williamson, sent out by the War Department to examine the country between San Francisco and the Columbia River. His geological investigations were published as a separate volume of the *Reports of Explorations and Surveys to Ascertain the Most Prac-*

tical and Economic Route for a Railroad from the Mississippi River to the Pacific Coast, Made in 1855–56 (Washington, 1857). In 1857–58 he acted as geologist to an expedition headed by Lieutenant Ives, sent out to explore the Colorado River. Newberry's paper relating to the geology, physiography, and Indian tribes undoubtedly forms the most valuable and interesting part of the *Report on the Colorado River of the West, Explored in 1857–58* (Washington, 1861). The next year Newberry again went into the field, this time as naturalist of an expedition under Captain Macombe, which explored southwestern Colorado and adjacent parts of Utah, Arizona, and New Mexico. The results appeared in 1876 as *Reports of the Exploring Expedition from Santa Fé to the Junction of the Grande and Green Rivers* (Washington, 1876). During the Civil War Newberry served as secretary to the Sanitary Commission for the Mississippi valley. Afterward he became attached to the Smithsonian Institution, at the same time holding a professorship in Columbian (now George Washington) University at Washington, to which he had been called in 1857. In 1866 he was offered the chair of geology and paleontology in the School of Mines, Columbia College, which he accepted and held for 24 years. In 1869, when the Ohio Geological Survey was established, he was made director and personally did much of the work described in several of the reports. In addition he was a member of the Illinois Geological Survey and described the extensive collections of fossil plants gathered by Hayden's survey of the West. In 1867 he was elected president of the American Association for the Advancement of Science and in the same year was chosen president of the New York Academy of Sciences, a position which he held for 24 years. He was also president of the Torrey Botanical Club from 1880 to 1890, assisted in the organization of the Geological Society of America at Cleveland in 1888, and served as a member of the commission to organize an international geological congress, of which he was president in 1891. The Murchison medal of the Geological Society of London was awarded to him in 1888. In addition to the works above mentioned Newberry also wrote: *The Rock Oils of Ohio* (1859); *Iron Resources of the United States* (1874); *The Structure and Relations of Dinichthys* (1875); *Report on the Fossil Fishes Collected on the Illinois Geological Survey* (1886); *Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley* (1888); *Paleozoic Fishes of North America* (1889); *Later Extinct Floras* (1898). Consult J. J. Stevenson, "Memoir," in the *American Geologist* (Minneapolis, July, 1893), and C. A. White, *Biographical Memoir of John Strong Newberry* (Washington, 1908).

NEWBERRY, Percy Edward (1869–). An English Egyptologist, born at Ealing and educated at King's College, London. He first prepared himself to be a botanist and in this field wrote between 1888 and 1890 a *History of English Gardening.* But as early as 1884 he had become interested in Egyptology, and in 1890 he was appointed the officer in charge of the archæological survey of Egypt for the Egypt Exploration Fund. Five years later he began a survey of the necropolis at Thebes which occupied him until 1901. Newberry served on the staff of the *Catalogue Général* of the museum at Cairo in 1902–03 and in 1907 was appointed Brunner professor of Egyptology at the University of Liverpool. Among his numerous writings on the subject of his researches are: *Beni Hasan* (1891–93); *El Bersheh* (1893–94); *The Amherst Papyri* (1900); *The Life of Rekhmara* (1900); *The Tomb of Thouthmosis IV* (1904); *Scarabs* (1905); *Five Years Explorations at Thebes* (1912).

NEWBERY, John (1713–67). A famous English bookseller and publisher, the son of a poor farmer of Waltham St. Lawrence in Berkshire. He attended the village school, but he educated himself mainly by reading. In 1730 he went to Reading, where he entered the service of William Carnan, editor of the *Mercury.* After the death of his employer, in 1737, he married his widow. Somewhat later he opened in London a bookshop and publishing house in St. Paul's Churchyard (1745). He started several newspapers, and among their contributors were Goldsmith and Dr. Johnson. To Newbery's *The Public Ledger* (founded 1760) the former contributed his *Citizen of the World.* Newbery was the first publisher to issue books especially for the young. His *Juvenile Library* was made up of dainty volumes bound in flowered and gilt Dutch paper. Among them were *Goody Two Shoes* (reprinted with introduction by C. Welsh, London, 1881) and *Tommy Trip.*

NEW BOGOSLOV. See Grewingk Island.

NEWBOLD, nū'bōld, W(illiam) Romaine (1865–). An American professor of philosophy. He was born at Wilmington, Del., and was educated at the University of Pennsylvania (A.B., 1887; Ph.D., 1891), where, after teaching Latin at the Cheltenham Military Academy in 1887–89, he was instructor in Latin, lecturer in philosophy, assistant professor of philosophy, professor in 1903–07, and Adam Seybert professor after 1907. He was also dean of the graduate school of the university from 1896 to 1904. In 1895–96 he was coeditor of the psychological department of the *American Naturalist.*

NEW'BOLT, Henry John (1862–). An English writer, born at Bilston, Staffordshire, where his father was vicar. He was educated at Clifton College, Bristol, and at Corpus Christi, Oxford. Called to the bar at Lincoln's Inn (1887), he practiced law till 1899. In 1900–04 he edited the London *Monthly Review.* He is best known for his martial poems in *Admirals All* (1897) and *The Island Race* (1898, largely a reprint). Among his other publications are a novel entitled *Taken from the Enemy* (1892); *Mordred,* a tragedy; *Stories from Froissart* (1899); *Froissart in Britain,* with illustrations taken from originals in the British Museum (1900); *The Old Country,* a romance (1906); *The New June* (1909); *The Twymans* (1911); *Poems Old and New* (1912); *The Book of the Blue Sea* (1914); *Drake's Drum and Other Poems of the Sea* (1915). Consult William Archer, *Poets of the Younger Generation* (New York, 1902).

NEW BRAUNFELS, broun'fĕlz. A city and the county seat of Comal Co., Tex., 31 miles northeast of San Antonio, at the confluence of the Guadalupe and Comal rivers, and on the Missouri, Kansas, and Texas and the International and Great Northern railroads (Map: Texas, C 5). Noteworthy features include Landa's Park and fine Federal and courthouse buildings. The Comal River, though short, is of considerable volume. The city is the dis-

tributing point for an extensive farming and cattle-raising district, and is industrially important because of its good water power, some of the largest flour mills in the State being situated here. The principal manufactured products include flour, cottonseed oil, leather, lime, and bricks. The water works and electric-light plant are owned by the city. Pop., 1900, 2097; 1910, 3165.

NEWBRIDGE. See PONTYPRIDD.

NEW BRIGHTON, brī'ton. A borough in Beaver Co., Pa., 28 miles northwest of Pittsburgh, on the Beaver River and on the Pittsburgh and Lake Erie and the Pennsylvania Company railroads (Map: Pennsylvania, A 5). It has the Merrick Art Gallery, a home for the aged, a children's home, a fine Federal building, Beaver Valley General Hospital, Y. M. C. A. and public high-school libraries, and a public park. The river furnishes adequate water power, and there are deposits of coal and clay in the vicinity. New Brighton is an important industrial centre, its manufactures including pottery, bricks, sewer pipe, glass, flour, twine, lead kegs, refrigerators, bath tubs, wall paper, steel castings, nails, rivets, wire, etc. Pop., 1900, 6820; 1910, 8329; 1914 (U. S. est.), 8971.

NEW BRIT'AIN. The former name of the Bismarck Archipelago (q.v.); also applied to the largest island of the archipelago, now called New Pomerania (q.v.).

NEW BRITAIN. A city and town (coextensive) in Hartford Co., Conn., 9 miles southwest of Hartford, on the New York, New Haven, and Hartford Railroad (Map: Connecticut, D 3). It has a State normal school and New Britain Institute, and two fine public parks, one of 90 acres developed and one of 138 acres undeveloped. New Britain is noted for its extensive manufactures, which, in 1909, represented an invested capital of $32,000,000 and had a production valued at $22,000,000. The manufacture of builders' hardware and cutlery is particularly noteworthy. Other important manufactures are hardware, foundry and machine-shop products, cutlery and edge tools, hosiery and knit goods, stamped ware, saddlery, buckles, etc. Situated in a fertile agricultural district, New Britain also has some farming and peach-growing interests. The government is administered, under a consolidation charter of 1905, by a mayor, chosen every two years, a unicameral council which controls elections of the majority of subordinate municipal officers, and commissions appointed by the mayor. The city clerk and treasurer, collector, auditor, and school board are, however, chosen by popular vote. There are municipal water works and municipally owned underground ducts. The city's income in 1914–15 was $1,332,211, while its payments amounted to $1,189,014, the chief items of expenditure being $55,394 for police department, $47,372 for fire department, and $208,172 for education. Pop., 1900, 25,998; 1910, 43,916; 1915, 52,203; 1920, 59,316. New Britain was settled in 1687 and was incorporated as a parish under the name New Britain Society in 1754. It was separated from Berlin and incorporated as a township in 1850, and in 1871 was chartered as a city. This was the birthplace and home of Elihu Burritt (q.v.). Consult Camp, *History of New Britain* (New Britain, 1889).

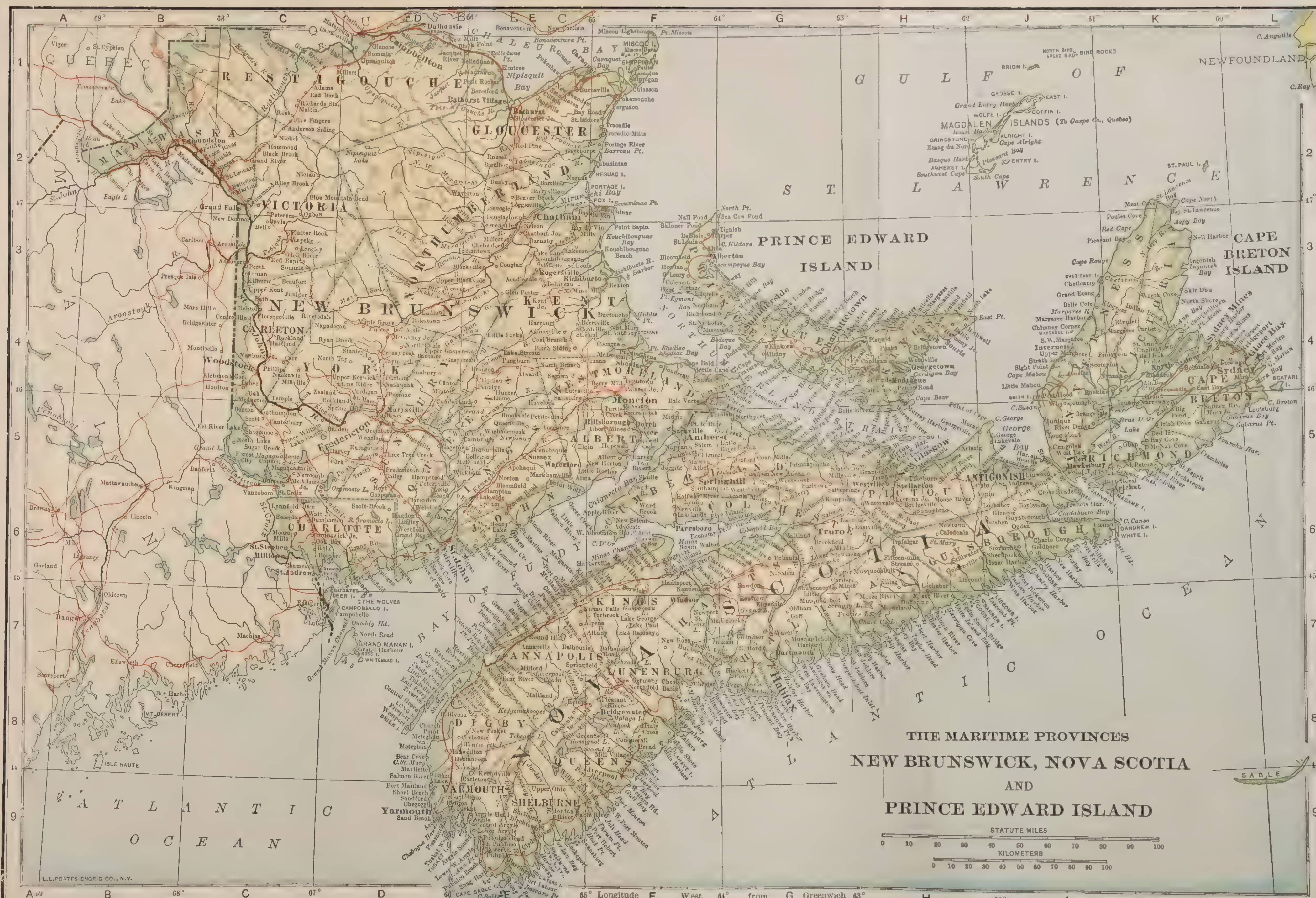
NEW BRUNSWICK, brŭnz'wĭk. A province of the Dominion of Canada. It lies between lat. 44° 30′ and 48° 6′ N. and long. 63° 47′ and 69° 5′ W., and is bounded on the north by Quebec and the Bay of Chaleur, on the east by the Gulf of St. Lawrence and Northumberland Strait, on the south by Nova Scotia and the Bay of Fundy, and on the west by the State of Maine and Quebec (Map: Canada, R 7). It has an area of 27,985 square miles, including 74 square miles of water area.

Topography. The coast on the Gulf of St. Lawrence is low and sandy, with numerous spits and lagoons; that on the Bay of Fundy is bold and rocky. The latter is protected from the scouring action of the extraordinarily high tides by a ridge of hard Cambrian rock, with small areas of Silurian and Devonian as well as of the older Huronian and Laurentian systems. Another ridge, composed of granite, traverses the province from the southwest to the northeast corner. It forms the main divide between the eastern and western rivers, and has an average height of 1000 to 1500 feet, with a number of detached monadnocks from 2000 to 2500 feet high. These ridges are regarded as outlying branches of the Appalachian system. They inclose between them a large, triangular tract of low, undulating plain, occupying the eastern half of the province, and underlain by the Carboniferous system. West of the dividing range is a Silurian plateau much eroded and trenched by the valley of the St. John River. The geology of the province is somewhat confused and not yet definitely understood; but it is probably in many respects similar to that of Nova Scotia (q.v.).

Nearly all the western half of New Brunswick is drained by the river St. John, which, after forming for a long distance the boundary between the Province of New Brunswick and the State of Maine, flows through the province in a southerly direction as far as the forty-sixth parallel, then turns to the east and discharges into the Bay of Fundy through an estuary extending north and south for about 50 miles. The northeastern part of the province is drained into the Gulf of St. Lawrence through a large number of small streams. There are numerous lakes. Grand Lake, in the south-central portion, is the only one of considerable size. The coast line is 500 miles in extent, and is indented by spacious bays, inlets, and harbors. The tides, which have a great range in height, the spring tides at the head of the Bay of Fundy rising 50 feet, determine in many instances the hours of movements of vessels. The chief bays are: Fundy, Chignecto, and Cumberland, the last two being merely extensions of the first; Passamaquoddy Bay in the south; Verte, Shediac, Cocaigne, Richibucto, and Miramichi bays on the east; and the Bay of Chaleur, 90 miles long by 12 to 25 broad, in the northeast.

Climate. New Brunswick is subject to extremes of heat and cold. At inland points the extremes are greatest, the temperature sometimes falling to 30° below zero F. in the winter and rising to 95° F. in the summer. The atmosphere, however, is drier than on the coast, and the extremes do not occasion great discomfort. Spring opens later and summer lingers longer than in the provinces farther west. The rainfall for the province averages above 40 inches.

Mining. Although a large part of the province is occupied by Carboniferous strata, the mineral coal is for the most part impure or in


THE MARITIME PROVINCES
NEW BRUNSWICK, NOVA SCOTIA
AND
PRINCE EDWARD ISLAND
STATUTE MILES
0 10 20 30 40 50 60 70 80 90 100
KILOMETERS
0 10 20 30 40 50 60 70 80 90 100
NEW BRUNSWICK
PRINCE EDWARD ISLAND
CAPE BRETON ISLAND
NEWFOUNDLAND
QUEBEC
GULF OF ST. LAWRENCE
BAY OF FUNDY
ATLANTIC OCEAN
NORTHUMBERLAND STRAIT
MAGDALEN ISLANDS (To Gaspe Co., Quebec)
RESTIGOUCHE
GLOUCESTER
VICTORIA
NORTHUMBERLAND
KENT
CARLETON
YORK
SUNBURY
QUEENS
WESTMORELAND
ALBERT
KINGS
CHARLOTTE
CUMBERLAND
COLCHESTER
PICTOU
ANTIGONISH
GUYSBOROUGH
HALIFAX
HANTS
KINGS
ANNAPOLIS
LUNENBURG
DIGBY
QUEENS
YARMOUTH
SHELBURNE
INVERNESS
VICTORIA
CAPE BRETON
RICHMOND
SABLE I.
Fredericton
Halifax
Moncton
Chatham
Sydney
Yarmouth
Charlottetown
Amherst
Truro
65° Longitude West 64° from Greenwich 63°
L.L.POATE'S ENGR'G CO., N.Y.

thin seams, and is but little worked. The coal-like mineral albertite, formerly mined with great profit in Albert County, has long since been exhausted. Salt springs are numerous. Nickel and iron ore are found, as are also antimony and manganese. Valuable copper deposits were reported to be discovered in 1913 at Black River, near St. John. Gypsum, plumbago, grindstone, and limestone are very abundant, and the freestone of the province, unsurpassed for beauty and durability, commands a high price in the United States. The value of the mineral production in 1913 was $1,049,320.

Fisheries. From an early period fishing has been one of the leading industries. The waters on both coasts rank among the best fishing grounds of the world. Fish breeding is assisted by the Dominion government. New Brunswick has 7 of the 51 fish hatcheries in Canada. For a decade and a half the annual earnings from fisheries have been about $4,000,000, Nova Scotia alone, among the Maritime Provinces, exceeding that amount. New Brunswick thus nearly ranks with Massachusetts, which is the leading sea-fishing State of the United States. The herring, smelt, sardine, and lobster fisheries are of greatest importance, and in the first three New Brunswick leads all the other provinces. For the fiscal year 1913 the value of the catch was $4,264,054. There were 21,675 men engaged in the industry.

Agriculture. The kind and quality of soil vary greatly with the underlying geological formation, but it is generally fertile, though much of the surface is too hilly to admit of profitable cultivation. In most of the valleys, and in the diked districts, e.g., at the head of the Bay of Fundy, the fertility is of a high grade. Originally the whole area was covered with forests, of which about one-half has been removed. The nature of the forests is not uniform, but they usually consist of both hard and soft woods. On the Bay of Fundy the species are largely confined to spruces and firs, as a consequence of the cold winds of that region. Spruce, fir, and tamarack also prevail in the western part of the province. But farther eastward the hardwood varieties, such as maple, beech, ash, and birch, prevail, interspersed with spruce and pine. The elm abounds in the river valleys, and with it are found the birch and red maple. According to the forestry branch of the Department of the Interior at Ottawa, the estimated acreage of commercial timber in 1914 was 9,000,000. In 1902 a law was passed for the establishment of a large national park and game preserve at the sources of the Tobique, Nipisiguit, and Miramichi rivers. Excellent laws protect fish and game. (See GAME LAWS.) The destruction of the forests in New Brunswick, as in the other Maritime Provinces, seems to have had a climatic effect quite different from that which usually follows, viz., the rainfall increases, resulting in the growth of the soft woods—balsam, spruce, and tamarack—in the region where the hard woods were removed.

Agriculture is the leading occupation, but it has not reached extensive proportions. The natural growth of marsh hay in the valleys supplies an abundant and valuable hay product. Hay, potatoes, oats, turnips, and buckwheat are the most valuable field crops. In 1913, 577,000 acres of hay and clover yielded 698,000 tons, valued at $7,615,000; 43,500 acres of potatoes yielded 10,629,000 bushels, valued at $4,677,000; 195,000 acres of oats, 5,946,000 bushels, value $3,032,000; 9000 acres of turnips, 3,346,000 bushels, value $1,271,000; 64,000 acres of buckwheat, 1,782,000 bushels, value $962,000. The total area under field crops in 1914 was 904,055 acres and the value of the product was $20,045,000. The climate is rather too severe for the large fruits, except in certain regions like the valley of the St. John, where the hardier varieties are successfully grown. The smaller fruits, however, are abundant, and, ripening late, are put on the New England market at monopoly prices. The situation of the province on the seaboard gives it a marked advantage in marketing produce.

Considerable attention is given to the raising of sheep, and more especially cattle, and in very recent years there has been a decided growth in the dairy industry. In 1913 there were 65,103 horses, 106,904 milch cows, 107,864 other cattle, 135,115 sheep, and 77,014 swine. In 1910 there were 42 butter factories and creameries, producing 1,166,243 pounds of cheese and 849,633 pounds of butter. Fox farming attained considerable proportions in 1913. At the close of that year there were 40 fox ranches in the province, and a large number of companies were incorporated. Silver-black foxes are imported from Alaska (see FUR FARMING). The province has government experimental farms and agricultural schools.

Manufacturing, Transportation, and Commerce. Dominion, provincial, and municipal aid has greatly facilitated the construction of railways; the mileage for all lines aggregated 1545 miles in 1913. There were in 1913 about 600 miles of railway under construction. The Canadian Pacific connects the province with the railroad systems west by running west from St. John and crossing the State of Maine. The Intercolonial enters the province from Quebec on the north and traverses the east side of the province, one branch connecting with St. John. The National Transcontinental, the eastern section of the Grand Trunk Pacific Railway, runs from Moncton westerly and northwesterly through the province and thence to Quebec and Winnipeg. The position of New Brunswick on the Atlantic coast, and the large number of excellent harbors, greatly favor its commercial advantage. The foreign trade of the province passes through the port of St. John. The winter port business of the city in 1912–13 was 407,829 tons. Regular ship lines connect this port with Atlantic coast points to the south and with European countries. The trade of the province for the fiscal year 1913 was $34,634,156 in exports and $14,445,811 in imports. Lumber is the chief article of export. The manufacture of lumber and of lumber products leads the manufacturing industries. Shipbuilding, which was formerly important, has greatly declined. The manufacture of wood pulp, on the other hand, is assuming large proportions, and the future of the industry is assured, because the supply of spruce—the wood used for this purpose—is practically inexhaustible. In 1911 the province had 1158 manufacturing establishments, with an invested capital of $36,125,012, employing 24,755 hands, with salaries and wages amounting to $8,314,212, and an output valued at $35,422,302 as compared with an output in 1905 valued at $22,133,951.

Government and Finance. The administration of the government is in the hands of a Lieutenant Governor and an executive council.

The council, of which the Premier is the chief, is responsible to the Legislative Assembly, composed of 46 members elected for four years. The Legislative Council was abolished in 1892. In striking contrast to some other Canadian provinces, there are no local municipal councils, the municipal affairs being managed by a county council. In this council each parish has two representatives, who serve without emolument (except in the County of Carleton), the term of office being one year. The various parish officers receive their appointments from the county council. The net debt of the province in 1912 was $4,693,457. The expenditures for 1913 amounted to $1,459,122 and the receipts to $1,446,962. Nearly half the receipts came from the Dominion subsidy, the timber licenses being next in importance. Of the ordinary expenditures, $273,189 were devoted to education and $383,363 to public works. Taxes are levied by the province upon telegraph, telephone, and insurance companies and banks. There is also a succession duty upon estates. Local expenditures are met by taxes collected upon real and personal property, income, and polls. Property is rated at its full value. The capital of New Brunswick is Fredericton.

Population. There is a high birth rate in the province, but also a rather large emigration. The censuses for 1891, 1901, and 1911 gave, respectively, 321,263, 331,120, and 351,889. There is a small French element. The great bulk of the population is of British origin, the Irish especially being well represented. St. John had a population of 42,511 (1911); 1915 (local est.), nearly 70,000. Moncton in 1911 had a population of 11,345, and Fredericton 7208.

Religion. The Roman Catholics number more than one-third of the total religious membership of New Brunswick, their number in 1911 being 144,889. Among the Protestants, the Baptists, according to the census of 1911, are strongest (82,106), followed by the Anglicans (42,864), Presbyterians (39,207), and Methodists (34,558).

Education and Charities. Educational affairs are in the hands of a superintendent of education and an educational council. Unlike Quebec and Ontario, the province does not provide for separate denominational schools. There is uniformity of methods, textbooks, etc., throughout the province. Attendance is compulsory. One in every 5.53 of the population is enrolled in the public schools, the proportion between the grammar and the elementary enrollment being about 1 to 60. In 1912–13 the number of public schools was 1897; teachers, 2003; pupils, 63,580, with boys and girls about equal in number; average daily attendance, 43,624; female teachers, 1810; male, 193. The province maintains normal schools and provides for higher education at the University of New Brunswick at Fredericton. The religious denominations maintain seminaries and universities, of which Mount Allison University (Methodist) at Sackville is the largest. The University of St. Joseph at Memramcook is a Roman Catholic institution. The expenditure for educational purposes shows a steady increase from $413,967 in 1888 to $955,224 in 1913.

Of the charitable institutions, the asylums for the insane constitute the greatest item of expenditure. The province supports also, in whole or part, a general hospital (at St. John), a boys' industrial home, a country home or shelter for children, and deaf and dumb institutions. Private and sectarian interests are well represented in charitable work. Convicts sentenced to penal life are sent to the Dominion penitentiary at Dorchester.

History. The first European settlement was made on the Bay of Chaleur by Frenchmen in 1639, and in 1672 further settlements were made on the Miramichi River and along the coast. With Nova Scotia, New Brunswick formed the original French colony of Acadia or New France, which was taken by the English in 1654, restored to France in 1667, but re-ceded to the English in 1713 by the Treaty of Utrecht, although disputes as to the boundaries lasted until the Treaty of Paris in 1763 finally settled the question in favor of the British. The first British settlements were made by Scottish agriculturalists and laborers along the Miramichi in 1764. In 1783 over 5000 United Empire Loyalists from the United States settled in the colony. In 1784 Nova Scotia and New Brunswick separated to form distinct colonies, and in January, 1786, the first Legislative Assembly of New Brunswick met at St. John. In 1848, after prolonged struggle, responsible government was established. In 1867 New Brunswick united with Ontario, Quebec, and Nova Scotia, and thus became one of the original provinces of the Dominion of Canada. After Confederation an agitation arose for full, undenominational public schools, which were established by law in 1871. The Roman Catholics strongly opposed this law, but were induced to accept a compromise in 1875. The course of provincial history thereafter followed local issues, and Liberal and Conservative administrations alternated according to the success or failure of the appeal for popular support upon those issues. The most noteworthy events were the Supreme Court of Judicature Act, establishing a court with three trial divisions (1906); the creation of a Public Utilities Commission, with three commissioners, for the regulation of rates and services of any public utility (1910); the destruction of the town of Campbellton by fire in the same year; and the various legislative measures for developing new railways and the natural resources of the province. Local option in regard to the liquor traffic is in force in several counties.

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NEW BRUNSWICK. A city and the county seat of Middlesex Co., N. J., 31 miles southwest of New York, at the head of navigation on the Raritan River, about 15 miles from its mouth, and on the Pennsylvania and the Raritan River railroads (Map: New Jersey, D 3). It is the eastern terminus of the Delaware and Raritan Canal. A magnificent railway bridge spans the river at this point. The city has a large public library and also the Voorhees and the Gardner A. Sage libraries, and is the seat of Rutgers College (q.v.), of the Theological Seminary of

the Dutch Reformed church in America, and of the State Agricultural and Mechanical College with the State model farms; and there are three hospitals and 229 acres of public parks. New Brunswick is extensively engaged in manufacturing, the chief products being hosiery, wall paper, automobiles, musical strings, rubber boots and shoes, bicycle and automobile tires, surgical and medical supplies, chemicals, fruit jars, boilers, cigars, foundry products, knitting needles, linoleum, washing bluing, sash and blinds, shoes, etc. The city is governed by the commission form of government. A commission of five men elected by the people for a term of four years, gives a direct administrative head to five departments, which cover all branches of the city government, excepting the board of education, which board is appointed by the mayor and is held absolutely responsible for the educational affairs of the city. The water works are owned and operated by the municipality. Pop., 1900, 20,006; 1910, 23,388; 1914, 24,827; 1920, 32,779. The first settlement here was made in 1681. The place was first called Prigmore's Swamp (1681–97), then Inian's Ferry (1691–1714), and finally New Brunswick, in honor of the house of Brunswick. New Brunswick was incorporated as a town in 1736 and was chartered as a city in 1784. It suffered much during the Revolution, and during the winter of 1776–77 was occupied by the British.

NEW BRUNSWICK THEOLOGICAL SEMINARY. See THEOLOGICAL SEMINARY OF THE REFORMED CHURCH IN AMERICA.

NEW'BURGH. A city in Orange Co., N. Y., 60 miles north of New York City, on the Hudson River, about 5 miles above the picturesque Highlands, on the Erie and the West Shore railroads, and on the lines of several steamship companies (Map: New York, A 1). It is built on a steep, terraced slope, rising about 300 feet above the river to an extended plateau. The city has a public library, two public parks, St. Luke's Home and Hospital, Home for the Friendless, Home for Children, and a county tuberculosis sanatorium. Among noteworthy buildings are a beautiful Masonic Temple, Y. M. C. A. building, and the Broadway School. The river here expands into Newburgh Bay, giving the city a deep water front and facilities for traffic by water. There is a trade in agricultural and dairy products, and large quantities of coal from Pennsylvania are here transferred to barges and coasting vessels. Newburgh is of considerable importance as an industrial centre, having manufactories of cottons, woolens, silks, paper, felt hats, baking powder, soap, paper boxes, brick, plush goods, steam boilers, tools, waterway gates, ice machines, pumps, moving-picture screens, overalls, perfumes, furniture, carpets, carburetors, spiral springs, spiral pipe, shirt waists, shirts, felt goods, lawn mowers; shipyards; foundries and machine shops; tanneries; leatherette works; plaster works. It is also a popular resort, being visited by thousands of New Yorkers during the summer months. Of particular interest is Orange Lake with its recreation park. The city has adopted Plan C of the Optional Charter Law of New York State. This provides for a mayor and four councilmen elected for four years. The executive power is vested in a city manager, who is appointed by the council. The water works are owned and operated by the municipality. Pop., 1890, 23,087; 1900, 24,943; 1910, 27,805; 1914, 29,023; 1920, 30,366. The first settlement at Newburgh was made in 1709 by German Lutherans from the Rhenish Palatinate, who named it the Palatine Parish by Quassaic. By 1750 most of the Germans had been replaced by people of English and Scottish descent, who in 1752 changed the name to the Parish of Newburgh (after Newburgh, Scotland). Newburgh was the headquarters of the American army from March, 1782, until the latter part of 1783, and it was here that the Newburgh Letters were circulated, that the army was disbanded, and that Washington received the famous Nicola letter proposing that he become King. The Hasbrouck house, then occupied by Washington, is now owned by the State and used as a museum for Revolutionary relics. On the grounds is the Tower of Victory, an imposing stone structure erected by the United States and State governments to commemorate the close of the war. Newburgh was incorporated as a village in 1800 and was chartered as a city in 1865. Consult: E. M. Ruttenber, *History of Orange County with History of the City of Newburgh* (Newburgh, 1876); J. J. Nutt, *Newburgh: Her Institutions, Industries, and Leading Citizens* (ib., 1891); L. P. Powell (ed.), *Historic Towns of the Middle States* (New York, 1899).

NEWBURGH, WILLIAM OF. See WILLIAM OF NEWBURGH.

NEWBURGH ADDRESSES. Two anonymous letters that appeared in 1783, after the close of the Revolutionary War. They urged some organized action to redress the wrongs of American soldiers, especially the withholding of their pay, and were later found to have been written by Gen. John Armstrong.

NEW'BURN. A town in Northumberland, England, on the Tyne, 5½ miles west of Newcastle. Pop., 1901, 12,500; 1911, 17,155.

NEW'BURY. A municipal borough and market town in Berkshire, England, on the Kennet and on the Kennet and Avon canal, 17 miles west-southwest of Reading (Map: England, E 5). It has fine municipal buildings. Trade in agricultural produce and malting are the principal industries, and an annual wool market is held. The chief buildings are the church, built in the reign of Henry VII, and the Corn Exchange. The town owns real estate, markets, and the gas works. It dates from the Roman period, and was a gift of the Conqueror to Ernulf de Hesdin. Newbury is best known for two hard-fought battles between the Royalists and Parliamentarian forces in September, 1643, and in October, 1644. On the battle field is a handsome memorial to Lords Falkland, Sutherland, and Carnarvon, Royalists, who fell there. Pop., 1901, 11,061; 1911, 12,107. Consult W. Money, *History of Newbury* (Oxford, 1887).

NEW'BURYPORT. A city, including several villages, a port of entry, and one of the county seats of Essex Co., Mass., 38 miles by rail northeast of Boston, on the Merrimac River and on the Boston and Maine Railroad (Map: Massachusetts, F 1). Among the city's noteworthy buildings and objects of interest are the public library of 40,000 volumes, Marine Museum, Putnam Free School, Anna Jaques Hospital, Old Ladies' Home, the Old South Church, containing the remains of George Whitefield, the house in which William Lloyd Garrison was born, the Dexter House, a statue of Washington, Washington Park, and a suspension bridge. The

harbor, opening into the Atlantic Ocean, is safe and spacious. The principal manufactured products include boots and shoes, cotton cloths, silverware, machinery, and combs. Shipbuilding was formerly a very extensive and important industry. Newburyport is also a distributing centre for coal. Under the original charter of incorporation of 1851, the government is administered by a mayor, annually elected, and a bicameral council, of which the Upper House is elected on a general ticket and the Lower by wards. The municipality owns and operates the water works. Pop., 1900, 14,478; 1910, 14,949; 1914 (U. S. est.), 15,147; 1920, 15,618.

Newburyport, settled about 1635, was a part of Newbury until 1764, when it was separately established and incorporated as a town, and was chartered as a city in 1851. It was the home of Theophilus Parsons and the birthplace of Francis C. Lowell, who introduced cotton manufacturing on a large scale into the United States. Consult: Smith, *History of Newburyport, Mass.* (Boston, 1854); D. H. Hurd, *History of Essex County, Mass.* (Philadelphia, 1888); J. J. Currier, *History of Newburyport* (Newburyport, 1906).

NEW CALEDONIA, kăl'ê-dō'nĭ-à. An island in the Pacific, belonging to France, the southernmost of the Melanesian Islands. It is situated 1200 miles southeast of New Guinea, 850 miles from the coast of Queensland, and about the same distance from New Zealand (Map: Australasia, J 5). It is elongated in shape, extending from northwest to southeast, with a length of 240 miles, an average width of 30 miles, and an area of 7650 square miles. It is almost entirely surrounded by a coral reef, which is 5 to 15 miles from the shores and affords a belt of well-protected navigable water inside. The coast itself is indented with numerous bays, forming, especially on the southwestern side, many excellent harbors. The interior is essentially mountainous, although of no great height. There are two parallel ranges running the entire length of the island and inclosing the valley of the Diahat, the only river of importance. They are of nearly uniform height, except in the south, where they are broken by marshy lowlands. The highest point is an unnamed peak near the northwest coast, with an altitude of about 5387 feet. Mount Humboldt in the southeast is 5360 feet high. The northeast consists of Archæan rocks; along the west coast is a narrow band of Triassic and Cretaceous strata; while eruptive rocks, principally serpentine, cover two-thirds of the island. There are no active volcanoes, but some evidences of ancient volcanic activity, including thermal springs.

The proverbially healthful climate is both drier and cooler than that of the other Melanesian Islands. A rainy season obtains from December to May and a comparatively dry and cool season the rest of the year, although no month is rainless. The rainfall (70 inches) is sufficient to sustain a very rich flora, although large areas are semiarid pine barrens in which the *Araucaria cookii* is prominent. True forests appear chiefly in the northern part and contain much valuable timber, though sandalwood has now practically disappeared. The fauna, like that of all other Oceanic islands, is very poor in varieties, a single species of bat being probably the only indigenous mammal, while reptiles are also few. The avifauna is the richest and is related to that of the Australian continent rather than to that of New Zealand. The natives of New Caledonia, whom the French style Canaques (Kanakas), are Melanesians, probably of mixed (Papuan-Polynesian) type. The coast tribes seem to be better shaped and more regularly featured than the rest. They are above the average in stature, with dolichocephalic head form. The absence of large animals on the island has made them practically vegetarians, but it may account in part for the cannibalism which once prevailed in this part of the world. One of their most interesting institutions is the pilu-pilu, or yam-harvest dance, with its mock fight. Something like the Dukduk Society of New Britain exists among them. Among other things worthy of note are their beehive huts, grotesque carvings of heads, and slingstones. The bow seems to be little employed, the spear and club being preferred. In many of the mountain valleys are found remains of terraced plantations which have been mistaken for aqueducts; their purpose was not so much to lead water upon the soil as to prevent the heavy flow of the rains from washing the soil away; many old terraces remain in use, and new are built as need arises. Numerous petroglyphs and rock carvings exist, some of which are considered pre-Kanaka. Since New Caledonia has been made a French penal colony, some admixture between the Europeans and the native women has taken place. Some of the tribes of the interior are still little known. The Webias of central New Caledonia, who still live in a state of independence and have not yet been seriously influenced by the whites, are said to be good-natured people and skillful fishermen. As in many of the Pacific islands, the natives are diminishing in number.

The natives are the best agriculturists of all the Oceanic tribes. They have succeeded even better than the white farmers, as the latter have been embarrassed for lack of labor, though they have imported Chinese and New Hebrides islanders. The natives live on reservations from which whites are excluded, but they are rapidly decreasing in number—50 per cent in the last 50 years. The chief agricultural products are coffee, maize, tobacco, sugar, copra, cassava, grapes, and pineapples. Wheat and cotton have also been introduced. The mineral wealth is considerable, including gold, silver, lead, copper, nickel, cobalt, chromate of iron, and coal, and these are worked mainly by Japanese miners. The last six are mined, and the nickel output is the most valuable, amounting in 1911 to 120,059,297 metric tons. The commerce is considerable. The exports in 1913 were valued at $3,082,000 and the imports at $3,447,000, the mineral exports amounting to $989,311. Of the exports, the principal are minerals, canned meats, and coffee. A railroad is under construction from Nouméa, the capital, to Bourail (90 miles). Nouméa is a municipality and the chief port of the island. It is in regular steamship communication with Sydney, New South Wales, having a good harbor, pier, and repairing slip. There are primary schools and a secondary school, a perfumery and a meat-canning factory.

The island with its dependencies, the isles of Pines, Wallis, Futuna, and Alafi, and the Huon and Loyalty Islands, is administered by a governor, who is assisted by a privy council of eight members, and there is an elective legisla-

tive body. Until 1896 the colony was chiefly used as a penal settlement, and convicts constituted the majority of the white inhabitants. Since that date no convicts have been sent, and the convict population is rapidly decreasing. In 1912 the population was 50,608, of whom 13,138 were free, 5671 were originally convicts, and 28,075 were aborigines. Immigration from France is slight, the majority of new settlers coming from Java, Tonkin, India, and other Pacific islands.

The island was discovered by Cook in 1774. In 1843 the French flag was raised, but the act was disavowed, owing to protests from England. Ten years later, however, the French took formal possession in order to put a stop to the cannibalism and excesses committed by the natives. In 1864 the penal settlement was founded, and after the Franco-Prussian War thousands of Communists were deported hither. The natives have always been suspicious of the whites and in 1878 and 1881 rose in revolt, massacring many of the colonists.

Consult: J. W. Anderson, *Fiji and New Caledonia* (London, 1880); Alfred Schreiner, *La Nouvelle-Calédonie depuis sa découverte jusqu'à nos jours* (Paris, 1882); León Vallée, *Essai d'une bibliographie de la Nouvelle-Calédonie et dépendances* (ib., 1885); G. Griffith, *In an Unknown Prison Land: An Account of Convicts and Colonists in New Caledonia* (London, 1901); J. B. Alberti, *La colonisation à la Nouvelle-Calédonie* (Paris, 1909).

NEW CA'NAAN. A town, including a village of the same name, in Fairfield Co., Conn., 8 miles by rail northeast of Stamford, on Five Mile River and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, A 5). It contains the Brooks Sanitarium, the B. P. Mead Memorial Park, and attractive town hall, school, and library buildings. There is also a shirt and overall factory. New Canaan is known chiefly as a summer resort, having splendid scenery and a number of facilities for sport. Pop., 1900, 2968; 1910, 3667.

NEW CASTILE, kăs-tēl'. The southern part of Castile (q.v.).

NEW'CASTLE, nū'kâs"l. A city of New South Wales, situated at the mouth of the Hunter River, 102 miles north-northeast of Sydney, with which it is connected by rail and by steamers (Map: New South Wales, F 3). It is a well-built town with paved streets and fine public buildings. It is the see of an Anglican bishop, whose cathedral of Christ Church is a notable building, as are also the library and art school, the school of mines, and the Victoria Theatre. It is the principal port for the northern part of New South Wales and is the greatest coaling port in the Southern Hemisphere. Large quantities of wood are also shipped from this port. In 1912 the total amount of tonnage entered and cleared at Newcastle was 3,966,255. Vessels of 4000 tons can be berthed, the greater portion of the wharfage, with that at Carrington, some 5 miles in extent, belonging to the government, which has provided ample shipping appliances, in the shape of four steam cranes—two of 25 tons, six of 15 tons, and four of 9 tons—as well as a number of chutes. There are three patent slips, one of which is capable of taking up vessels of 1000 tons, and a floating dock that can lift 2000 tons. The area of the harbor, which is defended by two forts and has two breakwaters, is 540 acres. The width of the channel at the entrance of the harbor is 1200 feet, and the depth of water on the bar 25½ feet and of the harbor 27 feet at high and 23 feet at low water. The industries of Newcastle include a steam biscuit factory, copper-smelting works, a brewery, shipbuilding yards, foundries, carriage factories, and boot factories. There is also a large trade in frozen mutton. Newcastle is the seat of a United States consul and owns its gas and electric-lighting plants. The water supply is controlled by the Hunter River Water Supply and Sewerage Board, which took over the control and management of the water supply from the government on July 1, 1892. Pop., 1901, 14,250; 1911, 14,405; with suburbs, 1913, 57,650.

NEWCASTLE. A town, port of entry, and the county seat of Northumberland County, New Brunswick, Canada, situated on the left bank of the Miramichi River, at the head of deep-water navigation, and on the Intercolonial Railway, 77 miles northeast of Moncton by rail (Map: New Brunswick, D 1). It contains the county buildings, customhouse, an academy, and a Roman Catholic convent, is a lumbering centre, with several large saw mills, and manufactures sashes and doors, chairs, and wagons. The surrounding district is widely known for moose hunting and salmon fishing. Pop., 1901, 2507; 1911, 2945; 1915 (local est.), 3100.

NEW CASTLE. A city in New Castle Co., Del., 6 miles by rail south of Wilmington, situated on the Delaware River, at the head of Delaware Bay, and on the Philadelphia, Baltimore, and Washington Railroad (Map: Delaware, H 1). New Castle has a good harbor and regular steamship connection with Philadelphia and Baltimore; is the centre of an agricultural and fruit-growing region; has large shad-fishing interests; and manufactures steel castings and cotton gloves. The city possesses several buildings of historic interest, a public library, and two parks. Settled by Swedes in 1640, New Castle was held successively by the Swedes, Dutch, and English, and was the landing place of William Penn in 1682. It was incorporated first in 1875. Pop., 1900, 3380; 1910, 3351.

NEW CASTLE. A city and the county seat of Henry Co., Ind., 44 miles by rail east-northeast of Indianapolis, on the Blue River, and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Fort Wayne, Cincinnati, and Louisville, and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads (Map: Indiana, G 5). The city is surrounded by a farming district and is an industrial centre of importance. The leading manufactures include sheet iron and steel, automobiles, caskets, clothing, scales, bridges, pianos, furniture, handles, shovels, lathes, bricks, flour, etc. The Indiana Village for Epileptics, comprising 1245 acres, is 2 miles north of the city. New Castle owns its water works and electric-lighting plant. Pop., 1900, 3406; 1910, 9446; 1914 (U. S. est.), 12,017; 1920, 14,458.

NEWCASTLE. A city and the county seat of Lawrence Co., Pa., 50 miles by rail northwest of Pittsburgh, at the junction of the Shenango and Neshannock rivers, and on the Erie, the Pennsylvania Company, the Pittsburgh and Lake Erie, the Baltimore and Ohio, and the Buffalo, Rochester, and Pittsburgh railroads (Map: Pennsylvania A 4). It is the commercial centre of a fertile agricultural region, which has also rich deposits of bituminous coal, lime-

stone and sandstone, fire clay, and iron ore. As a manufacturing city it ranks sixth in the State, its industrial importance being dependent upon the metal-working establishments, chief among which are the steel and rolling mills, blast furnaces, tin-plate and terneplate mills, and the car-construction shops. Other plants include large cement works and manufactories of pottery, wire novelties, tin cans, boxes, drugs and chemicals, hosiery, paints, boilers, machinery, lumber products, rubber tires, radiators, etc. The city maintains an old ladies' home, two hospitals, a public library, fine courthouse and high-school buildings, and Cascade Park, a beautiful place of resort, owned by the traction company. Settled in 1812, Newcastle was chartered as a city in 1869, and adopted the commission form of government in 1914. Pop., 1900, 28,339; 1910, 36,280; 1914 (U. S. est.), 39,569; 1920, 44,938.

NEWCASTLE, Henry Pelham Fiennes Pelham Clinton, fifth Duke of (1811–64). An English statesman. He was educated at Eton and at Christ Church, Oxford, and represented South Nottinghamshire in Parliament from 1832 to 1846, when he was ousted by the influence of his father, the fourth Duke, for supporting Sir Robert Peel in his free-trade measures. In the brief Conservative administration of 1834–35 he had been a Lord of the Treasury, and First Commissioner of Woods and Forests in the Peel administration, from 1841 to 1846. He was then made Chief Secretary to the Lord Lieutenant of Ireland, but went out of office with his chief a few months afterward. He succeeded to the dukedom in 1851 and returned to office in 1852, filling the post of Secretary of State for the Colonies (which formerly included the Department of War) in the Aberdeen government. The war with Russia broke out, and in June, 1854, it was found necessary to create a Secretary of State for War, and the new office was assigned to Newcastle. He resigned as a result of an investigation into the suffering of the army at Sebastopol. Newcastle was reappointed Secretary of State for the Colonies in the second administration of Lord Palmerston, 1859, and served until 1864. In 1860 he accompanied the Prince of Wales during a tour in Canada and a portion of the United States, and on his return received the Order of the Garter from the Queen. Consult John Martineau, *The Life of Henry Pelham, Fifth Duke of Newcastle* (London, 1908).

NEWCASTLE, Margaret, Duchess of. See Cavendish, Margaret.

NEWCASTLE, Thomas Pelham-Holles, first Duke of (1693–1768). An English officeholder. He was educated at Westminster School and for a short time attended the University of Cambridge. He was one of the largest landholders in the realm, was created Duke of Newcastle-on-Tyne in 1715, in 1724 he became Secretary of State for the southern department in Walpole's coalition administration and, in spite of his amazing incompetency, was continued in this office until 1754, when he became Prime Minister. He was in power at the beginning of the hostilities of the Seven Years' War (q.v.), but affairs were mismanaged completely, and in November, 1756, Newcastle resigned. Pitt now took charge of the war and foreign affairs. In 1757 a Newcastle-Pitt ministry was formed, Pitt being the virtual head. In 1762 Newcastle was forced out of office by Lord Bute and thereafter was of little importance, though during the short Rockingham administration, formed in 1765, he filled the office of Privy Seal. He died Nov. 17, 1768. Consult: William Coxe, *Memoir of the Administration of . . . Henry Pelham* (London, 1829); P. H. S. Stanhope, *History of England from the Treaty of Utrecht to the Treaty of Versailles, 1713–83* (ib., 1851–54); W. E. H. Lecky, *History of England in the Eighteenth Century* (ib., 1878–90).

NEWCASTLE, William Cavendish, Duke of. An English statesman. See Cavendish, William, Duke of Newcastle.

NEWCASTLE-UNDER-LYME, -līm. A parliamentary and municipal borough in Staffordshire, England, 15 miles north-northwest of Stafford (Map: England, D 3). Its chief buildings are the town hall and high school, with which is incorporated the free grammar school, founded in 1602. The quaint red-sandstone tower of the restored parish church of St. Giles dates from the twelfth century. It has an art school and a library. The town has greatly improved in modern times; it owns remunerative real estate, gas, markets, and maintains a sewage farm, cemetery, and isolation hospital. Hats were formerly the principal branch of manufacture, but the making of army clothing is now the chief industry. Newcastle-under-Lyme is surrounded by famous potteries; coal mines and ironworks are also in the vicinity. There are also manufactures of cotton, leather, paper, and malt. Of Saxon origin, the town was named after a castle built by Henry I under the great forest of Lyme. The town received its first charter from Henry II in 1175. Pop., 1901, 19,914; 1911, 20,201.

NEWCASTLE-UPON-TYNE, -tīn. A city and a county borough of England, county town of Northumberland, on the left bank of the Tyne, 8 miles from its mouth and 272 miles by rail north by west of London (Map: England, E 1). The town stands partly upon an elevated plateau and partly upon the north bank of the river. The river is crossed by four bridges, which connect Newcastle with Gateshead (q.v.)—the old high-level bridge (1849), the Redheugh suspension bridge (1871), an hydraulic swing bridge (1876), and the new high-level (railway) bridge (1906). The old high-level bridge is one of the engineering triumphs of Robert Stephenson. The length of the viaduct is 1337 feet, and the height of the railway above high water 112 feet. The bridge has a broad carriageway, by which the ordinary traffic avoids the precipitous streets on both sides of the river, with passenger paths on each side, and the railway above.

Some of the modern streets are handsome and spacious, especially Grey Street, which presents a scheme of Grecian architecture, and Grainger Street. The church of St. Nicholas, forming the cathedral of the diocese of Newcastle, is a noble edifice, chiefly in the Decorated style, though its leading feature is the Perpendicular lantern tower. Other old churches are St. Andrew's (damaged by the Parliamentarians in 1644) and St. John's. Among modern churches are St. George and the Roman Catholic cathedral. In the Guildhall, an old and somewhat inconvenient building, situated beside the river, the town assizes are opened and the quarter sessions held. Under the Guildhall proper there is an exchange for the merchants, ship-

owners, and brokers of the quayside. In the Moot Hall, a modern, handsome Grecian building overlooking the swing bridge, the town and county assizes are held. The spacious town hall, a modern building, stands on a block of ground facing St. Nicholas' Church; associated with it are a corn market and offices for the transaction of the town business. The market for the sale of meat and vegetables is one of the most spacious and commodious in the Kingdom. All the railways entering the town terminate in a large station near its centre. The jail, a heavy and costly building, occupies a low and confined situation. The postal and telegraph office is one of the largest and finest of the public buildings in the town. There are two theatres—the Royal (the ornament of Grey Street) and the Tyne Theatre in Westgate Street. Among the educational institutions are a public library, a literary and philosophical society, a society of antiquaries, a natural-history society (with museum), a mechanics' institute, and an institute of mining engineers. The colleges of medicine and science are both affiliated with Durham University. A column surmounted by a statue of Earl Grey, to commemorate the passing of the Reform Bill, and a bronze statue to George Stephenson are the principal monuments in the city.

Of benevolent institutions there are several hospitals, an eye infirmary, a dispensary, asylums for the blind, the deaf and dumb, two orphanages, etc. The municipal property consists of real estate, markets, street railways, and quays. The municipality maintains baths, washhouses, free libraries, cemeteries, and dust destructors, and indirectly contributes to technical education; important domestic utilities, such as gas, water, etc., are provisionally monopolized by companies. Extensive improvements have modernized the older portions of the town, and the streets generally are well paved and well lighted. The trade of Newcastle consists largely in coal from the Northumberland and Durham regions, of which it is the great centre. Large quantities of lead, the produce of the mines of Alston Moor and Weardale, are brought to Newcastle for manufacture, and a large quantity of unrefined lead is also imported from Spain.

At Newcastle the railway system had its origin, and its locomotive and engineering works are among the largest in England. The ordnance works of Lord Armstrong situated at Elswick, the western part of Newcastle, are well known. Here steel shipbuilding and various branches of engineering are extensively carried on, and since 1882 many warships have been constructed on the Tyne. Newcastle occupies an important position in the manufacture of soda, bleaching powder, vitriol, salt, and other chemical products. Earthenware is largely manufactured, and glass staining has reached great perfection. The fire-brick trade has attained large proportions, and there are important manufactures of gas retorts and fire-clay pipes, which are sent all over the world. Immense numbers of grindstones are exported. Portland and other cements are manufactured in vast quantities.

The river Tyne from the sea to Newcastle forms a natural dock for the accommodation of shipping, and for 10 miles both banks are lined with quays and factories. It has four natural docks, the largest nearly a mile long and including two piers at its mouth. Large sums have been spent on the improvement of the Tyne. The entrance and many parts of the river have been deepened by dredging. The net tonnage of vessels entered and of vessels cleared at Newcastle, together with North and South Shields, was 3,897,142 and 4,894,157 in 1900, 5,022,250 and 6,128,928 in 1910, and 6,421,195 and 7,632,672 in 1912. At Newcastle and North and South Shields imports and exports in 1900 were valued at £10,108,716 and £11,994,740 respectively; in 1910, £9,442,944 and £11,308,177; in 1912, £10,043,427 and £10,718,200 (£10,694,596 United Kingdom produce, £23,604 foreign and colonial produce). Exports consist chiefly of coal, iron, copper, lead, alkali, and machinery; imports comprise fruits, grain, butter, sugar, metals, petroleum, etc. Newcastle is the seat of a United States consul.

Newcastle dates from the Roman Pons Ælii—one of the chain of forts by which the wall of Hadrian was fortified. On the withdrawal of the Romans the deserted camp became the residence of a colony of monks, and the town was called Monkchester. Robert, eldest son of William the Conqueror, began to build a castle here in 1079 or 1080. Hence the modern name of Newcastle. William Rufus finished his brother's castle, surrounded the town with a wall, and gave the inhabitants special privileges. The present castle, which displays better than any other in England the genius of Norman military architecture, was erected by Henry II between the years 1172 and 1177. Newcastle, being made the rendezvous of the vast armaments which the first three Edwards led into Scotland, was in their time surrounded with new walls of unusual strength and magnitude; portions of them yet remain. During the Civil War it declared for the King and sustained a 10 months' siege by the Scots. The coal trade dates from the reign of Henry III. In 1615, 400 colliers cleared the port, one-half to supply London. Lords Stowel, Eldon, and Collingwood, Mark Akenside, and Hutton, the mathematician, were natives of Newcastle. Intimately connected with it, though not born in it, were Thomas Bewick, the engraver; Robert Morrison, the Chinese scholar; and George and Robert Stephenson. Pop., 1801, 28,400; 1851, 87,800; 1901, 247,023; 1911, 266,671. Consult D. B. Rendel, *Newcastle-on-Tyne: Its Municipal Origin and Growth* (London, 1898).

NEW CHURCH. See SWEDENBORGIANS.

NEWCHWANG, or **NIUCHWANG,** nu'-chwäng' (the cattle mart). One of the treaty ports of Manchuria, China, situated in the Province of Shingking, 10 miles from the mouth of the Liao River, which falls into the Gulf of Pechili, and on the southern branch of the Chinese Eastern Railway, which is now controlled by Japan, and which formerly was associated with the Russian Trans-Siberian system (Map: China, M 3). In commercial importance the port is a rival to Dairen (Dalny), but has not been so much favored by the Japanese as the latter. For a long time Newchwang was the port of entry for south Manchuria, and was without competition until the development of Dairen first by the Russians and later by the Japanese. The vicinity of Newchwang is not very productive agriculturally, but important coal mines have been opened along the railway line, and the city acquires additional importance from its railway connection with

Tientsin and Peking. The chief exports are beans, bean cake, and oil, which go largely to Japan, and also skins, mats, and cured fish. Imports consist mainly of cotton goods, petroleum, sugar, flour, coal, and matches. In 1913 foreign imports amounted to 16,050,514 hk. tls., native imports to 9,733,593 hk. tls., and net exports to 24,480,087 hk. tls.

Formerly Newchwang was situated at the mouth of the Liao River, but has retreated inland through the silting of the coast. Thus, what is commercially known as Newchwang is in reality the port of Yingkow, or Yingtse (also known as Port Newchwang), at the mouth of the Liao, population 61,000. This port of Newchwang, which has consular representatives, was taken by the Japanese in 1895, and was originally a part of the territorial concessions of China, but Japan was forced to relinquish it. During the Boxer uprising in 1900 Newchwang was occupied by Russia, from whom it was taken by the Japanese in 1904 during the Russo-Japanese War (q.v.). At present (1915) the Japanese have virtual control through their domination of the southern part of the Manchurian territory.

NEW COLLEGE. A college at Oxford, England, originally known as the College of St. Mary of Winchester. It was founded by William of Wykeham, Bishop of Winchester, and sometime Lord Chancellor of England, in 1379 for a warden, 70 fellows and scholars, 10 chaplains, 3 clerks, and 16 choristers. The college was but a part of Wykeham's plan, which included also the establishment of the famous school at Winchester, the first of the English public schools, from whose numbers the scholars of New College were to be chosen. To this new feature in English education was added also the beginning of a tutorial system in the college, by which the ordinary university instruction was supplemented by the work of the fellows of the college with the younger scholars. In the buildings of his college Wykeham founded the school of English college architecture, and the buildings remain to-day the finest of the early colleges. In every way this foundation was the most splendid of its time, but, owing chiefly to certain curious exemptions from university supervision in examinations (cf. King's College, Cambridge), it did not play the part that might have been expected of it during most of its history. Here Vitelli taught Grocyn Greek, and thus gave the college a very real connection with the new awakening. It is to-day, in scholarship and athletics, one of the leading colleges in Oxford. The establishment, as fixed by statutes of 1855 and 1881–82, consisted in 1912–13 of a warden, 32 fellows, 3 honorary fellows, 2 chaplains, 40 scholars, college officers, and a choir, with a total of some 300 undergraduates. The connection with Winchester School is still closely maintained. The buildings are of great beauty, particularly the hall and the chapel, with windows designed by Sir Joshua Reynolds, and an imposing tower. The gardens, which include in their limits part of the old city wall of Oxford, are among the most attractive in Oxford. The college presents to 40 livings. Among the worthies of New College have been Archbishop Chichele, founder of All Souls' College, Bishop Waynflete, founder of Magdalen College, Bishops Ken and Lowth, and Sydney Smith. See KING'S COLLEGE, Cambridge; OXFORD UNIVERSITY; WILLIAM OF WYKEHAM; WINCHESTER. Consult Rashdall and Rait, *New College* (London, 1911).

NEWCOMB, nū'kom, SIMON (1835–1909). An American astronomer and mathematician, born at Wallace, Nova Scotia, March 12, 1835. He was educated first in his father's school and came to the United States in 1853. A year afterward he began teaching in Maryland and in 1857 was appointed computer on the *Nautical Almanac* at Cambridge. Graduating at the Lawrence Scientific School, Harvard, in 1858, he spent three years there in further study and was then appointed professor of mathematics in the United States navy. He negotiated the contract for, and supervised the construction of, the 26-inch equatorial telescope at the Naval Observatory. He was secretary of the Transit of Venus Commission in 1871–74, observed the transit of Venus at the Cape of Good Hope in 1882, and directed several eclipse expeditions, beginning in 1860. In 1877 Newcomb became senior professor in the navy and director of the *Nautical Almanac*, a position which he held till he was retired for age in 1897. He was also professor of mathematics in Johns Hopkins University in 1884–94 and for many years editor of the *American Journal of Mathematics*. Newcomb's labors in investigation were prodigious. He developed formulæ for the construction of accurate lunar tables and made measurements relating to the major planets, the larger asteroids, and the planetary satellites. His conclusions were notable for accuracy and often for boldness, and his memoirs for the vigor and clarity of their style. Abroad, besides holding membership in many scientific societies, he was made an associate of the Institute of France, the first native American since Franklin to be so honored, Commander of the Legion of Honor, and Knight of the Prussian Order "Pour le Mérite." Some idea of the diversity of his interests may be gained from the fact that Newcomb served as president of the American Association for the Advancement of Science (1877), the Society for Psychical Research (1885–86), the American Mathematical Society (1897–98), and the Astronomical and Astrophysical Society of America (1899, 1905); as vice president of the National Academy of Sciences (1883–89); and as president of the Congress of Arts and Sciences at the St. Louis Exposition in 1904. He received the gold medal of the Royal Astronomical Society (1874), the Copley medal of the Royal Society (1890), and the first Bruce medal of the Astronomical Society of the Pacific; also numerous other distinctions at home and abroad, including degrees from 17 universities. Newcomb died at Washington, July 11, 1909, and received a military funeral, having been made rear admiral in 1906.

Among the more important of his 300-odd scientific memoirs, published mainly in the *Astronomical Papers of the American Ephemeris*, may be mentioned: "The Recurrence of Lunar Eclipses"; "A Transformation of Hansen's Lunar Theory"; "Development of the Perturbative Function and its Derivatives"; "On the Motion of Hyperion: A New Case in Celestial Mechanics." He also published: *Popular Astronomy* (1878), since translated into many foreign languages; *Astronomy for Schools and Colleges* (1880); with E. S. Holden, *Compendium of Spherical Astronomy* (1906); and numerous works of a similar character, on mathematics or astronomy, in general intended as

textbooks or for use by persons who desired comprehensive rather than detailed information. Much interested in economic questions, Newcomb wrote in this field: *A Critical Examination of our Financial Policy during the Southern Rebellion* (1865); *The A B C of Finance* (1877); *Principles of Political Economy* (1885); *A Plain Man's Talk on the Labor Question* (1886). He also wrote a novel, *His Wisdom the Defender* (1900). Consult his *Reminiscences of an Astronomer* (Boston, 1903) and Marcus Benjamin, in *Leading American Men of Science*, ed. by D. S. Jordan (New York, 1910).

NEWCOMBE, Frederick Charles (1858–). An American botanist. He was born at Flint, Mich., and graduated from the universities of Michigan (S.B., 1890) and Leipzig (Ph.D., 1893). He taught in the Michigan School for the Deaf in 1880–87, and at the University of Michigan he was instructor in botany (1890–92), assistant professor (1893–97), junior professor (1897–1905), and thereafter professor. He was president of the Michigan Academy of Science and of the Botanists of the Central States in 1906.

NEWCOMBE MEMORIAL COLLEGE. See Tulane University.

NEWCOMEN, nū-kŏm′en, Thomas (1663–1729). An English blacksmith, inventor of the atmospheric steam engine, considered the first combination of elements previously known into a true engine. He was born at Dartmouth and, it would seem, had addressed himself to the task of devising a practical engine before 1698, when Savery took out his patent. Possibly Newcomen had forged the larger parts of Savery's engine—they lived only 15 miles apart. But it is certain that Savery shared in the patent taken out by Newcomen about 1710. The part played by John Calley, who was more or less of a partner and assistant, is uncertain; probably he was a grazier who advanced Newcomen money. Newcomen's engine is described and pictured in a copper engraving dated 1719; it was a combination of preceding machines and an improvement on all of them, in that it was a complete change of type, the various elements of boiler, condenser, and engine pump being divided among so many separate parts, which, with the exception of the condenser (the present form of which is due to Watt), are essentially the same as those of the modern engine. Newcomen's was the first practical machine, and it was successfully and commonly used for pumping.

NEWCOMERSTOWN, nū-kŭm′ĕrz-toun. A town in Tuscarawas Co., Ohio, 85 miles east-northeast of Columbus, on the Erie Canal and on the Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads (Map: Ohio, H 5). It contains Mulvane's Free Park. The chief industrial establishments are pipe works, a file factory, clay works, and manufactories of brass and bricks. Coal and clay are found in the vicinity. Pop., 1900, 2659; 1910, 2943.

NEWCOMES, nū′komz, The. A novel by W. M. Thackeray (1854–55). The character of Colonel Newcome is one of the finest delineations of a simple-minded, pure-hearted gentleman in fiction, and is said to have been drawn from the author's stepfather, Colonel Smyth.

NEW CONNECTION METHODISTS. See Methodism.

NEW CONNECTION OF GENERAL BAPTISTS. See Baptists.

NEW CORINTH. See Corinth.

NEW CUM′BERLAND. A town and the county seat of Hancock Co., W. Va., 34 miles by rail north of Wheeling, on the Ohio River and on the Pittsburgh, Cincinnati, Chicago, and St. Louis Railroad (Map: West Virginia, D 1). It is chiefly engaged in the manufacture of fire and paving brick, sewer pipe, glassware, foundry and machine-shop products, and tiling, the adjacent region having valuable clay deposits. There are also coal mines and mills for the pulverization of fire clay for use in ironworks. Pop., 1900, 2198; 1910, 1807.

NEW DECATUR, dē-kā′tŭr. A city in Morgan Co., Ala., 81 miles north of Birmingham, on the Tennessee River, just above Decatur, and on the Louisville and Nashville Railroad (Map: Alabama, C 1). It is developing rapidly as an industrial centre, being noteworthy for iron manufactures. There are also important cottonseed-oil and lumber interests, railroad repair shops, and tanneries. New Decatur was settled in 1887 and was incorporated in 1889. Under a revised charter of 1899, the government is vested in a mayor, elected every two years, and a unicameral council. Pop., 1900, 4457; 1910, 6118.

NEWDIGATE, nū′dĭ-gāt, Sir Roger, fifth Baronet of Harefield and Arbury (1719–1806). An English patron of art and letters. He was educated at Westminster School and at University College, Oxford, served as a member of Parliament for Middlesex in 1741–47 and for Oxford in 1750–80, and was interested in collieries and in canal building. He made an extensive collection of ancient marbles, casts of statues, and vases. Two marble candelabra, found in Hadrian's Villa at Tivoli, were bought by Newdigate for £1800 and given to the Radcliffe Library, Oxford. In 1806 he established at Oxford the Newdigate prize of 21 guineas to encourage the writing of English verse.

NEW DONGOLA, dŏn′gō-lȧ. A town of the Egyptian Sudan. See El Ordeh.

NEWELL, nū′el, Frederick Haynes (1862–). An American hydrographer and irrigation engineer, born at Bradford, Pa. He graduated from Massachusetts Institute of Technology in 1885, and was afterward assistant hydraulic engineer (1888–90) and hydrographer (1890–1902) of the United States Geological Survey, and then served as chief engineer (1902–07) and as director after 1907 of the Reclamation Service. Newell became a member of the Land and Inland Waterways commissions. In 1907 he was president of the Washington Society of Engineers. His publications include: *Hydrography of the Arid Regions* (1891); *Agriculture by Irrigation* (1894); *The Public Lands and Their Water Supply* (1895); *Irrigation in the United States* (1902; rev. ed., 1906); *Hawaii: Its Natural Resources* (1909); *Principles of Irrigation Engineering* (1913).

NEWELL, Peter (Sheaf Hersey) (1862–). An American illustrator and writer, born in McDonough Co., Ill. He worked for a time as photographer and maker of crayon portraits in Jacksonville, Ill., and later studied at the Art Students' League in New York City. Afterward he settled at Leonia, N. J., and contributed constantly to various current publications. His work in flat tones was a later development of his original talent, and became very popular through the ingenious *Topsys and Turveys* (1893–94); *A Shadow Shown* (1896);

Peter Newell's Pictures and Rhymes (1899); *The Hole Book* (1908); *Jungle Jangle* (1909); *The Slant Book* (1910); *The Rocket Book* (1912)—volumes for which he furnished the text himself, and which display a thoroughly original humor and much quaintness of drawing. He also produced the clever and grotesque illustrations for John Kendrick Bangs's *House-Boat on the Styx, Pursuit of the House-Boat,* and *Mr. Munchausen;* Lee's *Tommy Toddles;* Stockton's *The Great Stone of Sardis;* Mark Twain's *Innocents Abroad;* and Lewis Carroll's *Alice in Wonderland* and *Through the Looking Glass.*

NEWELL, Robert Henry (1836–1901). An American humorist, born in New York. His reputation was made during the Civil War by newspaper sketches and letters over the name Orpheus C. Kerr (Office Seeker). These letters were collected in four volumes (1862–68). Newell also wrote romances and several volumes of verse. His humor lightened the toil of Lincoln, and it was genuine though not excellent.

NEW ENGLAND. The collective name of the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. It has an area of 67,384 square miles, and had a population, in 1910, of 6,552,681.

Leif Ericson is believed by many to have sailed along the coast of New England as early as 1000 A.D., and it is in New England that the mythical city, Norumbega (q.v.), is generally supposed to have been located. The coast seems to have been visited by Verrazano in 1524, and was to a considerable extent explored by Sir Humphrey Gilbert in 1583, by Gosnold in 1602, by Sir Martin Pring in 1603, and by George Weymouth in 1605. By the charter of 1606 the Plymouth Company was empowered to make settlements in what was then called North Virginia; but an attempt (1607), by a company under George Popham, to found a settlement on what is now the Maine coast, failed. In 1614 Capt. John Smith sailed along the coast, and also went for some distance inland up several of the rivers. He prepared a description of his voyage and a rough map of the coast, and suggested the name New England for the region. Beginning with 1620, when the Plymouth Colony was established in the present Massachusetts, settlers gradually came into New England, and in 1643 the colonies of Connecticut, New Haven, Massachusetts Bay, and Plymouth united to form a confederacy known as the United Colonies of New England, the first attempt at federation made in America. Each colony was to choose two commissioners, and the eight commissioners thus chosen were to hold annual sessions at Boston, Hartford, New Haven, and Plymouth, and were to take action with reference to various matters of common interest to the four colonies. In 1663 the meetings became triennial. Meetings were held as late as 1684, though in the last years little was accomplished. Of the present New England States, Connecticut resulted from the union of the colonies of Connecticut and New Haven, and Massachusetts from the union of the colonies of Massachusetts Bay and Plymouth; while both New Hampshire and Maine were originally under the jurisdiction of Massachusetts, Maine not receiving a separate organization until 1820. See articles on the States and United States.

NEW ENGLAND HISTORIC-GENEALOGICAL SOCIETY, The. An association incorporated in 1845 in Boston, Mass., for historical research in regard to the family histories of the early settlers in New England and the collection of old records. The society began the collection of a library which now contains 40,000 volumes and as many pamphlets, and has also a collection of relics and curios, manuscripts, and many old portraits and oil paintings. It now has a membership of 1000, and holds monthly meetings. In 1847 the society began the publication of a quarterly magazine, the *New England Historical and Genealogical Register,* for circulation among its members, giving the proceedings and necrology of the society, and is now publishing *Vital Records of Massachusetts Towns* to 1850.

NEW ENGLAND ORDER OF PROTECTION. See Protection, New England Order of.

NEW ENGLAND PRIMER, The. One of the most famous schoolbooks in the history of education. Yet it is uncertain when it first appeared, and of the 2,000,000 copies that it is reasonable to suppose were printed and sold in the eighteenth century, less than 50 survive, representing, however, some 40 editions. Much has been done to clear up the bibliography of the work by Paul Leicester Ford in *The New England Primer: A History of its Origin and Development, with a Reprint of the Unique Copy of the Earliest Known Edition, and Many Facsimile Illustrations and Reproductions* (New York, 1897). The compiler of the work was shown by Ford to have been Benjamin Harris, an English printer and rhymester, who during the reign of James II came to Boston. Here some time before 1690 he first issued the *Primer,* an abridgment of another compilation, *The Protestant Tutor.* A fragment of this first edition, or of a second, soon after, was found used as waste in the binding of a book printed in 1688, and is known as "The Bradford Fragment." The *Primer* was changed from time to time to suit not only religious but political feeling. The most familiar quotation from the *New England Primer* is doubtless the nursery prayer, "Now I Lay me Down to Sleep." The *Primer* was "embellished" by crude cuts which have today an exceedingly quaint aspect. The composition of its different editions varies greatly. The earliest is thus made up: (1) Title; (2) Godly Admonitions; (3) Alphabet and Syllabary; (4) Rhymed Alphabet; (5) The Dutiful Child's Promises; (6) An Alphabet of Lessons, Texts of Scripture; (7) Choice Sentences; (8) The Lord's Prayer, Creed, and Ten Commandments; (9) The Duty of Children, Texts; (10) Hortatory Verses; (11) Names in Order of Biblical Books; (12) Roman and Arabic Numerals from 1 to 100; (13) John Rogers' Exhortation to his Children; (14) The Shorter Catechism. Some of the more noteworthy features of other editions are the following: John Cotton's "Spiritual Milk for American Babes," a still shorter catechism, and a "Dialogue between Christ, Youth, and the Devil." A reprint of the *Primer* (Albany, 1899) is easily accessible.

NEW ENGLAND THEOLOGY. The name given to a distinct school of Calvinistic theology, originating in New England, and characterized by modifications of the older theology in respect to the nature of God; the freedom, ability, and responsibility of man; the nature of moral action; and the constitutive principle of virtue.

The school arose in an effort to make of Calvinism "a theology that could be preached," and to ground doctrine upon reason. The originator of the school was Jonathan Edwards (q.v.). With Edwards and his immediate successors the general aim was to combat Arminianism. In 1770 John Murray (q.v.) arrived in New England and began to preach Universalism. (See UNIVERSALISM.) The early decades of the nineteenth century were occupied with the Unitarian controversy and with discussion of the teachings of Dr. Taylor, of New Haven, particularly concerning sin, depravity, and regeneration. The outcome was the adoption of the principles which have since been known as the New England theology, and which may be stated in the propositions that all sin is voluntary; that through the connection with Adam there is in man a sinful propensity which renders it certain that every man will sin from the beginning of moral action; that, though man has complete freedom of will, as a fact, he never turns to God without the previous regenerating operation of the Holy Spirit, which persuasively turns him to repentance and holiness; that holiness is disinterested love; that election is the choice, for reasons lying in the knowledge of God alone, of certain persons, without regard to their own merits, as the recipients of such gracious influence as shall certainly secure their repentance. During the past half century theological thought in New England, as elsewhere, has been profoundly influenced by German philosophy and historical criticism and by the theory of evolution. As a consequence the New England theology as a distinct school has become a thing of the past, and the unmodified doctrines of the older leaders are no longer taught in the Congregational seminaries. Attention has passed from the subjects which this theology considered central. Among those prominent in developing and defending the teachings of the school, after Edwards (1703–58), may be mentioned: Joseph Bellamy (1719–90); Samuel Hopkins (1721–1803); Jonathan Edwards, the Younger (1745–1801); Stephen West (1735–1819); Samuel West (1730–1807); Nathaniel Emmons (1745–1801); Timothy Dwight (1752–1817); Nathaniel W. Taylor (1786–1858); Leonard Woods (1774–1854); Moses Stuart (1780–1852); Edwards A. Park (1808–1900); Henry B. Smith (1815–76); Horace Bushnell (1802–76); Samuel Harris (1814–99). Consult: Williston Walker, *History of the Congregational Churches in the United States* (New York, 1894); G. P. Fisher, *History of Christian Doctrine* (ib., 1896); G. N. Boardman, *History of New England Theology* (ib., 1899); F. H. Foster, *A Genetic History of the New England Theology* (Chicago, 1907). See also CONGREGATIONALISM; and the biographical notices of the leaders.

NEW FOREST. A forest region in the southwestern part of Hampshire, England, with an area of 92,365 acres (Map: England, E 6). It dates from the Norman Conquest, when the district was afforested and protected by severe laws by William the Conqueror. It is a crown possession managed by the Court of Verderers as a public pleasure ground. It is a favorite resort of artists. Consult C. J. Cornish, *The New Forest* (London, 1905).